HARRIS-GALVESTON SUBSIDENCE DISTRICT

# 2022 ANNUAL GROUNDWATER REPORT

## Determination of Groundwater Withdrawal and Subsidence in Harris and Galveston Counties

by Ashley Greuter, P.G.

Harris-Galveston Subsidence District Report 2023-01

Harris-Galveston Subsidence District
1660 West Bay Area Boulevard | Friendswood, Texas 77546
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# MICHAEL J. TURCO

## GENERAL MANAGER

The Harris-Galveston Subsidence District (District) has monitored water use, groundwater levels, and subsidence in Harris, Galveston, and adjacent counties since 1975. Subsidence, the lowering of land-surface elevation, is caused by the depressurization of our aquifers due to the widespread use of groundwater as a primary water source. The mission of the District is to cease ongoing subsidence and prevent the occurrence of future subsidence. As part of this effort, it is important for the District to provide consistent, high-quality information to the public regarding groundwater use, aquifer water levels, and subsidence.

The information contained within this report is the compilation of the largest multi-agency effort in the State of Texas that leverages the resources of both the Harris-Galveston and Fort Bend Subsidence Districts with the City of Houston, the U.S. Geological Survey, the Brazoria County Groundwater Conservation District, and the Lone Star Groundwater Conservation District. This year, this multi-agency partnership will publish the 47th volume of this important data compilation. This report is intended to exceed the requirements of section 8801.117 of the District's enabling legislation.

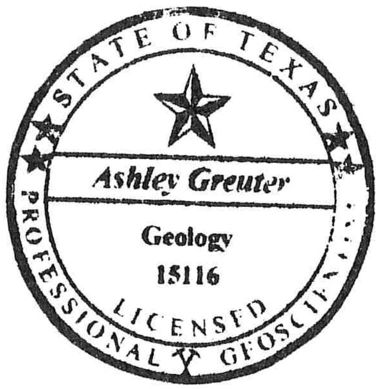
On behalf of the Harris-Galveston Subsidence District Board of Directors, I would like to thank you for your interest in the District. We look forward to continuing to provide timely, accurate, high-quality data and research to inform the District's Regulatory Planning efforts to prevent subsidence and water planning throughout the region.

Sincerely,

Michael J. Turco
General Manager

# Professional Geoscientist Seal

The contents of this report (including figures and tables) document the work of the following Licensed Professional Geoscientist:




**Ashley Greuter, P.G. No. 15116**

Ms. Greuter was responsible for working on all aspects of the climate, water use, and subsidence sections of the report, including the preparation of report figures, tables, and written text. The groundwater level data collection and interpretations were performed by the USGS and are included in the report for informational purposes. The subsidence data were processed and analyzed by Dr. Guoquan Wang at the University of Houston.

Ashley Greuter

Signature

May 11, 2023

Date

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## Acknowledgements

The compilation of the data and analysis contained within this report would not be possible without the concerted effort of many that contributed to the 2022 Annual Groundwater Report. The author would like to thank the staff of the Harris-Galveston Subsidence District for their diligent field work in collecting GPS data, as well as Veronica Osegueda, Ronald Geesing, Brian Ladd, Vanson Truong, Karimah Hasan, Ana Ruiz, and Stephanie Lafranca (Harris-Galveston Subsidence District) for their processing of water use data; Dr. Guoquan Wang (University of Houston) and his students for processing and archiving raw GPS data; and the engineers, staff, and owners of over 8,600 actively permitted wells in the District that submitted detailed water use information contained in this report.



| | |
|---|---|
| Public Hearing Notice was posted on: | March 08, 2023 |
| Draft Presentation Posted on District Website on: | April 26, 2023 |
| Public hearing held on: | April 27, 2023 |
| Hearing Examiner: | Ms. Helen Truscott |
| Hearing Record held open for public comment until: | May 5, 2023 |
| Approved by the Board of Directors: | May 10, 2023 |

## Conversions Factors and Datums

| Multiply | By | To obtain |
|---:|---:|---|
| inch (in) | 2.54 | centimeter (cm) |
| foot (ft) | 0.305 | meter (m) |
| mile (mi) | 1.61 | kilometer (km) |
| square mile ($mi^2$) | 2.59 | square kilometer ($km^2$) |
| gallon (gal) | 3.785 | liter (L) |
| million gallons per day (MGD) | 3785.41 | cubic meter ($m^3$) |
| million gallons per day (MGD) | 3.0688 | acre-feet (acre-ft) |

## List of Acronyms

| | |
|---|---|
| BCGCD | Brazoria County Groundwater Conservation District |
| CORS | continuously operating reference station |
| FBSD | Fort Bend Subsidence District |
| GNSS | global navigation satellite system |
| GPS | global positioning system |
| GRP | groundwater reduction plan |
| HGSD | Harris-Galveston Subsidence District |
| LSGCD | Lone Star Groundwater Conservation District |
| MGD | million gallons per day |
| NGS | National Geodetic Survey |
| NOAA | National Oceanic and Atmospheric Administration |
| NWS | National Weather Service |
| PAM | periodically measured station |
| POR | period of record |
| TxDOT | Texas Department of Transportation |
| UH | University of Houston |
| USGS | United States Geological Survey |

# Executive Summary

Groundwater was the primary source of water for municipal, agricultural, and industrial users over the last century. The rapid increase in population in the 1950s, due to the expansion of the industrial complex in the Houston Ship Channel area, led to a dramatic increase in water demand and groundwater withdrawal. The reliance on groundwater and subsequent subsidence that was caused by its regional development resulted in the creation of the Harris-Galveston Subsidence District (District) in 1975. The District's mission is to regulate the use of groundwater in Harris and Galveston counties to minimize subsidence that can cause infrastructure damage and contribute to flooding.

This report comprises the 47th Annual Groundwater Report for the District. Pursuant to District Resolution No. 2023-1098 passed on February 8, 2023, the Board of Directors held a public hearing at 9:00 a.m. on April 27, 2023, to present climatic conditions, groundwater use, groundwater levels and measured subsidence within the District through December 31, 2022. This report provides an overview of the information presented during the Public Hearing.

## Climate

Annual variations in precipitation can significantly impact the total water demand in the District. Groundwater use patterns fluctuate during periods of climatic variation, which results in changes in aquifer water levels and, potentially, in subsidence rates. During periods of excessive rainfall, total water demand can decline; conversely, during periods of drought, water use can increase, resulting in declining water levels in the aquifer and increased rates of subsidence. The 2022 calendar year began with below normal rainfall for seven (7) out of eight (8) National Weather Service (NWS) climate stations analyzed for the region. The year progressed with all stations recording below the 1991-2020 average normal precipitation and worsened in the summer months, where an exceptional drought was classified for the region. All climate stations ended 2022 with rainfall accumulations below normal for with some stations measuring over 20 inches below normal, marking a sharp change in rainfall from previous years where rainfall was near to above normal.

## Water Use

Since 1976, water users in the District have been working to change their primary source of water from groundwater to alternative sources of water (primarily treated surface water) as required by the District regulatory plan to prevent subsidence. The percentage of total water demand sourced from groundwater has decreased from about 60 percent in 1976 to about 24 percent in 2022. Most of the current groundwater use occurs in Regulatory Area Three, where the regulatory compliance timeline will not be completed until 2035. The three primary water uses in the District are public supply, industrial, and irrigation. The overall groundwater use within the District in 2022 is 252.9 MGD, which is a 24 percent increase in pumpage from 2021. Groundwater used for public supply remains the largest single-use category at 231.63 million gallons per day (MGD), a 24 percent increase from 2021, and accounts for approximately 92 percent of groundwater used in the District.

The District's Regulatory Plan requires permittees to convert to alternative water supplies in order to reduce their reliance on groundwater. The primary alternative water supply used in our region is treated surface water sourced from three river basins: the Brazos River Basin, the San

Jacinto River Basin and the Trinity River Basin. In 2022, the total alternative water use was 810.6 MGD, with the Trinity River remaining the single largest source of alternative water providing a total of 546.2 MGD in surface water supply. Groundwater remains the second largest source of water supply within the District as a whole. The total water use for the District was 1,063.5 MGD in 2022, which is approximately 8 percent higher than the reported water use in 2021.

## Groundwater Levels

Annually, since 1975, the United States Geological Survey (USGS) has measured the water level in hundreds of wells throughout the Houston region in cooperation with the District through a joint funding agreement along with additional cities, subsidence districts and groundwater conservation districts. These data are used to monitor the groundwater level altitude data for the Chicot/Evangeline and Jasper Aquifers and evaluate the temporal change in water level. Since aquifer water level is the best measure of the pressure in the aquifer, this information is also of vital importance to understanding the impact of changes in water use on subsidence.

The change in water level in the Chicot and Evangeline (undifferentiated) aquifers since 1977 clearly shows the impact of District regulation on the aquifers. Generally, Regulatory Areas One and Two have seen a significant rise in the potentiometric water level over 200 feet (60 meters) in the Chicot and Evangeline (undifferentiated) aquifers. The highest historical water level rises were measured in the Houston Ship Channel. The area of rise is a result of the reduction of groundwater use required by the District's Regulatory Plan. Conversely, in Regulatory Area Three, water levels continue to be significantly lower than the historical benchmark, declines of over 200 feet (60 meters) in the Chicot and Evangeline (undifferentiated) aquifers. These areas are growing rapidly and the conversion to alternative sources of water will not be completed in the District until 2035. The highest historical water level declines were measured in southern Montgomery County, with over 350 feet (106 meters) around The Woodlands.

## Subsidence

Since the 1990s, the District has utilized global positioning system (GPS) technology to monitor land surface deformation in the area. Working collaboratively with University of Houston researchers, the subsidence monitoring network has grown to over 230 GPS stations throughout the region. These stations are operated by the District, the Fort Bend Subsidence District (FBSD), the University of Houston (UH), the Lone Star Groundwater Conservation District (LSGCD), the Brazoria County Groundwater Conservation District (BCGCD), Texas Department of Transportation (TxDOT), and other local entities.

The average annual rate of vertical movement is a useful measure to show current conditions at a GPS station. The annual rates of subsidence observed in Regulatory Areas One and Two are stable, since both areas have reached their full regulatory conversion level (1990 and 2002, respectively), and Chicot/Evangeline water levels have risen. Subsidence rates are generally above 0.5 centimeters (cm) per year throughout Regulatory Area Three, as groundwater is still the primary water source in this area, and groundwater levels are significantly below the historical benchmarks. Regulatory Area Three is actively developing water infrastructure to reduce groundwater use in those areas by 2025 and 2035, as specified in the District Regulatory Plan. The highest subsidence rates were measured at GPS stations in Katy, with over two (2) centimeters per year.

# Introduction

The Houston region has relied on groundwater as a primary source of water since the early 1900s. During and following the economic boom of the 1940s, rapid population expansion and increased water use resulted in potentiometric water level declines in the Chicot and Evangeline Aquifers of 250 and 300 feet (76 and 91 meters), respectively from 1943 to 1977 (Gabrysch, 1982) The potentiometric surface is the level to which water rises in a well. In a confined aquifer, this surface is above the top of the aquifer unit; whereas, in an unconfined aquifer, it is the same as the water table.

The reliance on groundwater and subsequent subsidence that was caused by regional development resulted in the creation of the Harris-Galveston Subsidence District (District) in 1975 and the Fort Bend Subsidence District in 1989. The District's mission is to regulate the use of groundwater in Harris and Galveston counties in order to cease ongoing and prevent future subsidence that can contribute to flooding, faulting, and lead to infrastructure damage.

## Purpose of Report

This document comprises the 47th Annual Groundwater Report for the District. Pursuant to District Resolution No. 2023-1098, passed on February 8, 2023, the Board of Directors held the Annual Groundwater Hearing beginning at 9:00 a.m. on April 27, 2023. The public hearing was held at the District office and also offered virtually for viewing purposes only. The public hearing fulfills the requirements of Section 8801.117, Texas Special Districts Local Laws Code, which states that each year, the Board of Directors shall hold a public hearing for the purpose of taking testimony concerning the effects of groundwater withdrawals on the subsidence of land within the District during the preceding year.

The hearing was attended by 17 people, which includes both in-person and virtual participants, registered for the hearing, including members of the USGS staff, members of the District's staff, one Director, representatives from regional water authorities, and the public. Those giving testimony were Ms. Ashley Greuter, Director of Research and Water Conservation, of the District and Mr. Jason Ramage, Hydrologist, Gulf Coast Programs Office, Texas-Oklahoma Water Science Center, of the United States Geological Survey (USGS), Department of the Interior. Ms. Greuter submitted 15 exhibits, including topics of precipitation, groundwater withdrawal, alternative water usage, and subsidence measurements. Mr. Ramage presented 16 exhibits, including topics of water level altitudes, water level changes, and aquifer compaction. The record for testimony and public comment was open from April 28 through May 5, 2023. No testimony or public comments were received.

This report provides a general description of the District, which includes hydrogeology, alternative water sources, and regulatory planning, as well as an overview of the information presented during the Public Hearing, including climatic conditions, reported groundwater use, groundwater levels and measured subsidence within the District from January 1, 2022, through December 31, 2022. **Appendix A** of this report includes the exhibits presented at the public hearing held on April 27, 2023.

# Description of the Study Area

The following section provides an overview of the study area, including the hydrogeology and an overview of the District's regulatory planning areas.

## Hydrogeology

The Gulf Coast Aquifer exists as an accretionary wedge of unconsolidated sediments composed primarily of sand, silt, and clay. Indicative of a transgressive-regressive shoreline, the interbedded sands and clays are not horizontally or vertically continuous at larger than a local scale. From youngest to oldest, these hydrogeologic units include the Chicot, Evangeline, Burkeville Confining Unit, Jasper, and Catahoula Sandstone aquifers.

The three-primary water-bearing units located within the District include the Chicot, Evangeline, and Jasper Aquifers. The Chicot and the Evangeline Aquifers comprise the shallow system of aquifers. These aquifers are hydrologically connected, allowing for the free flow of water between the two units. Historically, nearly all of the groundwater production in the Gulf Coast Aquifer System in the District occurred in the shallow system. The Jasper Aquifer is the deepest of the three primary water-bearing units and is isolated by the regionally persistent Burkeville confining unit. In the region, the Catahoula Sandstone, the deepest water-bearing unit in the Gulf Coast Aquifer System and the Burkeville confining unit are utilized as a groundwater supply in areas to the north and west of the District where these units may produce appreciable amounts of water.

Most of the subsidence that has occurred in the District can be sourced to clay compaction in the shallow water-bearing units associated with long-term water use and the decline in the aquifers' potentiometric surface. Because of the significant amount of clay material in the primary water-bearing units of the aquifer, the risk of compaction is high in areas where the developed portions of the aquifers are within about 2,000 feet of land surface under high stress from groundwater development and have had sustained potentiometric water level declines (Yu, et al., 2014).

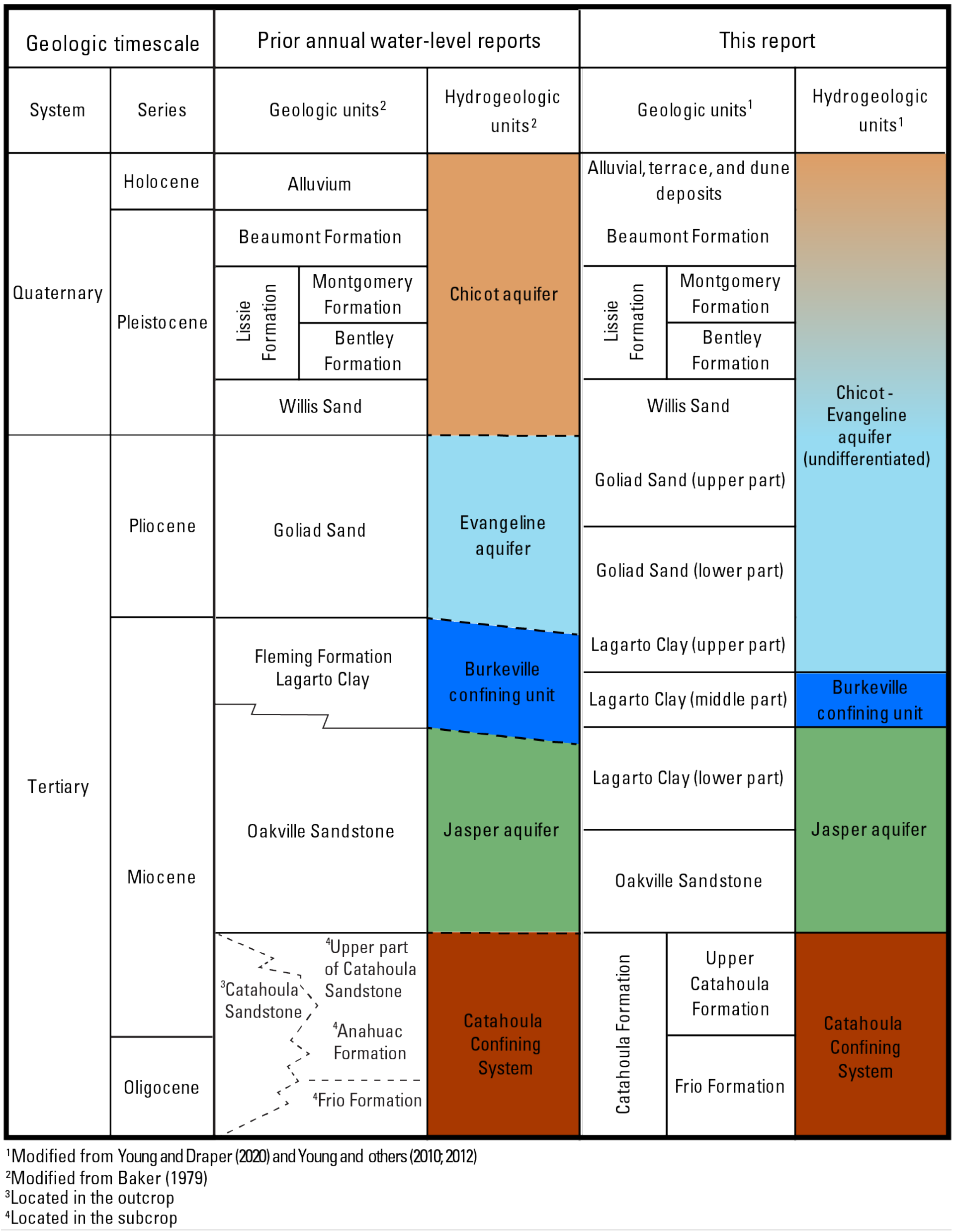



**Figure 1.** Updated stratigraphic column of the Gulf Coast Aquifer System in Harris and adjacent counties, Texas (Source: Ramage et al., 2022).

## Surficial Hydrology

The District's Regulatory Plan requires permittees to convert to alternative water supplies in order to reduce their reliance on groundwater sources. The primary alternative water supplies used in the Houston region is surface water sourced from three (3) main river basins: the Brazos River Basin, the San Jacinto River Basin and the Trinity River Basin (**Figure 2**).

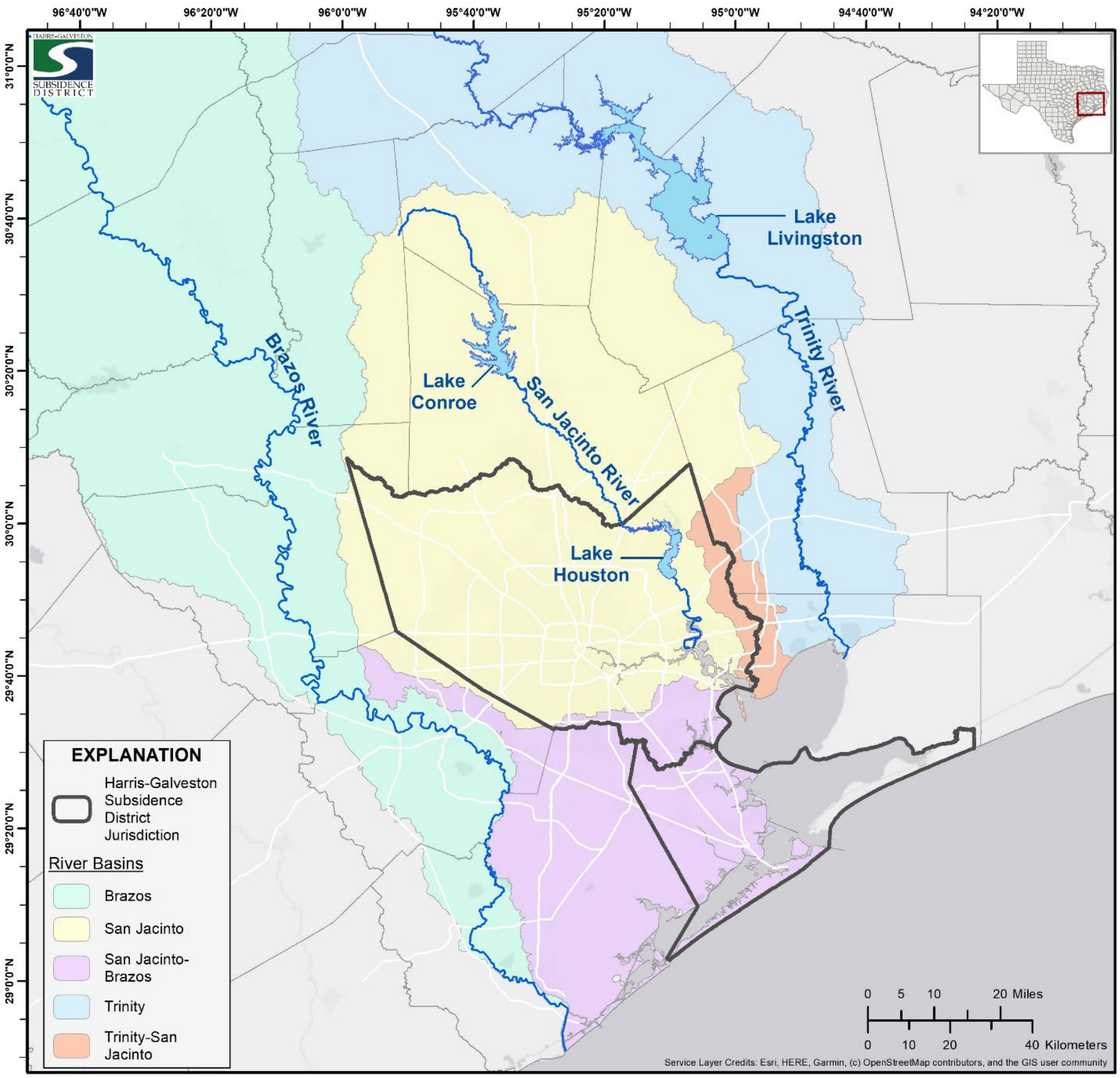



**Figure 2**: River basins that supply alternative water to Harris and Galveston counties, Texas.

The Brazos River Basin is the second largest river basin in Texas, covering over 45,000 square miles (116,550 sq km) (TWDB, 2020). The headwaters of the Brazos River are located near the Texas-New Mexico border and the river travels over 800 miles (1,287 km) to discharge into the Gulf of Mexico near Freeport, Texas. The Brazos River Authority manages the 11 reservoirs within this basin, eight of which are owned by the Brazos River Authority and three are owned by the U.S. Army Corps of Engineers (Region H Water Planning Group, 2016).

The San Jacinto River Basin is the smallest river basin in Texas, covering almost 4,000 square miles (10,360 sq. km) according to Texas Water Development Board (2020). Lake Conroe and Lake Houston are the two (2) water supply reservoirs located within the San Jacinto River Basin. Lake Conroe is jointly owned by the City of Houston and the San Jacinto River Authority.

The San Jacinto River Authority operates Lake Conroe and provides water supply to Harris and Montgomery Counties. Lake Houston is owned by the City of Houston and operated by the Coastal Water Authority.

The Trinity River Basin covers almost 18,000 square miles (46,619 sq. km), with headwaters of the basin located in north central Texas (TWDB, 2020). The Trinity River flows through the Dallas-Fort Worth metroplex, traversing 550 miles (885 km) until the river discharges into Trinity Bay near Anahuac, Texas. There are numerous reservoirs located on the Trinity River that are owned and operated by several different agencies, including Lake Livingston, which is owned and operated by the Trinity River Authority.

## Alternative Source Waters

In the 1950s, the City of Houston along with other entities in the region began the development of several water supply reservoirs within the San Jacinto and Trinity River Basins to provide water for the rapidly growing region. Today, water treatment plants served by these surface water sources and the Brazos River Basin are operated by the City of Houston, the City of Sugar Land, the City of Richmond, the Gulf Coast Water Authority, the Brazosport Water Authority, and others.

To meet the Harris-Galveston and Fort Bend Subsidence Districts' regulatory requirements to convert from groundwater to surface water, the City of Houston and four regional water authorities—the Central Harris County Regional Water Authority, North Fort Bend Water Authority, North Harris County Regional Water Authority, West Harris County Regional Water Authority, and Coastal Water Authority (collectively, the Water Authorities) – began working together to plan, design, finance, and construct several major infrastructure projects.

Four projects are underway to develop the necessary alternative water supply and distribution infrastructure to facilitate the District's future conversion requirements (**Figure 3**):

- Luce Bayou Interbasin Transfer: will pump untreated surface water from the Trinity River through a series of canals and water pipelines along Luce Bayou to Lake Houston.
- Northeast Water Purification Plant Expansion: will expand the existing surface water treatment plant located on Lake Houston from 80 MGD up to 320 MGD, in order to treat the raw surface water conveyed by the Luce Bayou Interbasin Transfer project.
- Northeast Transmission Line Project: will provide for the conveyance of the additional treated surface water from Lake Houston into central and northern Harris County.
- The Surface Water Supply Project: will convey treated water from the expanded Northeast Water Purification Plant into western Harris County and northeastern Fort Bend County.

In addition to the four projects described above, the City of Houston and the Water Authorities are each designing and constructing their own distribution systems to convey the treated surface water to their customers. These interrelated regional projects are planned to be completed by 2025, when the next conversion requirements go into effect.

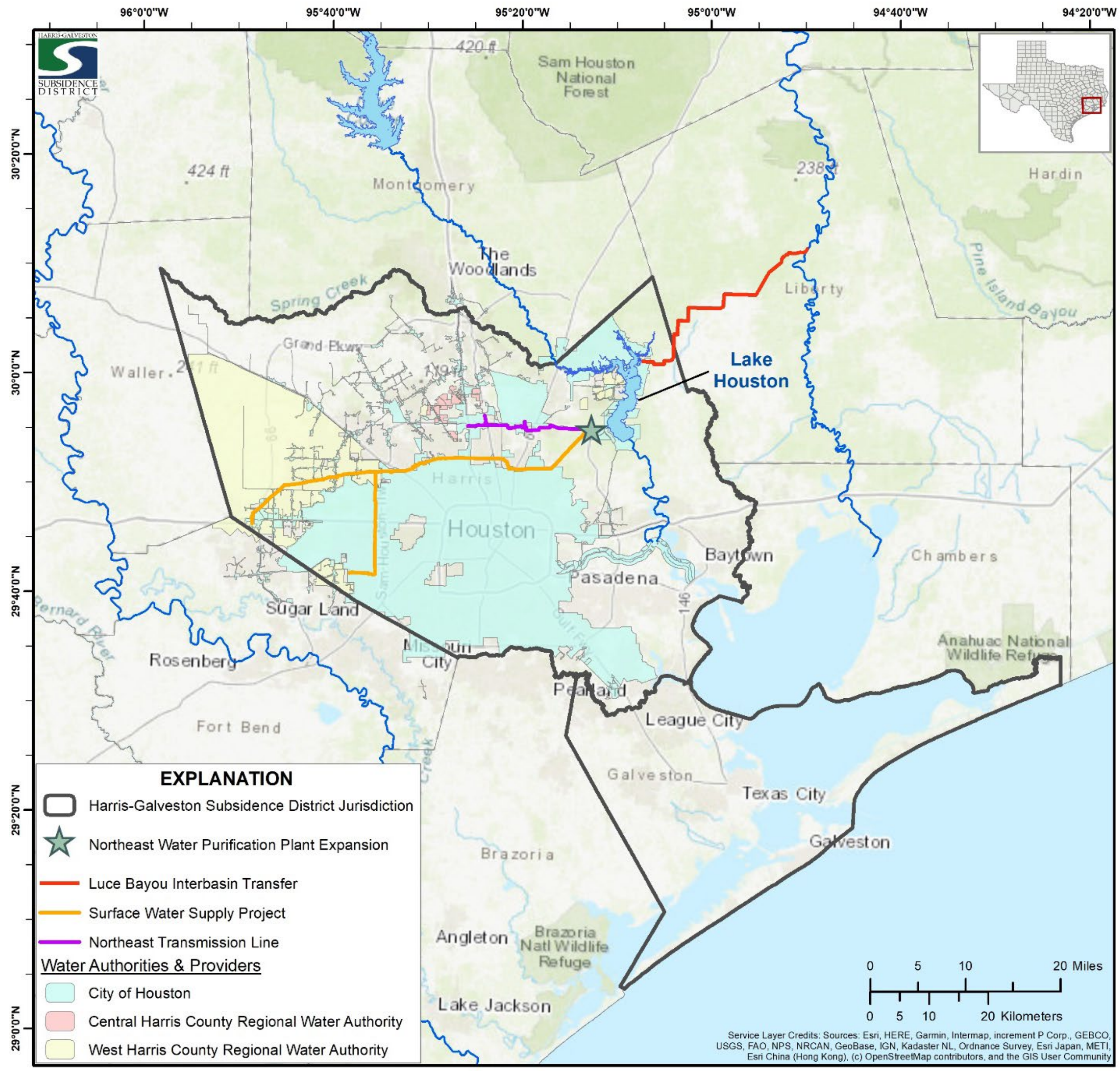



**Figure 3:** Alternative water supply and infrastructure distribution projects in the greater Houston region.

## Regulatory Planning

The District's Regulatory Plan was developed to reduce groundwater withdrawal to a level that ceases ongoing subsidence and prevents future subsidence within the District. The District utilizes a novel approach to regulate groundwater withdrawal in order to prevent subsidence by allowing a portion of the total water demand of a water user to be sourced from groundwater. Total water demand is defined as the total amount of water used by an entity from all sources including groundwater, treated surface water, reclaimed water, etc. The District adopted the most recent Regulatory Plan on January 9, 2013, and it was subsequently amended on May 08, 2013 and April 14, 2021 (Harris-Galveston Subsidence District, Amended 2021).

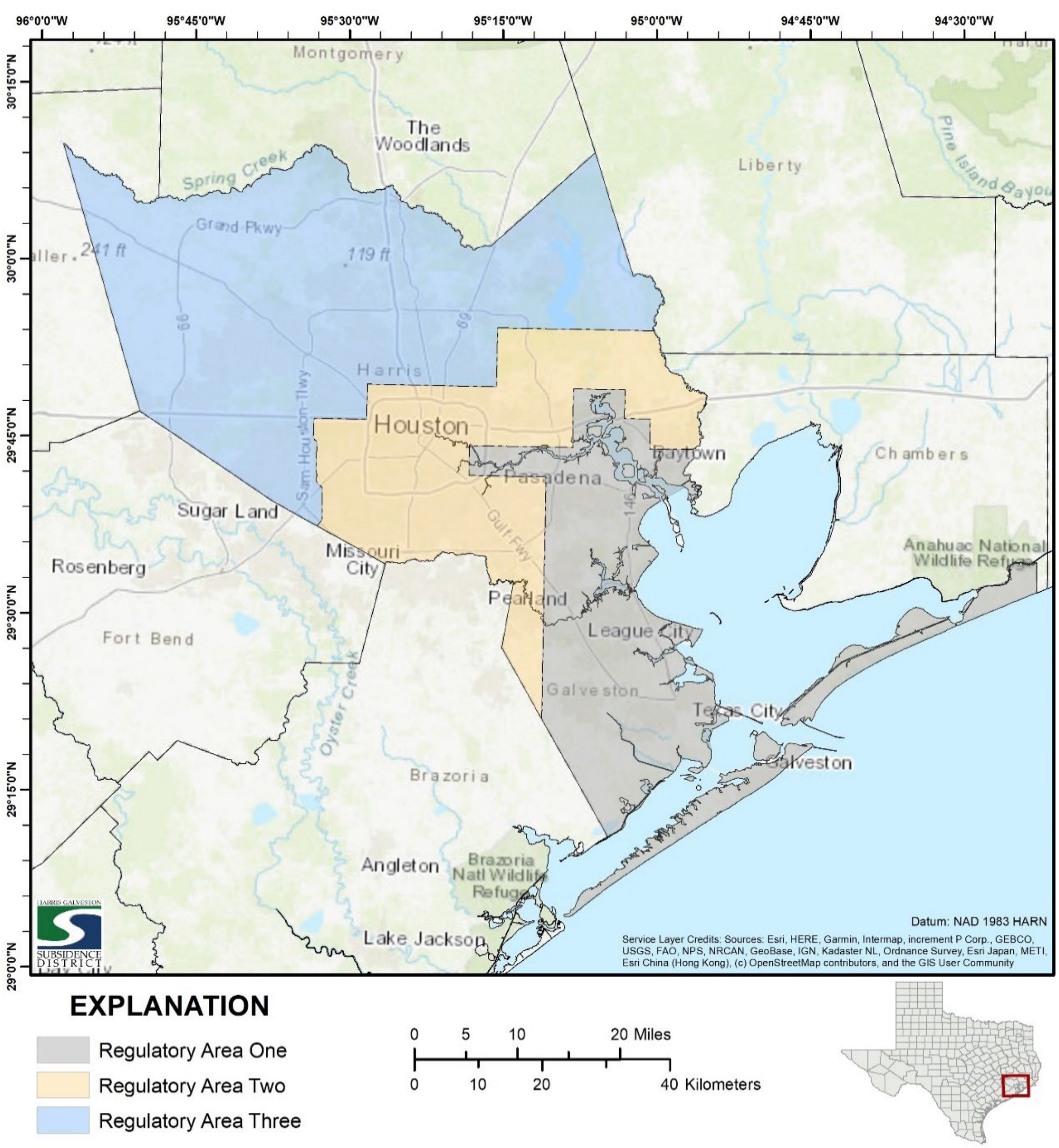



**Figure 4.** Location of the Harris-Galveston Subsidence District Regulatory Areas.

The District has historically used regulatory areas to guide groundwater conversion deadlines and regulations. The 2013 Regulatory Plan has subdivided Harris and Galveston counties into three regulatory areas (**Figure 4**). Regulatory Area One includes the Houston Ship Channel, Industrial Corridor, and coastal areas of Galveston and Harris Counties. Regulatory Area Two is primarily an urban intermediate area that includes downtown, the Texas Medical Center, and parts of eastern Harris County. Regulatory Area Three covers the remaining areas of the District in northern and western Harris County.

Permittees in Regulatory Area One are required to have no more than 10% of their total water demand come from groundwater sources. Permittees in Regulatory Area Two must have no more than 20% of their total water demand come from groundwater sources. Reduction in groundwater use for both Regulatory Area One and Two began once the District was created in 1975, and by 1990 most of those areas had been fully converted to using alternative sources of water.

Regulatory Area Three is still undergoing conversion from groundwater to surface water sources. This area completed its first conversion in 2010, reducing groundwater use from 100% to 70% of total water demand. The District's Regulatory Plan allows permittees with more than ten million gallons per year of total water demand the option to establish groundwater reduction plans (GRPs) that provide a phased approach to conversion in Area Three with additional conditions in Area Two. For those permittees operating under a GRP in Area Three, permittees are required to adhere to the following future conversion deadlines:

- In 2025, groundwater withdrawals must not comprise more than 40 percent of the permittee's total water demand.
- In 2035, groundwater withdrawals must not comprise more than 20 percent of the permittee's total water demand.

All other permittees in Regulatory Area Three (i.e., those without GRPs) are required to reduce their groundwater withdrawals so that no more than 20 percent of their total water demand was sourced from groundwater.

# 2022 Climate Summary

The District reviews local climatic data provided by the National Oceanic and Atmospheric Administration (NOAA) – National Weather Service (NWS) climate stations within and adjacent to the District boundary (**Figure 6**). Variation in local precipitation, specifically deviation from historical normal, is important to the District because it directly impacts the magnitude of the total water demand from water users in the region and the availability of alternative water supplies, such as surface water.

During periods of above normal precipitation in the region, total water demand remains typically near normal or below normal due to reduced municipal and agricultural water uses. Conversely, during periods of below normal precipitation, the total water demand of the region will typically increase due to increased water use. Additionally, during prolonged periods of below normal precipitation, natural limitations on alternative supplies may require additional groundwater use and subsequently result in additional lowering of groundwater levels, compaction of the aquifer materials, and subsidence observed at land surface.

As shown in **Figure 5**, precipitation throughout 2022 is marked by below normal rainfall for the majority of NWS climate stations analyzed. The cumulative precipitation departure from 1991-2020 normal precipitation is referenced against each NWS climate station displayed in **Figure 5**.

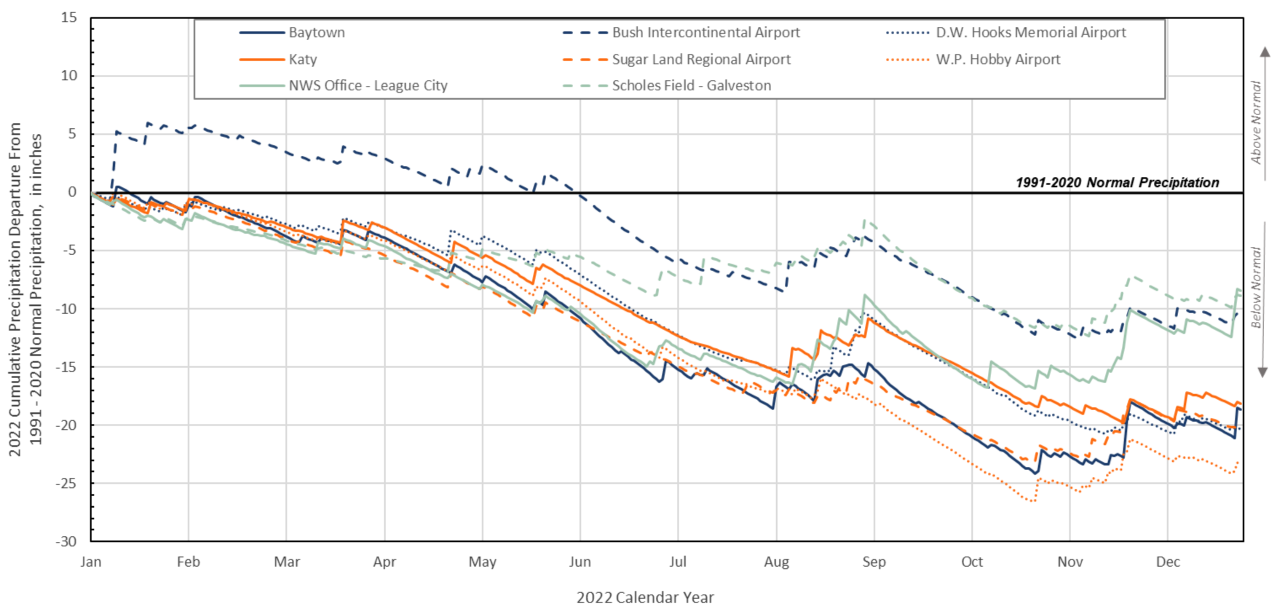



**Figure 5.** Cumulative precipitation departure, in inches, from 1991-2020 normal precipitation (sourced from https://www.ncei.noaa.gov/data/normals-daily/1991-2020/access/) at selected NOAA-NWS Climate Stations in the Houston region. Individual climate station data are sourced from NOWData – NOAA Online Weather Data accessed via https://www.weather.gov/wrh/Climate?wfo=hgx.

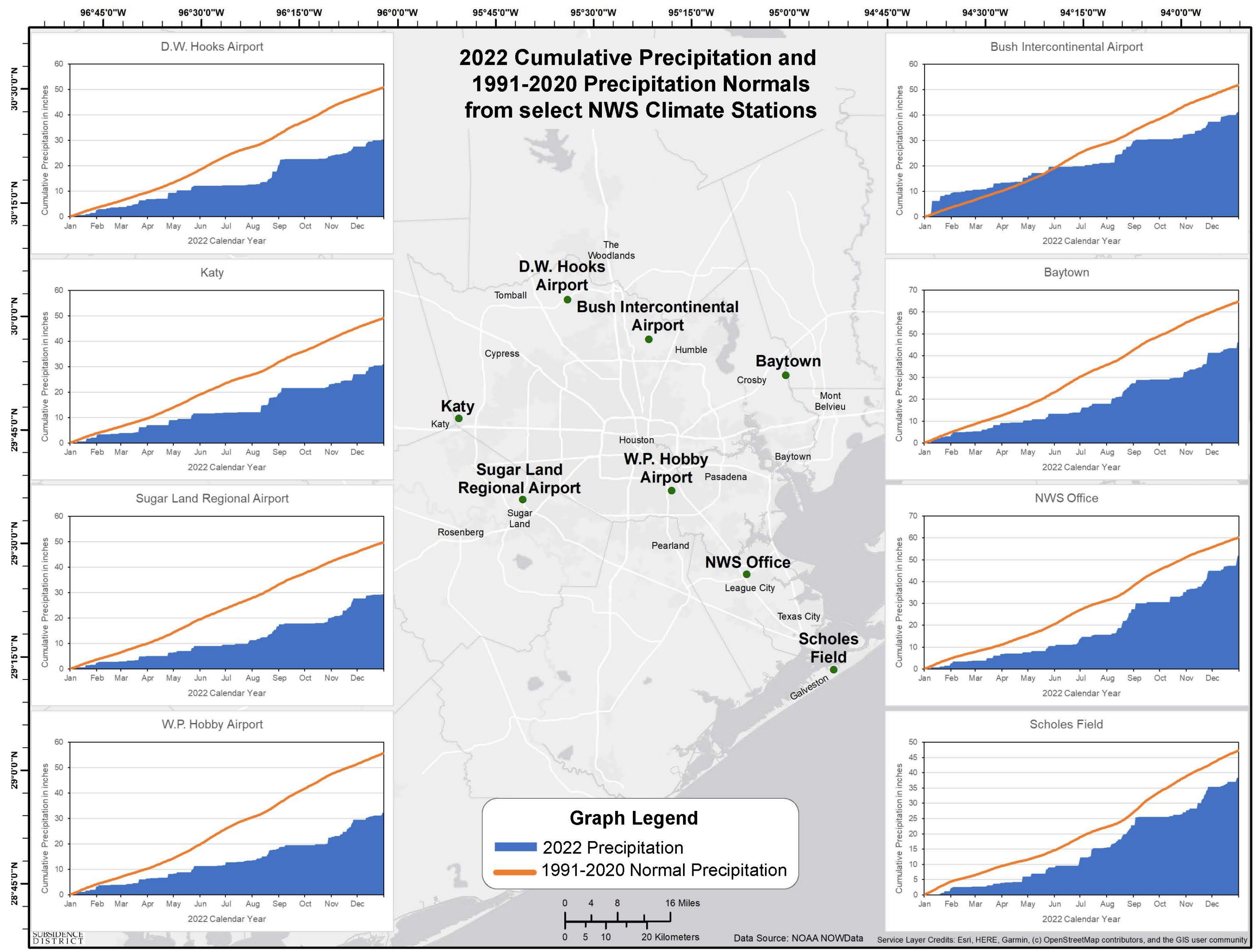



**Figure 6.** Location of National Oceanic and Atmospheric Administration (NOAA)-NWS climate stations analyzed in the greater Houston region. Graphs contain individual station cumulative precipitation, in inches, shown in blue and the 1991-2020 Normal Precipitation average in orange.

Most of the Houston-Galveston area precipitation was about 5 inches below normal precipitation totals by April and worsened to over 15 inches below normal by the end of July. This marked an exceptional drought throughout the region (Fowler, 2023). Some intermittent storms provided five (5) to 19 inches of rainfall in August, followed by a lack of rain from September through the end of October. For the remainder of the year, no significant precipitation was recorded. All eight (8) climate stations ended the year with measured rainfall totals below normal, with five (5) climate stations over 15 inches below normal (**Figure 5**).

Precipitation was below normal for the majority of 2022. The largest cumulative rainfall recorded at the selected NOAA-NWS climate stations was 51.76 inches (131.47 cm) at the NWS office (League City), which is 8.4 inches (21.4 cm) below the 1991-2020 normal annual precipitation. The lowest cumulative rainfall of 29.4 inches (74.68 cm) was recorded at Sugar Land Regional Airport, which is 20.3 inches (51.6 cm) below normal. At the end of the year in December, the William P. Hobby Airport measured the greatest departure from normal at approximately 23.3 inches (59.3 cm) below normal (**Figure 5**).

# 2022 Water Use Summary

The District collects groundwater and alternative water supply use annually from permittees. This information provides an understanding of how much groundwater is being used, how permittees are using groundwater, and perspective on the conversion from groundwater to surface water.

As of April 2023, a total of 7,757 permittees had submitted their annual water use data for the District to compile and use in this report. The groundwater withdrawals associated with missing reports were estimated based on permitted allocations to be 5.2 MGD, which equates to about two (2) percent of withdrawals.

In addition to providing water use data for 2022, this report also provides updated groundwater withdrawal totals for the previously reported year of 2021. These changes are made during the normal permitting and reporting process as part of the exchange between the District and its permittees. The changes include updating estimated amounts with actual amounts, correction of data entry errors, and errors in the submitted data. The reported 2021 groundwater withdrawal total increased by 0.4 MGD to a new total of 204 MGD.

The following sections provide a summary of the information presented at the Public Hearing held on April 27, 2023. The exhibits used to provide testimony during the hearing are included in **Appendix A – Exhibits Presented at Public Hearing held on April 27, 2023.**

## Overall Water Use

The three primary water uses in the District are public supply, industrial, and irrigation. The total amount of groundwater withdrawal for 2022 is 252.9 MGD, about a 24 percent increase over 2021 (**Table 1**). As a result of the District's Regulatory Plan, groundwater withdrawals have decreased since the District's inception in 1975, with a 45 percent decline from 456.3 MGD in 1976 to 252.9 MGD in 2022 (**Figure 7**).

**Table 1**. Summary of Reported Groundwater Use (in MGD) by Regulatory Area.

| Water Use Category | Area 1 | | | Area 2 | | | Area 3 | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 1-Year Change | 2021 | 2022 | 1-Year Change | 2021 | 2022 | 1-Year Change | 2021 | 2022 | 1-Year Change |
| Public | 2.3 | 2.5 | 9% | 23.9 | 27.7 | 16% | 161.1 | 201.4 | 25% | 187.3 | 231.6 | 24% |
| Industrial | 5.4 | 6.5 | 20% | 2.5 | 2.5 | 0% | 2.4 | 2.6 | 8% | 10.3 | 11.6 | 13% |
| All Irrigation | 0.16 | 0.17 | 6% | 0.75 | 0.97 | 29% | 5.4 | 8.6 | 59% | 6.3 | 9.7 | 54% |
| Total | 7.9 | 9.2 | 17% | 27.2 | 31.2 | 15% | 168.9 | 212.6 | 26% | 203.9 | 252.9 | 24% |

Patterns in groundwater use have shifted over time, resulting in reduced groundwater use for industrial and agricultural needs compared with the 1970s and 1980s. Public supply continues to be the dominant use in the District and comprised over 90 percent of the total groundwater used in 2022 (**Figure 7**).

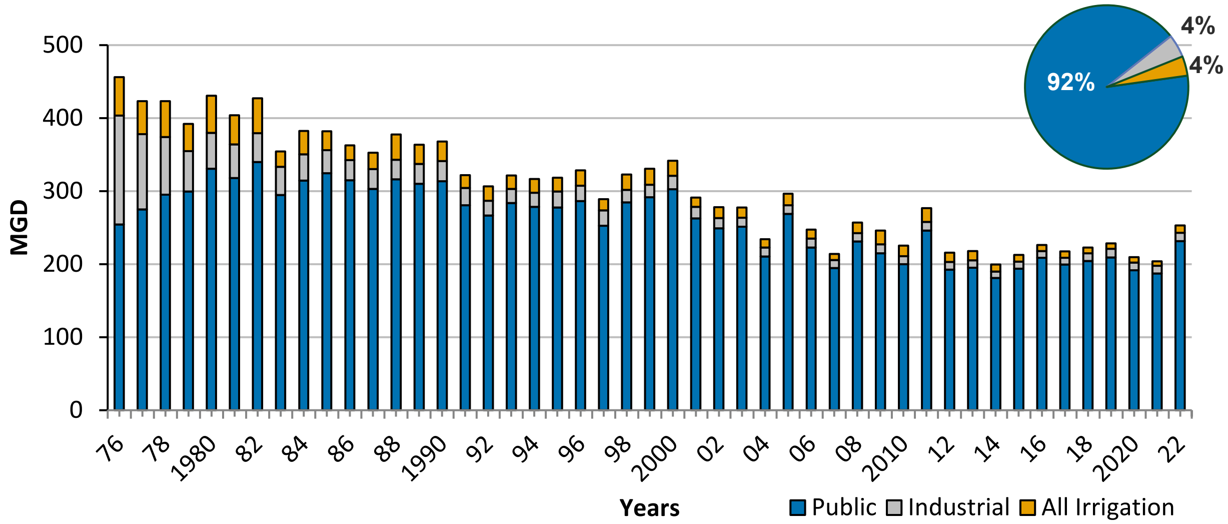



**Figure 7**: Groundwater withdrawals, in million gallons per day, by water use category from 1976 to 2022. The total groundwater used in the District was 252.9 MGD in 2022, with 92 percent as public supply.

The District is divided into three regulatory areas that define how much groundwater may be utilized as a percentage of the total water demand. The groundwater withdrawals are grouped by regulatory area in **Figure 8**. This chart shows the impact of the District's Regulatory Plan, requiring conversion from groundwater to alternative water over time and as a result, the reduction in groundwater withdrawals in regulatory areas that have fully converted to alternative water (i.e., Regulatory Areas One and Two). As a result, the majority of groundwater use within the District is occurring within Regulatory Area Three. The following sections provide additional information regarding groundwater withdrawals in each Regulatory Area.

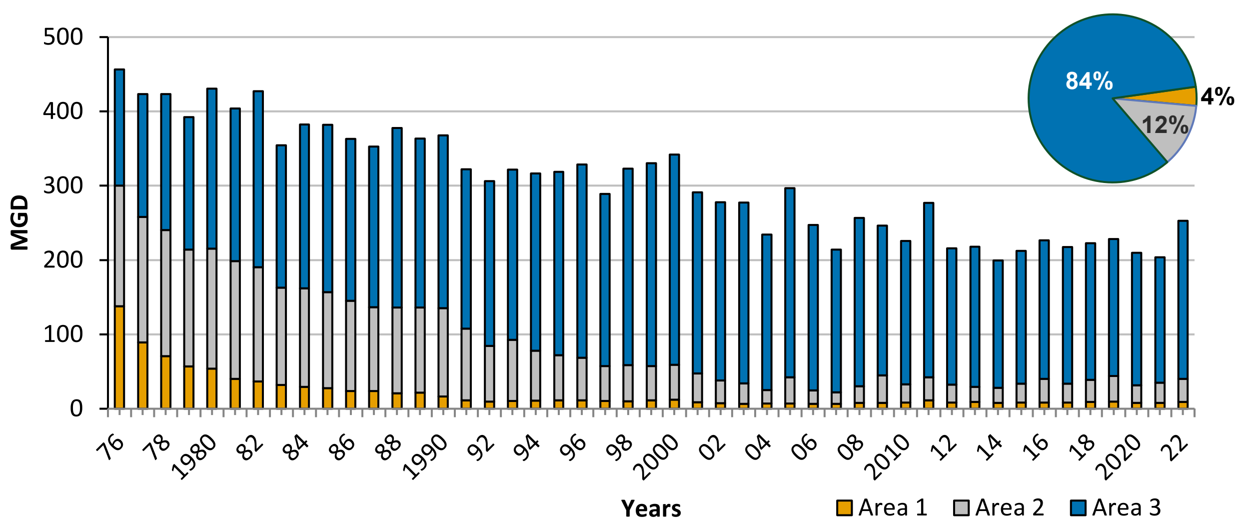



**Figure 8**: Groundwater withdrawals, in million gallons per day, by regulatory area from 1976 to 2022. In 2022, a total of 9.2 MGD of groundwater was used in Regulatory Area One, with 31.1 MGD used in Regulatory Area Two and 212.6 MGD used in Regulatory Area Three.

## Regulatory Area One

Regulatory Area One covers most of Galveston County and the southeastern portion of Harris County. Cities and villages included are Bacliff, Baytown, Bayou Vista, Channelview, Clear Lake Shores, Deer Park, Dickinson, El Lago, Galena Park, Galveston, Highlands, Hitchcock, Kemah, La Marque, La Porte, League City, Morgan's Point, Nassau Bay, Pasadena, San Leon, Santa Fe, Texas City, Seabrook, Shoreacres, Taylor Lake Village, Tiki Island, and Webster. Also included are Clear Lake, Johnson Space Center, and Bolivar Peninsula Areas. This area converted to alternate water sources back in the 1970s, 1980s and early 1990s.

In 2022, total groundwater withdrawal in Regulatory Area One was 9.2 MGD, a 17 percent increase from the previous year (**Table 1**). The majority of groundwater use in Regulatory Area One is associated with industrial use, which comprises 71 percent of the use in this area. Industrial use has been relatively stable since 1990, and groundwater use for public supply has remained generally stable since 2001 (**Figure 9**). Industrial use also increased by 21 percent in 2022 from the previous year, where other uses, such as public supply and irrigation, increased by nine (9) and ten (10) percent, respectively. Historically, groundwater withdrawals have declined in Regulatory Area One from a maximum of 138.1 MGD in 1976 to 9.2 MGD in 2022 (**Figure 9**).

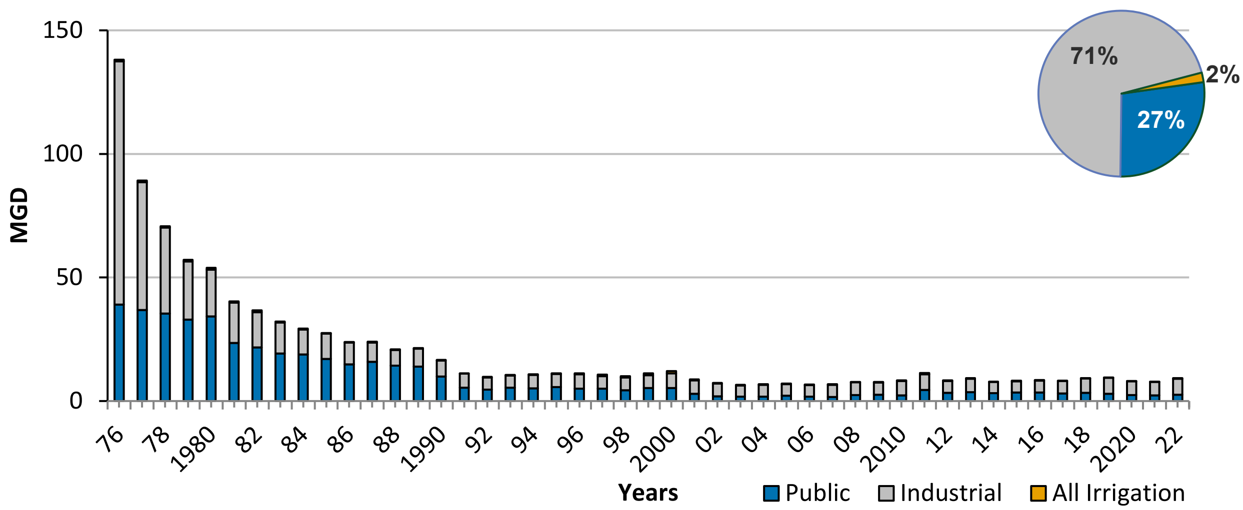



**Figure 9**: Groundwater withdrawals for Regulatory Area One, in million gallons per day, by water use category from 1976 to 2022. A total of 9.2 MGD of groundwater was used in Regulatory Area One in 2022, with 71% of the withdrawals being used for industrial use.

## Regulatory Area Two

Regulatory Area Two covers a small northwestern slice of Galveston County and southern and eastern Harris County. Cities, entities, and areas included are Bellaire, Cloverleaf, Crosby, Friendswood, Highlands, Hobby Airport, Pasadena, Sheldon, South Houston, the Villages, West University, and large portions of the City of Houston. Regulatory Area Two has been converted to alternate water sources since 2002, where possible.

In 2022, total groundwater withdrawal in Regulatory Area Two was 31.1 MGD, a 15 percent increase from the previous year (**Table 1**). Public supply continues to be the dominant use and has decreased by 80 percent from the maximum of 143.5 MGD in 1980 to 27.6 MGD in 2022

(**Figure 10**). Overall, groundwater use in Regulatory Area Two has declined from above 160 MGD in the 1970s to below 40 MGD since 2001. Irrigation had the largest increase of 29 percent most likely attributed to the exceptional drought experienced in the summer of 2022.

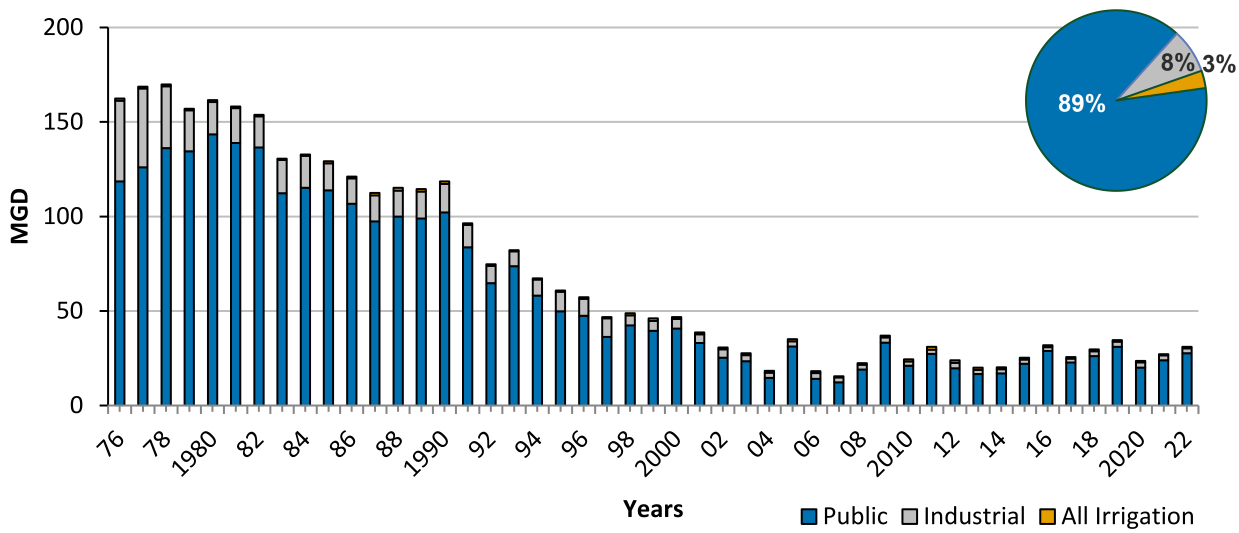



**Figure 10:** Groundwater withdrawals for Regulatory Area Two, in million gallons per day, by water use category from 1976 to 2022. A total of 31.1 MGD of groundwater was used in Regulatory Area Two in 2022, with 89% of the withdrawals being used for public supply.

## Regulatory Area Three

Regulatory Area Three covers north and west Harris County. Cities, entities and areas included are the Jersey Village, Humble, Kingwood, Huffman, Tomball, Cypress, Hockley, Spring, and parts of Katy. Entities in this regulatory area were required to convert to alternate water beginning in 2010, with this conversion facilitated by the City of Houston and the Regional Water Authorities. Two subsequent conversion deadlines in 2025 and 2035 remain for permittees with groundwater reduction plans.

In 2022, total groundwater withdrawal in Regulatory Area Three was 212.6 MGD, a 26 percent increase from the previous year (**Table 1**). Similar to Regulatory Area Two, the largest category of water use is public supply, which was reported at 201.5 MGD and accounts for 95 percent of the groundwater use in the area (**Figure 11**). Industrial water use has been below 4 MGD since 2010. While irrigation water use remained below 10 MGD since 2014, a 59 percent increase was reported for irrigation use in Regulatory Area Three. This large increase in irrigation use is most likely attributed to the exceptional drought in the summer of 2022.

Groundwater withdrawals in Regulatory Area Three show a generally increasing trend beginning in 1976 through 2000, reflecting the impacts of climate and population increase as development progressed in northern and western Harris County.

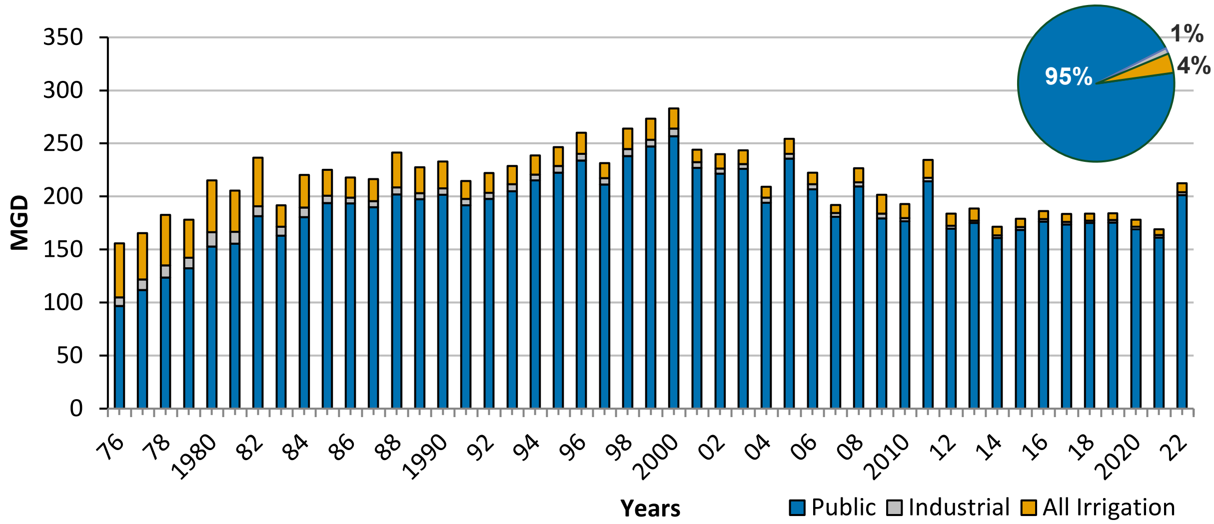



**Figure 11:** Groundwater withdrawals for Regulatory Area Three, in million gallons per day, by water use category from 1976 to 2022. A total of 212.6 MGD of groundwater was used in Regulatory Area Three in 2022, with 95% of the withdrawals being used for public supply.

## Alternative Water Supply and Total Water Use

The District's Regulatory Plan requires permittees to convert to alternative water supplies in order to reduce their reliance on groundwater sources. The primary alternative water supply used in our region is surface water sourced from three river basins: the Brazos River Basin, the San Jacinto River Basin and the Trinity River Basin (**Table 2**).

**Table 2**. Summary of Reported Alternative Water Supply Use and Total Water Use (in MGD)

| Source | | 2021 | 2022 | 1-Year Change |
|---|---|---|---|---|
| Alternative Supplies | Brazos River Basin | 70.9 | 82.7 | 17% |
| | San Jacinto River Basin | 172.8 | 177.2 | 3% |
| | Trinity River Basin | 535.9 | 546.2 | 2% |
| | Reclaimed Water | 3.5 | 4.5 | 29% |
| | Alternative Subtotal | 783.1 | 810.6 | 4% |
| Groundwater | | 204.0 | 252.9 | 24% |
| **Total Water Use** | | **987.1** | **1063.5** | **8%** |

Since 1992, the Trinity River Basin is still the single largest source of alternative water used within the District. Groundwater remains the second largest source of water supply within the District as a whole. Compared with 2021, the use of both the San Jacinto River Basin and Brazos River Basin supply increased by three (3) and two (2) percent, respectively. Additionally, reclaimed water increased by 29 percent to approximately 4.5 MGD.

The total water use for the District was determined to be 1,063.5 MGD in 2022, which is an eight (8) percent increase from 2021 (**Figure 12** and **Table 2**).

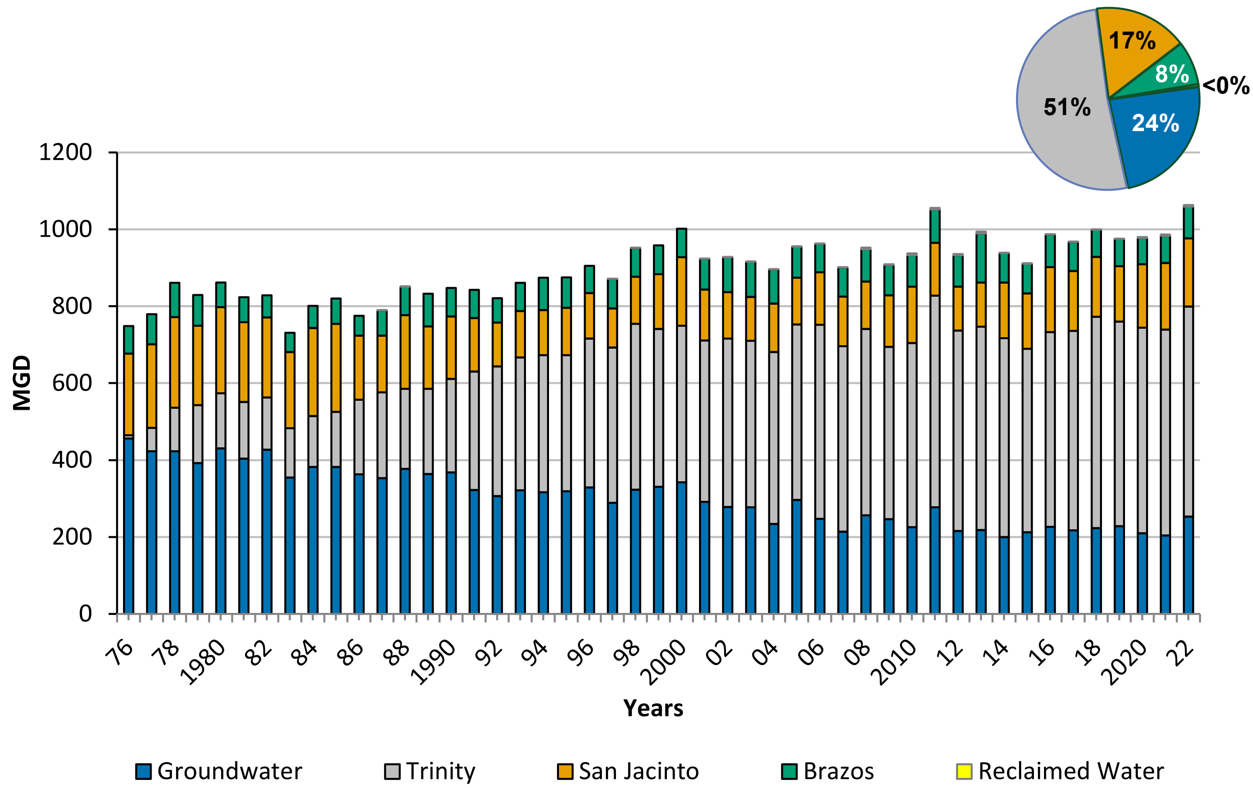



**Figure 12**: Total water use for District, in million gallons per day, by source water, from 1976 to 2022. The reported total water use for the District in 2022 was 1,063.5 MGD.

# 2022 Groundwater Level Summary

All groundwater used in the District is sourced from the Gulf Coast Aquifer System, which is comprised of three primary water-bearing units. The two units most widely used in the District are the Chicot and Evangeline Aquifers. The Chicot is the shallowest aquifer in the District which is directly connected to the Evangeline Aquifer immediately below. The Burkeville confining unit lies beneath the Evangeline Aquifer and isolates the third primary aquifer, the Jasper Aquifer. The Jasper Aquifer is not widely used in the District but is a primary source of water for Montgomery County.

Annually, since 1975, the USGS has measured the water level in over 500 wells throughout the Houston region in cooperation with the District through a joint funding agreement along with additional cities, subsidence districts, and groundwater conservation districts to monitor and provide reports on groundwater level altitude data for the Chicot/Evangeline and Jasper Aquifers. Since aquifer water level is the best measure of the pressure in the aquifer, this information is essential to understand the impact of changes in water use on subsidence. USGS staff measures the water level in various wells (e.g., public supply, industrial, irrigation, and observation) from December through March on an annual basis. The collected data and analyses are performed by USGS staff and provided to the District through the joint funding agreement for the purposes of the annual groundwater report.

The 2023 potentiometric surface (i.e., the interpolated surface from water level data) for the Chicot and Evangeline (undifferentiated) aquifer shows the areas of primary stresses occur in northern and western Harris County, southern Montgomery County, and small portions of northern Fort Bend County (**Figure 13**). The 2023 potentiometric surface was created using measurements collected from 479 wells across 11 countries in the greater Houston-Galveston region. The black circles in **Figure 13** designate the location of the wells that were measured.

The change in water level in the Chicot/Evangeline Aquifer since 1977 clearly demonstrates the impact of District regulation on the aquifers (**Figure 14**). Generally, Regulatory Areas One and Two have seen a significant rise in the potentiometric water level up to 228 feet (69.5 meters) in the Chicot and Evangeline (undifferentiated) aquifer. The areas of rise are a result of the reduction of groundwater use required by the District's Regulatory Plan. Conversely, in Regulatory Area Three water levels continue to be significantly lower than the historical benchmark as these areas are growing rapidly, and the conversion to alternative sources of water will not be completed in the District until 2035. The maximum declines for the Chicot and Evangeline (undifferentiated) aquifer occur in southern Montgomery County, with 371 feet (113 meters) change from 1977 to 2023 (**Figure 14**).

Groundwater levels in southern Montgomery County are of particular concern. The cone of depression with the greatest water level declines in the Chicot and Evangeline (undifferentiated) aquifer exists in southern Montgomery County near The Woodlands (**Figure 14**). Recent changes in the management plan of Montgomery County's LSGCD de-regulated the use of groundwater in Montgomery County. This area is an important area of interest as continued population growth and expanded groundwater use may result in an expansion of the area of decline into northern Harris County.

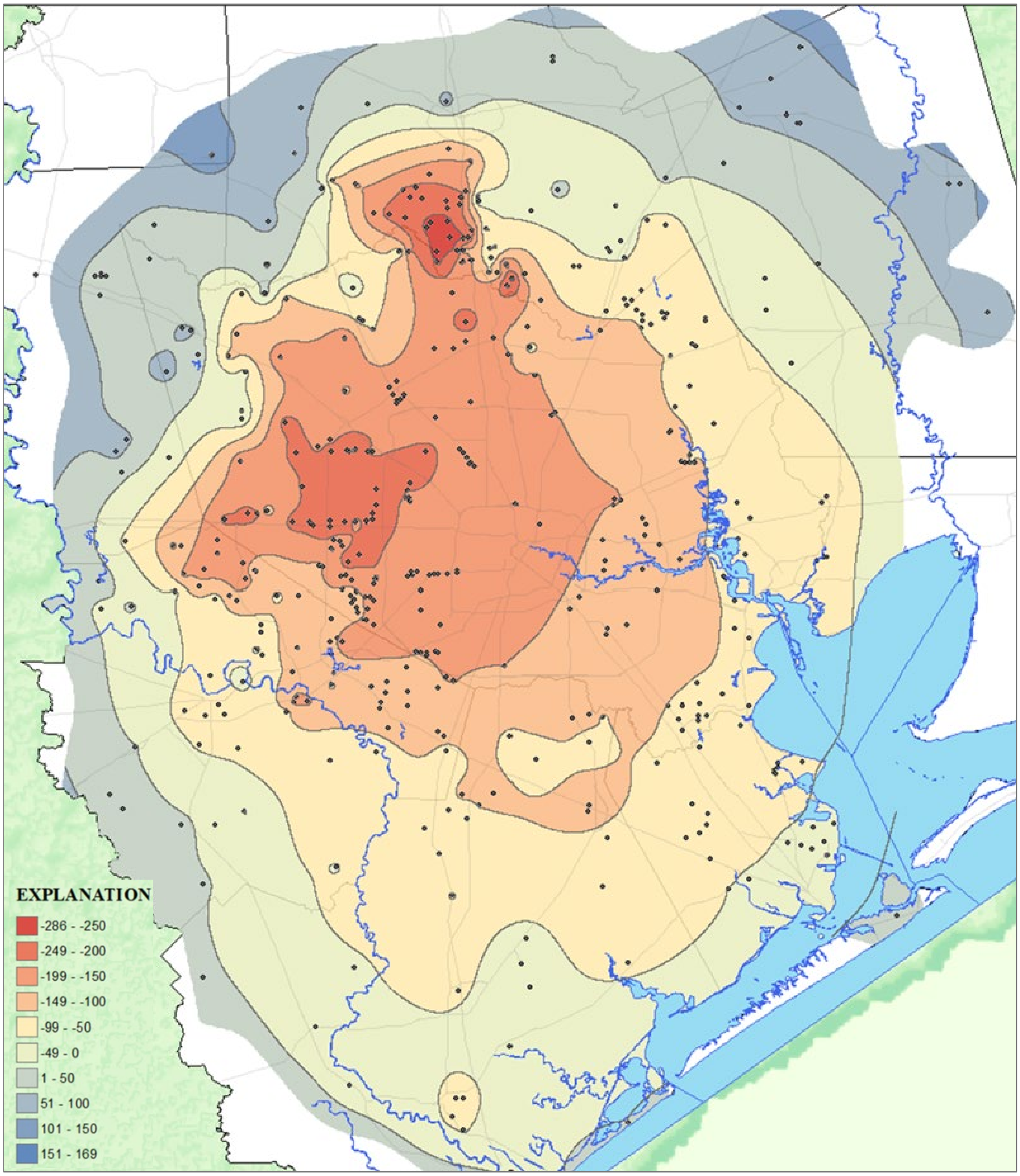



**Figure 13**: Altitude of the potentiometric surface determined from water levels measured in tightly cased wells (black circles) screened in the Chicot and Evangeline (Undifferentiated) aquifer, Houston region, Texas, 2023 (Source: USGS provisional data – preliminary and subject to change, WL – Water Level).

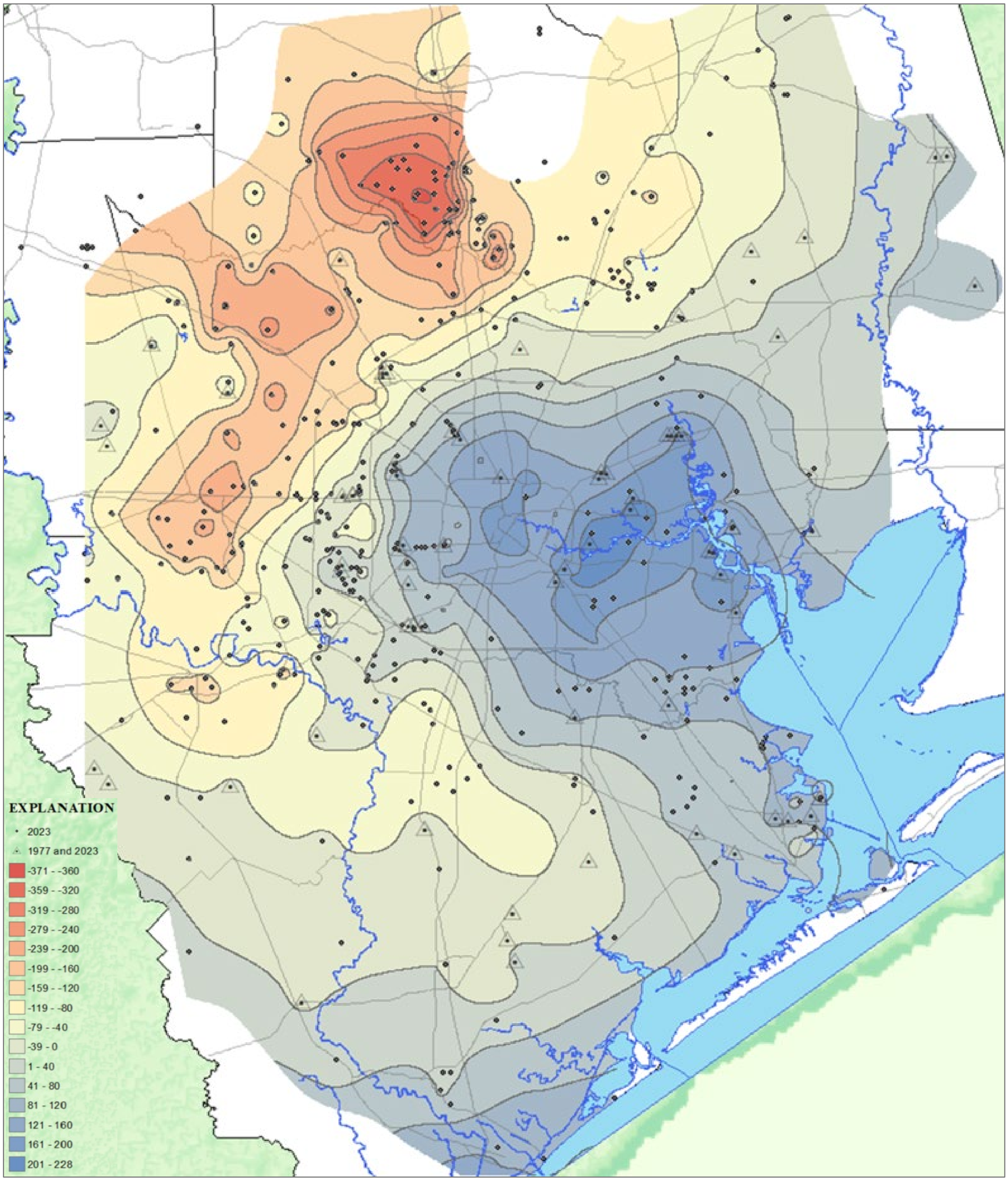



**Figure 14**: Potentiometric water level change at wells screened in the Chicot and Evangeline (Undifferentiated) aquifer, Houston region, Texas, from 1977 to 2023 (Source: USGS provisional data – preliminary and subject to change).

The information presented in this section is a summary of the provisional data presented at the Public Hearing held on April 27, 2023. The exhibits used to provide testimony during the hearing are included in **Appendix A**. A USGS Scientific Investigation Report should be released later in 2023, documenting the status of groundwater level altitudes and the long-term changes in the Chicot and Evangeline (undifferentiated) and the Jasper Aquifers. Once released, this report will be available through the USGS website at https://txpub.usgs.gov/houston_subsidence/.

# 2022 Subsidence Trend Analysis

Subsidence is the lowering of land surface elevation. In the Houston-Galveston region, subsidence occurs from the compaction of clays due to groundwater withdrawal for municipal, industrial, and irrigation water supply. As the water level of the aquifer declines, fine-grained sediments, such as silt and clay, in the aquifer depressurize and compact. This compaction results in the lowering of overlying stratigraphic units and is observed at the land surface as subsidence.

Global positioning system (GPS) stations have been installed in various locations across southeast Texas in order to track subsidence since the 1990s. This geodetic monitoring network consists of a collaboration between the District, FBSD, UH, LSGCD, Brazoria County Groundwater Conservation District (BCGCD), the National Geodetic Survey (NGS), the USGS, the City of Houston, and the Texas Department of Transportation (TXDOT). The geodetic monitoring network has grown to over 230 sites throughout the region. Additional information is provided in **Appendix B – Subsidence Monitoring Network Overview and Data** and **Appendix C – Period of Record Data.**

Satellite signals are collected every 30 seconds and averaged over 24 hours by global navigation satellite system (GNSS) antenna and receiver into one (1) raw daily data file. Raw data files are processed by Dr. Guoquan Wang at the UH and are processed to a stable regional reference frame designated as Houston20 that uses 25 continuously operating GPS stations that have a long history (greater than eight years) and are located outside the greater Houston area (Agudelo, et al., 2020). Additional details on the GPS data processing methodology are provided in **Appendix B**.

The District uses these GPS data in two (2) ways: 1) period of record and 2) as an average annual subsidence rate in order to understand subsidence trends within the geodetic monitoring network. Additional information on the average annual subsidence rate and period of record data for each GPS station is provided in **Appendix C**.

## Period of Record Data

The period of record includes GPS measurements of the ellipsoidal height that are collected over the lifespan of each GPS station. It is used to track the full history of land-surface deformation and is represented as a vertical displacement time series. The vertical displacement is determined by the change in ellipsoidal height, which is the distance from a point on the earth's surface to the reference ellipsoid. The reference ellipsoid is a mathematical representation of the earth's surface as a smoothed ellipsoid. Although the ellipsoid height is not the same as elevation, or the orthometric height, research has shown that linear trends of vertical displacement at GPS stations over the same time interval were the same for both ellipsoidal and orthometric heights (Wang & Soler, 2014). Therefore, ellipsoidal heights are used to estimate vertical displacement of the land surface. Period of record plots give a historical context to understand local to regional subsidence trends. Period of record plots for each GPS station in the subsidence monitoring network are provided in **Appendix C**.

## Average Annual Subsidence Rate

The average annual subsidence rate is a useful measure to show the recent change in land surface deformation at each GPS station. The subsidence rate presented in this report is determined by using linear regression (i.e., the statistically determined best fit straight line through a scatter plot of data points) of the last five (5) years of data for GPS stations with at least three (3) years of GPS data. **Figure 15** depicts the average annual subsidence rate from 2018 to 2022 for over 200 GPS stations in the greater Houston area.

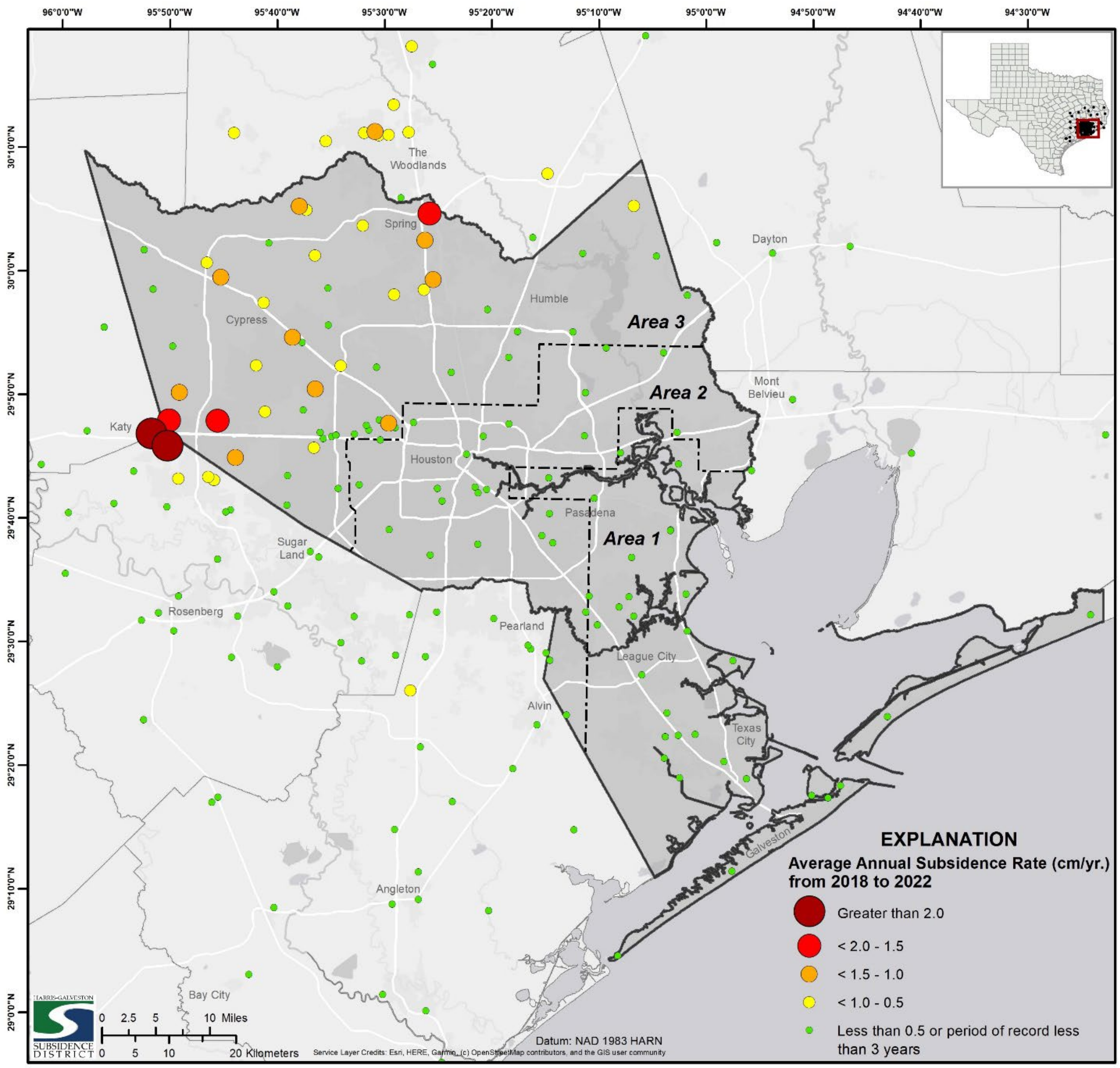



**Figure 15**: Annual subsidence rate, measured in centimeters per year, from 2018 to 2022, referenced to Houston20 and estimated from three or more years of GPS data collected from GPS stations in Harris, Galveston, and surrounding counties, Texas.

Regulatory Areas One and Two show similar subsidence rates as both areas have been fully converted since the late 1990s, and USGS groundwater level monitoring data show that potentiometric water levels have risen. The majority of the GPS stations in Regulatory Areas One and Two show little to no subsidence with rates under half centimeters per year and even some uplift is observed, such as GPS station P038, which is located in Pasadena (**Figure 16**).

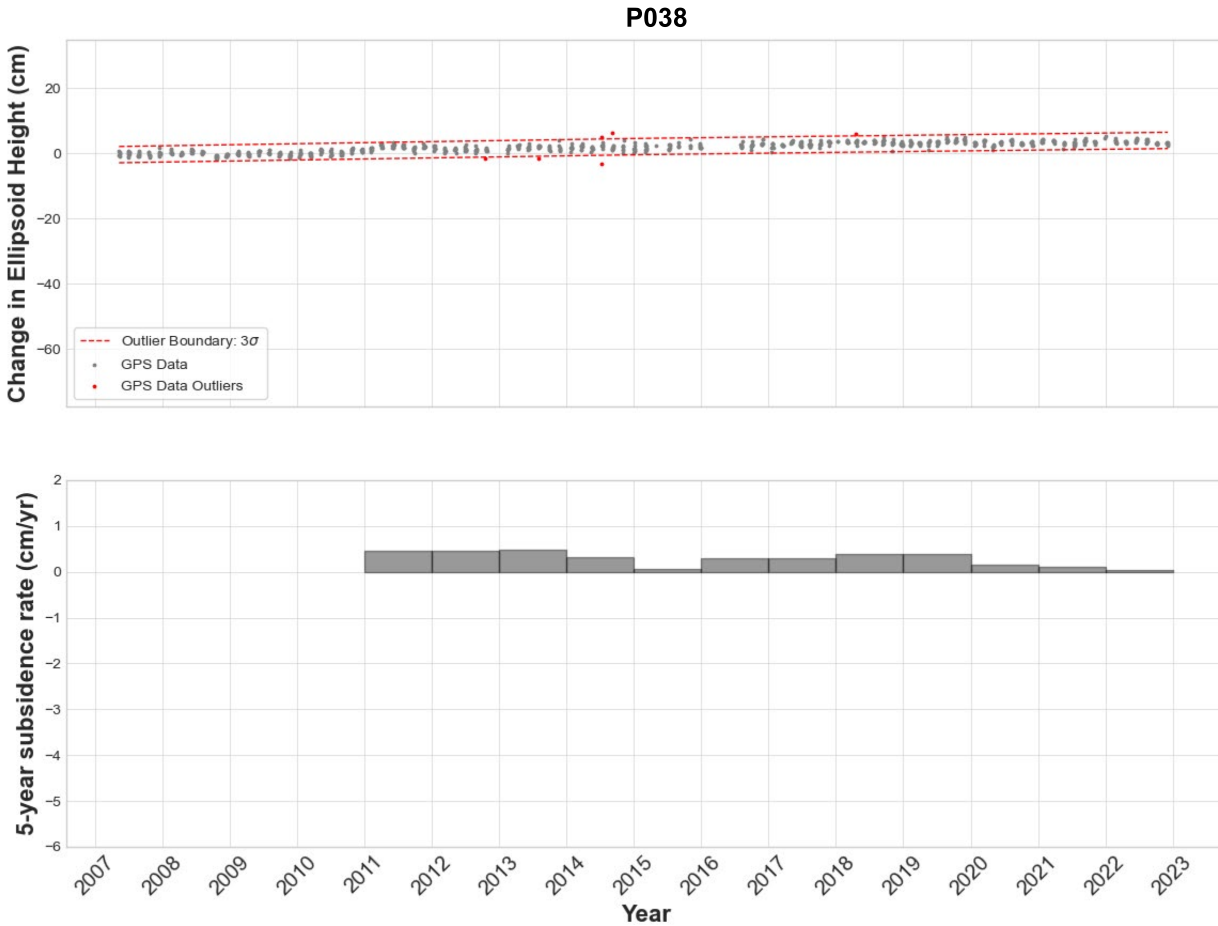



**Figure 16**: Period of record data from GPS station P038 located in Pasadena, 2007 to 2022. P038 has recorded approximately 3.3 cm (1.3 inches) since 2007. The 2018-2022 rate is 0.03 cm/yr. of uplift. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

The highest subsidence rates (greater than 2 centimeters per year) occur in Regulatory Area Three within western Harris County as well as southeastern Waller County and northeastern Fort Bend County. GPS station P029, located in Katy within Fort Bend County, has the highest subsidence rate estimated at 2.13 centimeters per year. Additionally, subsidence rates greater than 1.5 centimeters per year were observed in northern Harris County, such as GPS station P047, located in Spring (**Figure 17**).

Other areas in Regulatory Area Three, such as Cypress and Tomball as well as The Woodlands, in southern Montgomery County, have subsidence rates greater than one (1) centimeter per year. Based on the GPS data collected in the greater Houston area, subsidence is occurring in Regulatory Area Three, as this area is still undergoing conversion to alternative water supplies.

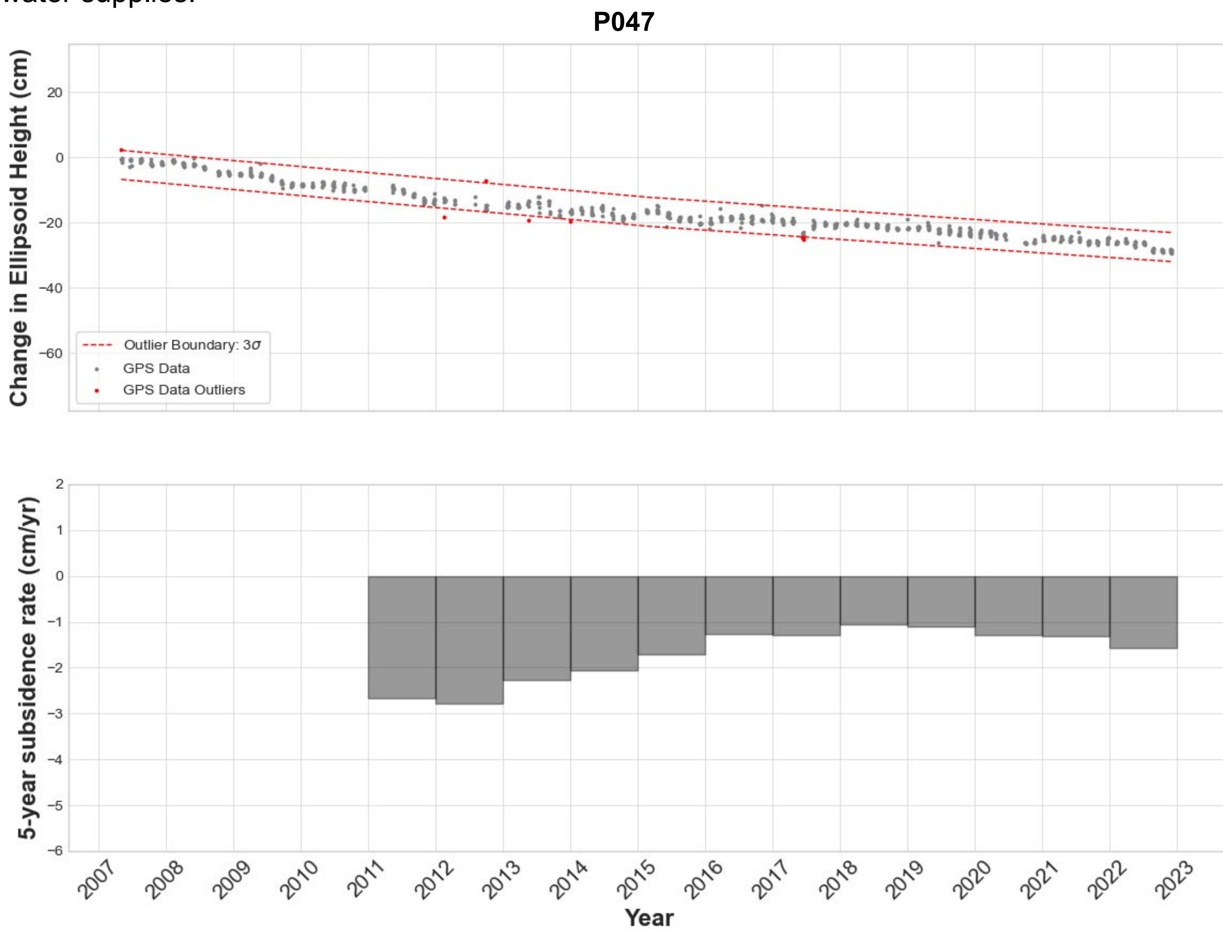



**Figure 17**: Period of record data from GPS station P047 located in Spring, Texas, 2007-2022. P047 has recorded approximately 27.5 cm (10.8 inches) since 2007. The 2018-2022 subsidence rate is 1.57 cm/yr. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# References

Agudelo, G. et al., 2020. *GPS Geodetic Infrastructure for Subsidence and Fault Monitoring in Houston, Texas, USA.* s.l.:Tenth International Symposium on Land Subsidence.

Fowler, J., 2023. *NWS Houston, Texas Annual 2022 Regional Climate Summary.* s.l., National Oceanic and Atmospheric Administration.

Gabrysch, R. K., 1982. *Groundwater withdrawals and land-surface subsidence in the Houston-Galveston region, Texas, 1906-80,* Austin, TX: U.S. Geological Survey.

Harris-Galveston Subsidence District, Amended 2021. *Regulatory Plan 2013,* Friendswood: s.n.

Ramage, J.K., Braun, C.L., and Ellis, J.H., 2022, Treatment of the Chicot and Evangeline Aquifers as a single hydrogeologic unit and use of geostatistical interpolation methods to develop gridded surfaces of water level altitudes and water level changes in the Chicot and Evangeline Aquifers (undifferentiated) and Jasper Aquifer, greater Houston area, Texas, 2021: U.S. Geological Survey Scientific Investigations Report 2022–5064, 51 p., https://doi.org/10.3133/sir20225064.

Wang, G. & Soler, T., 2014. Measuring land subsidence using GPS: Ellipsoid height versus orthometric height. *Journal of Surveying Engineering,* 141(2).

Yu, J., Wang, G., Kearns, T. J. & Yang, L., 2014. Is There Deep-Seated Subsidence in the Houston-Galveston Area?. *International Journal of Geophysics,* Volume 2014.

## Appendix A – Exhibits Presented at Public Hearing held on April 27, 2023

# Welcome to the Public Hearing for the 2022 Annual Groundwater Report

- Participants will be muted for the entire hearing.
- Public testimony will be available for participants at the end of the hearing. The hearing is presented virtually for viewing purposes only.
- The webinar is being recorded including all chat between participants.
- For any problems, please chat with the organizer.

HARRIS-GALVESTON SUBSIDENCE DISTRICT

# 2022 Annual Groundwater Report

Public Hearing – April 27, 2023

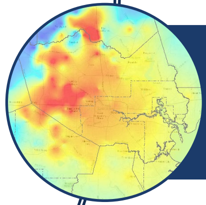
# Harris-Galveston Subsidence District Mission

- The Harris-Galveston Subsidence District was created in 1975 to prevent land subsidence in Harris and Galveston counties through the regulation of groundwater.
- Land subsidence contributes to flooding, threatening the economic health of the area.
- Efforts to prevent subsidence by the District and the regulated community have required significant investment to create a more resilient infrastructure while securing reliable water sources for future needs.
- An annual groundwater hearing is required by enabling the act to receive testimony regarding the effects of groundwater withdrawals on subsidence.

# Agenda


Climate


Groundwater Use

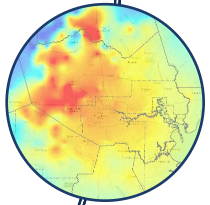

Groundwater Levels


Subsidence Data

# Agenda

- Climate

- Groundwater Use

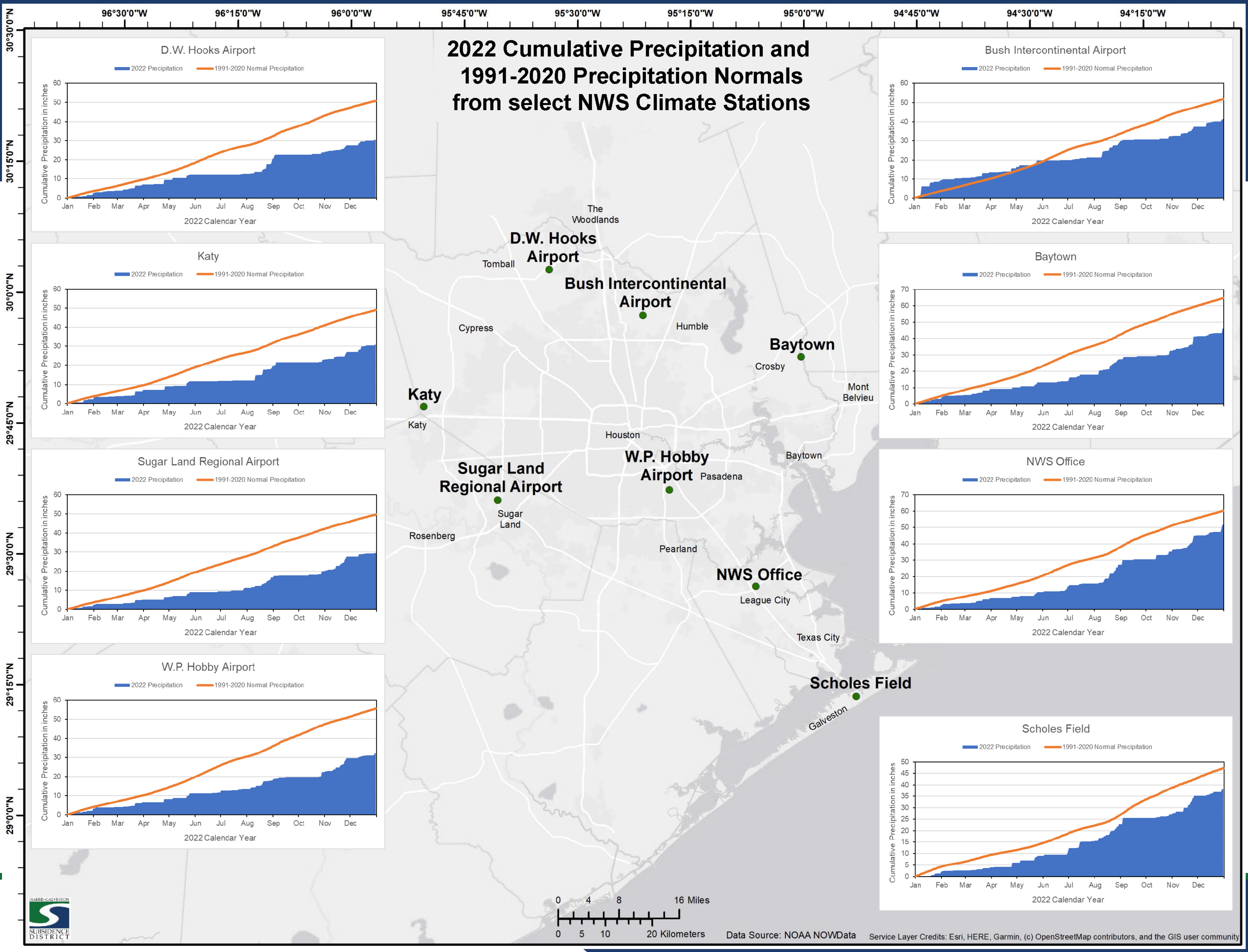


- Groundwater Levels

- Subsidence Data

# Exhibit 1

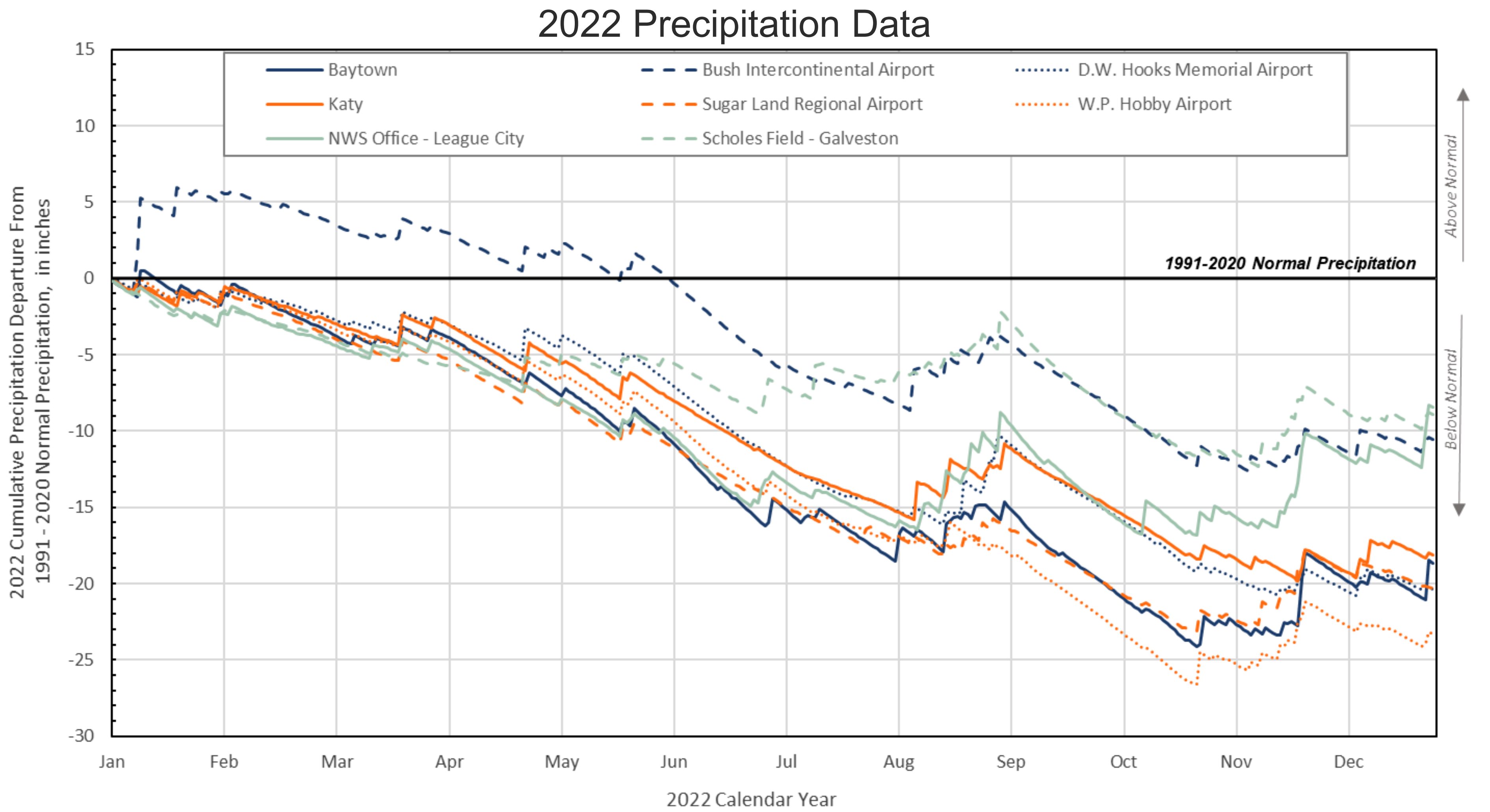
Location of National Weather Service (NWS) climate stations used for precipitation data for the 2022 calendar year.




*(Provisional - Subject to Revision)*

HARRIS-GALVESTON SUBSIDENCE DISTRICT

# Exhibit 2



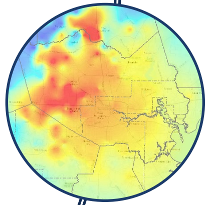



*(Provisional - Subject to Revision)*

# Agenda

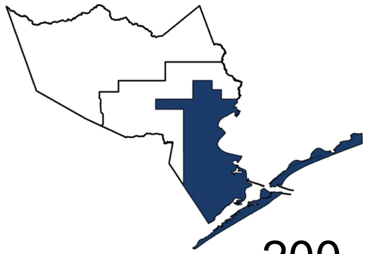

Climate

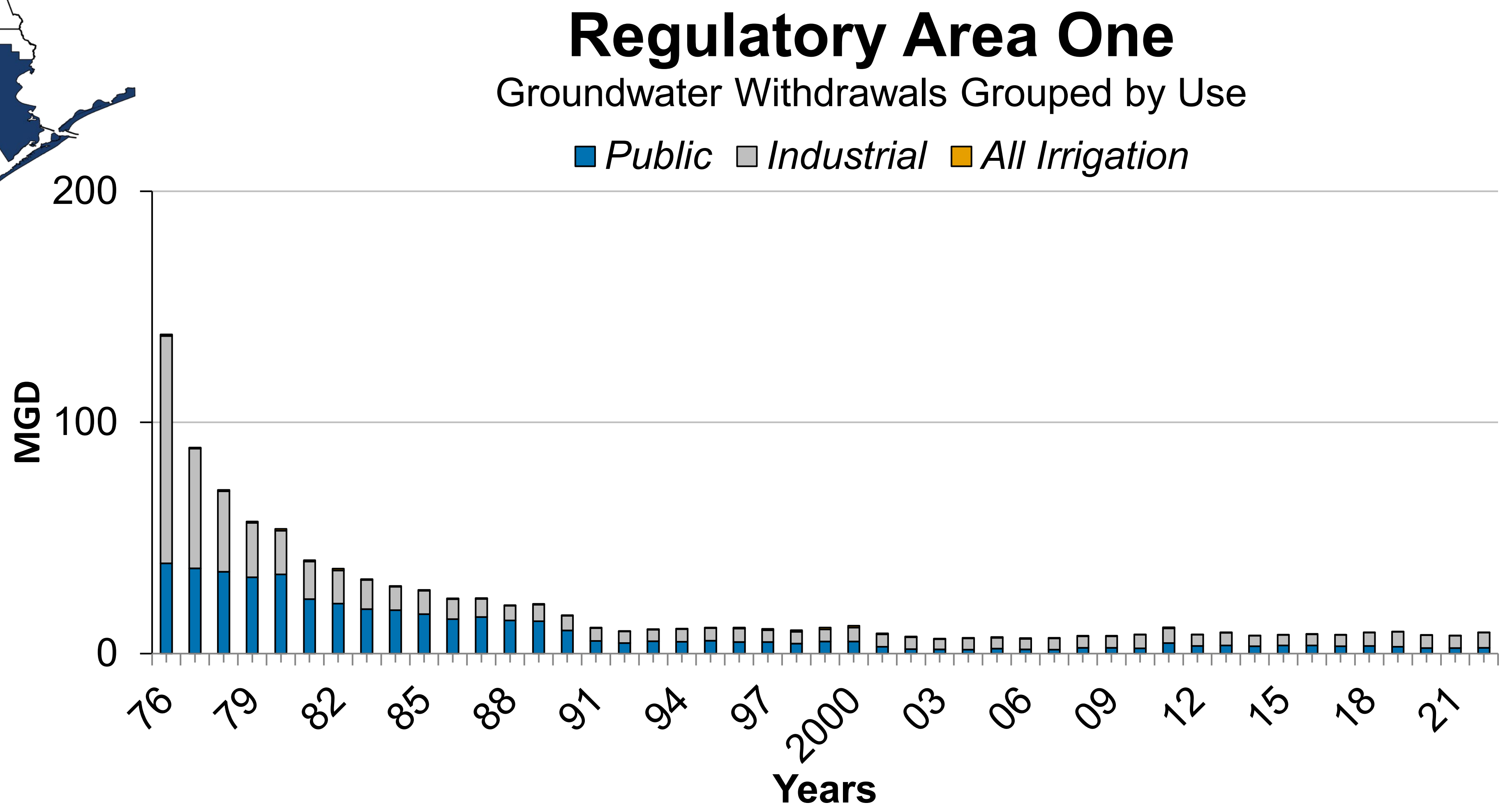

Groundwater Use

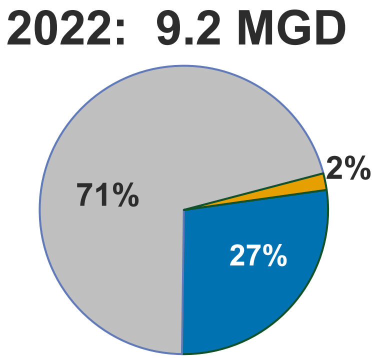

Groundwater Levels


Subsidence Data

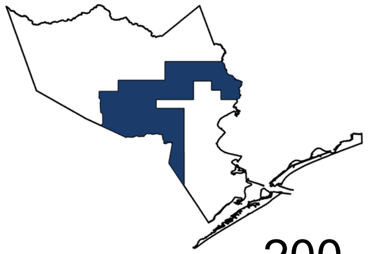
# Exhibit 3

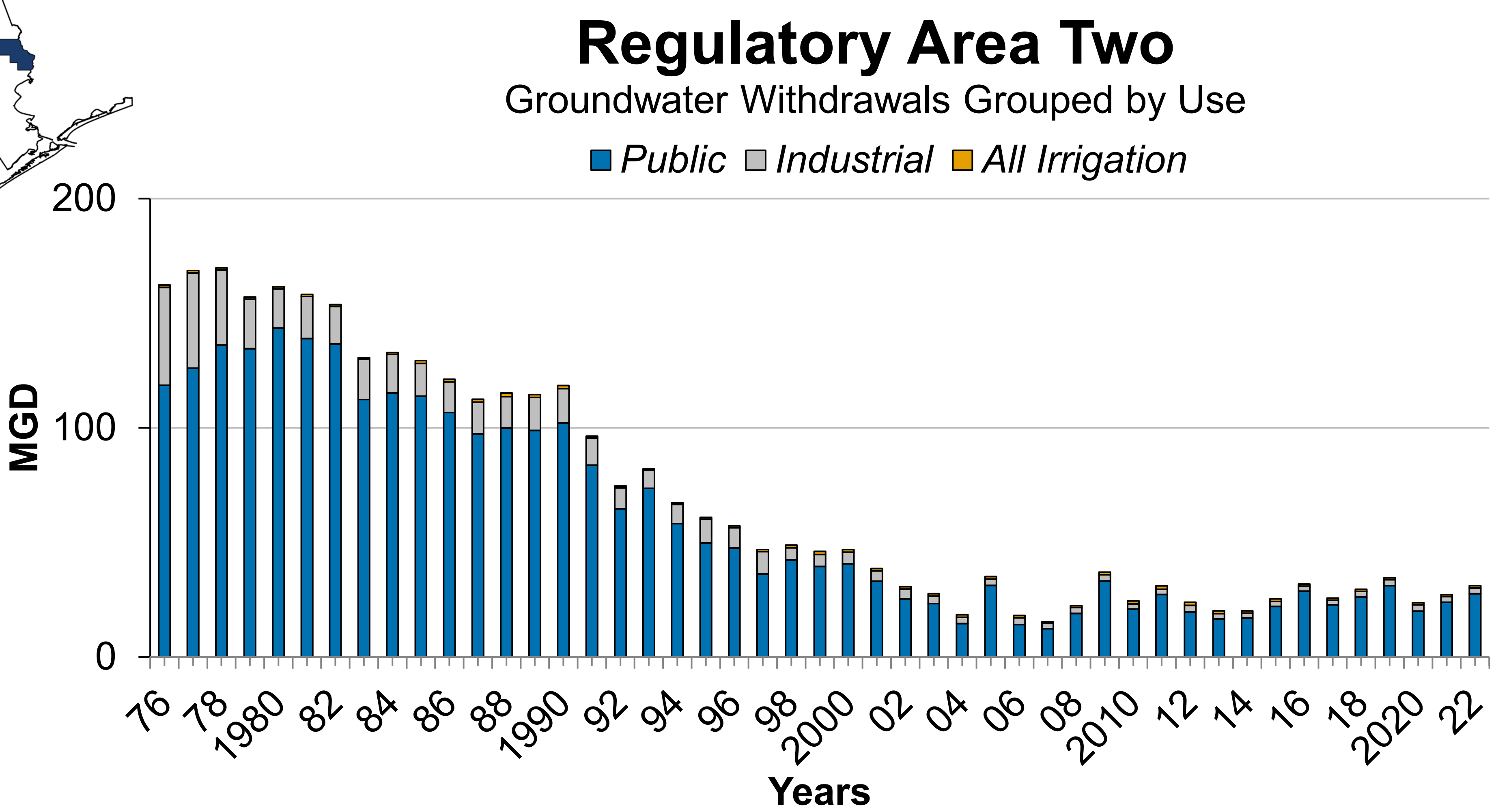


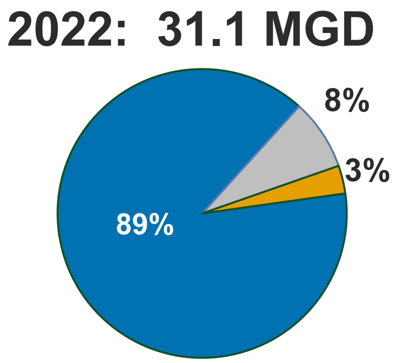

Regulatory Area One
Groundwater Withdrawals Grouped by Use
Public
Industrial
All Irrigation
200
100
0
MGD
76
79
82
85
88
91
94
97
2000
03
06
09
12
15
18
21
Years


2022: 9.2 MGD
71%
2%
27%

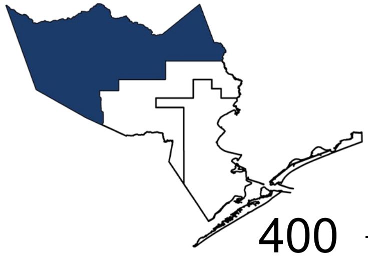
# Exhibit 4

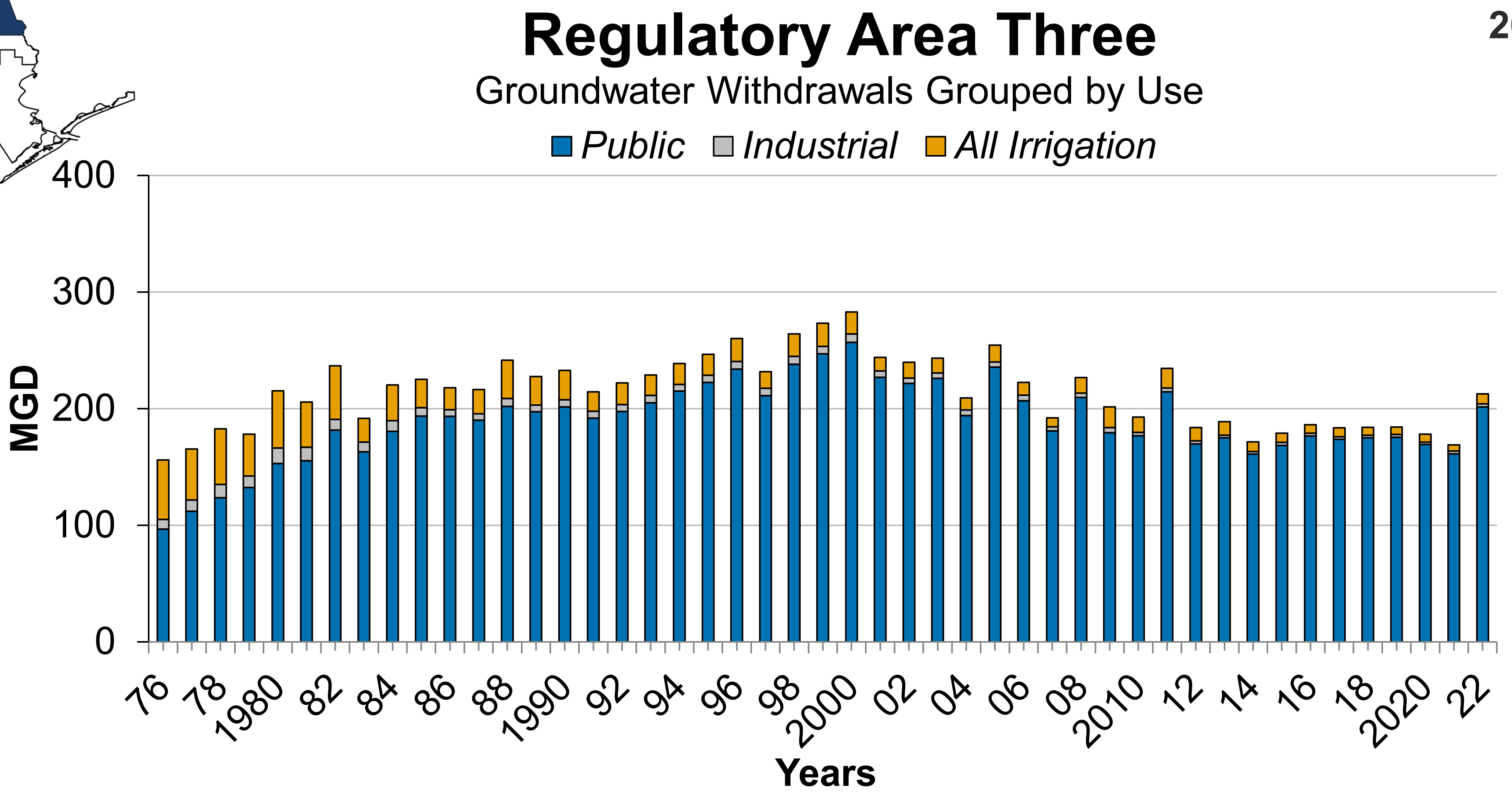


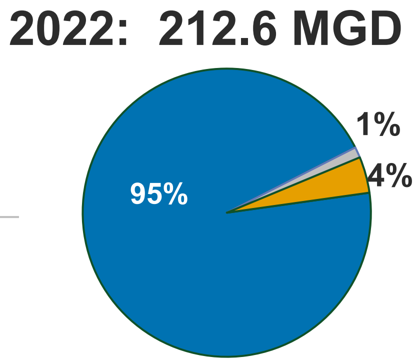

Regulatory Area Two
Groundwater Withdrawals Grouped by Use
Public
Industrial
All Irrigation
200
100
0
MGD
76
78
1980
82
84
86
88
1990
92
94
96
98
2000
02
04
06
08
2010
12
14
16
18
2020
22
Years


2022: 31.1 MGD
8%
3%
89%

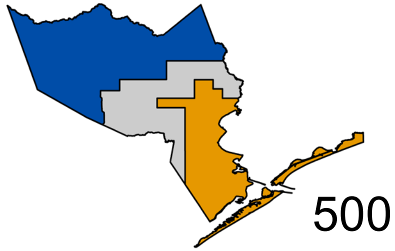
# Exhibit 5

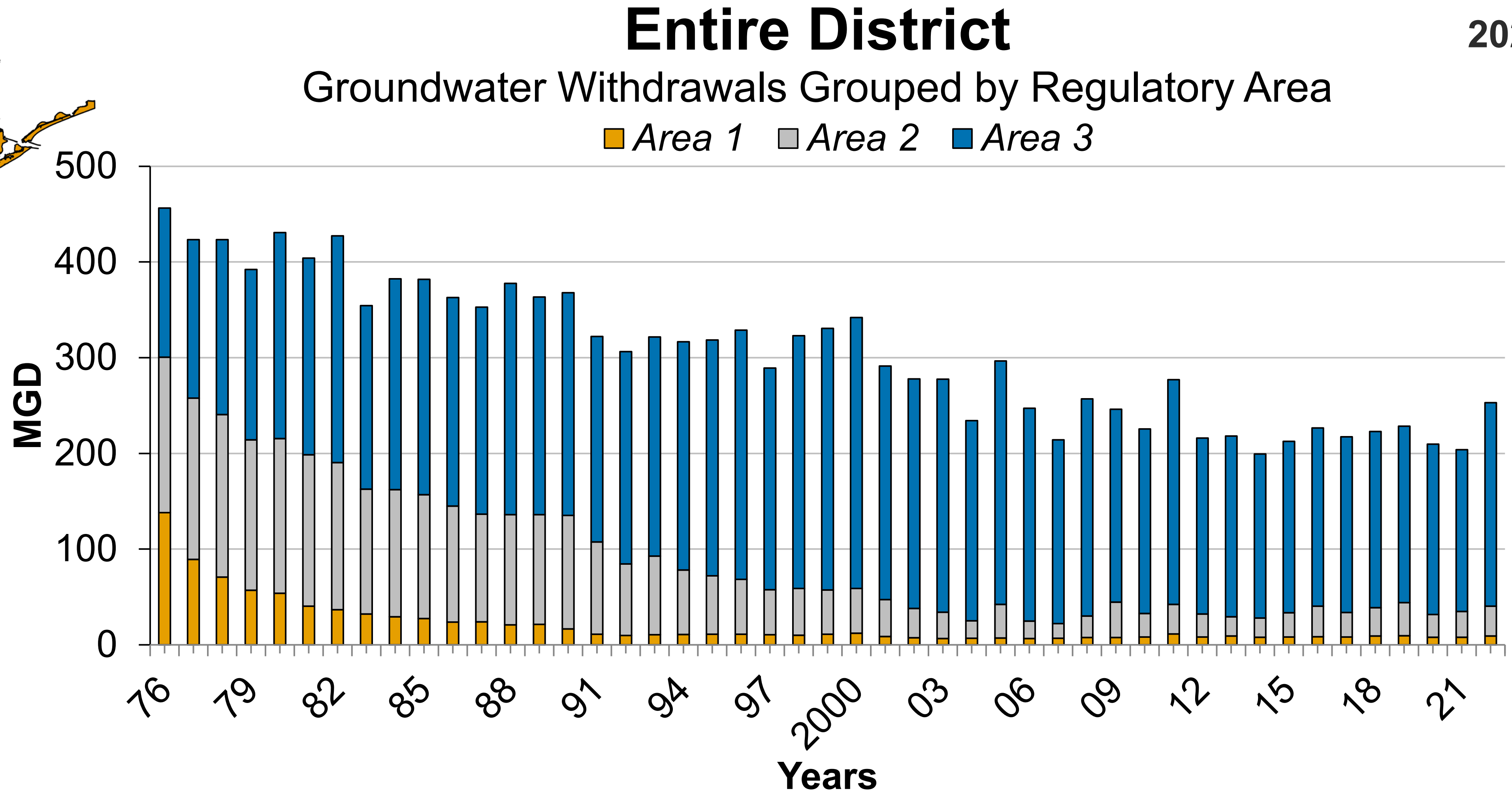


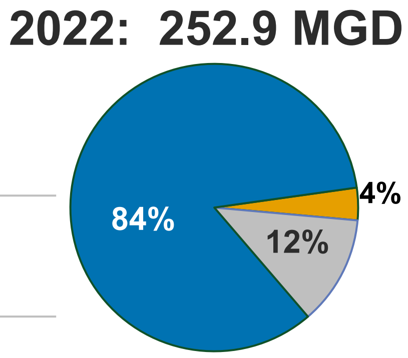

Regulatory Area Three
Groundwater Withdrawals Grouped by Use
Public
Industrial
All Irrigation
400
300
200
100
0
MGD
76
78
1980
82
84
86
88
1990
92
94
96
98
2000
02
04
06
08
2010
12
14
16
18
2020
22
Years


2022: 212.6 MGD
95%
1%
4%

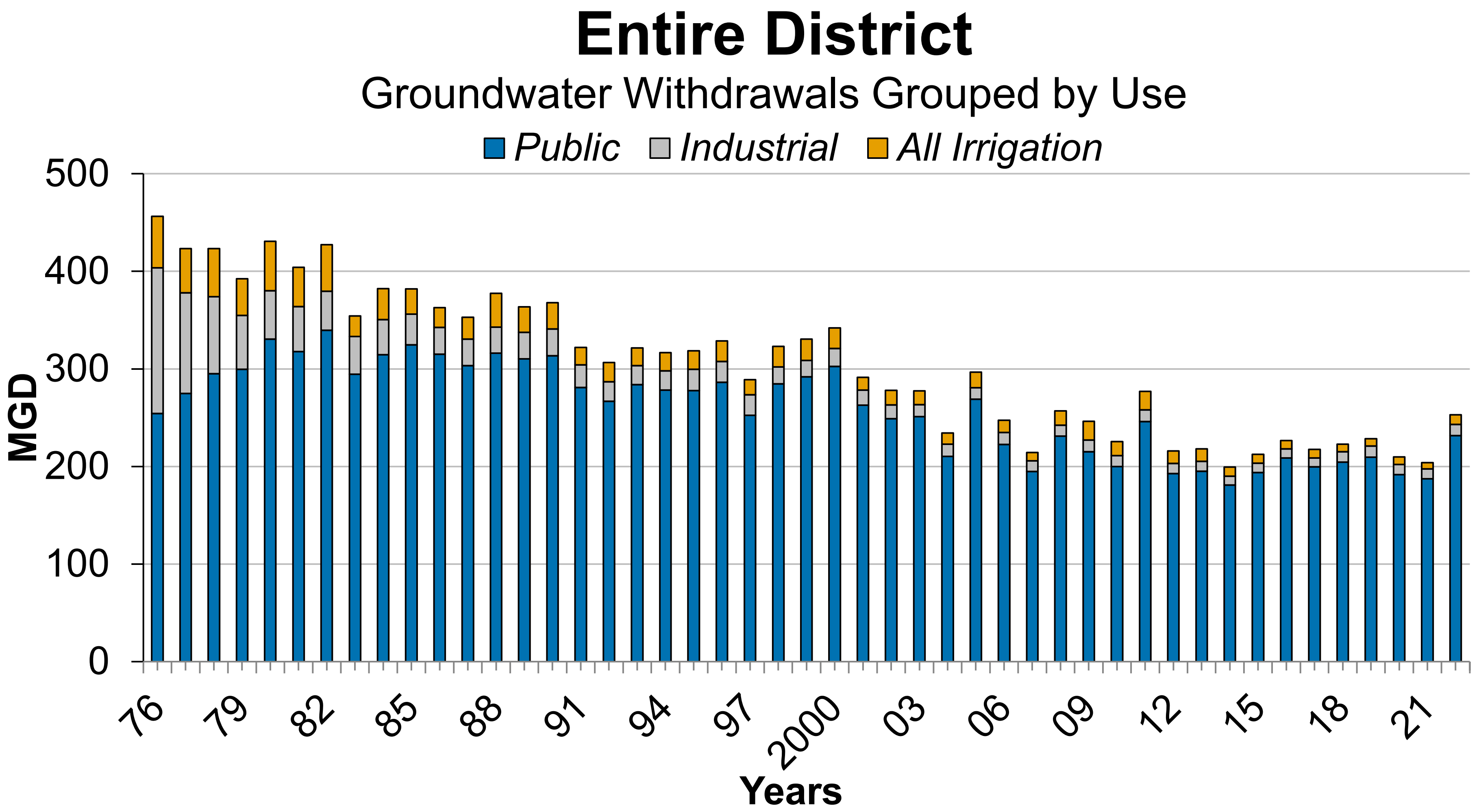
# Exhibit 6

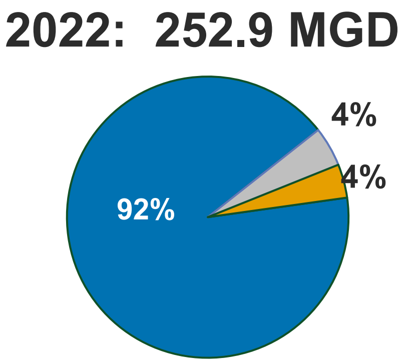



Entire District
Groundwater Withdrawals Grouped by Regulatory Area
Area 1
Area 2
Area 3
500
400
300
200
100
0
MGD
76
79
82
85
88
91
94
97
2000
03
06
09
12
15
18
21
Years


2022: 252.9 MGD
84%
12%
4%

# Exhibit 7

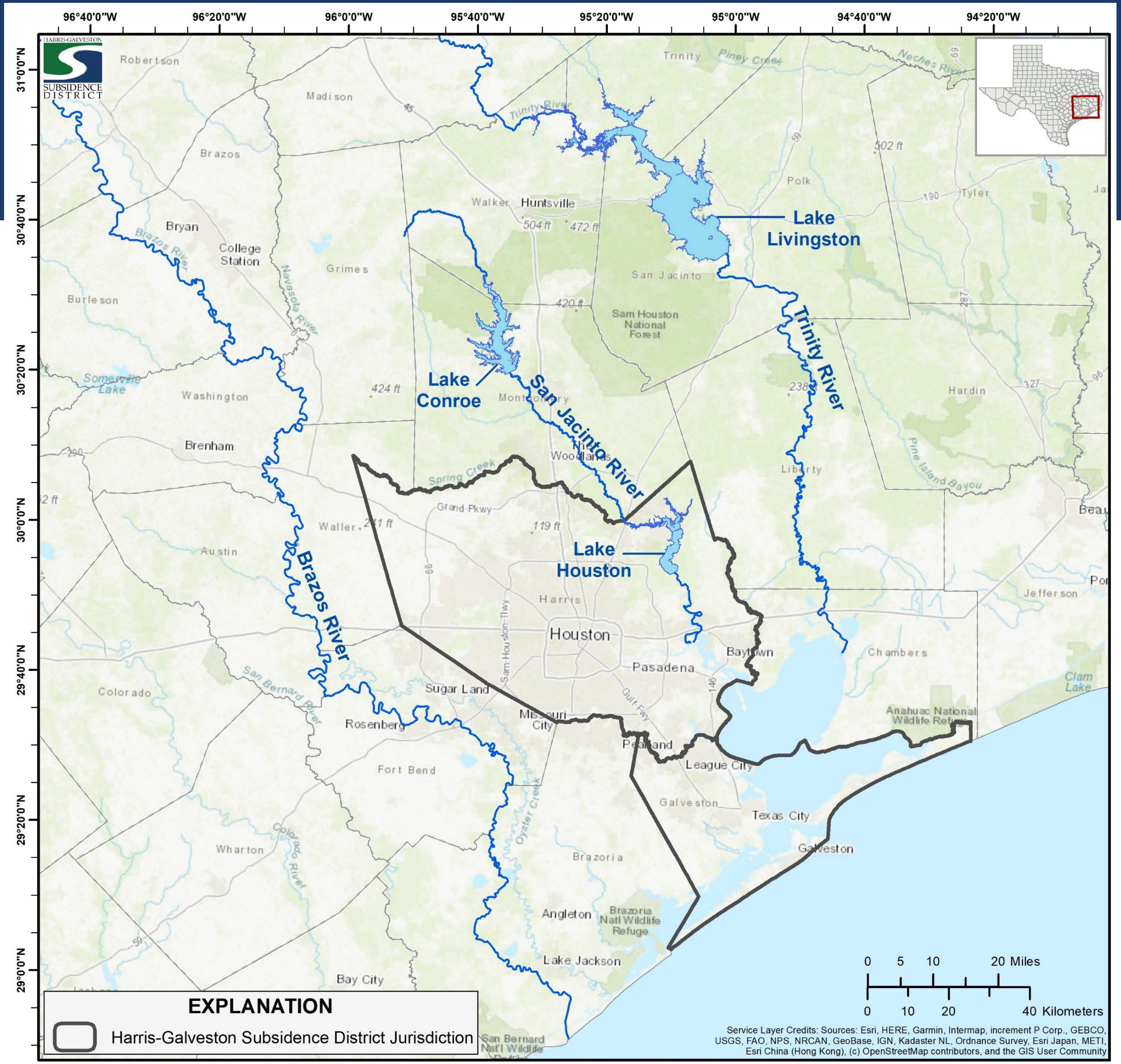

Entire District
Groundwater Withdrawals Grouped by Use
Public
Industrial
All Irrigation
500
400
300
200
100
0
MGD
76
79
82
85
88
91
94
97
2000
03
06
09
12
15
18
21
Years


2022: 252.9 MGD
4%
4%
92%

# Exhibit 8

Location of surface water sources:

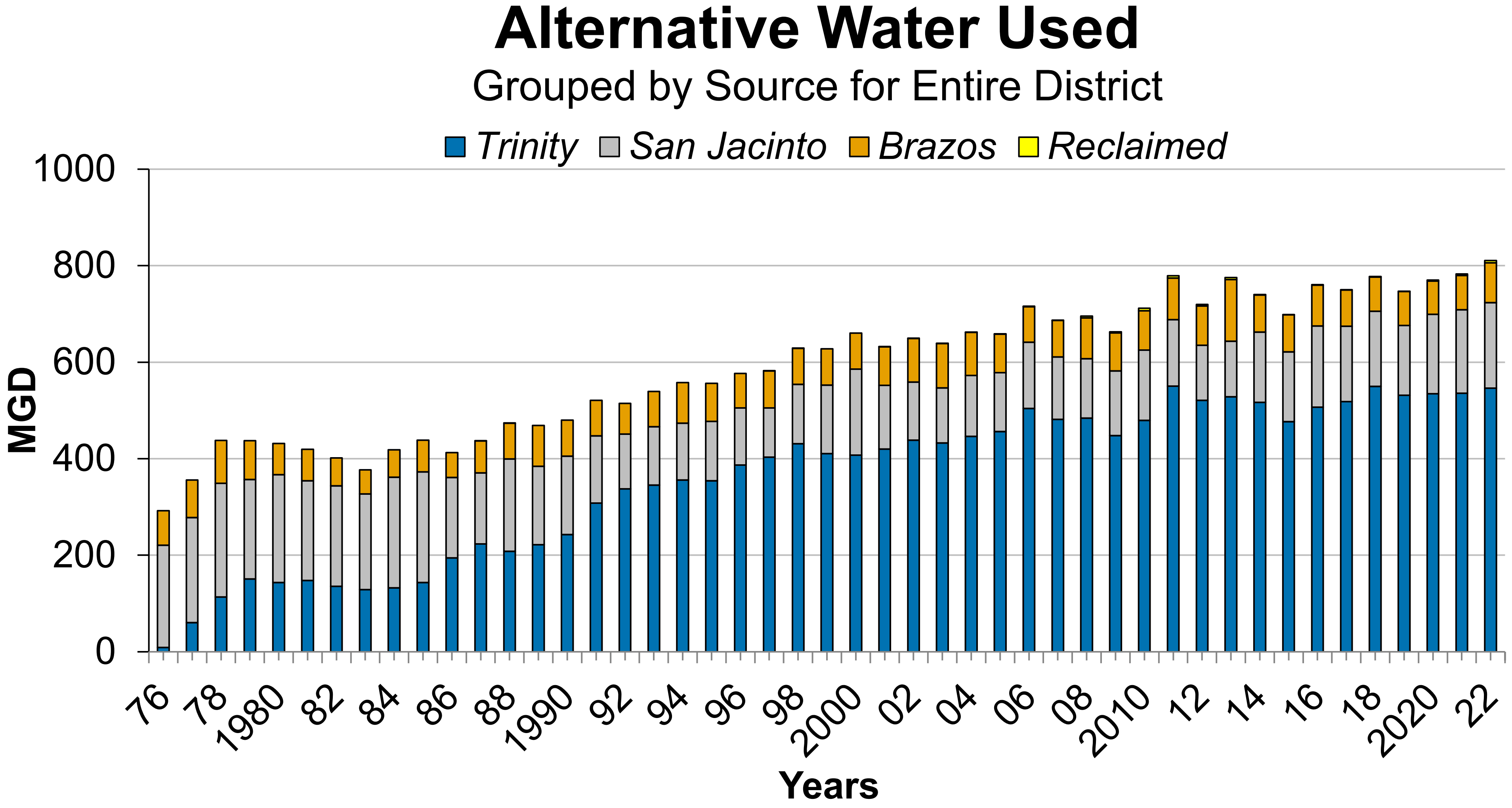
- Trinity River
- San Jacinto River
- Brazos River

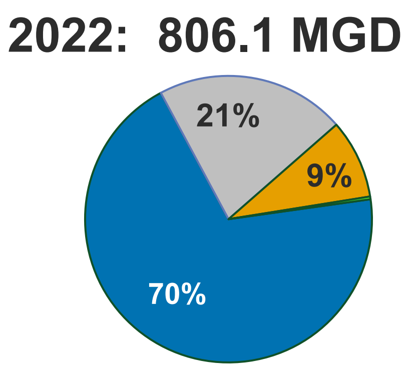



HARRIS-GALVESTON SUBSIDENCE DISTRICT

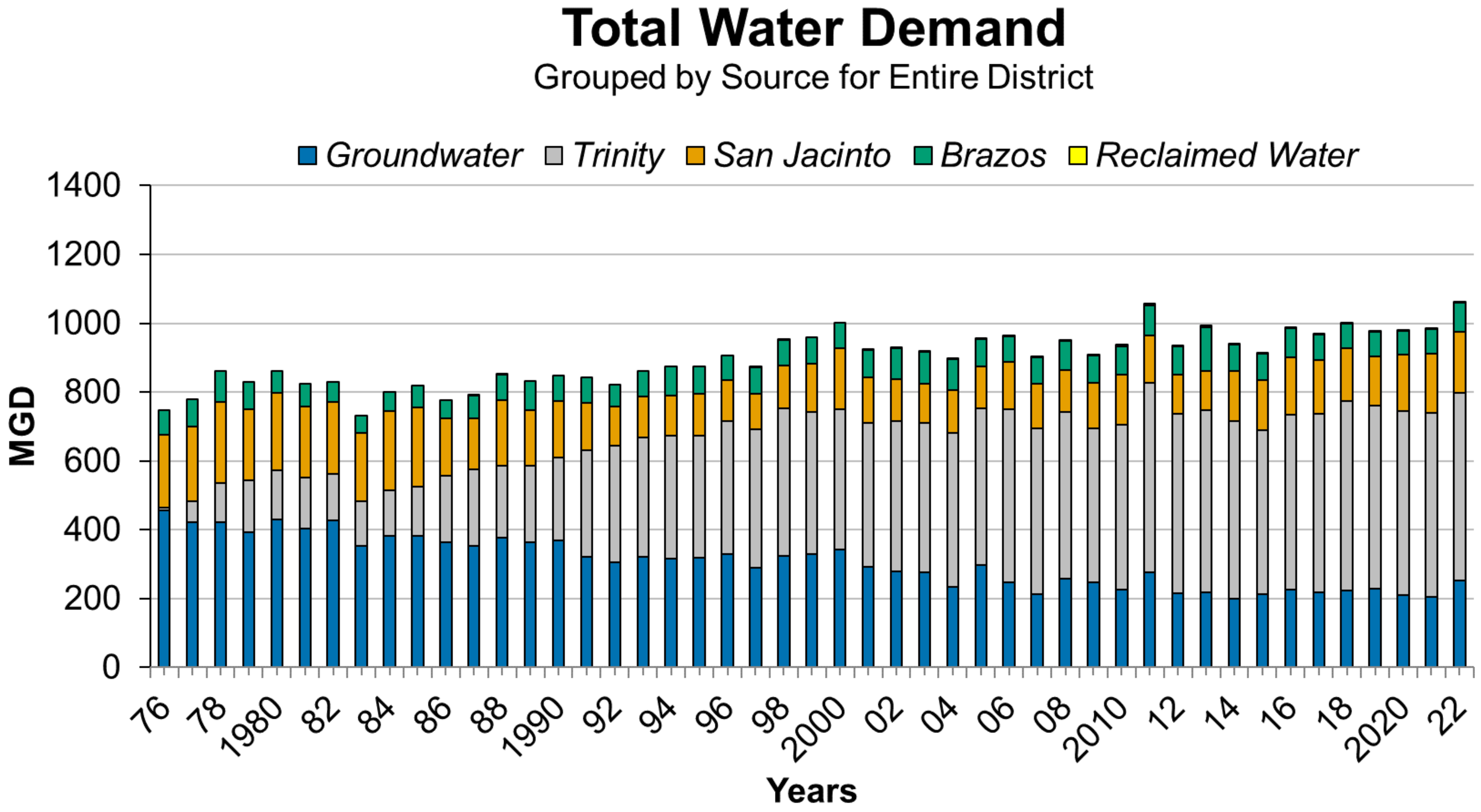
*(Provisional - Subject to Revision)*

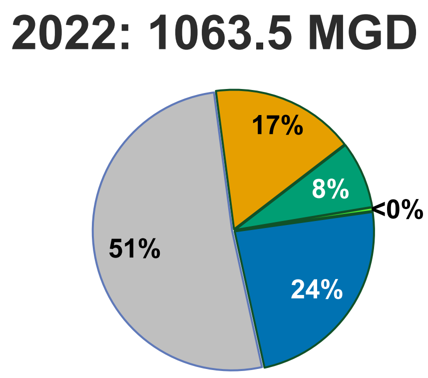
# Exhibit 9


Alternative Water Used
Grouped by Source for Entire District
Trinity
San Jacinto
Brazos
Reclaimed
1000
800
600
400
200
0
MGD
76
78
1980
82
84
86
88
1990
92
94
96
98
2000
02
04
06
08
2010
12
14
16
18
2020
22
Years


2022: 806.1 MGD
21%
9%
70%

# Exhibit 10



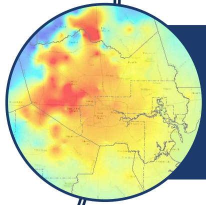

(Provisional - Subject to Revision)

HARRIS-GALVESTON SUBSIDENCE DISTRICT

# Agenda

- Climate

- Groundwater Use



- **Groundwater Levels**

- Subsidence Data

USGS
science for a changing world

Lone Star Groundwater Conservation District
Brazoria County Groundwater Conservation District
City of Houston Texas
Harris-Galveston Subsidence District
Fort Bend Subsidence District

# Groundwater-level Altitudes, Long-Term Change & Compaction

## Chicot/Evangeline and Jasper aquifers

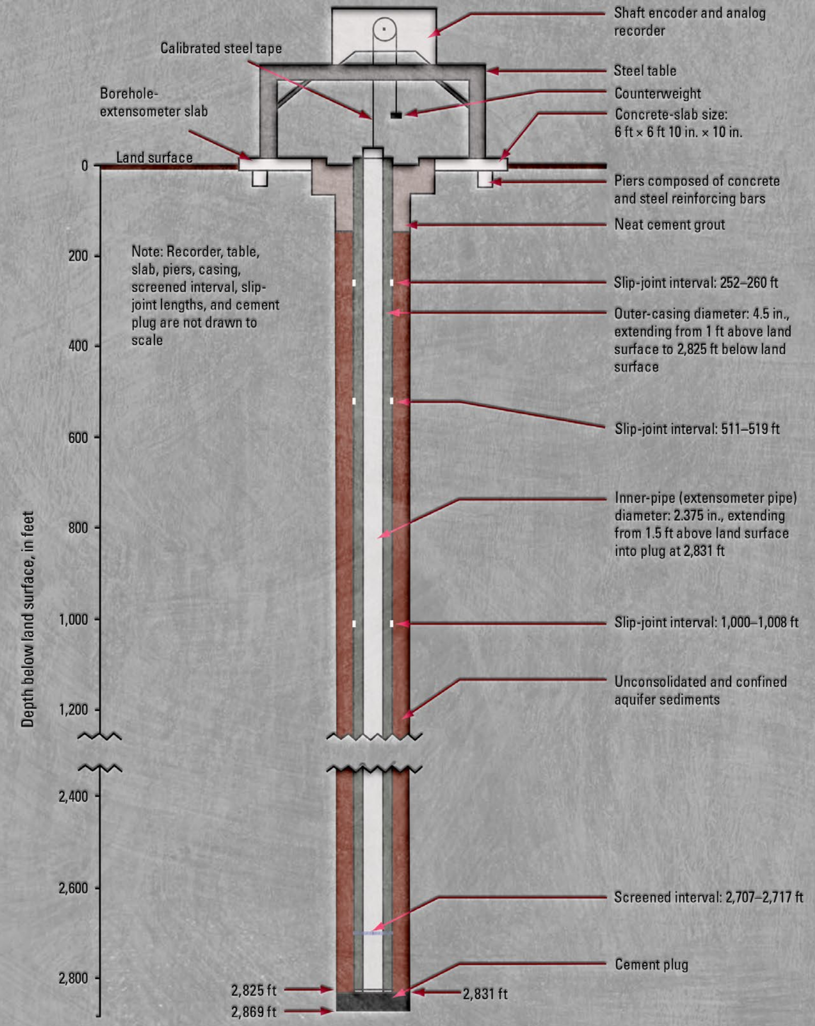
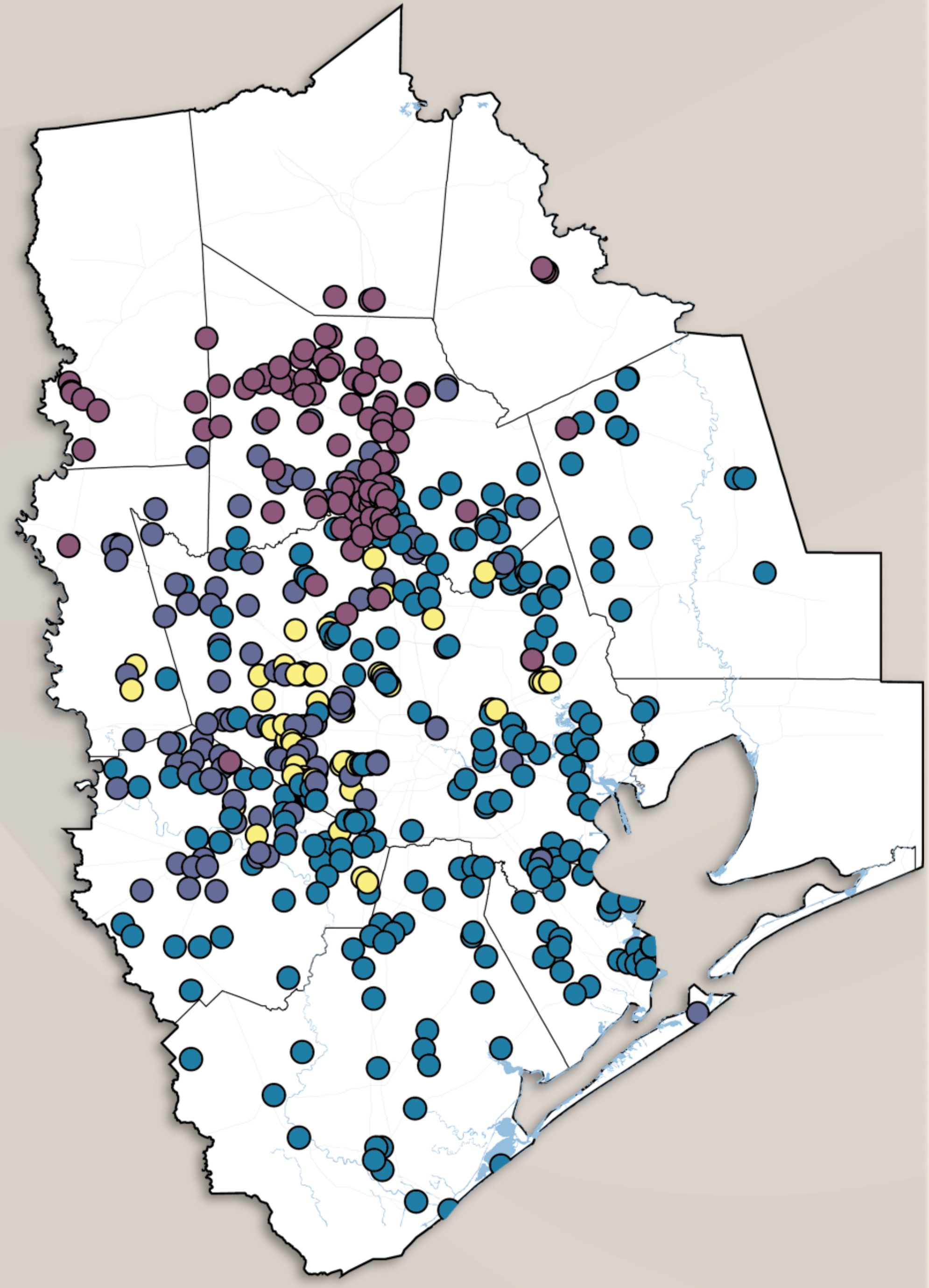



Diagram of a Borehole extensometer

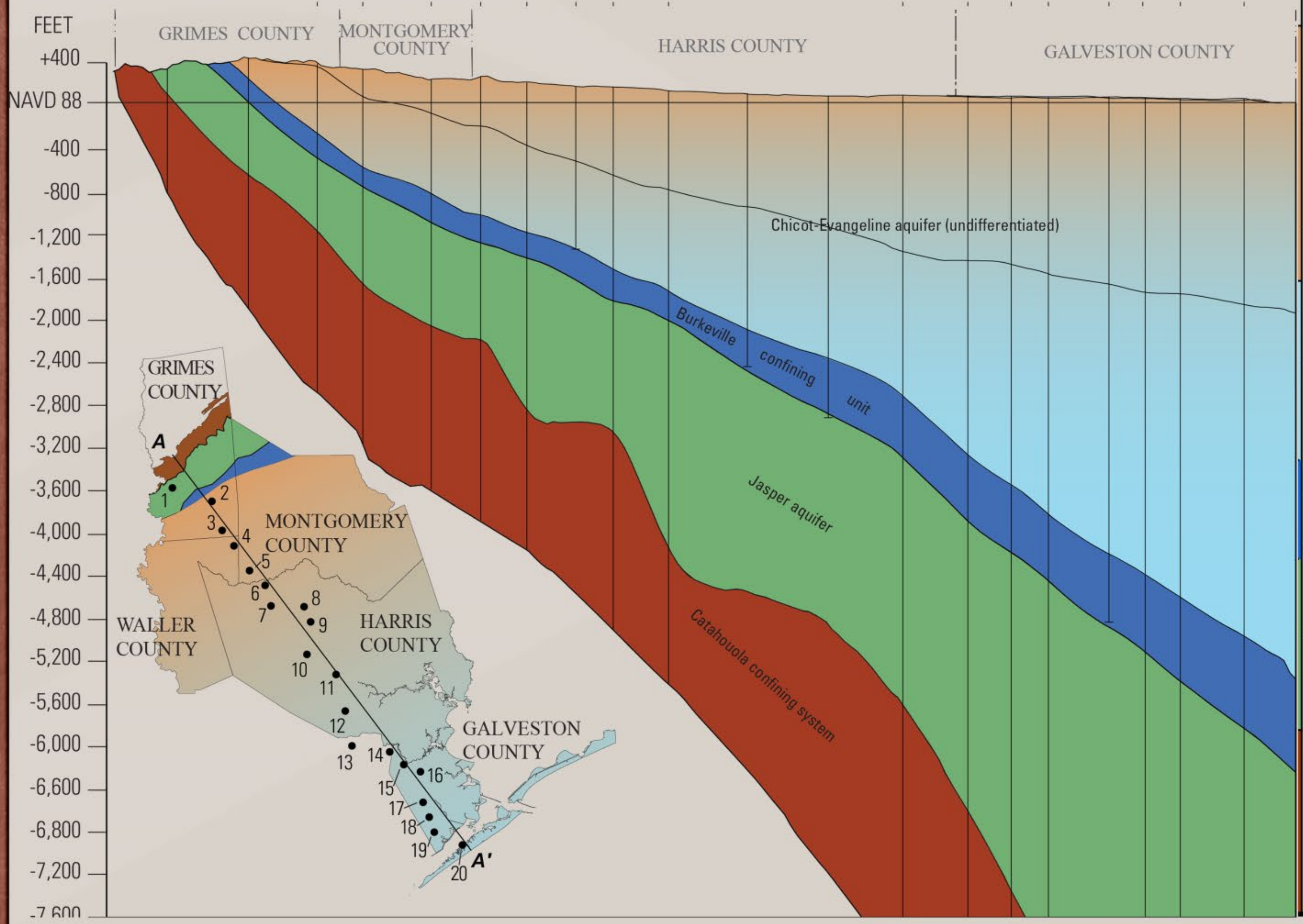
Research in cooperation with the Harris–Galveston & Fort Bend Subsidence Districts Brazoria Groundwater Conservation District, The City of Houston and Lone Star Groundwater Conservation District

# 2023 Water-Level Map Series



- Chicot and Evangeline Aquifers (undifferentiated)
  - 2023 Water-Level Altitude
  - 2022 to 2023 Water-Level Change
  - 2018 to 2023 Water-Level Change
  - 1990 to 2023 Water-Level Change
  - 1977 to 2023 Water-Level Change
- Jasper Aquifer
  - 2023 Water-Level Altitude
  - 2022 to 2023 Water-Level Change
  - 2018 to 2023 Water-Level Change
  - 2000 to 2023 Water-Level Change
- Compaction 1973 to 2022
  - Compaction Data from 14 Extensometers

# Geology and Hydrology



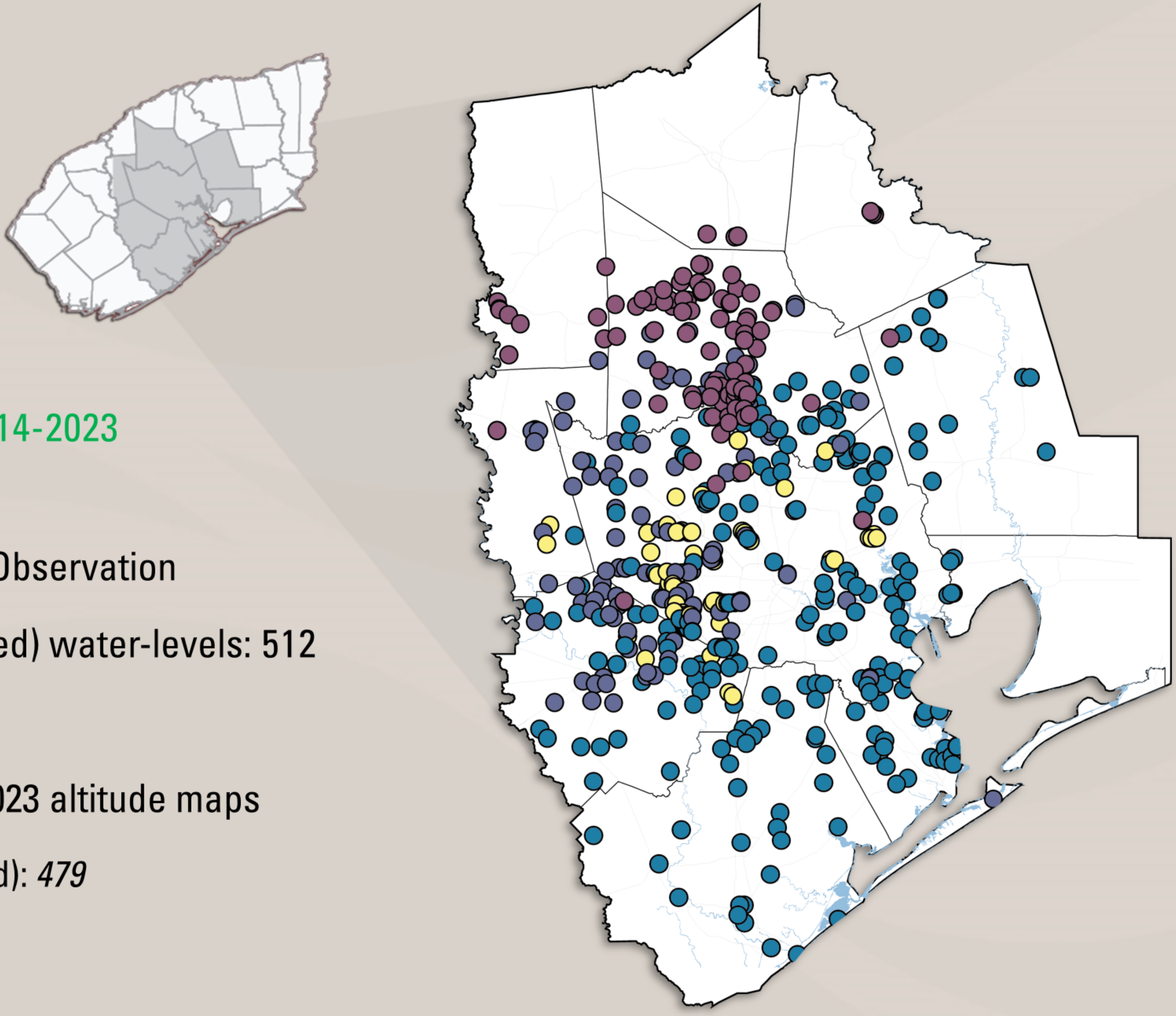

| In 2021 and Moving Forward | | |
|---|---|---|
| Geologic units[1] | | Hydrogeologic units[1] |
| | Alluvial, terrace, and dune deposits<br>Beaumont Formation | Chicot - Evangeline aquifer (undifferentiated) |
| Lissie Formation | Montgomery Formation | |
| | Bentley Formation | |
| | Willis Sand | |
| | Goliad Sand (upper part) | |
| | Goliad Sand (lower part)<br>Lagarto Clay (upper part) | |
| | Lagarto Clay (middle part) | Burkeville confining unit |
| | Lagarto Clay (lower part) | Jasper aquifer |
| | Oakville Sandstone | |
| Catahoula Formation | Upper Catahoula Formation | Catahoula Confining System |
| | Frio Formation | |

- Chicot and Evangeline aquifers (undifferentiated)
  - combined for annual regional-scale assessments
  - Updated aquifer tops and bases*
  - Chicot thickened across much of southeast Harris County
  - Distribution of Evangeline wells changed significantly


*Young, S.C., Kelley, V.A., Deeds, N., Hudson, C., Piemonti, D., Ewing, T.E., Banerji, D., Seifert, J., and Lyman, P., 2017

*Young, S.C., and Draper, C., 2020

# Network



- Data collected across 11 counties
- Data collection from 12-09-2022 to 3-14-2023
- Well Types:
  - Public Supply, Irrigation, Industrial, Observation
- Chicot and Evangeline (undifferentiated) water-levels: 512
- Jasper water-levels: 101
- Number of wells used to create the 2023 altitude maps
  - Chicot and Evangeline (undifferentiated): *479*
  - Jasper: *98*

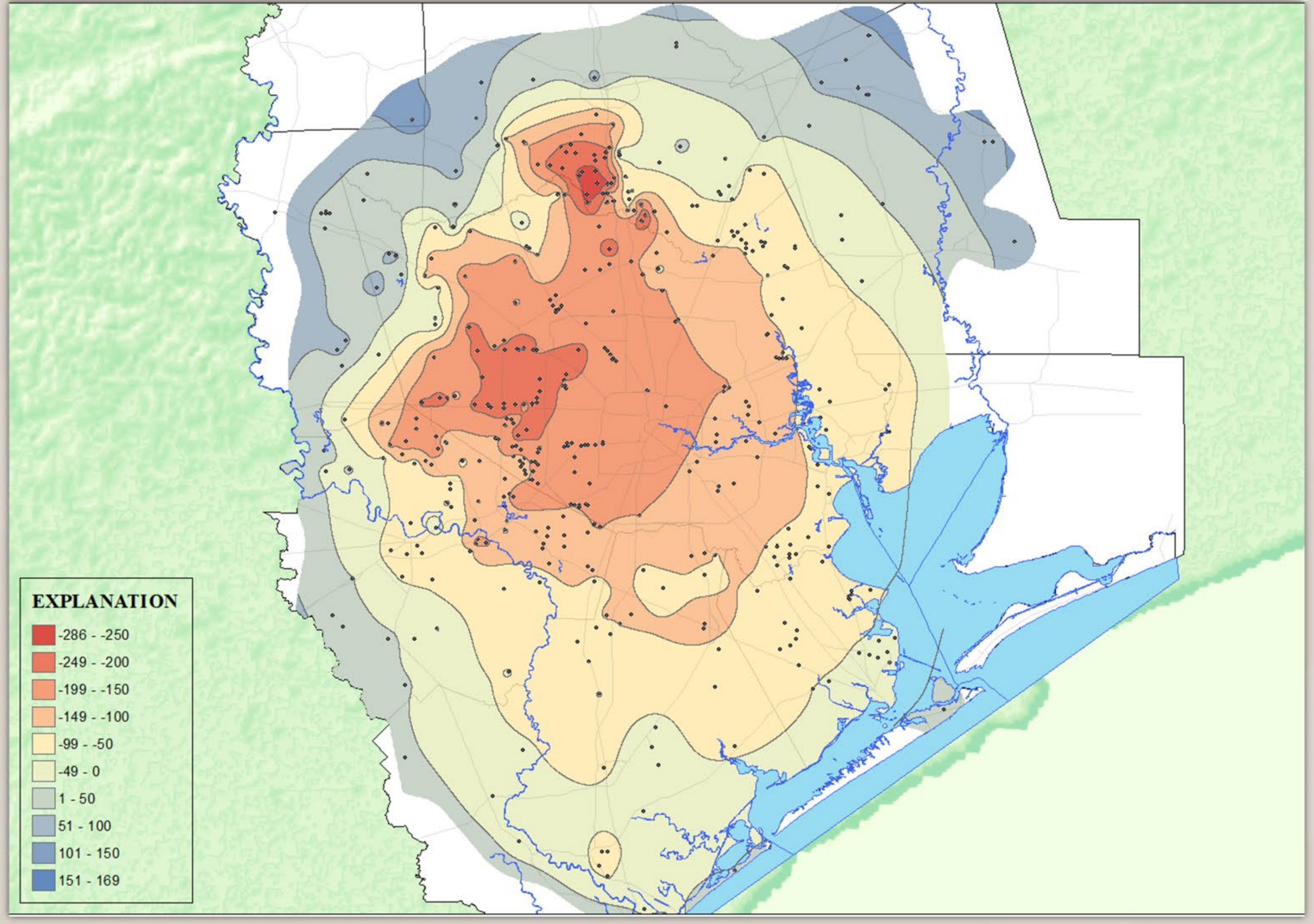
# Water-Level Altitude

## Chicot and Evangeline (undifferentiated)

Altitudes are referenced from NAVD 88

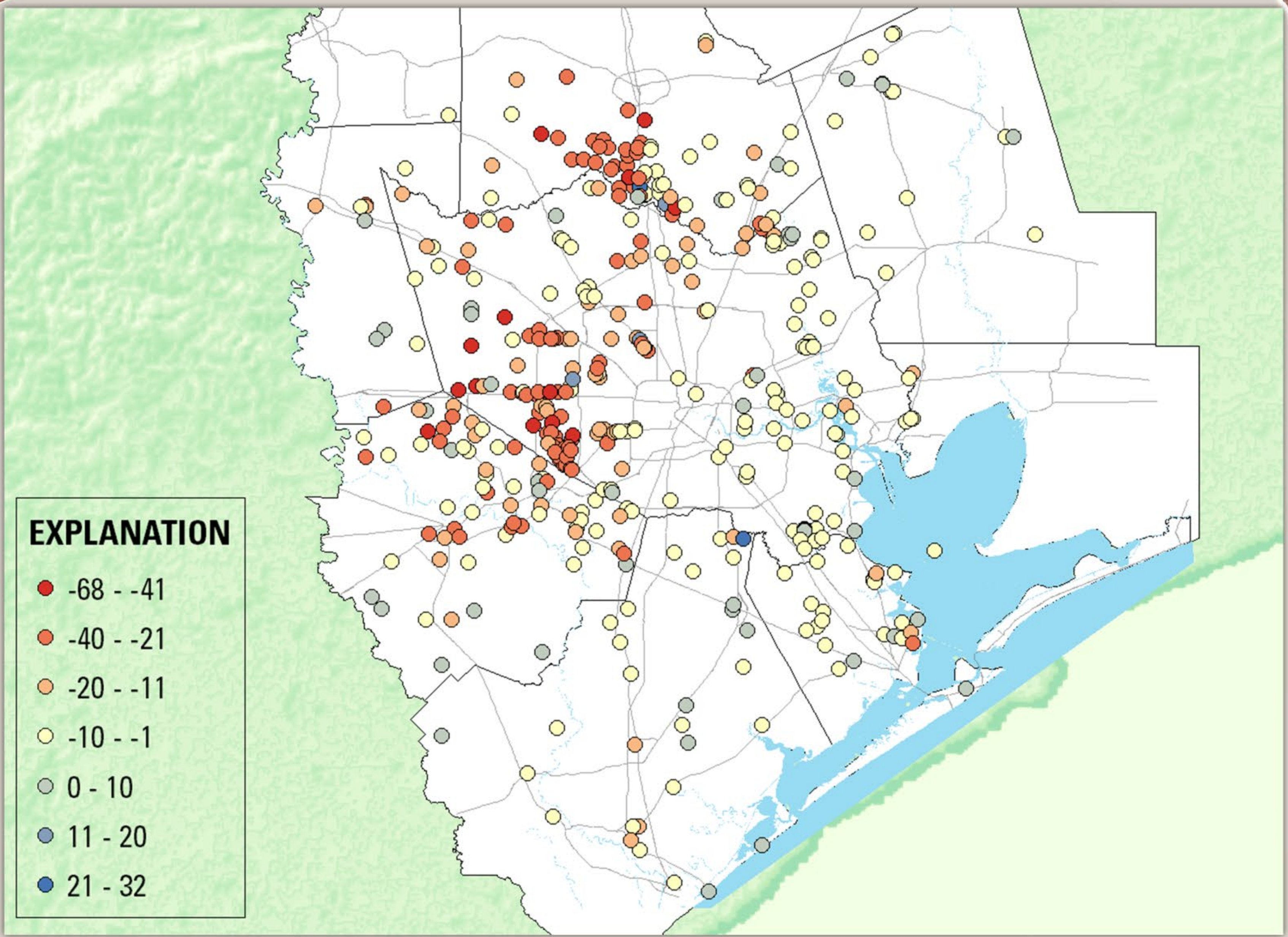
Lowest altitudes in south-central portion of Montgomery County and western Harris County

Highest altitudes in portions of south-eastern Grimes County, south-eastern San Jacinto County, and central Liberty County



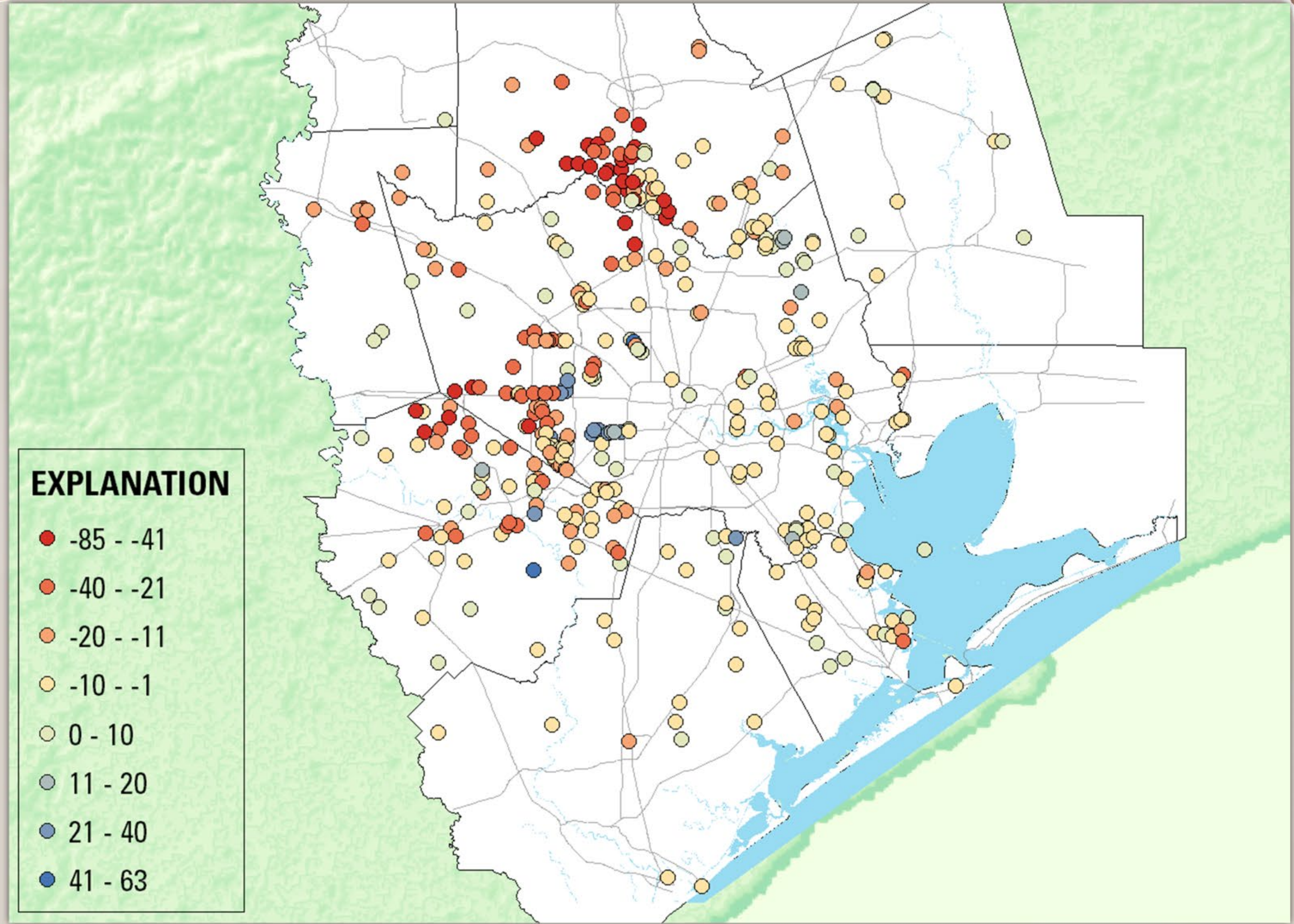
# 2022 to 2023 Water-Level Change

- 454 water-level pairs
  - Mostly declines
  - Largest declines (>40 ft):
    - portions of western Harris county and south-central Montgomery County
    - 1 in Fort Bend County
  - Largest rises (> 20 ft):
    - 1 in south-central Montgomery County
    - 1 in Brazoria County



# 2018 to 2023 Water-Level Change

- 420 water-level pairs
  - Mostly declines
  - Largest declines (>40 ft):
    - portions of western Harris county, northern Fort Bend County and south-central Montgomery County
  - Largest rises (> 40 ft):
    - 1 in central Harris County
    - 1 in Fort Bend County

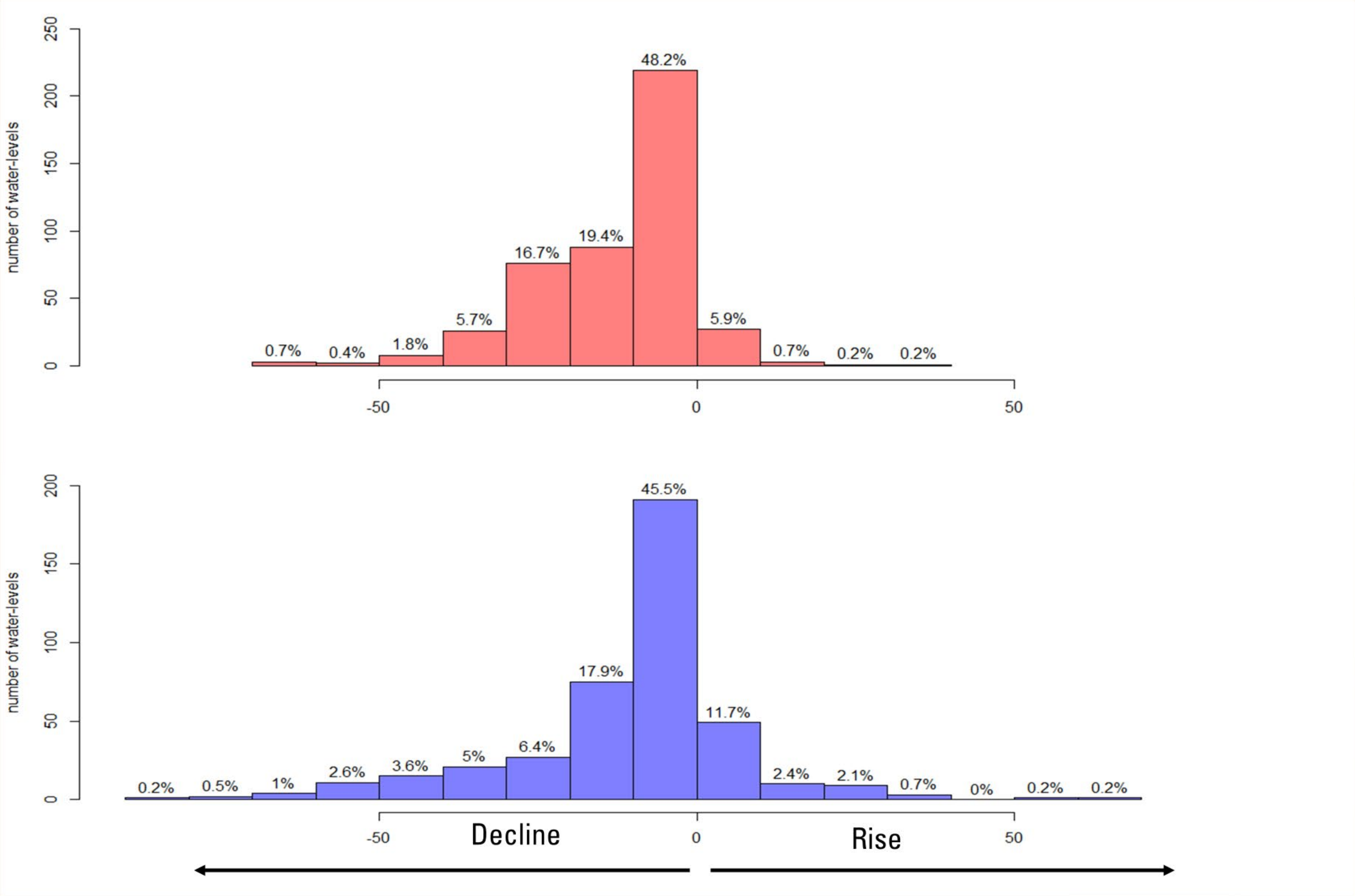


## Change Comparison

Chicot and Evangeline (undifferentiated)

1 Year
2022 to 2023

5 Year
2018 to 2023

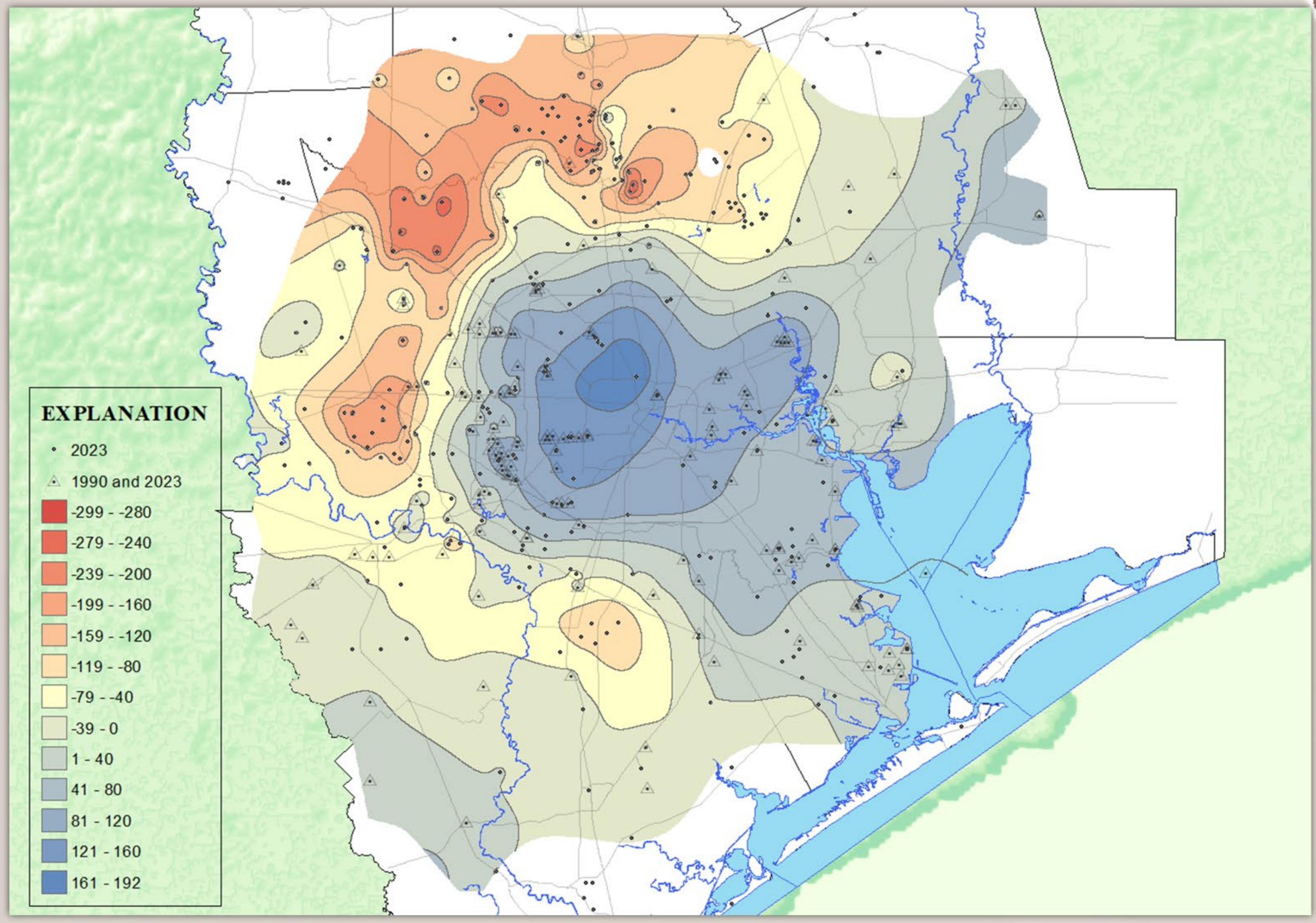


# Long term change

Water level rises across most of central and eastern Harris County and Galveston County

Water-level declines from central Brazoria County, much of Fort Bend County, Western and NW Harris County, portions of Waller County, and portions of Montgomery County

**Chicot and Evangeline (undifferentiated) Water-Level Change 1990 to 2023**

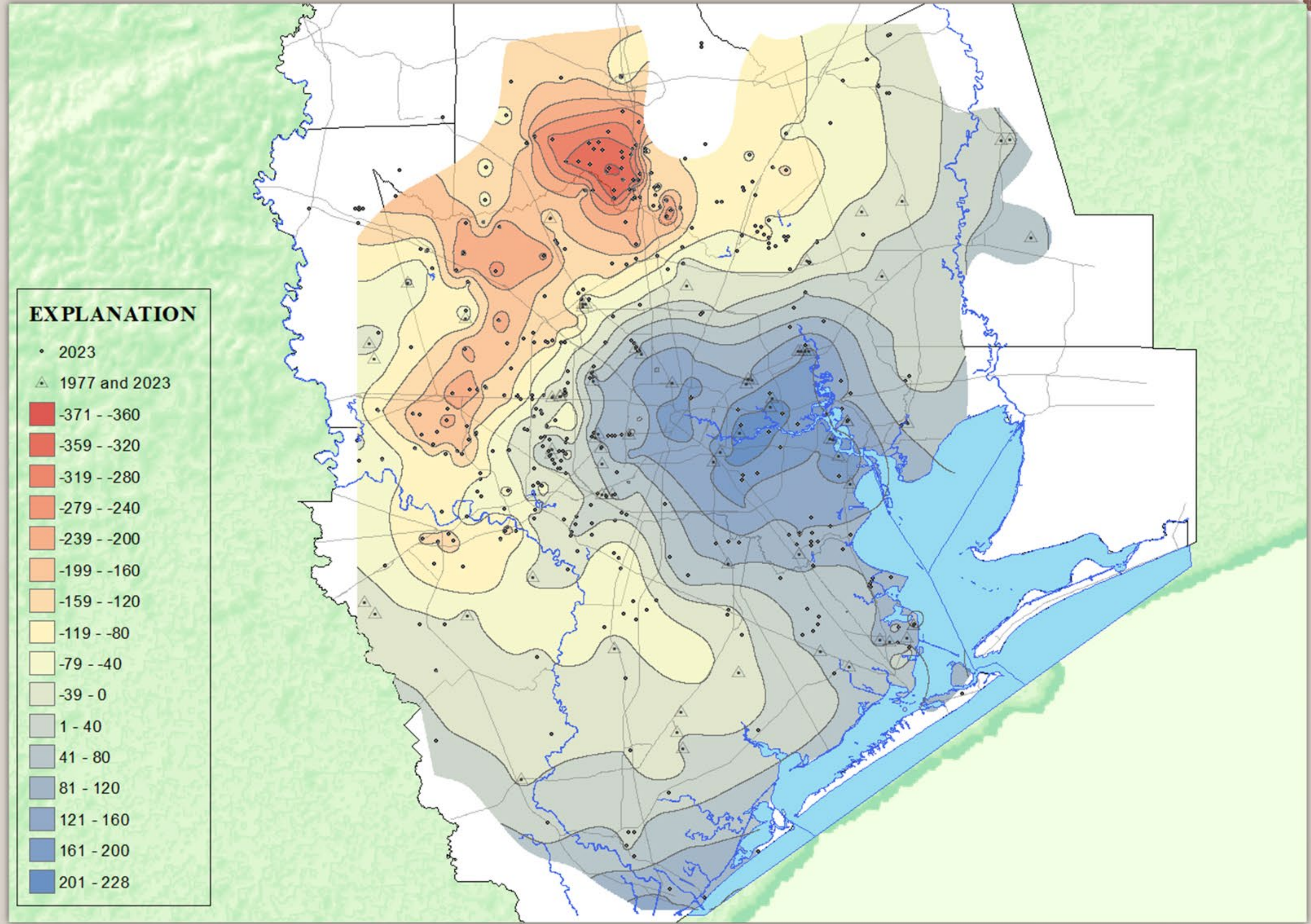


# Long term change

Water level rises across most of central and eastern Harris County and Galveston County

Water-level declines from central Brazoria County, much of Fort Bend County, Western and NW Harris County, portions of Waller County, and portions of Montgomery County

## Chicot and Evangeline (undifferentiated) Water-Level Change 1977 to 2023

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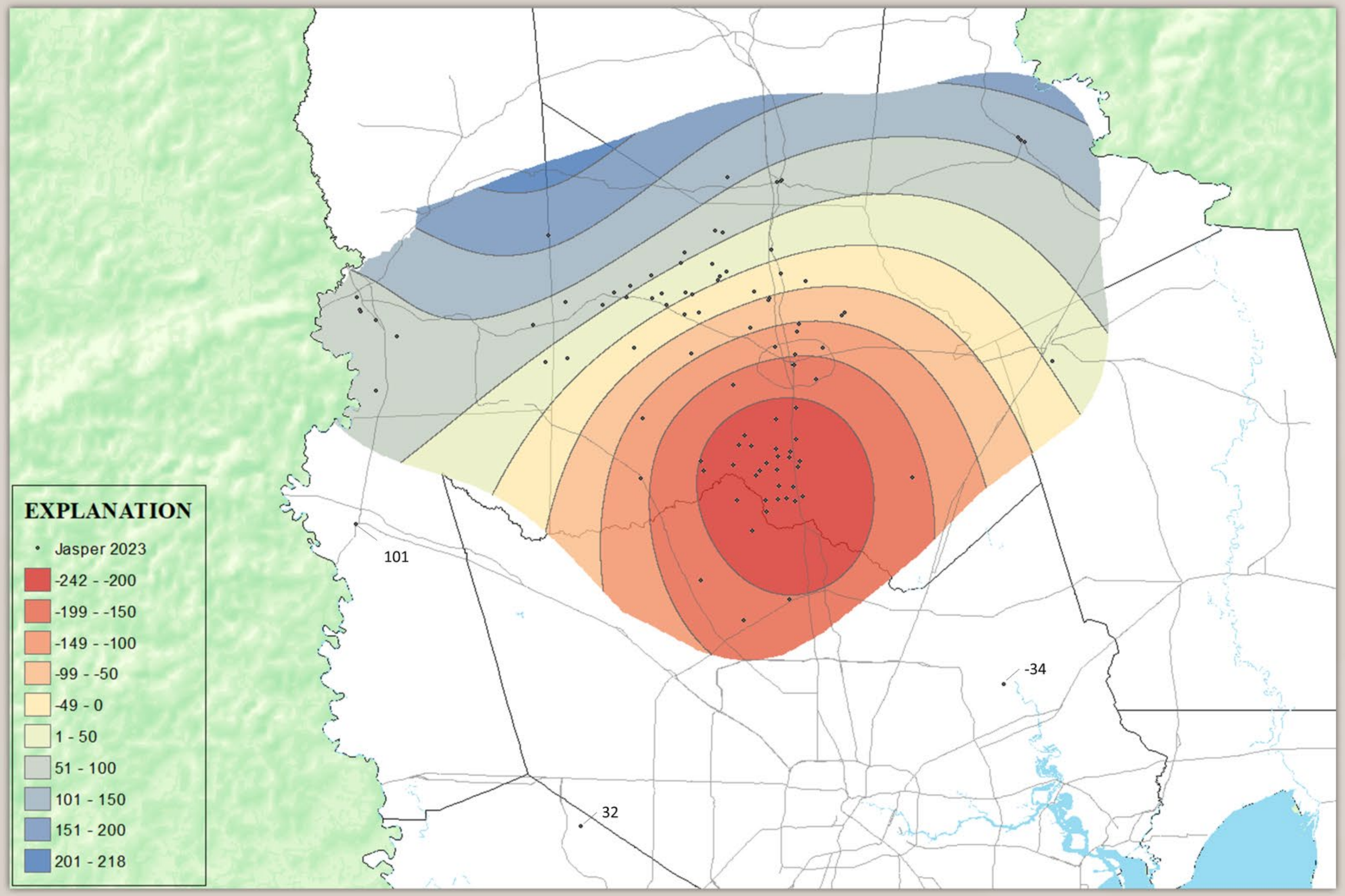
# Water-Level Altitude

## Jasper

Altitudes are referenced from NAVD 88

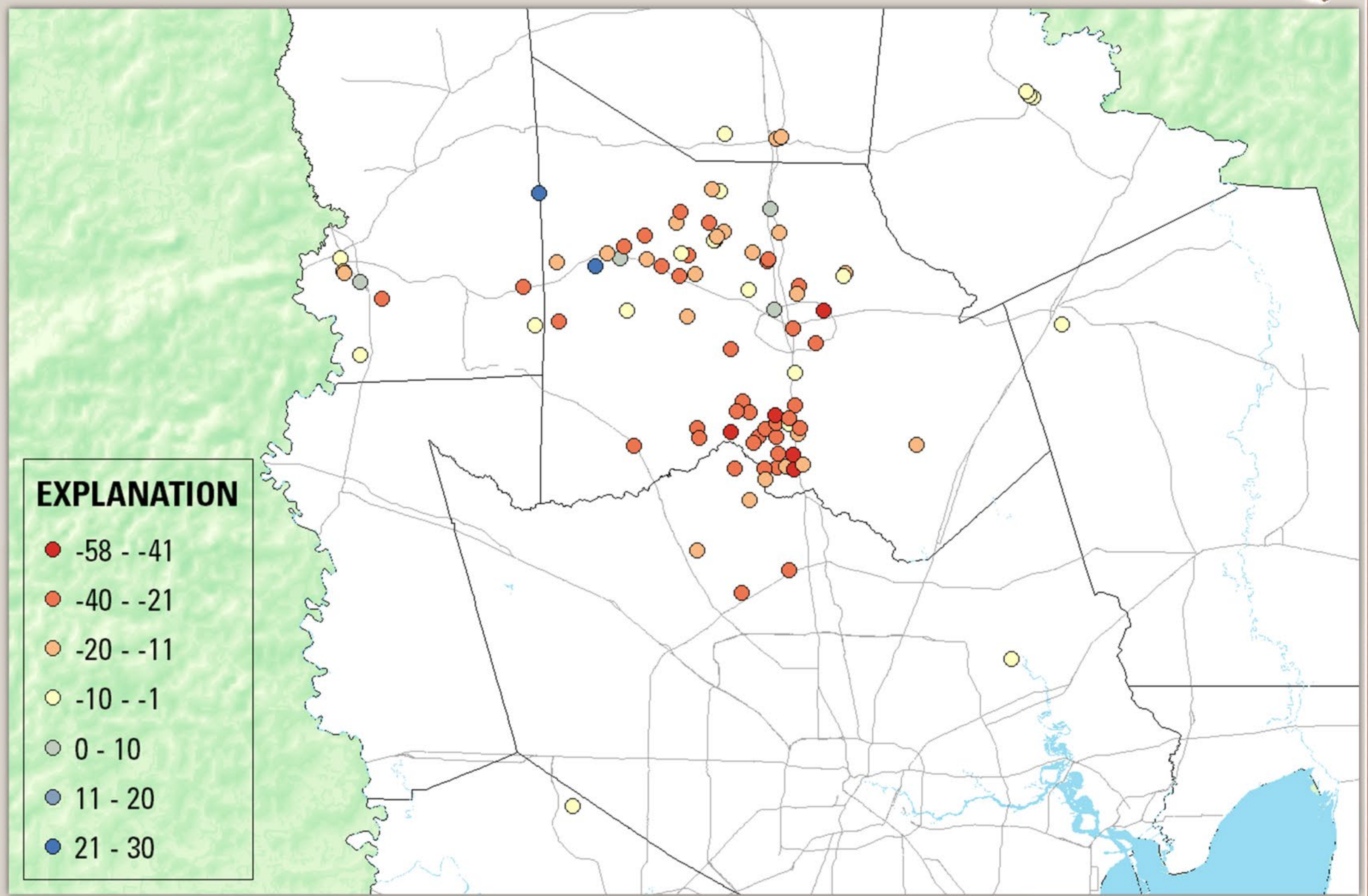
General trend of altitudes deepening in down-dip direction (NW-SE)

Lowest altitudes in south-central Montgomery County and north-central Harris County



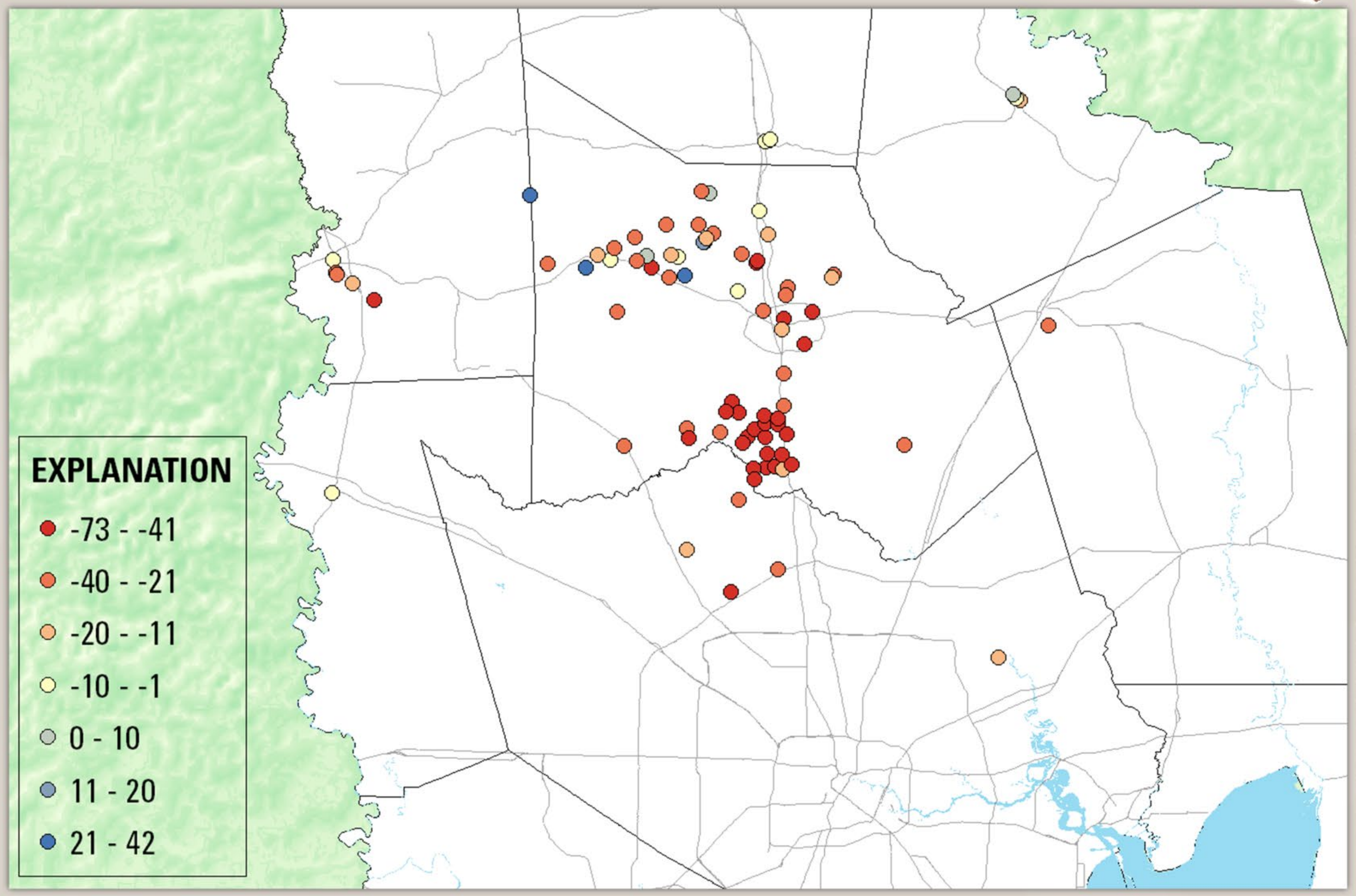
# 2022 to 2023 Water-Level Change

- 92 water-level pairs
  - Mostly declines (~93%)
  - Largest declines (>40 ft):
    - 4 in south-central Montgomery County
    - 1 in central Montgomery County
  - Largest rises (> 20 ft):
    - 2 in west-central Montgomery County



# 2018 to 2023 Water-Level Change

- 83 water-level pairs
  - Mostly declines (~92%)
  - Largest declines (>40 ft):
    - Central and south-central Montgomery County
    - 1 in Grimes County and 1 in west-central Harris County
  - Largest rises (> 20 ft):
    - West-central Montgomery County

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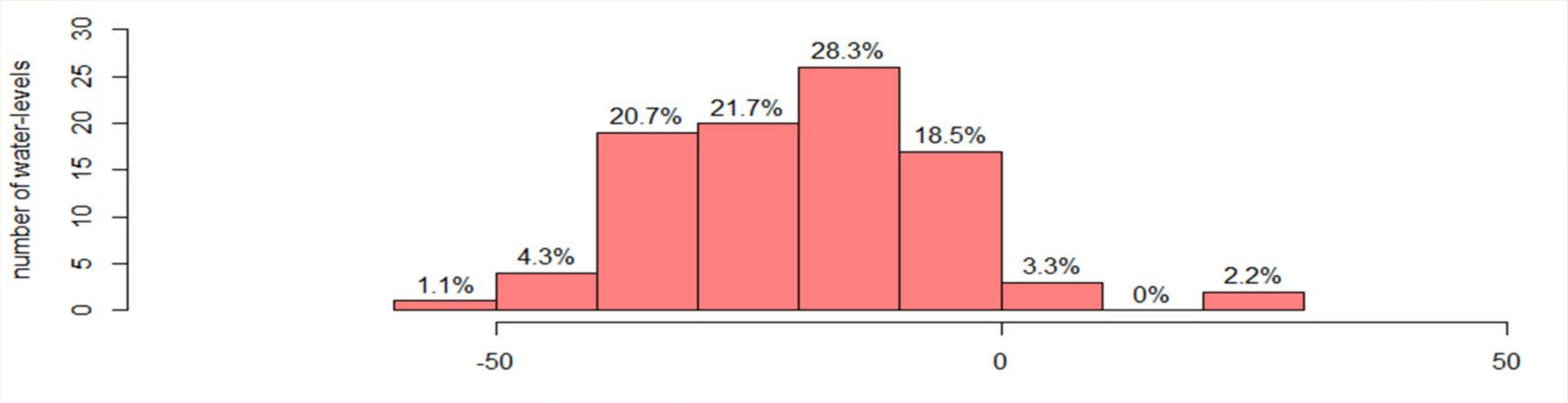
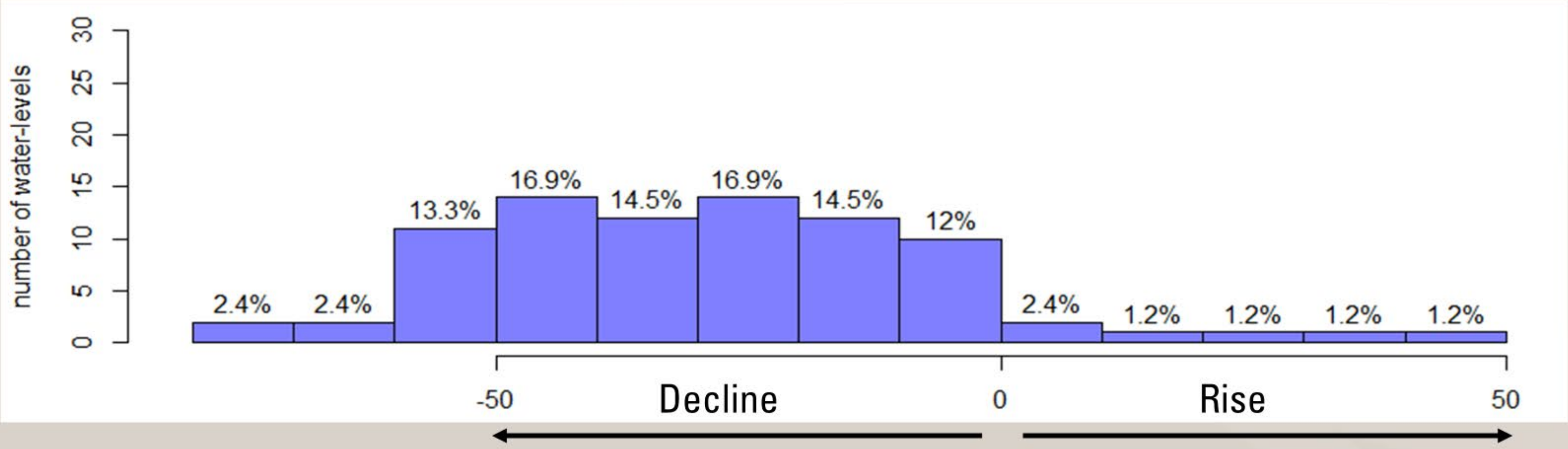
# Change Comparison

Jasper

1 Year
2022 to 2023



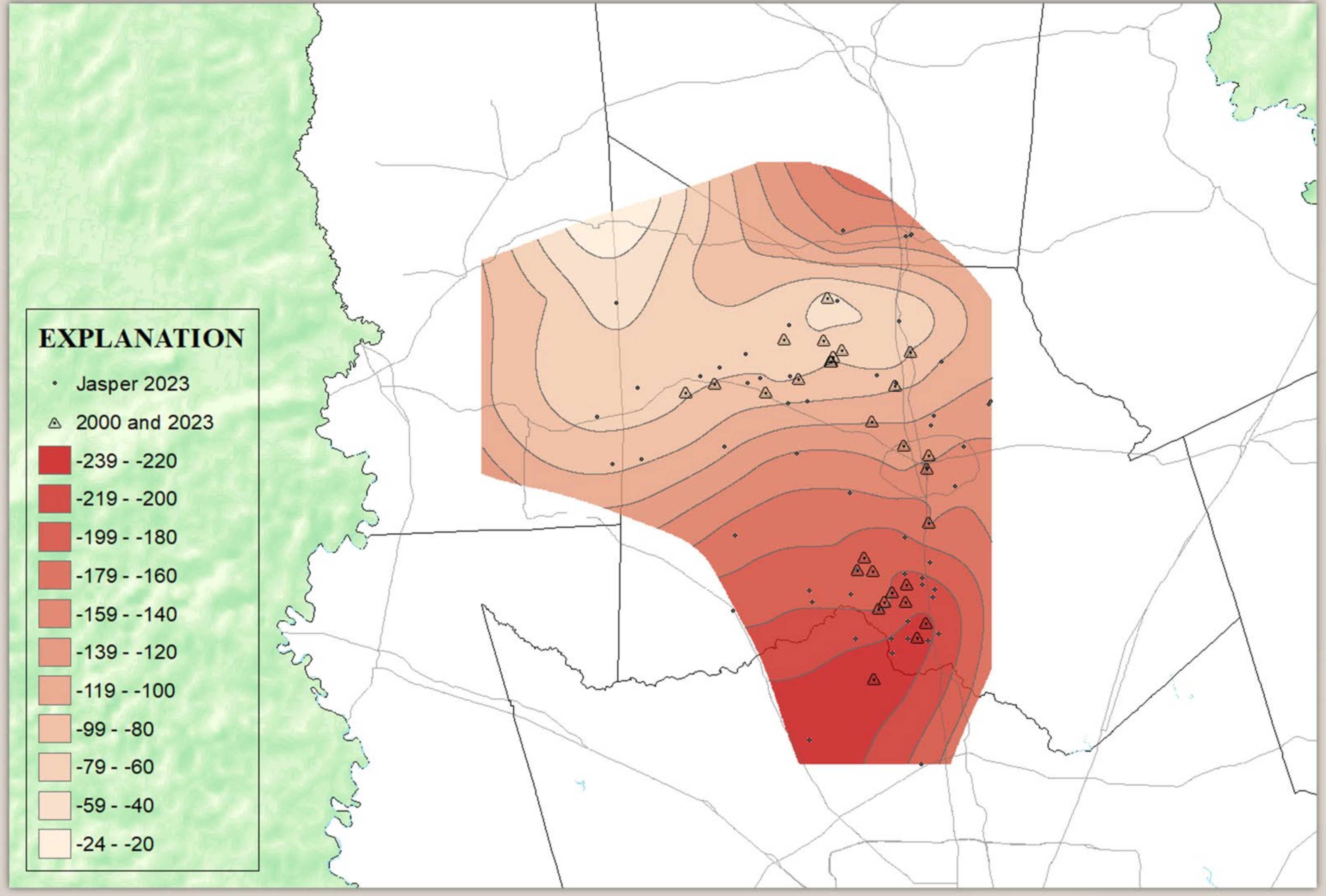

5 Year
2018 to 2023



# Long term change

Water-level declines from north-west Montgomery and Grimes Counties down-dip into south-central Montgomery County and northern Harris County

## Jasper Water-Level Change 2000 to 2023



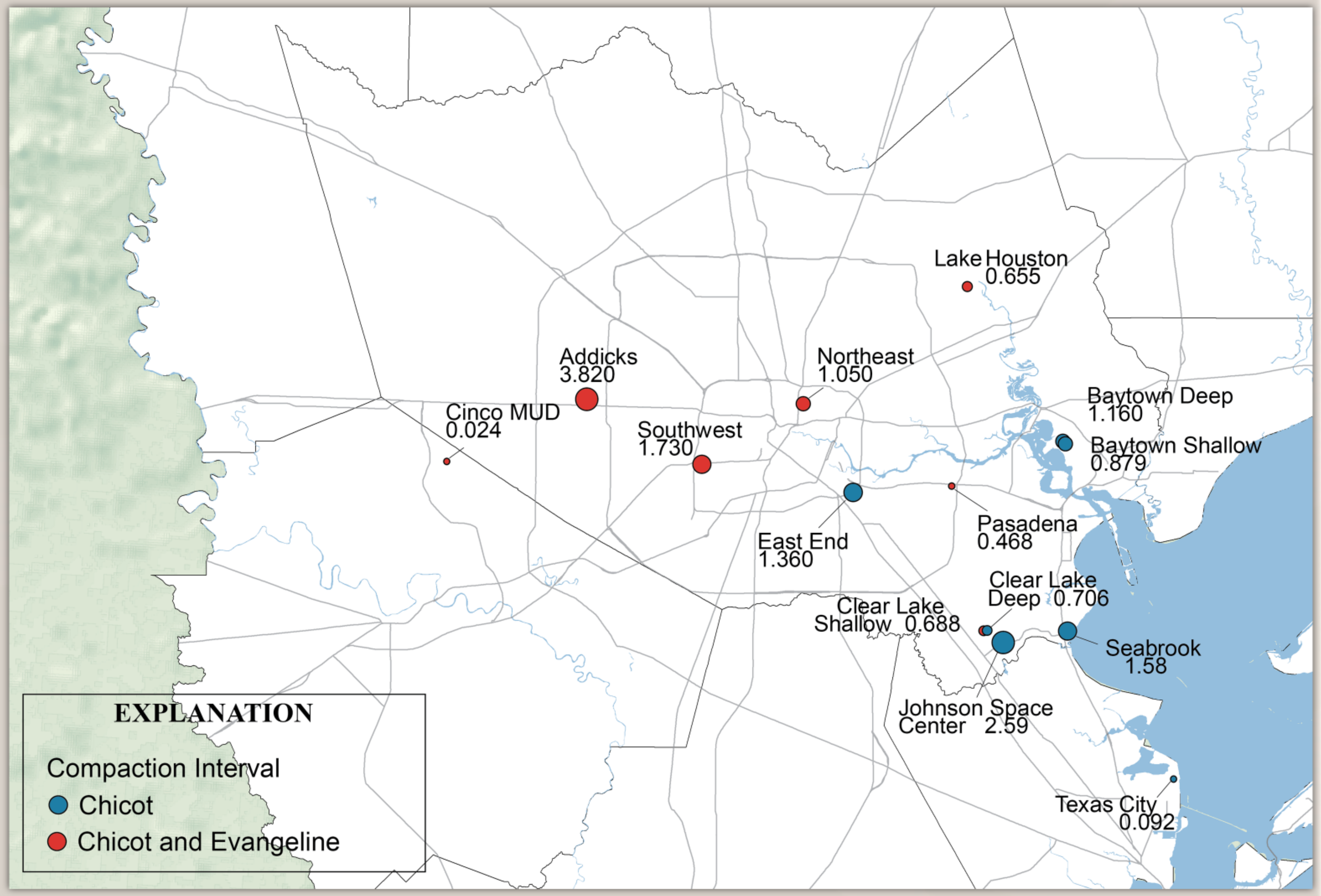
Compaction Interval:
Chicot

1. 1973 | Baytown Shallow 0.879 ft.
2. 1973 | East End 1.360 ft.
3. 1973 | Johnson Space Center 2.590 ft.
4. 1973 | Seabrook 1.580 ft.
5. 1973 | Texas City 0.092 ft.
6. 1976 | Clear Lake Shallow 0.688 ft.

Compaction Interval:
Chicot and Evangeline

7. 1973 | Baytown Deep 1.160 ft.
8. 1974 | Addicks 3.820 ft.
9. 1974 | Pasadena 0.468 ft.
10. 1976 | Clear Lake Deep 0.706 ft.
11. 1980 | Lake Houston 0.655 ft.
12. 1980 | Northeast 1.050 ft.
13. 1980 | Southwest 1.730 ft.
14. 2017 | Cinco MUD 0.024 ft.

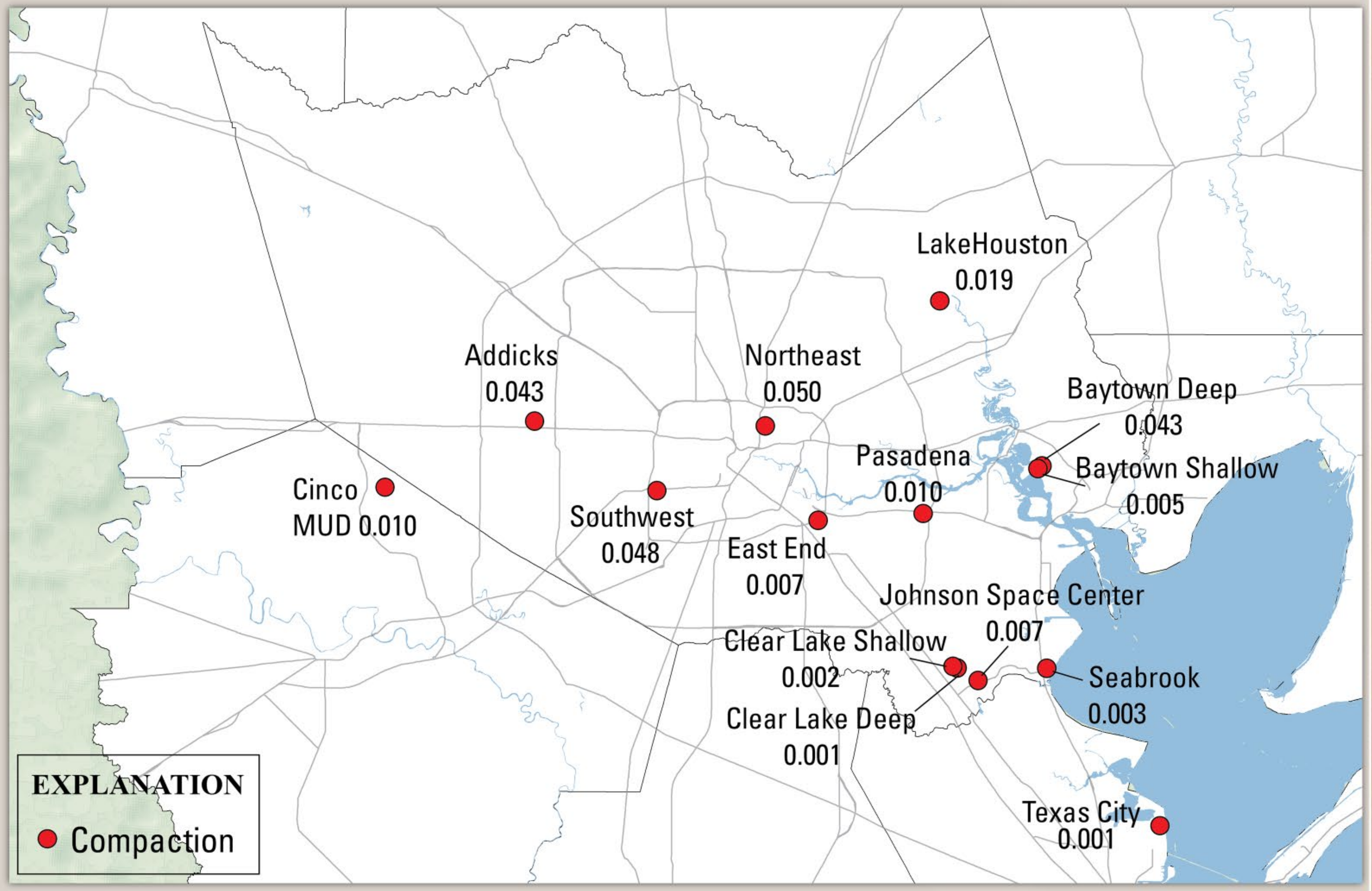
# Compaction 1973 - 2022



# 2022 Compaction Summary

- All sites recorded compaction for the period (no expansion)
- Compaction ranged from 0.001 ft to 0.050 ft

## Compaction December 2021 to December 2022

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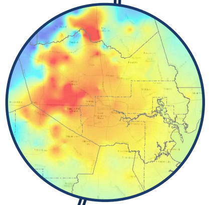
# Agenda

Climate

Groundwater Use



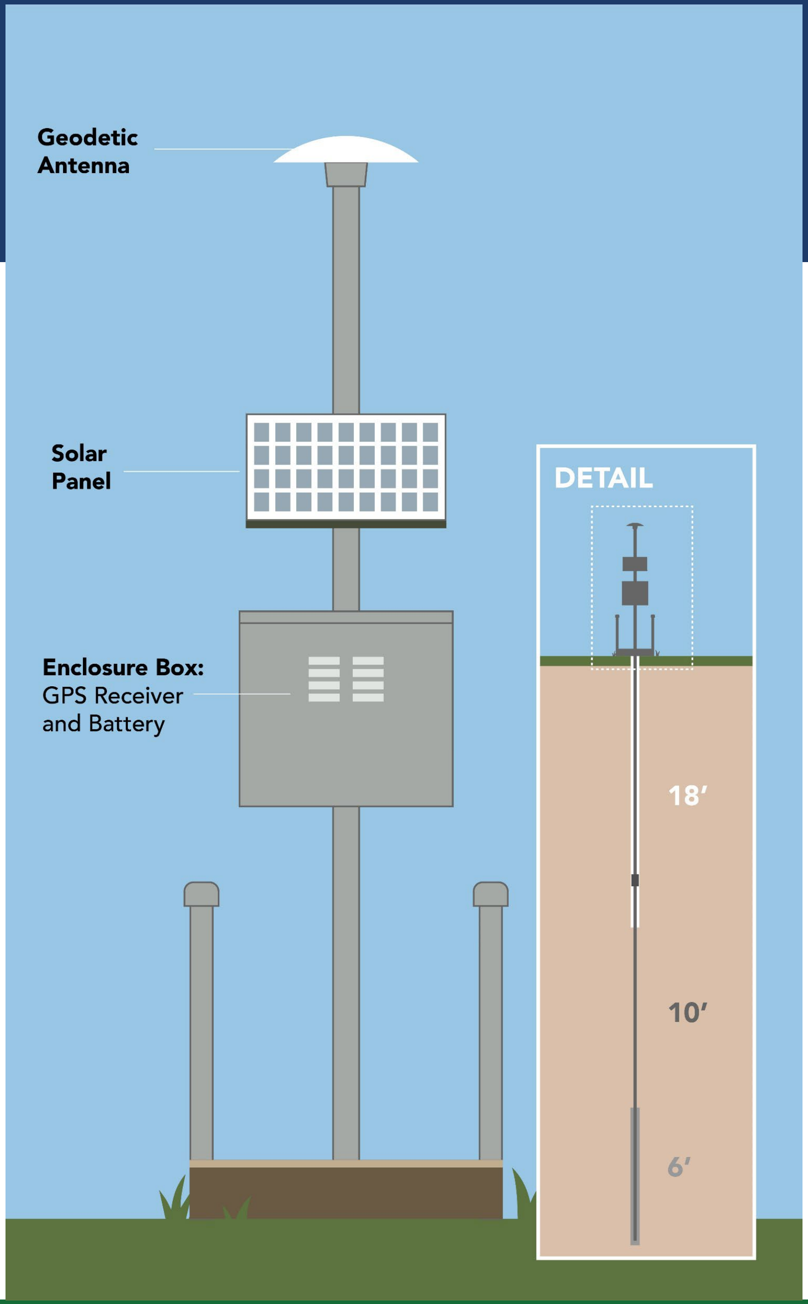
Groundwater Levels

Subsidence Data

# Exhibit 11

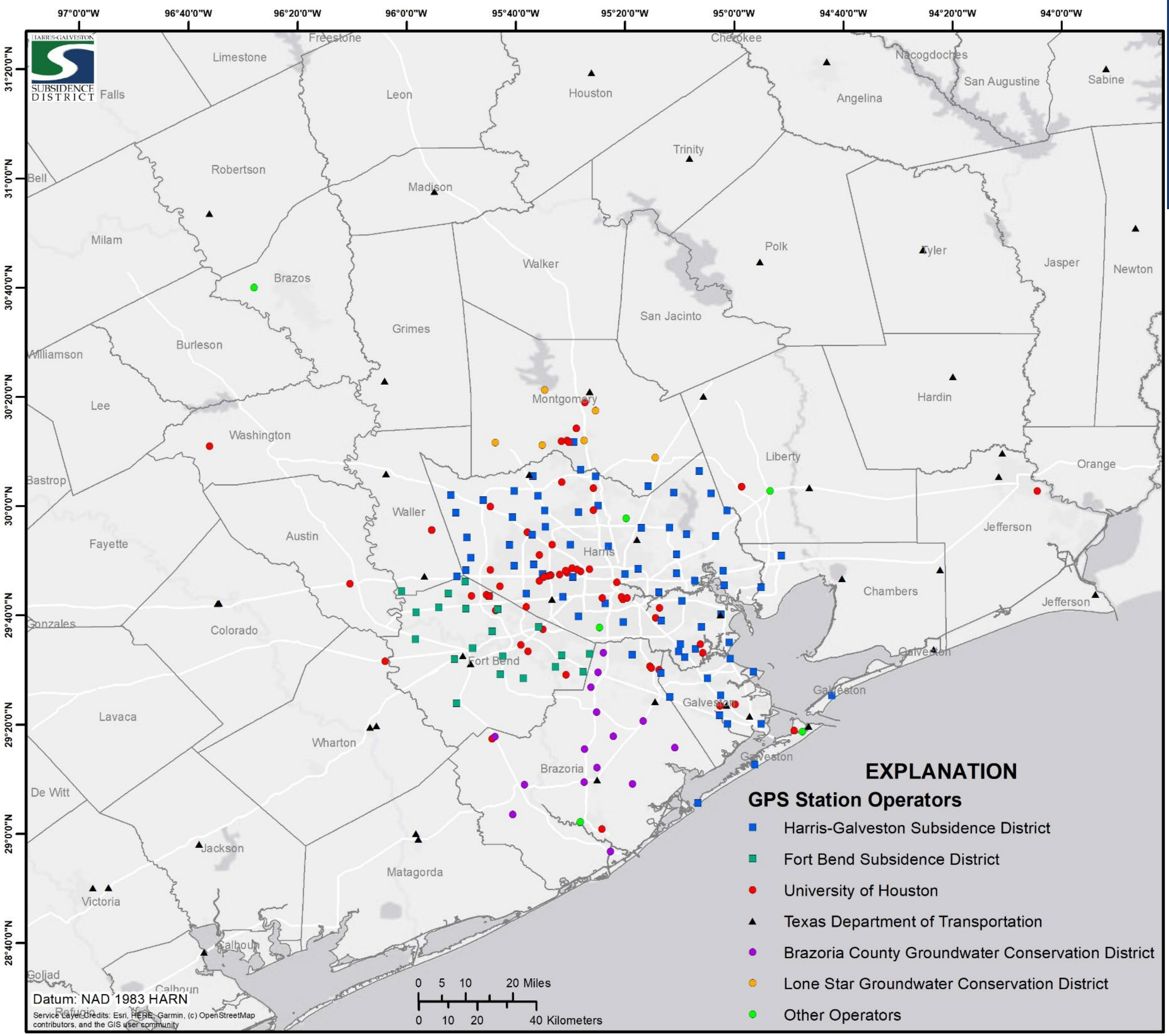
All District operated global positioning system (GPS) stations are constructed in a custom design.

GPS data are collected for approximately one week every two months (periodic monitoring).



# Exhibit 12

Location and operator of GPS stations that monitor land-surface deformation periodically or continuously within the greater Houston-Galveston region in 2022.

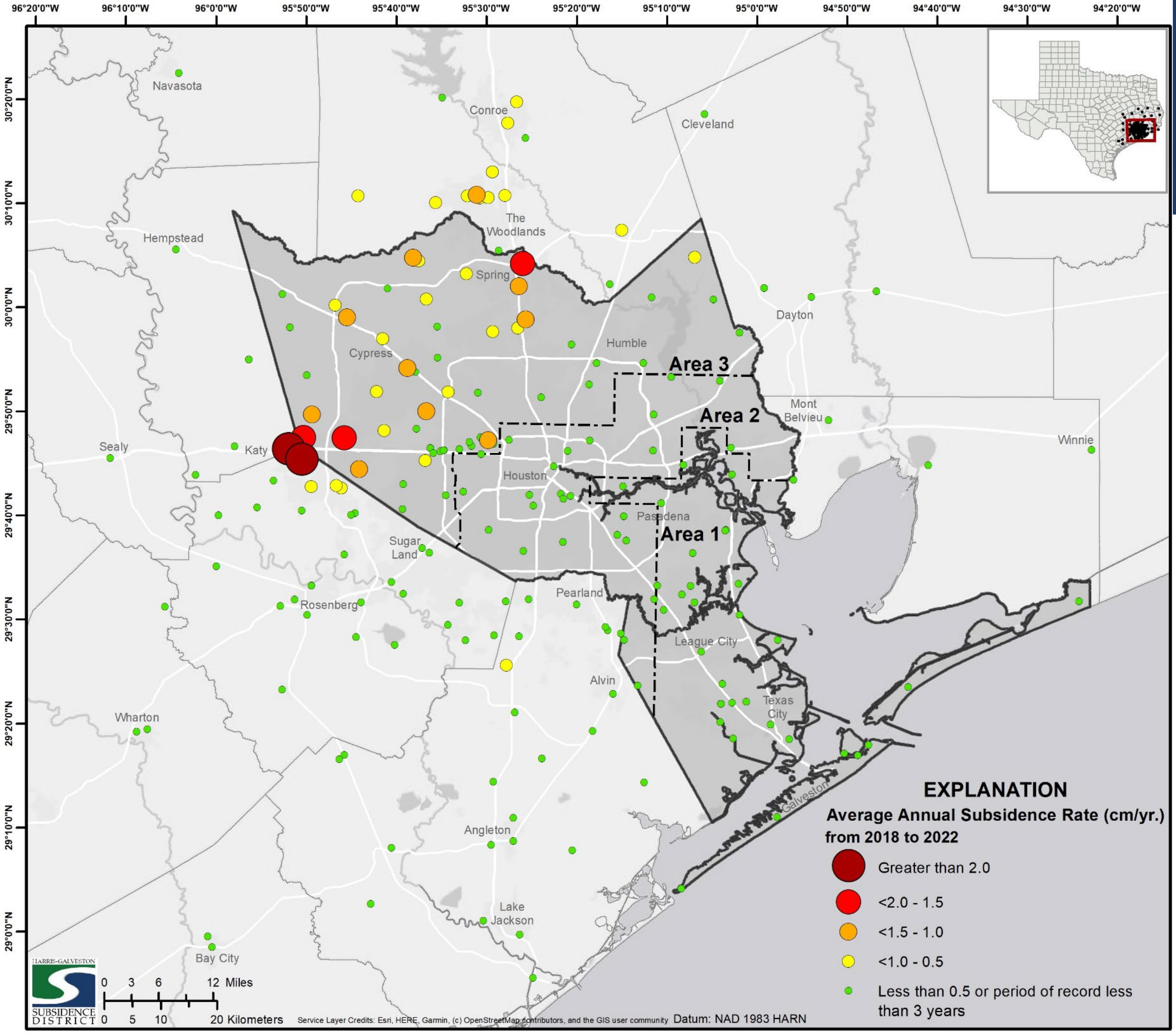





*(Provisional - Subject to Revision)*

# Exhibit 13

Annual subsidence rate, in centimeters per year (cm/yr.), measured at GPS stations with three or more years of GPS data in Harris, Galveston, and surrounding counties, averaged from 2018 to 2022.

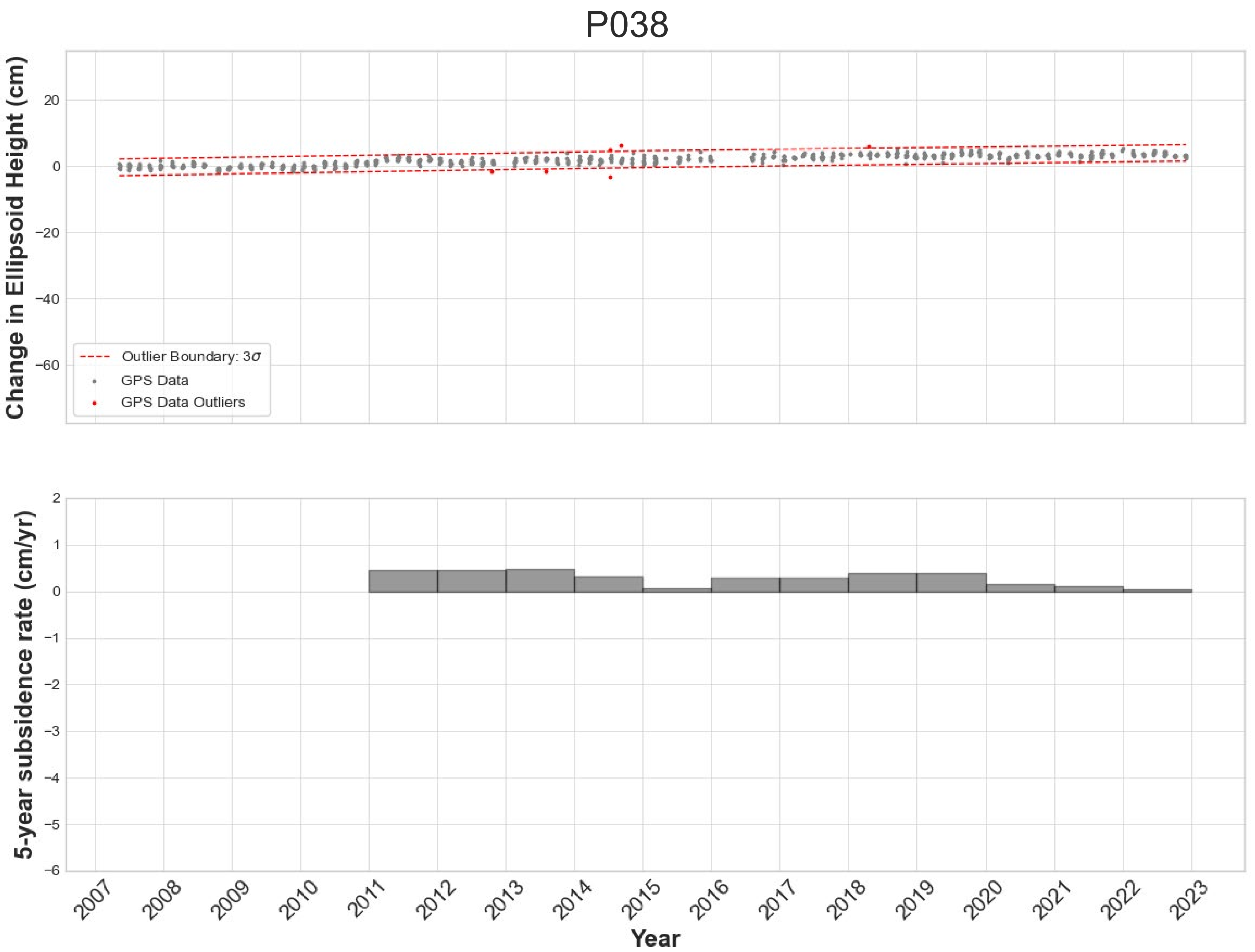



HARRIS-GALVESTON SUBSIDENCE DISTRICT

*(Provisional - Subject to Revision)*

# Exhibit 14

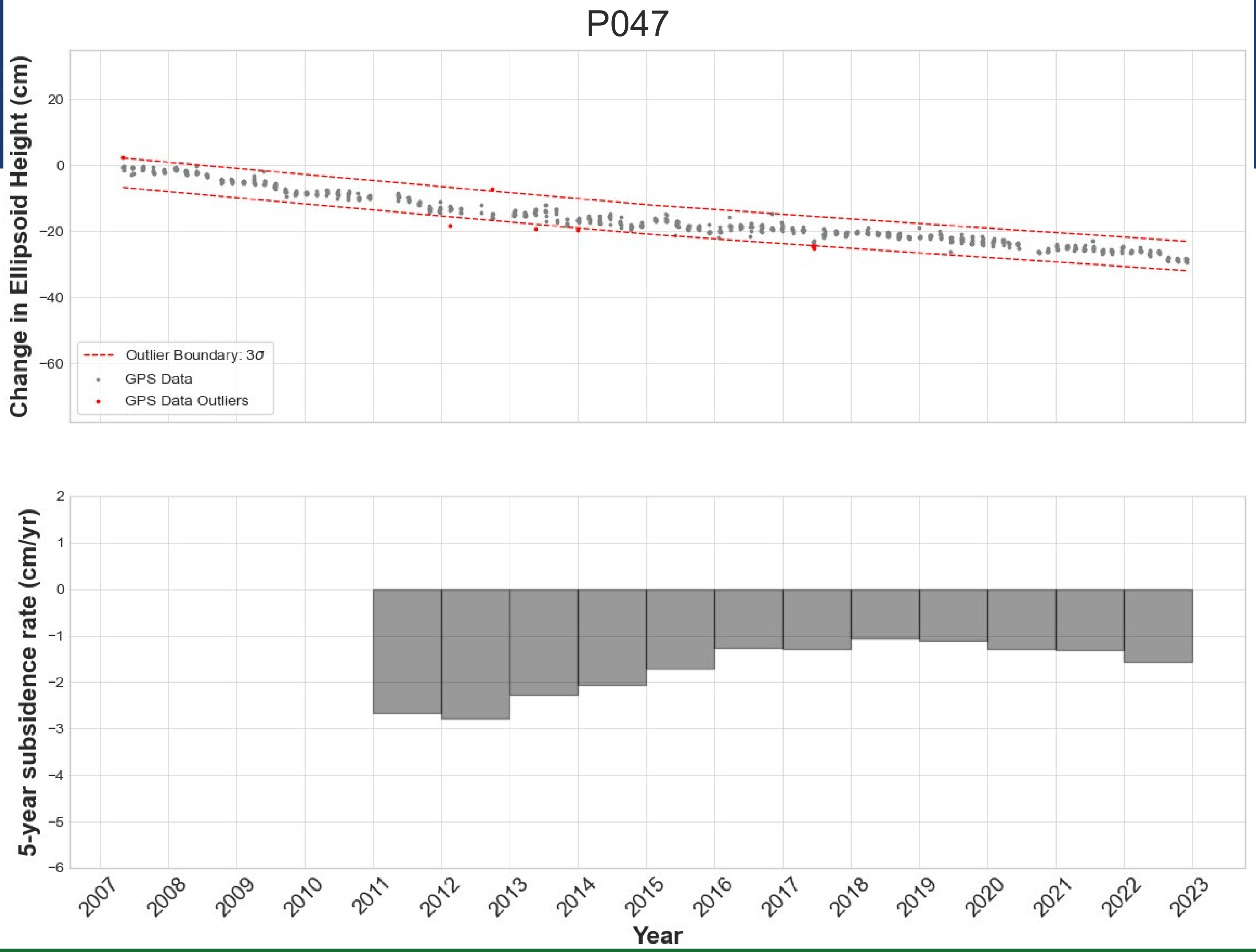
GPS station P038, located in Pasadena, has measured a total of approximately 3.3 cm of uplift since 2007.




Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown for informational purposes only.

# Exhibit 15

GPS station P047, located in Spring, has measured a total of approximately 27.5 cm of subsidence since 2007.




Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown for informational purposes only.

HARRIS-GALVESTON SUBSIDENCE DISTRICT

*(Provisional - Subject to Revision)*

# Testimony and Public Comment

Any person who wishes to appear at the hearing and present testimony, evidence, exhibits or other information may do so in person, by counsel, via email to **info@subsidence.org** or any combination of these options.

# Thank you for attending the Public Hearing for the 2022 Annual Groundwater Report

- Record will be open until May 5, 2023. You may provide comments by sending an email to **info@subsidence.org**.
- The 2022 Annual Groundwater Report will be presented to the Harris-Galveston Subsidence District Board of Directors on May 10, 2023.
- The 2022 Annual Groundwater Report will be posted on the District's website (**www.hgsubsidence.org**) upon approval of the District's Board of Directors.

HARRIS-GALVESTON
SUBSIDENCE DISTRICT

# Contact Information

(281) 486-1105

info@subsidence.org

www.hgsubsidence.org

1660 W. Bay Area Blvd.
Friendswood, TX 77546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# Appendix B – Subsidence Monitoring Network and Data

# Table of Contents



# List of Figures

# Subsidence Monitoring Network

## GPS Station Overview

The subsidence monitoring network comprises a collaboration of local, state, and federal agencies that operate and maintain global position system (GPS) stations in the greater Houston-Galveston region. In 2022, the Harris-Galveston Subsidence District (the District) collected raw data from 230 GPS stations to assess and understand changes in the land-surface elevation in the region. The analysis of such data, including details on data processing and uncertainty, is provided in subsequent sections.

The District currently operates and maintains 73 GPS stations in the greater Houston region with approximately 66 stations located in Harris and Galveston counties and the remaining seven (7) stations within Brazoria, Waller, Montgomery, and Chambers counties. Fort Bend Subsidence District (FBSD) operates and maintains 22 GPS stations with 21 stations in Fort Bend County and one (1) in Waller County. Surrounding groundwater conservation districts (GCDs) such as Brazoria County GCD and Lone Star GCD operate and maintain 15 and six (6) GPS stations, respectively. The University of Houston (UH) operates 66 GPS stations, and the Texas Department of Transportation (TXDOT) operates 46 GPS stations spread across southeast Texas. **Figure 1** includes the location and operators of GPS stations within the greater Houston-Galveston area.

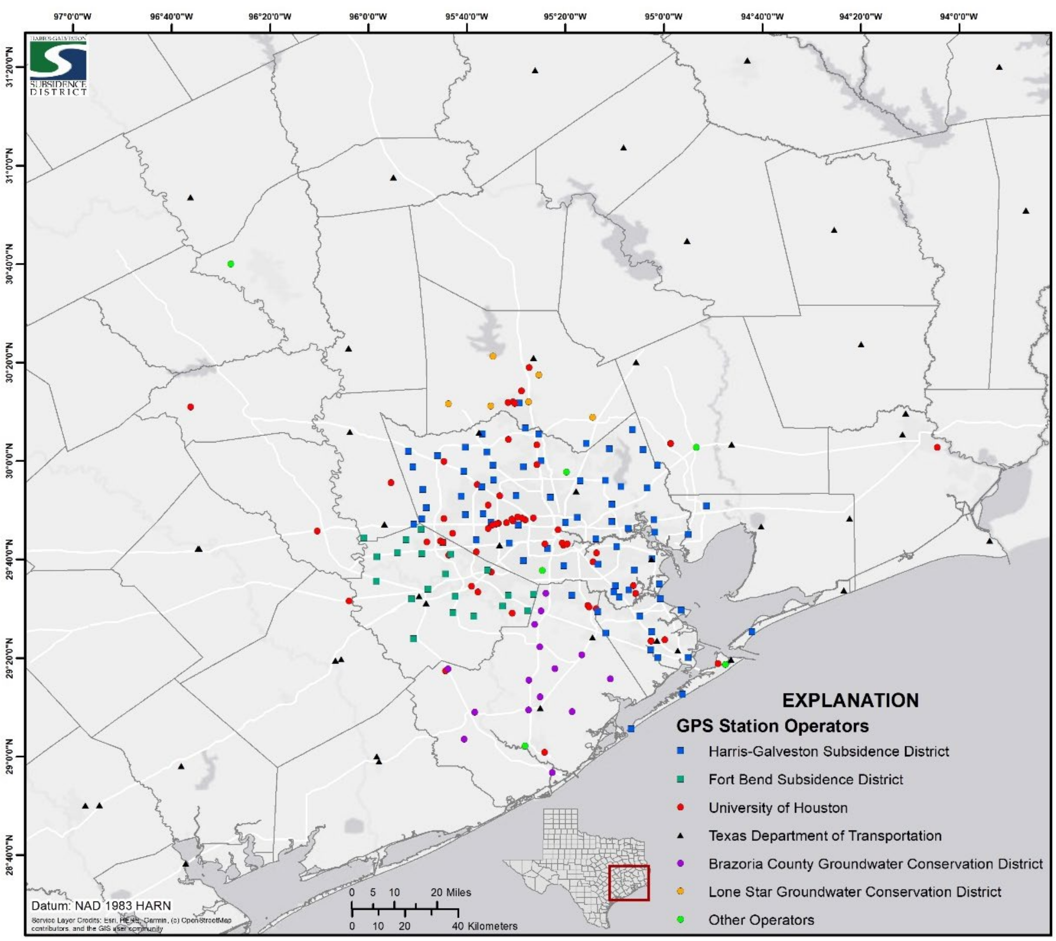

**Figure 1**: Location of GPS stations designated by operator in the greater Houston region.

The GPS stations are constructed in different ways based on when they were installed and operator preferences. The monitoring types are described in the section below. Two main designs of permanent GPS stations utilized by the District are a periodically measured (PAM) GPS station and an extensometer. Another type of permanent GPS station is a building mount, which is primarily used by UH.

The District designed a permanent GPS station in the mid-1990s to apply a consistent measurement method across multiple counties. This design is known as a PAM and is named after the original port-a-measure method utilized by the District in the early 1990s when the GPS station was a survey benchmark disk and each location collected data periodically. The PAM design consists of a two-inch galvanized pipe drilled approximately 34 feet below ground surface and extends eight feet above the ground surface. The pipe is anchored in a concrete plug at the base and enclosed by centering bands and PVC pipe near the surface to reduce movement. The exposed pipe (i.e., the section of pipe that extends eight feet above the ground surface) is mounted with an antenna adapter to secure the global navigation satellite system (GNSS) antenna. A separate two-inch pipe is installed within a few feet from the antenna pipe to hold an enclosure box, which stores a battery and GNSS receiver, and a mounted solar panel. Both pipes are surrounded by four bollards and encased in a concrete slab for protection. **Figure 2** depicts a schematic of the District's PAM design.

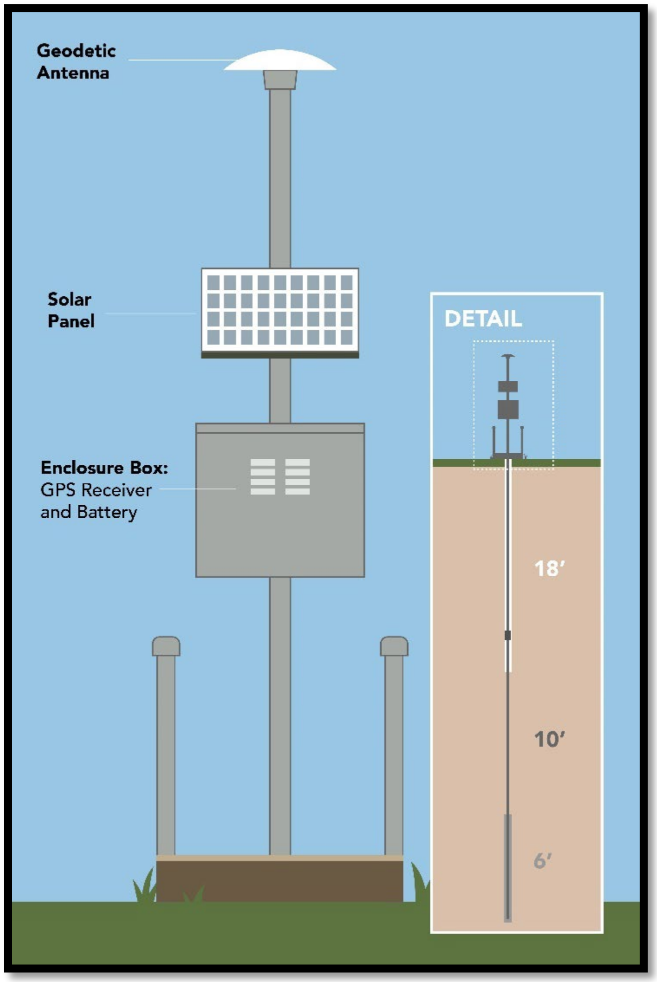


**Figure 2**: Schematic of the District's PAM design for a permanent GPS station. Note the schematic is not drawn to scale and is intended for visual purposes only. All numbers are provided in US standard measurement.

The USGS operates and maintains 14 borehole extensometers, which are wells drilled to various depths (650 to 3,300 feet below ground surface) and anchored with a concrete plug in order to measure compaction within different aquifers (Kasmarek, et al., 2015). **Figure 3** illustrates the extensometer design that includes an outer casing equipped with slip joints to maintain well integrity by preventing damage from subsidence and the inner pipe attached to a concrete plug at the bottom of the borehole. Such extensometers use digital recorders, which are connected to the inner pipe, to continuously measure the change between the inner pipe and the land-surface elevation. The District operates four (4) GPS stations (i.e., ADKS, LKHU, NETP, and TXEX) that include a GNSS antenna mounted on the extended inner pipe.

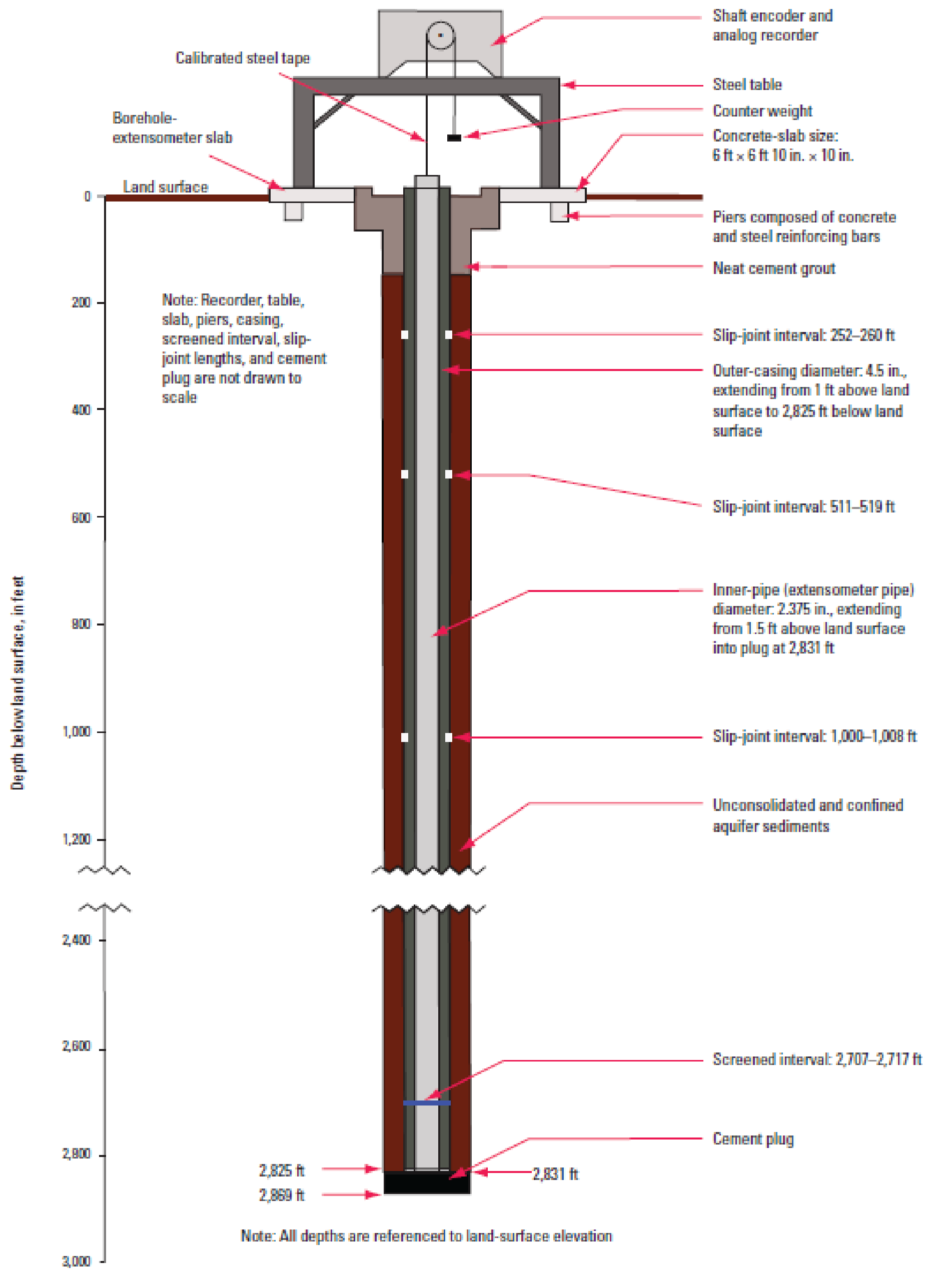


**Figure 3:** Cross-sectional view of an extensometer adapted from (Kasmarek, et al., 2016).

The building mount is another design for a GPS station. Building mounts have a GNSS antenna mounted on or near the roof. Buildings with deep foundations and clear sky views are optimal locations to measure land-surface elevation change and limit interference. This building mount design is used by UH throughout the greater Houston area.

## Subsidence Monitoring Types

GPS data are collected at each GPS station every 30 seconds during the duration of monitoring, which varies from periodic to continuous. The District operates both periodic and continuous monitoring GPS stations. Other operators, such as UH and TXDOT, operate continuous monitoring stations.

Periodic monitoring stations collect GPS data for approximately seven days every two months at the GPS station. These stations are constructed in the PAM design and use a Trimble GNSS antenna and receiver to gather land-surface data.

Continuous monitoring stations collect GPS data every day of the year and some are designated as continuously operating reference stations (CORS). CORS are designed in two ways: 1) the PAM design or 2) mounted on preexisting structures. The District operates seven (7) CORS (i.e., P026, P034, P043, P049, P080, P081, and YORS) that are constructed in the PAM design. Additionally, the District operates four (4) CORS (i.e., ADKS, LKHU, NETP, and TXEX) that are mounted to the extended inner stem of an extensometer.

# Subsidence Data

As of 2022, the District uses GPS data from 230 GPS stations spread across 20 counties in southeast Texas. The District collects GPS data from other agencies like FBSD, Brazoria County GCD, Lone Star GCD, and TxDOT as well as the UH to understand local to regional subsidence trends. Additional information for each individual station is included as a table within **Appendix C.**

The GPS data collected by the District measure the land surface as a three-component displacement time series involving the horizontal (East-West), vertical (North-South), and ellipsoidal height (up-down) components. GPS data are processed and converted to a stable reference frame called Houston20 to remove natural movements such as plate tectonics (Agudelo, et al., 2020). Additional methods of GPS data processing include the identification of outliers and estimations of site velocities and associated uncertainties.

Outliers are identified through a series of steps that include applying a locally weighted scatterplot smoothing (LOWESS) algorithm to obtain a time-series trend with two (2) iterations, removing the residual time-series trend, and estimating the median of absolute deviations (MAD) of the residual time-series (Wang, et al., 2022). The subsidence rate of a GPS station is estimated using the linear regression of the most recent five-year ellipsoidal height data (i.e., 2018-2022), at stations that have a minimum of three years of data. The root mean square (RMS) accuracy of the GPS data provided in this report is approximately 5-8 millimeters for the vertical direction or ellipsoidal height (Wang, et al., 2022).

The entire GPS dataset from all contributors is reprocessed every few years as improvements in positioning software, updates to global to regional reference frames, and other data processing analysis tools, such as orbital clock updates, are disseminated to users. Caution should be applied when attempting to mix or compare old GPS datasets with newer versions as GPS data processing is both a complex and a dynamic procedure.

## Regulatory Areas One and Two

Regulatory Areas One and Two achieved full regulatory level conversion in 1990 and 2002, respectively. GPS stations have been operating since 1993 within this area to measure subsidence. **Figure 4** displays the GPS stations in Regulatory Areas One and Two with labels identifying the name of each station. Regulatory Area One contains 31 GPS stations with about 18 stations that measured minor uplift, 11 stations that measured minor subsidence (e.g., lowest value is 0.28 cm/yr.), and 1 station that has been monitoring for less than three years, so no rate was estimated (**Figure 4**). Regulatory Area Two includes 25 GPS stations with 19 stations that measured minor uplift and six stations that measured minor subsidence (e.g., lowest value is 0.09 cm/yr.) (**Figure 4**).

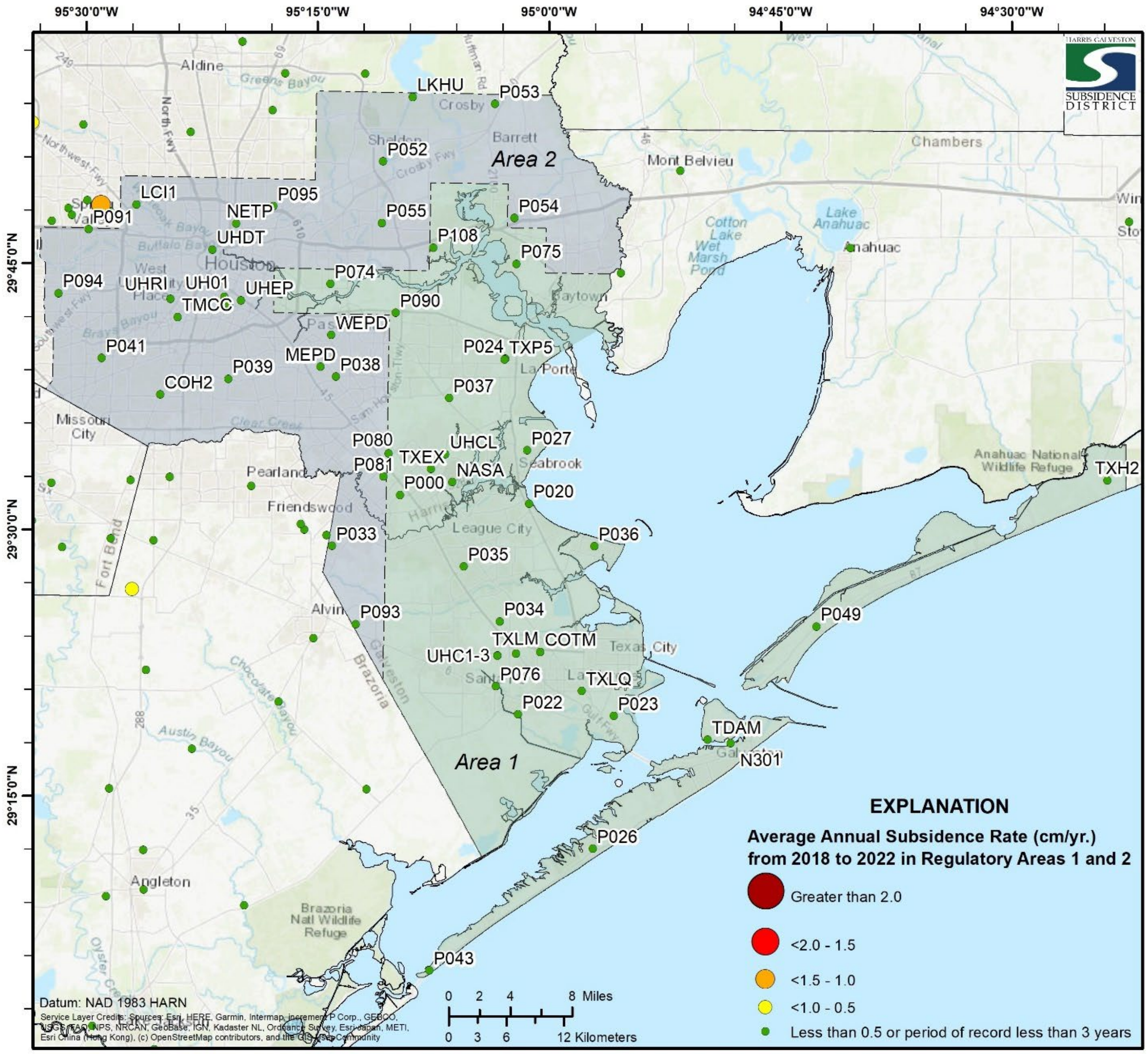


**Figure 4**: Annual subsidence rate, in cm/year, estimated from periodic and continuous GPS data measured from GPS stations within Regulatory Area One and Two in Harris and Galveston Counties, Texas, 2018-2022.

A representative sample time-series displacement plot and five-year subsidence rate graph for a GPS station in these Regulatory Areas is P020. P020, which is located in Kemah, shows a gradually stable trend with a recent subsidence rate of 0.30 cm per year and has measured approximately 1.3 cm (0.51 inches) of uplift over 20 years (**Figure 5**).

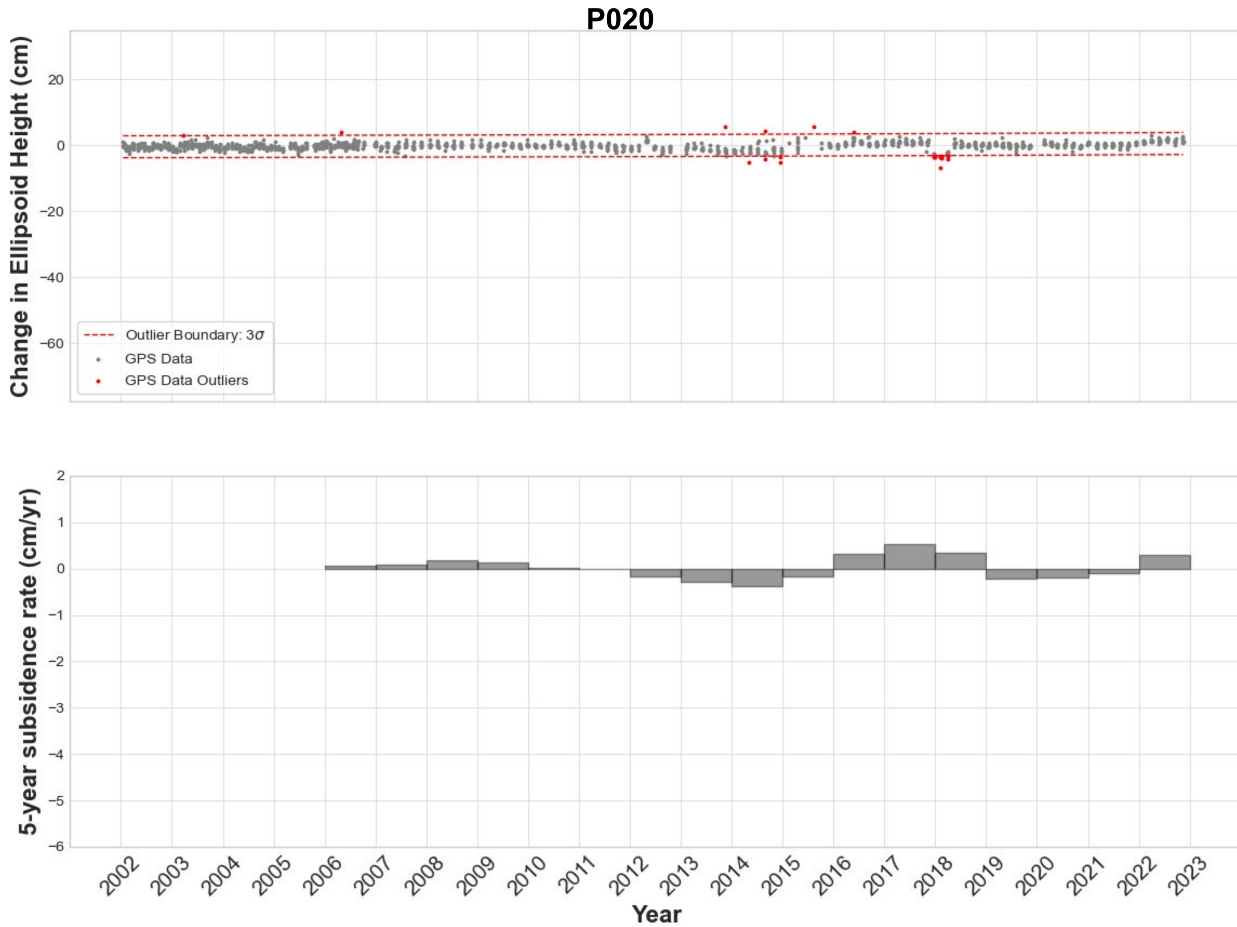


**Figure 5**: Period of record data for GPS station P020 located in Kemah, Texas, has been monitoring since 2002. This station measured 1.3 cm of uplift over 20 years and the annual subsidence rate is 0.3 cm per year from 2018 to 2022. Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown for informational purposes only.

## Regulatory Area Three

Regulatory Area Three has not been fully converted; although some entities such as the City of Houston and Regional Water Authorities have been transitioning to alternative water sources since 2010. Regulatory Area Three contains 55 GPS stations primarily operated by the District, UH, and TxDOT. **Figure 6** displays the GPS stations in Regulatory Area Three with labels identifying the name of each station. The highest subsidence rates, estimated at over 2 cm per year, were observed in Katy in southeastern Waller County and northeastern Fort Bend County. Other areas with high subsidence rates (e.g., over 1.5 cm per year) were recorded in Katy in western Harris County and Spring in northern Harris County.

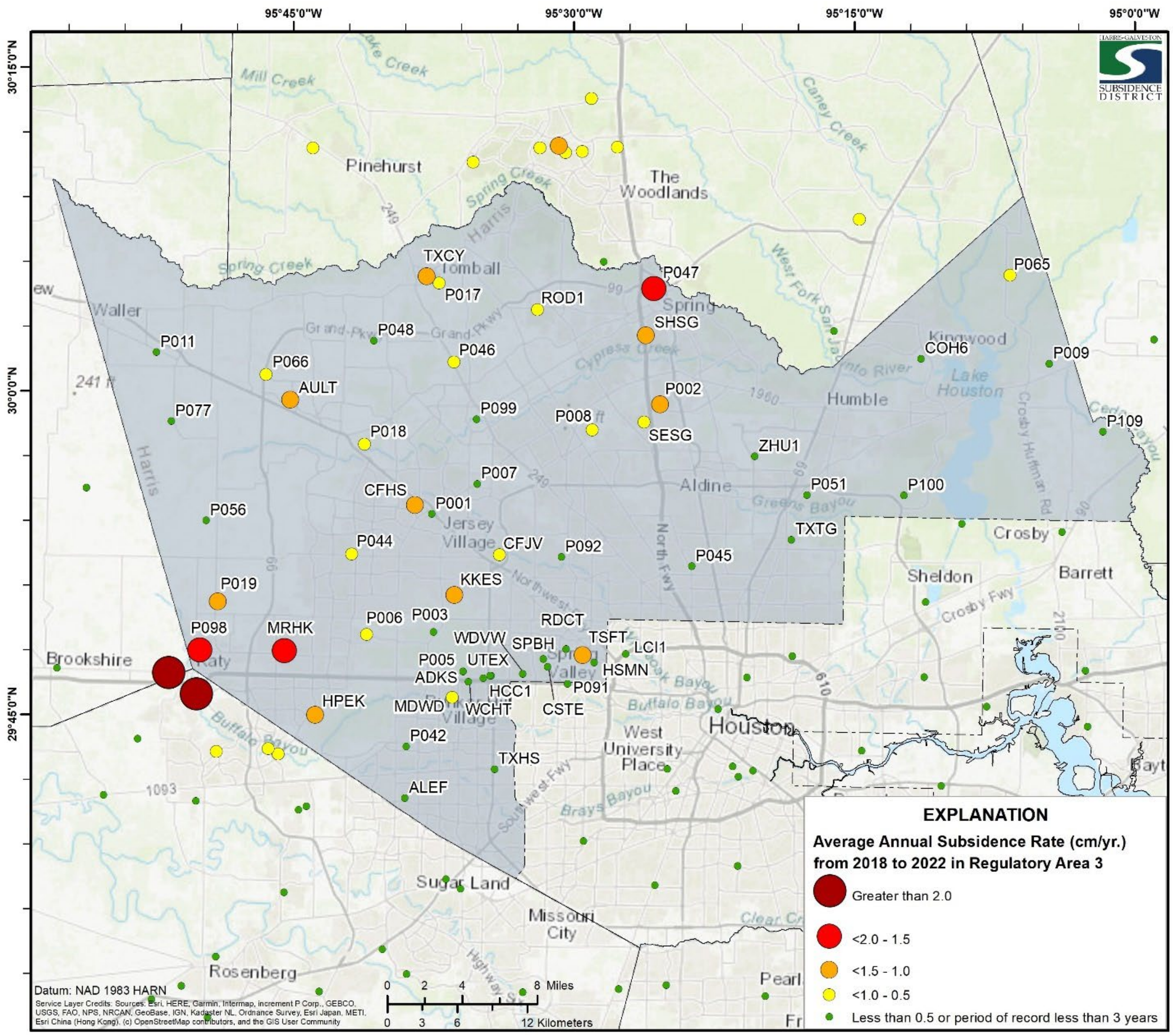


**Figure 6**: Annual subsidence rate, in cm/year, estimated from periodic and continuous GPS data measured from GPS stations within Regulatory Area Three in Harris County, Texas, 2018-2022.

GPS station P001, located in Jersey Village, has measured the greatest total subsidence with approximately 71.7 cm (28.2 in) over 28 years. **Figure 7** contains the period of record plot for P001 that shows a subsidence rate of 0.20 cm per year from 2018 to 2022. P001 began monitoring in the mid-1990s and measured high subsidence rates from over 4 cm per year in the late 1990s, then gradually lessened to under 2 cm per year in recent years.

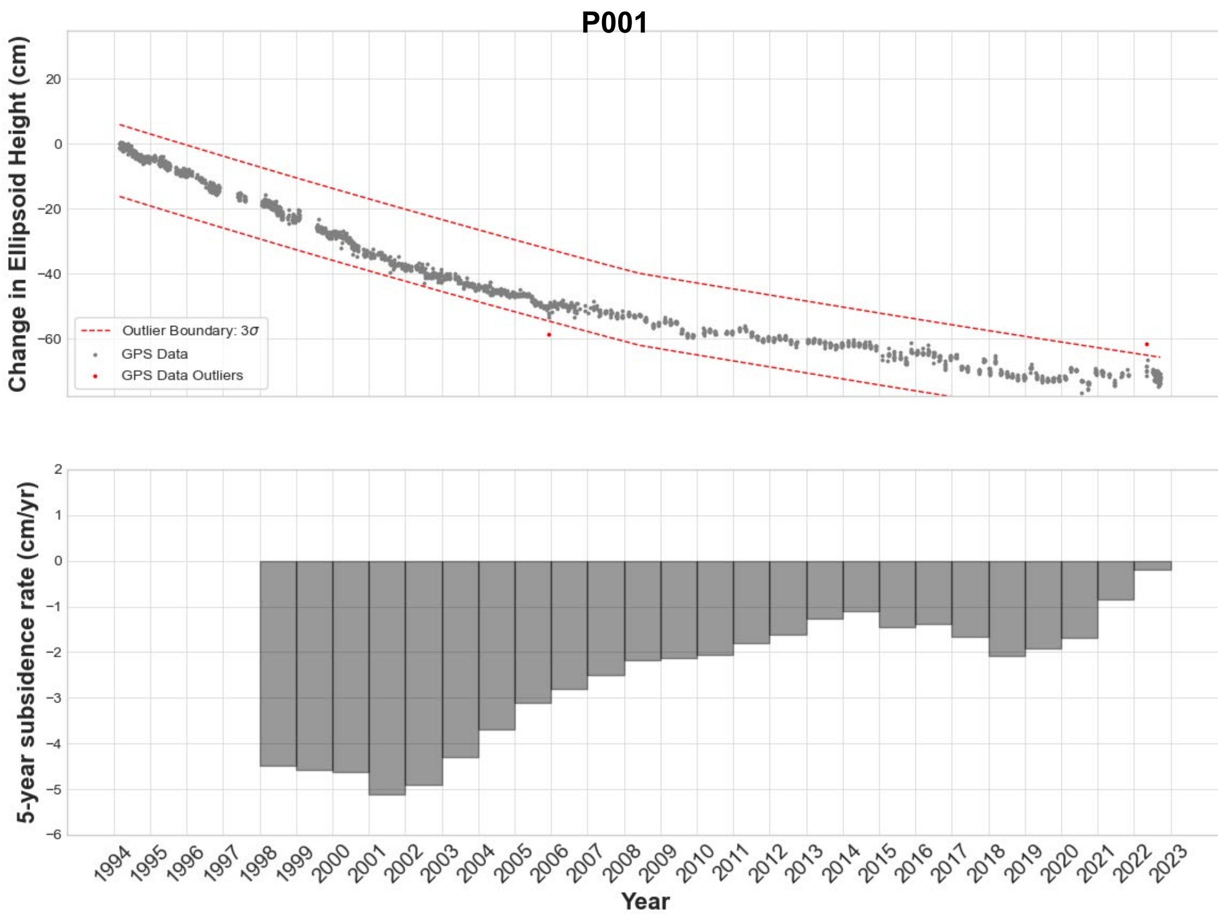


**Figure 7**: Period of record plot for GPS station P001 located in Jersey Village, Texas, 1994-2022. This station measured 71 cm of subsidence over 28 years and the annual subsidence rate is 0.2 cm per year from 2018 to 2022. Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown for informational purposes only.

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# Appendix C – Period of Record Data

A comprehensive table is provided, which includes the GPS station name, coordinates, dates of operation, sample count, total vertical displacement, and the annual rate of change in ellipsoidal height from 2018 to 2022. A period of record time-series plot and a five-year subsidence rate graph is also included for each GPS station.

| Site Name | Latitude (Decimal degrees) | Longitude (Decimal degrees) | Start of POR (Decimal year) | End of POR (Decimal Year) | Length of POR (Years) | Number of Samples (Days) | Total Vertical Displacement over POR (cm) | Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.) |
|---|---|---|---|---|---|---|---|---|
| ADKS | -95.586 | 29.791 | 1993.520 | 2022.999 | 29.479 | 8799 | -2.1 | -0.08 |
| ALEF | -95.635 | 29.692 | 2014.259 | 2023.036 | 8.778 | 3205 | -5.3 | -0.47 |
| AULT | -95.745 | 29.998 | 2015.557 | 2023.036 | 7.480 | 2664 | -7.8 | -1.10 |
| CFHS | -95.632 | 29.919 | 2015.595 | 2023.036 | 7.441 | 2662 | -10.1 | -1.17 |
| CFJV | -95.556 | 29.882 | 2015.773 | 2023.036 | 7.263 | 2651 | -6.5 | -0.70 |
| CMFB | -95.729 | 29.681 | 2014.409 | 2023.036 | 8.627 | 3117 | -4.1 | -0.43 |
| COH2 | -95.412 | 29.629 | 2009.005 | 2023.023 | 14.018 | 4440 | -3.4 | 0.09 |
| COH6 | -95.185 | 30.040 | 2004.249 | 2022.950 | 18.701 | 3207 | -9.4 | -0.15 |
| COTM | -94.998 | 29.394 | 2015.097 | 2023.036 | 7.940 | 2642 | -1.4 | -0.08 |
| CSTE | -95.511 | 29.796 | 2015.387 | 2023.036 | 7.650 | 2792 | -4.0 | -0.21 |
| DEN1 | -95.258 | 29.510 | 2011.778 | 2022.877 | 11.099 | 3883 | -2.2 | -0.22 |
| DEN2 | -95.254 | 29.505 | 2011.778 | 2022.877 | 11.099 | 2686 | -0.9 | -0.07 |
| DEN4 | -95.230 | 29.500 | 2015.825 | 2022.675 | 6.850 | 1899 | -0.6 | -0.06 |
| DISD | -95.740 | 29.289 | 2015.480 | 2023.036 | 7.556 | 2614 | 1.7 | 0.18 |
| DMFB | -95.584 | 29.623 | 2014.771 | 2023.036 | 8.266 | 3018 | -4.5 | -0.32 |
| DWI1 | -95.404 | 29.014 | 2009.399 | 2023.036 | 13.637 | 4593 | -1.6 | 0.04 |
| FSFB | -95.630 | 29.556 | 2014.371 | 2023.036 | 8.665 | 3032 | -1.4 | -0.28 |
| GSEC | -95.528 | 30.197 | 2015.756 | 2023.036 | 7.280 | 2477 | -4.5 | -0.79 |
| HCC1 | -95.561 | 29.788 | 2012.914 | 2023.036 | 10.122 | 3686 | -6.3 | -0.35 |
| HCC2 | -95.562 | 29.788 | 2013.139 | 2022.798 | 9.659 | 3051 | -8.0 | -0.39 |
| HPEK | -95.716 | 29.755 | 2014.396 | 2022.486 | 8.090 | 1909 | -10.3 | -1.31 |
| HSMN | -95.470 | 29.800 | 2013.298 | 2023.036 | 9.739 | 3551 | -3.6 | -0.12 |
| JGS2 | -94.891 | 30.045 | 2012.463 | 2023.036 | 10.574 | 3578 | -1.7 | 0.09 |
| KKES | -95.595 | 29.850 | 2015.598 | 2022.398 | 6.801 | 2353 | -6.8 | -1.08 |
| KPCD | -95.924 | 29.926 | 2016.441 | 2022.428 | 5.988 | 2187 | -1.9 | -0.31 |
| KPCS | -95.924 | 29.926 | 2016.441 | 2022.316 | 5.875 | 1846 | -1.5 | -0.35 |
| LCBR | -96.602 | 30.182 | 2010.538 | 2023.036 | 12.498 | 2899 | -0.8 | 0.03 |
| LCI1 | -95.442 | 29.807 | 2012.463 | 2021.892 | 9.429 | 3001 | -2.9 | -0.03 |
| LGC1 | -94.075 | 30.045 | 2013.531 | 2023.036 | 9.506 | 2973 | -0.6 | 0.00 |
| LKHU | -95.146 | 29.913 | 1993.517 | 2022.999 | 29.482 | 9822 | 5.0 | 0.05 |
| MDWD | -95.595 | 29.771 | 2013.303 | 2023.036 | 9.733 | 3513 | -6.9 | -0.55 |
| MEPD | -95.240 | 29.658 | 2014.040 | 2023.036 | 8.997 | 3197 | 1.5 | 0.19 |
| MRHK | -95.745 | 29.804 | 2014.396 | 2023.036 | 8.641 | 3062 | -14.8 | -1.66 |
| N301 | -94.792 | 29.311 | 2018.530 | 2023.036 | 4.506 | 1552 | -1.3 | -0.08 |
| NASA | -95.096 | 29.552 | 2014.201 | 2022.858 | 8.657 | 2948 | -0.5 | 0.10 |
| NBRY | -96.467 | 30.666 | 2012.463 | 2021.336 | 8.873 | 3149 | -1.8 | -0.22 |
| NETP | -95.334 | 29.791 | 1993.517 | 2022.999 | 29.482 | 8412 | 0.1 | -0.02 |
| OKEK | -95.803 | 29.725 | 2014.576 | 2022.875 | 8.298 | 2964 | -8.0 | -0.94 |
| P100 | -95.198 | 29.934 | 2019.309 | 2022.969 | 3.660 | 236 | -0.1 | n/a |
| P101 | -95.378 | 28.945 | 2019.714 | 2022.810 | 3.096 | 74 | 0.3 | n/a |
| P102 | -95.641 | 29.149 | 2019.641 | 2022.408 | 2.767 | 79 | 0.0 | n/a |
| P103 | -95.311 | 29.151 | 2019.714 | 2022.808 | 3.093 | 79 | -1.3 | n/a |
| P104 | -95.421 | 29.370 | 2019.980 | 2022.129 | 2.148 | 41 | -0.8 | n/a |
| P105 | -95.416 | 29.492 | 2019.657 | 2022.756 | 3.099 | 111 | -2.1 | n/a |
| P106 | -95.400 | 29.552 | 2019.695 | 2022.756 | 3.060 | 112 | -0.7 | n/a |
| P107 | -95.459 | 29.157 | 2019.616 | 2022.364 | 2.748 | 99 | 4.1 | n/a |
| P108 | -95.121 | 29.772 | 2021.244 | 2022.988 | 1.745 | 106 | 0.3 | n/a |
| P109 | -95.022 | 29.986 | 2021.148 | 2022.777 | 1.630 | 105 | 0.0 | n/a |

| Site Name | Latitude (Decimal degrees) | Longitude (Decimal degrees) | Start of POR (Decimal year) | End of POR (Decimal Year) | Length of POR (Years) | Number of Samples (Days) | Total Vertical Displacement over POR (cm) | Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.) |
|---|---|---|---|---|---|---|---|---|
| P110 | -95.442 | 29.548 | 2021.192 | 2022.996 | 1.805 | 75 | -3.4 | n/a |
| P111 | -95.873 | 29.733 | 2021.287 | 2022.871 | 1.583 | 63 | -2.2 | n/a |
| P112 | -95.420 | 29.201 | 2022.361 | 2022.372 | 0.011 | 5 | 0.0 | n/a |
| P000 | -95.152 | 29.539 | 1996.003 | 2022.966 | 26.964 | 1704 | -2.2 | 0.57 |
| P001 | -95.617 | 29.912 | 1994.164 | 2022.720 | 28.556 | 2183 | -71.7 | -0.20 |
| P002 | -95.416 | 30.001 | 1994.318 | 2022.909 | 28.591 | 2162 | -65.2 | -1.21 |
| P003 | -95.613 | 29.821 | 1994.328 | 2022.813 | 28.485 | 1727 | -55.5 | -0.22 |
| P004 | -95.597 | 29.630 | 1994.660 | 2022.832 | 28.172 | 2004 | -27.6 | -0.49 |
| P005 | -95.586 | 29.791 | 1996.698 | 2022.966 | 26.268 | 1734 | -32.8 | -0.18 |
| P006 | -95.672 | 29.818 | 2014.276 | 2022.657 | 8.380 | 408 | -7.8 | -0.65 |
| P007 | -95.577 | 29.936 | 1999.115 | 2022.432 | 23.318 | 1556 | -57.2 | 0.30 |
| P008 | -95.476 | 29.980 | 1999.610 | 2022.909 | 23.298 | 1416 | -41.7 | -0.99 |
| P009 | -95.071 | 30.038 | 1999.345 | 2022.931 | 23.586 | 1481 | -3.9 | -0.19 |
| P010 | -95.799 | 29.566 | 1999.266 | 2022.914 | 23.649 | 1710 | -6.8 | 0.11 |
| P011 | -95.865 | 30.032 | 1999.345 | 2022.909 | 23.564 | 1527 | -8.8 | 0.05 |
| P012 | -95.263 | 30.060 | 2000.895 | 2022.547 | 21.652 | 1435 | -12.1 | -0.45 |
| P013 | -95.490 | 30.195 | 2000.914 | 2022.928 | 22.014 | 1348 | -26.3 | -0.94 |
| P014 | -95.644 | 29.474 | 2000.879 | 2022.969 | 22.090 | 1248 | -4.8 | 0.24 |
| P016 | -95.527 | 29.544 | 2000.860 | 2022.432 | 21.573 | 1306 | -4.9 | 0.14 |
| P017 | -95.615 | 30.091 | 2000.895 | 2022.890 | 21.995 | 1251 | -36.3 | -0.98 |
| P018 | -95.678 | 29.965 | 2000.862 | 2022.829 | 21.967 | 1235 | -34.8 | -0.83 |
| P019 | -95.805 | 29.841 | 2000.892 | 2022.988 | 22.096 | 1200 | -21.9 | -1.12 |
| P020 | -95.013 | 29.533 | 2002.044 | 2022.873 | 20.829 | 1254 | 1.3 | 0.30 |
| P021 | -95.312 | 29.545 | 2002.082 | 2022.939 | 20.857 | 1180 | 0.7 | 0.01 |
| P022 | -95.021 | 29.335 | 2002.041 | 2022.999 | 20.958 | 1201 | -5.9 | -0.17 |
| P023 | -94.918 | 29.335 | 2002.060 | 2022.999 | 20.939 | 1283 | 1.4 | 0.08 |
| P024 | -95.041 | 29.669 | 2002.118 | 2022.909 | 20.791 | 1240 | 5.7 | 0.11 |
| P026 | -94.938 | 29.210 | 2002.194 | 2022.901 | 20.706 | 2801 | -0.5 | -0.01 |
| P027 | -95.016 | 29.583 | 2002.367 | 2022.887 | 20.520 | 1217 | -5.1 | 0.04 |
| P028 | -94.918 | 29.751 | 2002.194 | 2022.999 | 20.805 | 1203 | 1.3 | 0.05 |
| P029 | -95.822 | 29.769 | 2007.320 | 2022.849 | 15.528 | 693 | -25.8 | -2.13 |
| P030 | -95.902 | 29.689 | 2007.350 | 2022.873 | 15.523 | 689 | -6.5 | -0.32 |
| P031 | -95.848 | 29.398 | 2007.350 | 2022.972 | 15.622 | 695 | 3.3 | 0.24 |
| P032 | -95.707 | 29.541 | 2007.350 | 2022.950 | 15.600 | 703 | -0.3 | 0.34 |
| P033 | -95.224 | 29.490 | 2006.323 | 2022.950 | 16.627 | 871 | -1.1 | -0.01 |
| P034 | -95.042 | 29.422 | 2010.356 | 2022.999 | 12.643 | 4433 | -3.6 | 0.27 |
| P035 | -95.082 | 29.473 | 2006.621 | 2022.969 | 16.348 | 724 | 3.2 | 0.01 |
| P036 | -94.942 | 29.494 | 2006.966 | 2022.871 | 15.904 | 750 | -1.7 | 1.10 |
| P037 | -95.101 | 29.631 | 2007.383 | 2022.892 | 15.509 | 607 | 3.0 | 0.43 |
| P038 | -95.223 | 29.649 | 2007.356 | 2022.928 | 15.572 | 795 | 3.3 | 0.03 |
| P039 | -95.339 | 29.645 | 2011.093 | 2022.931 | 11.838 | 586 | -0.1 | 0.07 |
| P040 | -95.462 | 29.493 | 2007.353 | 2022.988 | 15.635 | 641 | -8.8 | -0.28 |
| P041 | -95.476 | 29.662 | 2007.337 | 2022.986 | 15.649 | 792 | -8.3 | -0.06 |
| P042 | -95.635 | 29.732 | 2007.334 | 2022.966 | 15.632 | 732 | -9.0 | 0.08 |
| P043 | -95.111 | 29.093 | 2006.545 | 2022.999 | 16.454 | 2612 | -0.8 | -0.03 |
| P044 | -95.687 | 29.880 | 2007.320 | 2022.827 | 15.506 | 715 | -17.3 | -0.86 |
| P045 | -95.385 | 29.876 | 2007.331 | 2022.890 | 15.559 | 771 | -4.8 | -0.33 |
| P046 | -95.600 | 30.030 | 2007.323 | 2022.695 | 15.372 | 739 | -22.0 | -0.69 |

| Site Name | Latitude (Decimal degrees) | Longitude (Decimal degrees) | Start of POR (Decimal year) | End of POR (Decimal Year) | Length of POR (Years) | Number of Samples (Days) | Total Vertical Displacement over POR (cm) | Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.) |
|---|---|---|---|---|---|---|---|---|
| P047 | -95.424 | 30.090 | 2007.339 | 2022.928 | 15.589 | 739 | -27.5 | -1.57 |
| P048 | -95.672 | 30.045 | 2007.320 | 2022.890 | 15.569 | 716 | -16.1 | -0.31 |
| P049 | -94.702 | 29.422 | 2006.279 | 2022.909 | 16.630 | 2241 | -2.1 | -0.12 |
| P050 | -94.856 | 29.848 | 2006.835 | 2022.999 | 16.164 | 809 | -1.2 | -0.01 |
| P051 | -95.284 | 29.933 | 2007.339 | 2022.964 | 15.624 | 756 | -9.6 | -0.37 |
| P052 | -95.177 | 29.852 | 2007.339 | 2022.988 | 15.649 | 745 | -0.3 | 0.08 |
| P053 | -95.057 | 29.908 | 2007.339 | 2022.912 | 15.572 | 701 | -3.8 | 0.21 |
| P054 | -95.034 | 29.801 | 2006.816 | 2022.892 | 16.077 | 805 | -1.0 | -0.06 |
| P055 | -95.177 | 29.794 | 2006.799 | 2022.999 | 16.200 | 776 | 3.0 | 0.08 |
| P056 | -95.817 | 29.903 | 2007.320 | 2022.920 | 15.600 | 647 | -6.8 | -0.16 |
| P057 | -95.722 | 29.684 | 2009.137 | 2022.835 | 13.698 | 585 | -5.8 | -0.13 |
| P058 | -95.715 | 29.485 | 2010.591 | 2022.950 | 12.359 | 558 | -2.3 | -0.06 |
| P059 | -95.740 | 29.617 | 2010.572 | 2022.931 | 12.359 | 557 | -3.6 | -0.09 |
| P060 | -95.820 | 29.686 | 2012.071 | 2022.854 | 10.783 | 445 | -7.1 | -0.45 |
| P061 | -95.972 | 29.675 | 2011.129 | 2022.892 | 11.764 | 544 | -4.0 | 0.05 |
| P062 | -95.974 | 29.593 | 2011.129 | 2022.912 | 11.783 | 489 | -4.3 | -0.30 |
| P063 | -95.547 | 29.508 | 2011.432 | 2022.988 | 11.556 | 526 | -1.2 | 0.45 |
| P065 | -95.107 | 30.106 | 2012.432 | 2022.931 | 10.498 | 501 | -6.3 | -0.61 |
| P066 | -95.767 | 30.017 | 2011.167 | 2022.723 | 11.556 | 549 | -14.5 | -0.97 |
| P067 | -95.855 | 29.532 | 2011.109 | 2022.912 | 11.802 | 520 | -2.0 | 0.18 |
| P068 | -95.587 | 30.185 | 2011.799 | 2022.950 | 11.151 | 662 | -11.8 | -0.98 |
| P069 | -95.459 | 30.199 | 2011.747 | 2022.969 | 11.222 | 672 | -13.1 | -0.95 |
| P070 | -95.424 | 30.291 | 2011.761 | 2022.999 | 11.238 | 616 | -5.3 | -0.02 |
| P071 | -95.579 | 30.353 | 2011.780 | 2022.912 | 11.132 | 682 | -5.3 | -0.29 |
| P072 | -95.242 | 30.147 | 2011.994 | 2022.988 | 10.995 | 513 | -9.4 | -0.97 |
| P073 | -95.730 | 30.193 | 2012.052 | 2022.931 | 10.879 | 693 | -9.0 | -0.72 |
| P074 | -95.231 | 29.736 | 2011.972 | 2022.999 | 11.027 | 516 | 2.4 | 0.08 |
| P075 | -95.031 | 29.758 | 2012.432 | 2022.884 | 10.452 | 532 | 0.0 | 0.18 |
| P076 | -95.045 | 29.361 | 2012.643 | 2022.991 | 10.348 | 485 | -5.2 | -0.28 |
| P077 | -95.850 | 29.979 | 2013.197 | 2022.928 | 9.731 | 437 | -2.1 | -0.29 |
| P078 | -96.016 | 29.739 | 2014.331 | 2022.890 | 8.559 | 411 | -3.3 | -0.09 |
| P079 | -95.471 | 29.035 | 2014.827 | 2022.999 | 8.172 | 2246 | -0.7 | -0.14 |
| P080 | -95.165 | 29.578 | 2014.862 | 2022.999 | 8.137 | 2799 | 0.7 | 0.18 |
| P081 | -95.170 | 29.556 | 2014.854 | 2022.999 | 8.145 | 2769 | -0.1 | 0.01 |
| P082 | -95.731 | 29.296 | 2016.109 | 2022.742 | 6.632 | 260 | 0.9 | 0.21 |
| P083 | -95.182 | 29.262 | 2016.014 | 2022.780 | 6.767 | 228 | -0.9 | 0.21 |
| P084 | -95.370 | 29.297 | 2016.052 | 2022.698 | 6.646 | 296 | 3.7 | 0.89 |
| P085 | -95.278 | 29.343 | 2016.033 | 2022.799 | 6.767 | 258 | -0.2 | -0.15 |
| P086 | -95.458 | 29.258 | 2016.071 | 2022.520 | 6.449 | 239 | 1.5 | 0.61 |
| P087 | -95.677 | 29.058 | 2016.090 | 2022.717 | 6.627 | 252 | -0.9 | -0.13 |
| P088 | -95.438 | 29.446 | 2016.131 | 2022.925 | 6.794 | 255 | -2.8 | -0.50 |
| P089 | -95.799 | 29.566 | 2015.766 | 2022.931 | 7.164 | 314 | -0.5 | -0.01 |
| P090 | -95.160 | 29.710 | 2015.977 | 2022.912 | 6.934 | 443 | 2.4 | 0.05 |
| P091 | -95.493 | 29.783 | 2016.320 | 2022.947 | 6.627 | 435 | -2.7 | 0.17 |
| P092 | -95.501 | 29.881 | 2016.320 | 2022.947 | 6.627 | 406 | -4.3 | -0.10 |
| P093 | -95.197 | 29.417 | 2017.238 | 2022.994 | 5.756 | 306 | -1.6 | 0.88 |
| P094 | -95.524 | 29.722 | 2017.298 | 2022.986 | 5.687 | 366 | -2.1 | -0.09 |
| P095 | -95.294 | 29.808 | 2017.200 | 2022.890 | 5.690 | 382 | 0.0 | 0.20 |

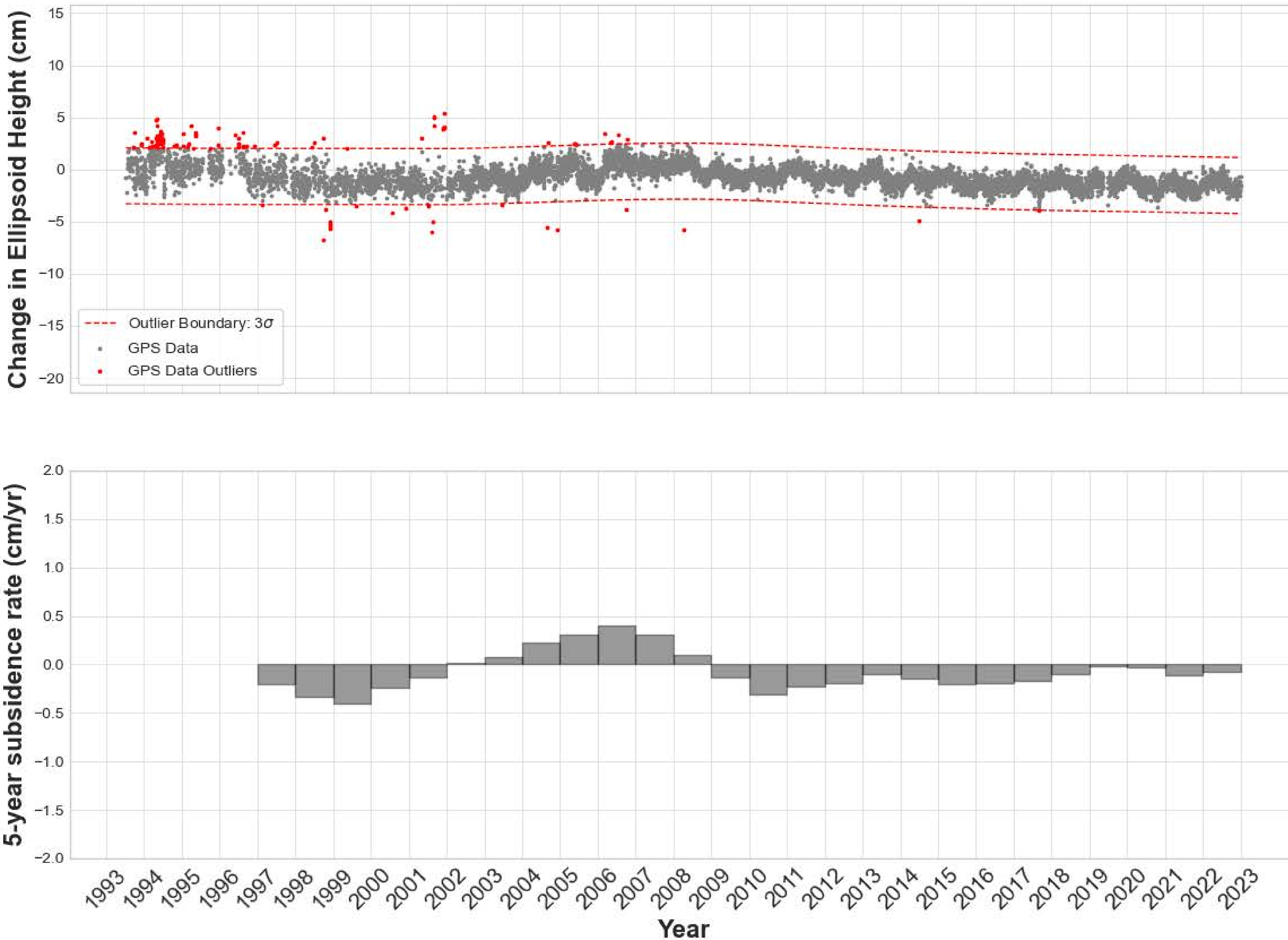
| Site Name | Latitude (Decimal degrees) | Longitude (Decimal degrees) | Start of POR (Decimal year) | End of POR (Decimal Year) | Length of POR (Years) | Number of Samples (Days) | Total Vertical Displacement over POR (cm) | Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.) |
|---|---|---|---|---|---|---|---|---|
| P096 | -95.748 | 29.724 | 2017.553 | 2022.999 | 5.446 | 1844 | -1.2 | -0.83 |
| P097 | -95.847 | 29.785 | 2018.104 | 2022.999 | 4.895 | 304 | -9.2 | -2.00 |
| P098 | -95.820 | 29.803 | 2018.120 | 2022.772 | 4.652 | 290 | -7.1 | -1.89 |
| P099 | -95.579 | 29.986 | 2018.140 | 2022.693 | 4.553 | 287 | -0.8 | -0.47 |
| PWES | -95.511 | 30.199 | 2015.220 | 2023.036 | 7.817 | 2855 | -8.9 | -1.17 |
| RDCT | -95.495 | 29.810 | 2013.563 | 2023.036 | 9.473 | 3220 | -3.1 | -0.21 |
| ROD1 | -95.527 | 30.072 | 2007.003 | 2023.036 | 16.033 | 5532 | -18.5 | -0.88 |
| RPFB | -95.514 | 29.484 | 2014.773 | 2023.036 | 8.263 | 3018 | -0.6 | -0.02 |
| SESG | -95.430 | 29.987 | 2014.678 | 2023.036 | 8.359 | 3047 | -7.9 | -0.89 |
| SHSG | -95.430 | 30.054 | 2014.721 | 2023.036 | 8.315 | 3036 | -10.3 | -1.32 |
| SISD | -96.174 | 29.762 | 2015.176 | 2023.036 | 7.860 | 2781 | -0.4 | -0.04 |
| SPBH | -95.515 | 29.802 | 2013.303 | 2023.036 | 9.733 | 3554 | -4.9 | -0.27 |
| TDAM | -94.817 | 29.314 | 2013.435 | 2023.036 | 9.602 | 3275 | -2.1 | -0.05 |
| THSU | -95.340 | 29.714 | 2012.953 | 2023.036 | 10.083 | 3391 | 0.3 | 0.17 |
| TMCC | -95.395 | 29.702 | 2003.271 | 2022.901 | 19.630 | 4901 | -1.6 | 0.10 |
| TSFT | -95.480 | 29.806 | 2013.380 | 2023.036 | 9.656 | 3481 | -11.3 | -1.28 |
| TXAC | -94.671 | 29.778 | 2011.124 | 2023.036 | 11.912 | 4292 | 2.5 | 0.37 |
| TXAG | -95.419 | 29.164 | 2005.580 | 2020.558 | 14.979 | 5422 | -1.7 | -0.04 |
| TXAV | -95.242 | 29.403 | 2017.147 | 2023.036 | 5.889 | 1691 | -1.1 | -0.20 |
| TXB1 | -94.181 | 30.161 | 2013.191 | 2023.036 | 9.845 | 3292 | 1.3 | 0.29 |
| TXB2 | -94.192 | 30.090 | 2012.463 | 2023.036 | 10.574 | 3514 | -9.4 | -0.26 |
| TXBC | -95.972 | 29.000 | 2009.405 | 2023.036 | 13.632 | 4909 | -2.3 | -0.08 |
| TXBH | -95.946 | 29.786 | 2017.150 | 2023.036 | 5.886 | 2067 | -2.6 | -0.37 |
| TXC5 | -96.573 | 29.704 | 2017.213 | 2023.036 | 5.823 | 2085 | 0.0 | -0.03 |
| TXCF | -96.573 | 29.704 | 2017.065 | 2023.036 | 5.971 | 2128 | 0.4 | -0.03 |
| TXCK | -95.436 | 31.323 | 2012.022 | 2023.036 | 11.014 | 3952 | 1.0 | 0.12 |
| TXCM | -96.577 | 29.703 | 2010.437 | 2023.036 | 12.600 | 4561 | -0.2 | 0.02 |
| TXCN | -95.441 | 30.349 | 2005.580 | 2023.036 | 17.457 | 6345 | -18.2 | -0.65 |
| TXCV | -95.094 | 30.335 | 2012.665 | 2021.468 | 8.802 | 2936 | -3.6 | -0.24 |
| TXCY | -95.626 | 30.096 | 2017.391 | 2023.036 | 5.646 | 1894 | -6.2 | -1.08 |
| TXED | -96.634 | 28.968 | 2009.429 | 2023.036 | 13.607 | 3324 | 0.1 | 0.10 |
| TXEX | -95.119 | 29.564 | 2010.881 | 2022.980 | 12.099 | 3956 | 4.5 | 0.20 |
| TXGA | -94.773 | 29.328 | 2005.580 | 2023.036 | 17.457 | 6164 | -3.5 | -0.18 |
| TXGN | -95.136 | 31.061 | 2012.022 | 2023.036 | 11.014 | 3700 | 0.1 | 0.07 |
| TXH1 | -96.602 | 30.893 | 2013.191 | 2023.036 | 9.845 | 3287 | 0.3 | 0.15 |
| TXH2 | -94.391 | 29.563 | 2016.090 | 2023.036 | 6.946 | 2258 | 0.8 | 0.14 |
| TXHE | -96.063 | 30.099 | 2005.580 | 2023.036 | 17.457 | 6341 | -5.1 | -0.01 |
| TXHP | -93.865 | 31.334 | 2012.022 | 2023.036 | 11.014 | 3953 | -1.6 | 0.32 |
| TXHS | -95.556 | 29.716 | 2012.463 | 2021.092 | 8.630 | 2937 | -4.9 | -0.34 |
| TXKO | -94.332 | 30.395 | 2011.770 | 2023.036 | 11.266 | 4065 | 0.4 | 0.16 |
| TXLF | -94.718 | 31.356 | 2005.580 | 2023.036 | 17.457 | 6335 | 0.9 | 0.11 |
| TXLI | -94.771 | 30.056 | 2005.580 | 2023.036 | 17.457 | 6296 | 1.3 | 0.17 |
| TXLM | -95.024 | 29.392 | 2005.580 | 2023.036 | 17.457 | 6332 | -4.7 | -0.08 |
| TXLQ | -94.953 | 29.358 | 2013.059 | 2023.036 | 9.977 | 3503 | 0.8 | 0.11 |
| TXLV | -94.922 | 30.745 | 2011.778 | 2023.036 | 11.258 | 4084 | -0.9 | -0.03 |
| TXMD | -95.915 | 30.960 | 2010.584 | 2023.036 | 12.452 | 4218 | 1.9 | 0.16 |
| TXMG | -95.964 | 28.983 | 2013.309 | 2023.036 | 9.728 | 3156 | -2.1 | -0.11 |
| TXNE | -93.775 | 30.848 | 2013.191 | 2023.036 | 9.845 | 3206 | -0.4 | 0.12 |

| Site Name | Latitude (Decimal degrees) | Longitude (Decimal degrees) | Start of POR (Decimal year) | End of POR (Decimal Year) | Length of POR (Years) | Number of Samples (Days) | Total Vertical Displacement over POR (cm) | Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.) |
|---|---|---|---|---|---|---|---|---|
| TXNV | -96.067 | 30.382 | 2012.463 | 2023.036 | 10.574 | 3773 | -2.5 | -0.03 |
| TXP5 | -95.042 | 29.668 | 2019.181 | 2023.036 | 3.855 | 1270 | 1.0 | n/a |
| TXPV | -96.619 | 28.638 | 2010.292 | 2023.036 | 12.745 | 4621 | 0.2 | -0.05 |
| TXRN | -95.829 | 29.543 | 2015.206 | 2023.036 | 7.830 | 2816 | -0.5 | 0.02 |
| TXRS | -95.805 | 29.519 | 2011.447 | 2021.711 | 10.264 | 3707 | -2.9 | -0.35 |
| TXSP | -93.897 | 29.731 | 2016.454 | 2023.036 | 6.582 | 2126 | 1.1 | 0.13 |
| TXTG | -95.297 | 29.898 | 2015.466 | 2023.036 | 7.570 | 2697 | -2.0 | -0.17 |
| TXVA | -96.910 | 28.835 | 2005.092 | 2023.036 | 17.944 | 6373 | 1.8 | -0.06 |
| TXVC | -96.958 | 28.834 | 2015.310 | 2023.036 | 7.726 | 2777 | 0.7 | 0.22 |
| TXWH | -96.112 | 29.325 | 2010.426 | 2023.036 | 12.611 | 4548 | -0.9 | 0.33 |
| TXWI | -94.371 | 29.806 | 2015.480 | 2023.036 | 7.556 | 2564 | -0.8 | -0.10 |
| TXWN | -96.092 | 29.329 | 2015.003 | 2023.036 | 8.033 | 2874 | 0.5 | 0.03 |
| TXWO | -94.424 | 30.782 | 2013.191 | 2023.036 | 9.845 | 3069 | -1.0 | 0.07 |
| UH01 | -95.345 | 29.722 | 2012.745 | 2022.678 | 9.933 | 2900 | 0.9 | 0.19 |
| UH02 | -95.457 | 30.315 | 2015.003 | 2023.036 | 8.033 | 2763 | -5.1 | -0.75 |
| UHC1 | -95.044 | 29.390 | 2014.138 | 2023.036 | 8.898 | 3148 | -1.4 | -0.10 |
| UHC2 | -95.044 | 29.390 | 2014.138 | 2023.036 | 8.898 | 3150 | -2.0 | -0.13 |
| UHC3 | -95.044 | 29.390 | 2014.155 | 2023.036 | 8.882 | 3044 | -3.2 | -0.22 |
| UHCL | -95.104 | 29.578 | 2014.242 | 2023.036 | 8.794 | 3004 | 0.8 | 0.15 |
| UHCR | -95.757 | 29.728 | 2014.125 | 2022.606 | 8.482 | 3093 | -8.6 | -0.85 |
| UHDT | -95.359 | 29.766 | 2013.563 | 2022.858 | 9.295 | 3395 | -0.1 | 0.15 |
| UHEB | -96.066 | 29.526 | 2014.595 | 2023.036 | 8.441 | 2782 | -0.5 | -0.01 |
| UHEP | -95.327 | 29.719 | 2014.365 | 2022.872 | 8.506 | 3067 | -0.8 | 0.16 |
| UHF1 | -95.483 | 30.236 | 2014.390 | 2022.486 | 8.096 | 2554 | -6.4 | -0.63 |
| UHJF | -95.483 | 30.236 | 2014.393 | 2022.483 | 8.090 | 2338 | -5.7 | -0.65 |
| UHKD | -95.748 | 29.724 | 2018.971 | 2022.590 | 3.619 | 1241 | -2.5 | -0.52 |
| UHKS | -95.748 | 29.724 | 2018.412 | 2022.590 | 4.178 | 1524 | -2.4 | -0.37 |
| UHL1 | -94.978 | 30.058 | 2014.365 | 2021.142 | 6.776 | 2357 | 1.7 | -0.11 |
| UHRI | -95.403 | 29.719 | 2014.330 | 2023.036 | 8.706 | 3164 | -1.9 | 0.11 |
| UHSL | -95.652 | 29.575 | 2014.185 | 2022.601 | 8.416 | 2858 | -2.0 | -0.11 |
| UHWL | -94.978 | 30.058 | 2014.357 | 2021.142 | 6.784 | 2105 | -0.6 | -0.13 |
| UTEX | -95.568 | 29.786 | 2012.496 | 2022.801 | 10.305 | 3548 | -6.9 | -0.32 |
| WCHT | -95.581 | 29.783 | 2013.295 | 2023.036 | 9.741 | 3445 | -8.2 | -0.36 |
| WDVW | -95.533 | 29.790 | 2013.320 | 2022.949 | 9.629 | 3452 | -5.9 | -0.30 |
| WEPD | -95.229 | 29.688 | 2014.075 | 2023.036 | 8.961 | 3186 | 1.9 | 0.21 |
| WHCR | -95.505 | 30.194 | 2014.779 | 2023.036 | 8.257 | 3013 | -5.2 | -0.87 |
| YORS | -95.469 | 30.110 | 2020.827 | 2022.909 | 2.082 | 760 | -4.3 | n/a |
| ZHU1 | -95.331 | 29.962 | 2003.042 | 2023.036 | 19.995 | 6943 | -16.3 | -0.49 |

**Notes:**

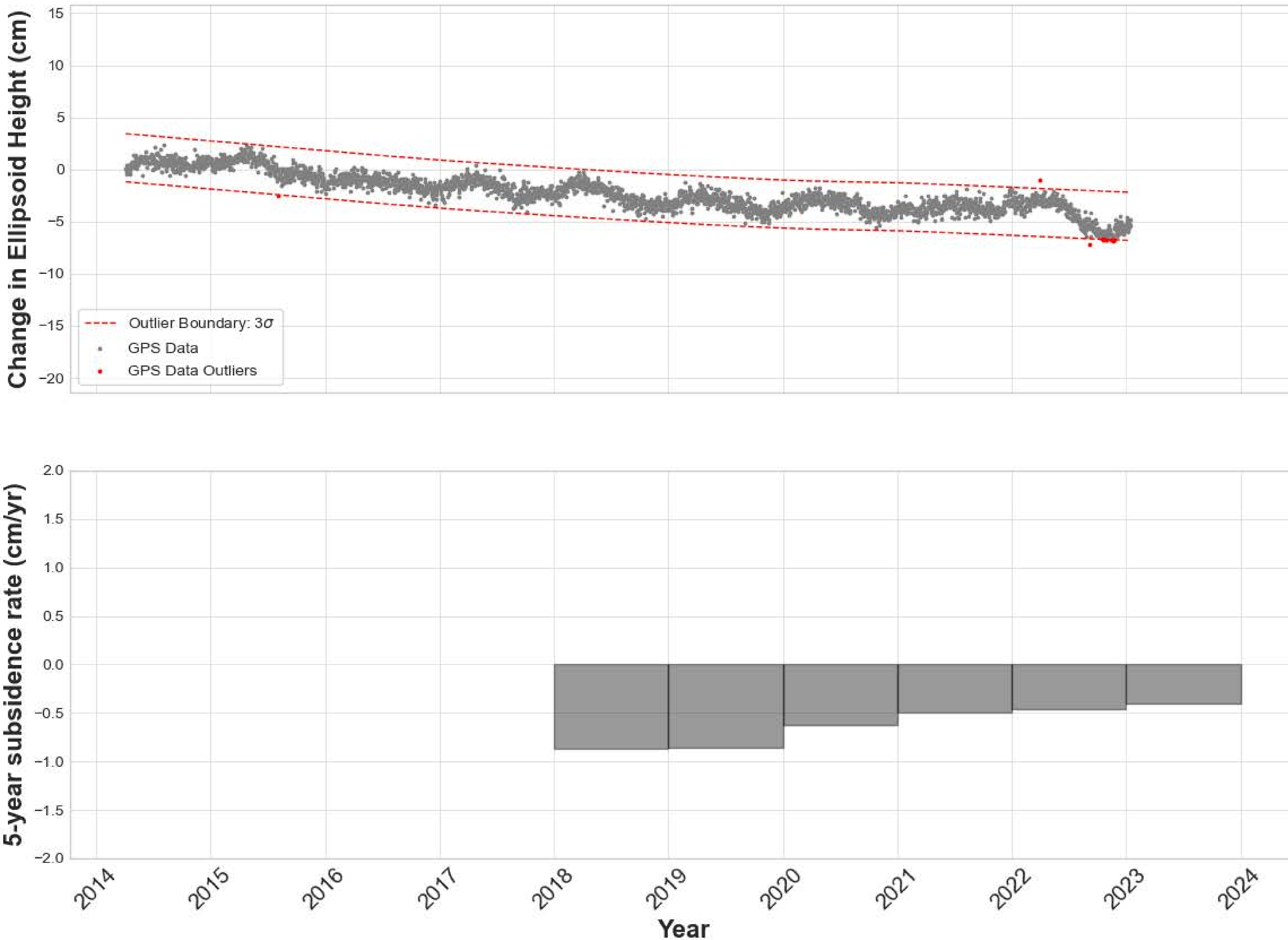
n/a: rate of change in ellipsoidal height not calculated.

# ADKS



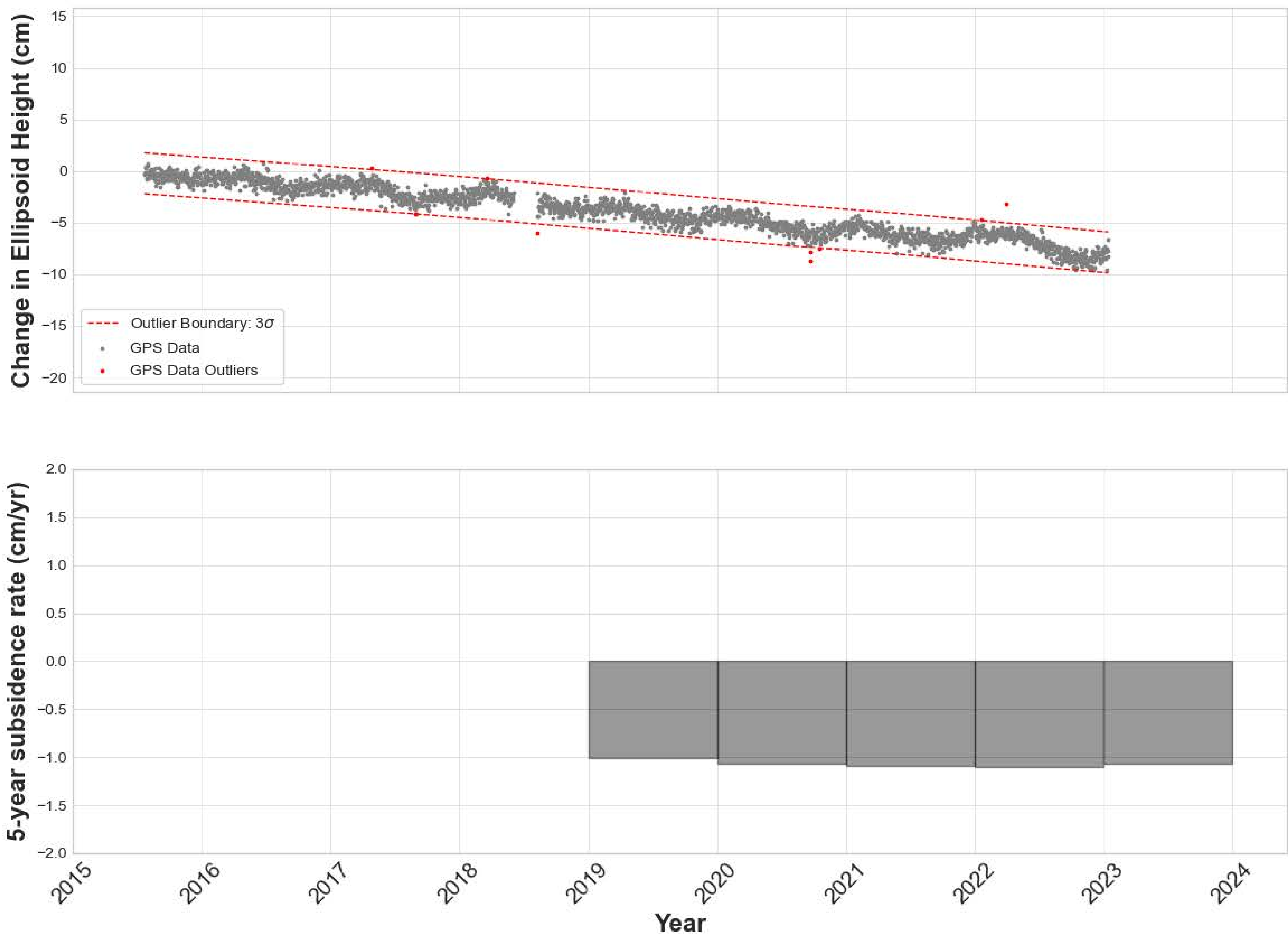

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# ALEF



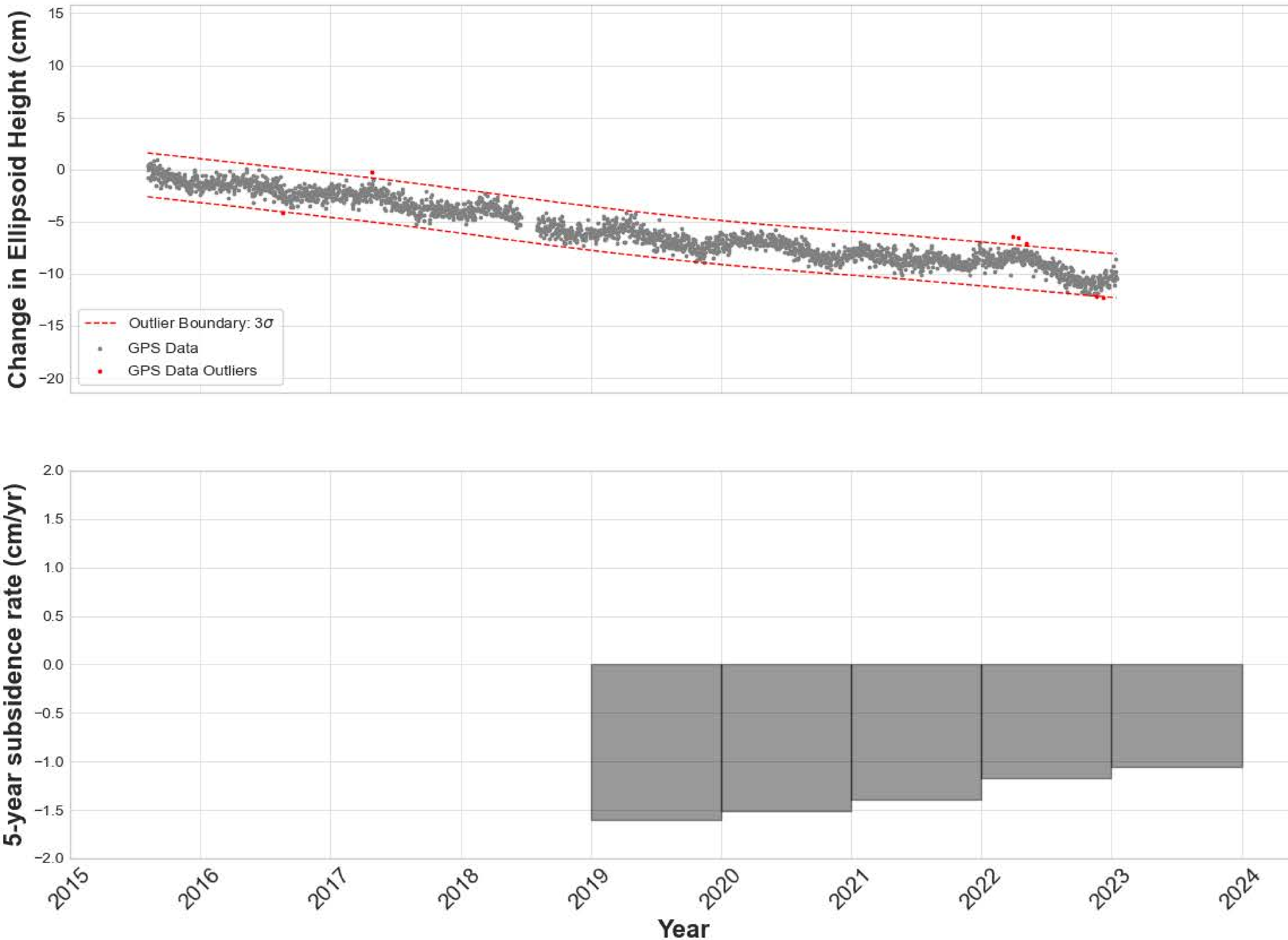

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# AULT



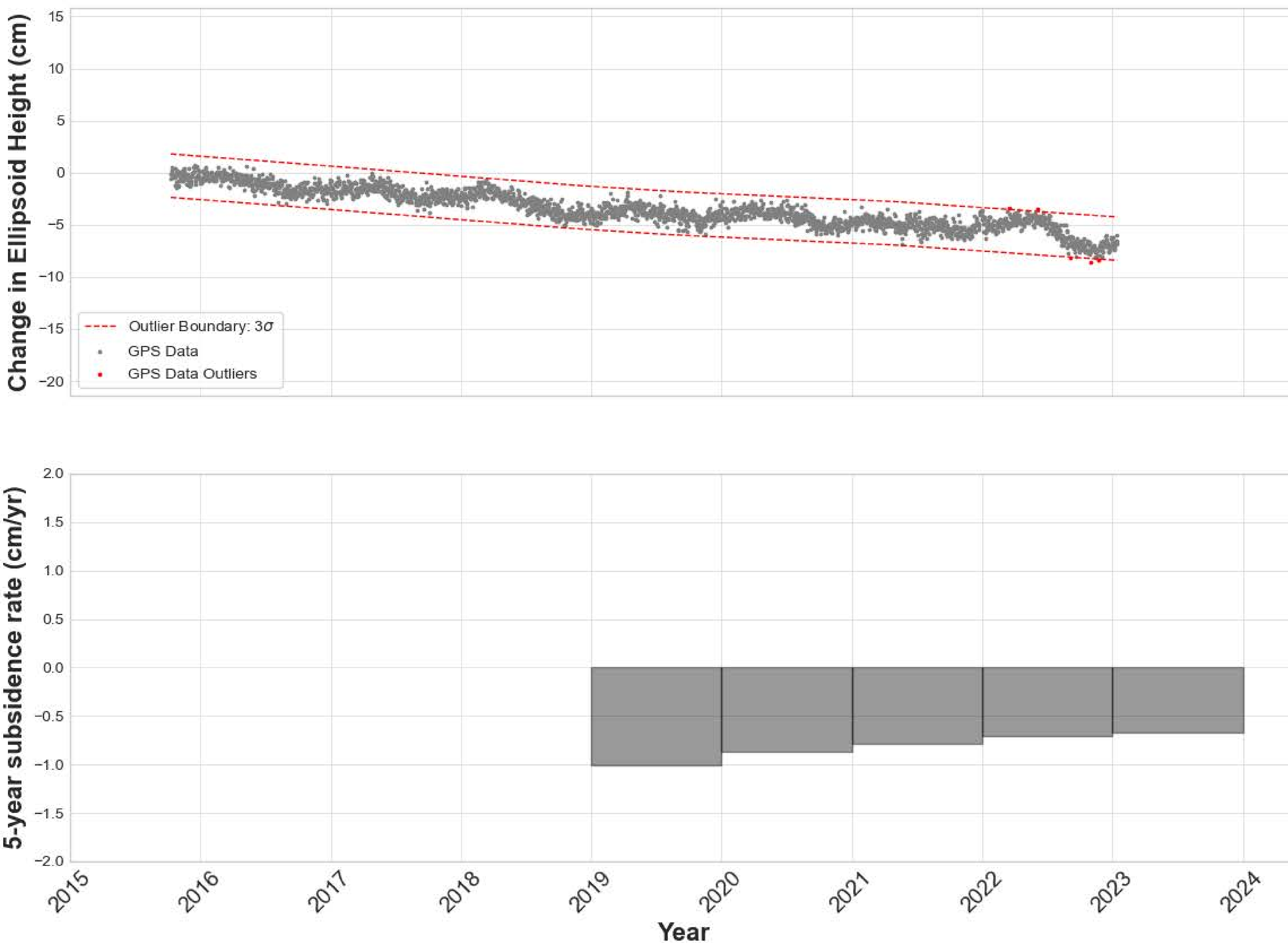

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# CFHS



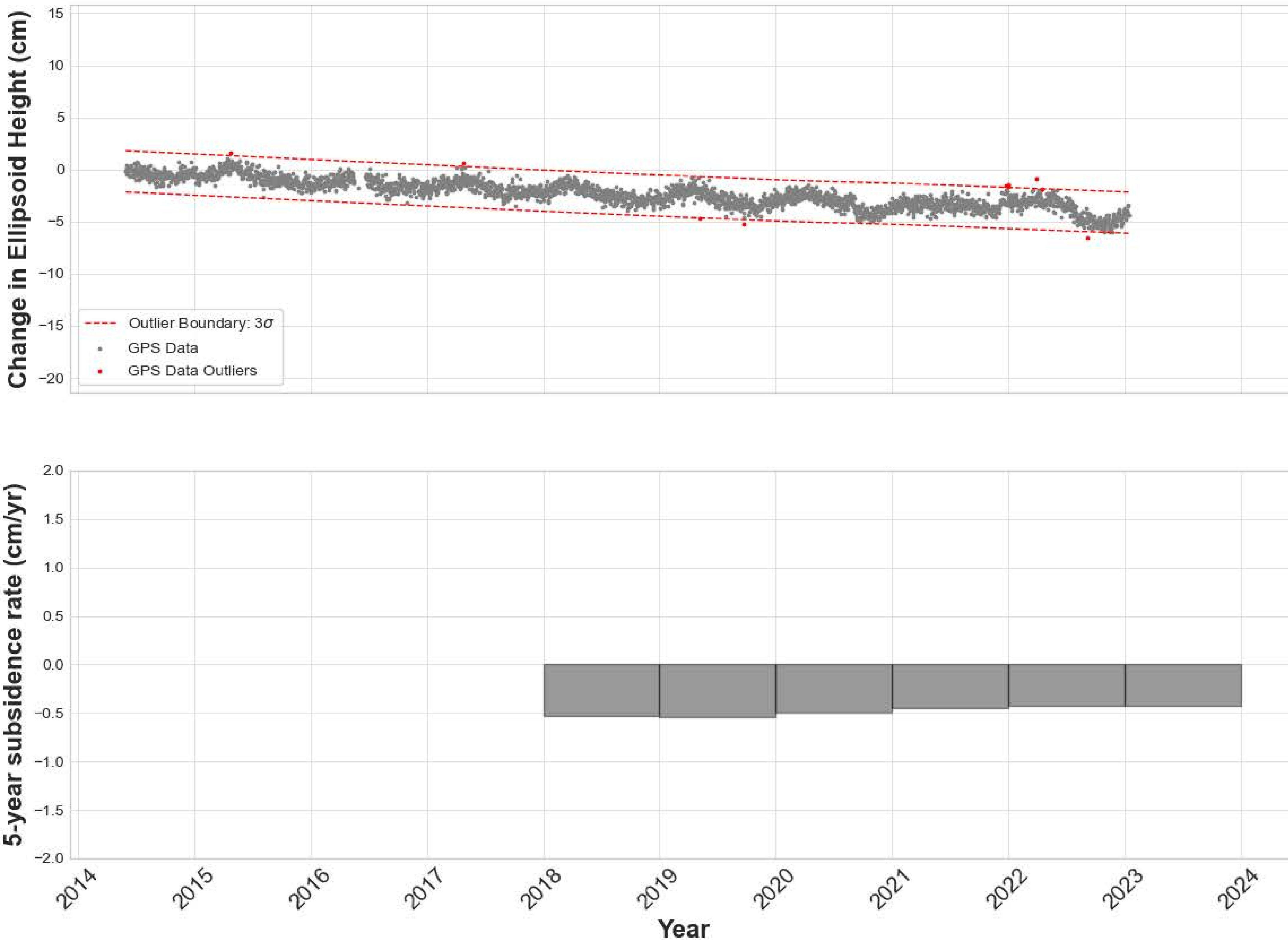

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# CFJV



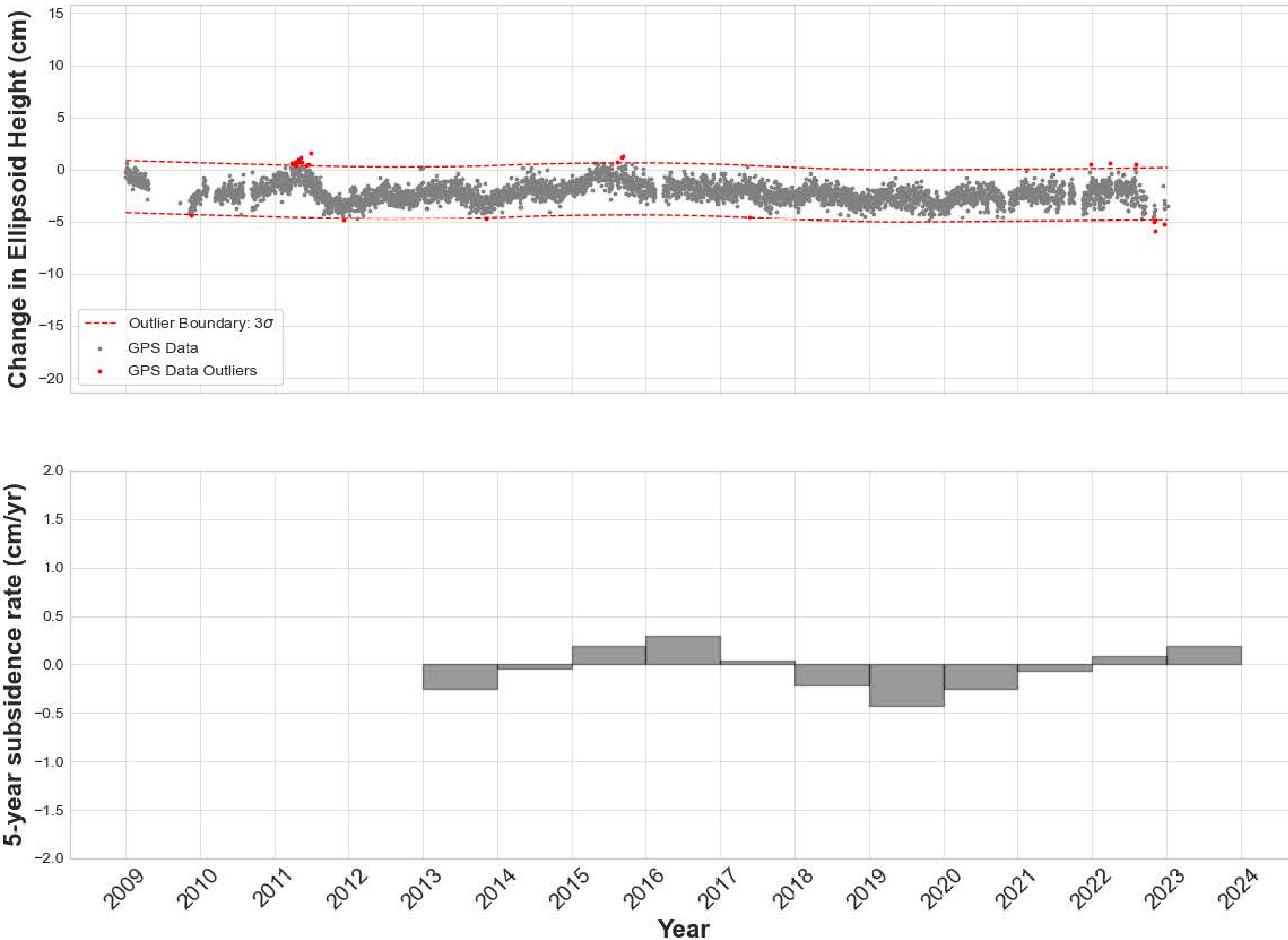

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# CMFB



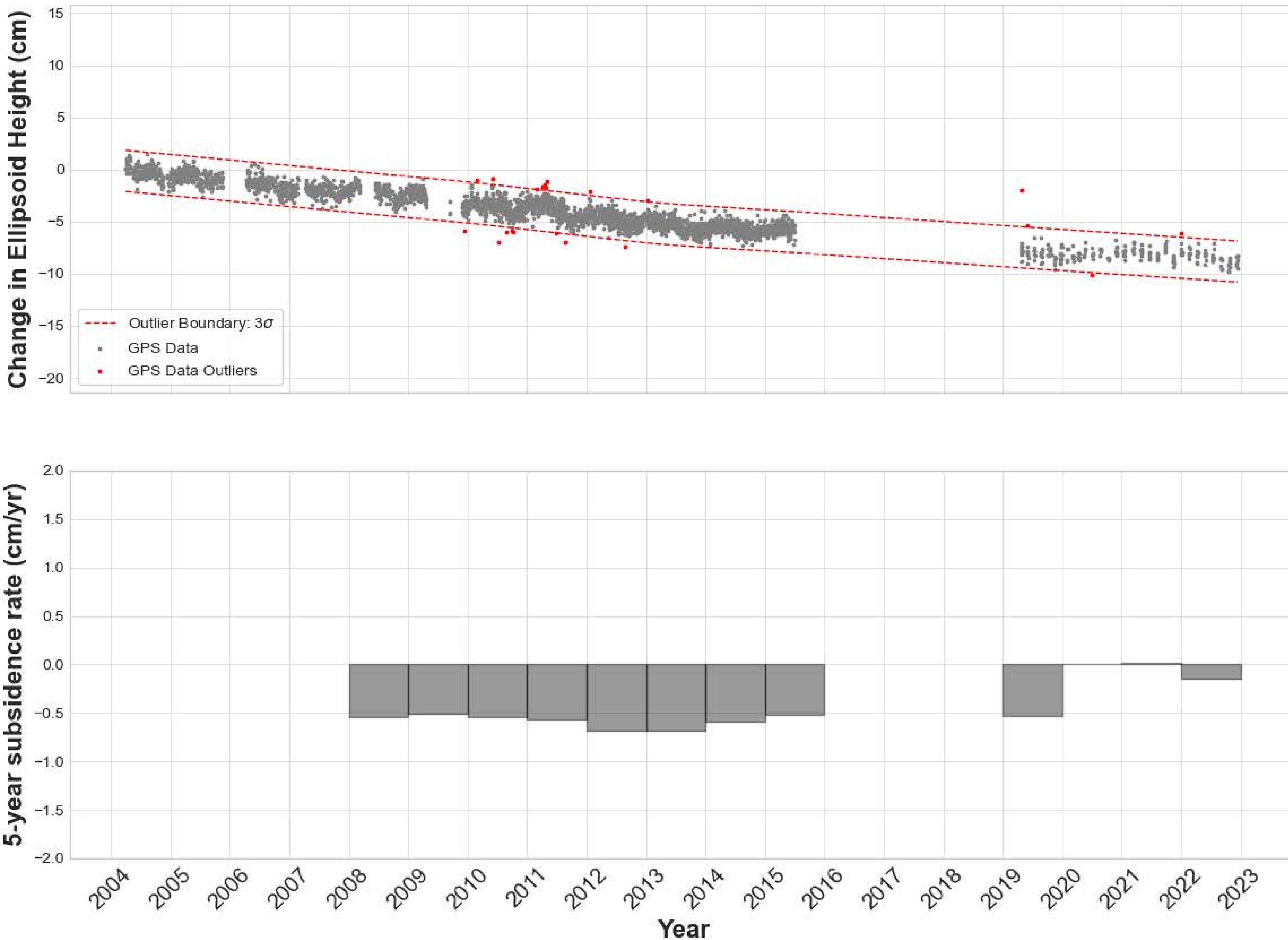

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# COH2



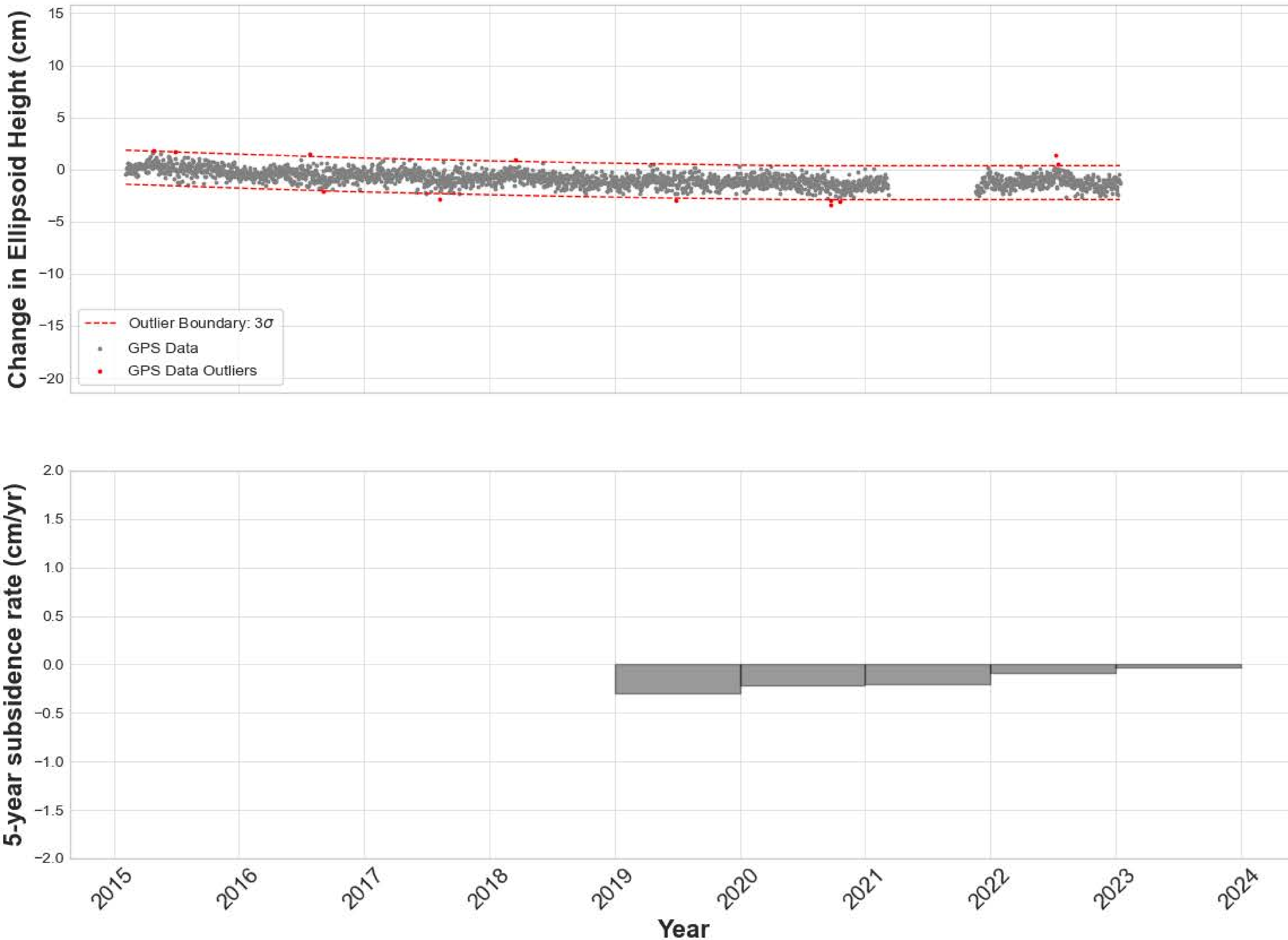

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# COH6



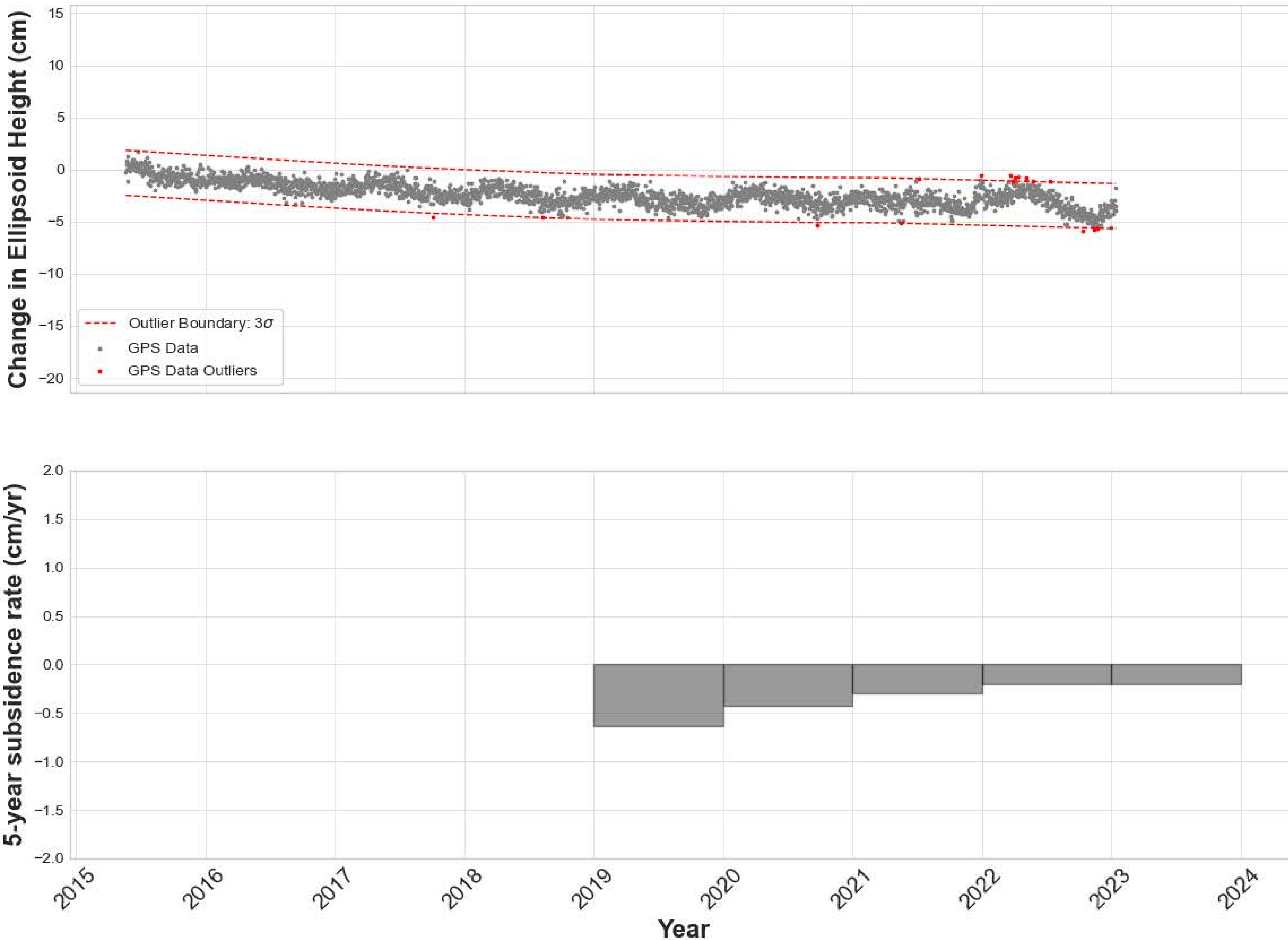

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# COTM



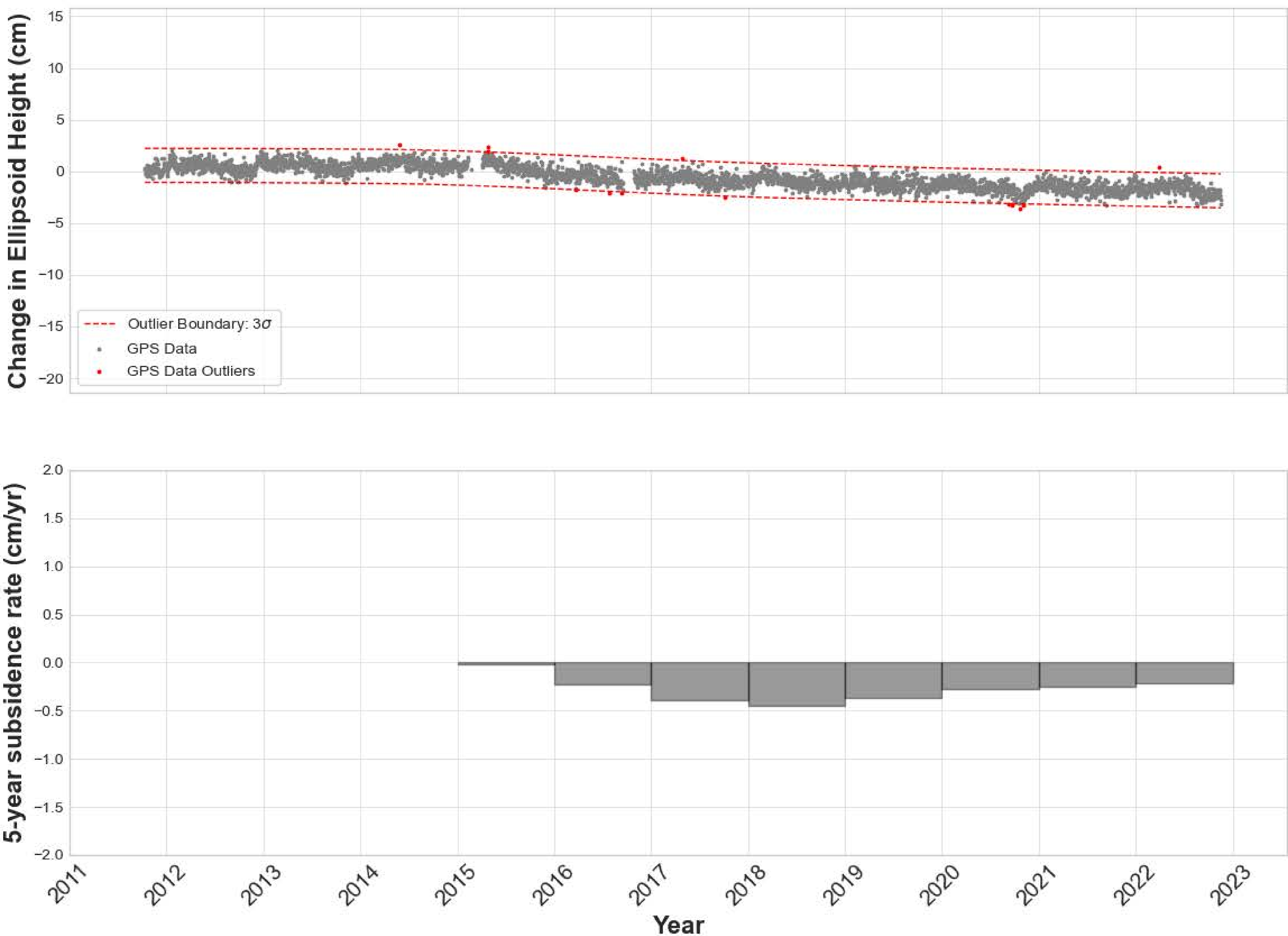

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# CSTE



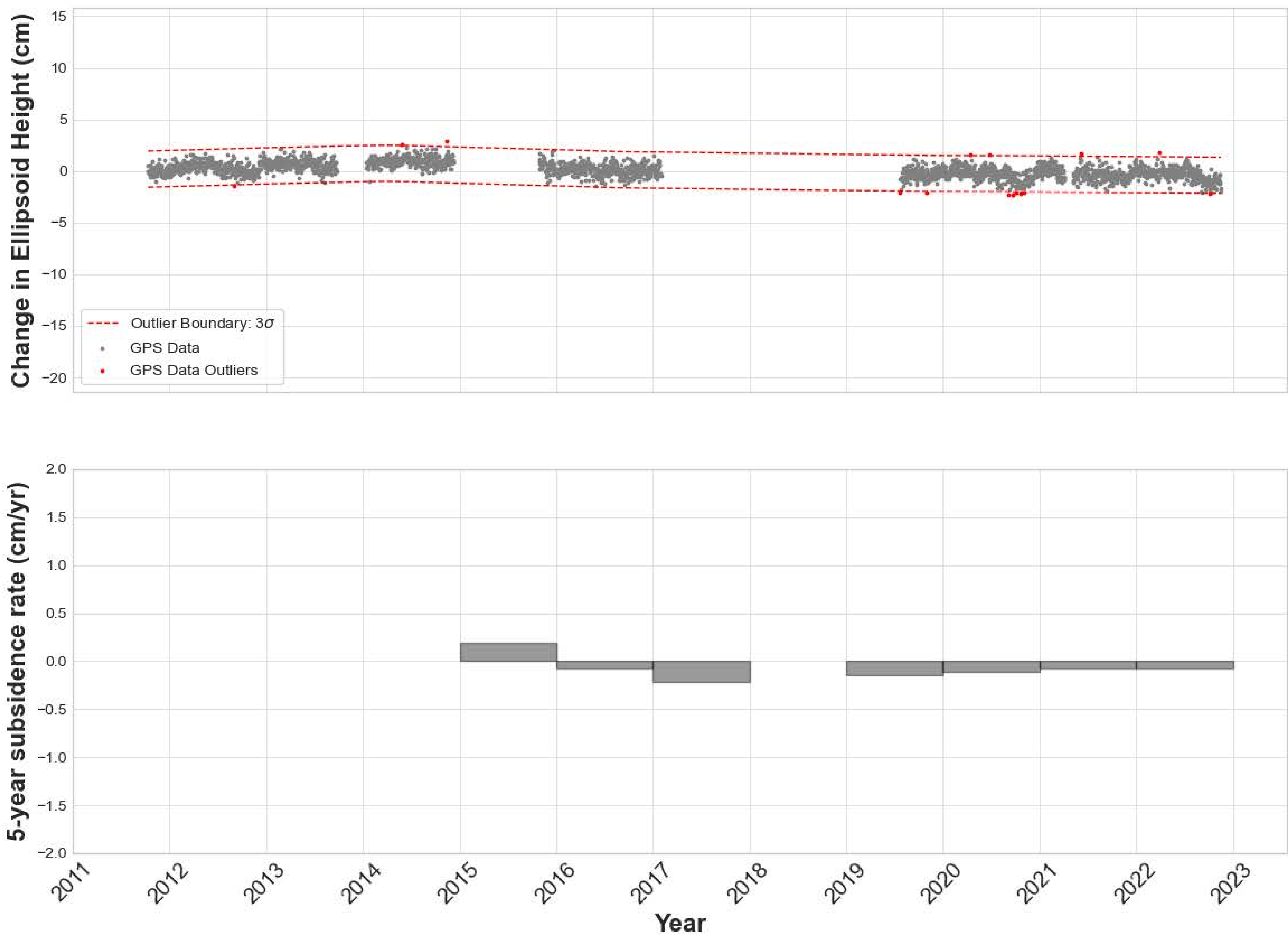

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# DEN1



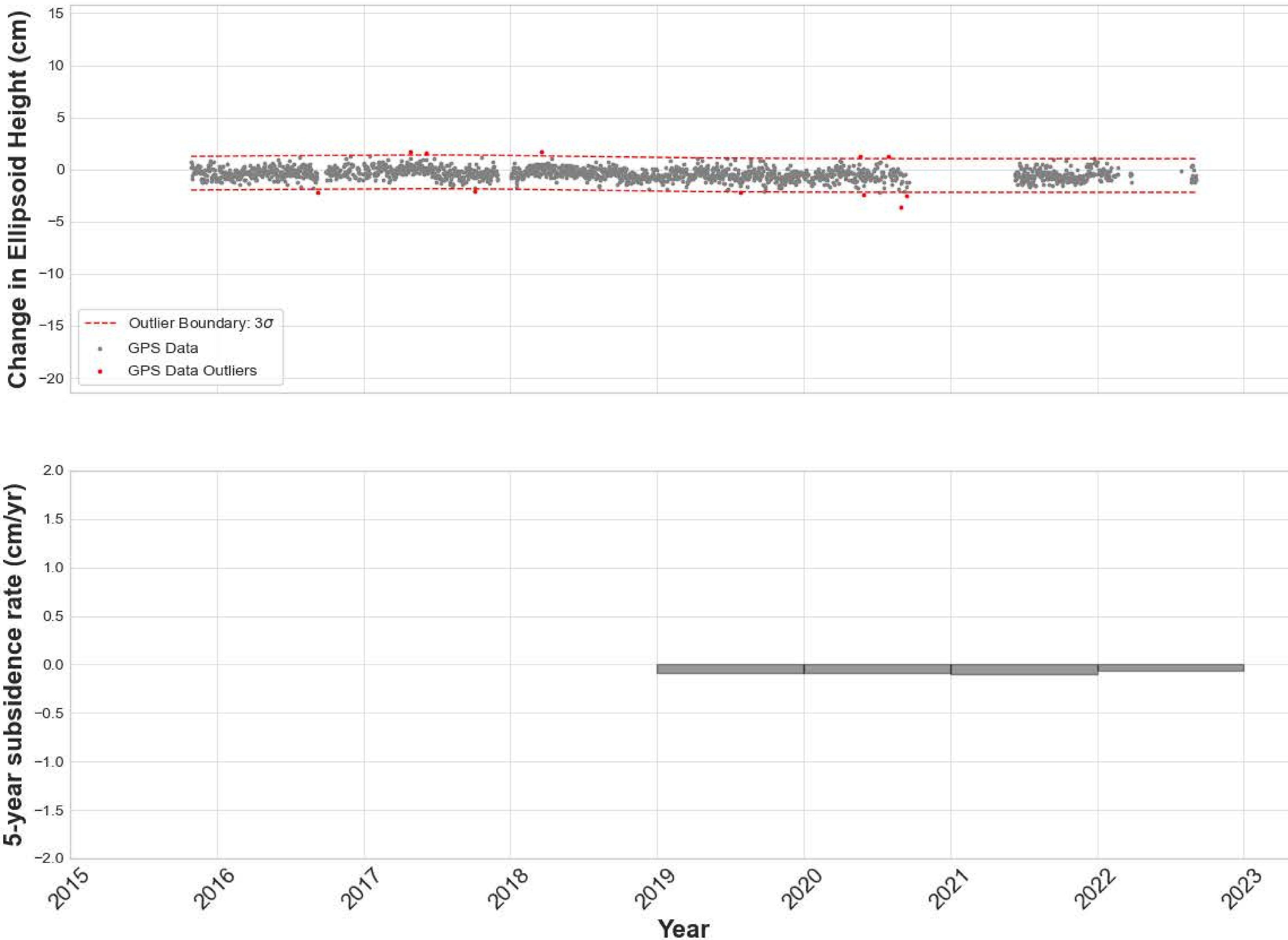

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# DEN2



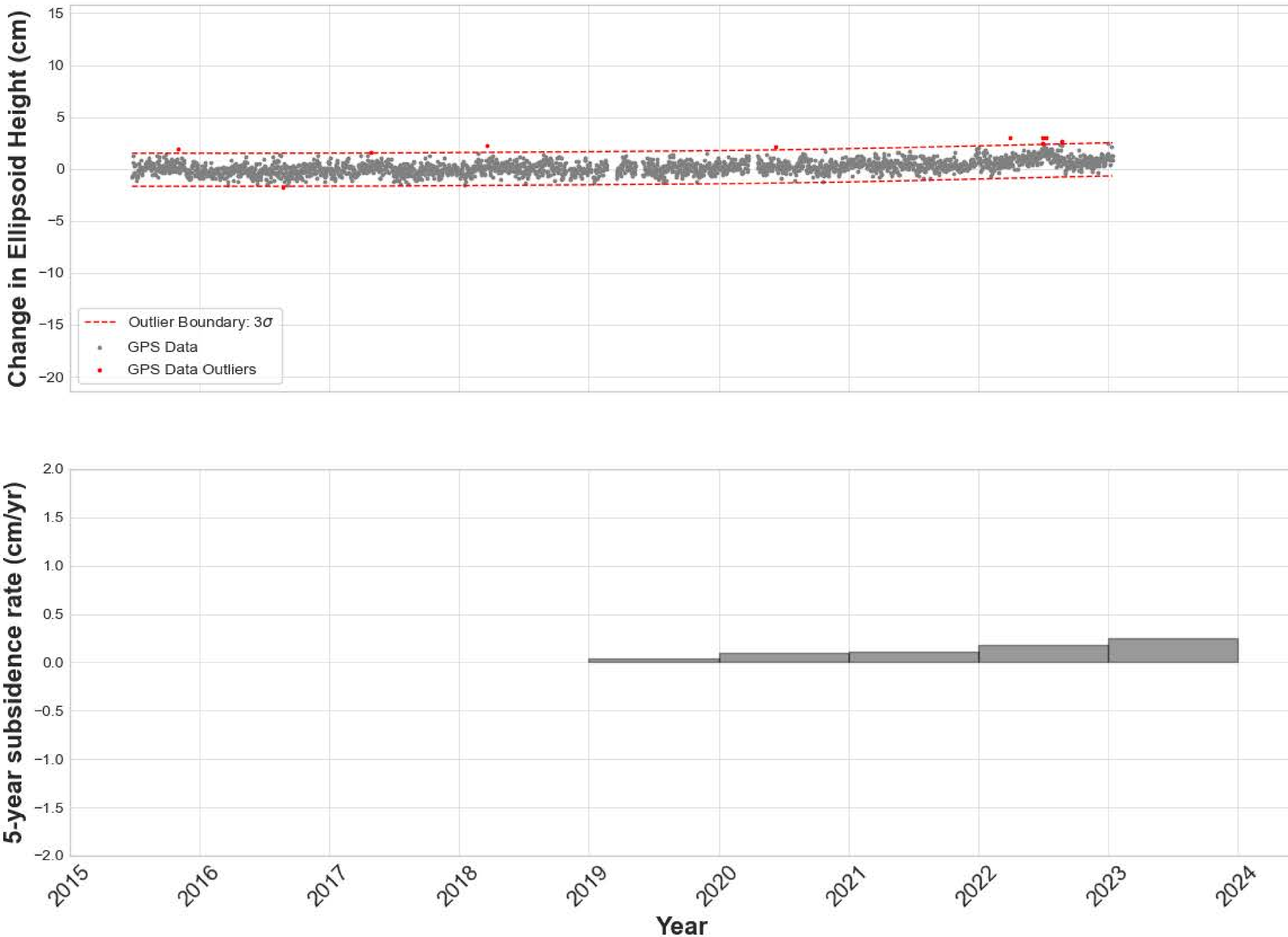

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# DEN4



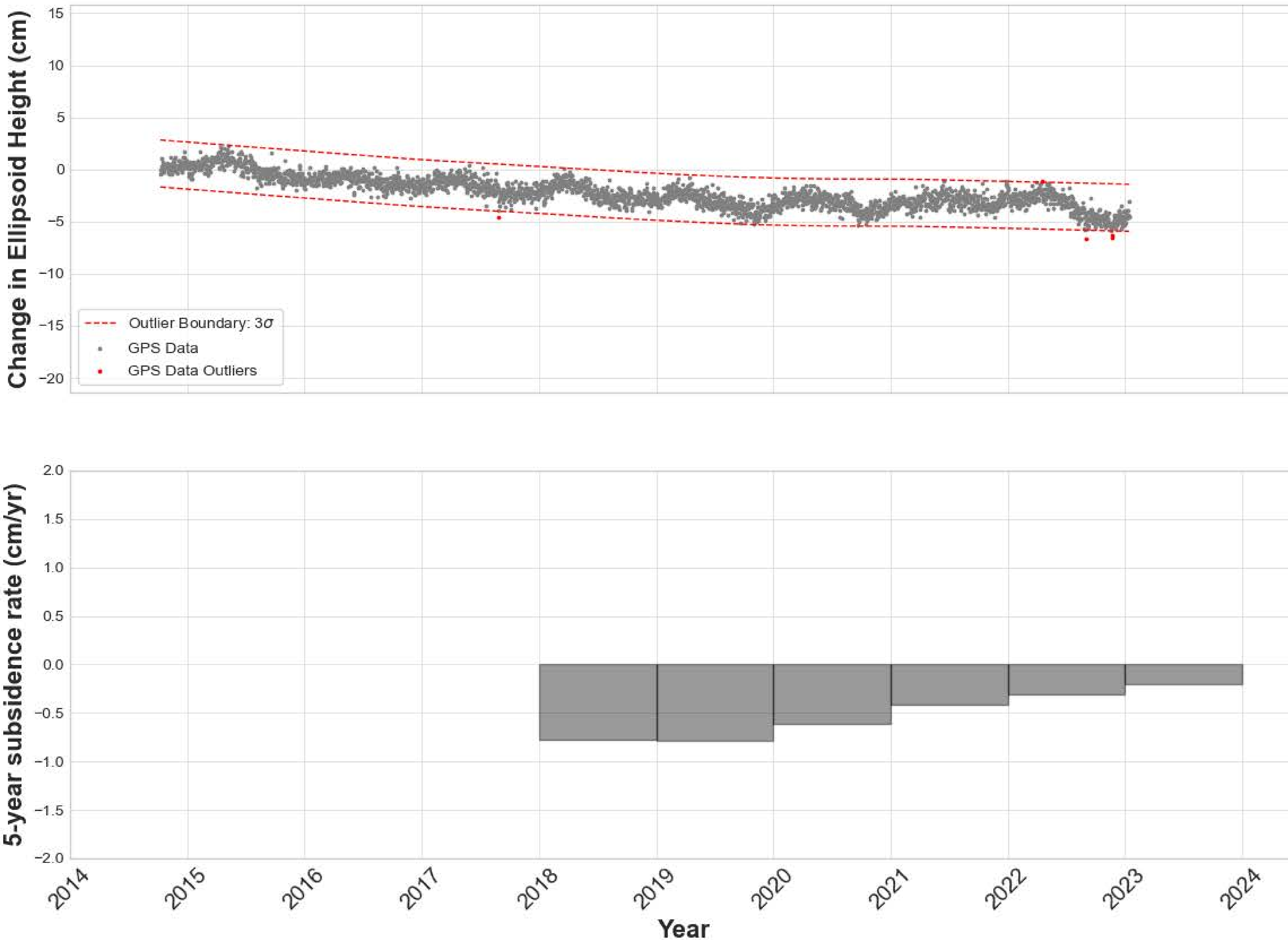

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# DISD

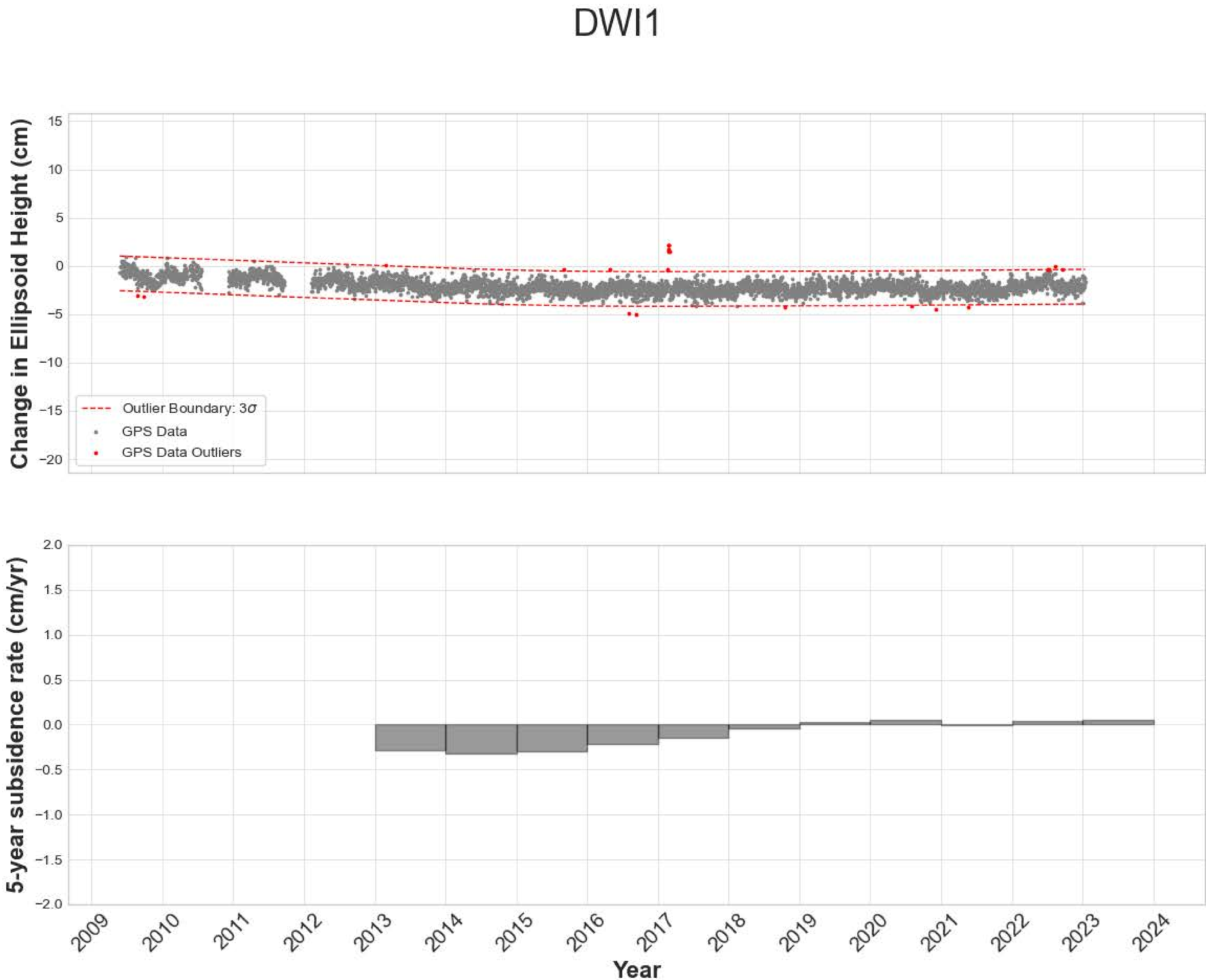



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# DMFB

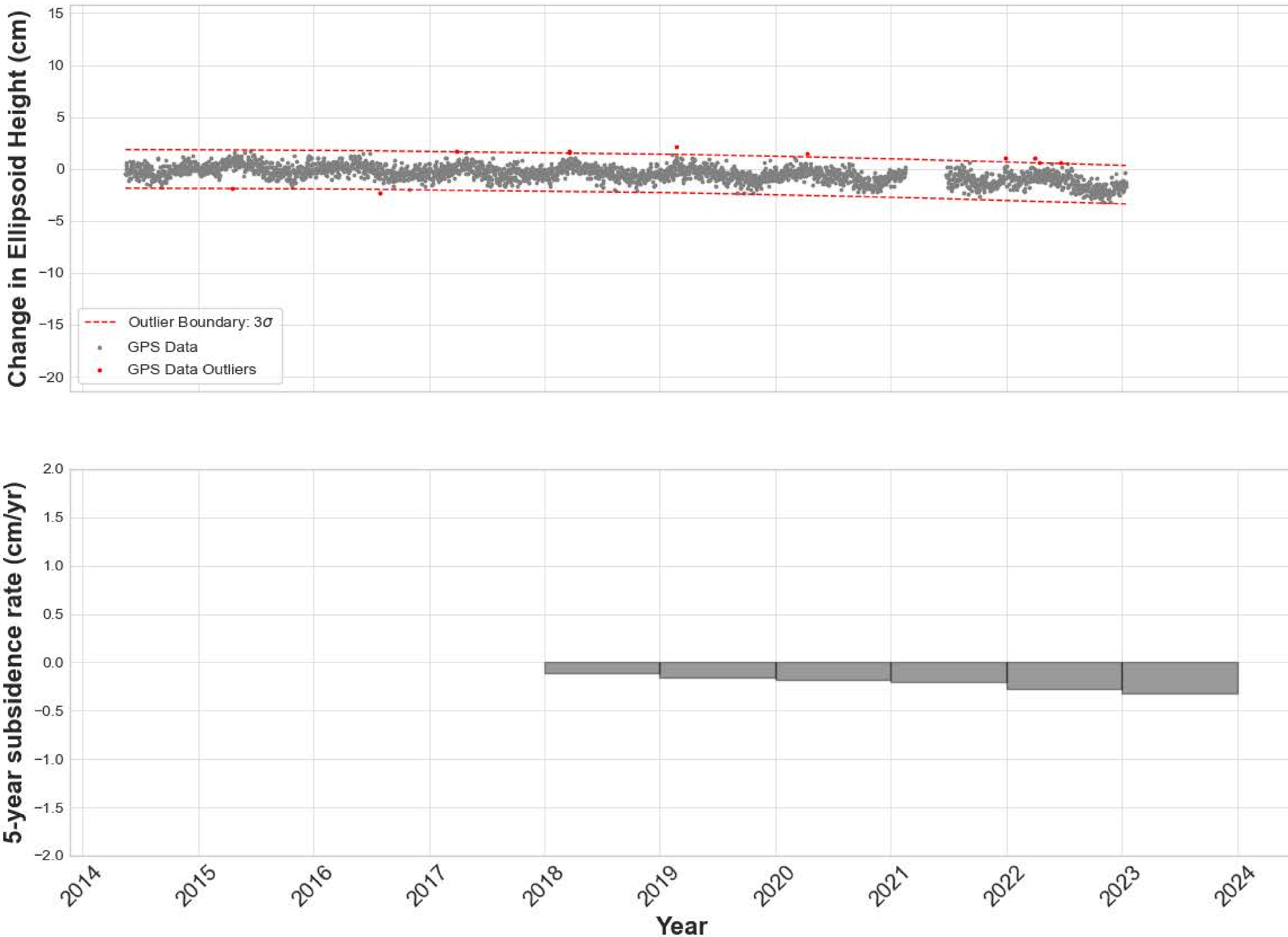



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.



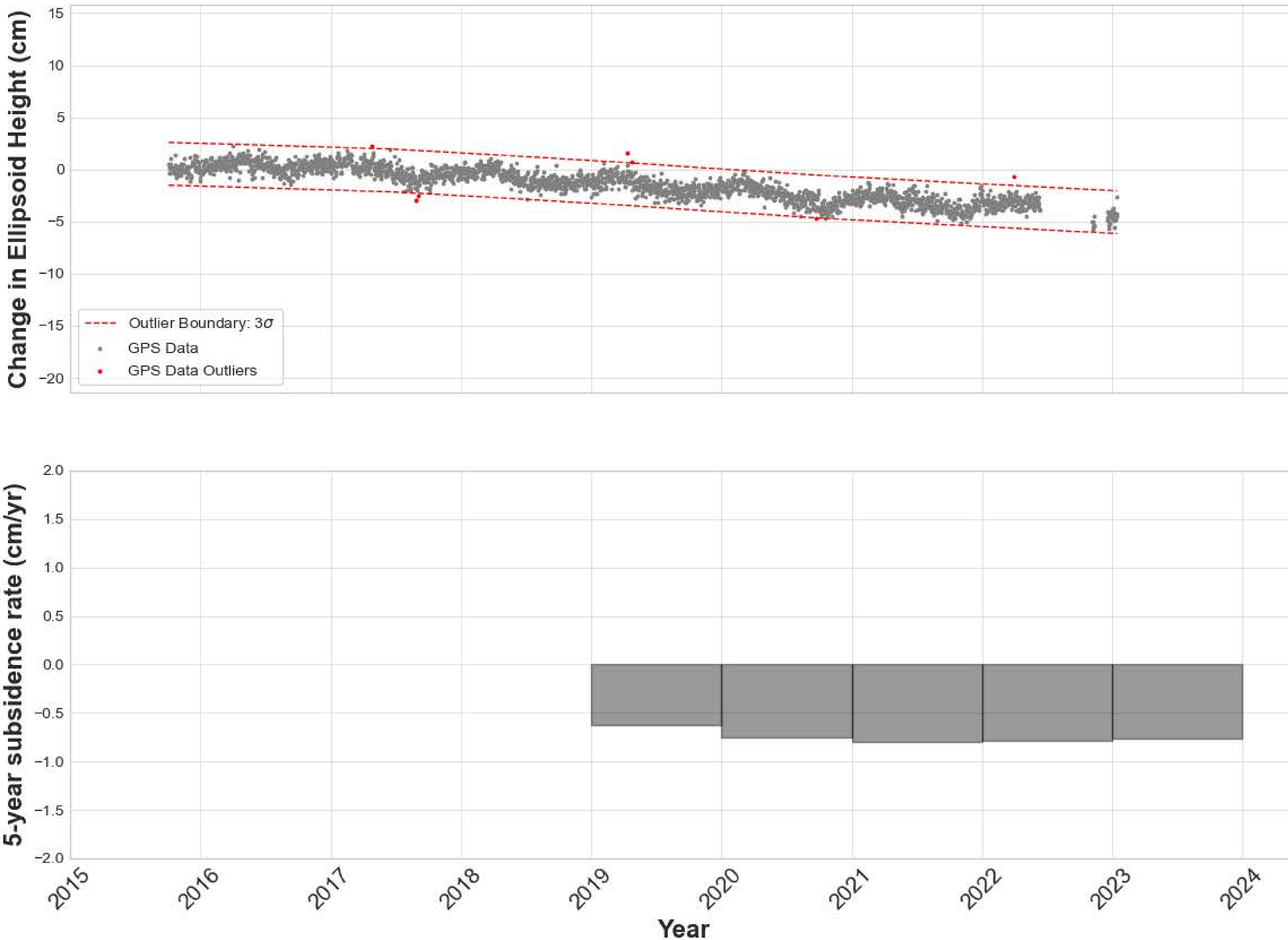

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# FSFB



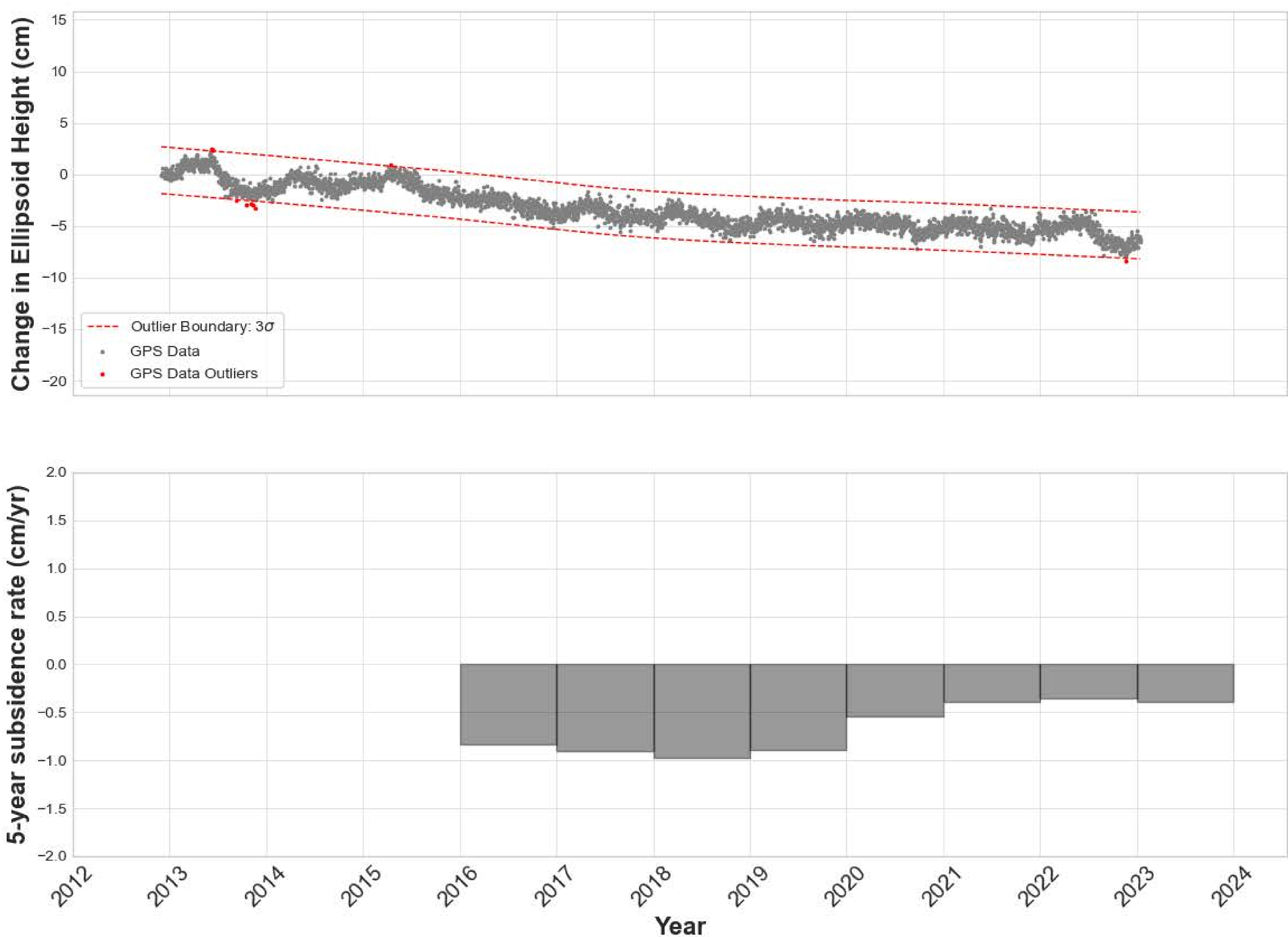

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# GSEC



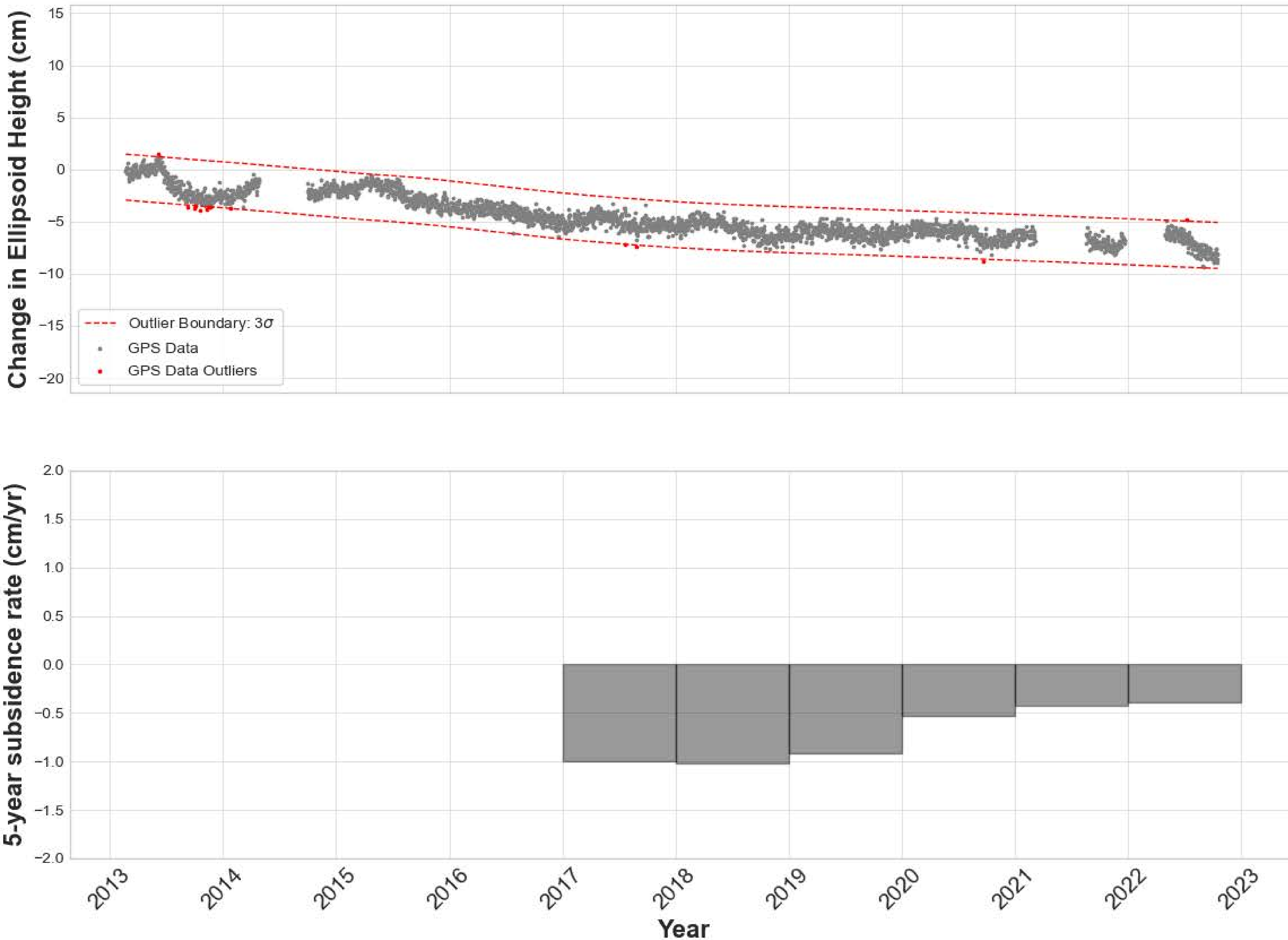

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# HCC1



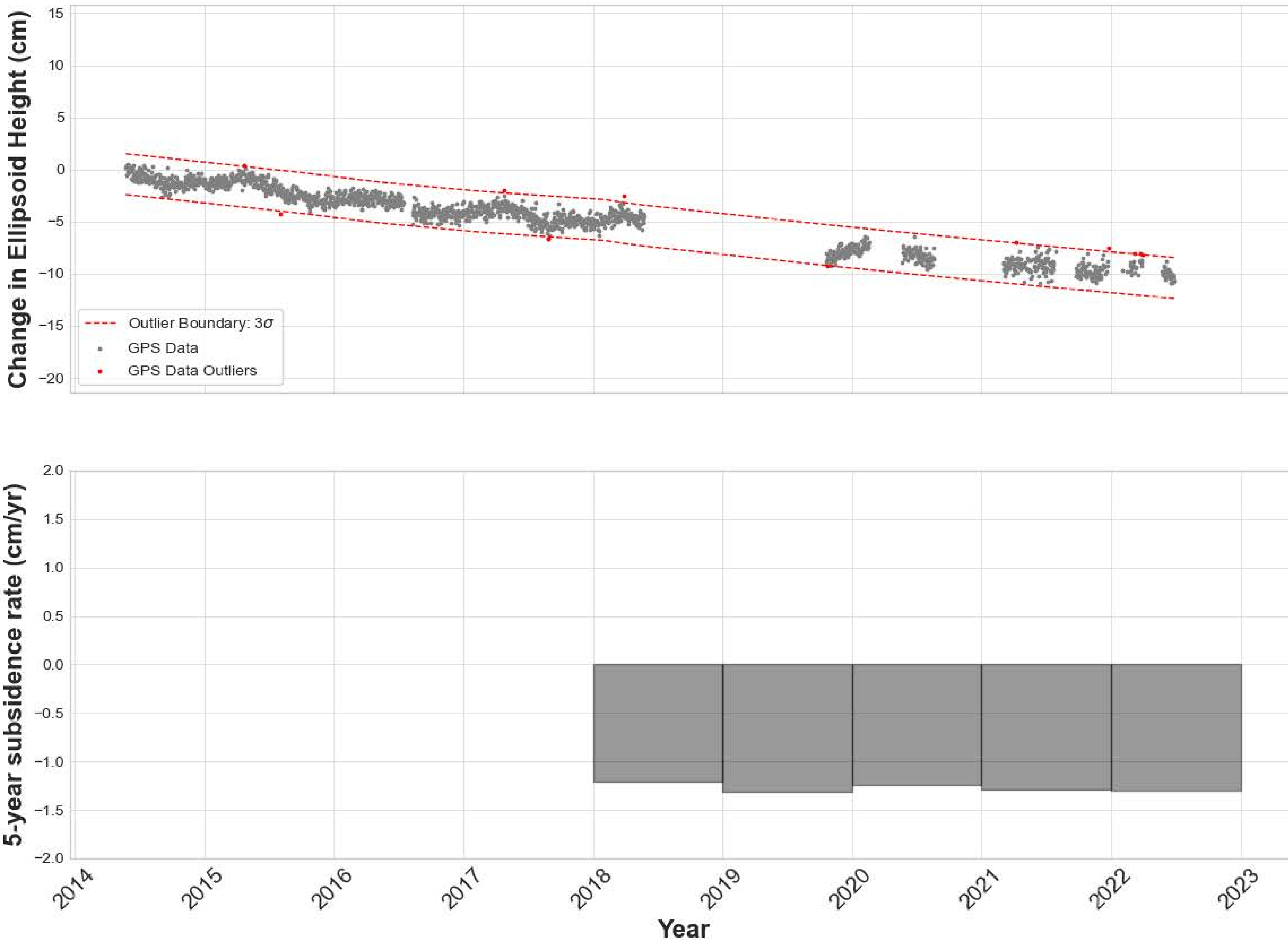

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# HCC2



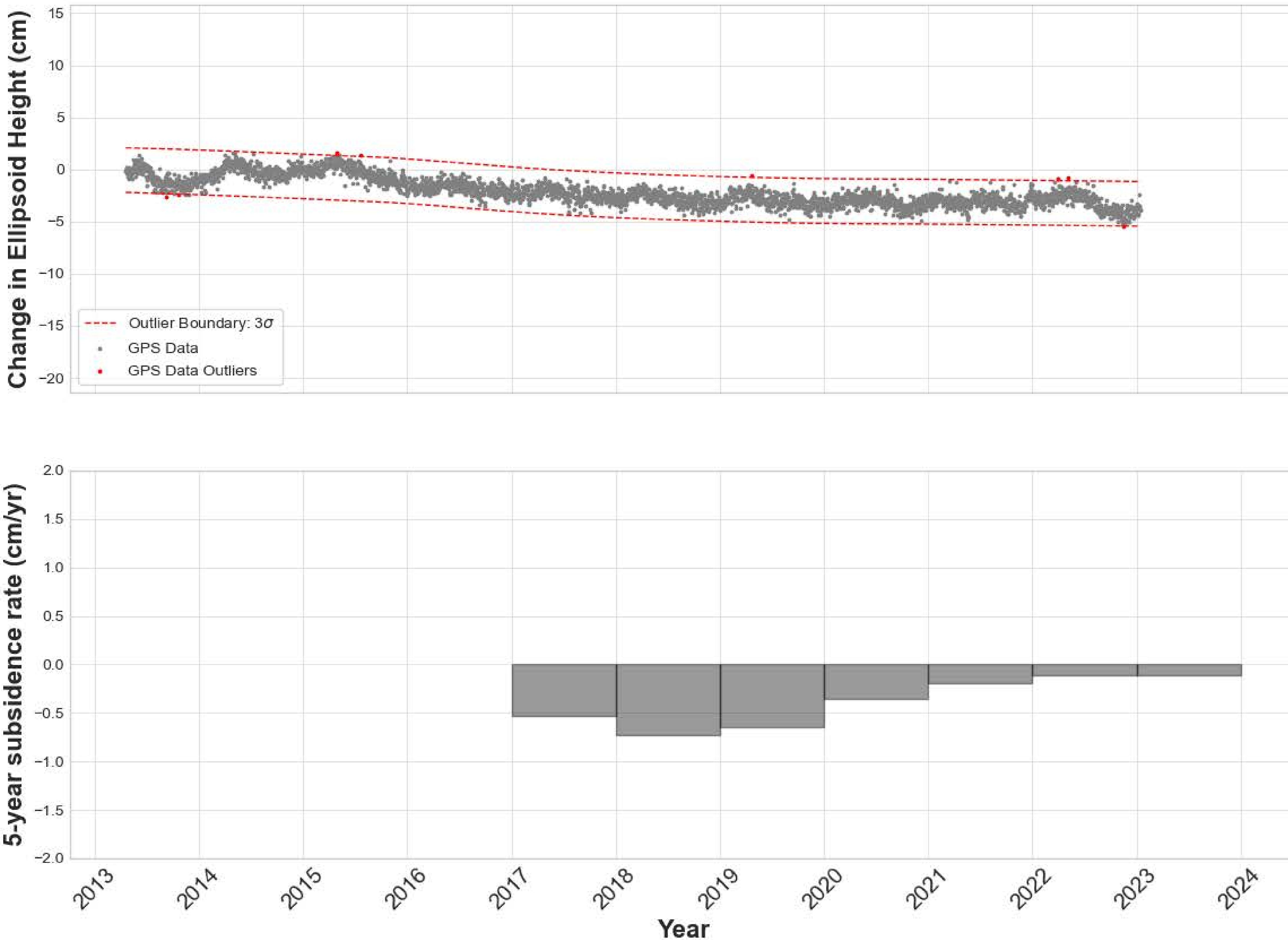

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# HPEK



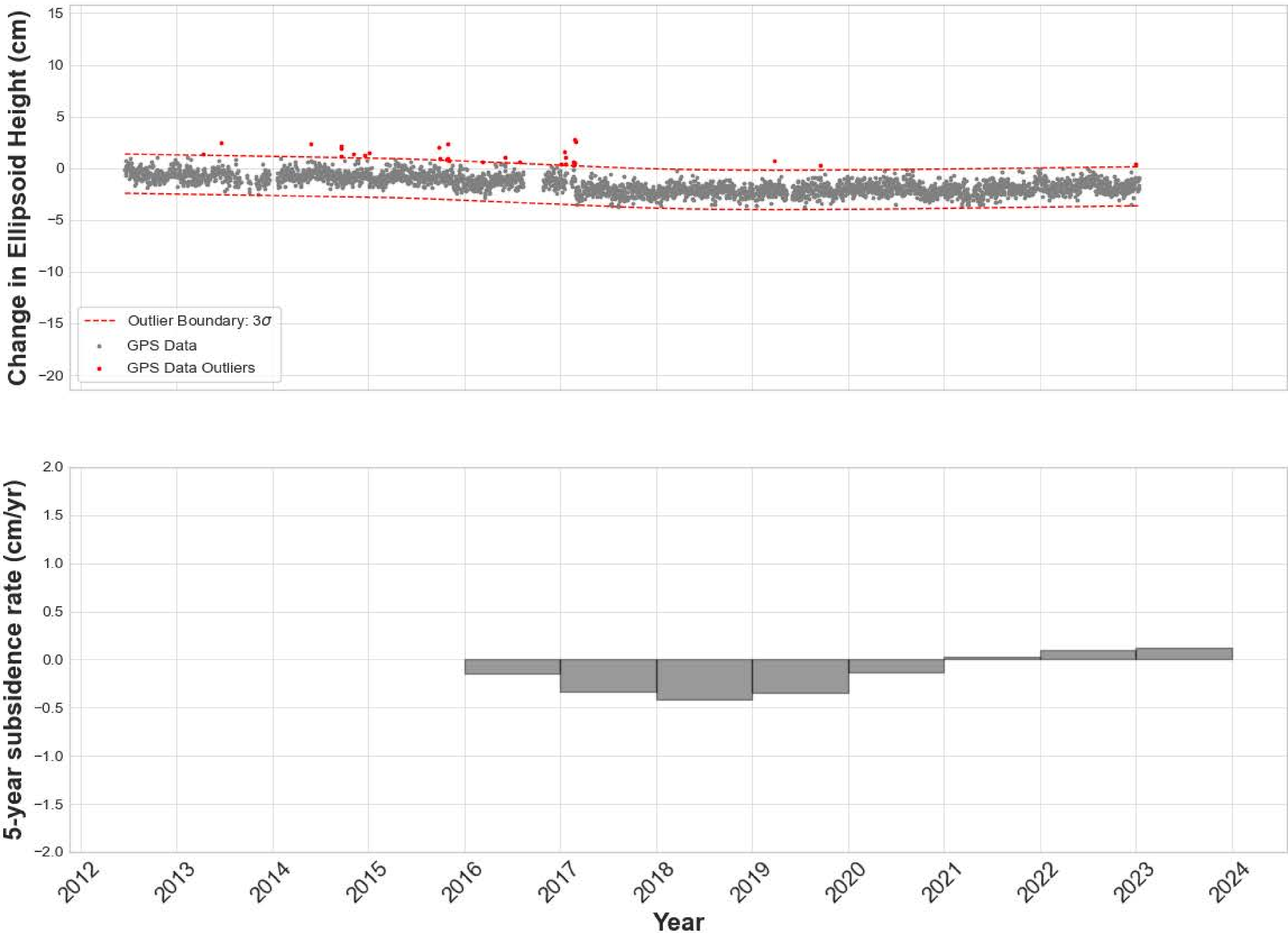

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# HSMN



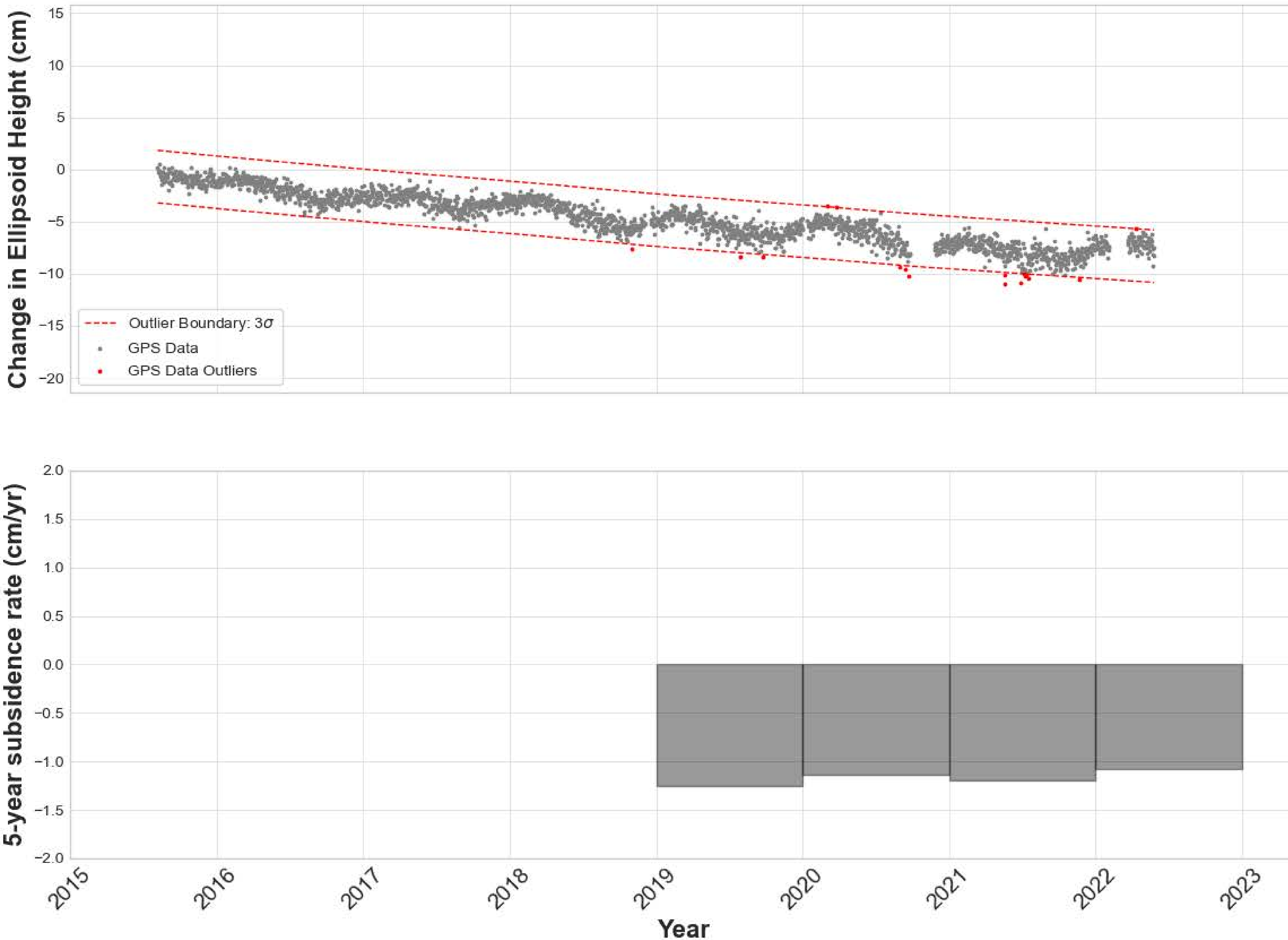

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# JGS2



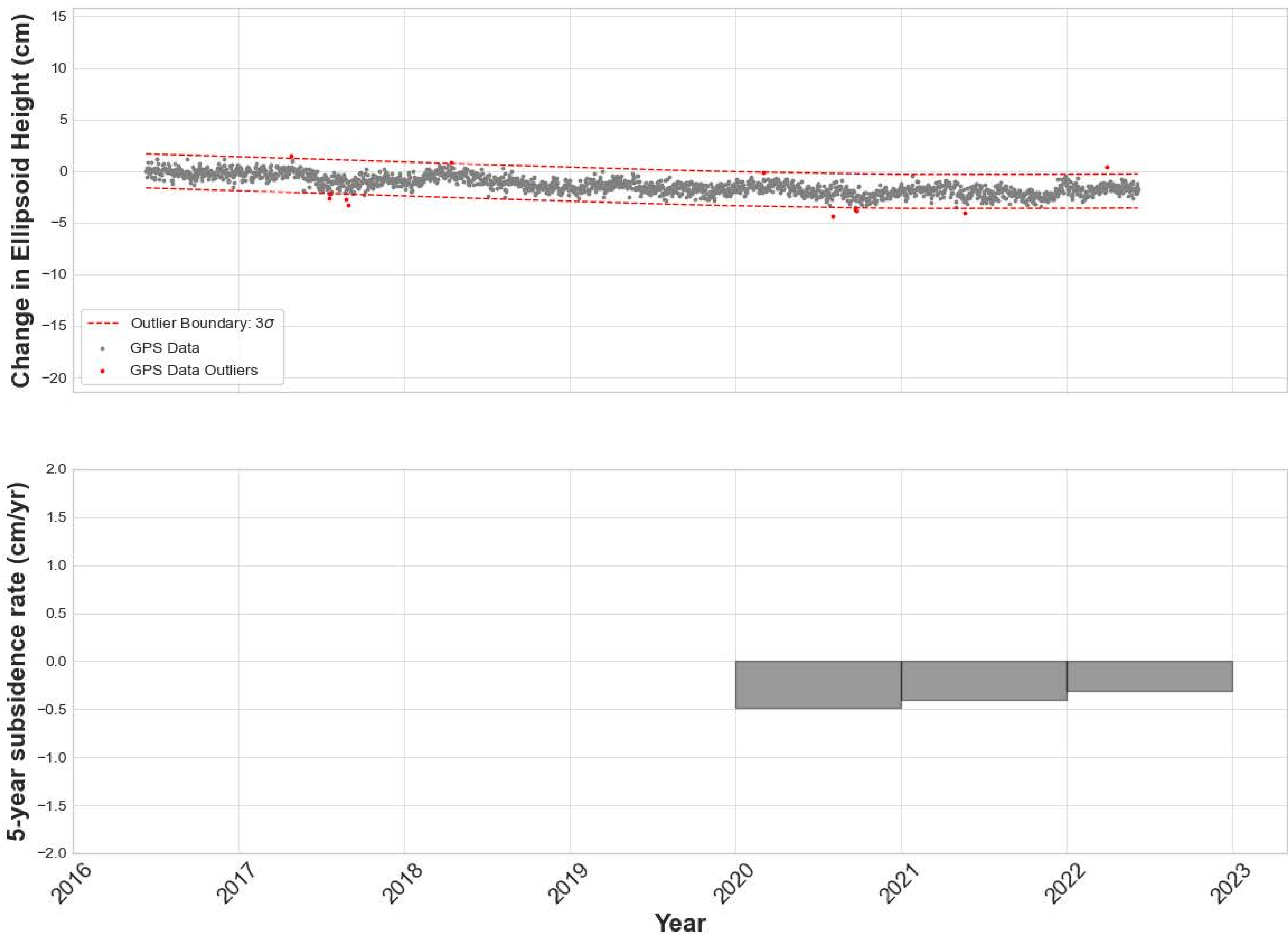

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# KKES



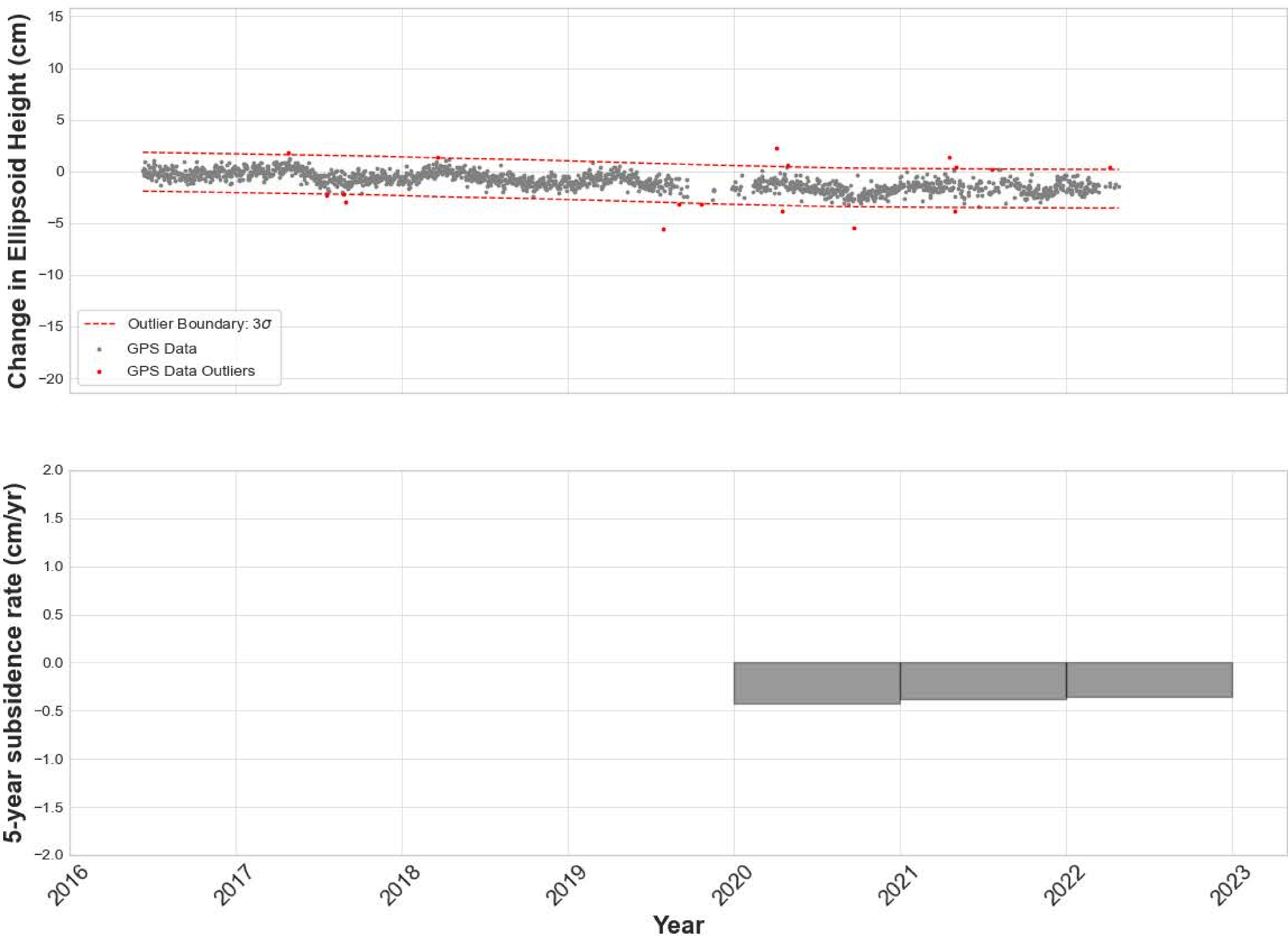

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# KPCD



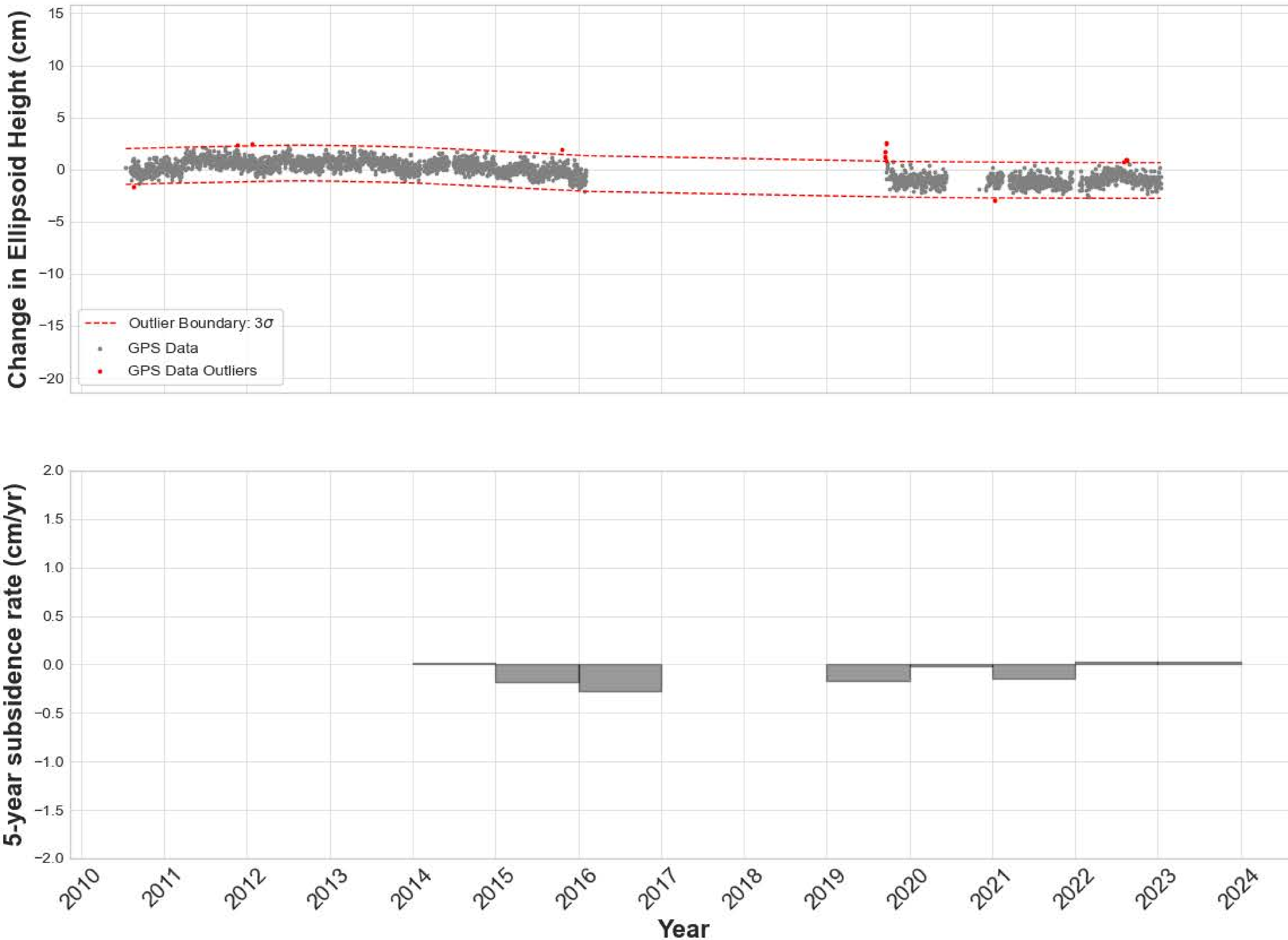

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# KPCS



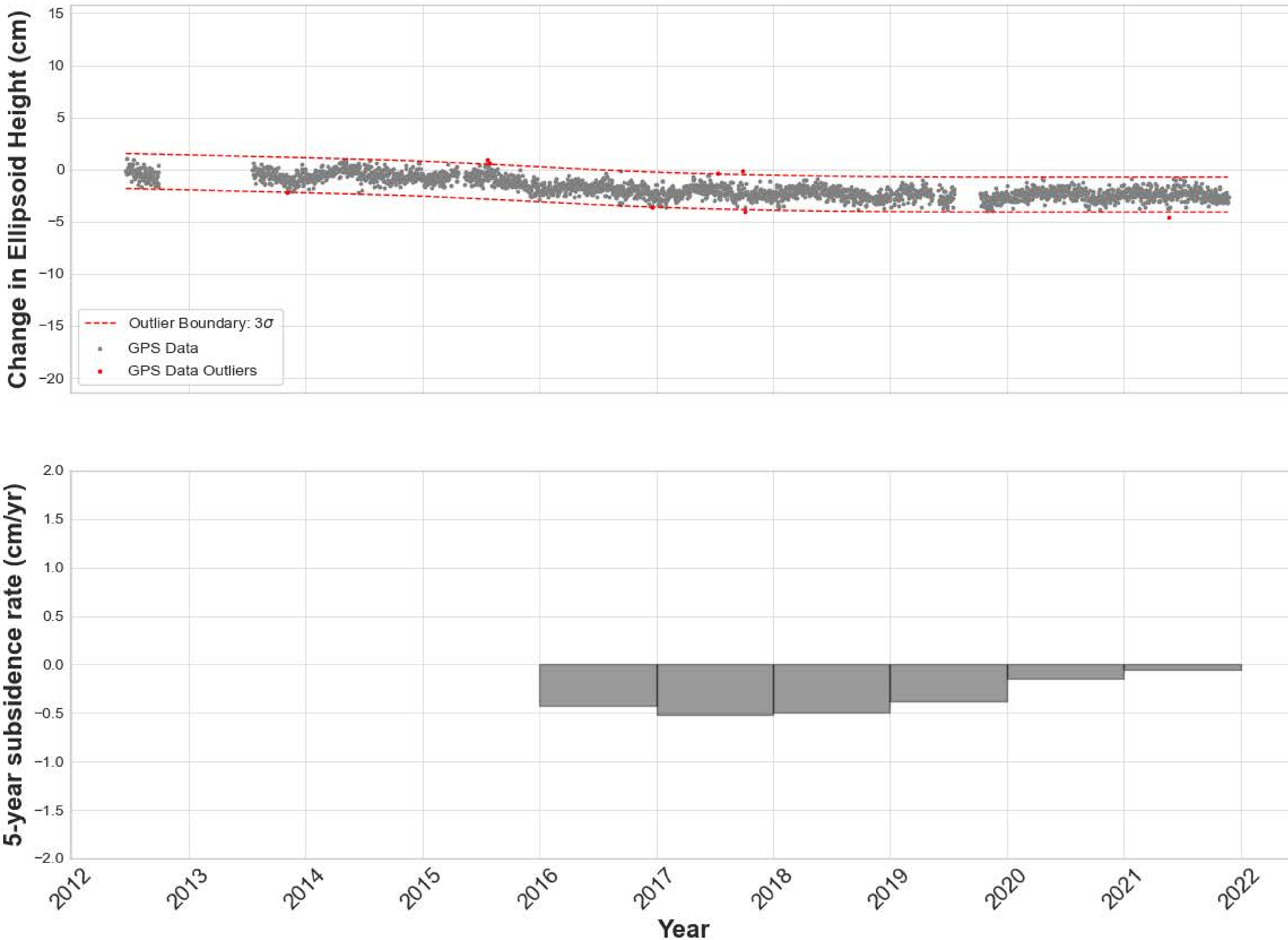

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# LCBR



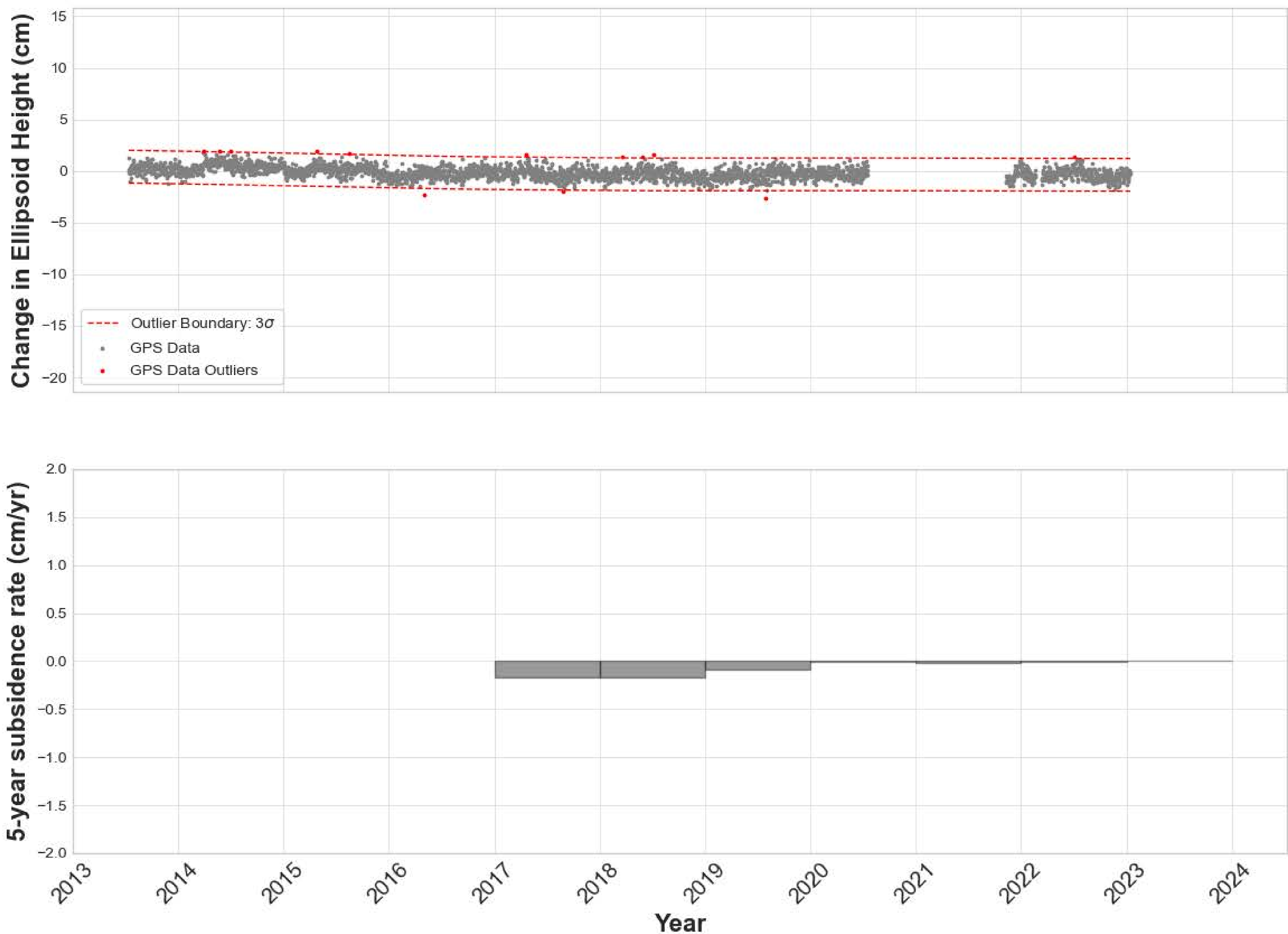

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# LCI1



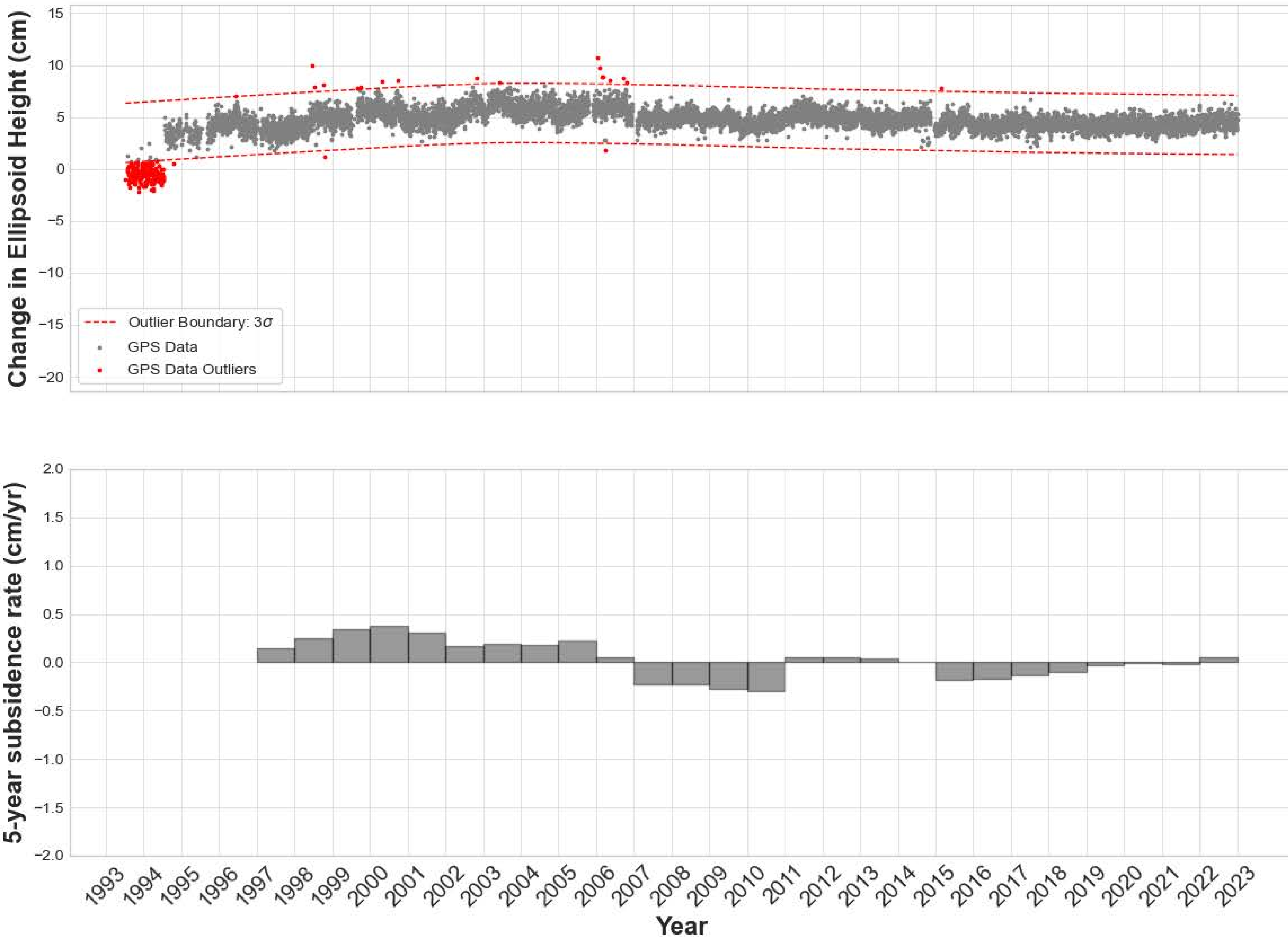

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# LGC1



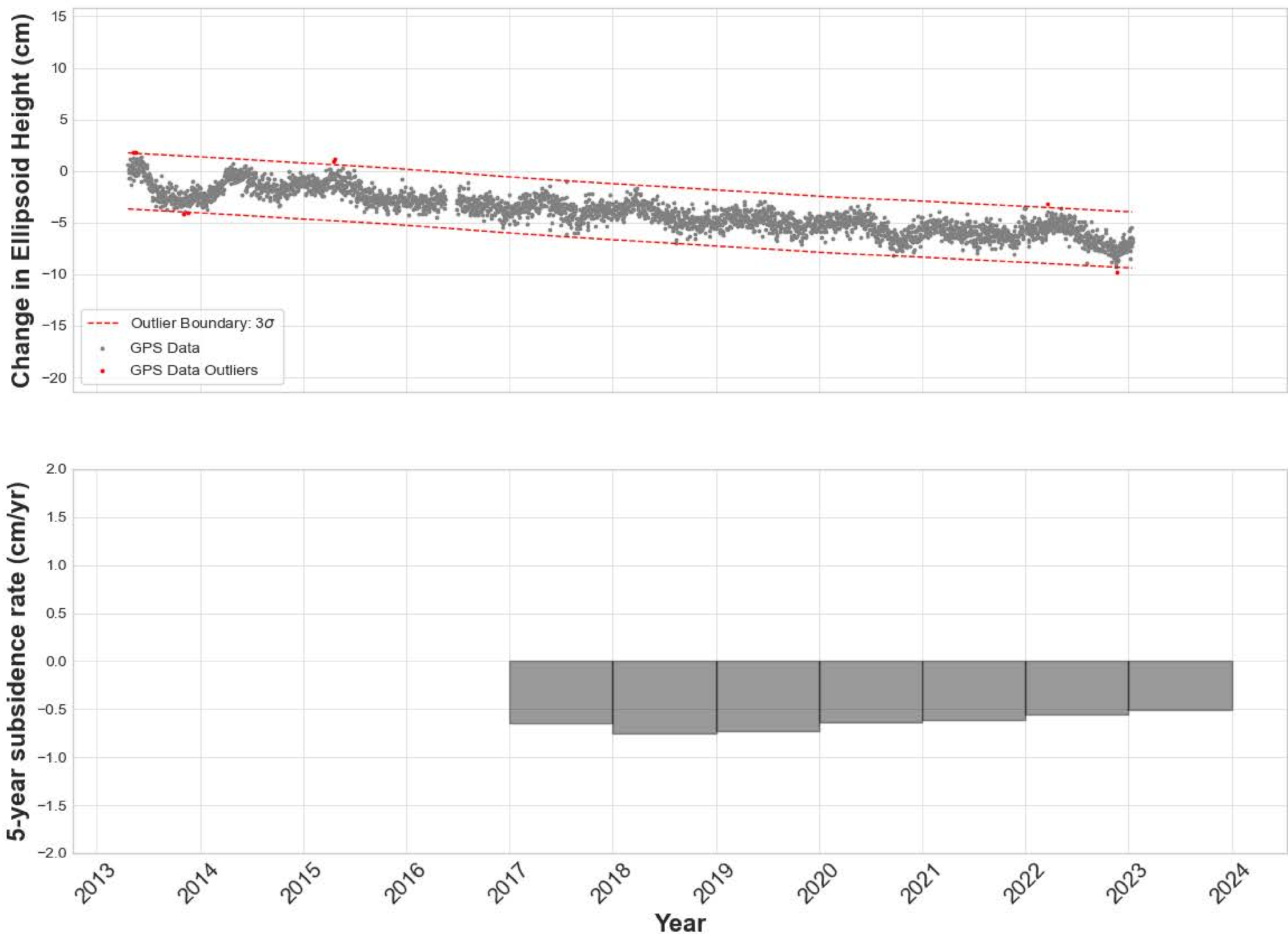

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# LKHU



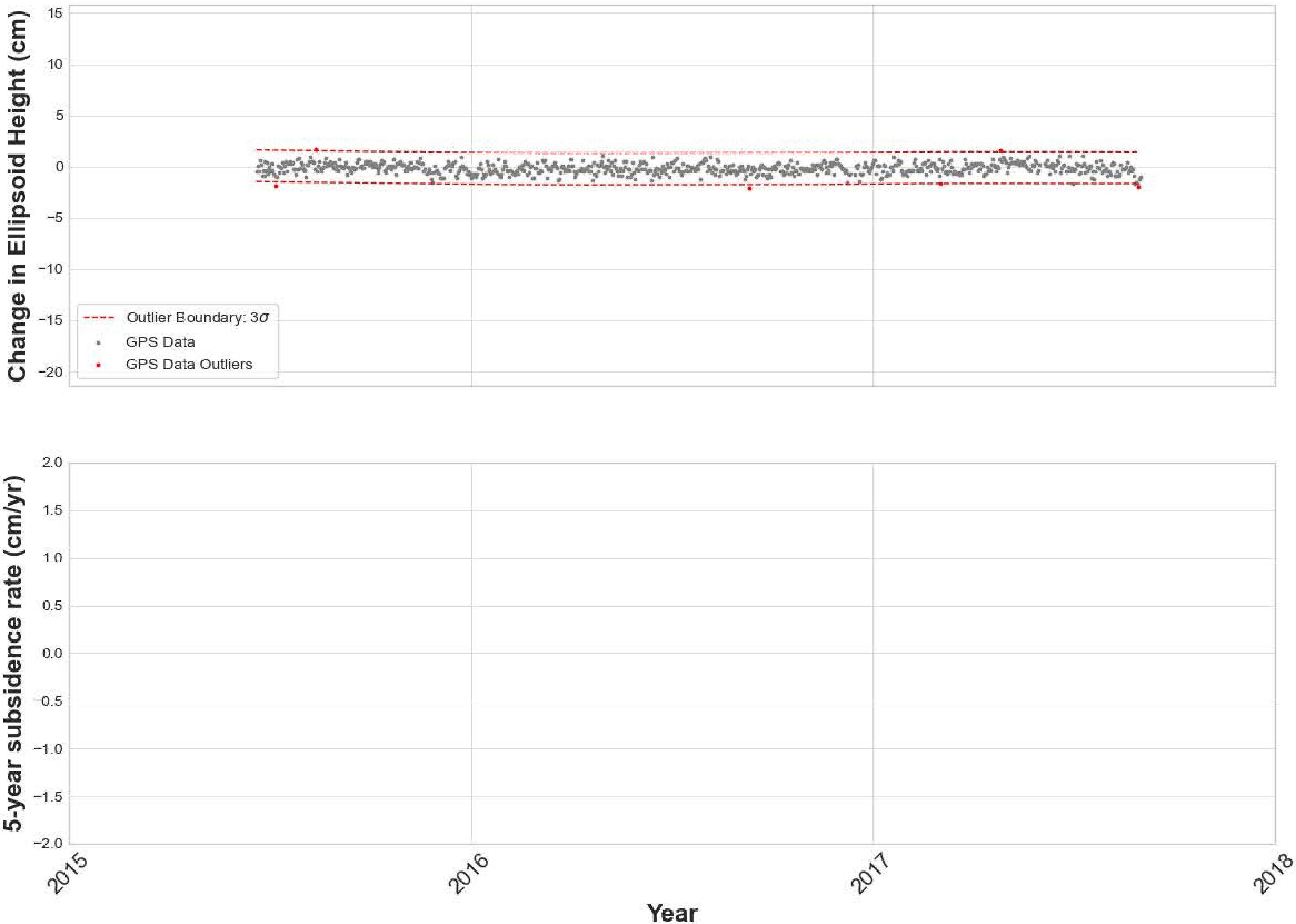

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# MDWD



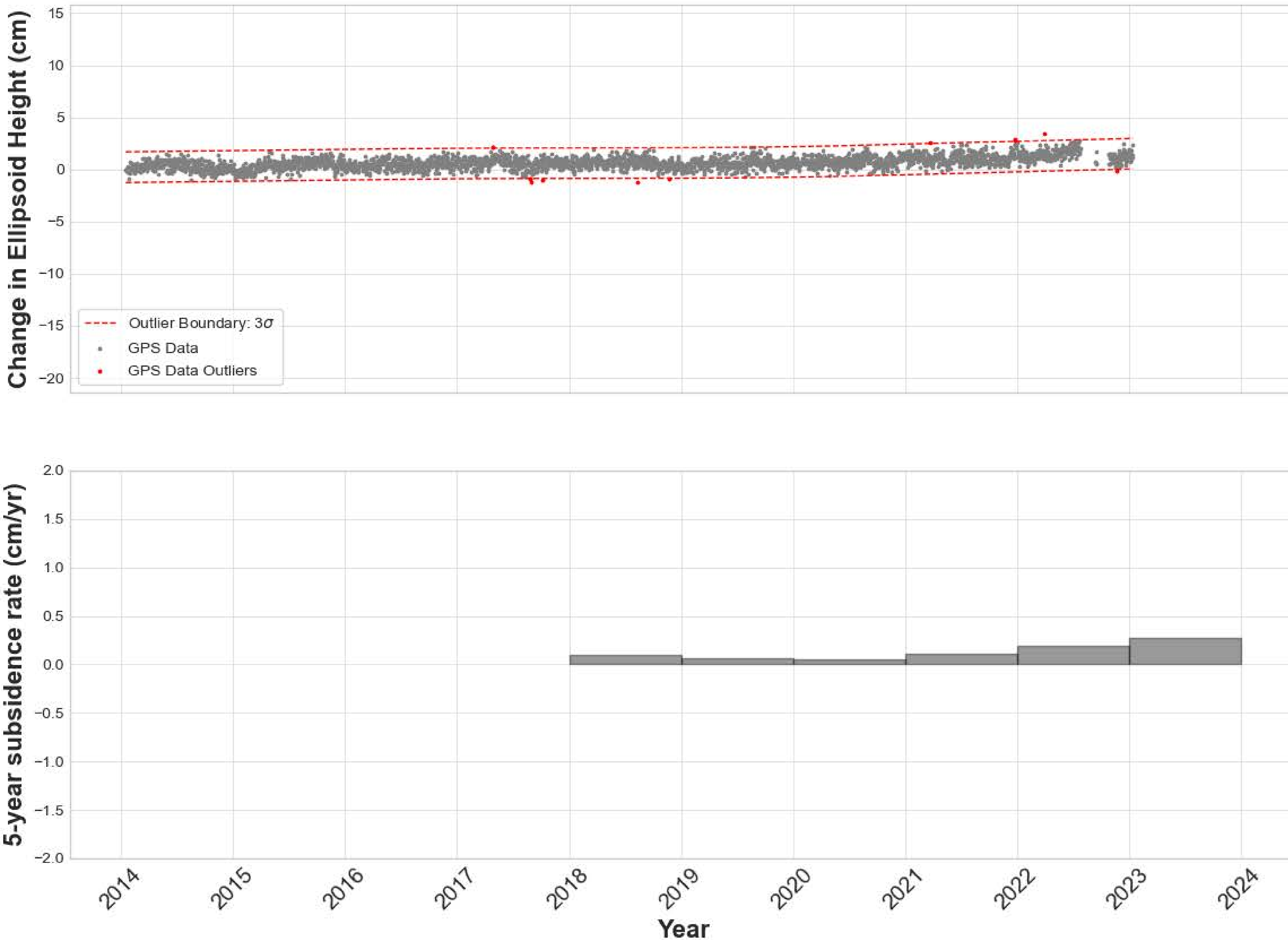

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# ME01



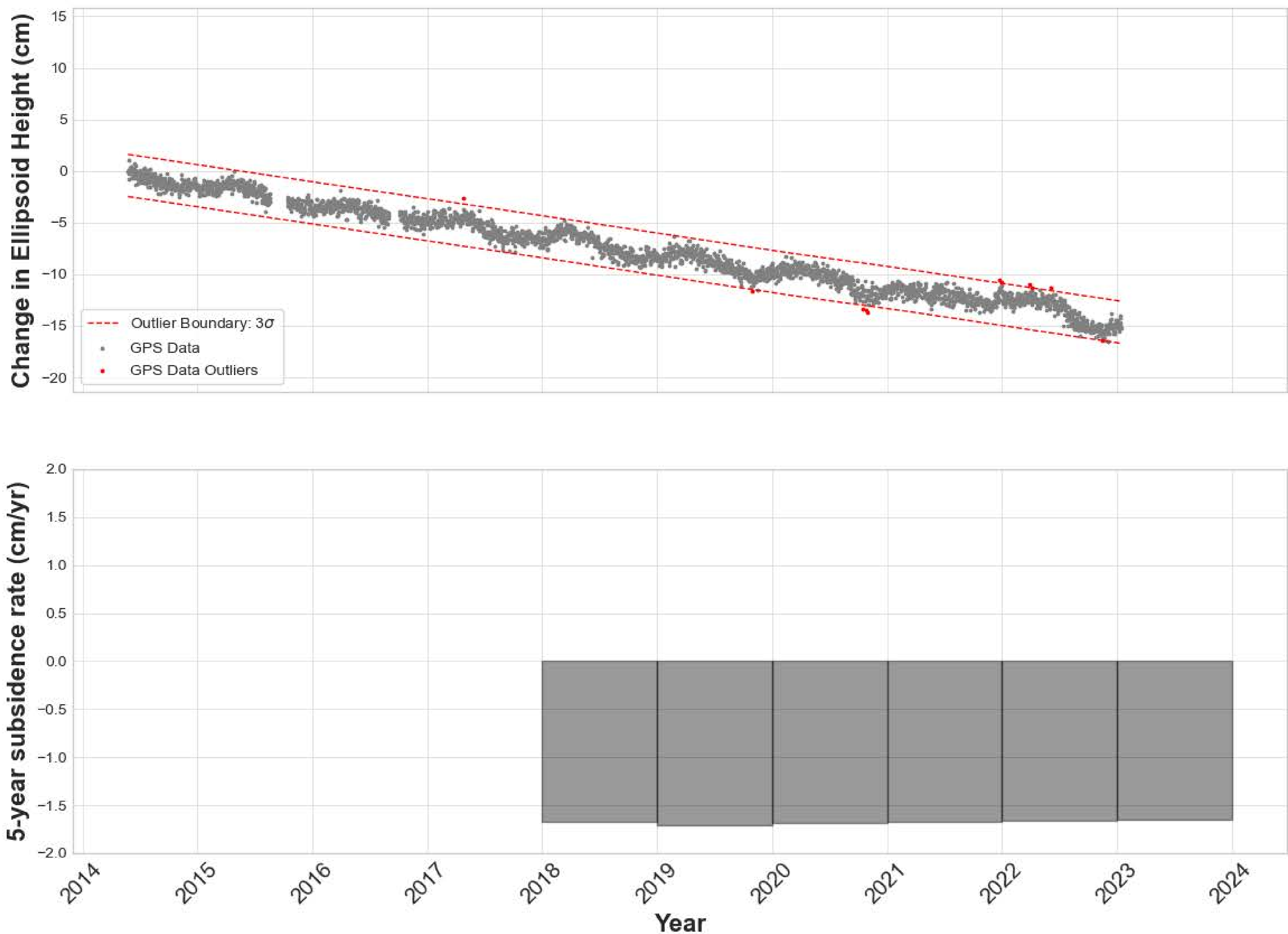

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# MEPD



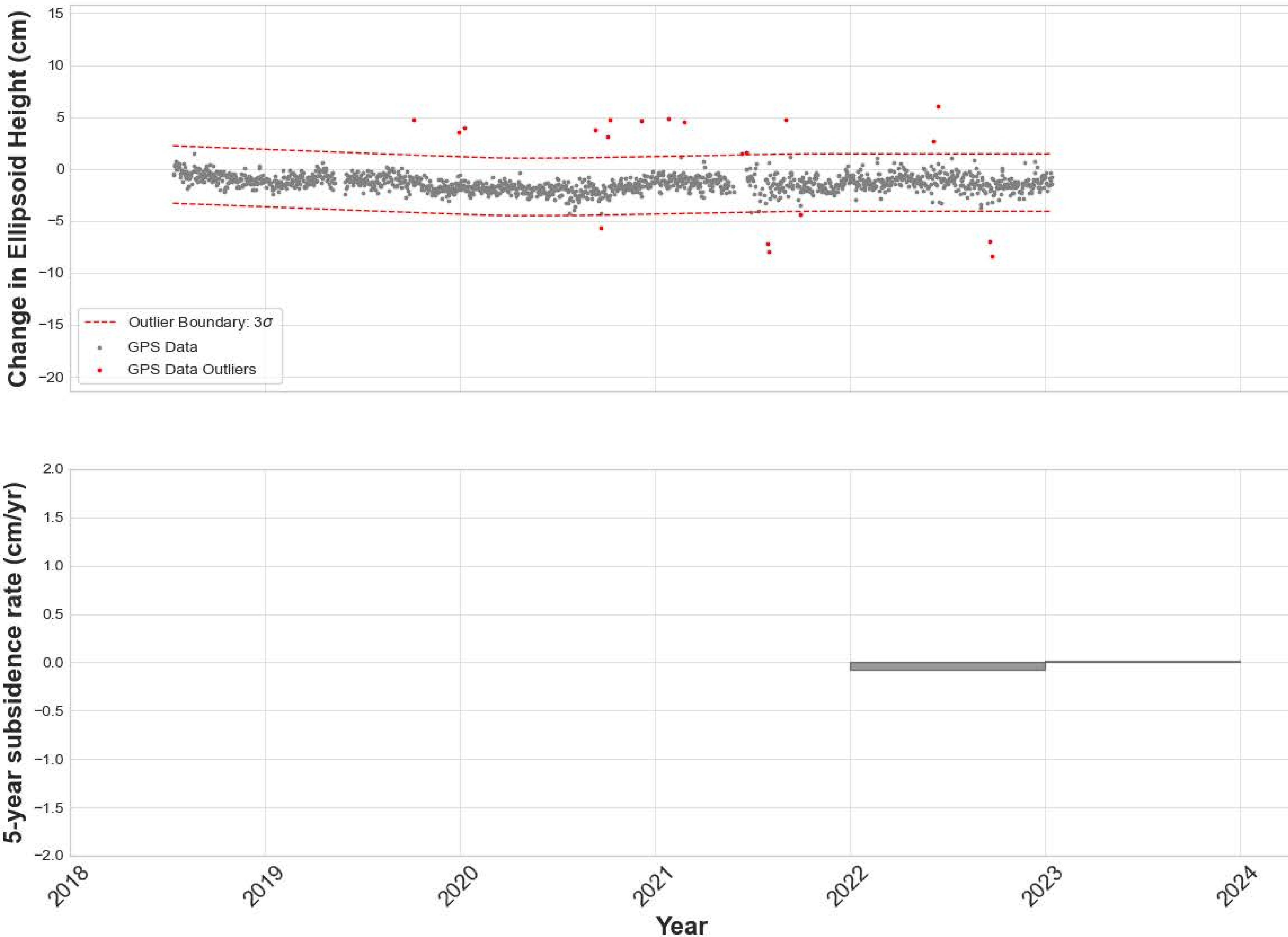

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# MRHK



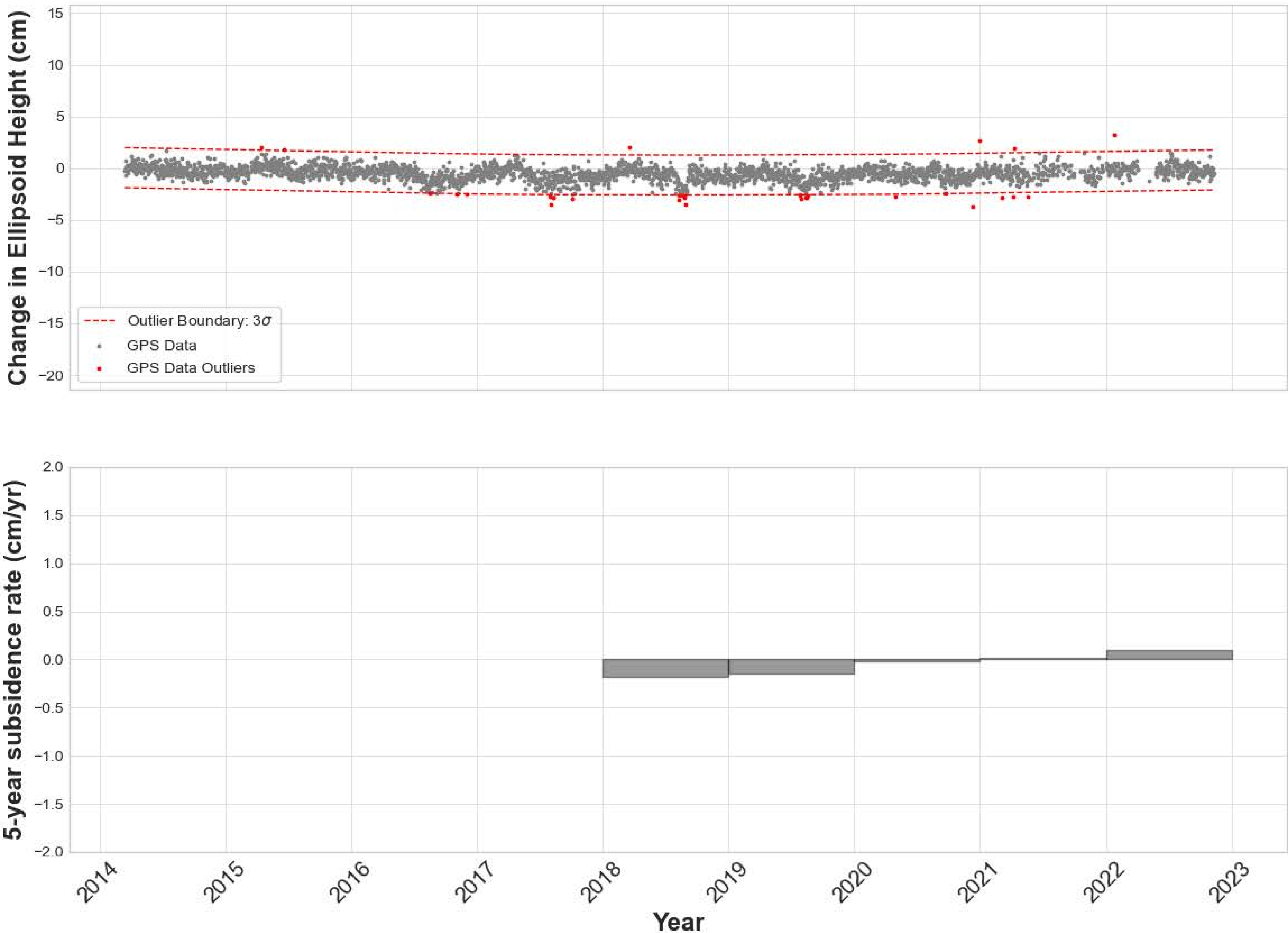

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# N301



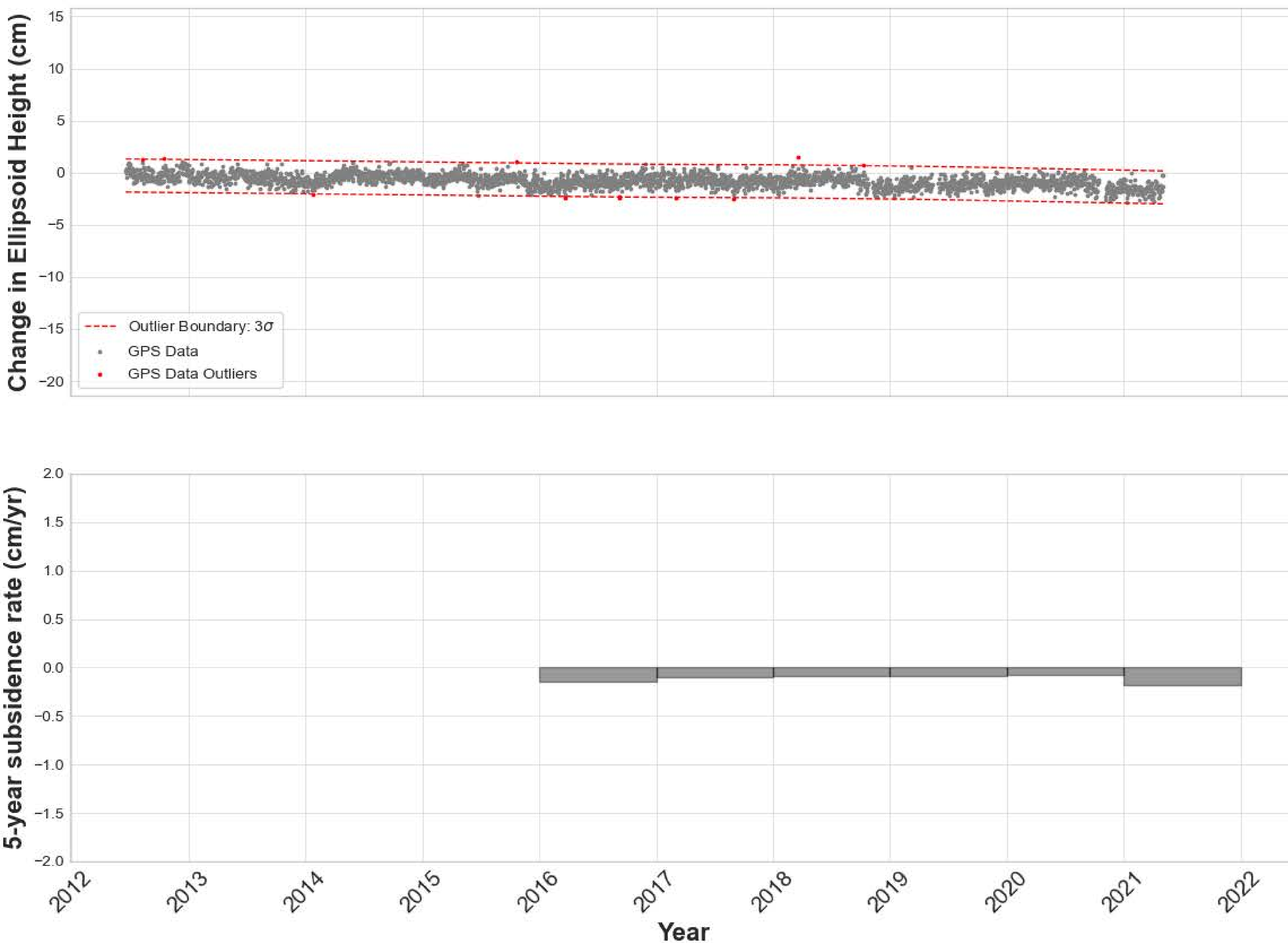

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# NASA



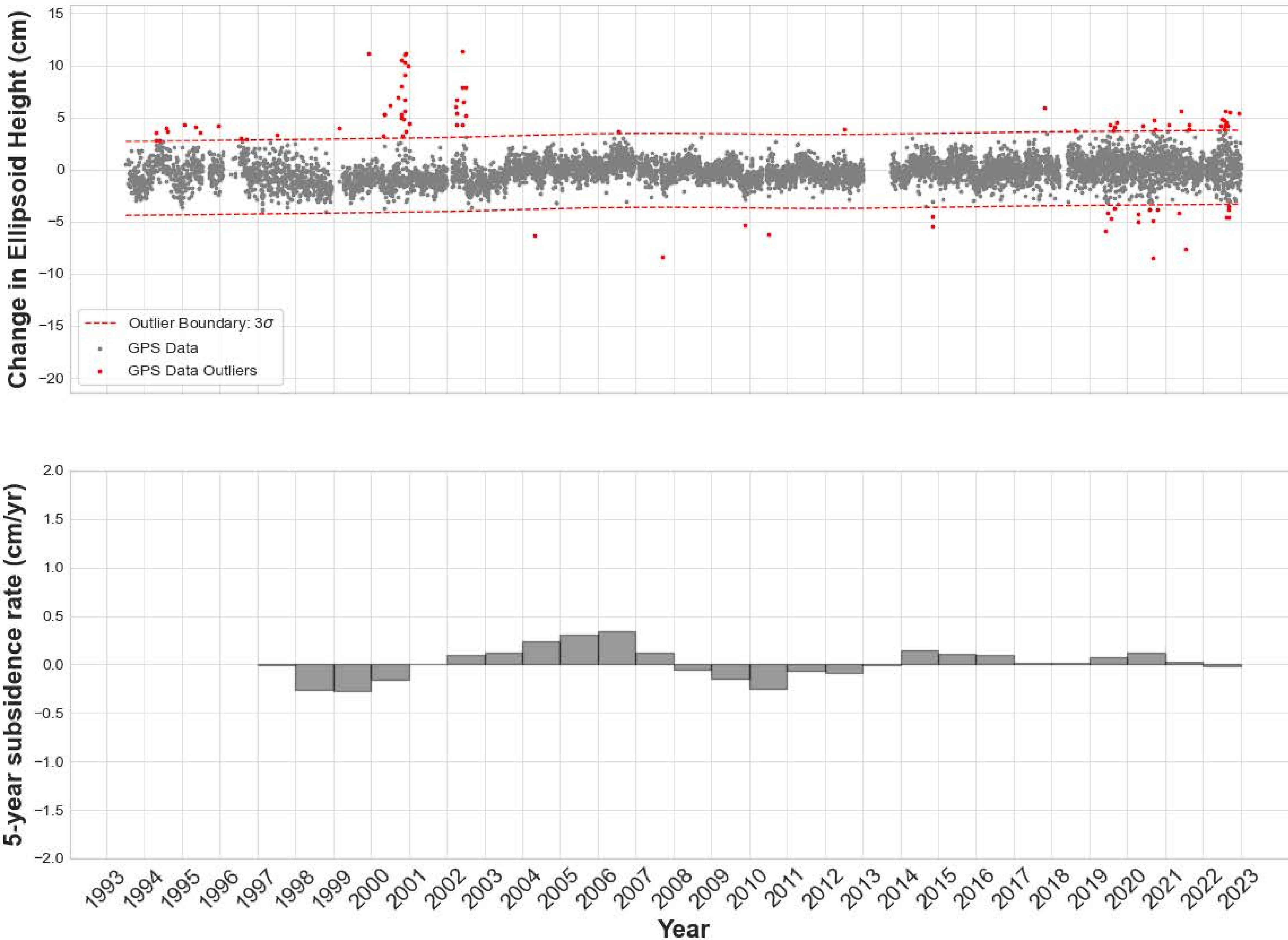

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# NBRY



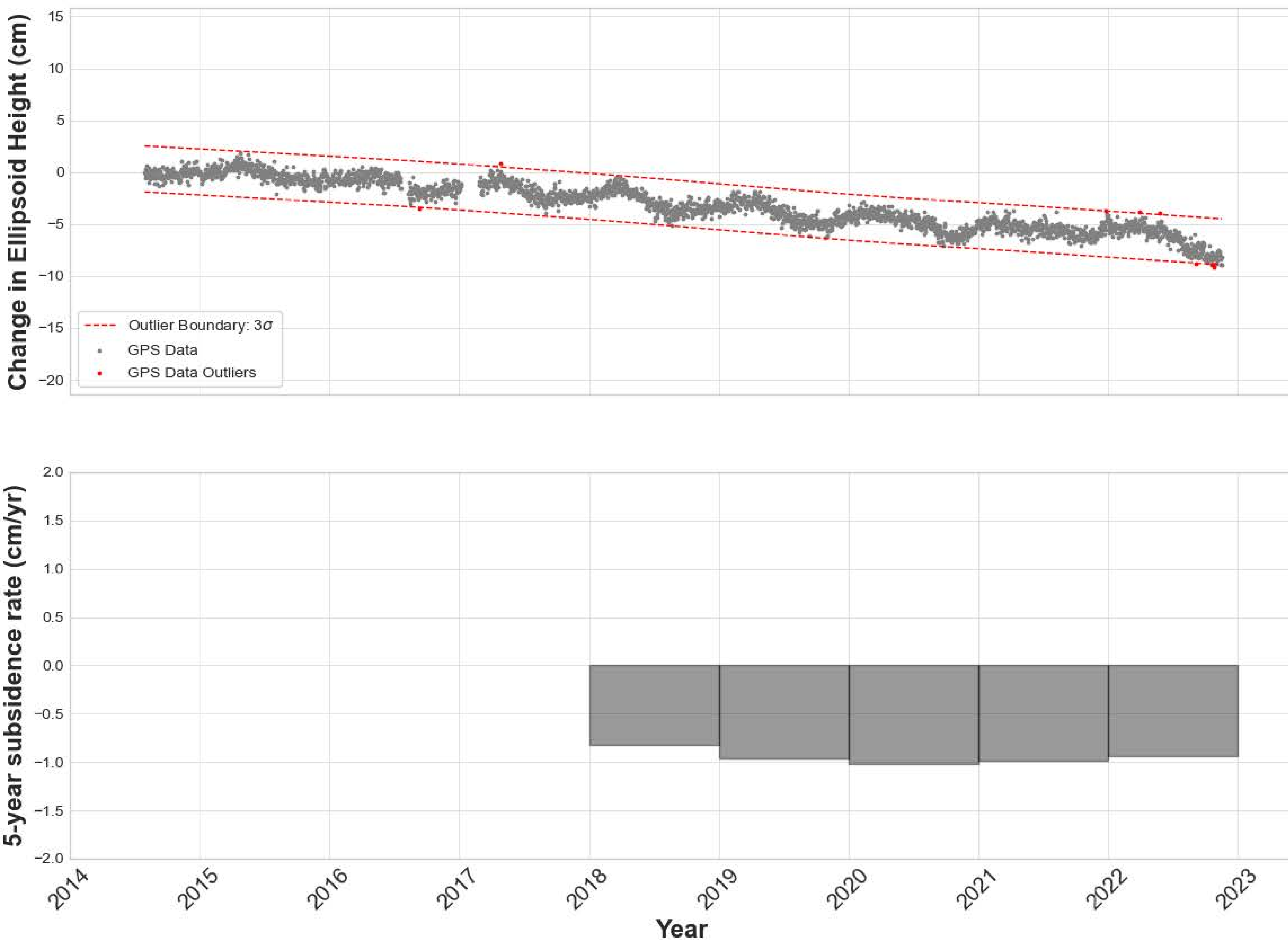

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# NETP



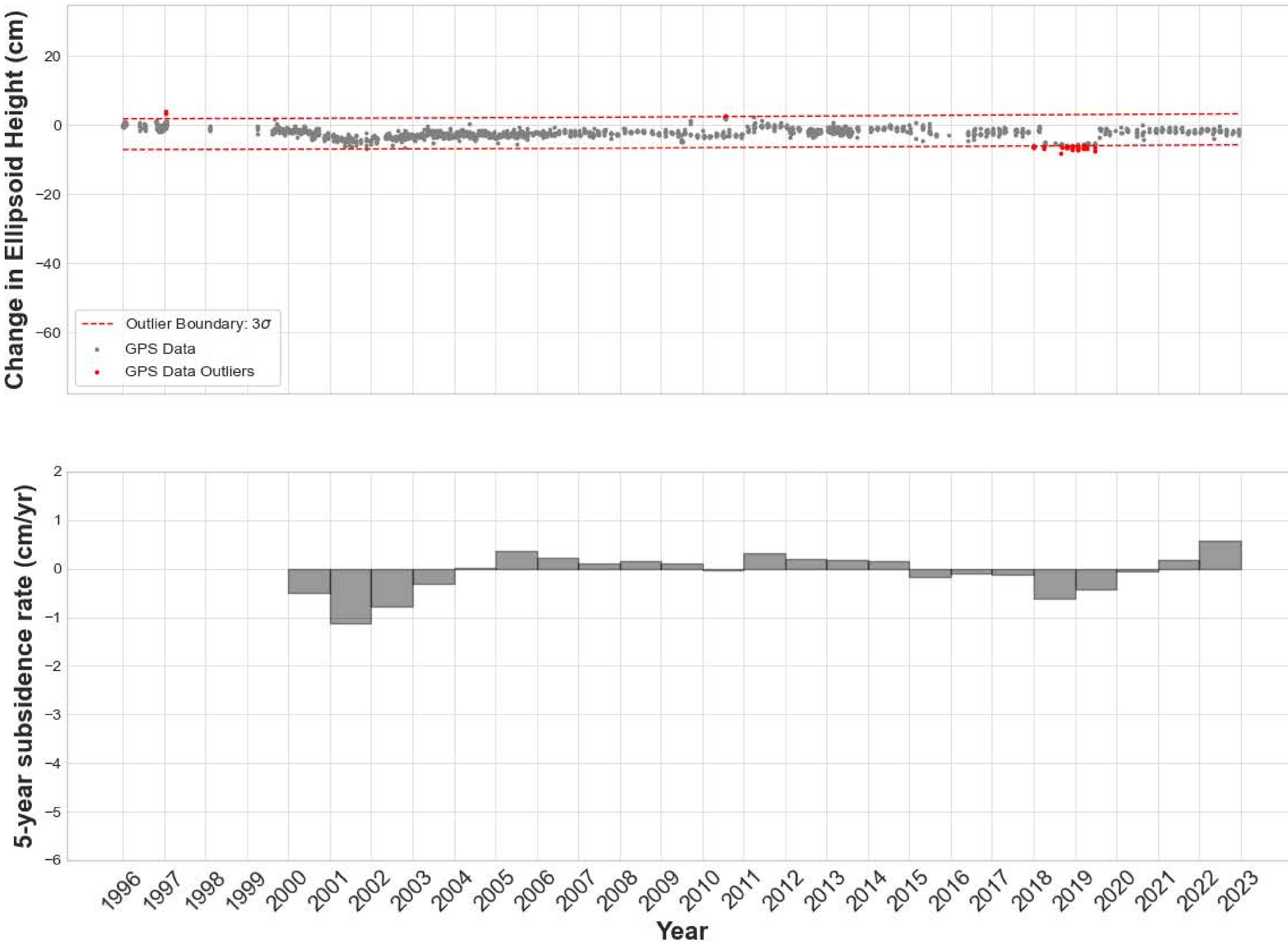

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# OKEK



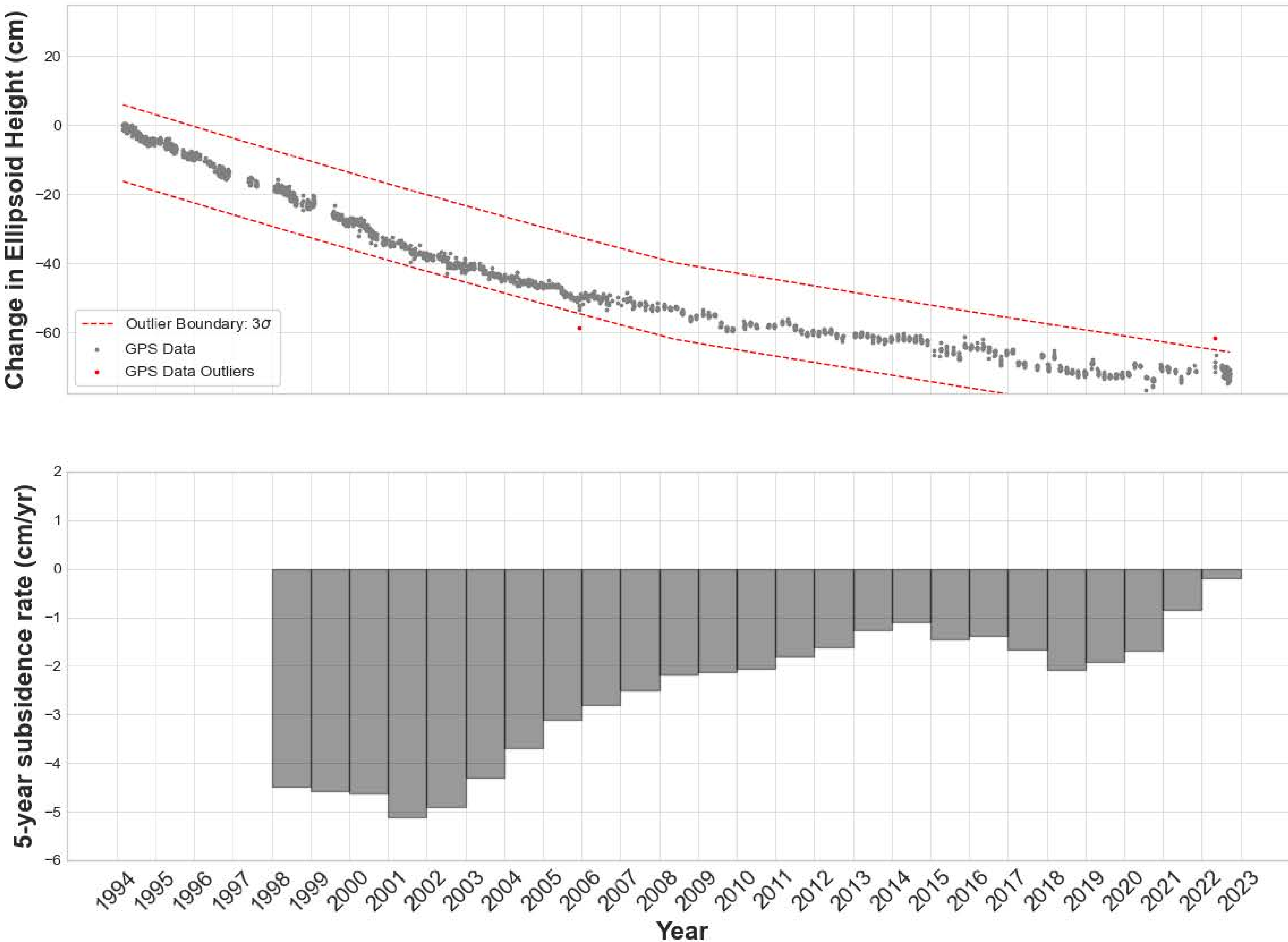

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P000



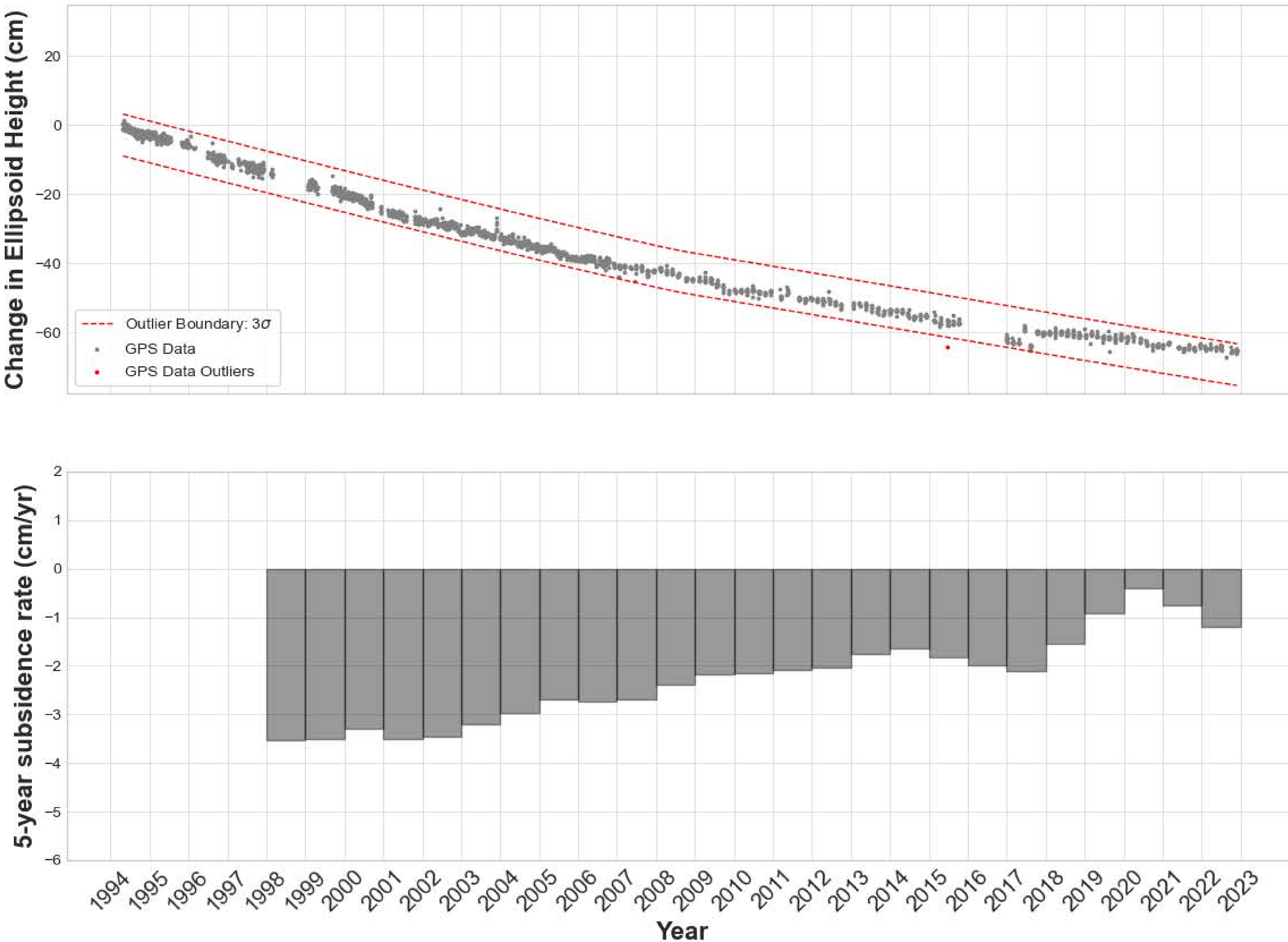

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P001



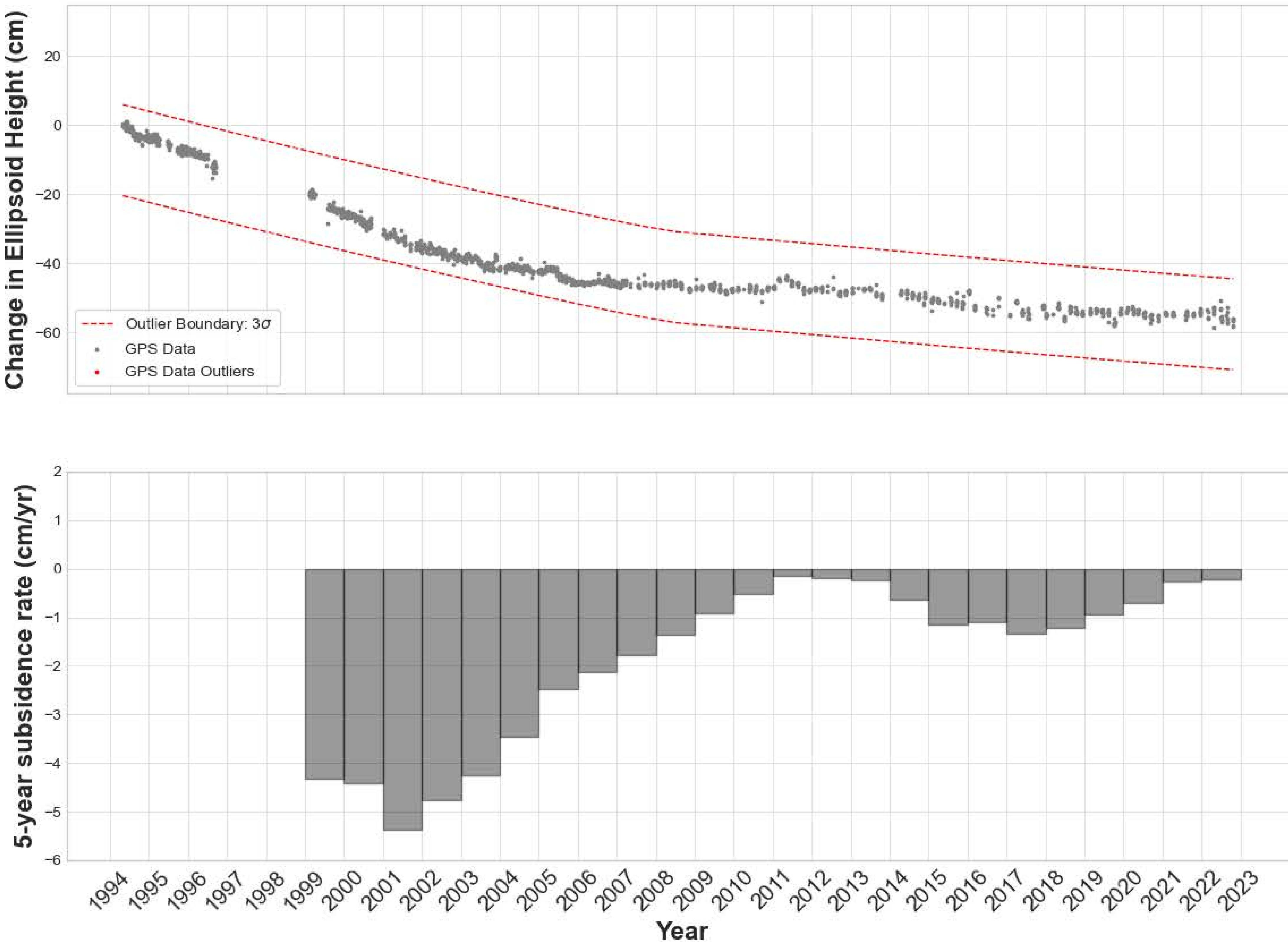

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P002



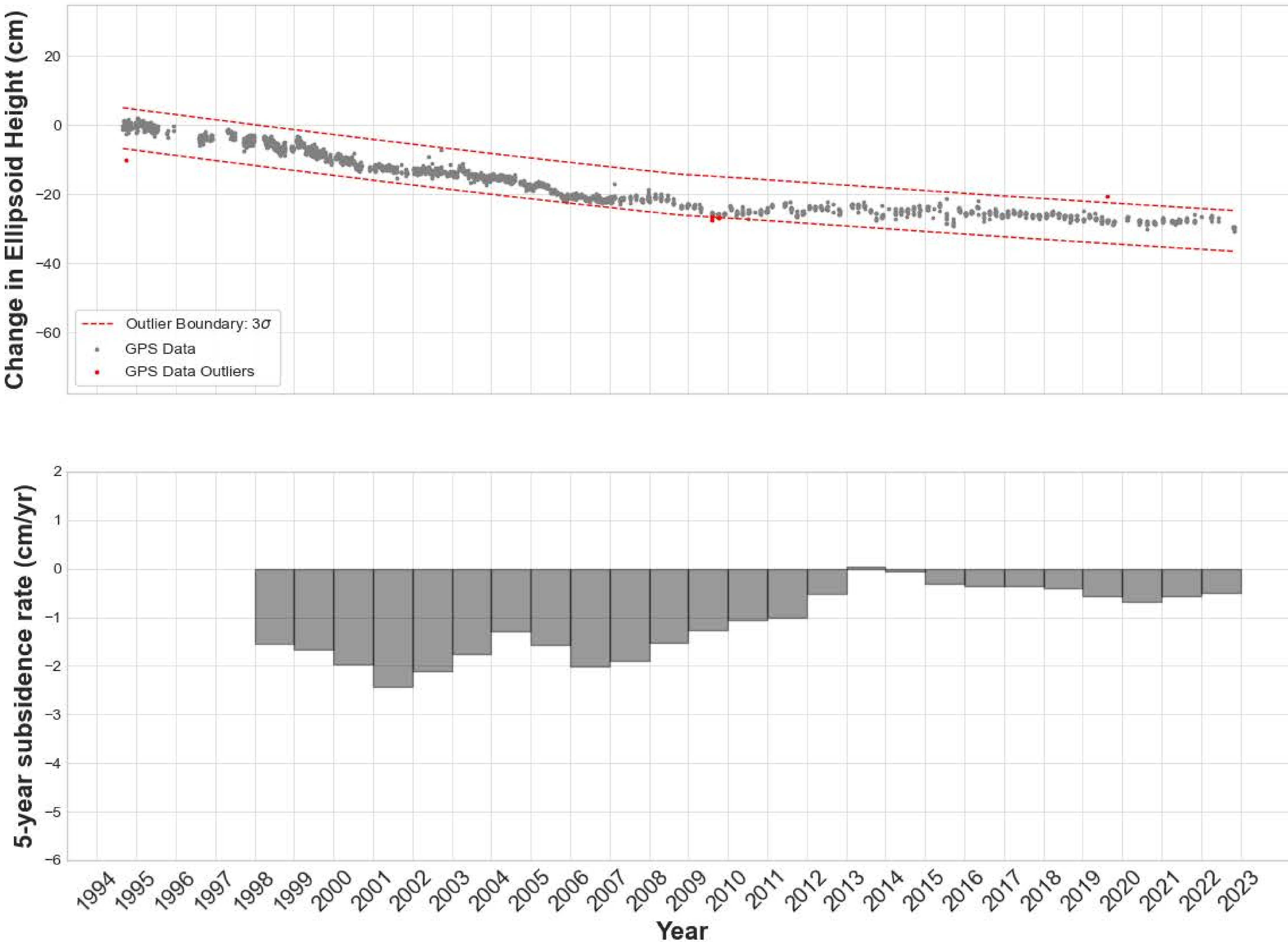

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P003



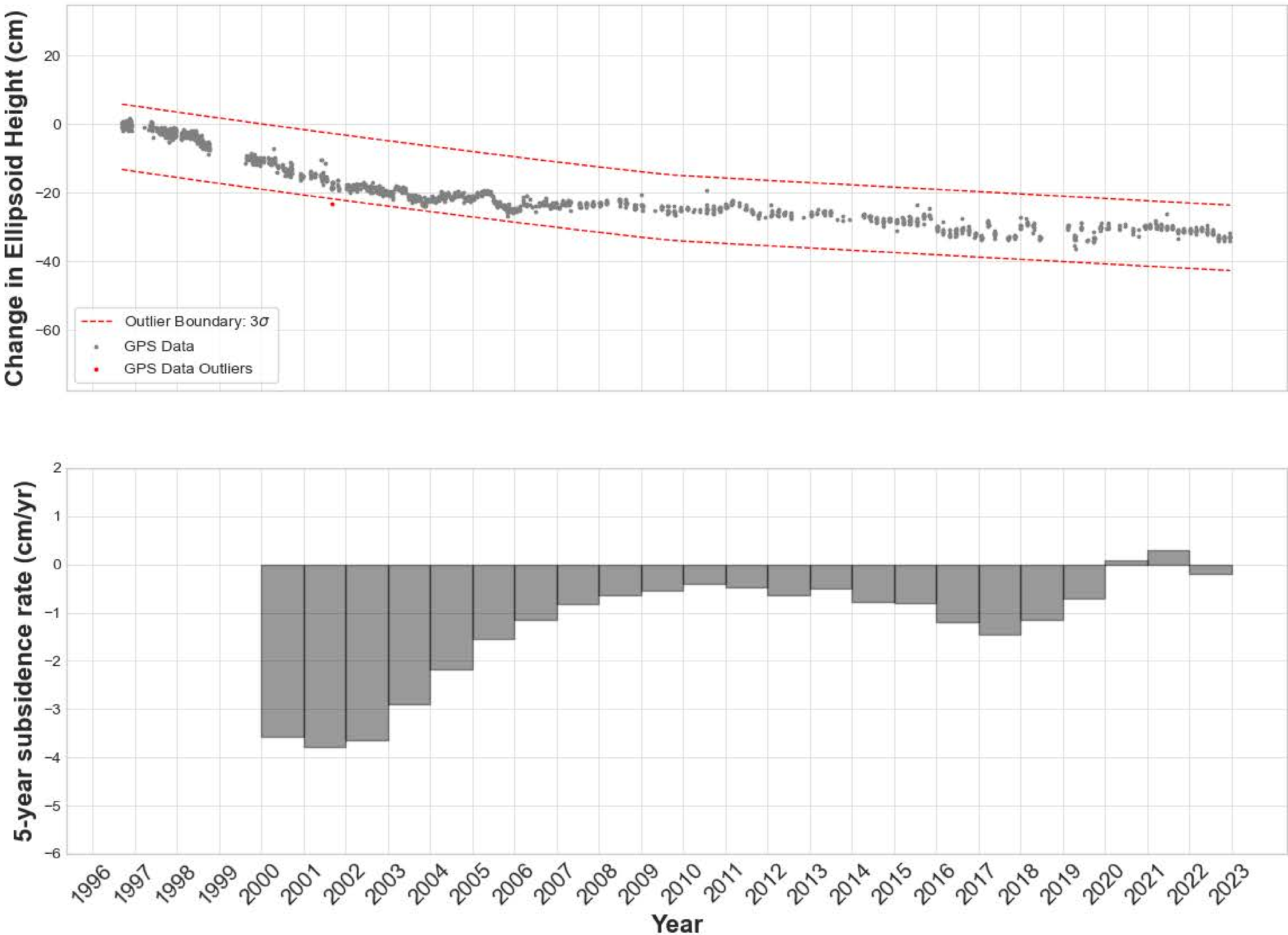

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P004



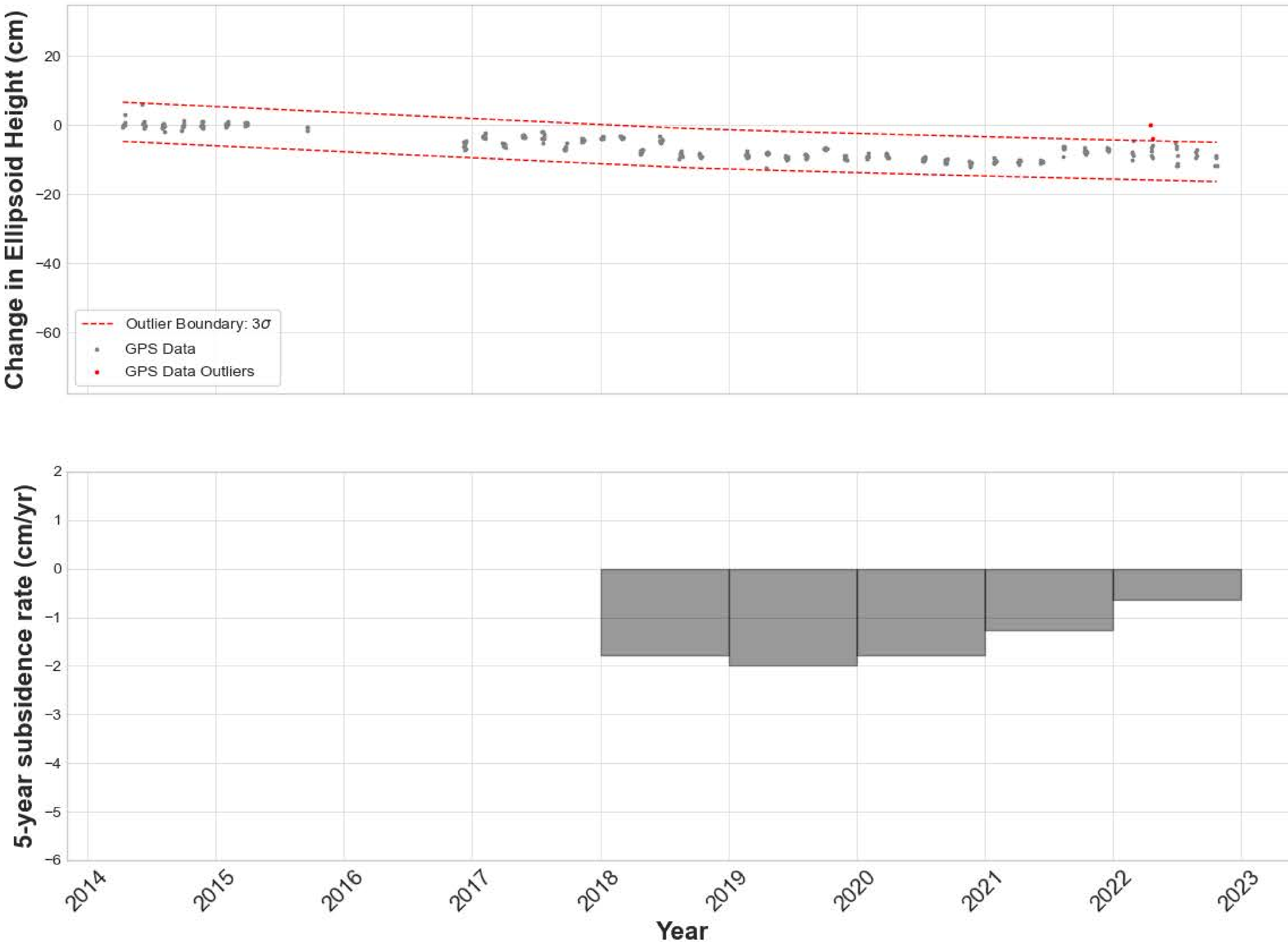

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P005



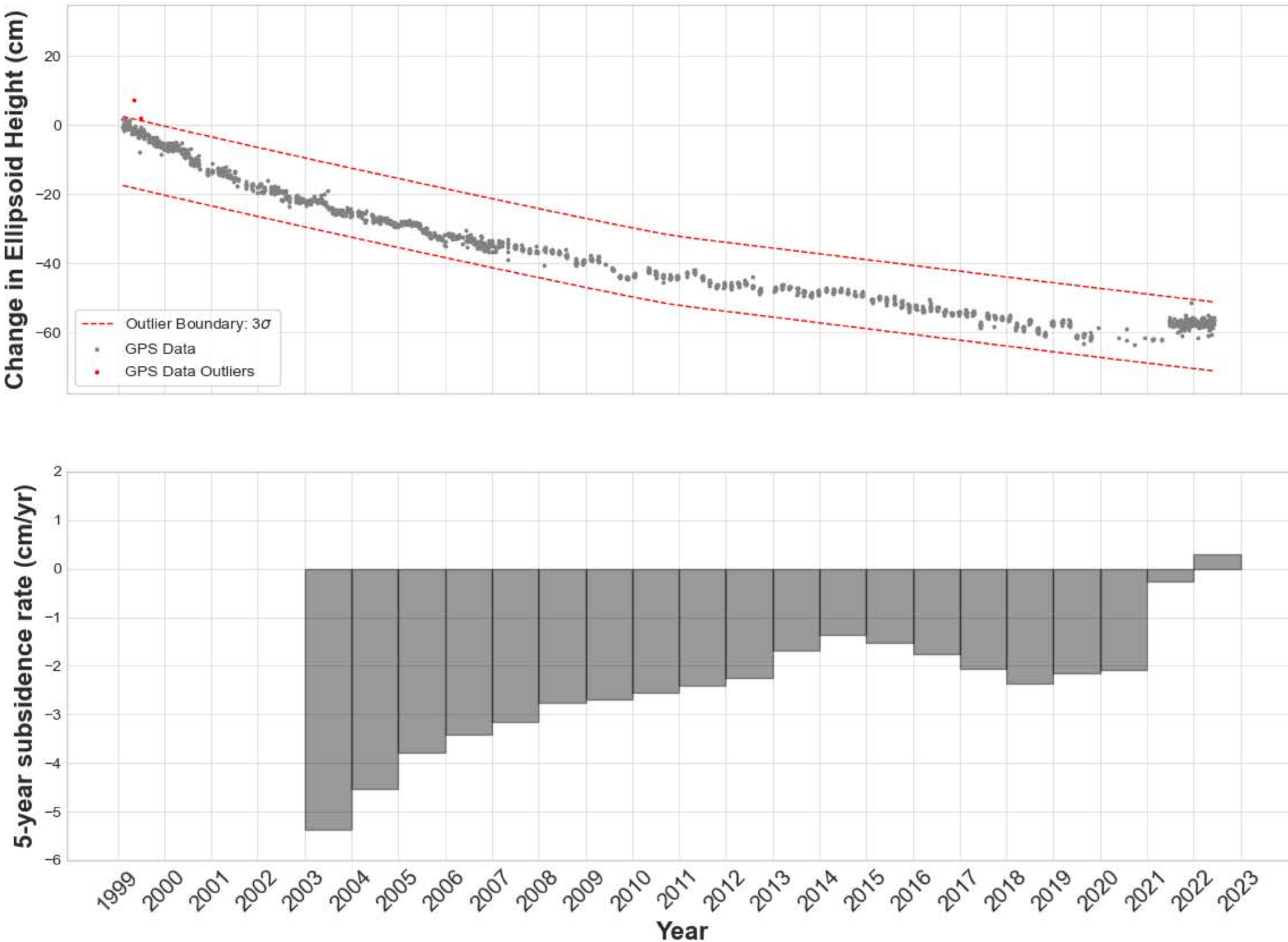

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P006



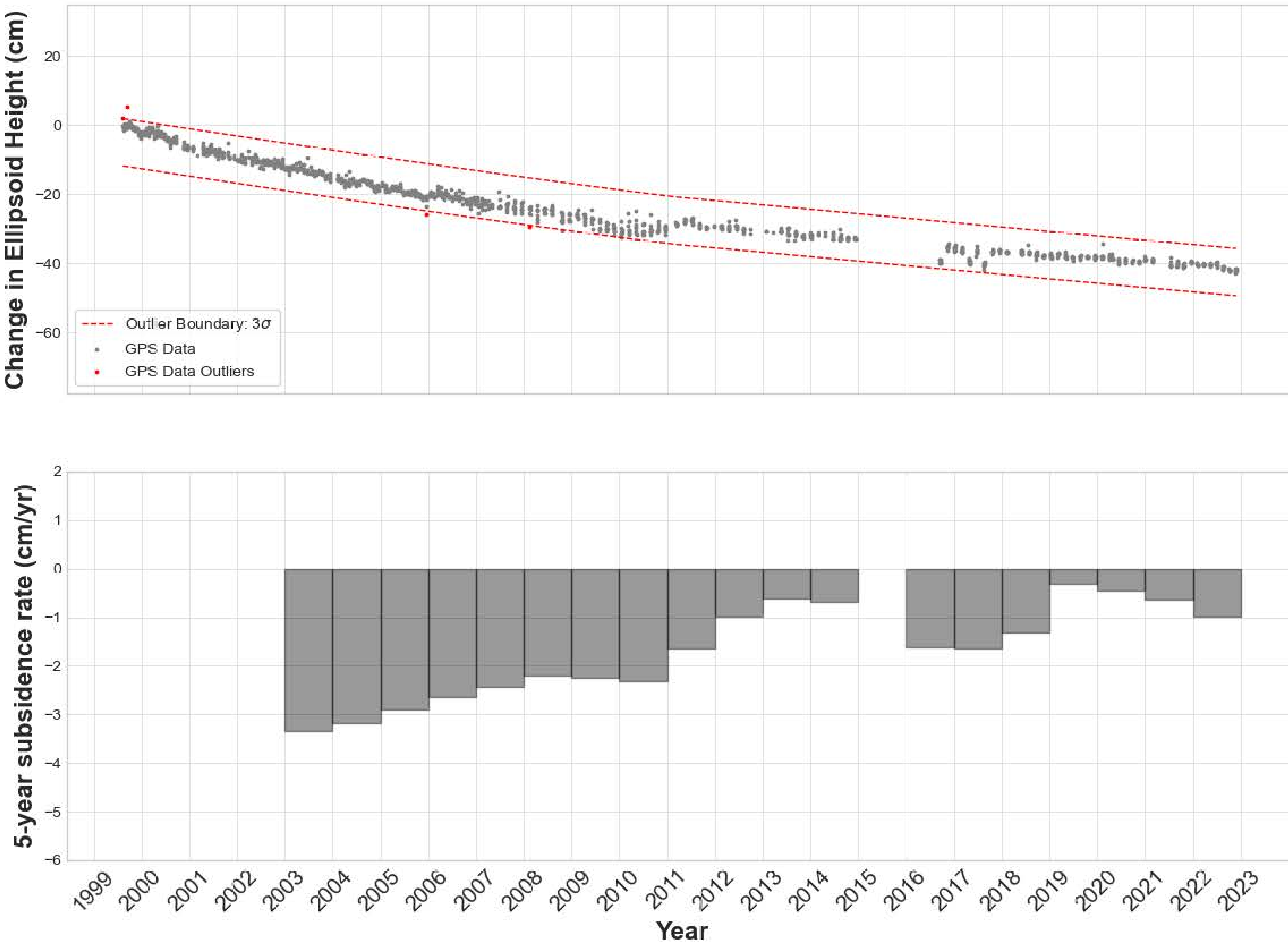

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P007



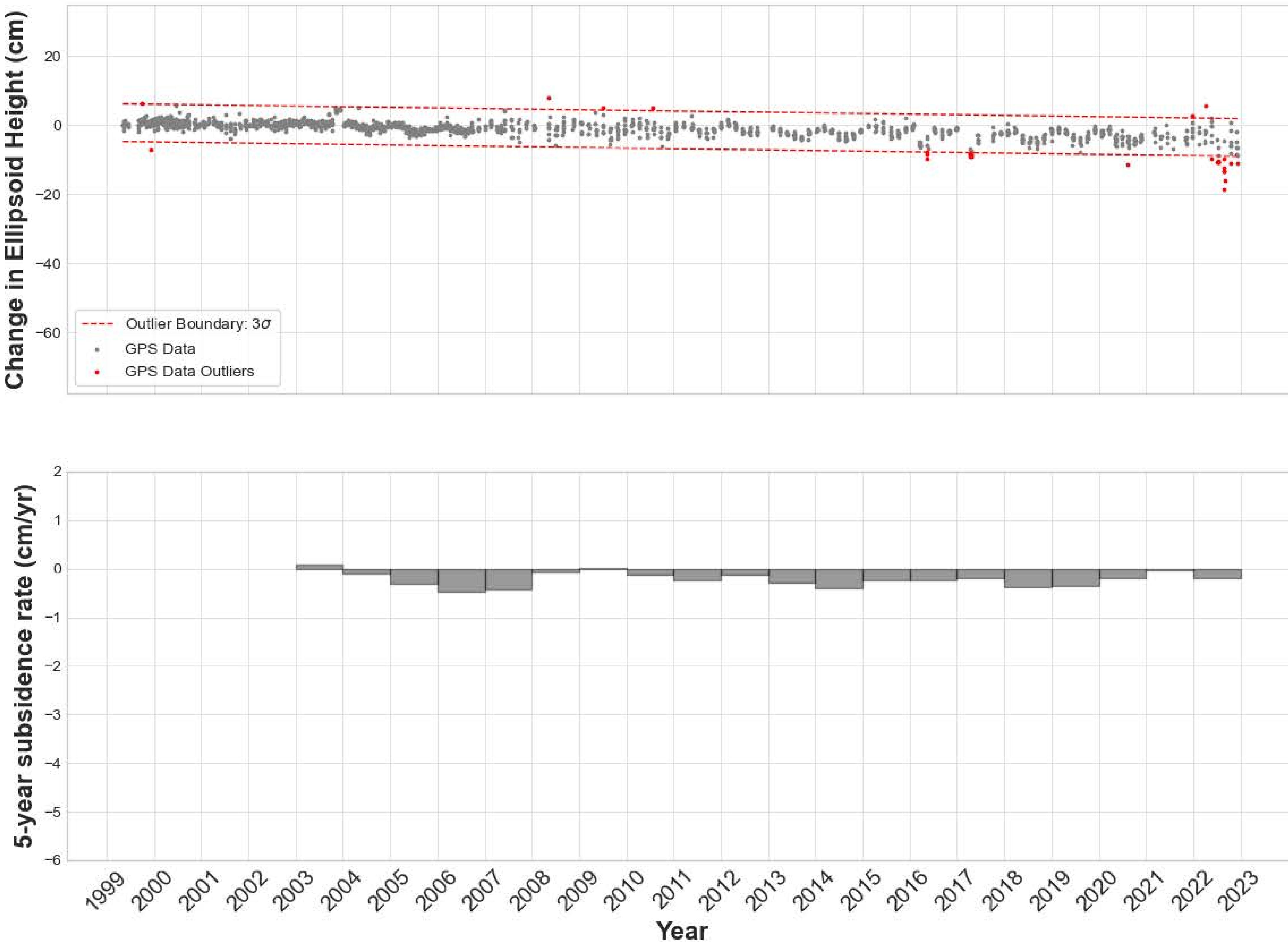

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P008



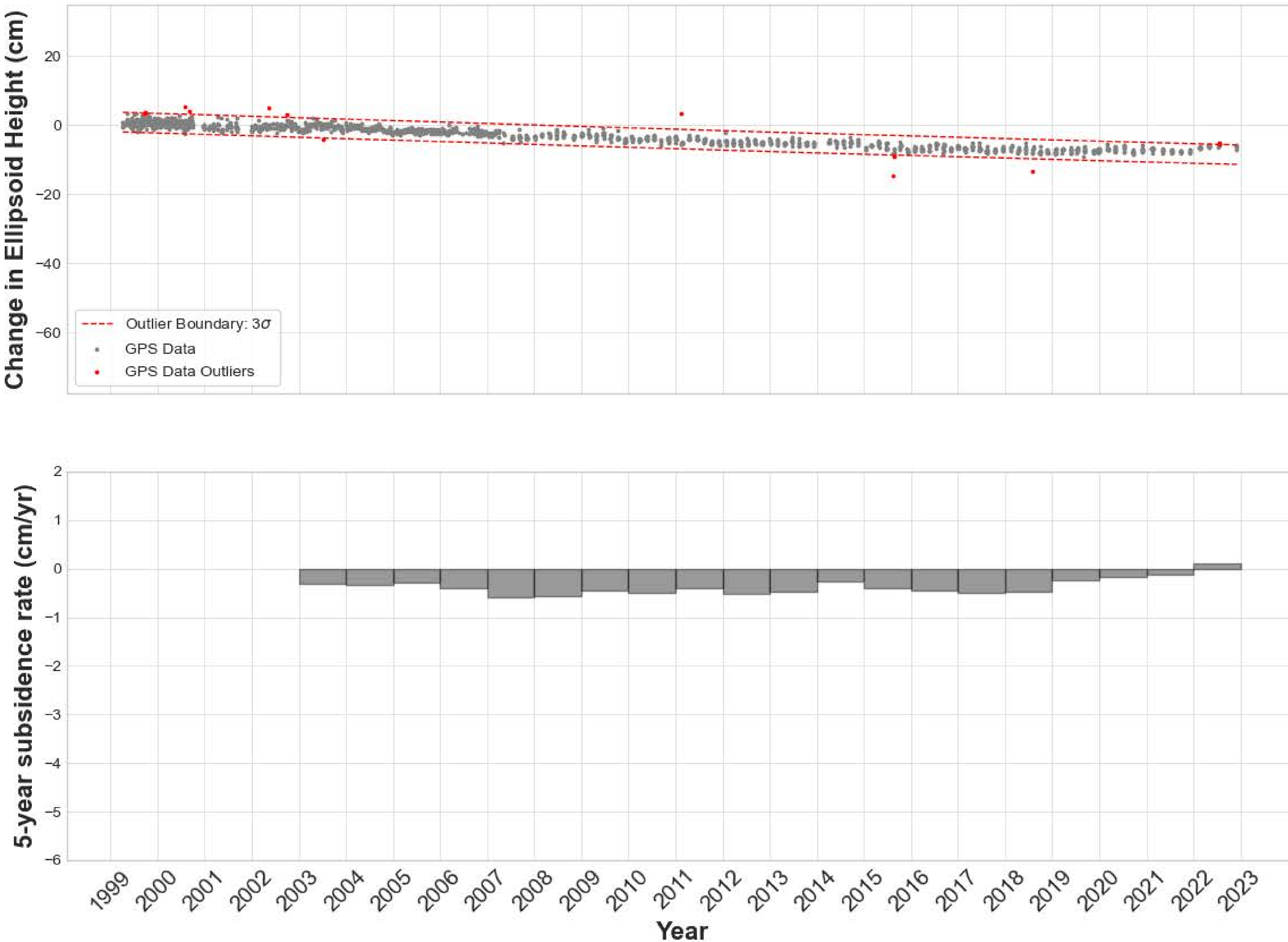

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P009



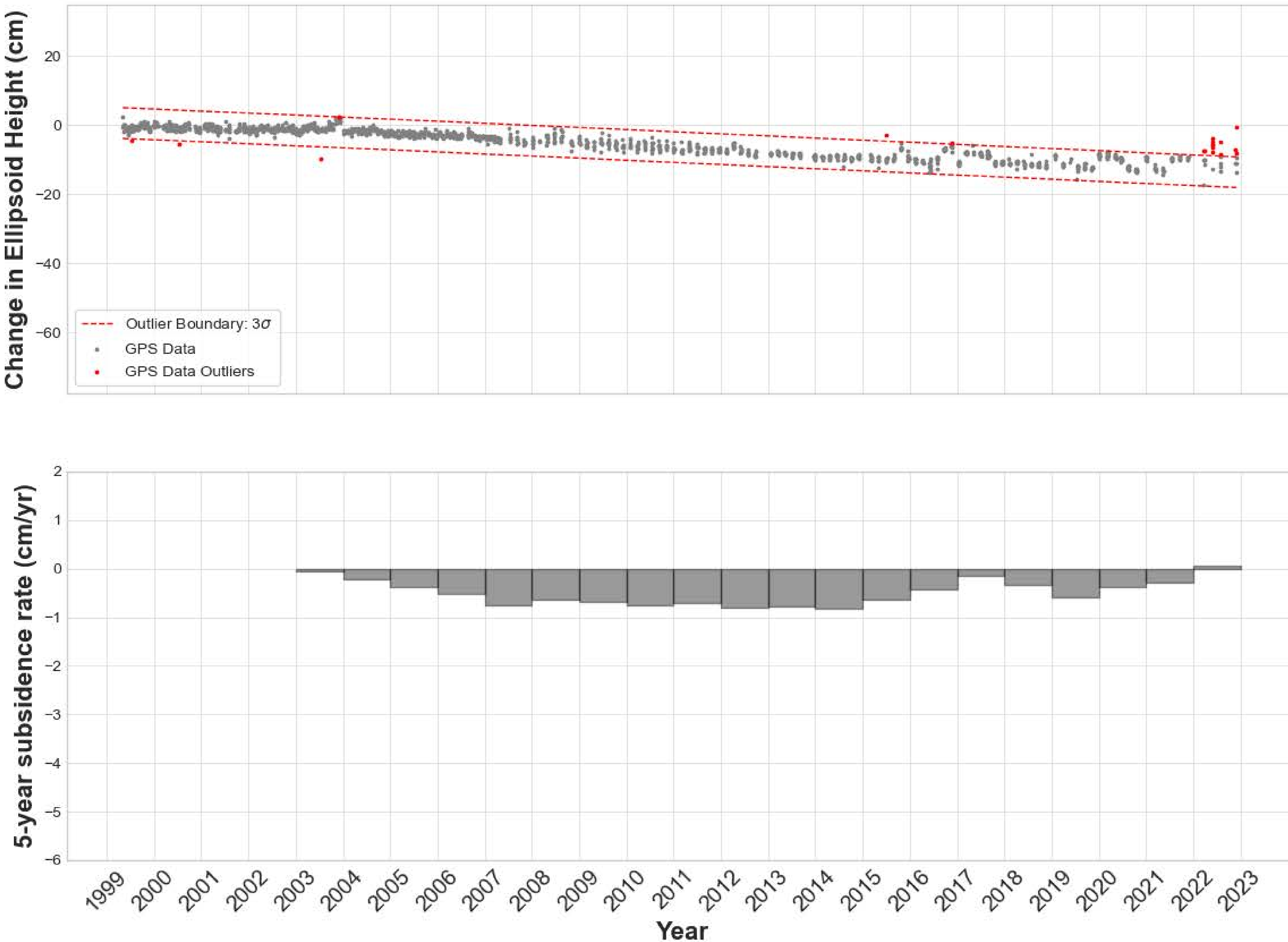

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P010



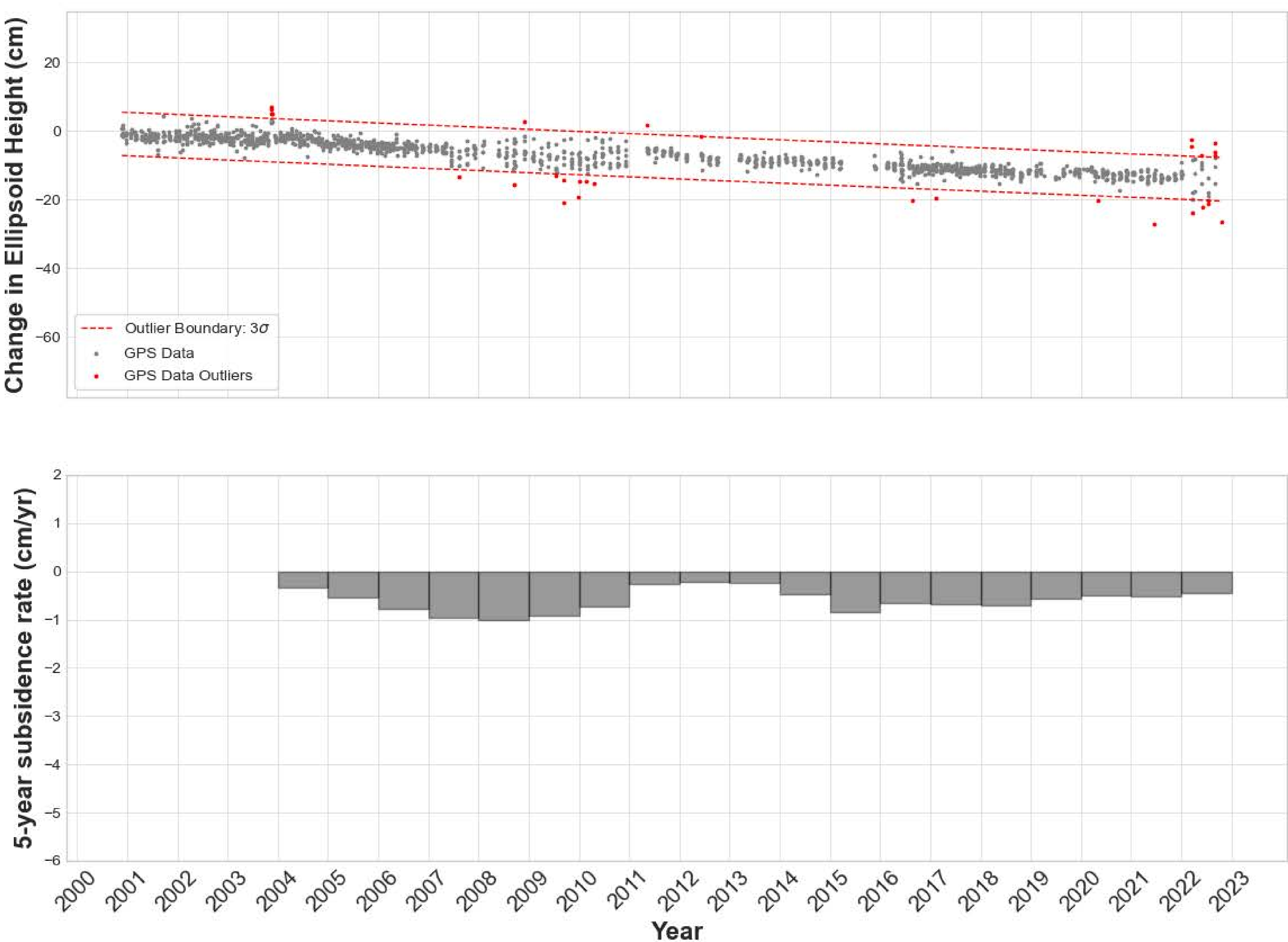

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P011



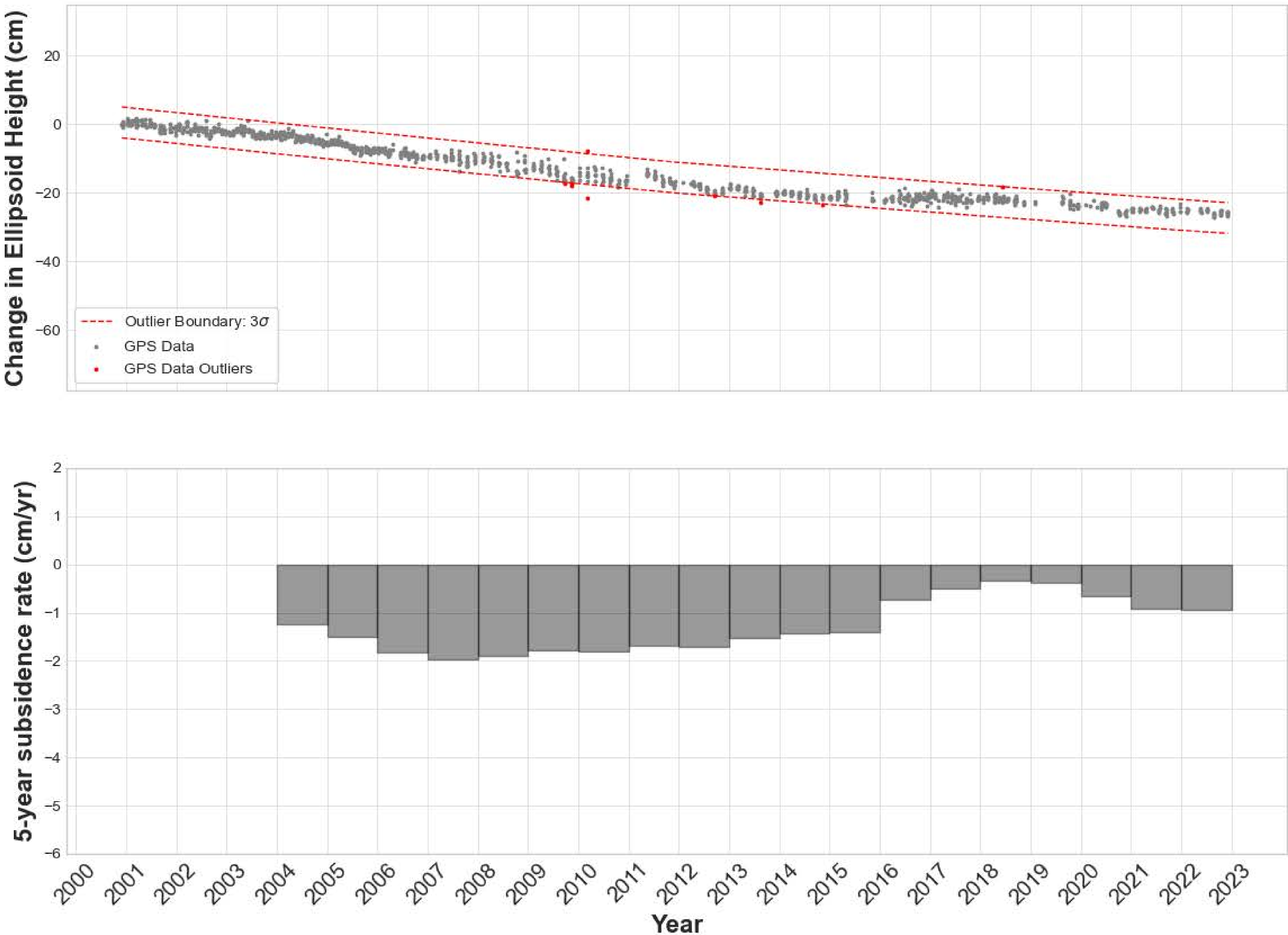

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P012



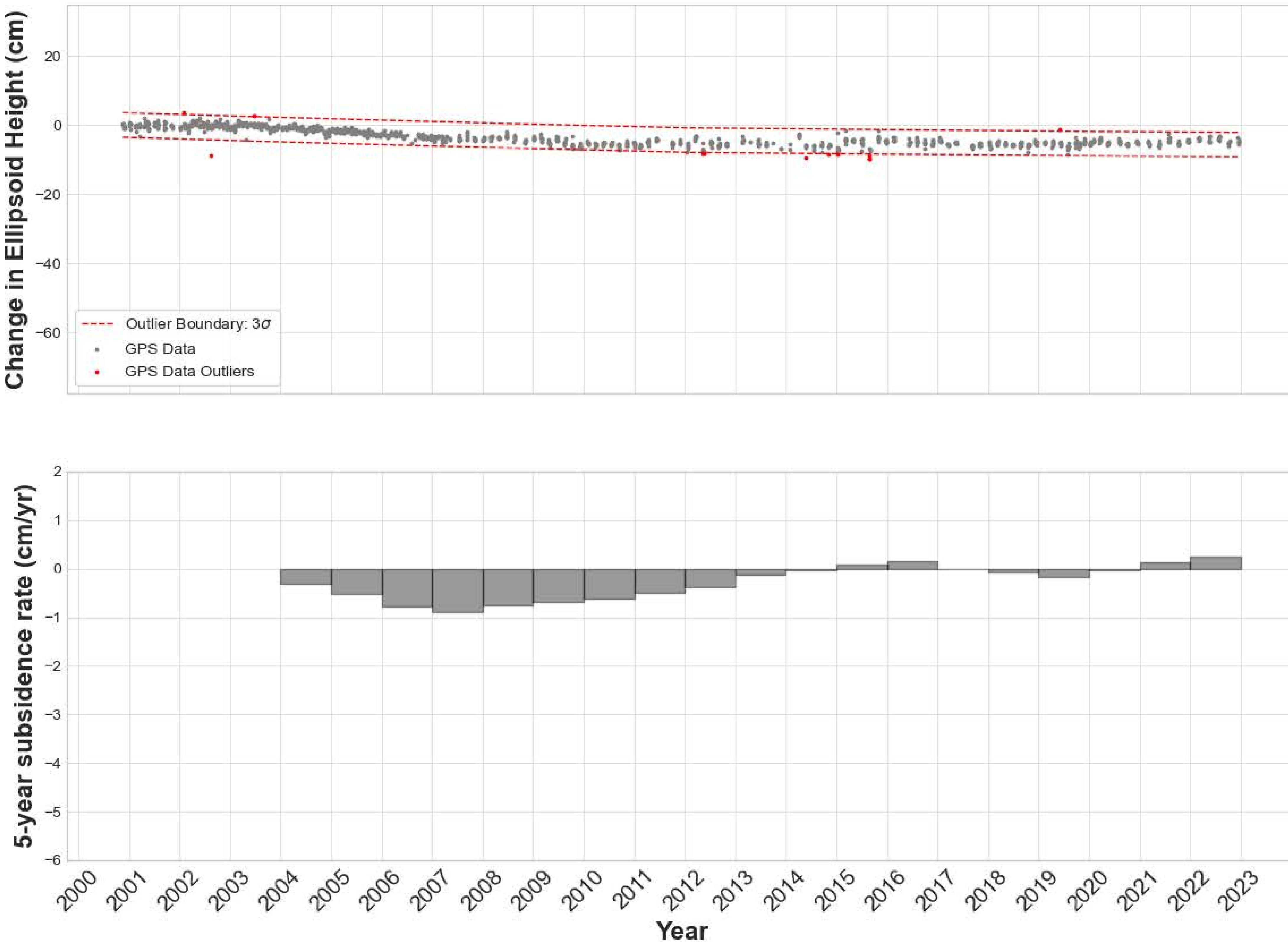

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P013



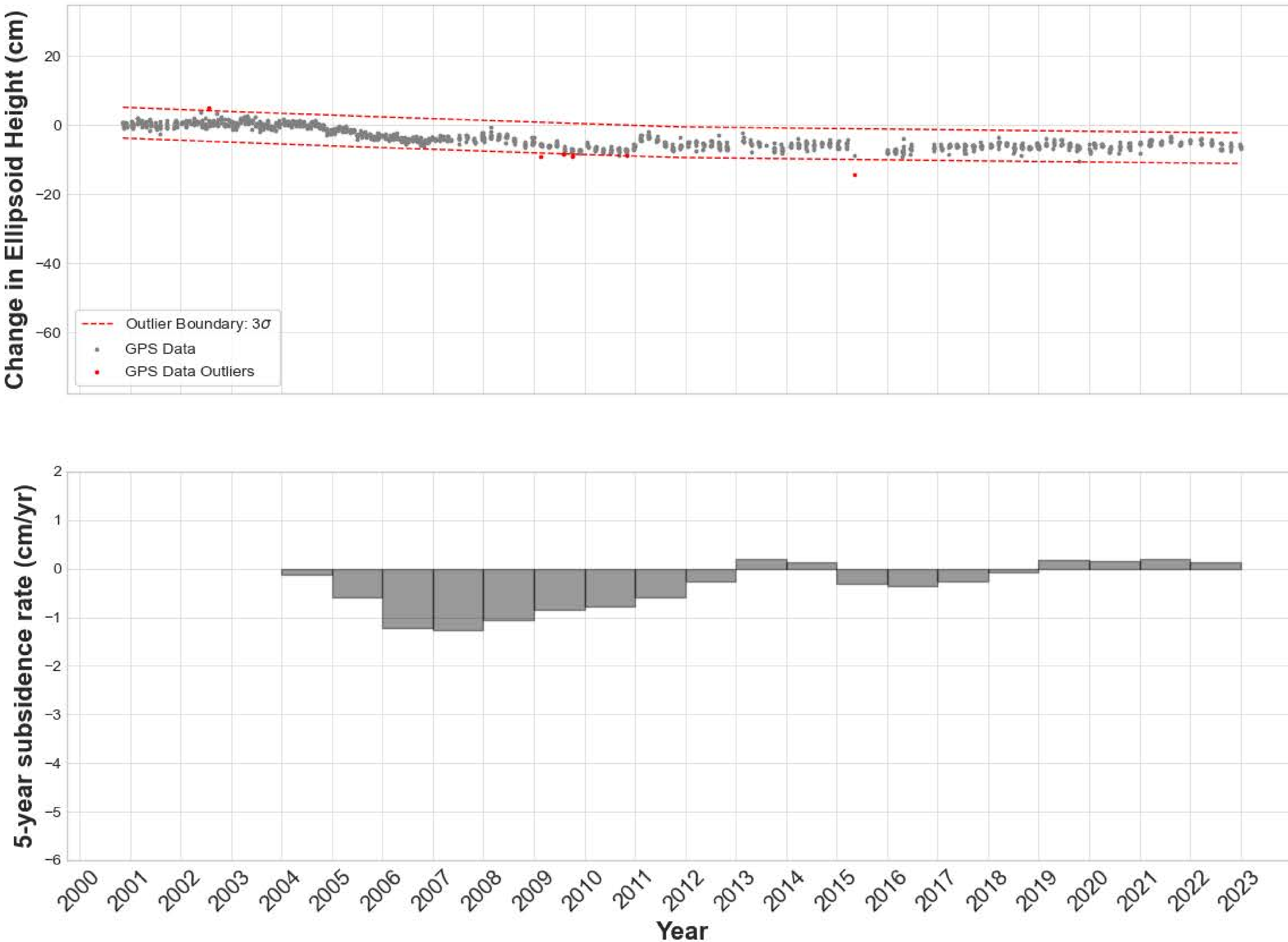

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P014



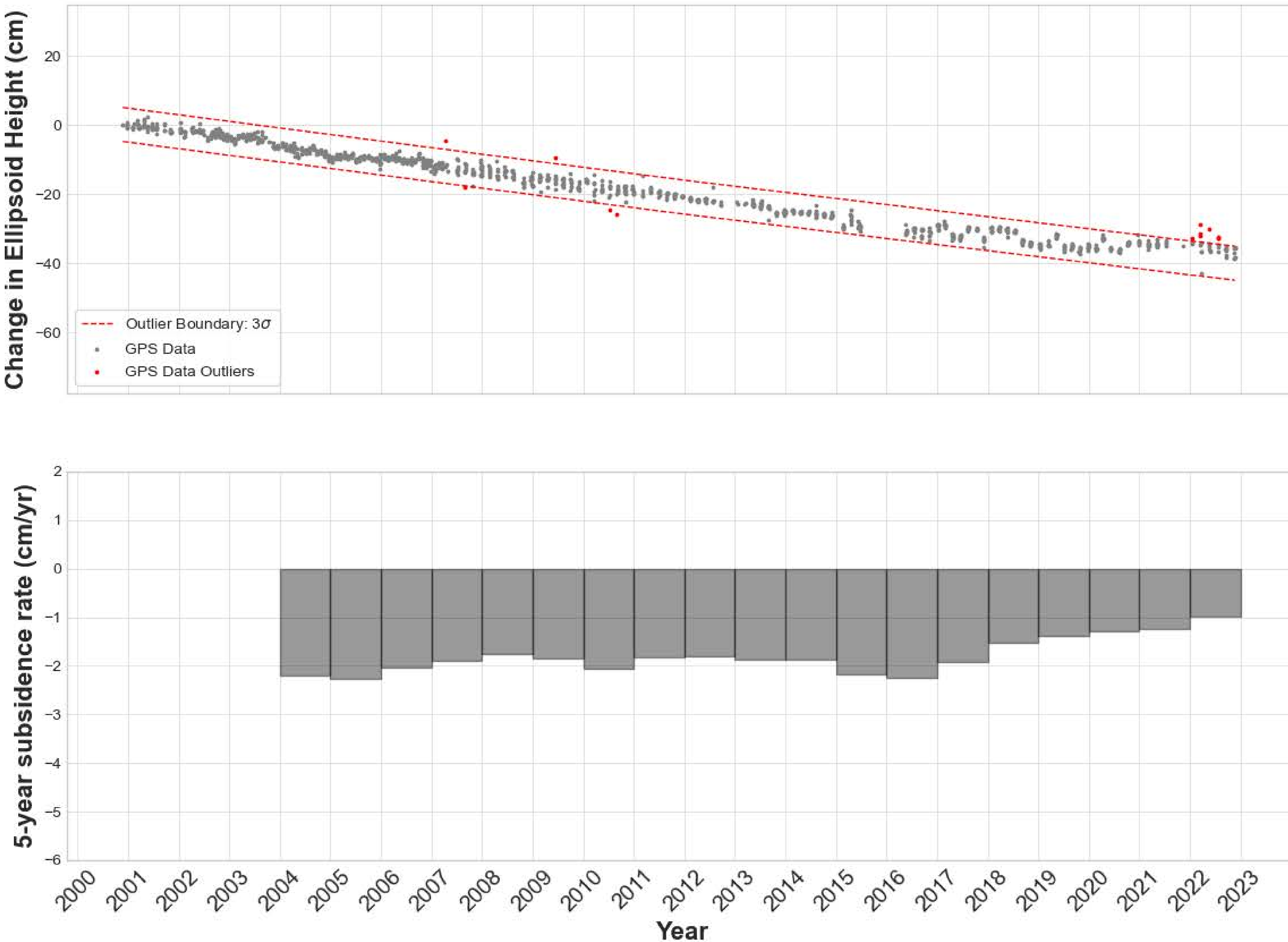

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P016



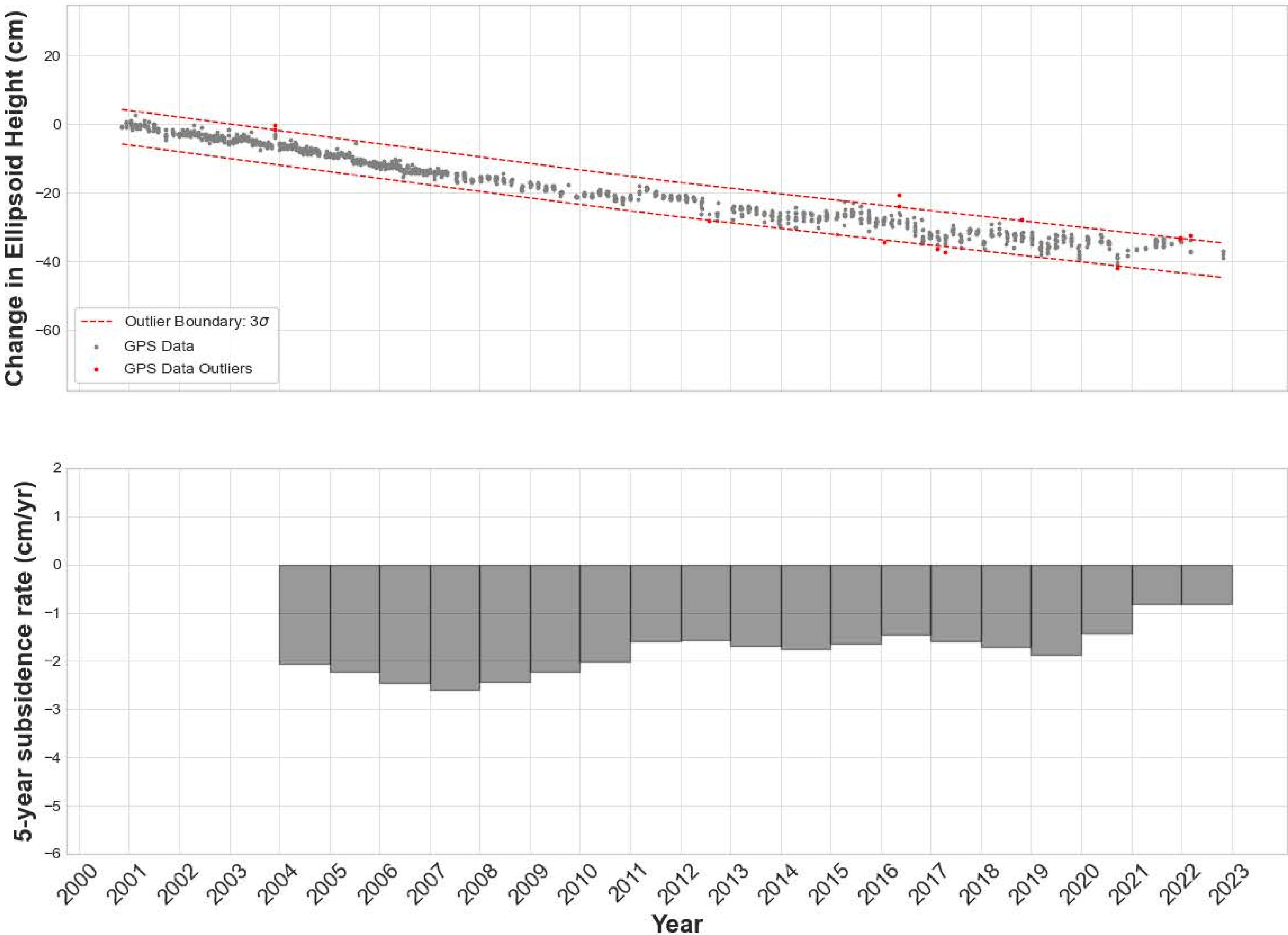

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P017



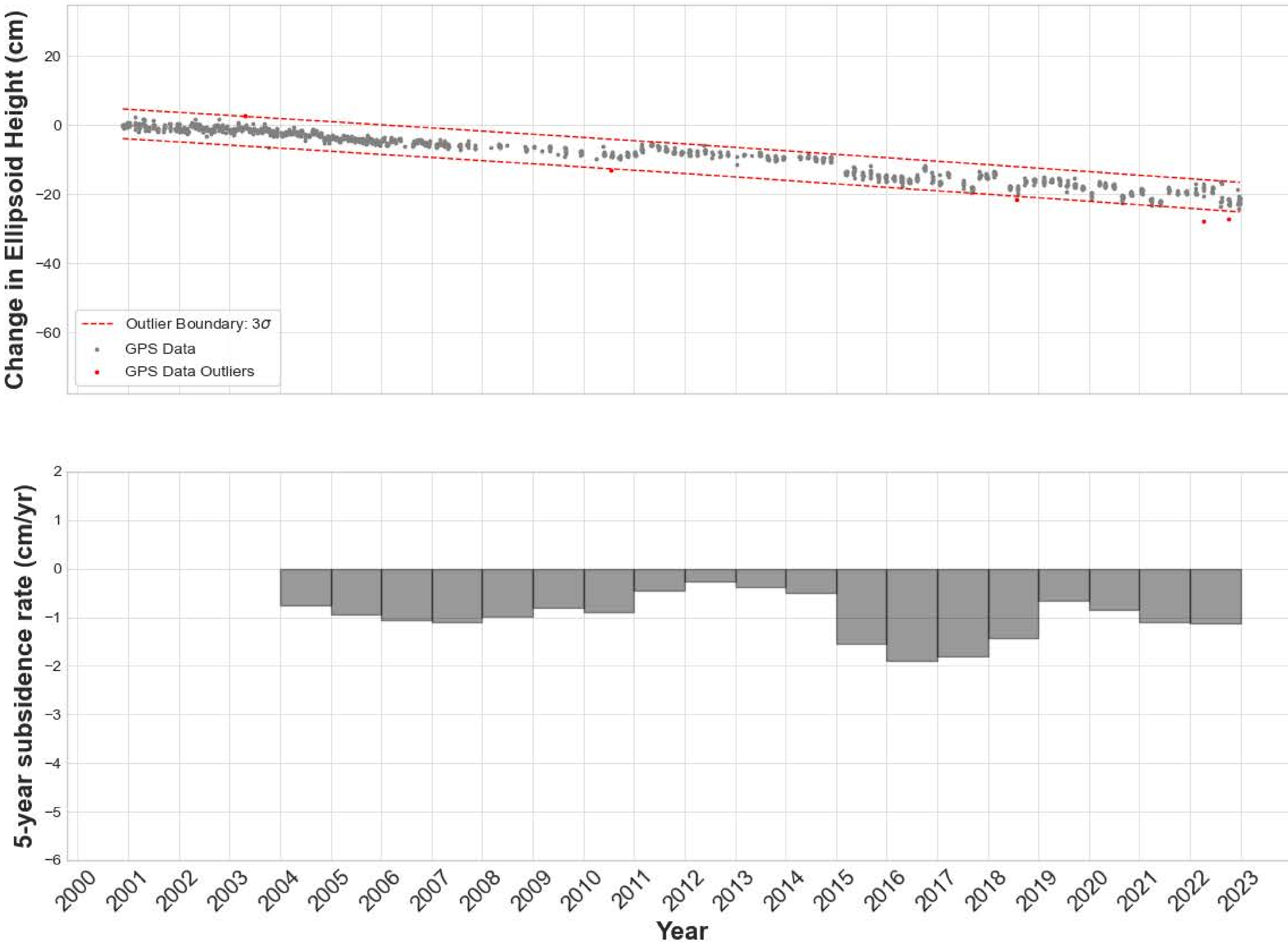

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P018



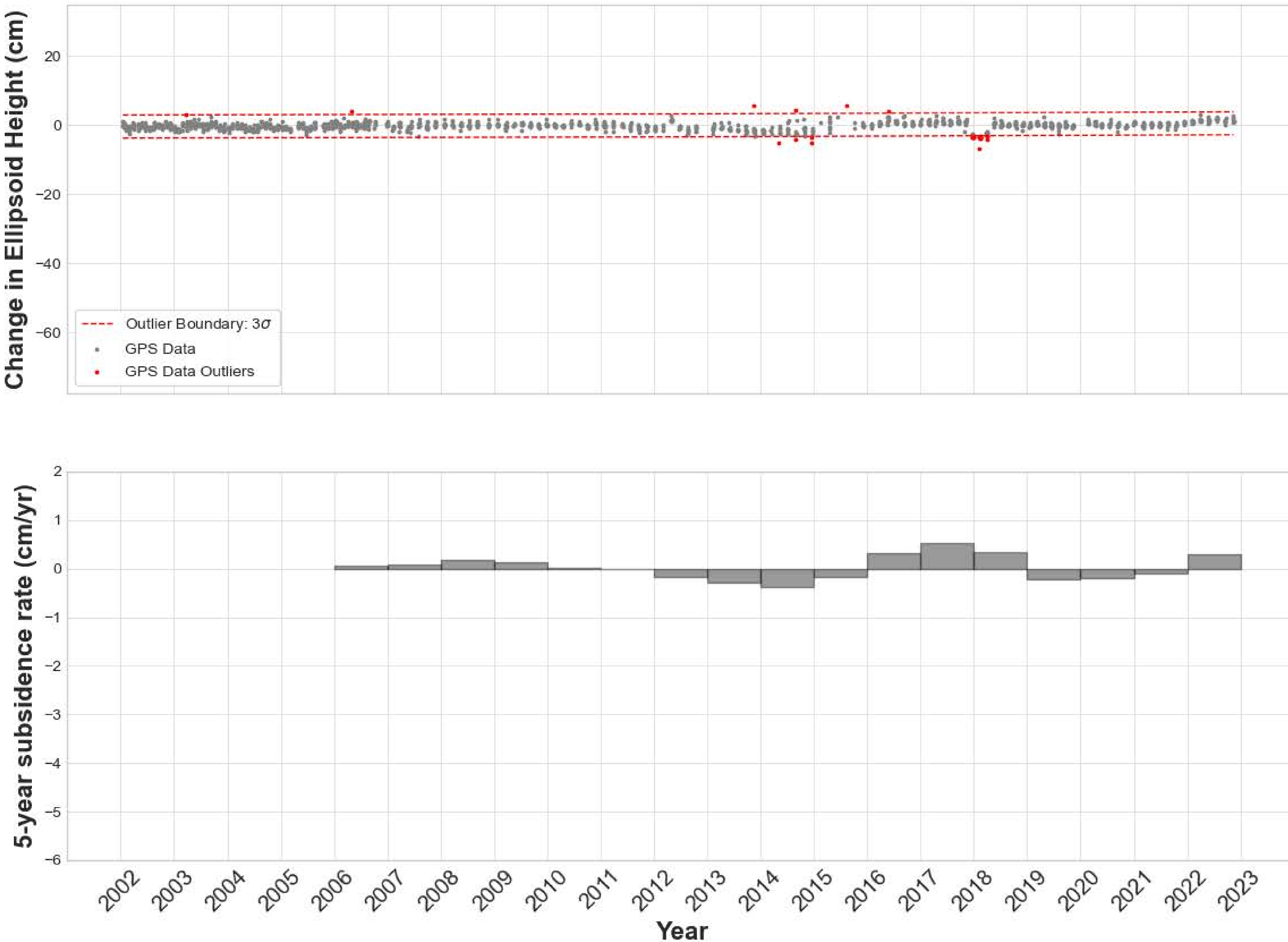

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P019



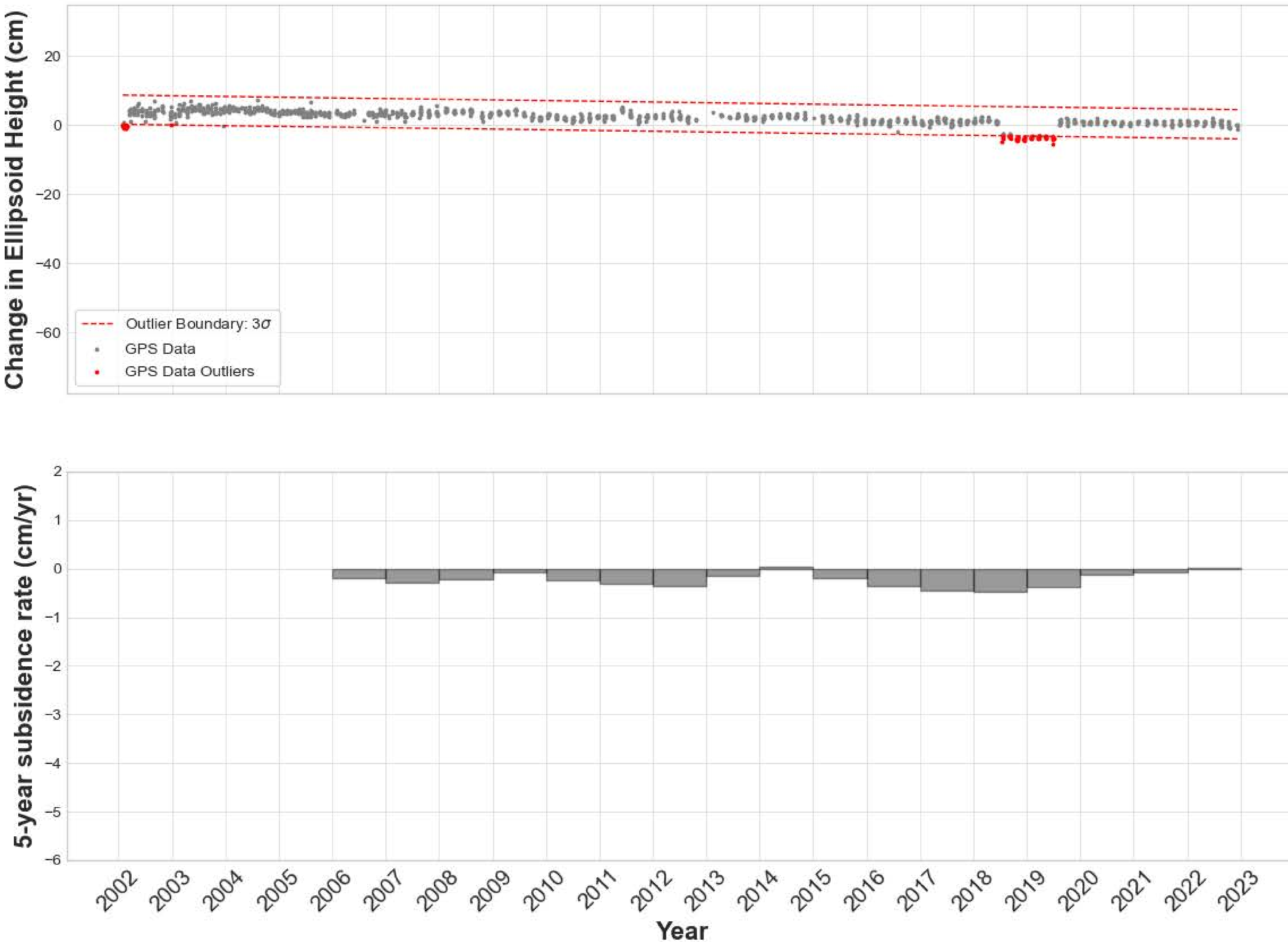

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P020

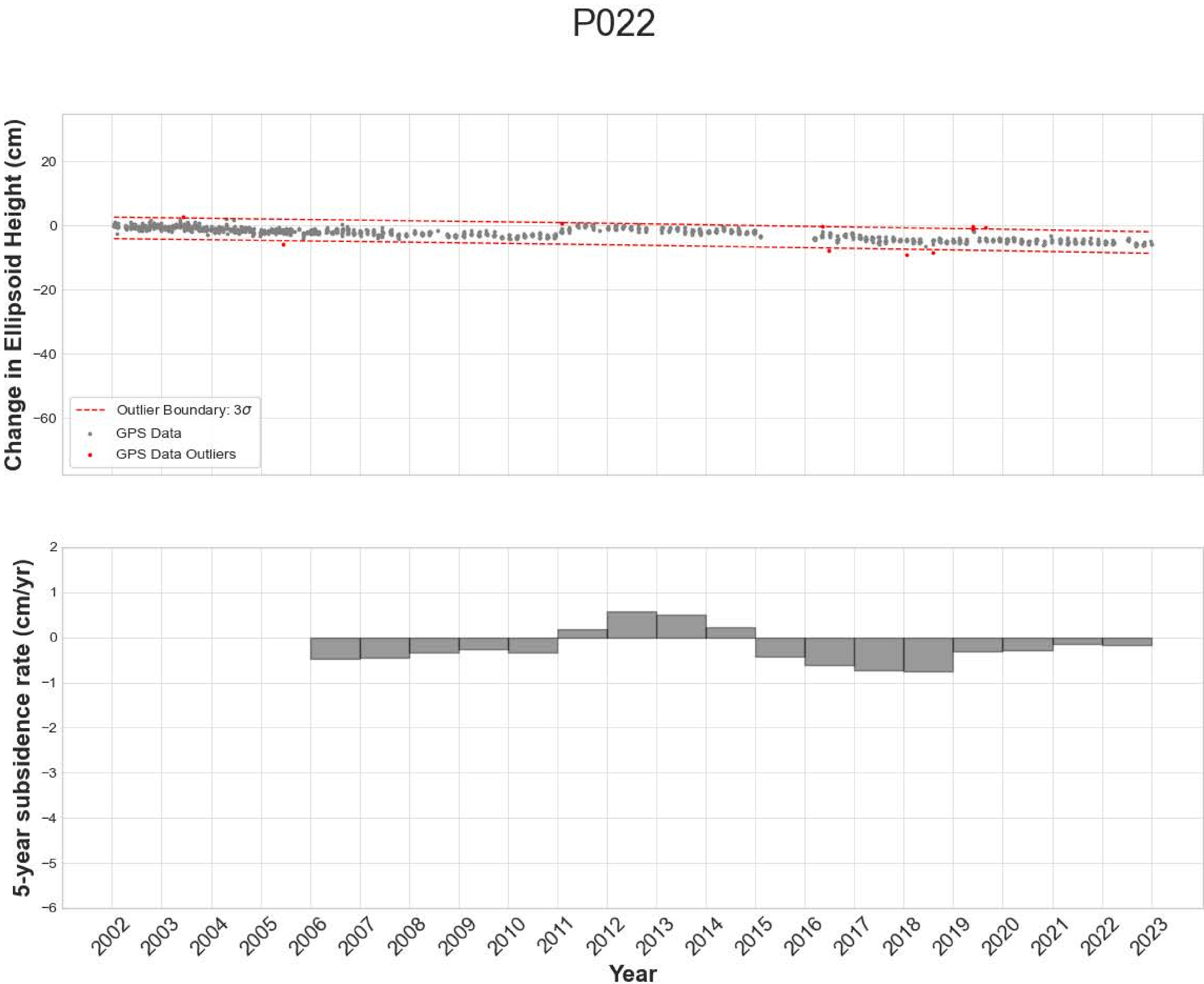



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P021

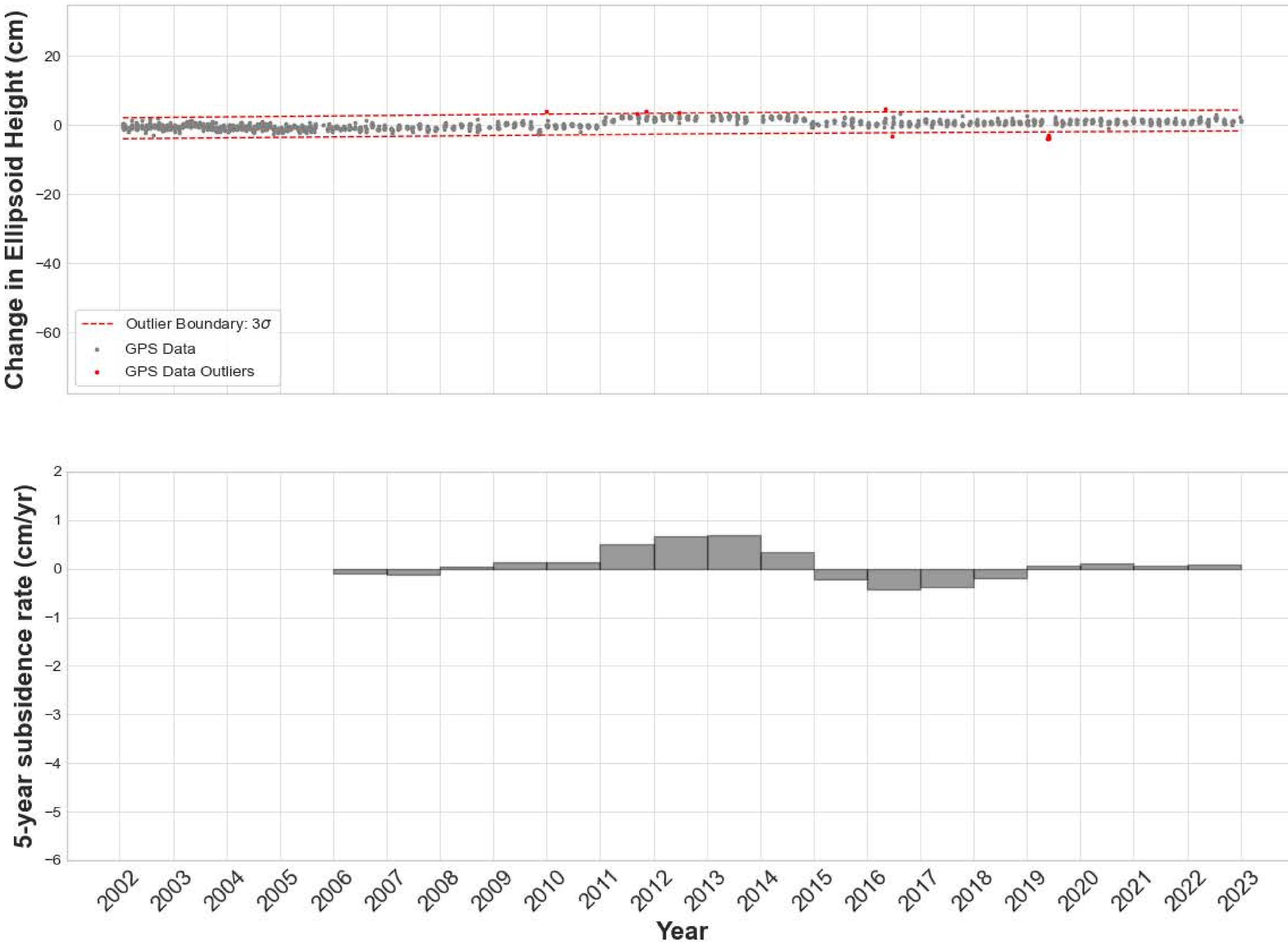



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.



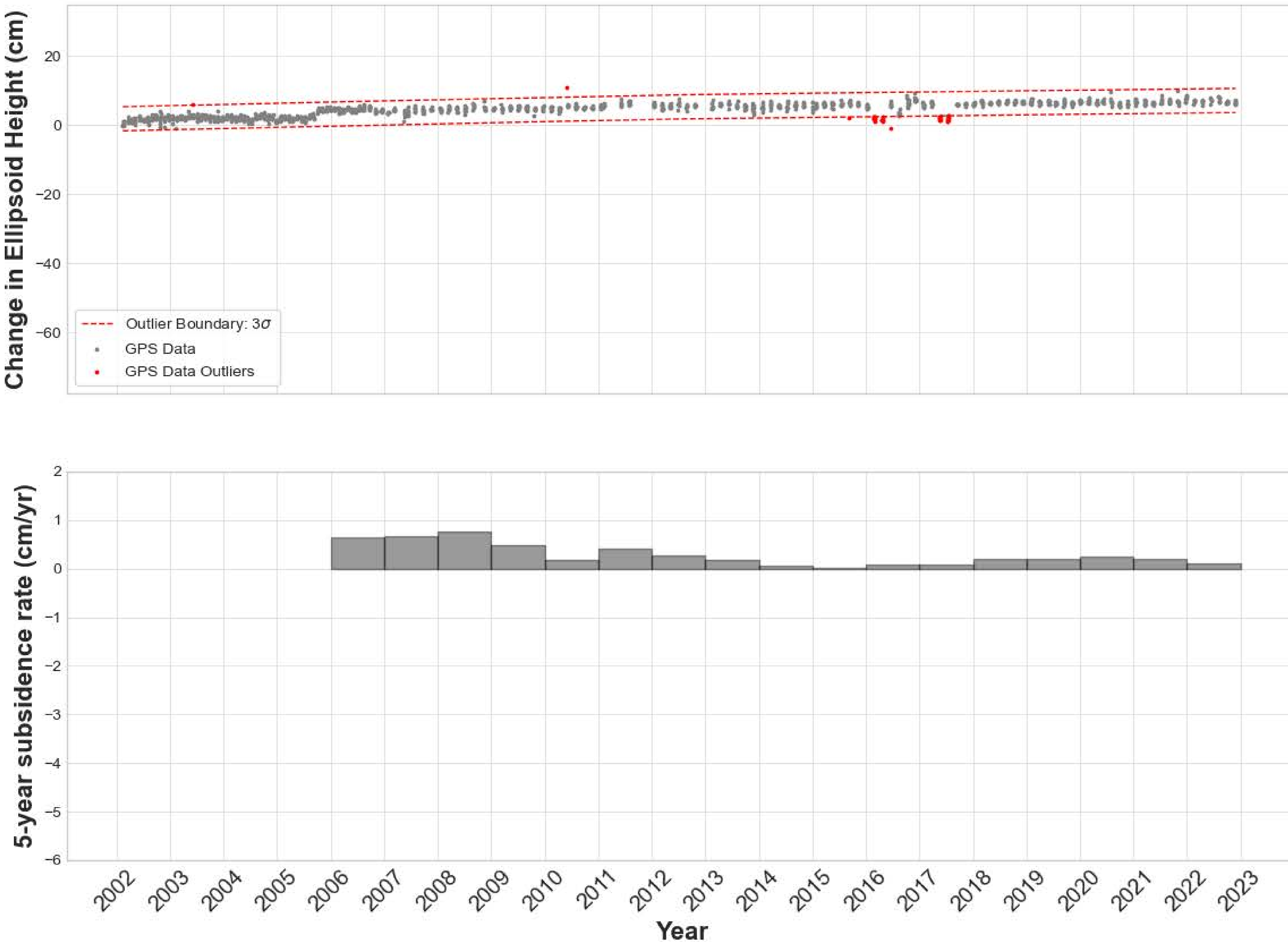

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P023



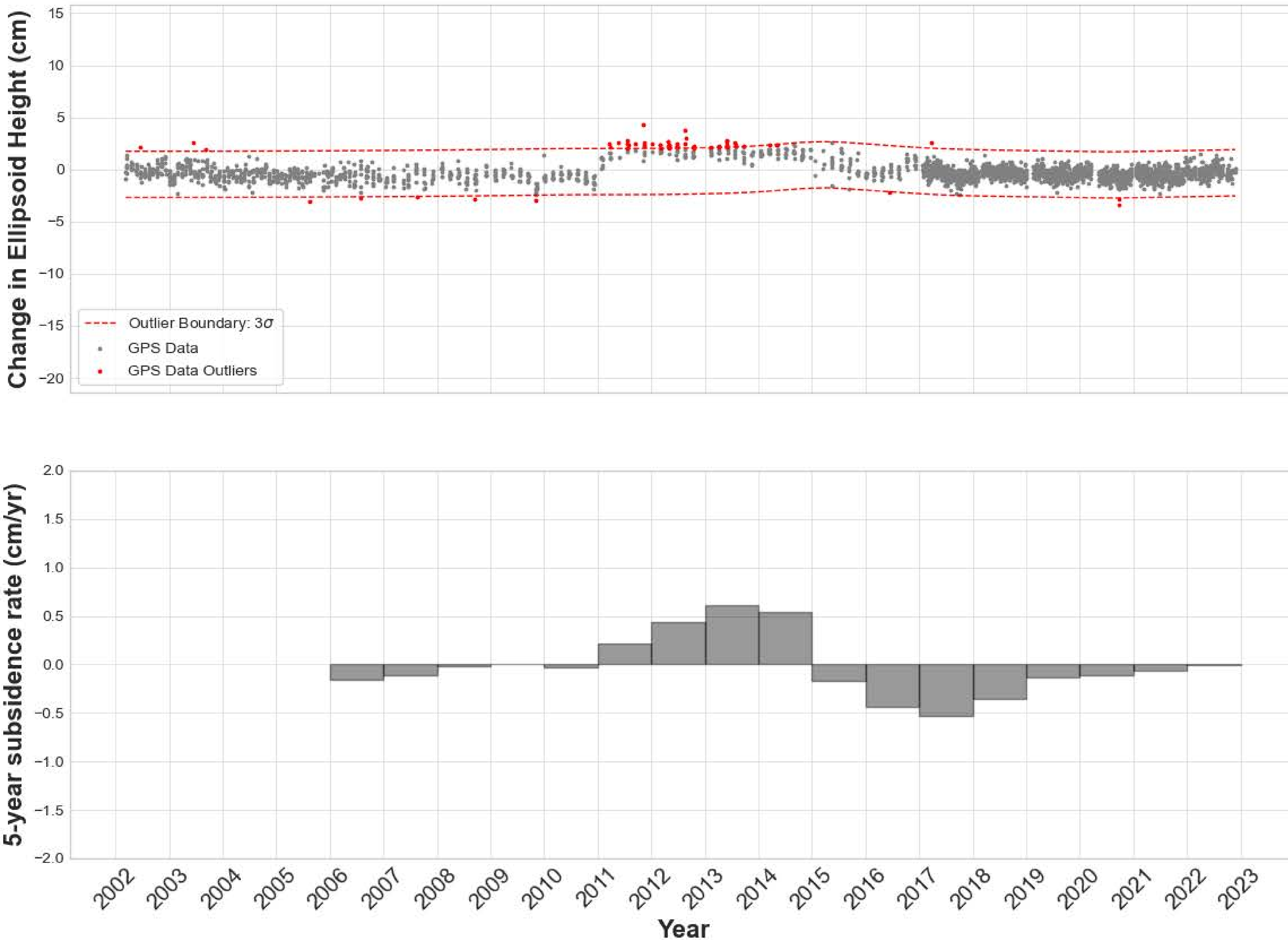

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P024



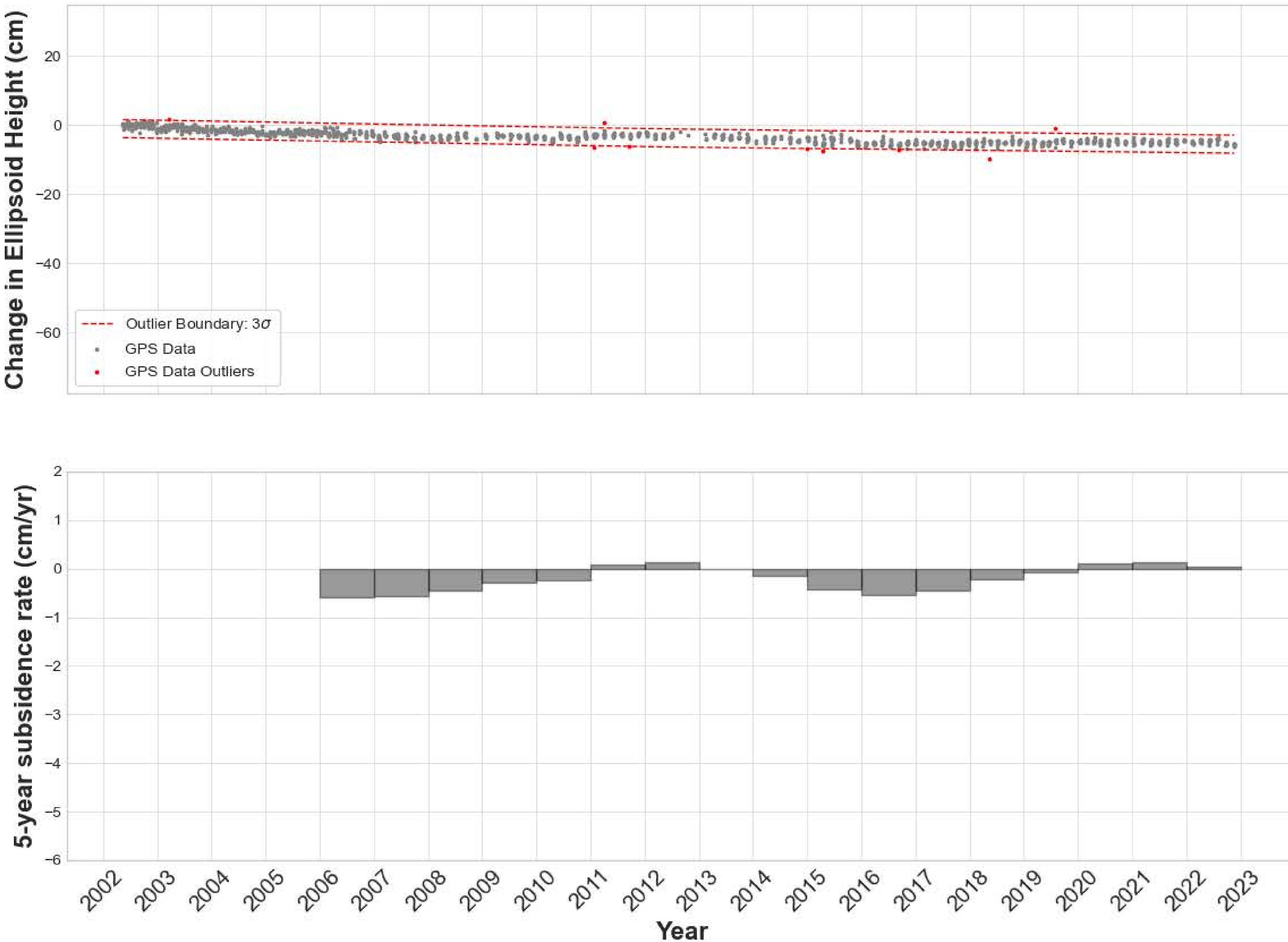

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P026



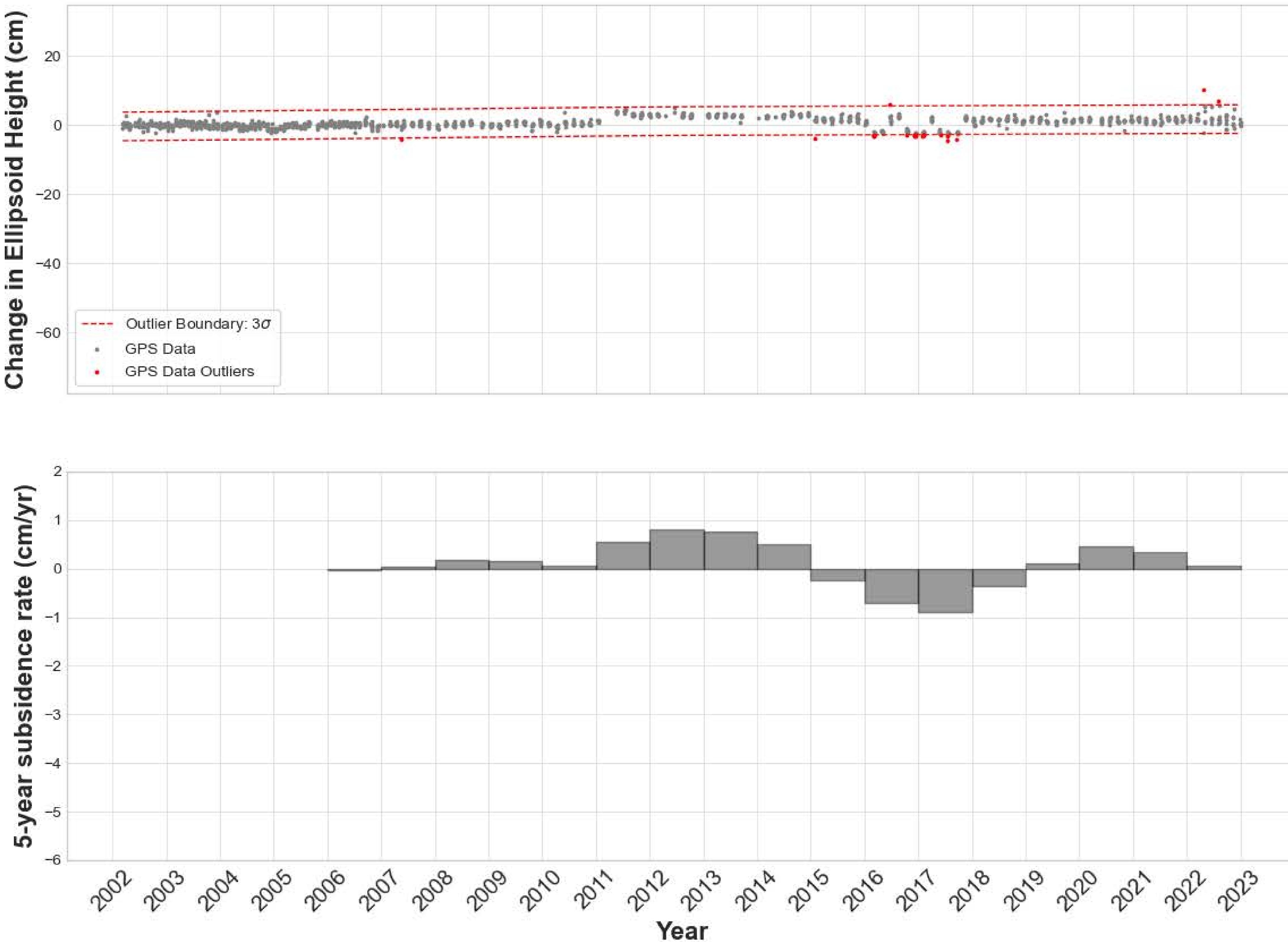

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P027



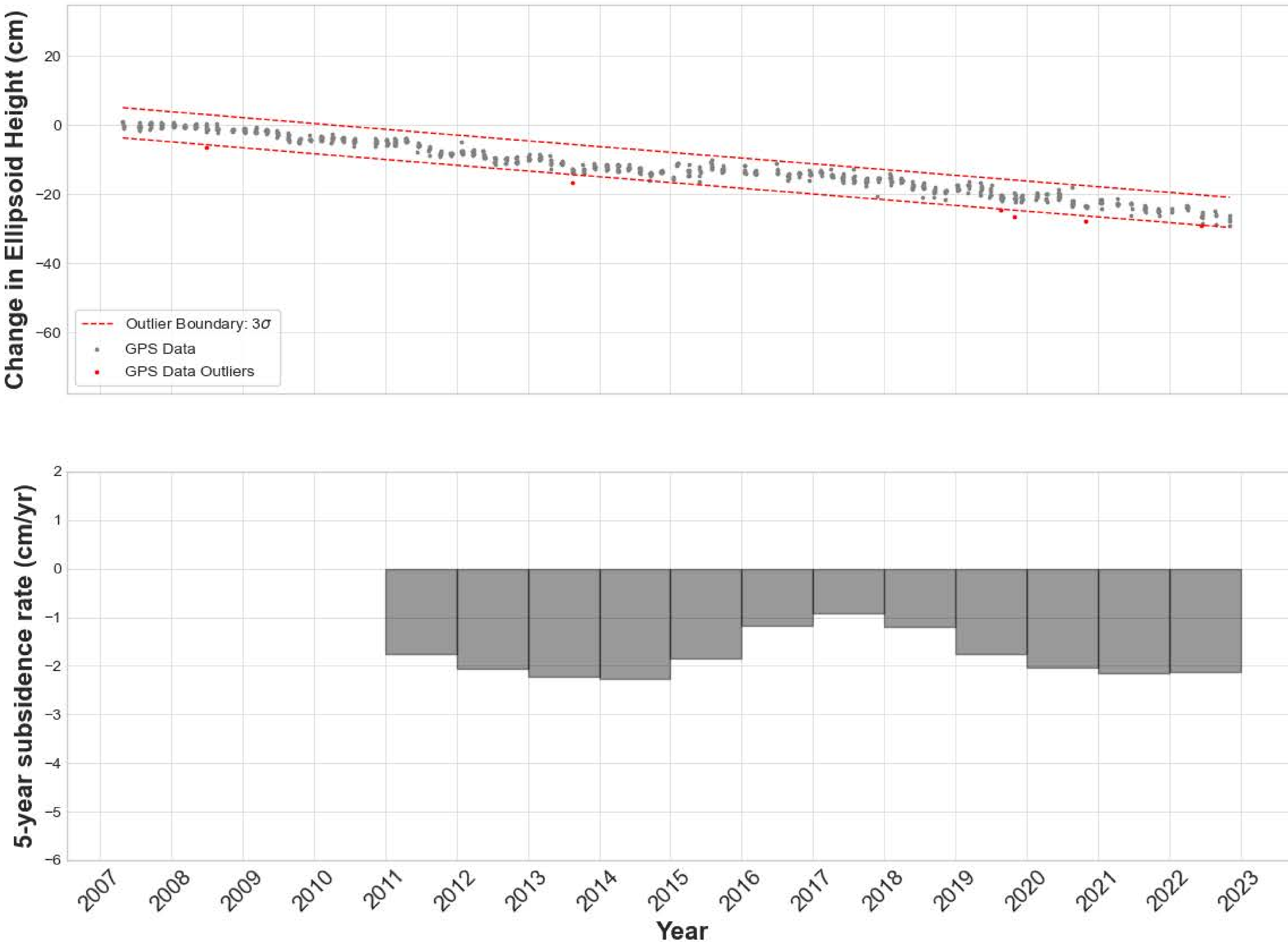

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P028



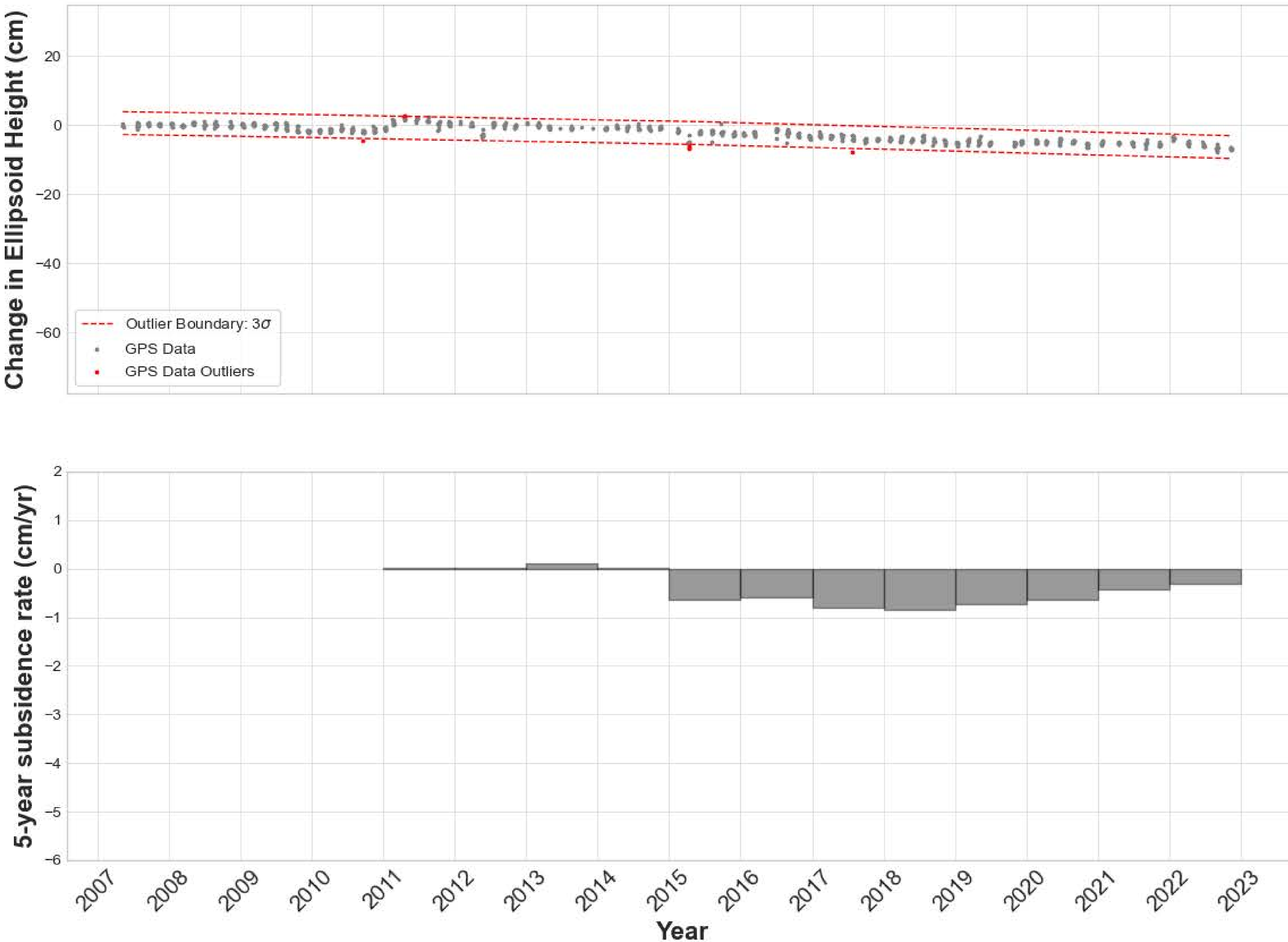

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P029



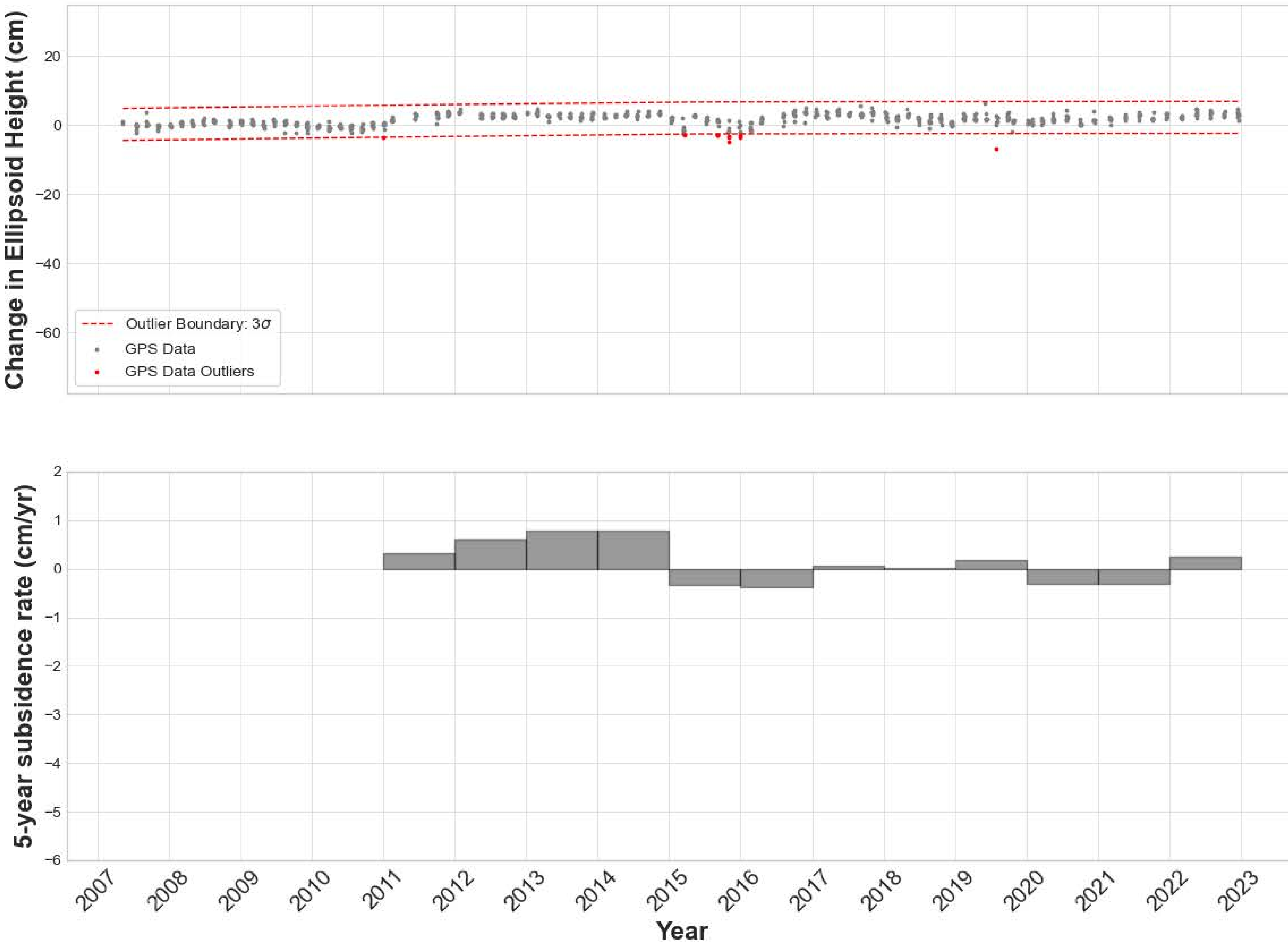

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P030



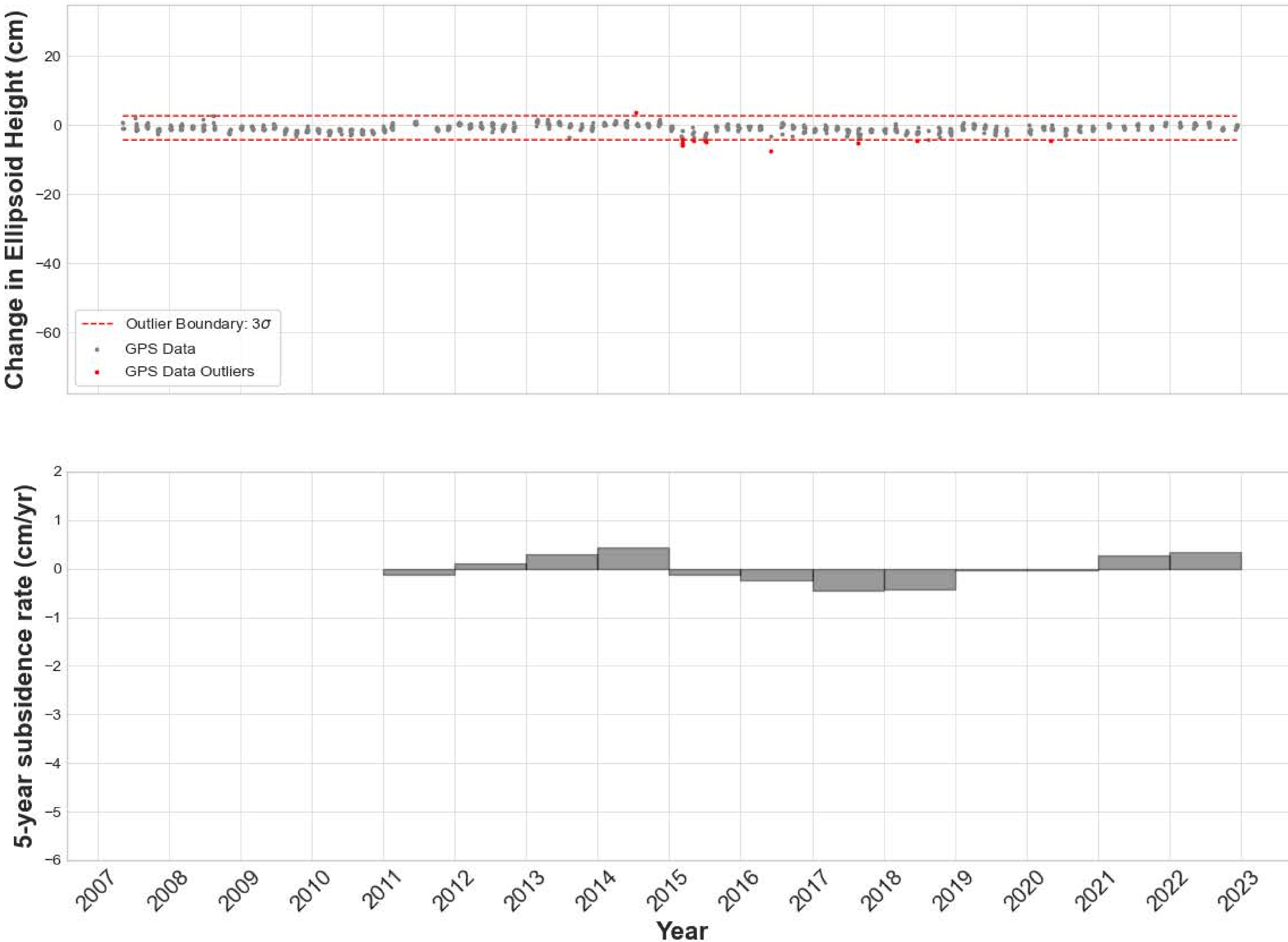

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P031



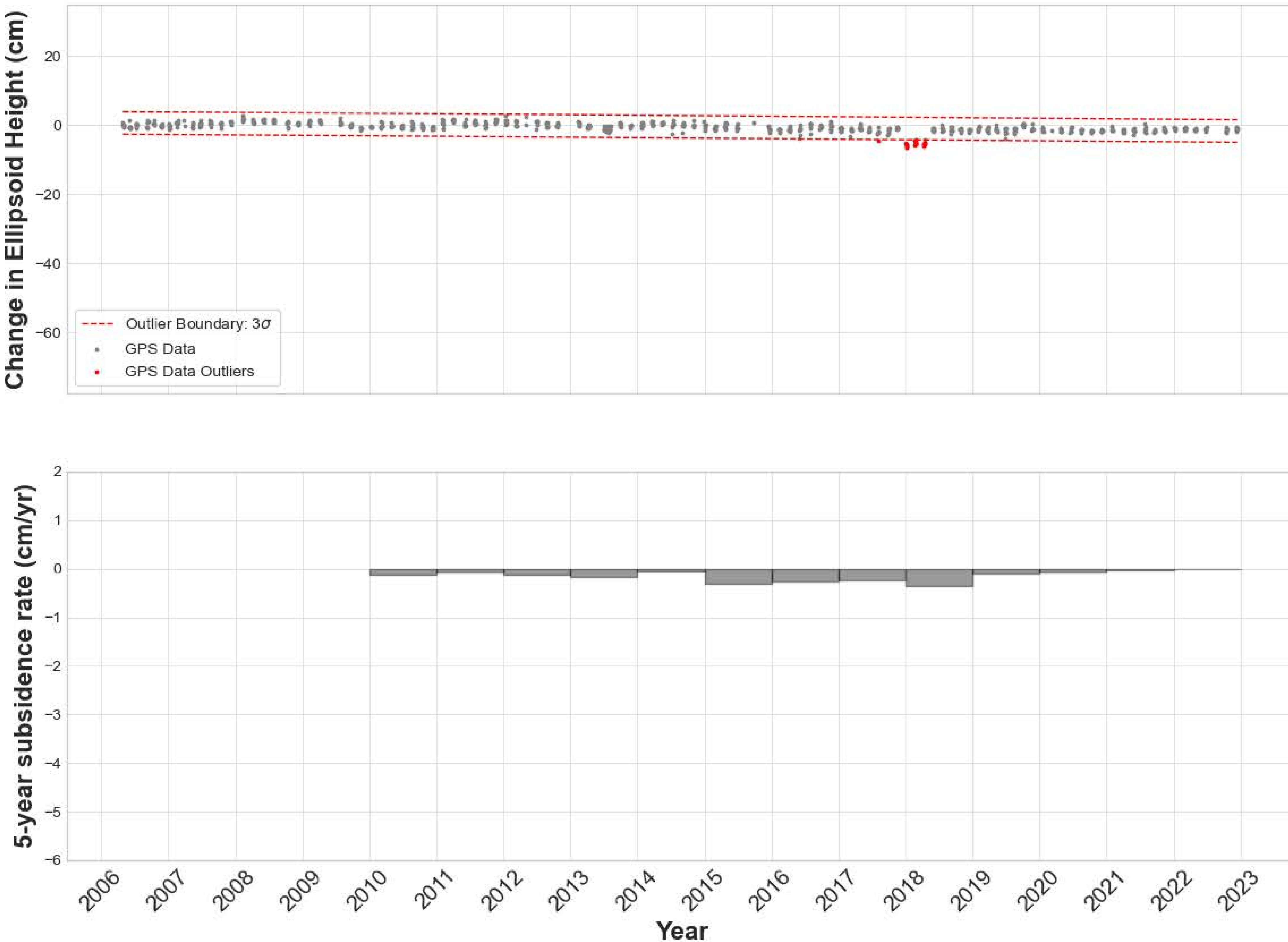

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P032



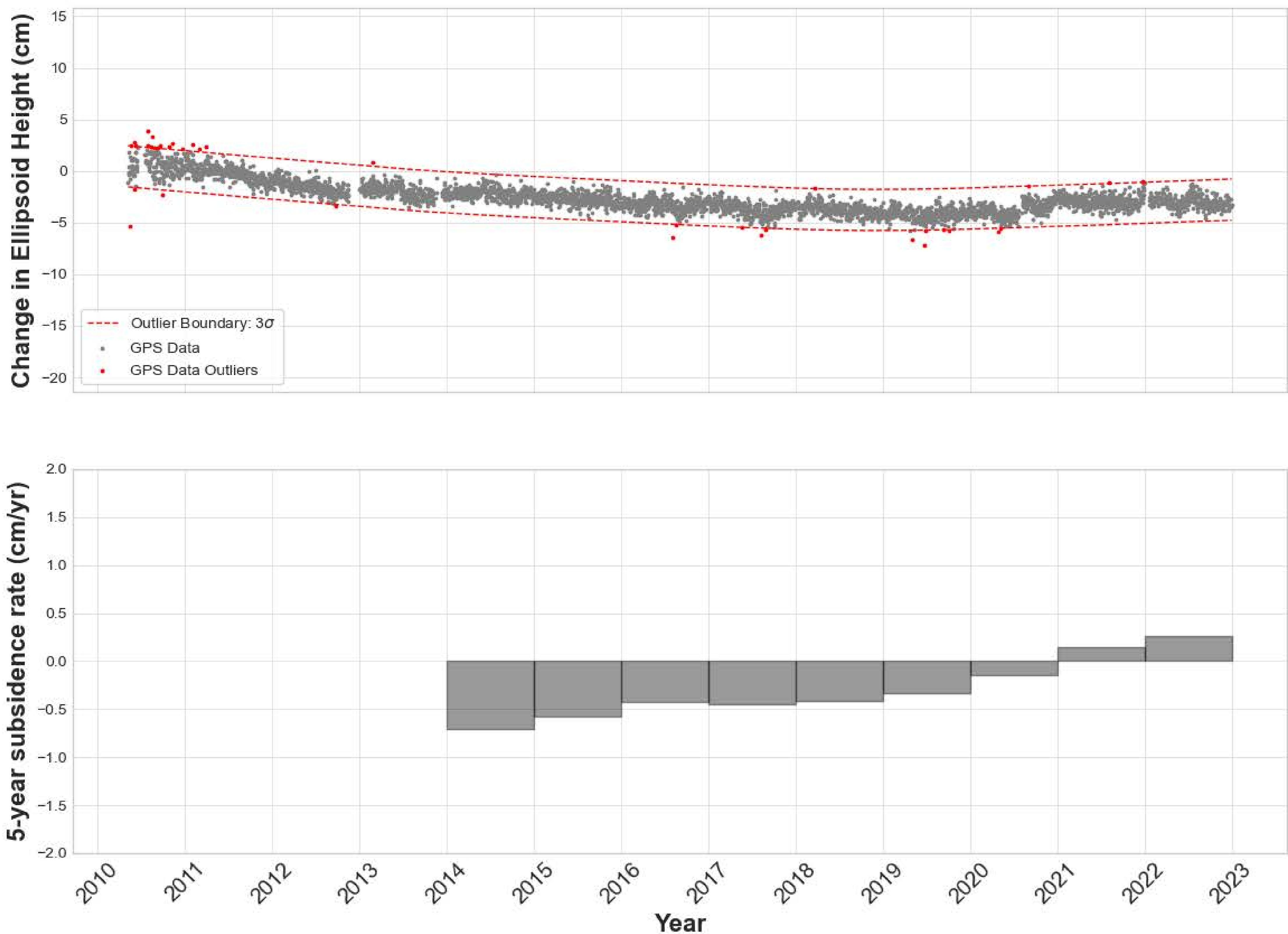

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P033



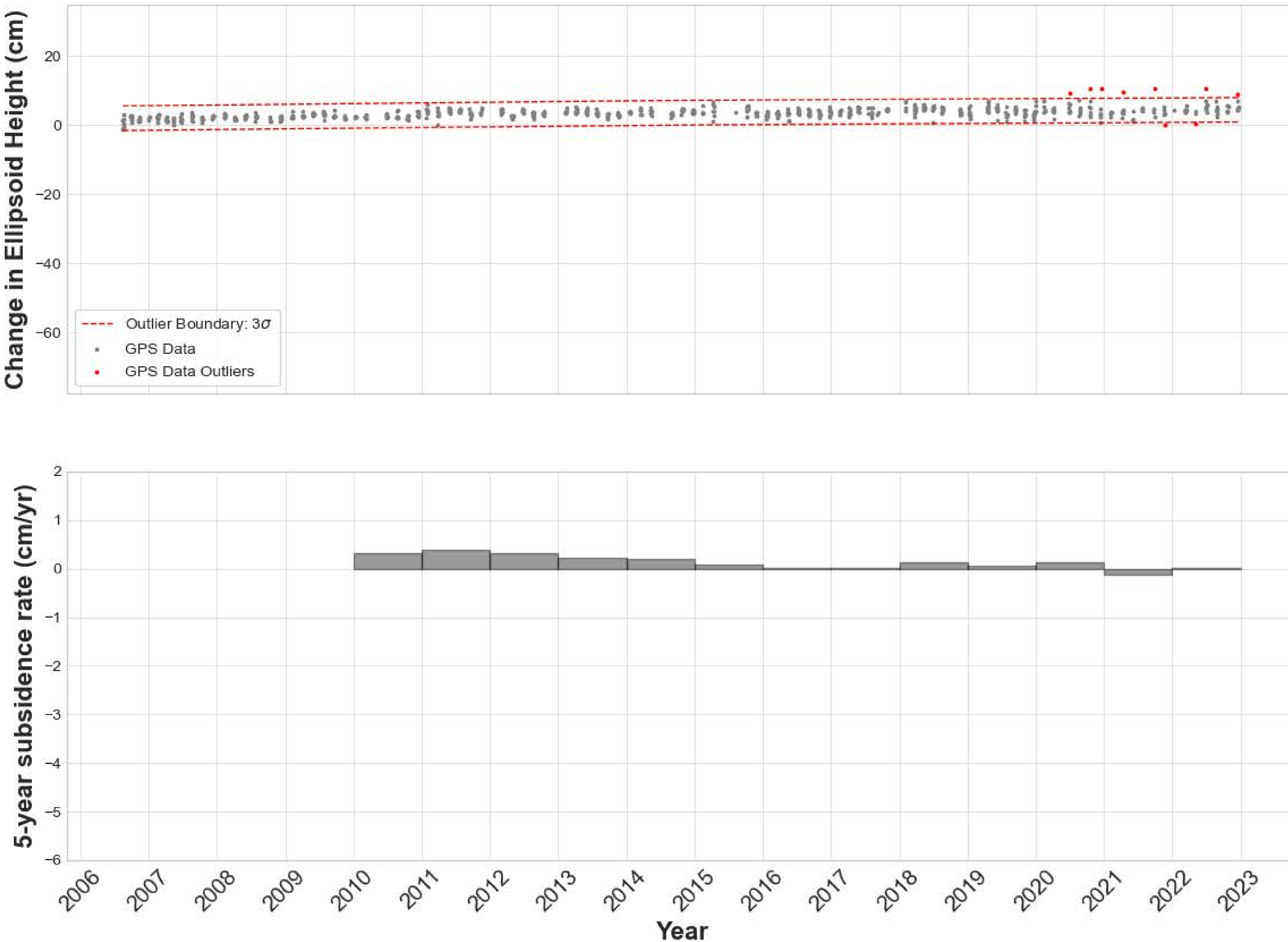

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P034



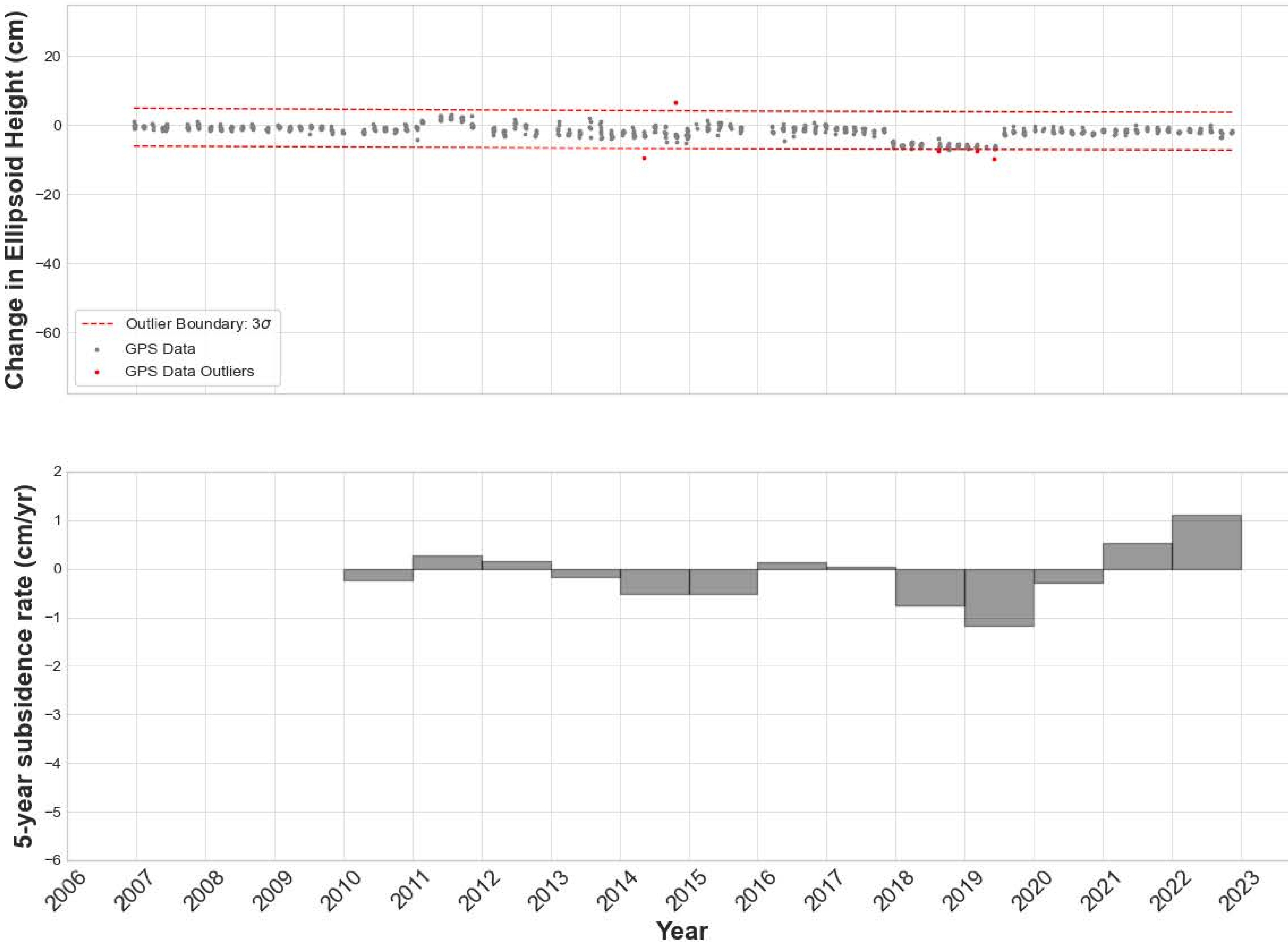

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P035



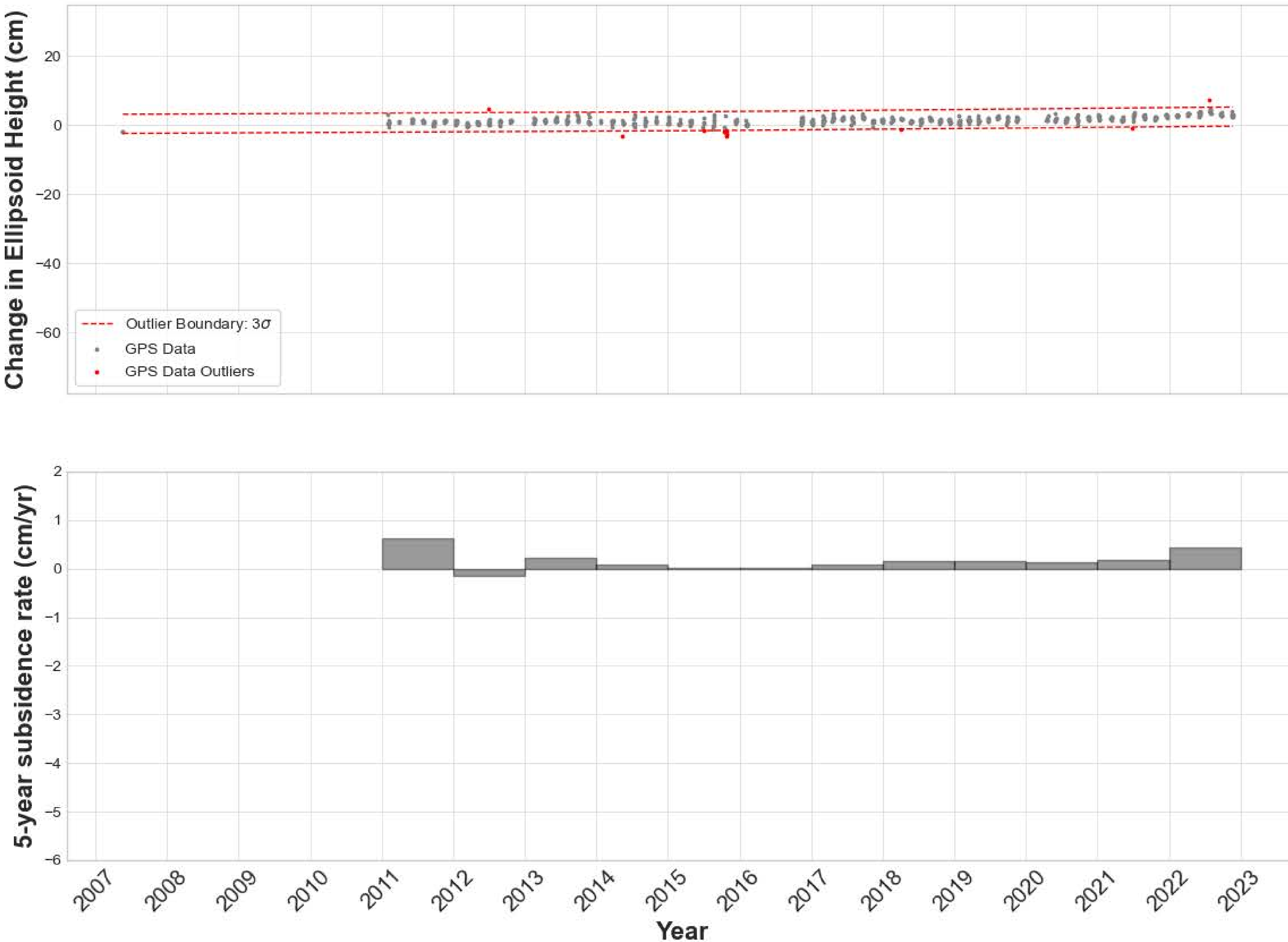

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P036



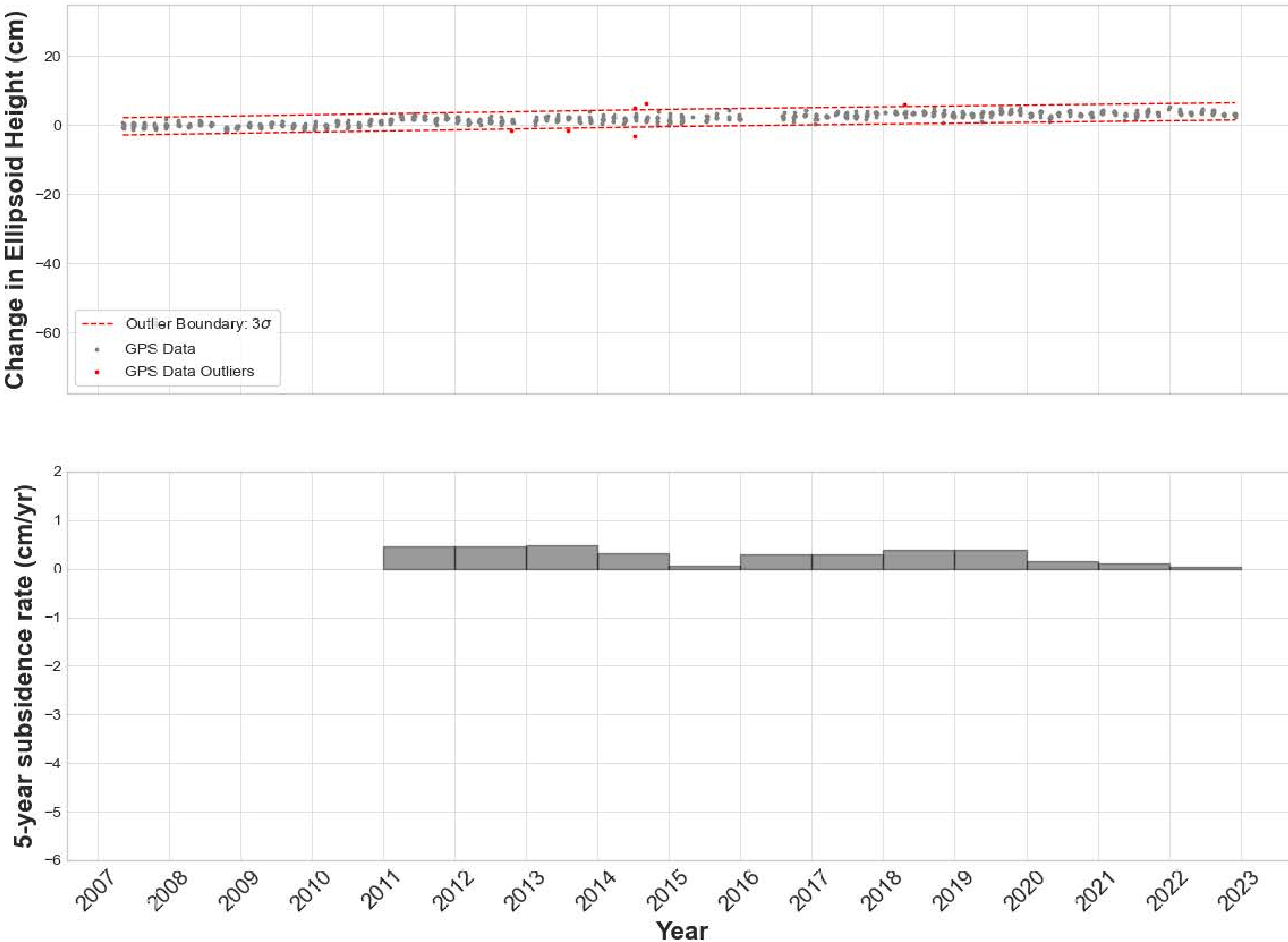

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P037



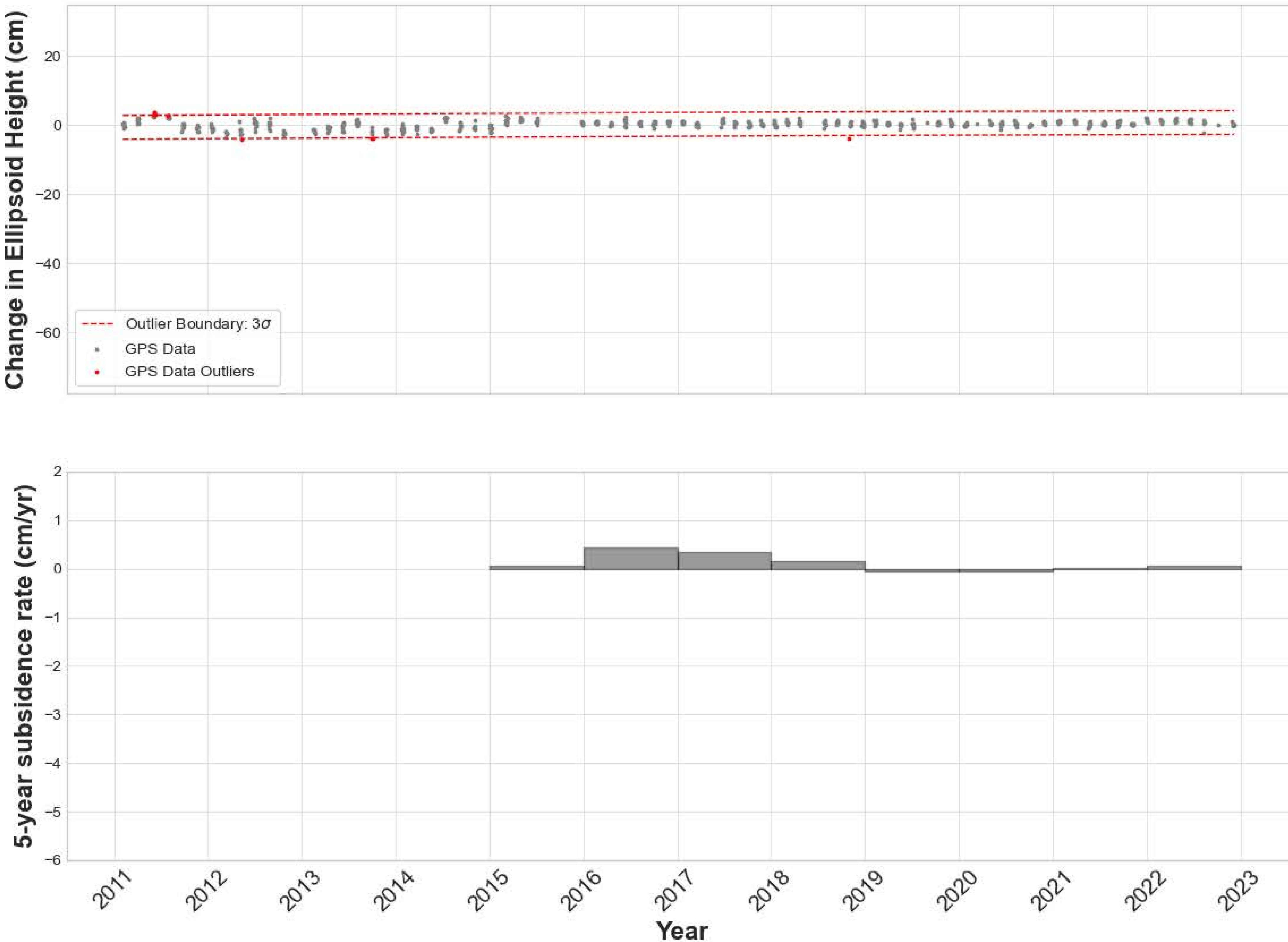

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P038



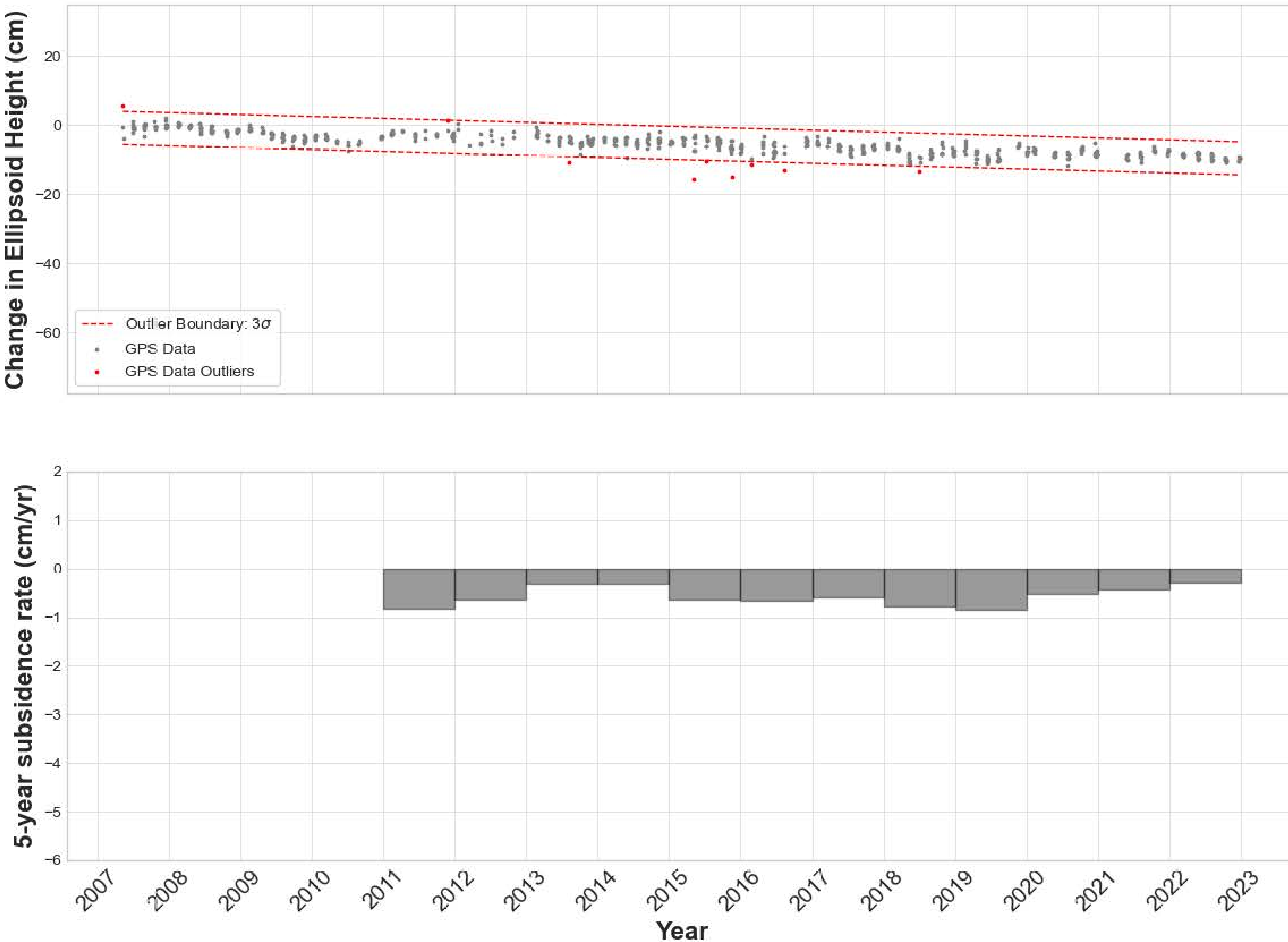

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P039



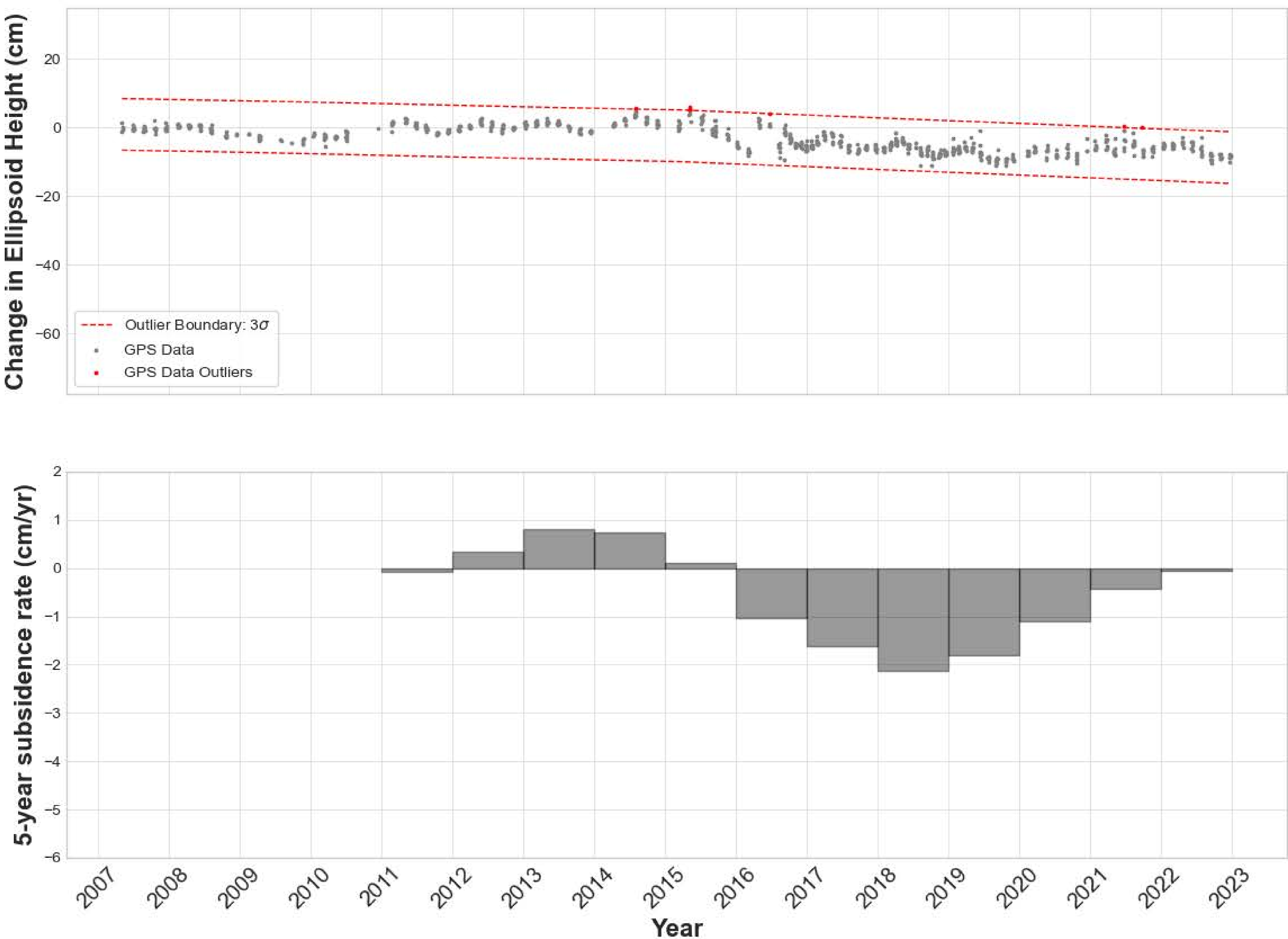

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P040



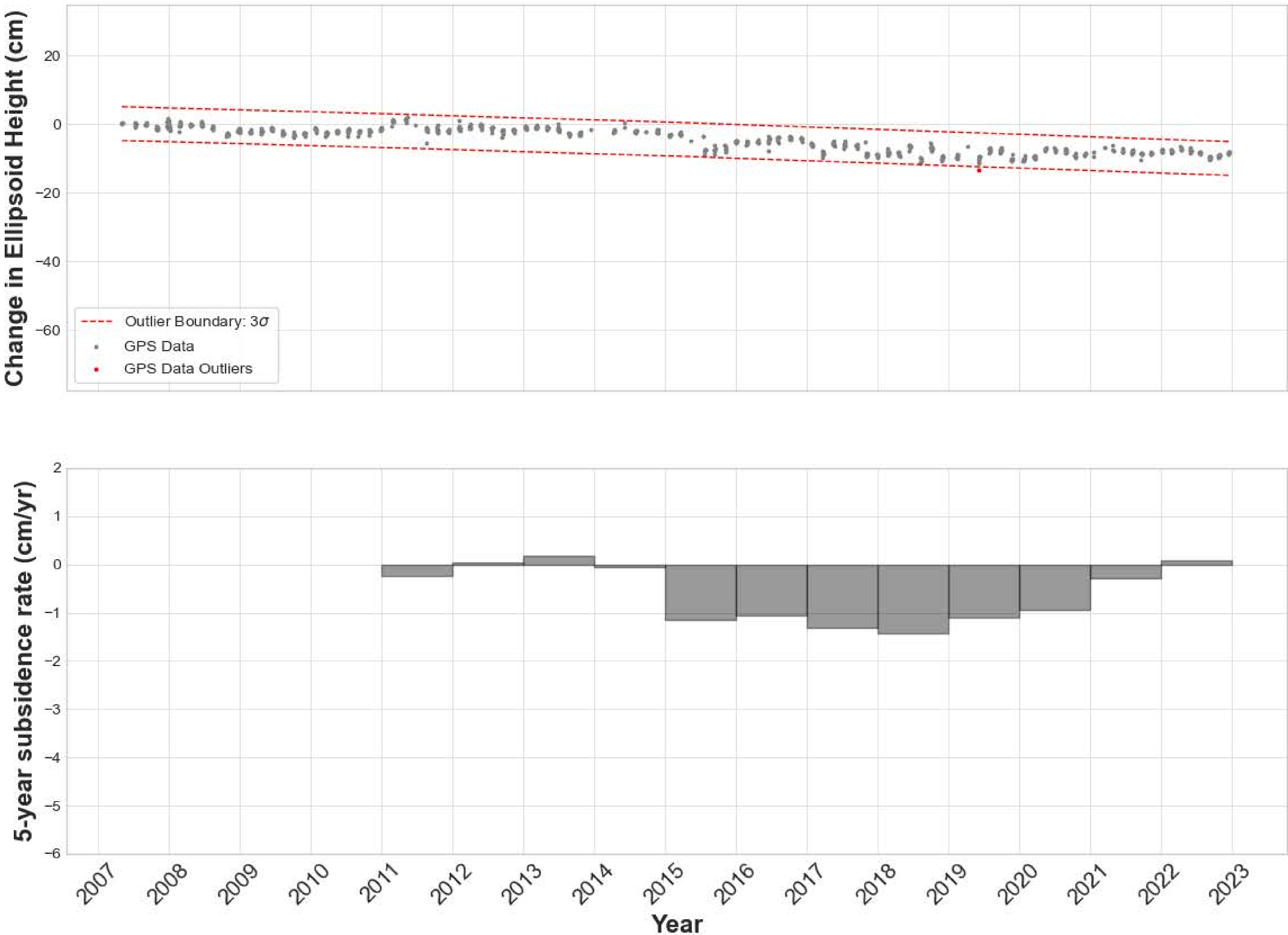

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P041



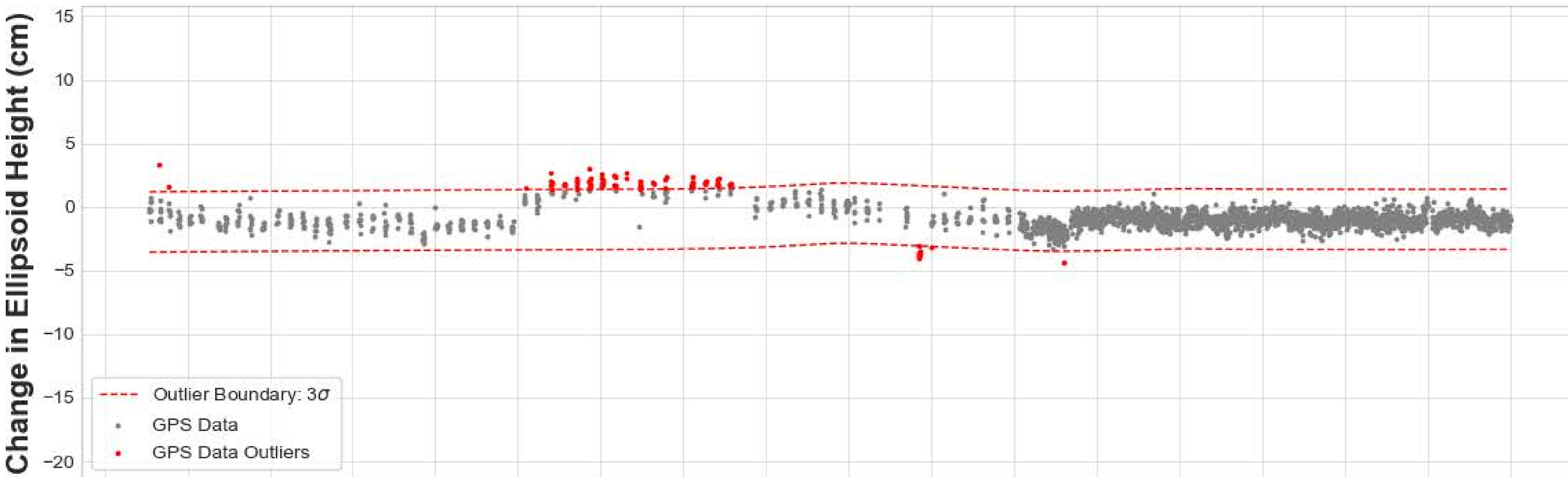

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

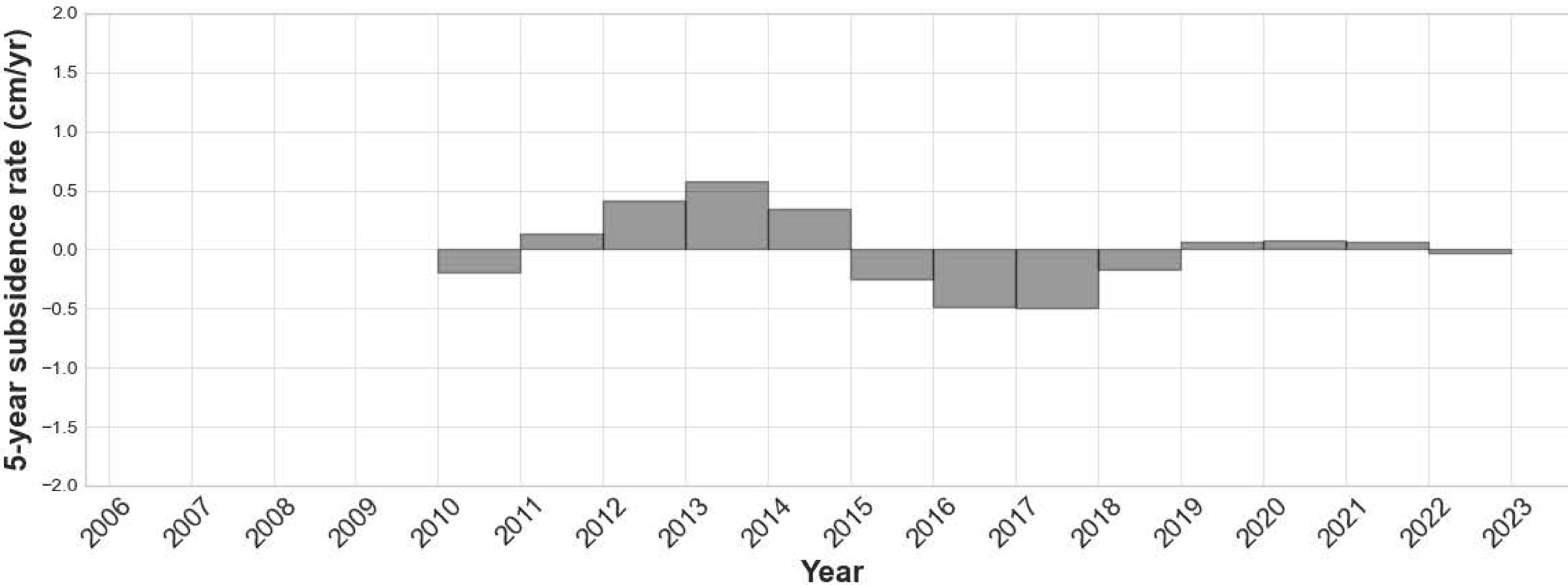
# P042




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

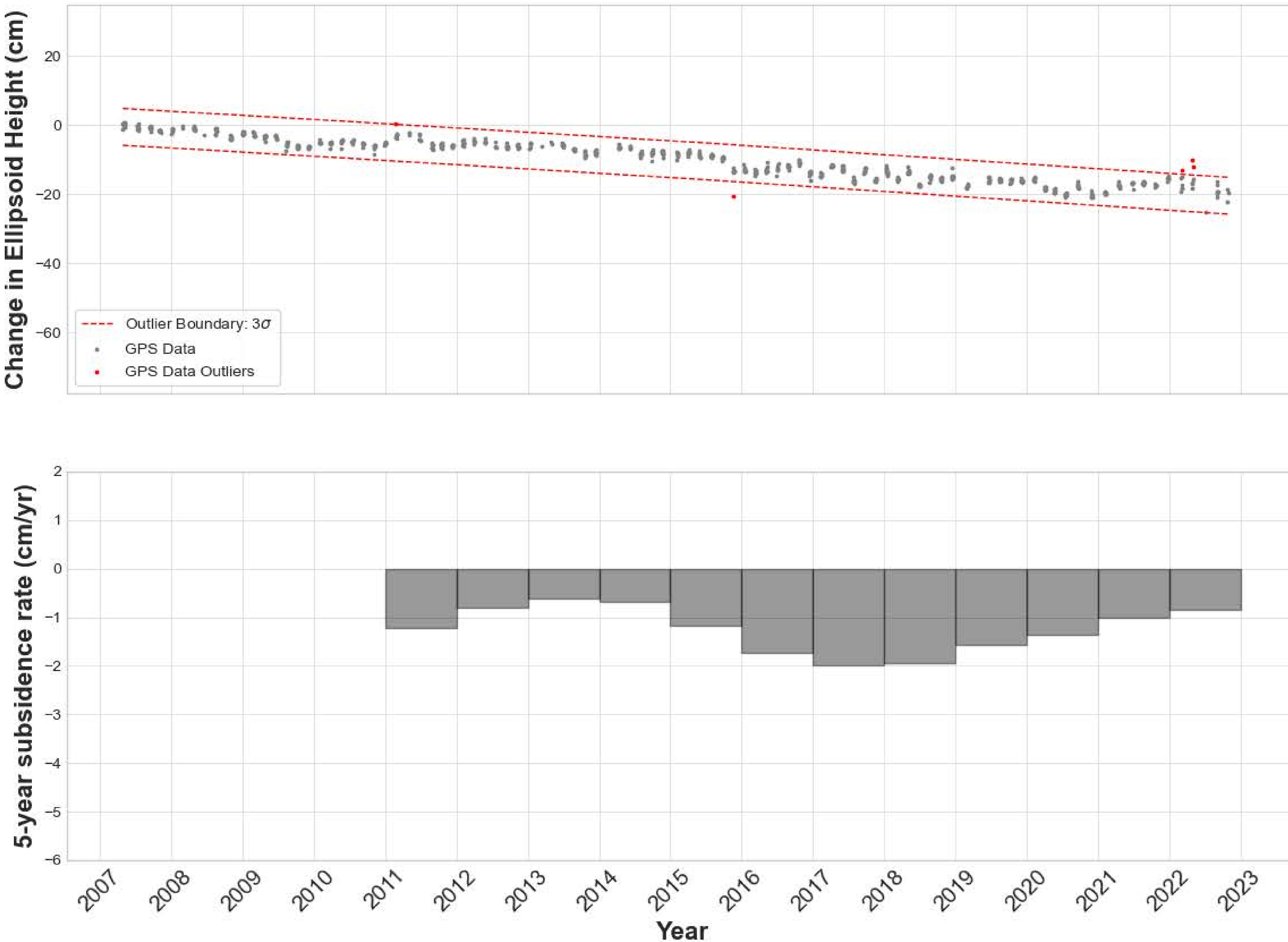
# P043



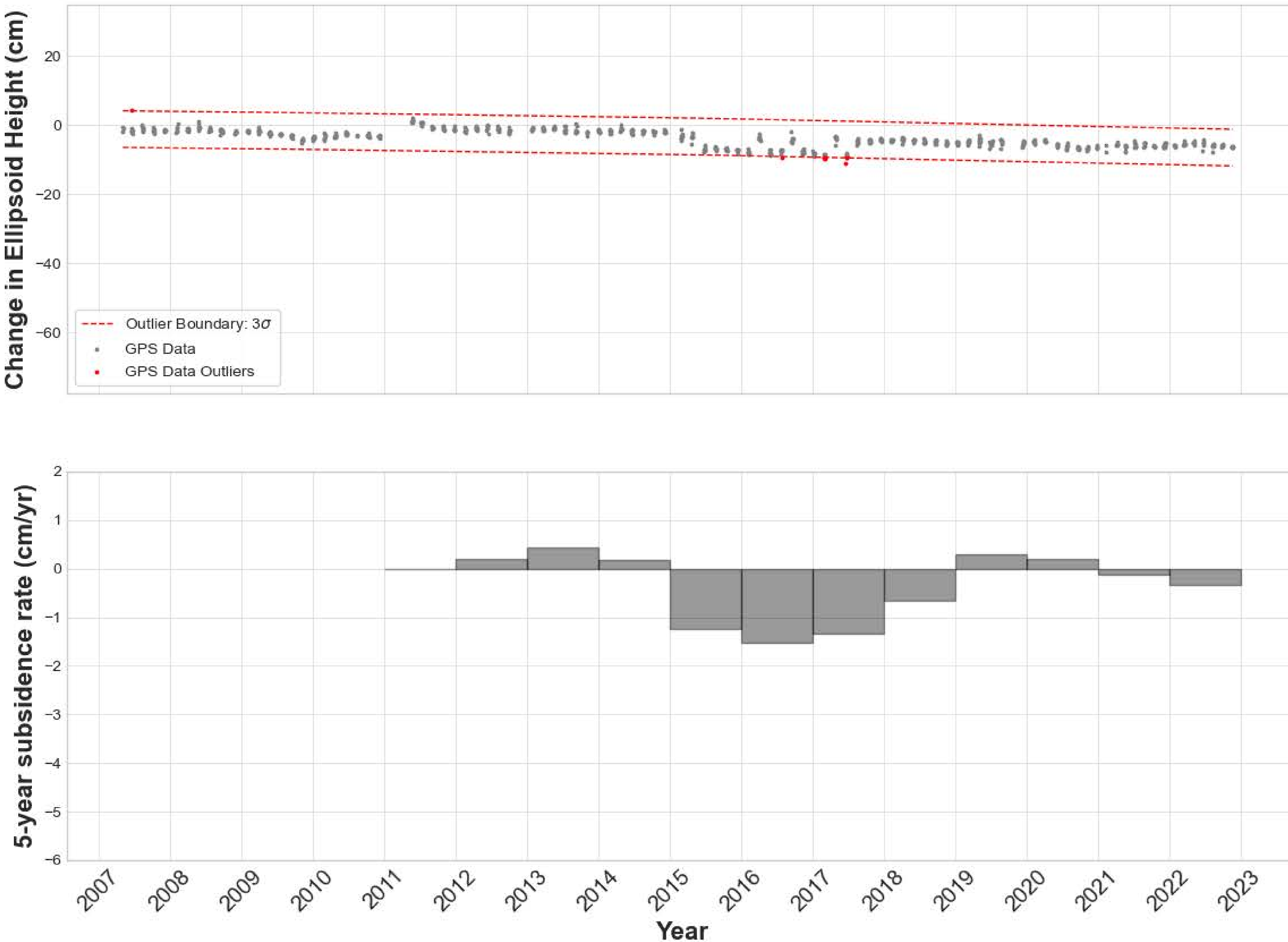

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P044



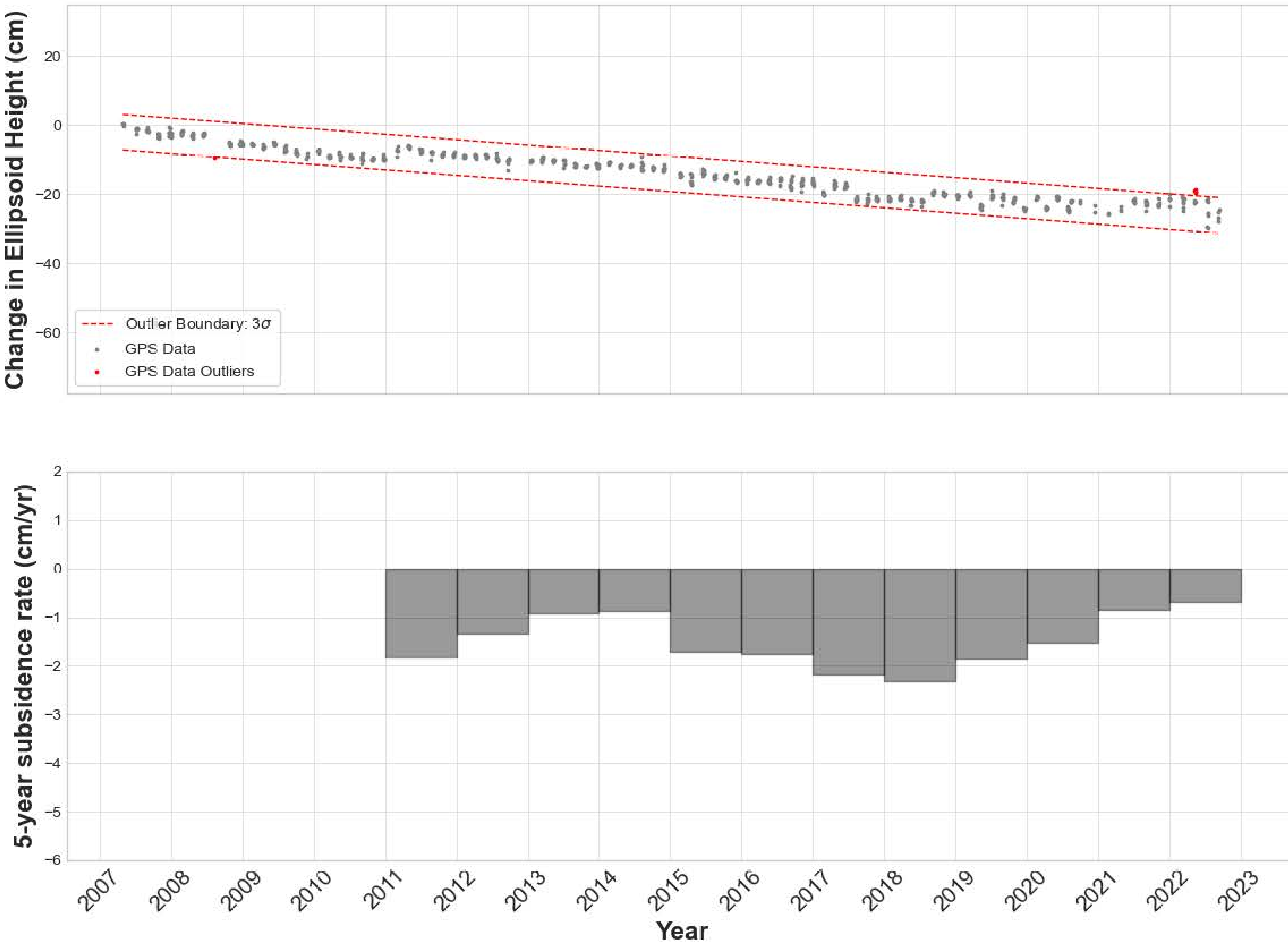

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P045



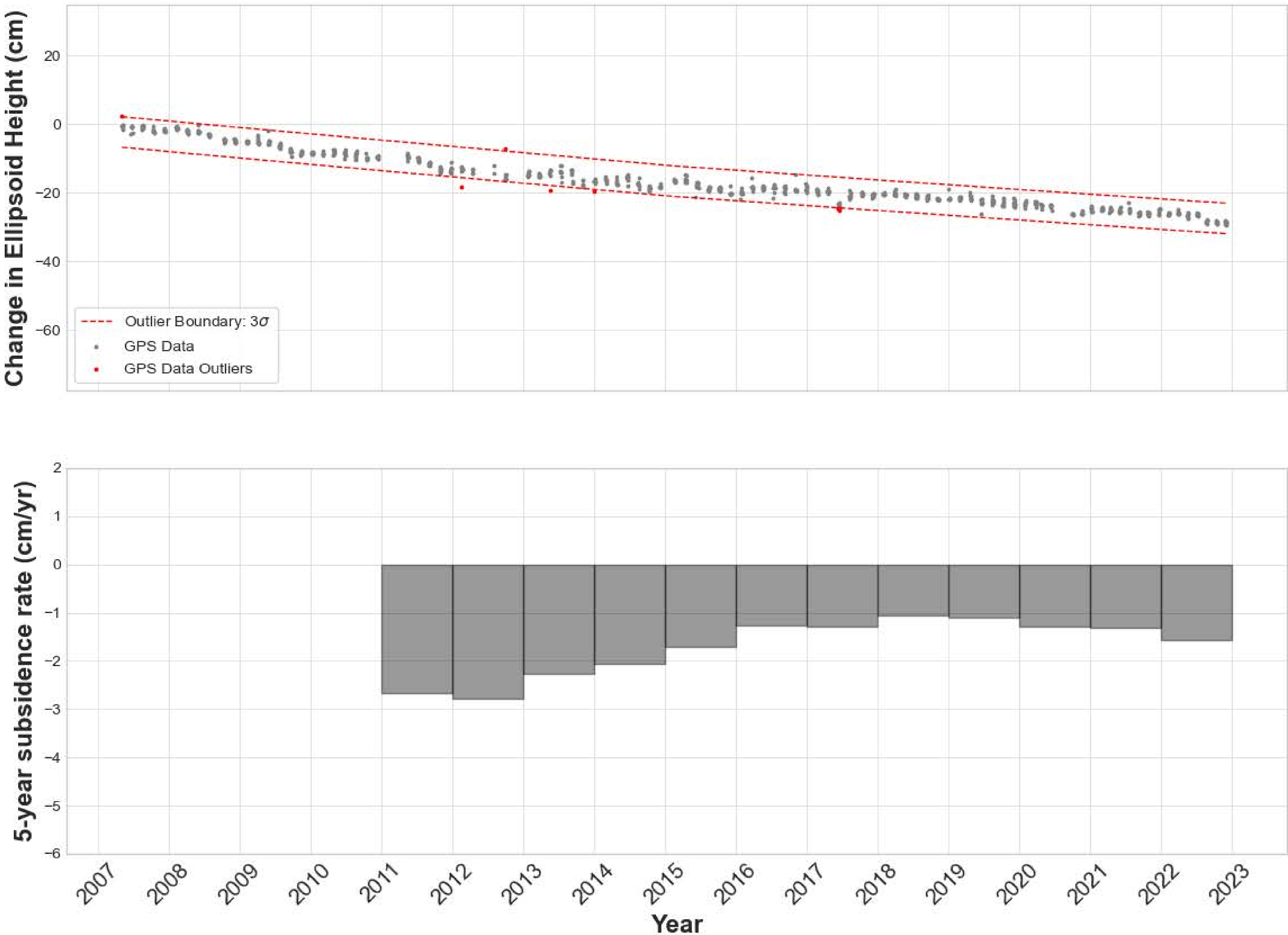

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P046



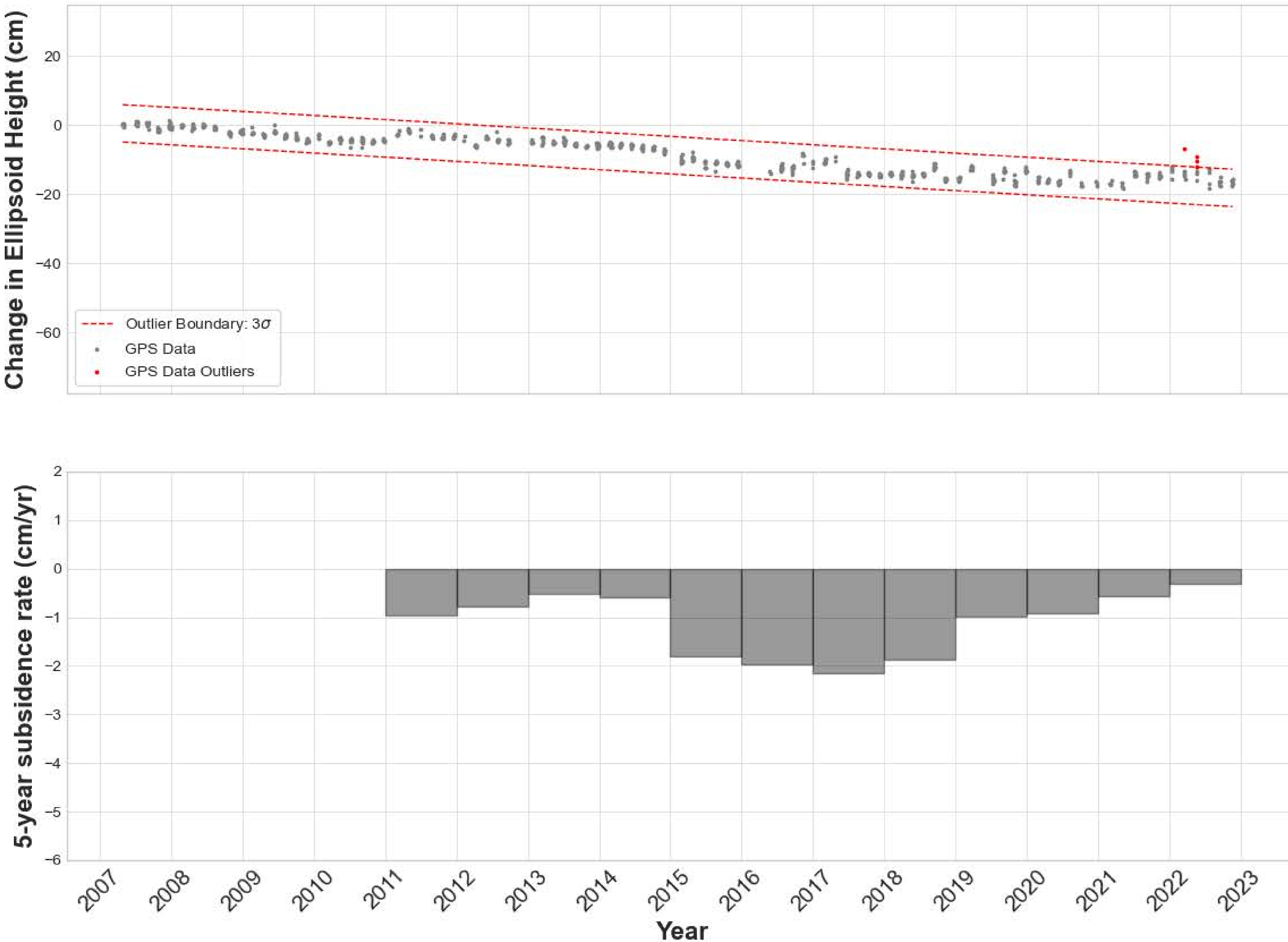

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P047




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P048

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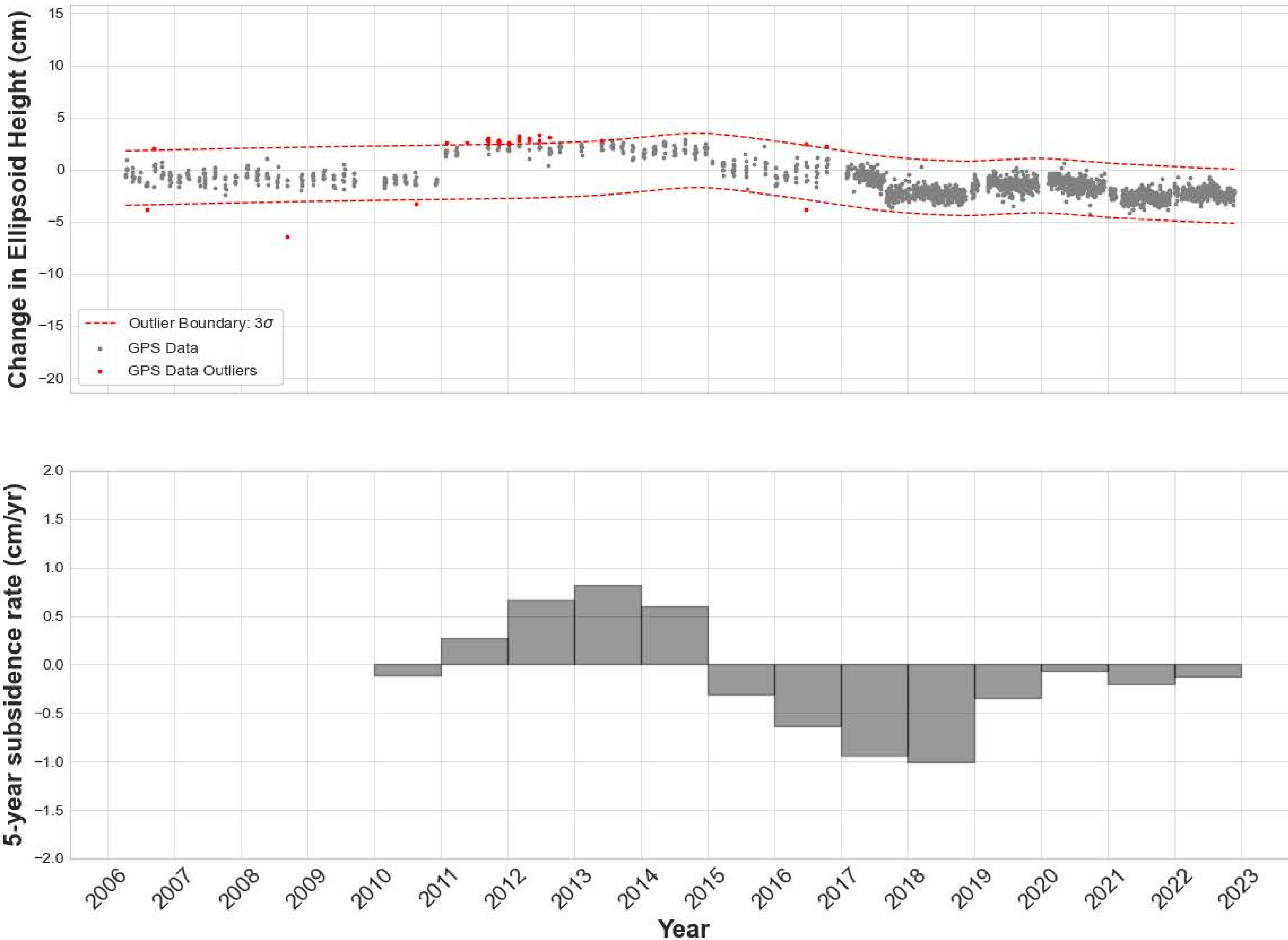
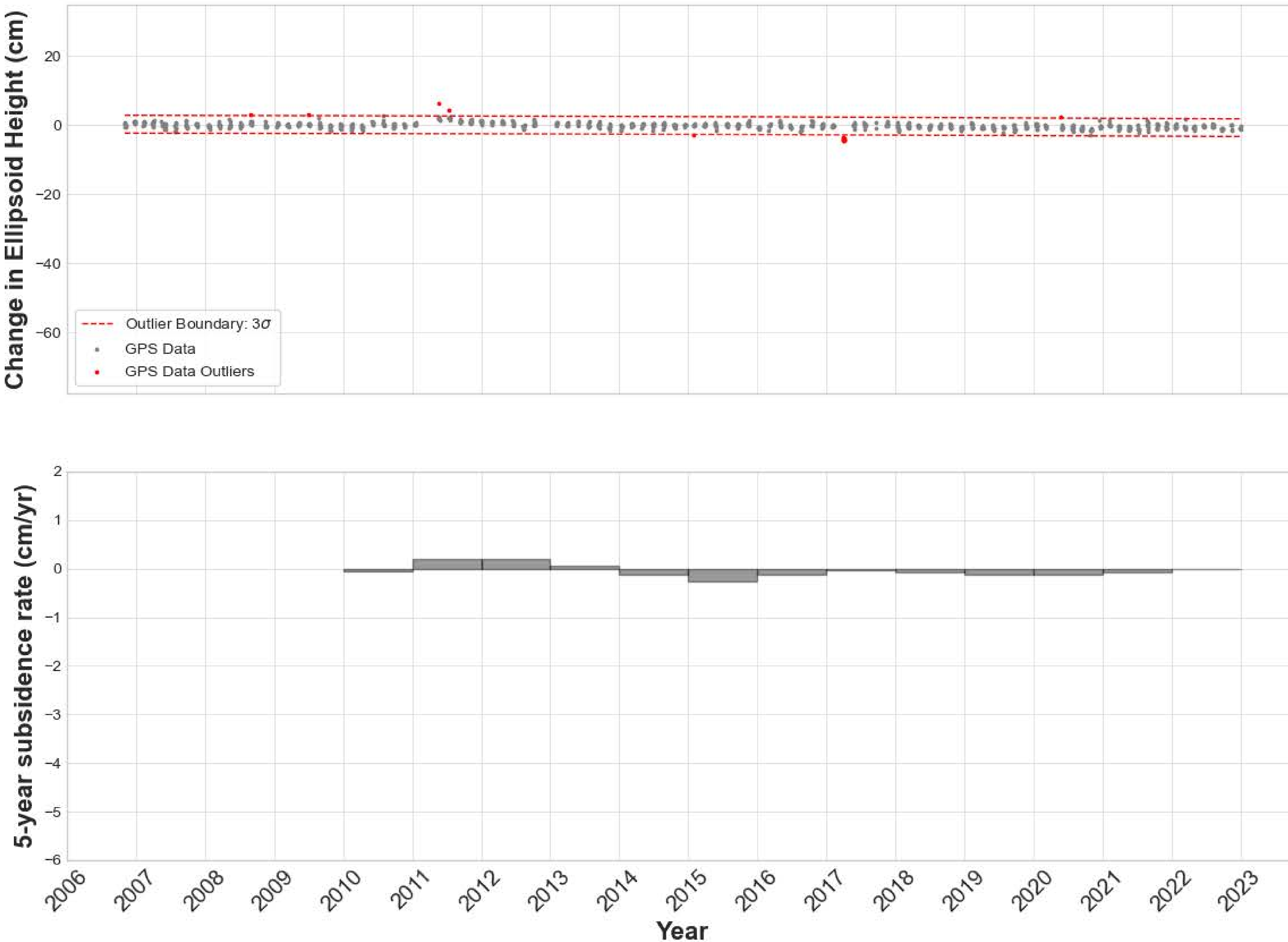
# P049



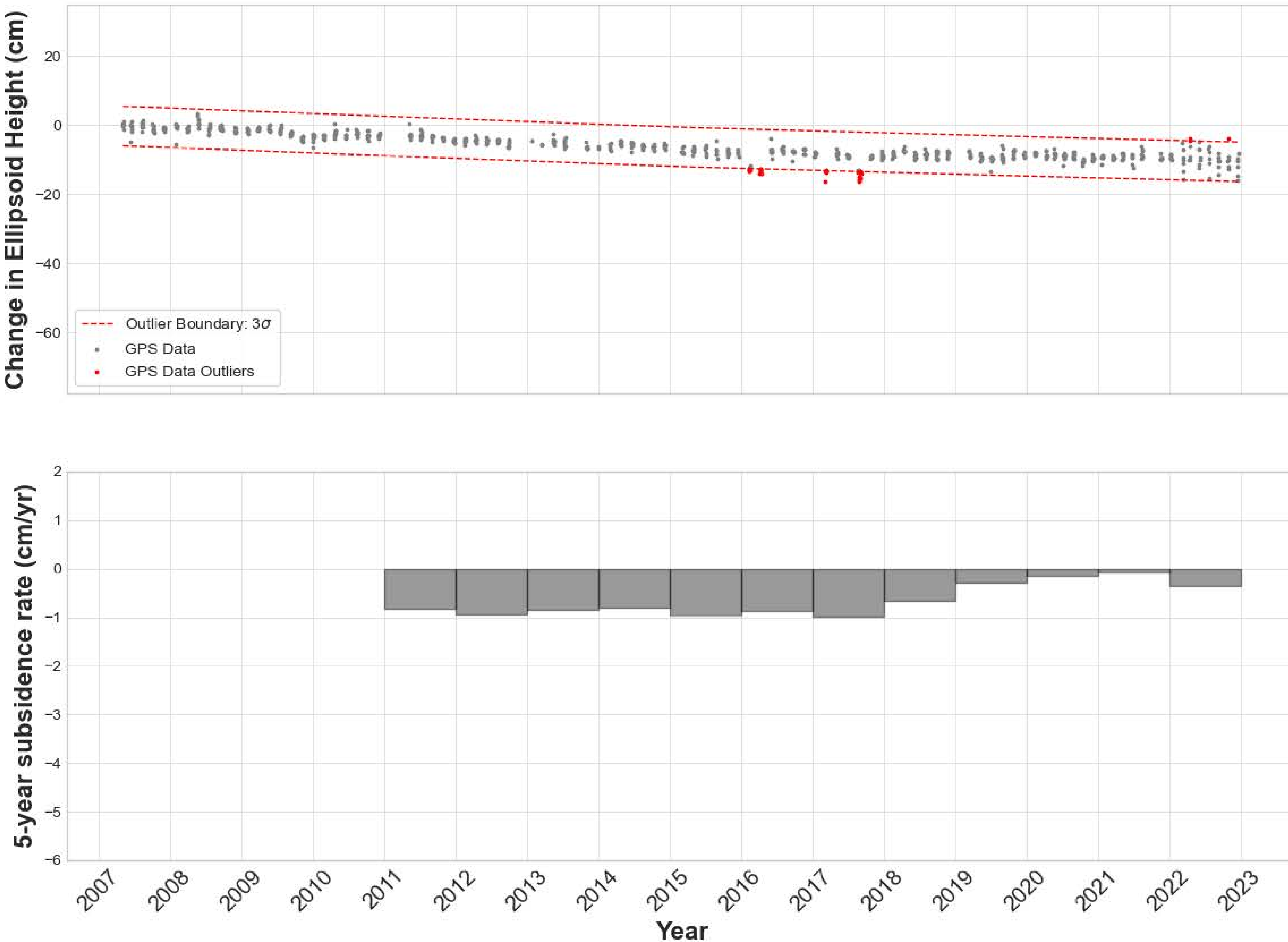

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P050



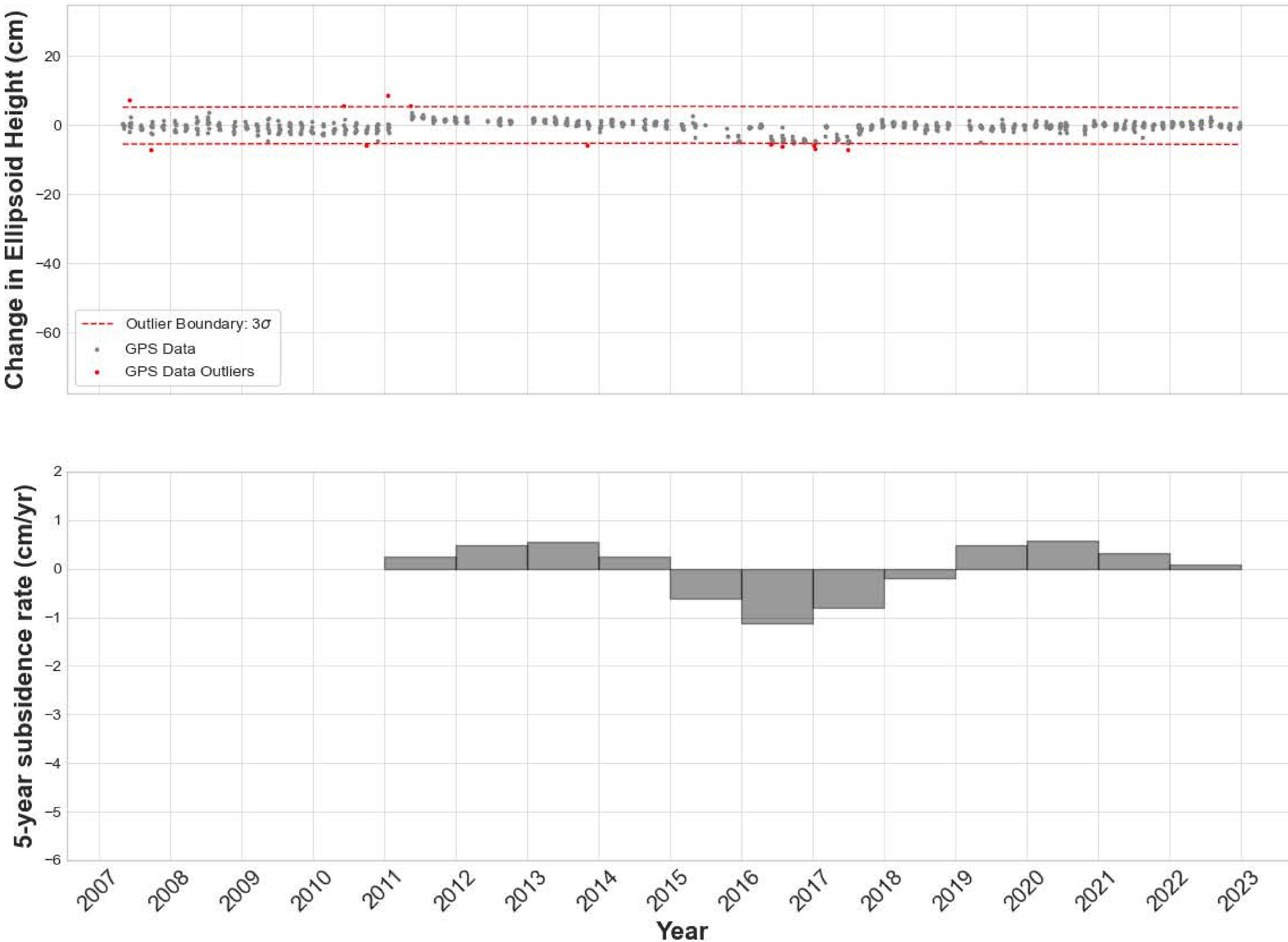

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P051



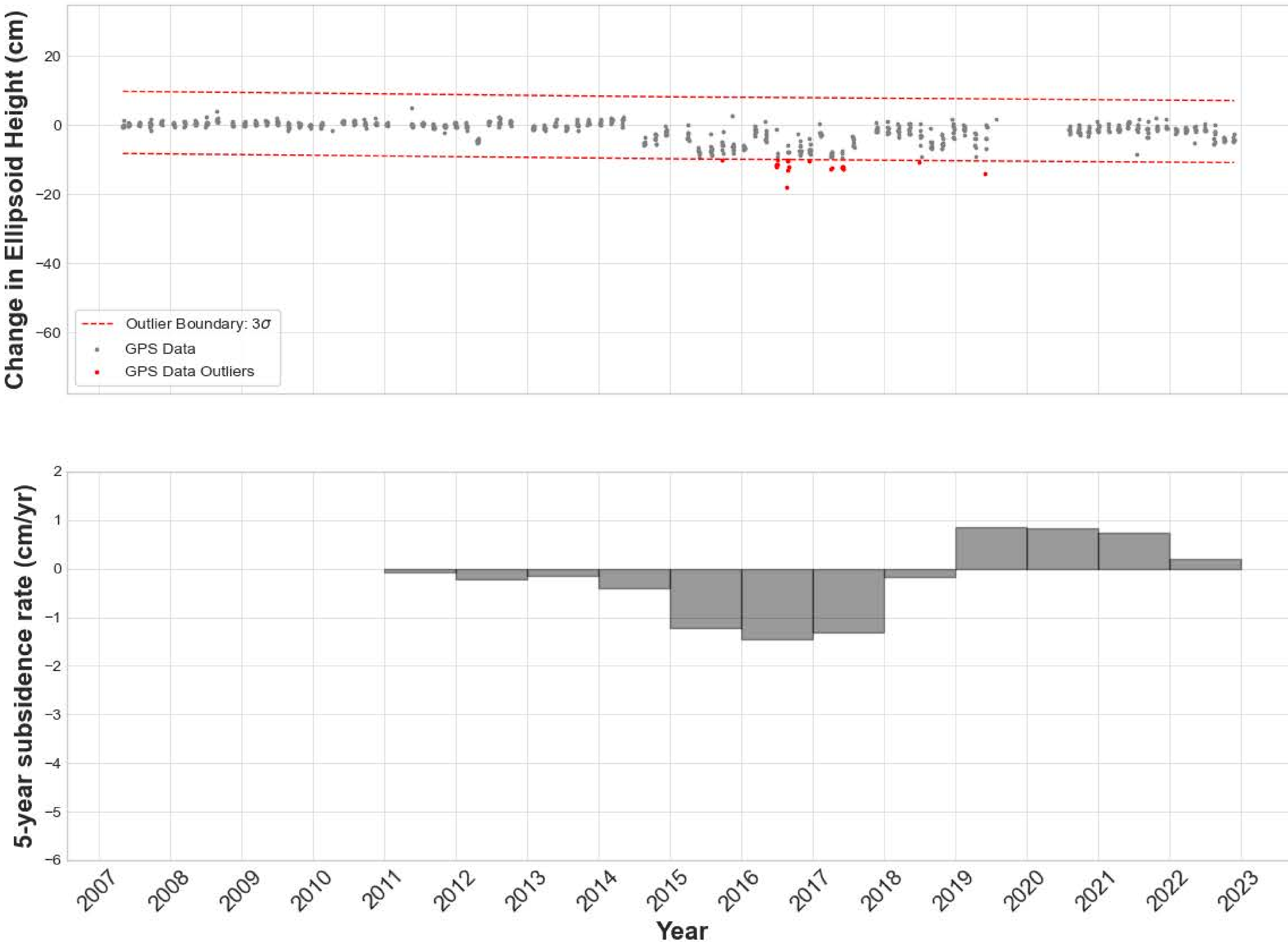

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P052



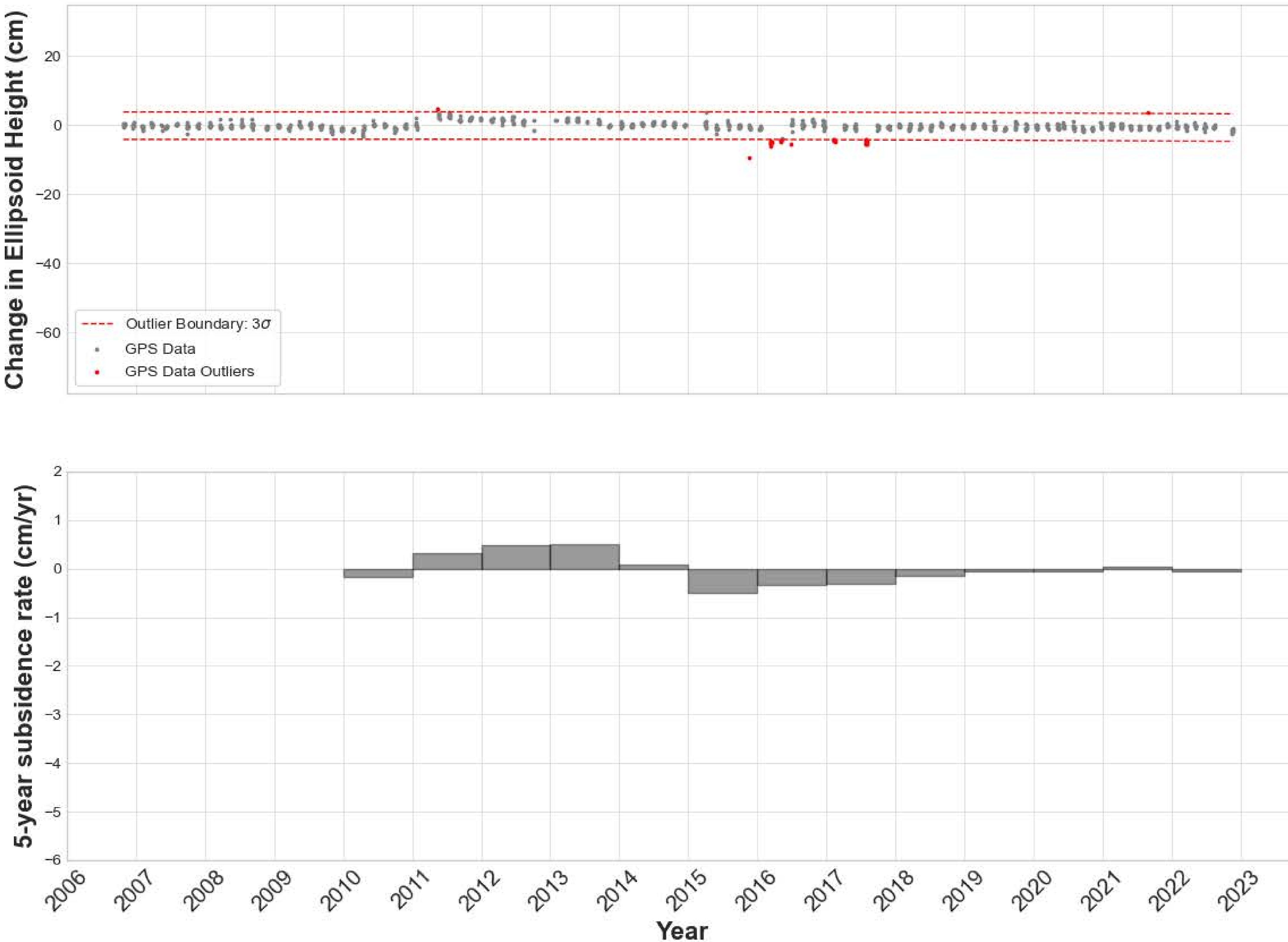

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P053



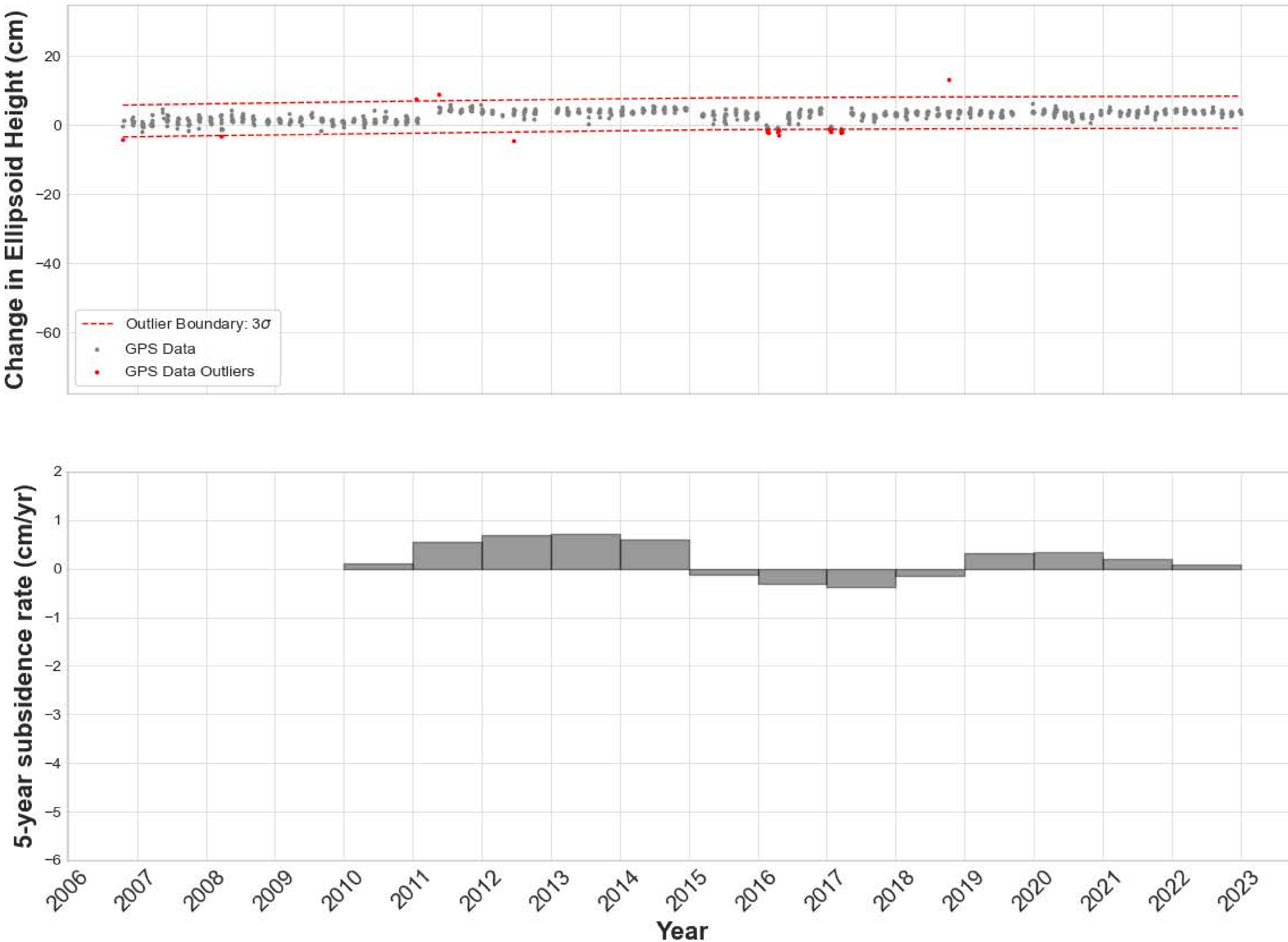

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P054



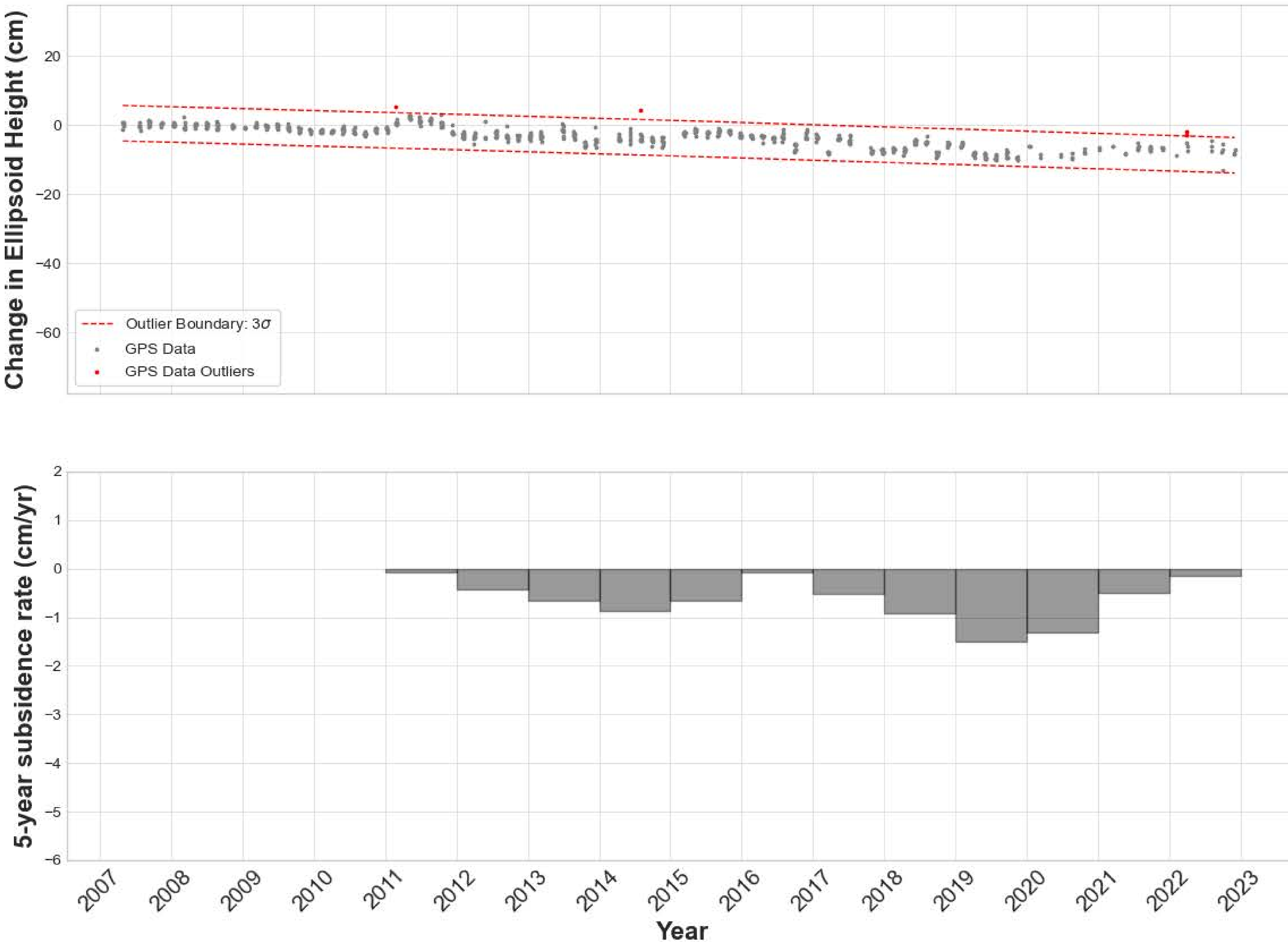

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P055



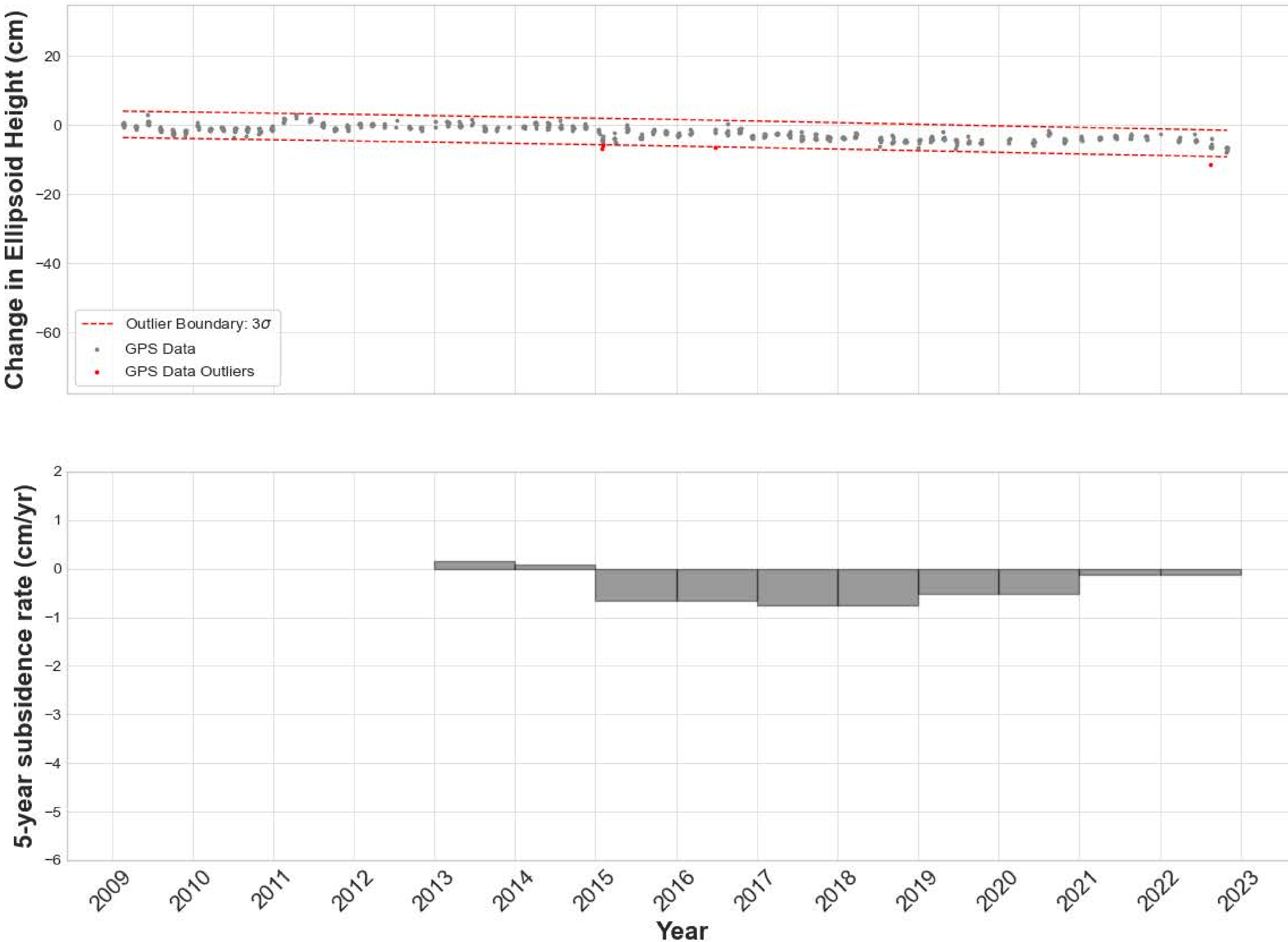

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P056



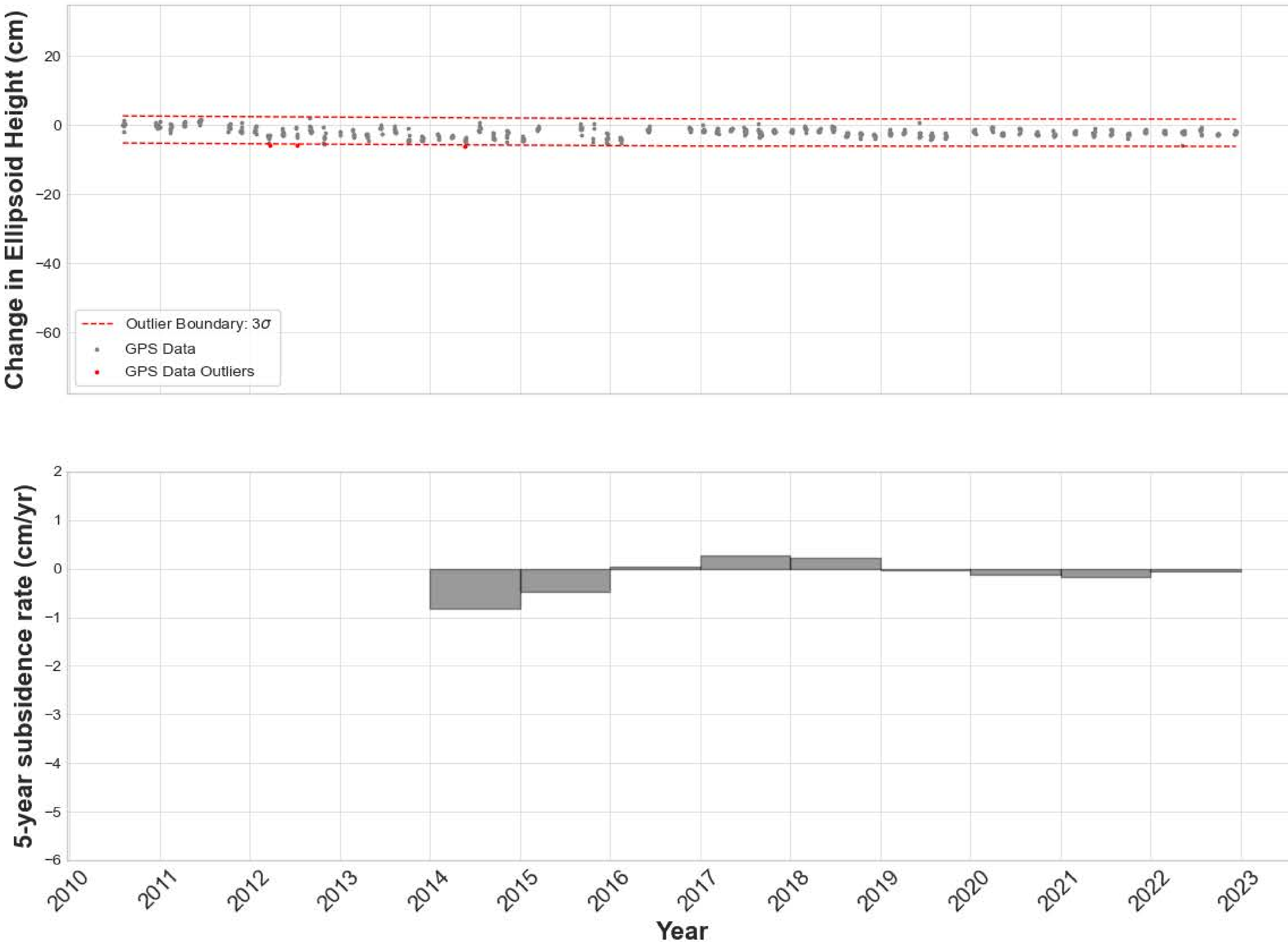

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P057



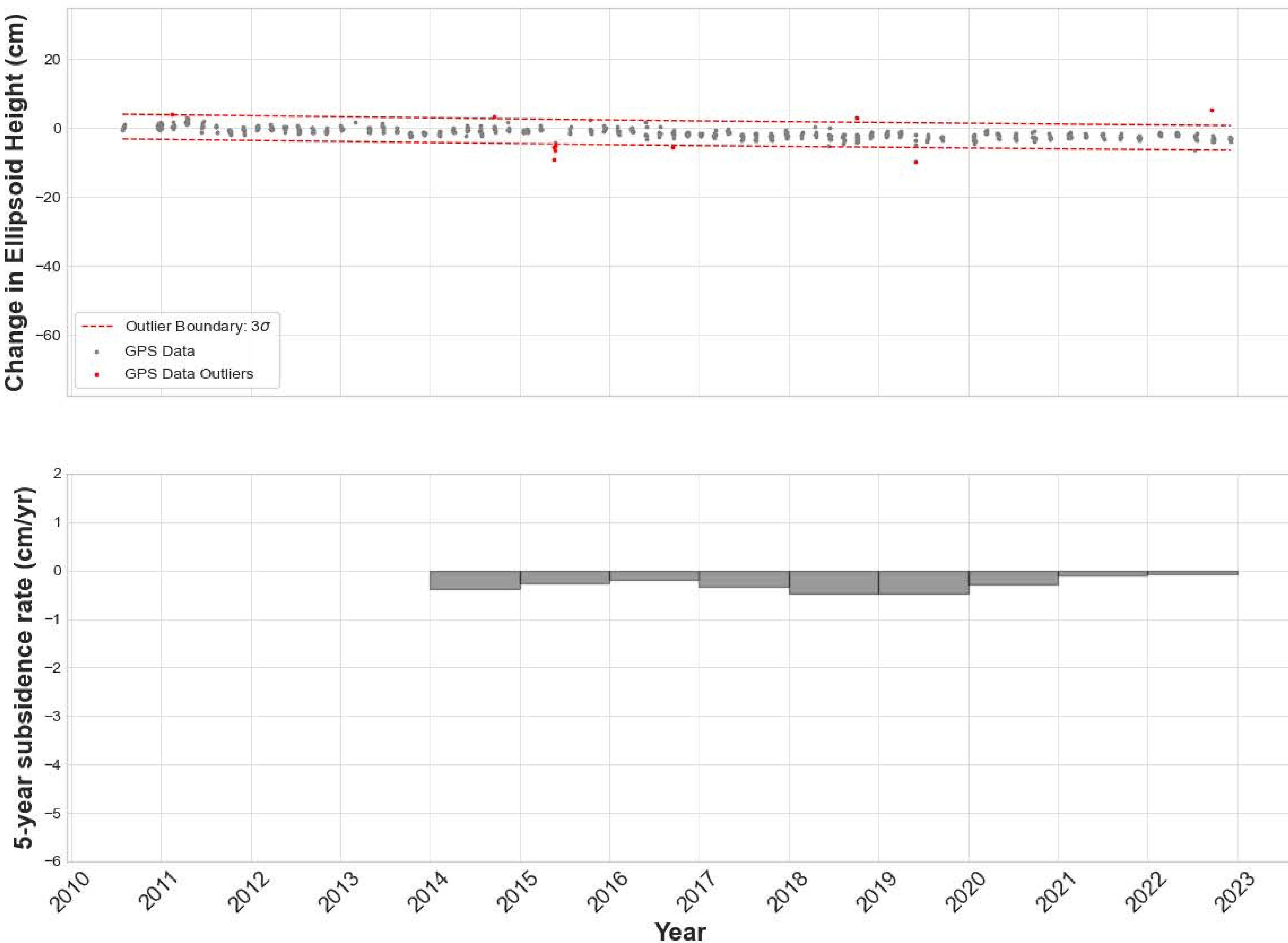

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P058



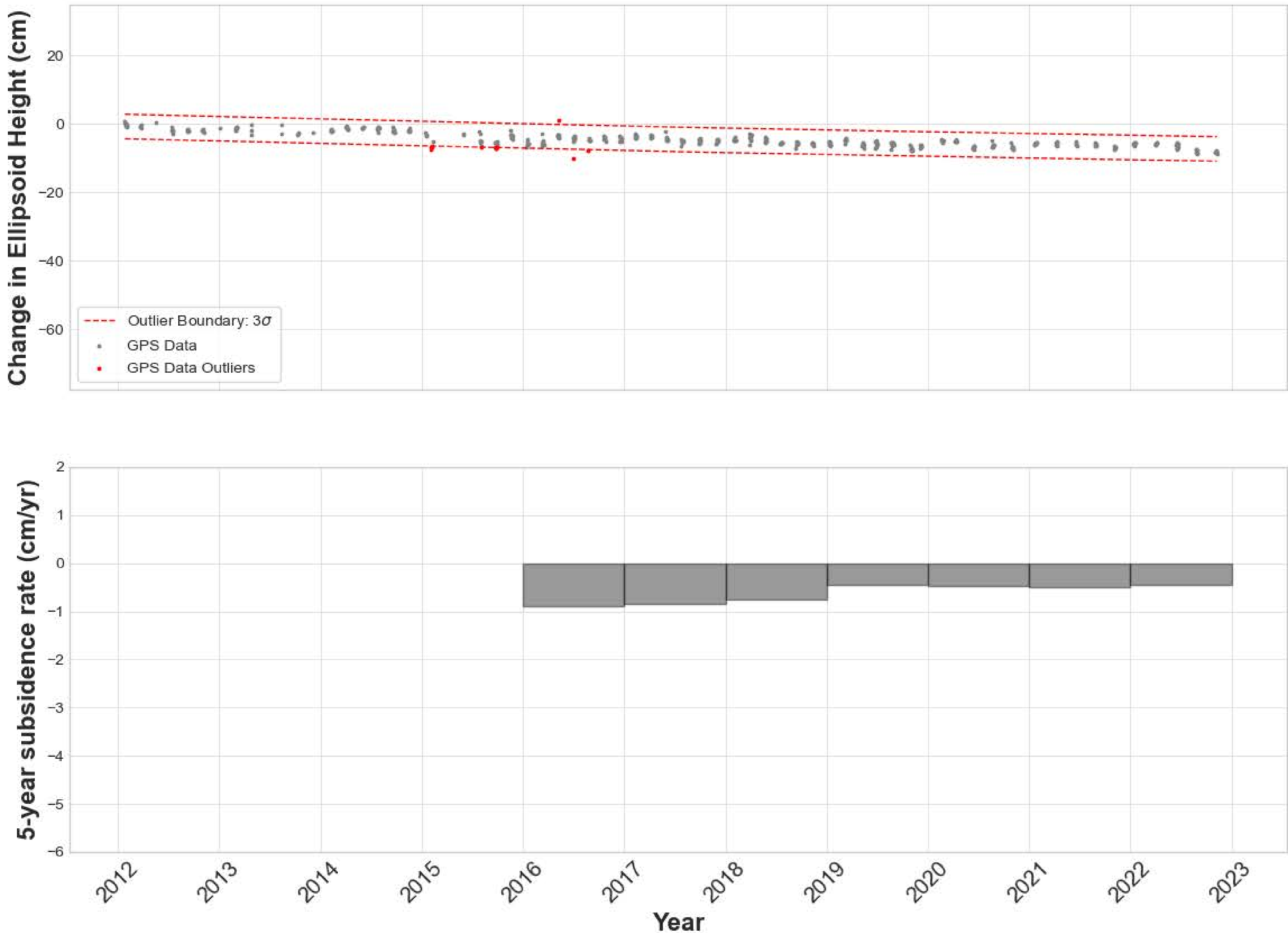

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P059



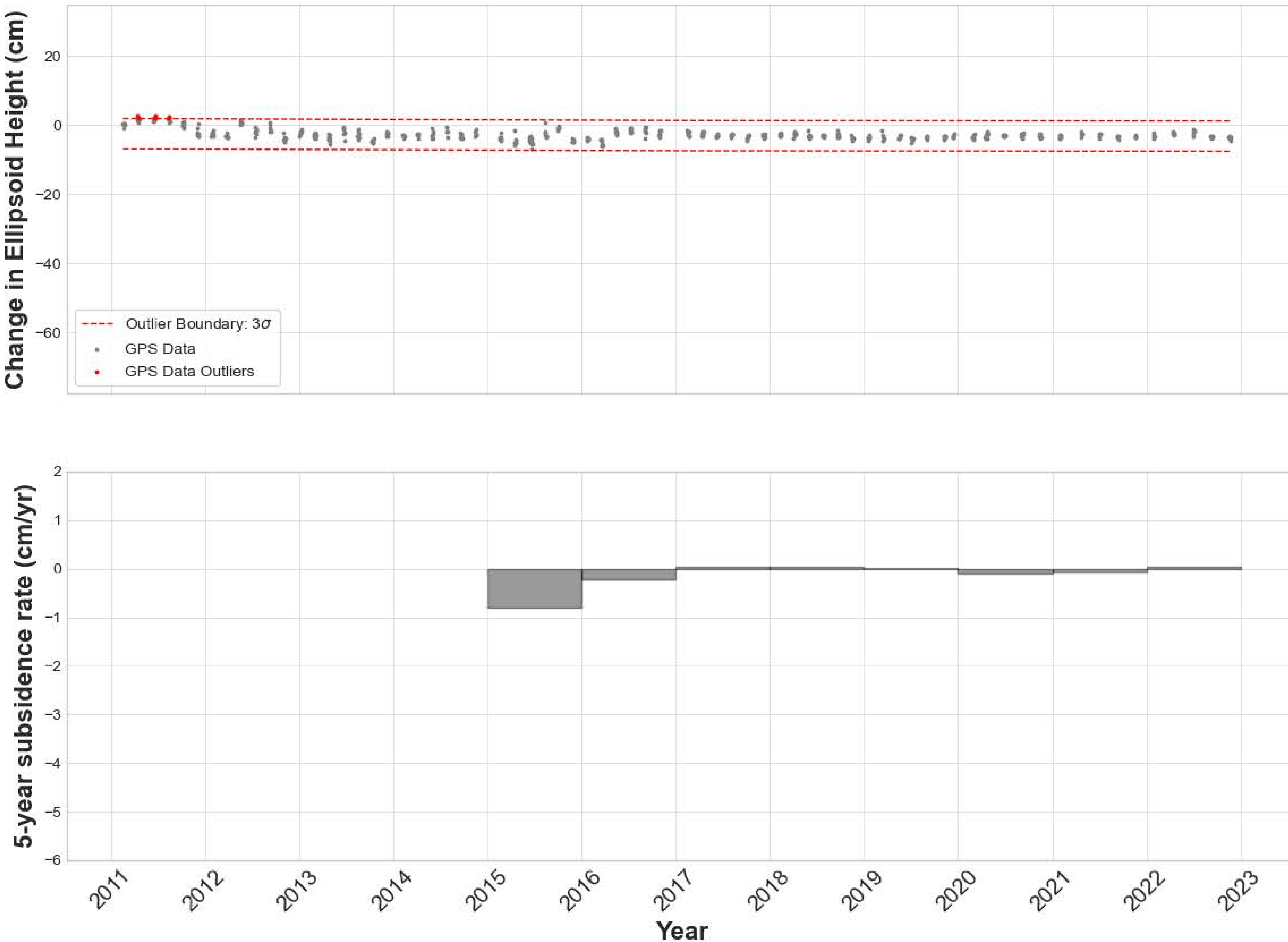

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P060



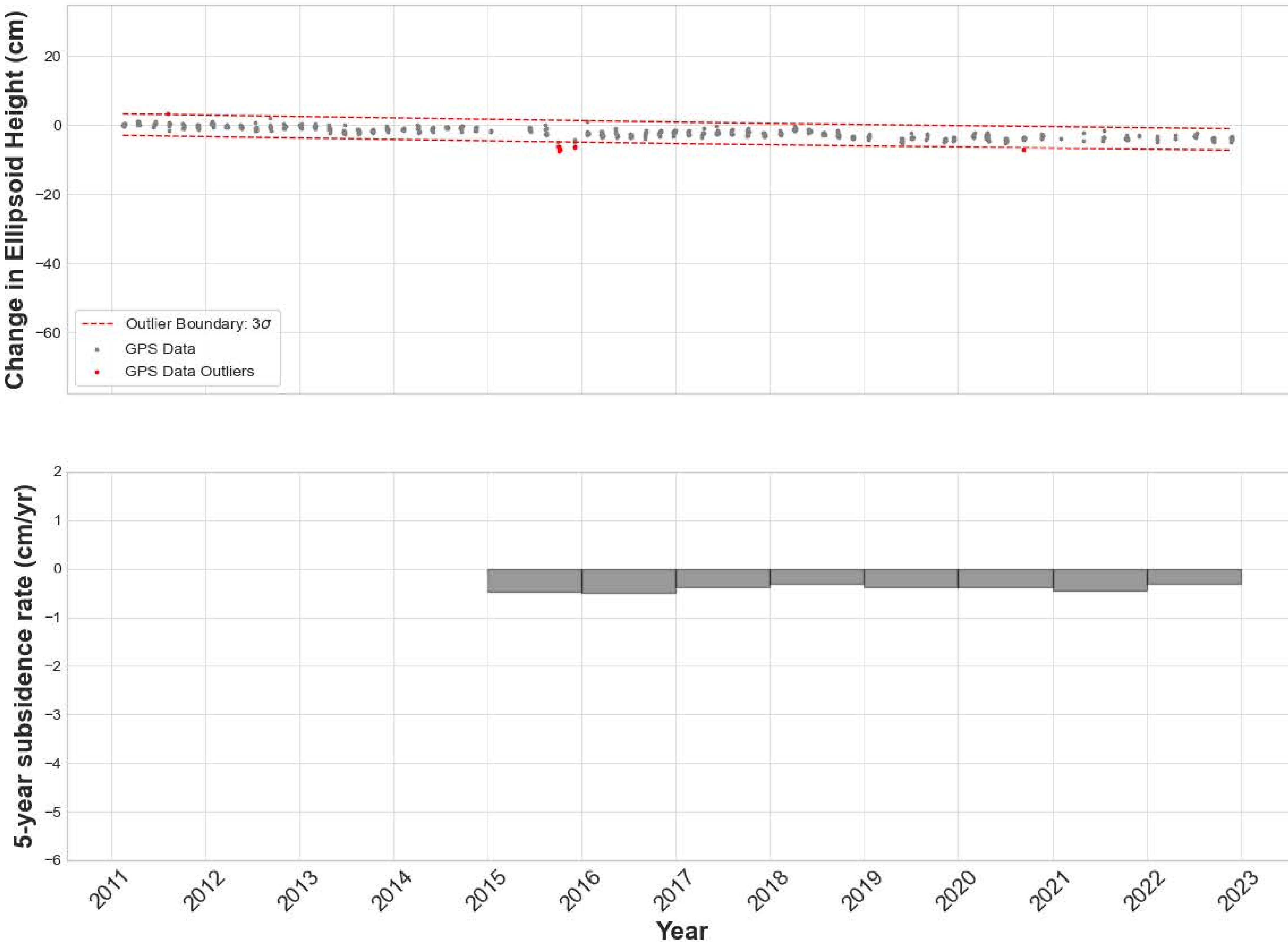

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P061



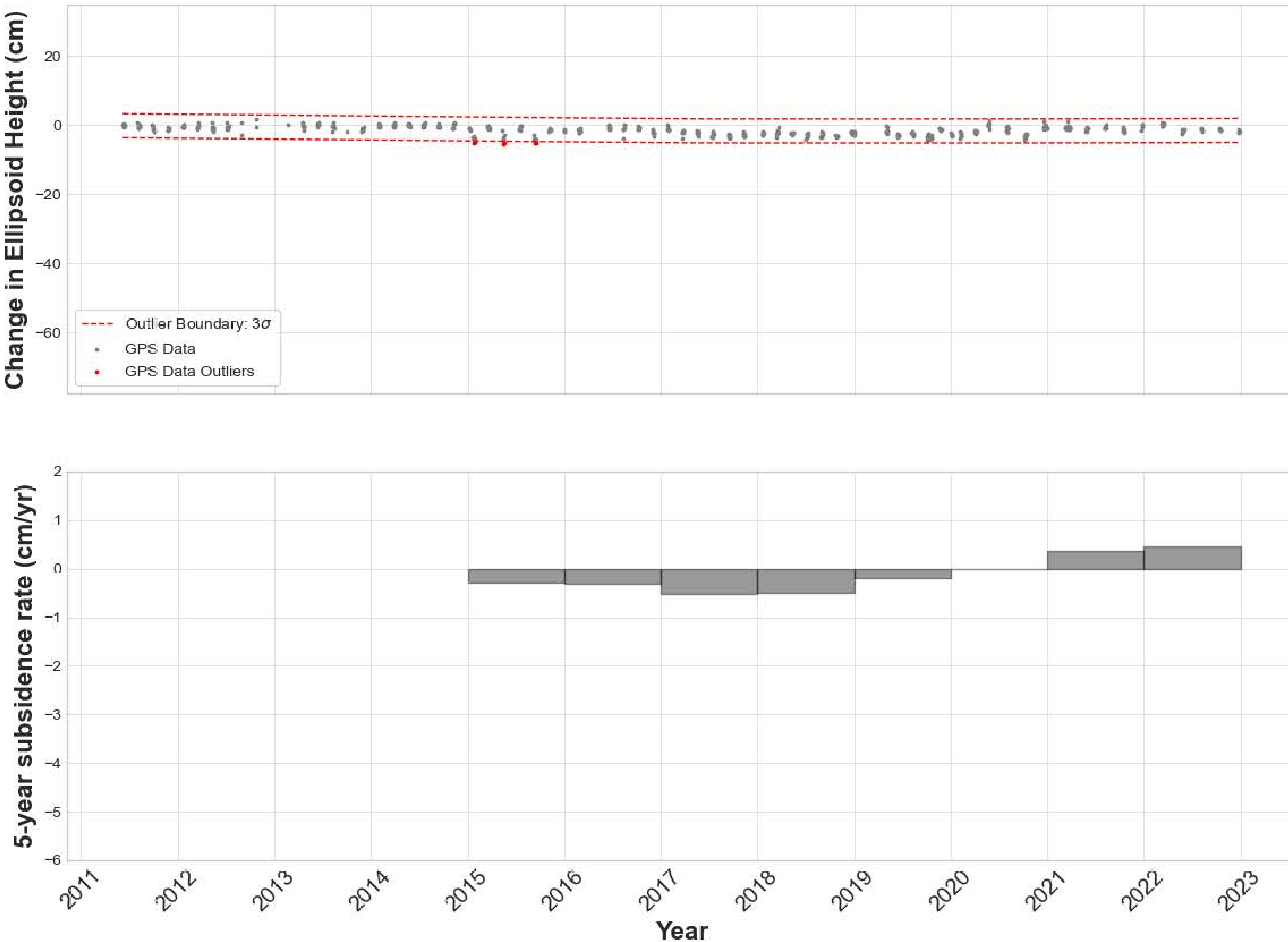

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P062



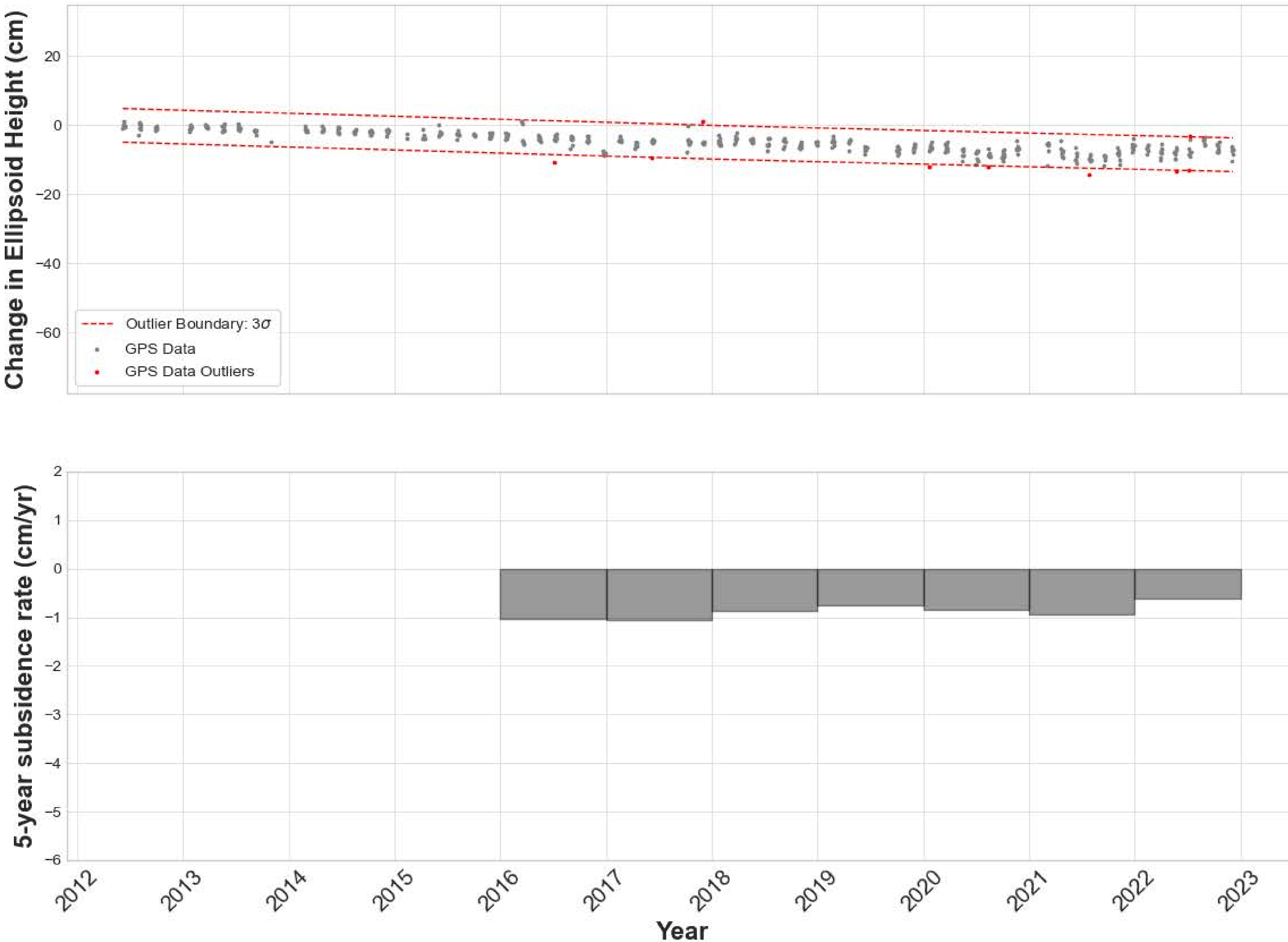

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P063



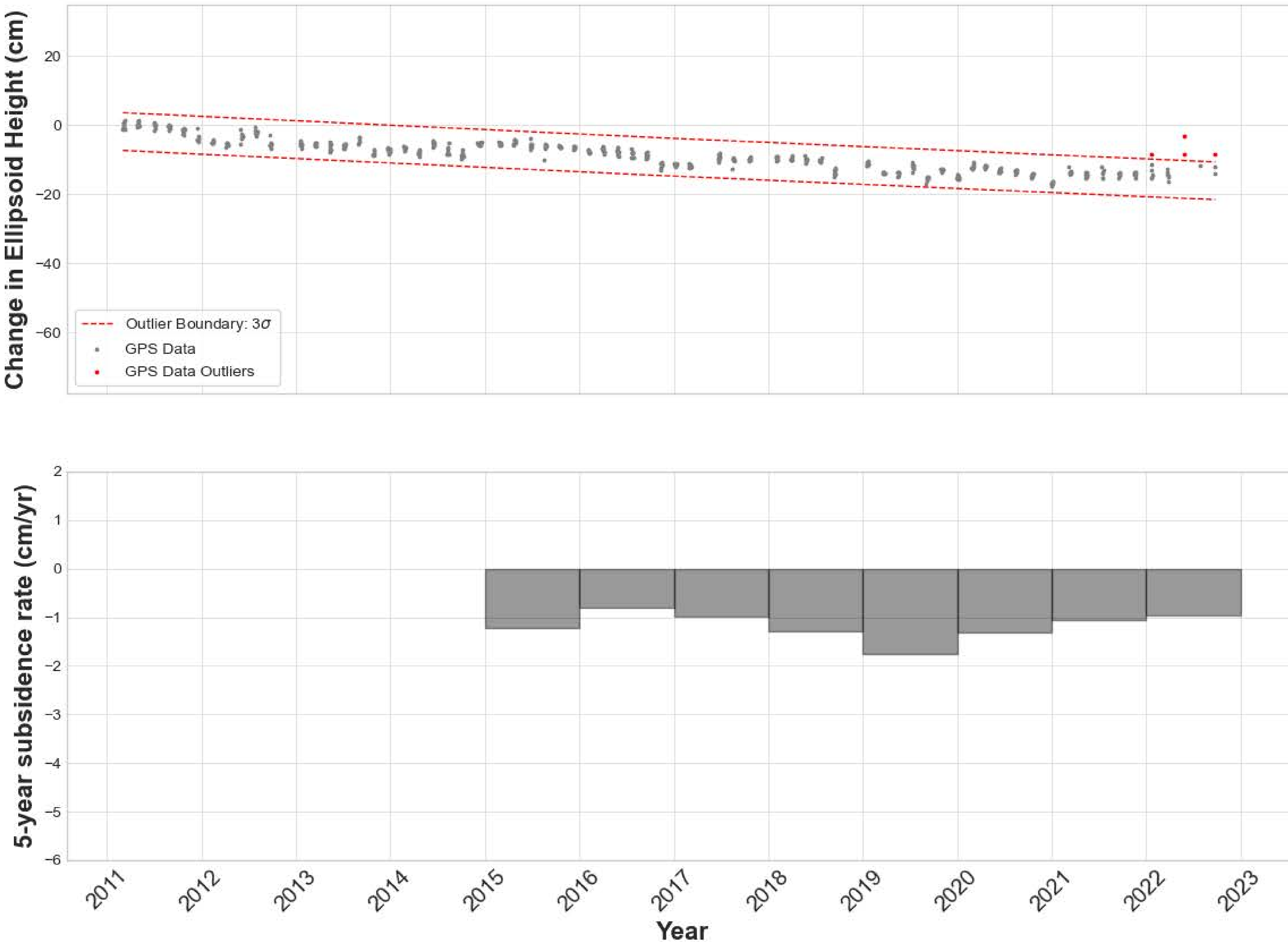

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P065



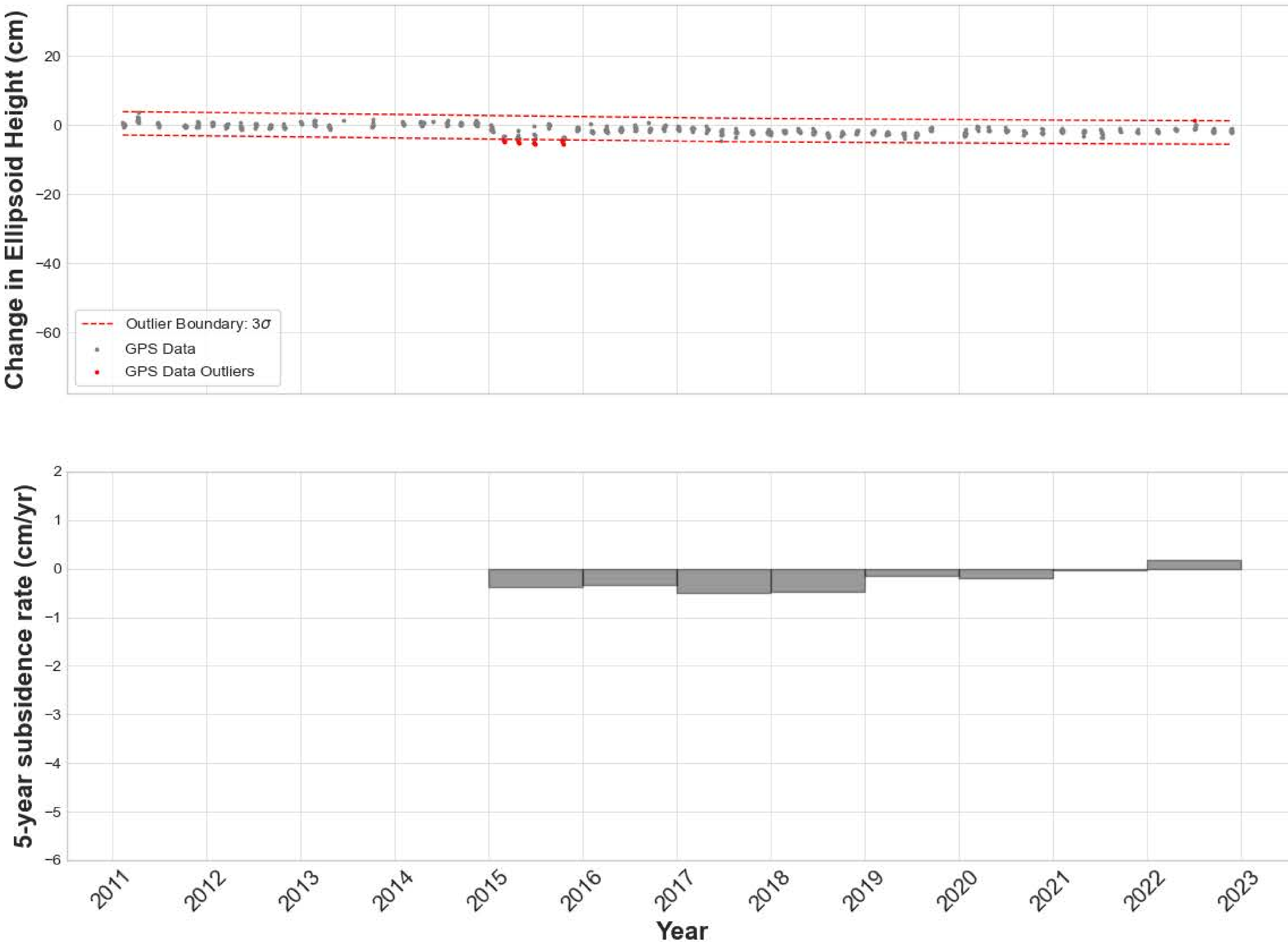

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P066



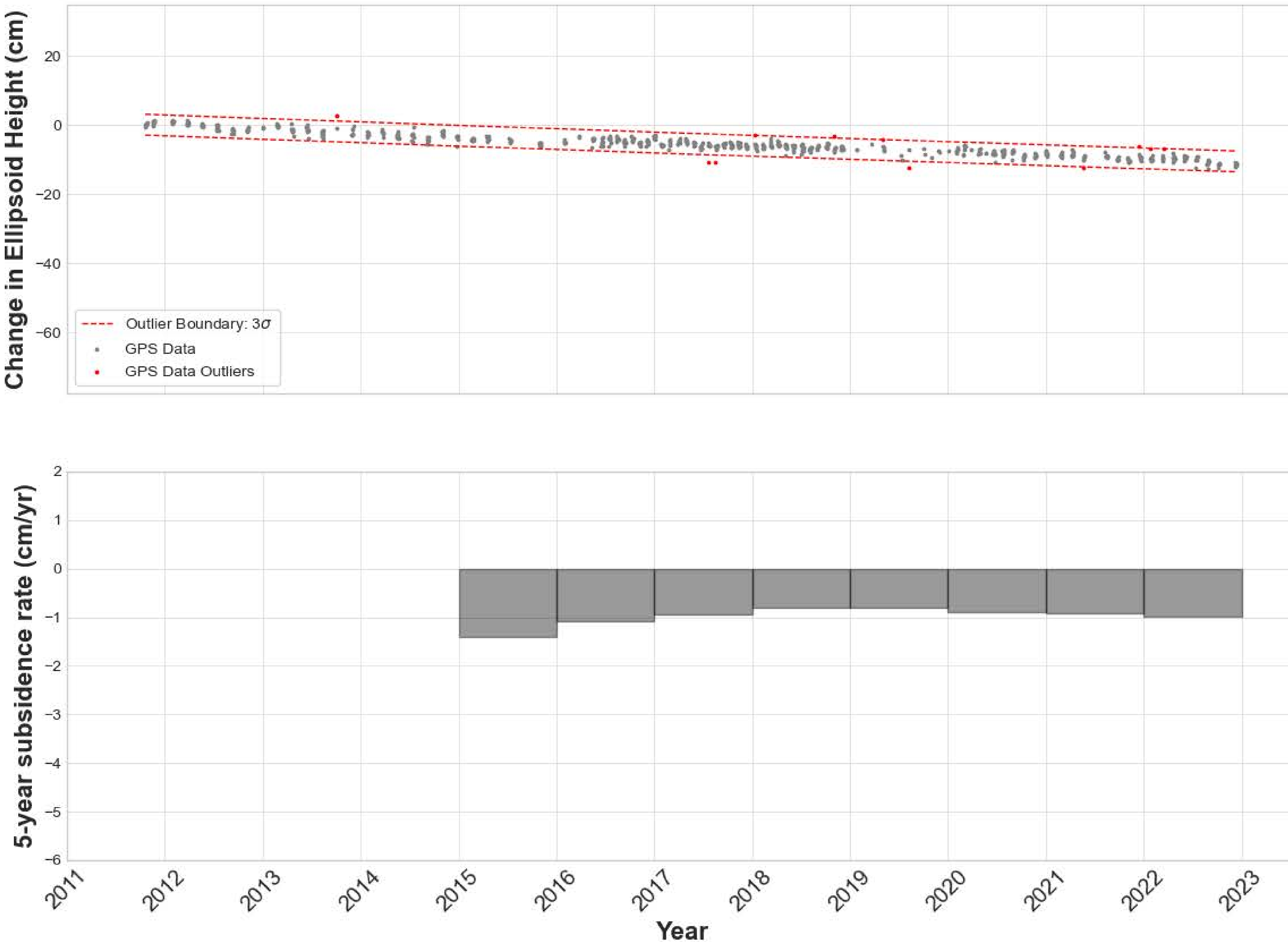

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P067



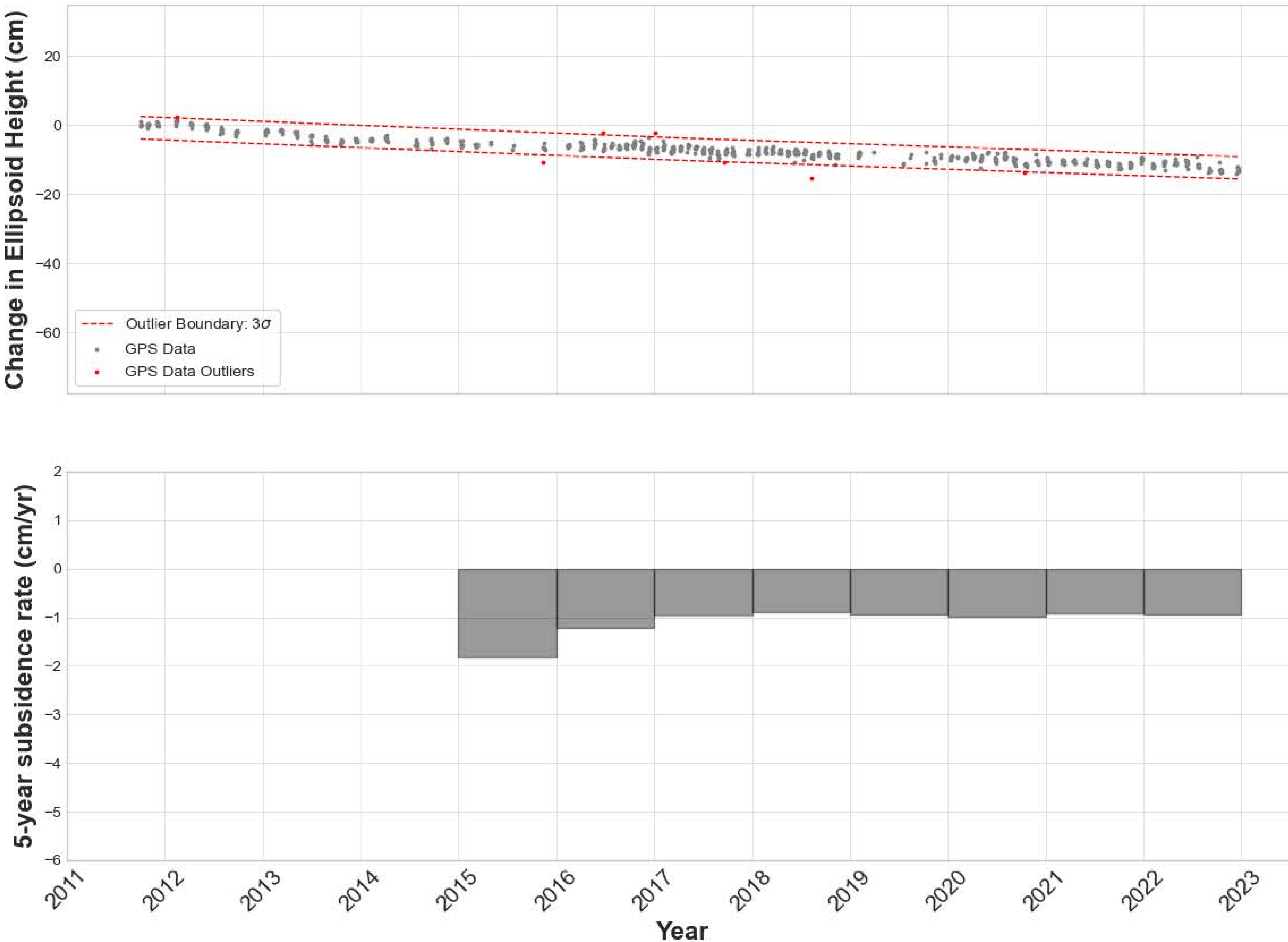

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P068



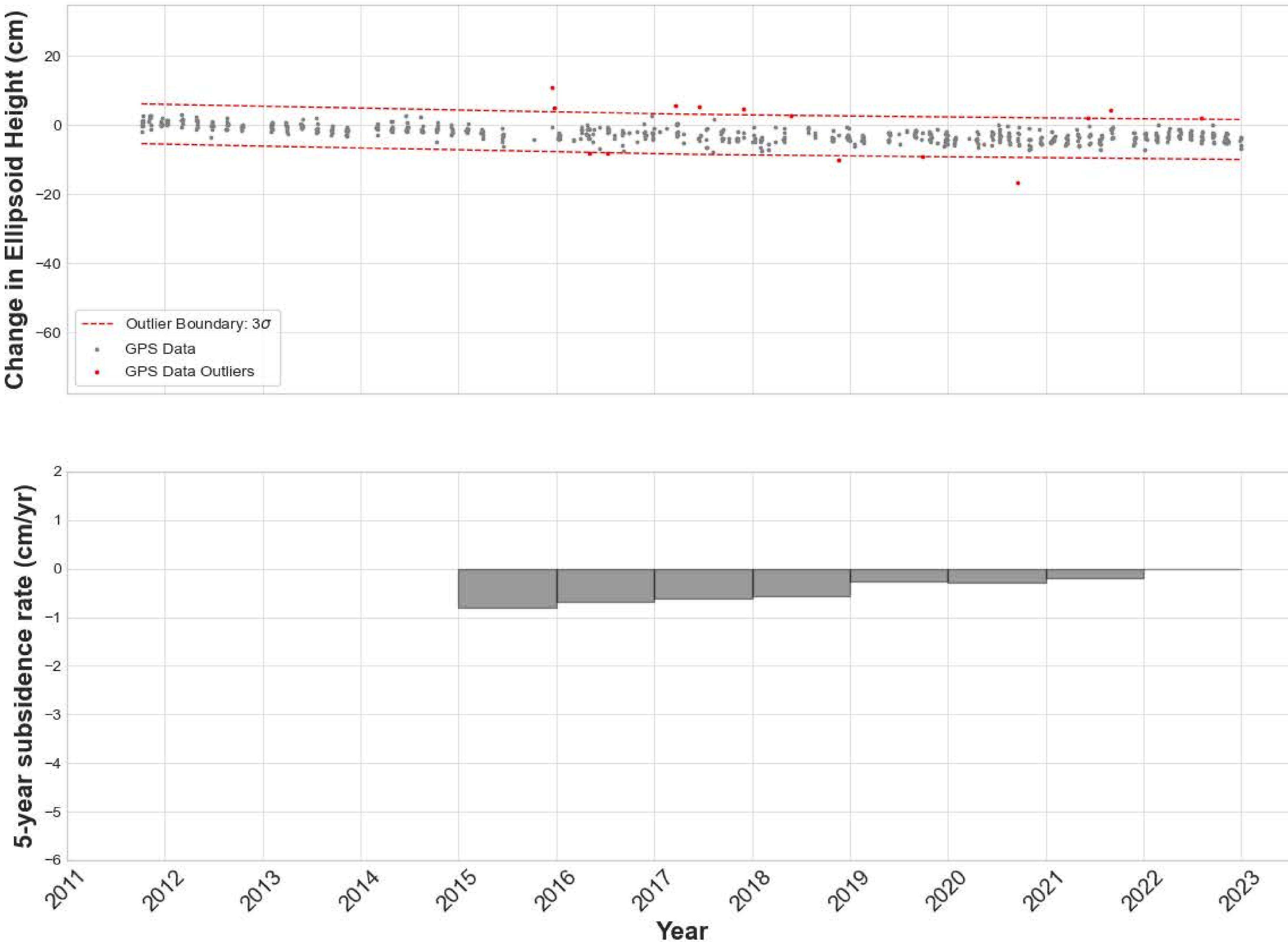

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P069



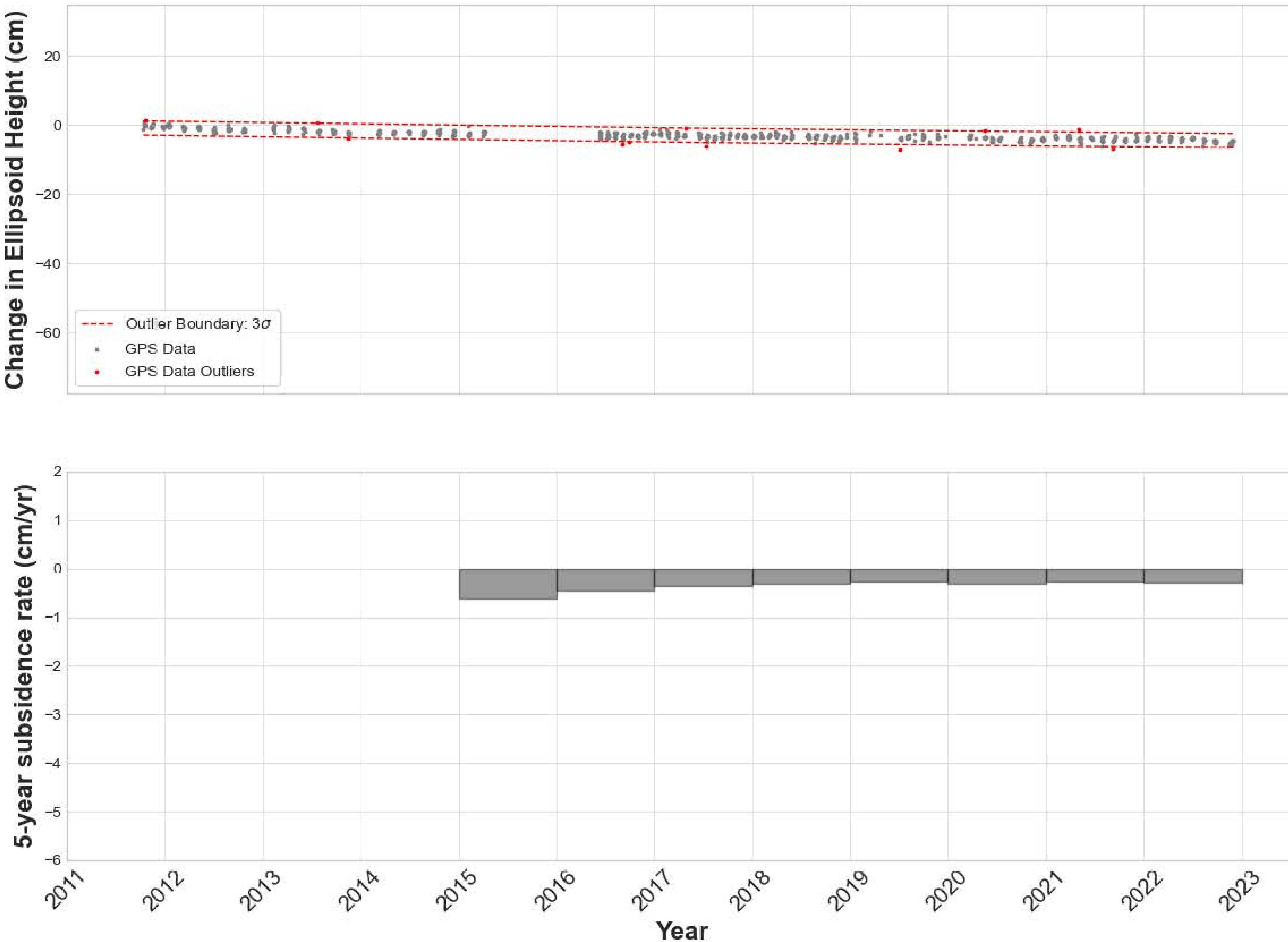

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P070



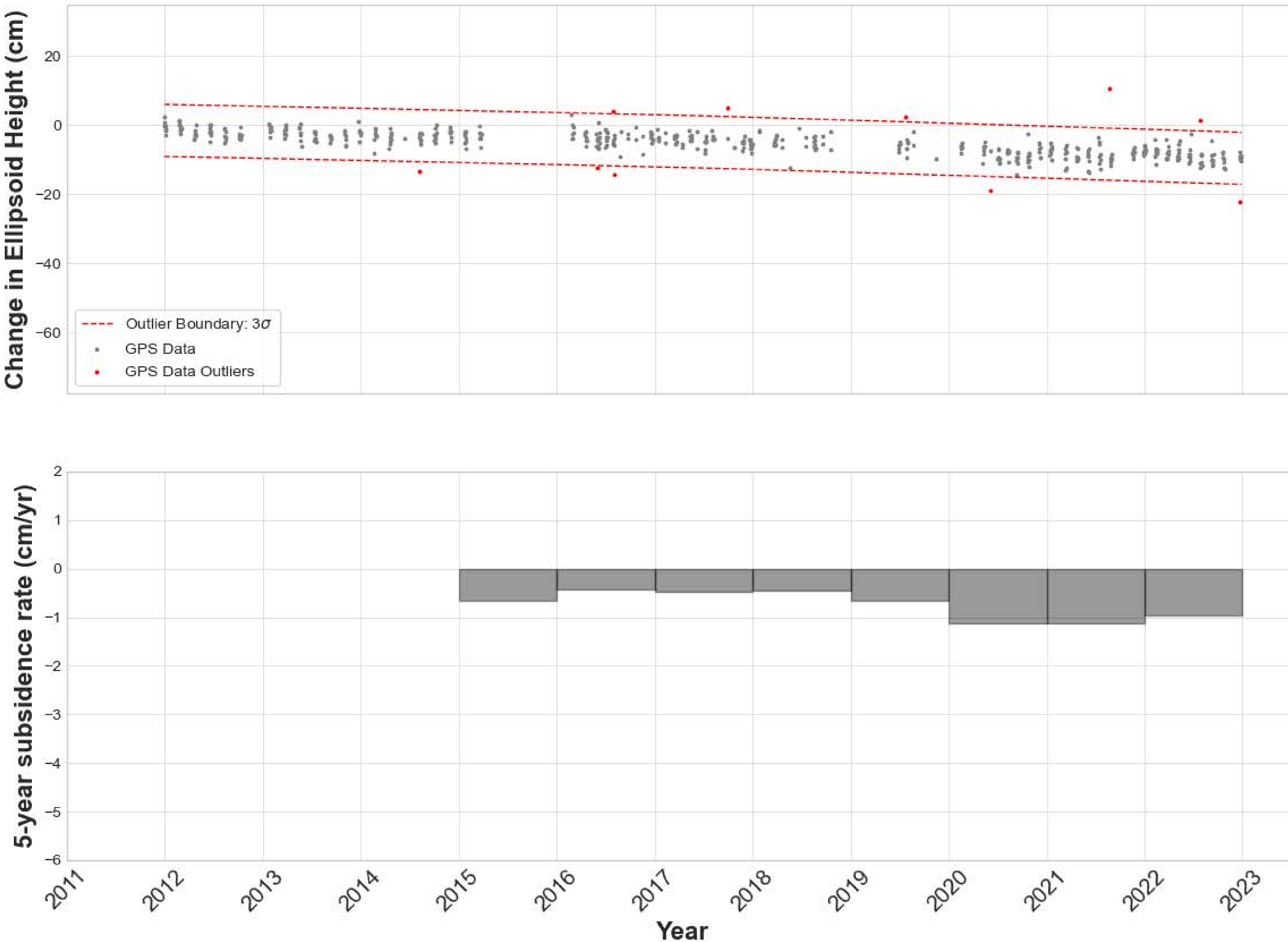

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P071



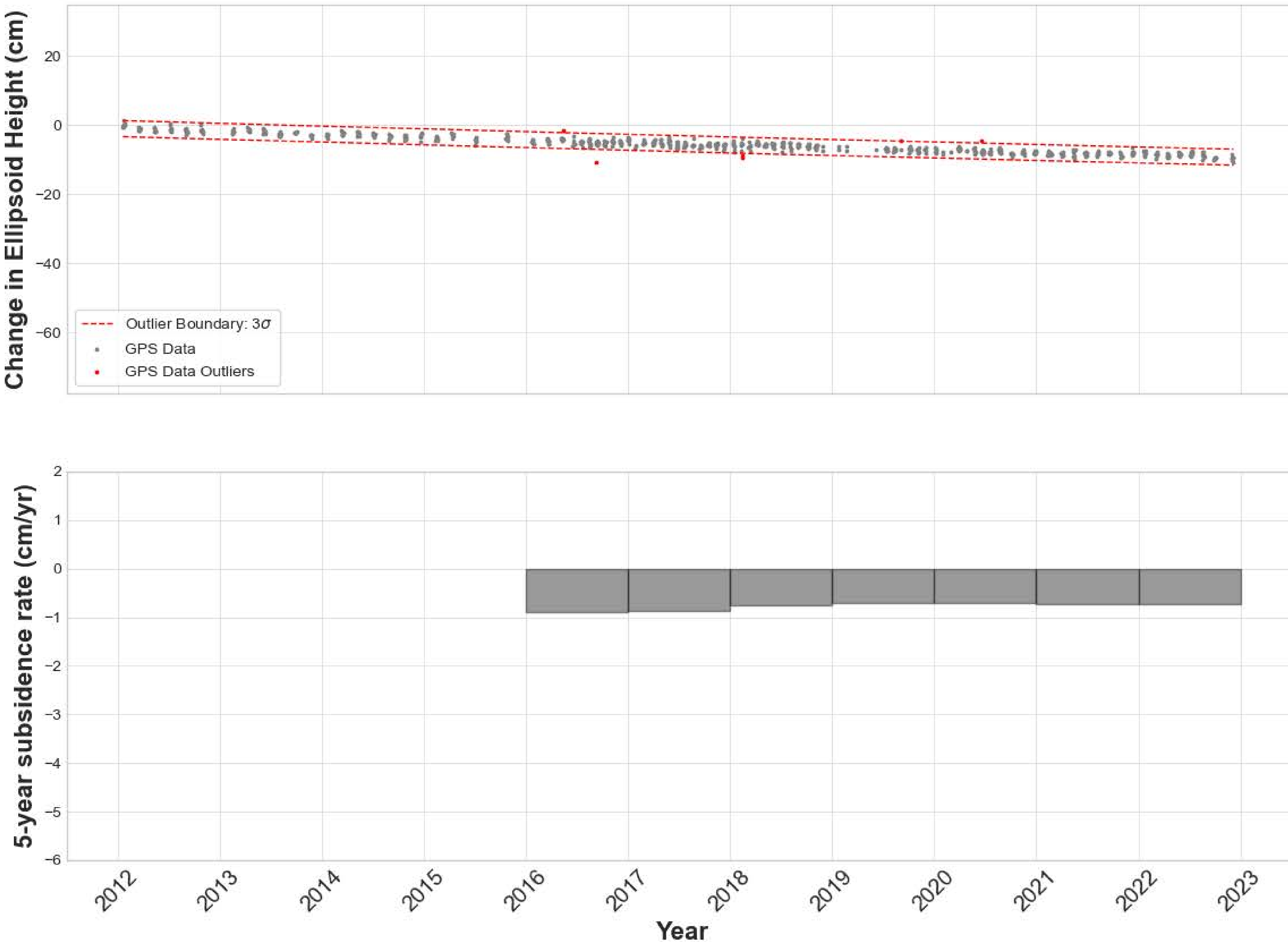

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P072



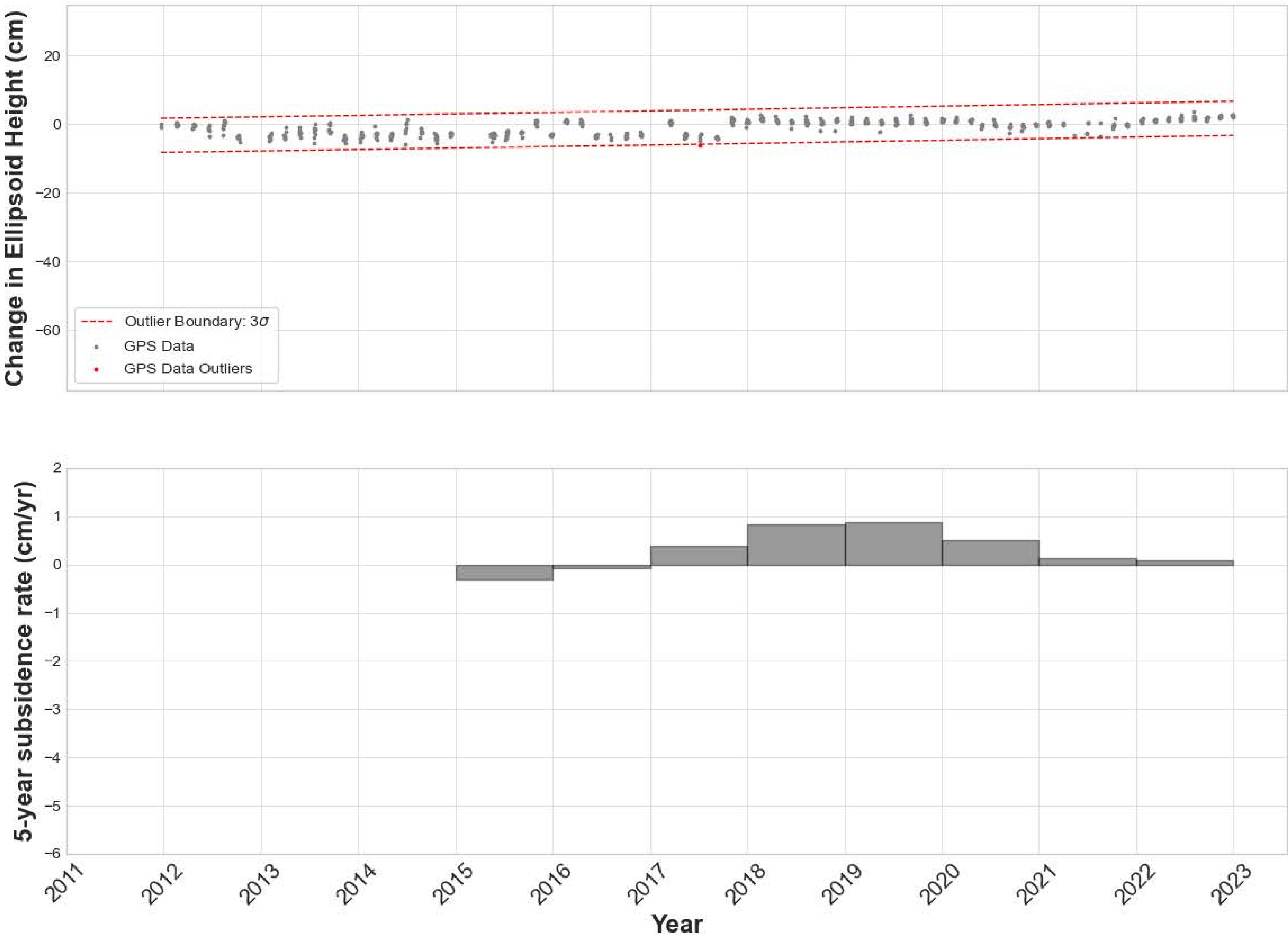

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P073



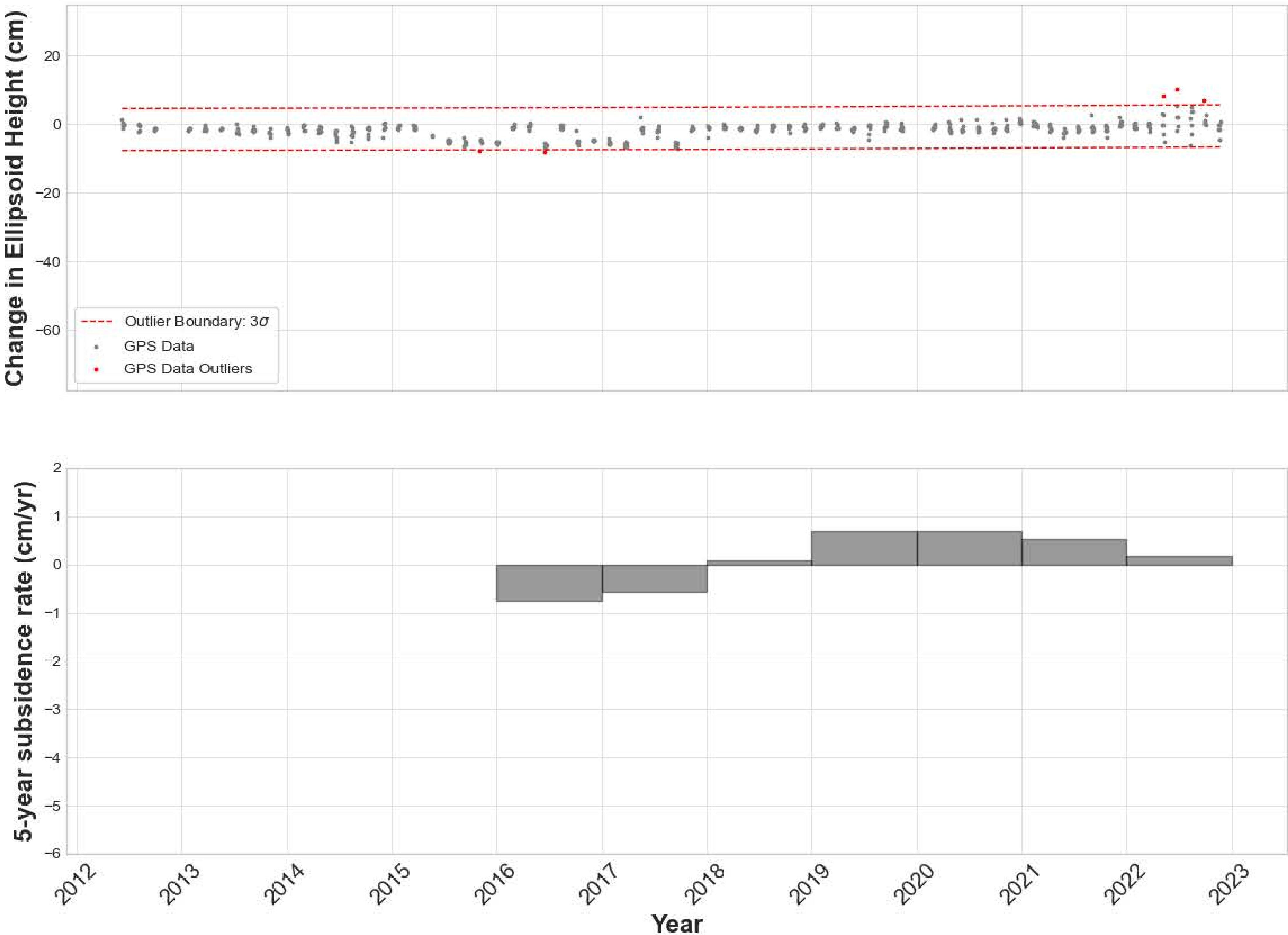

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P074



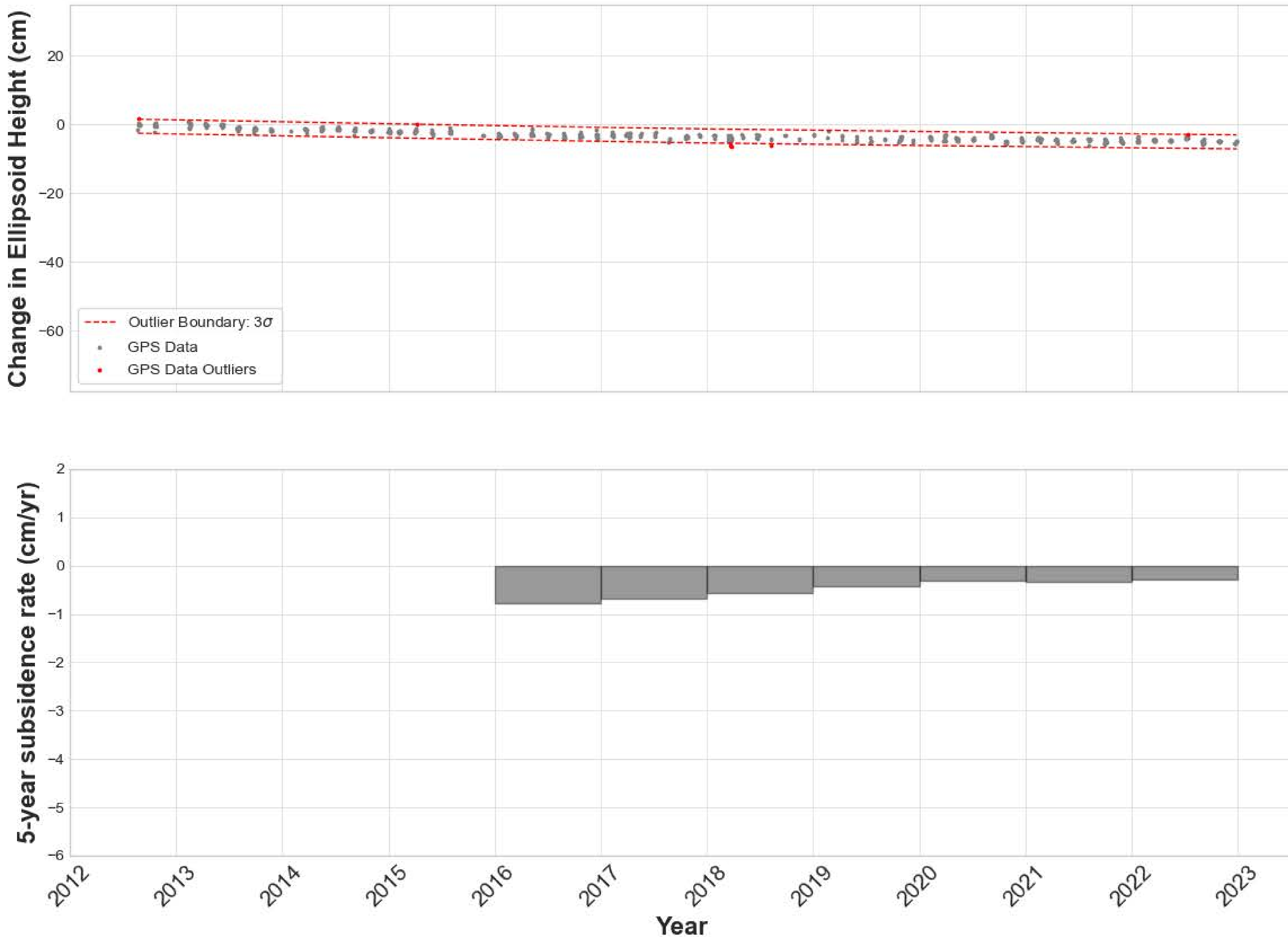

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P075



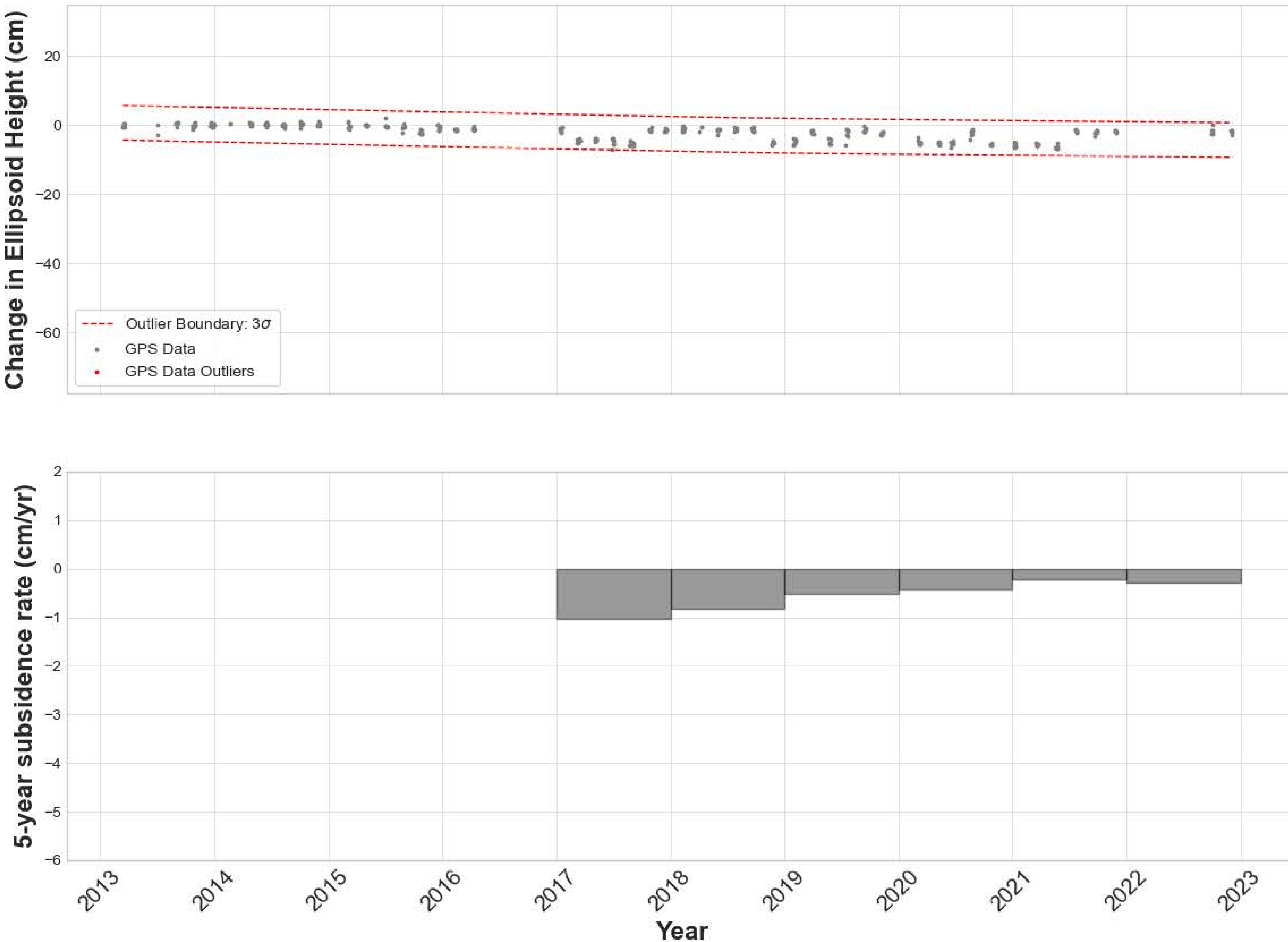

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P076



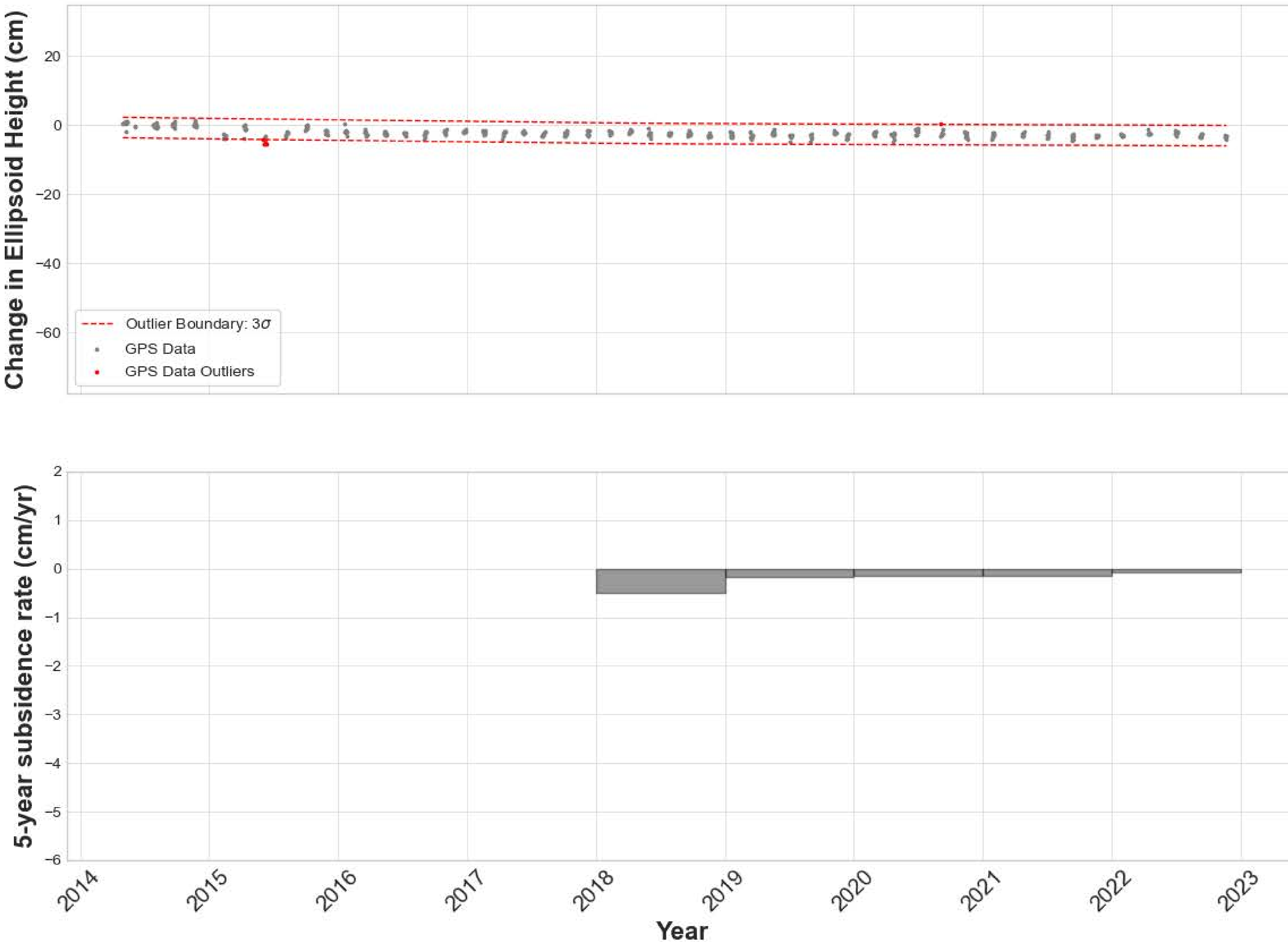

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P077



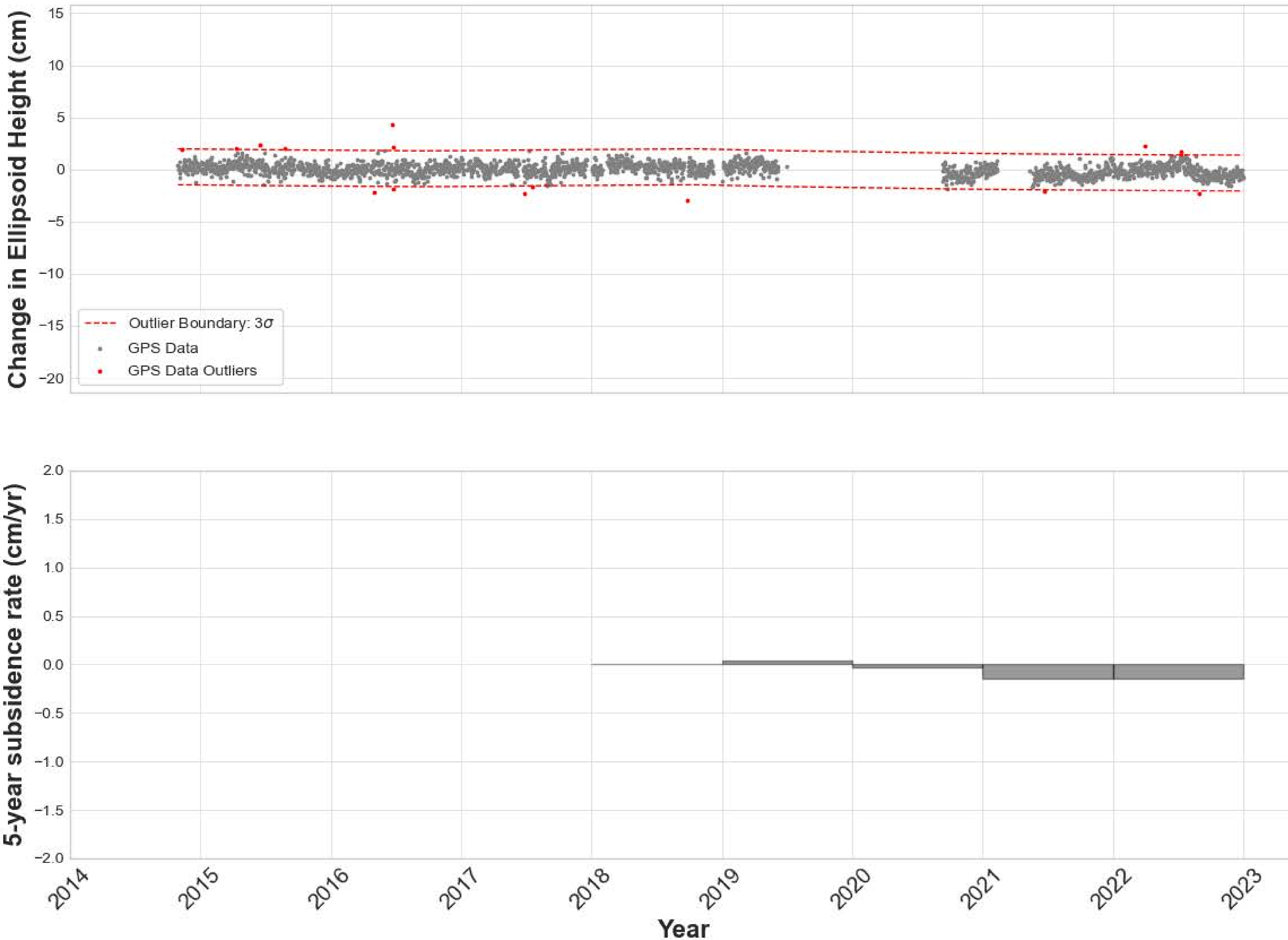

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P078



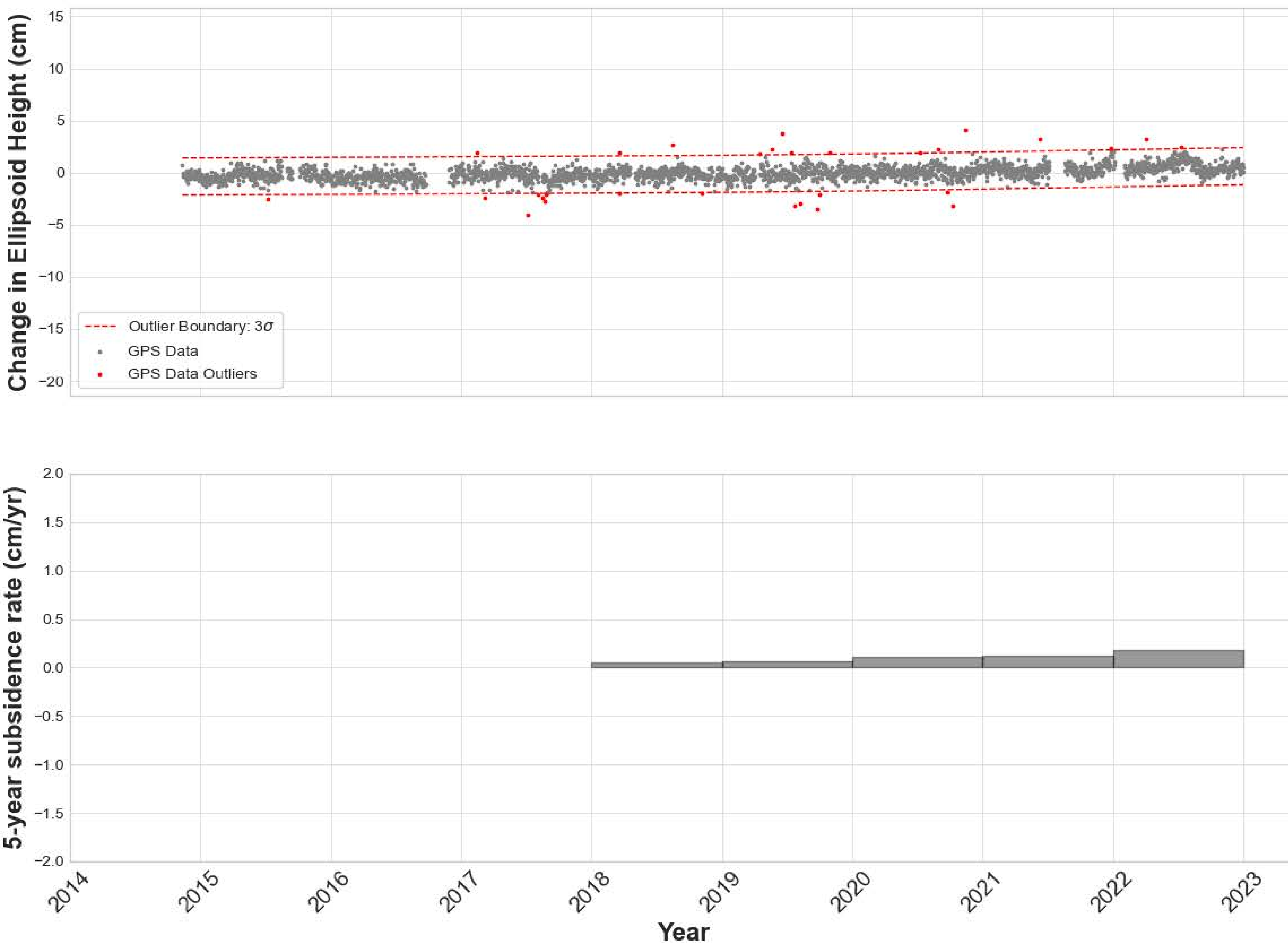

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P079



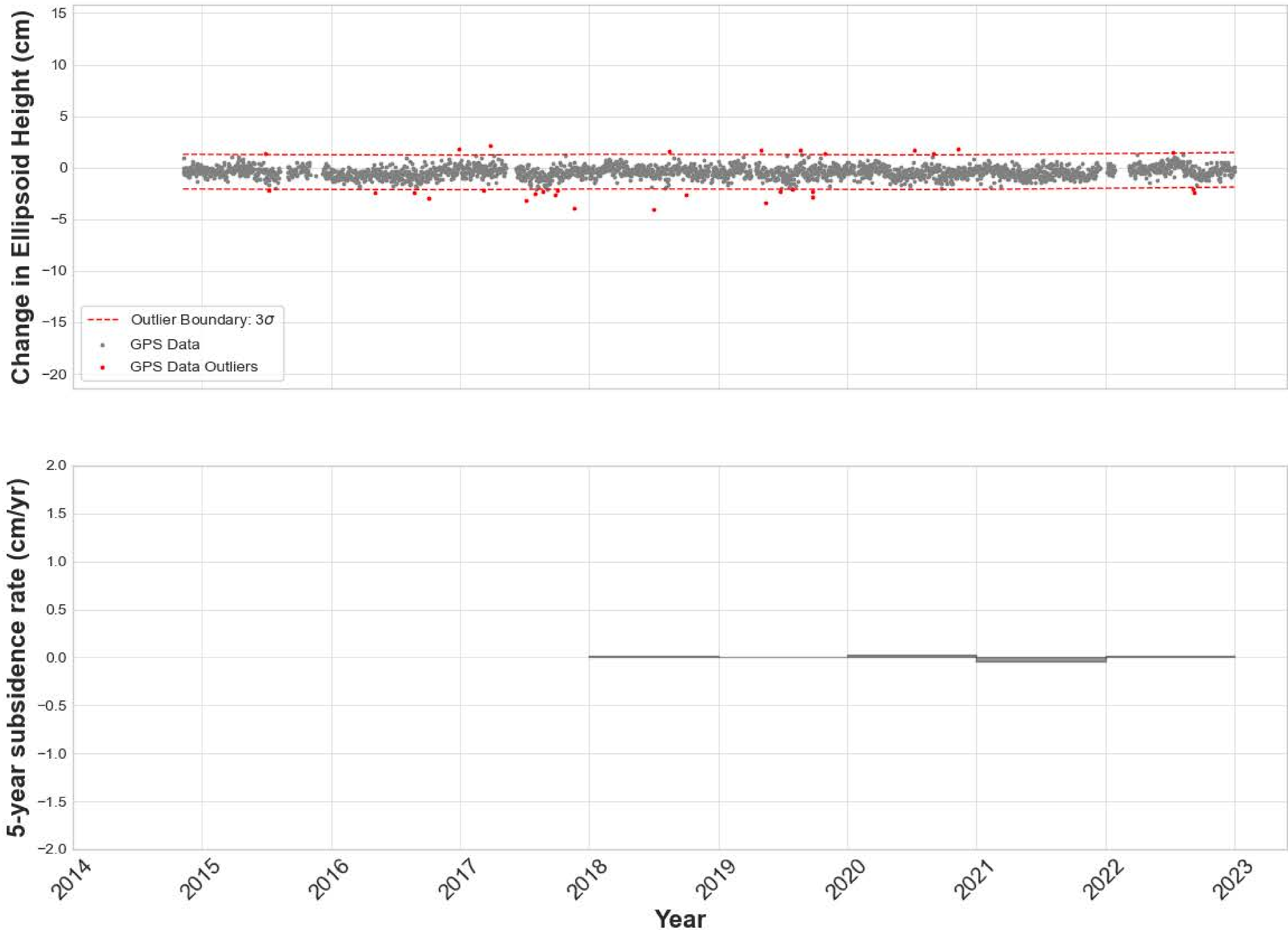

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P080



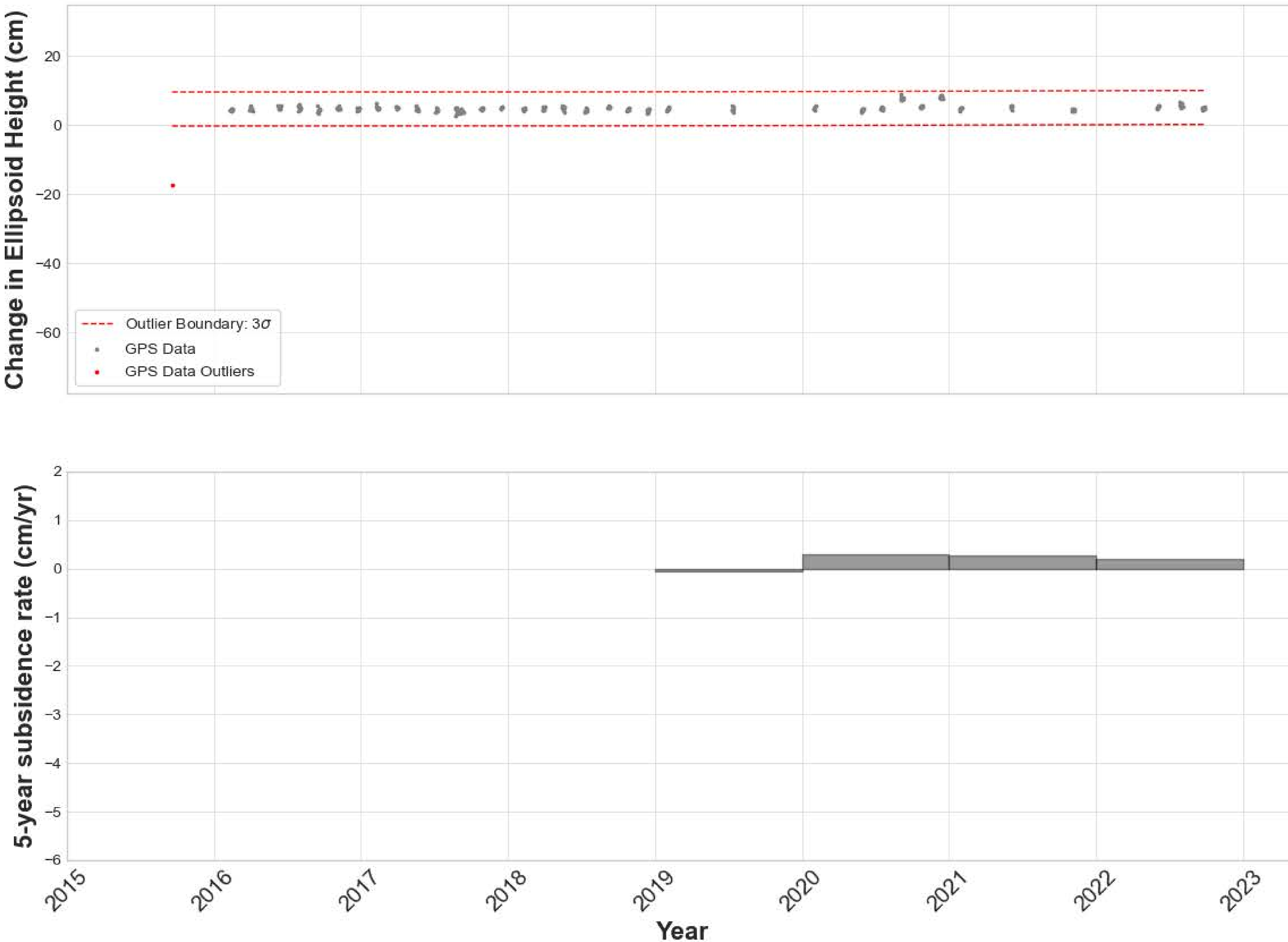

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P081



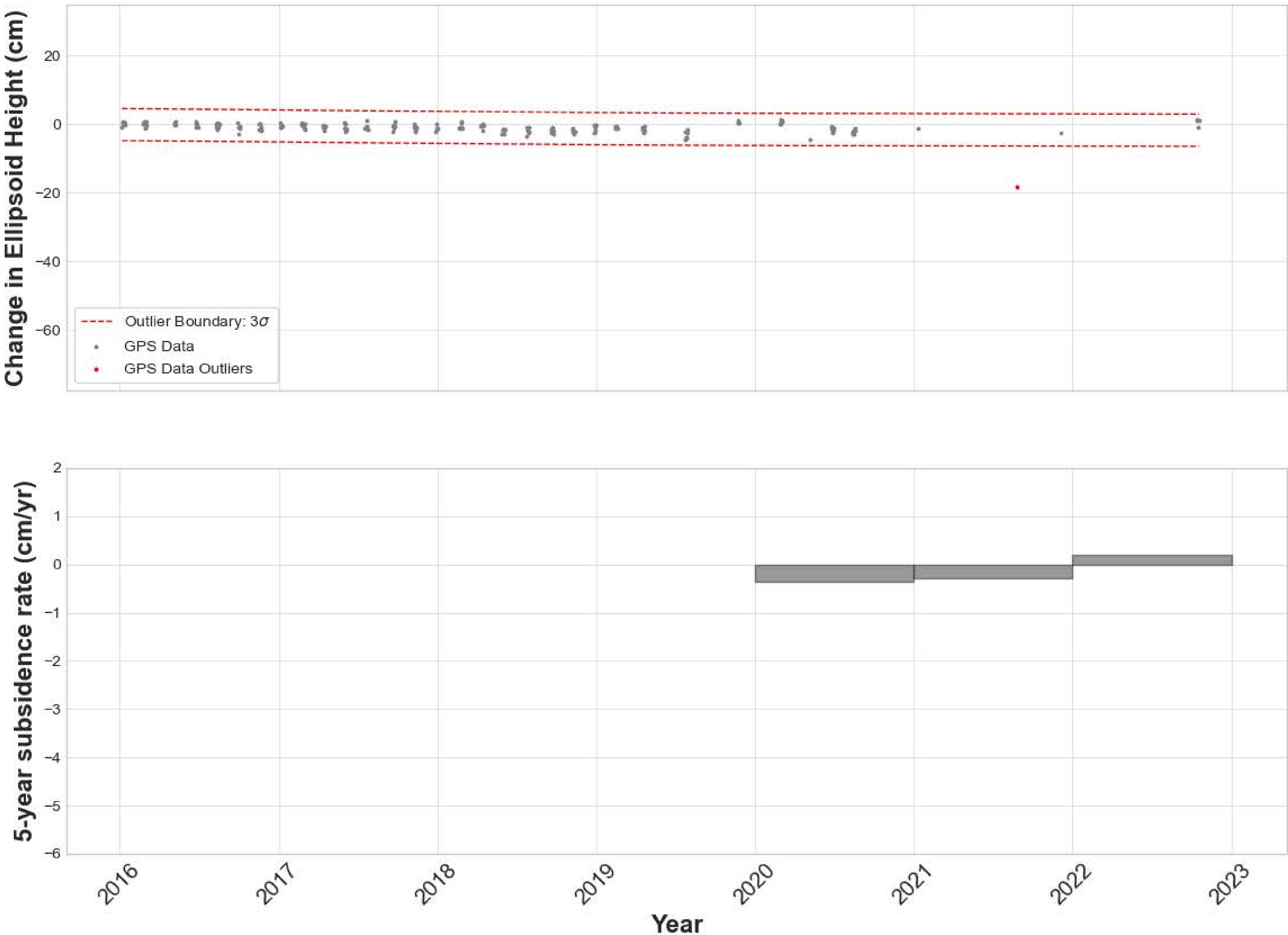

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P082



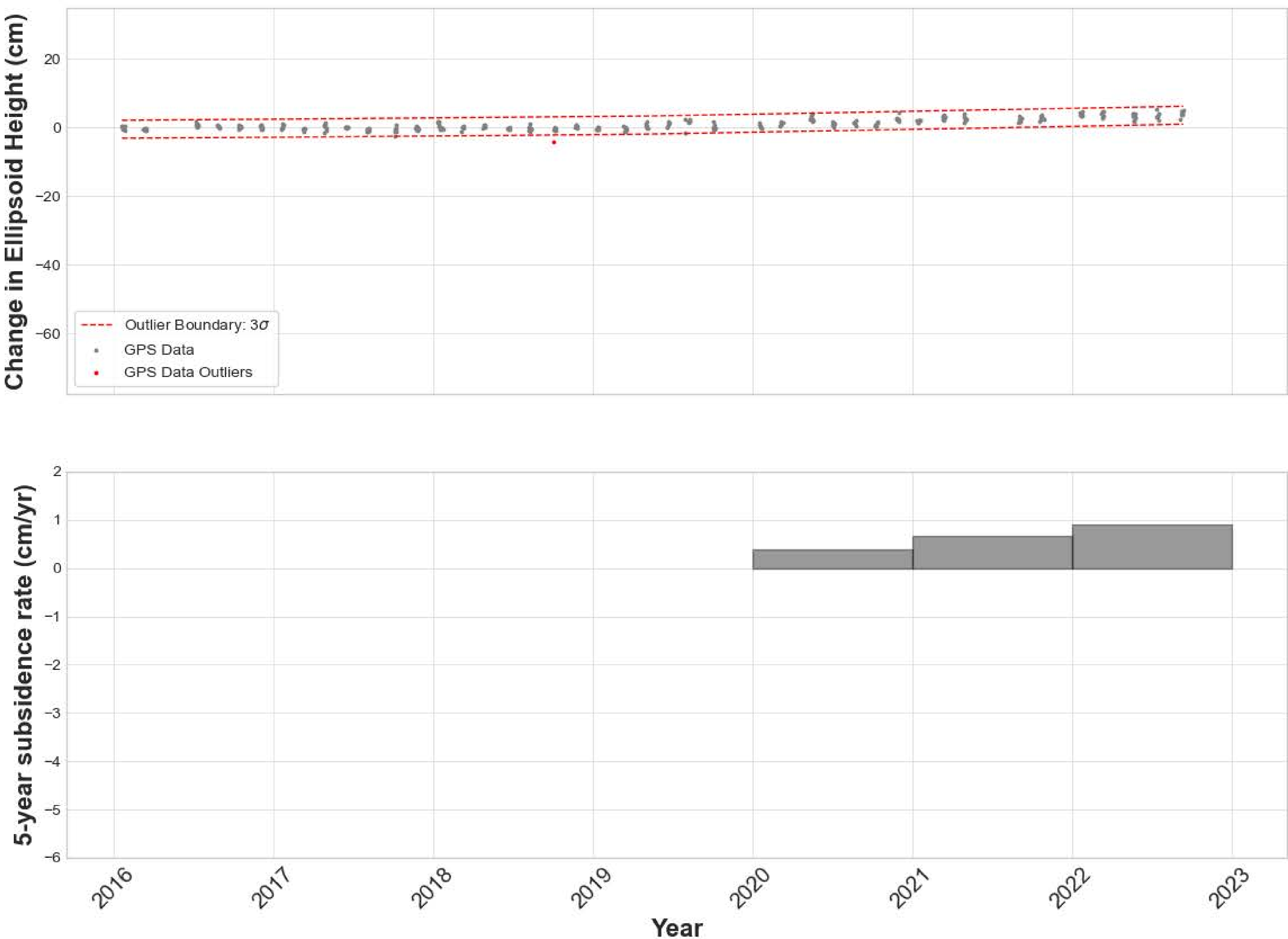

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P083



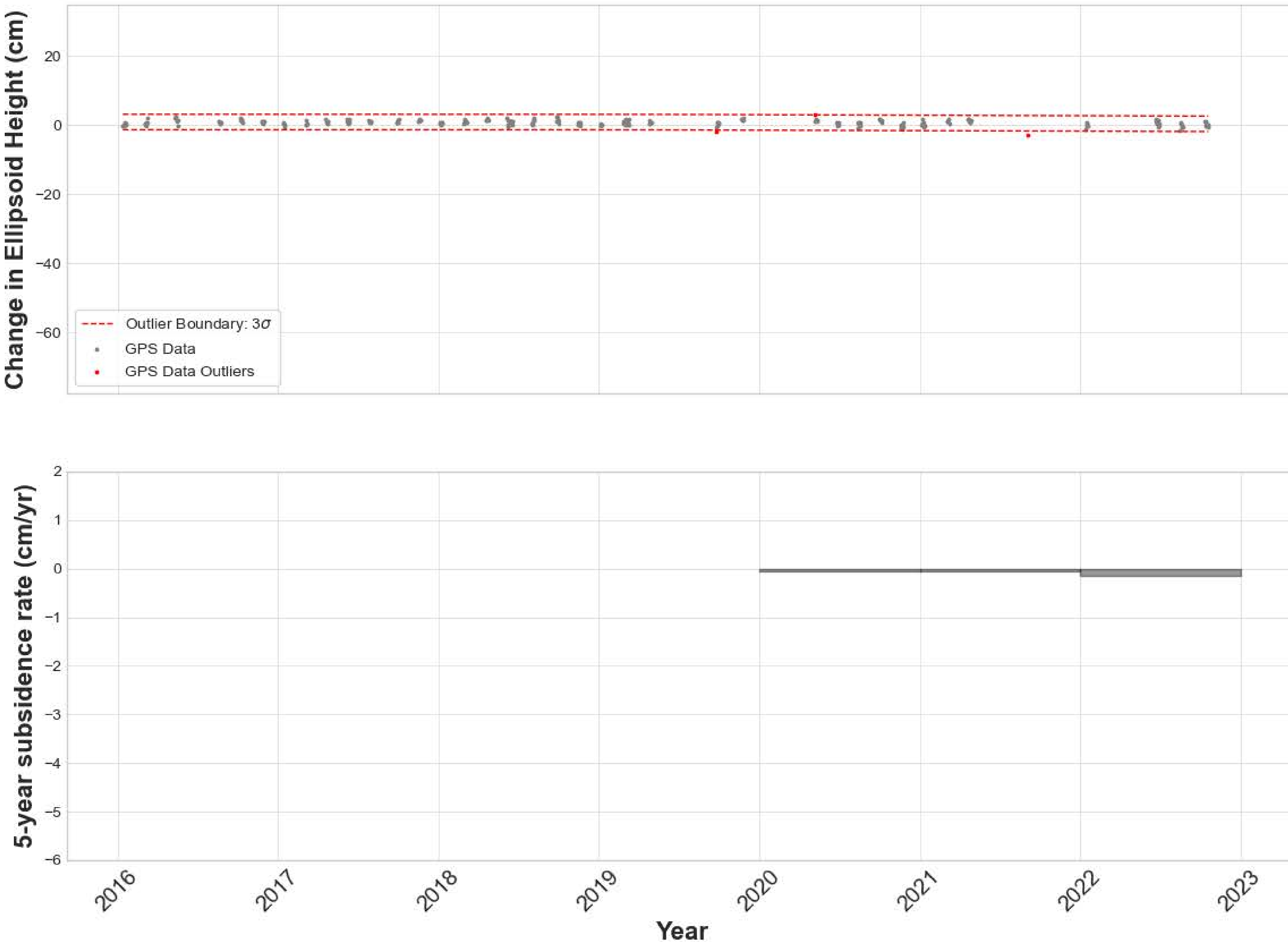

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P084



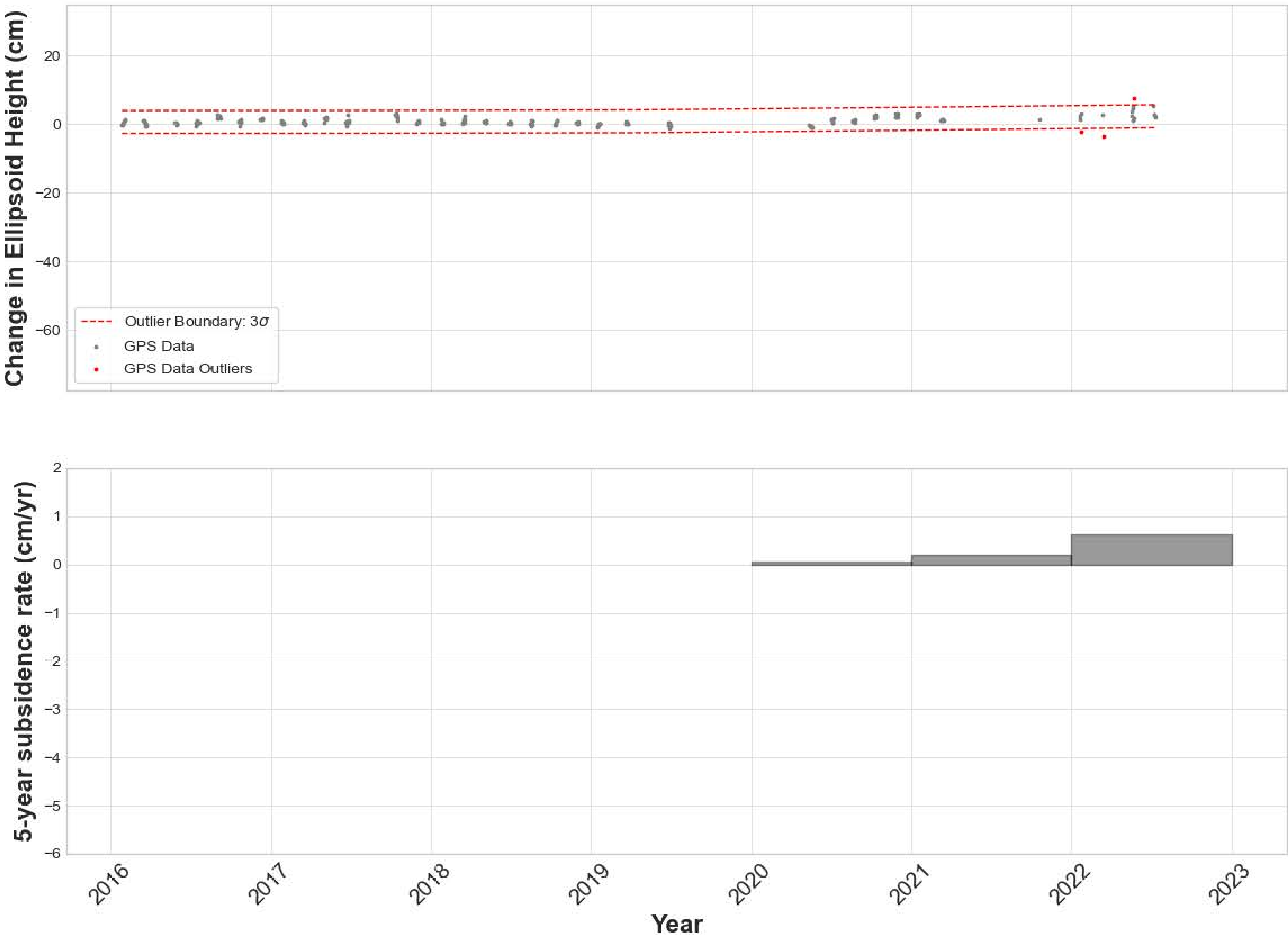

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P085



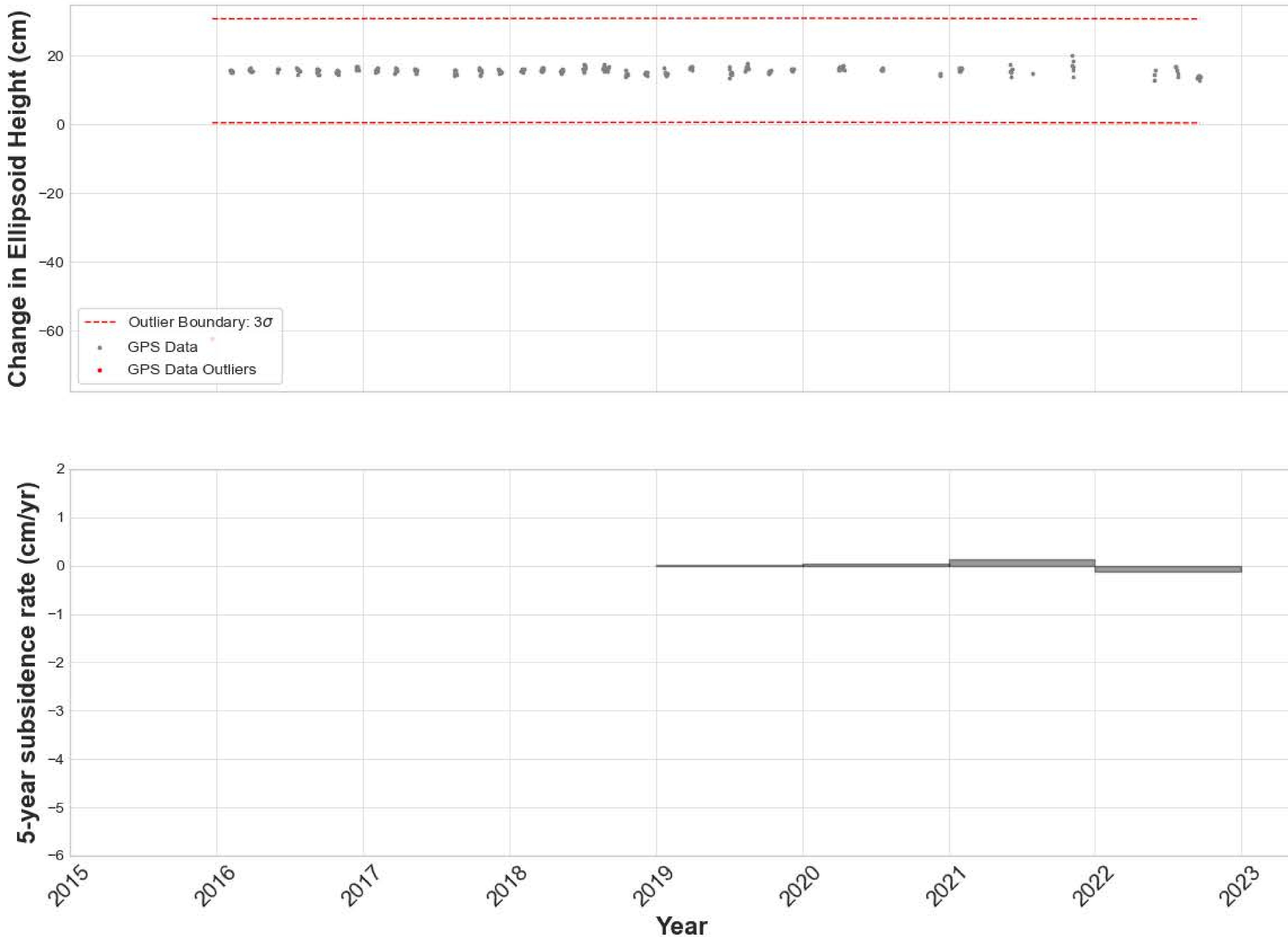

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P086

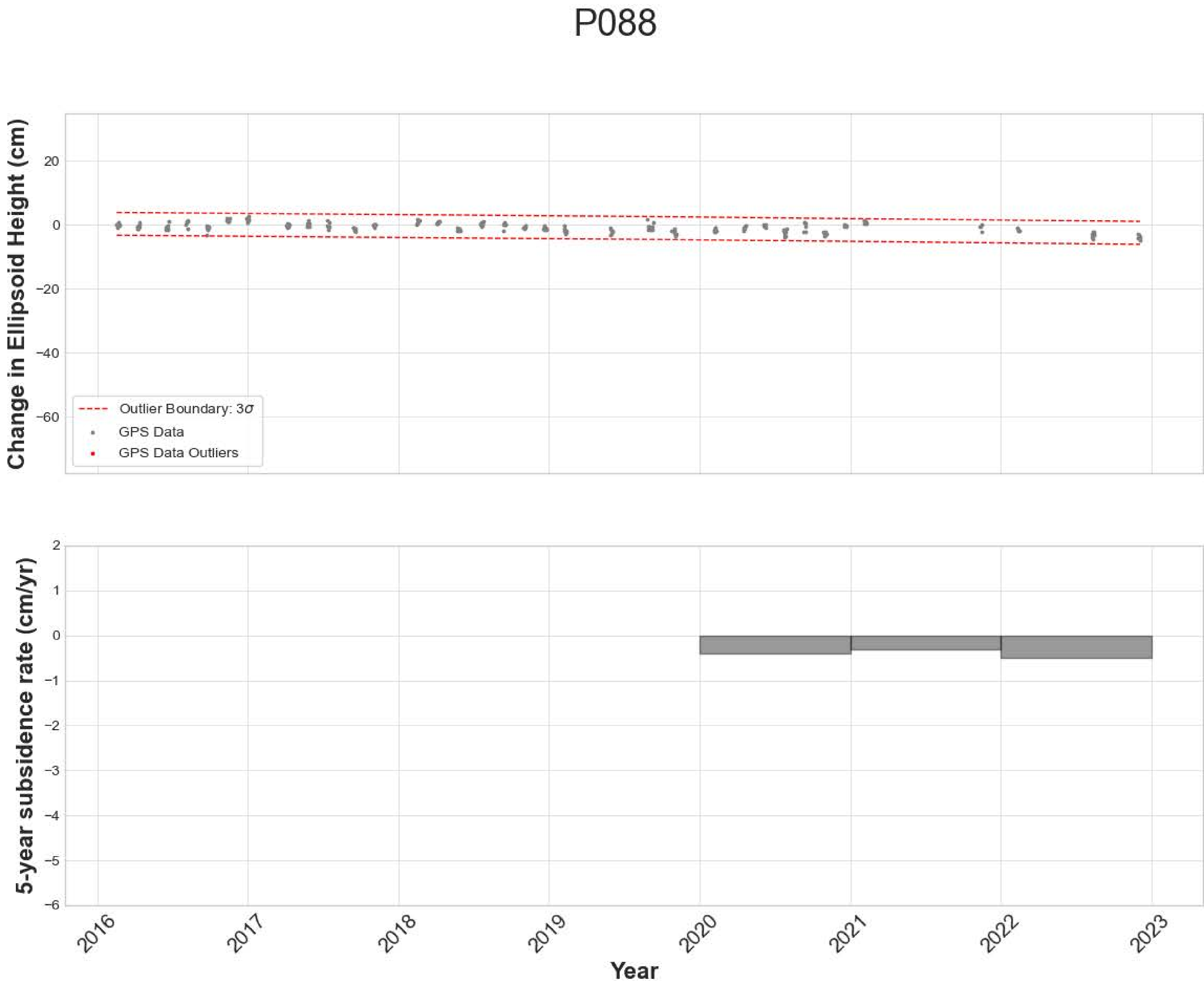



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P087

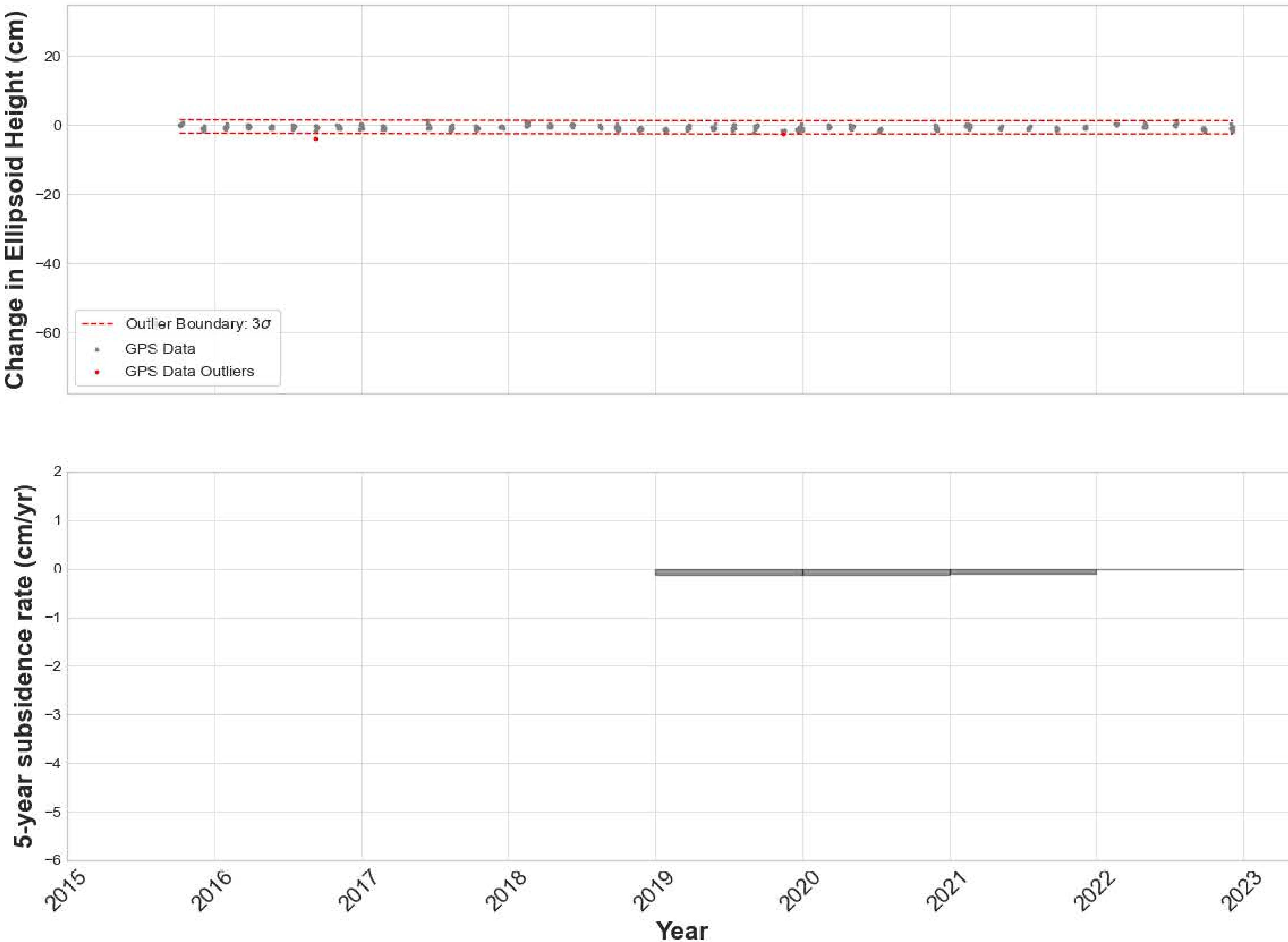



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.



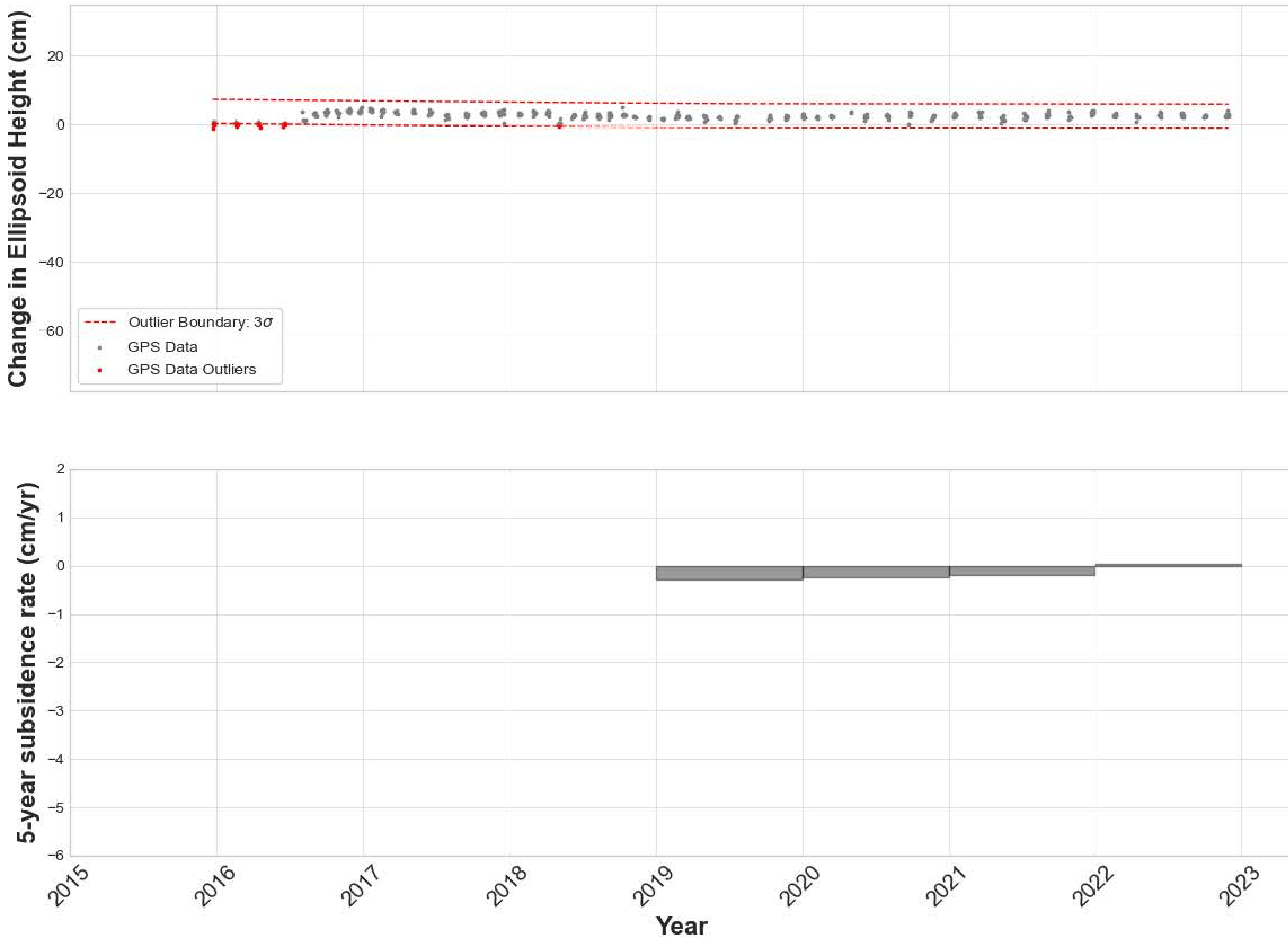

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P089



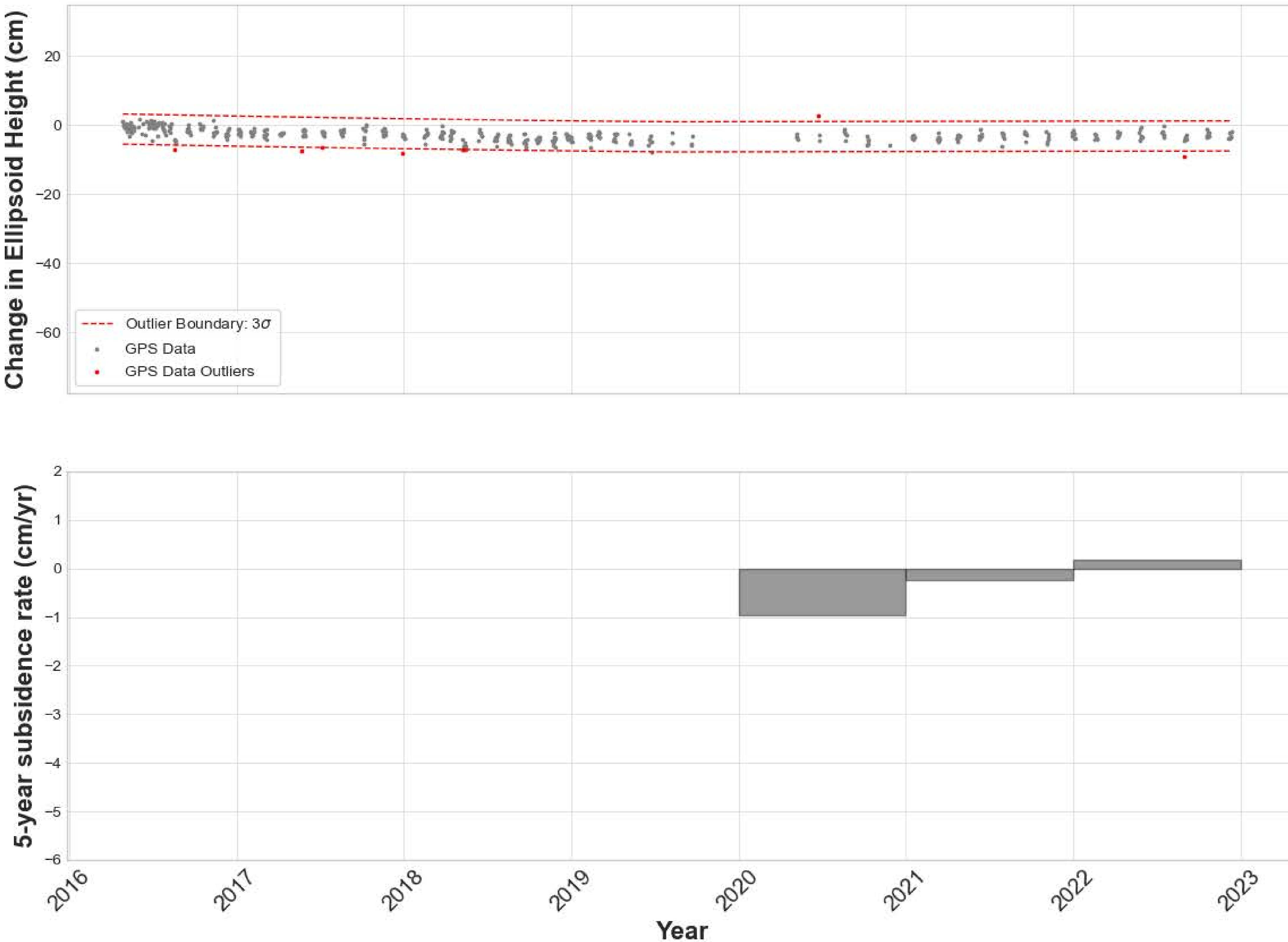

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P090



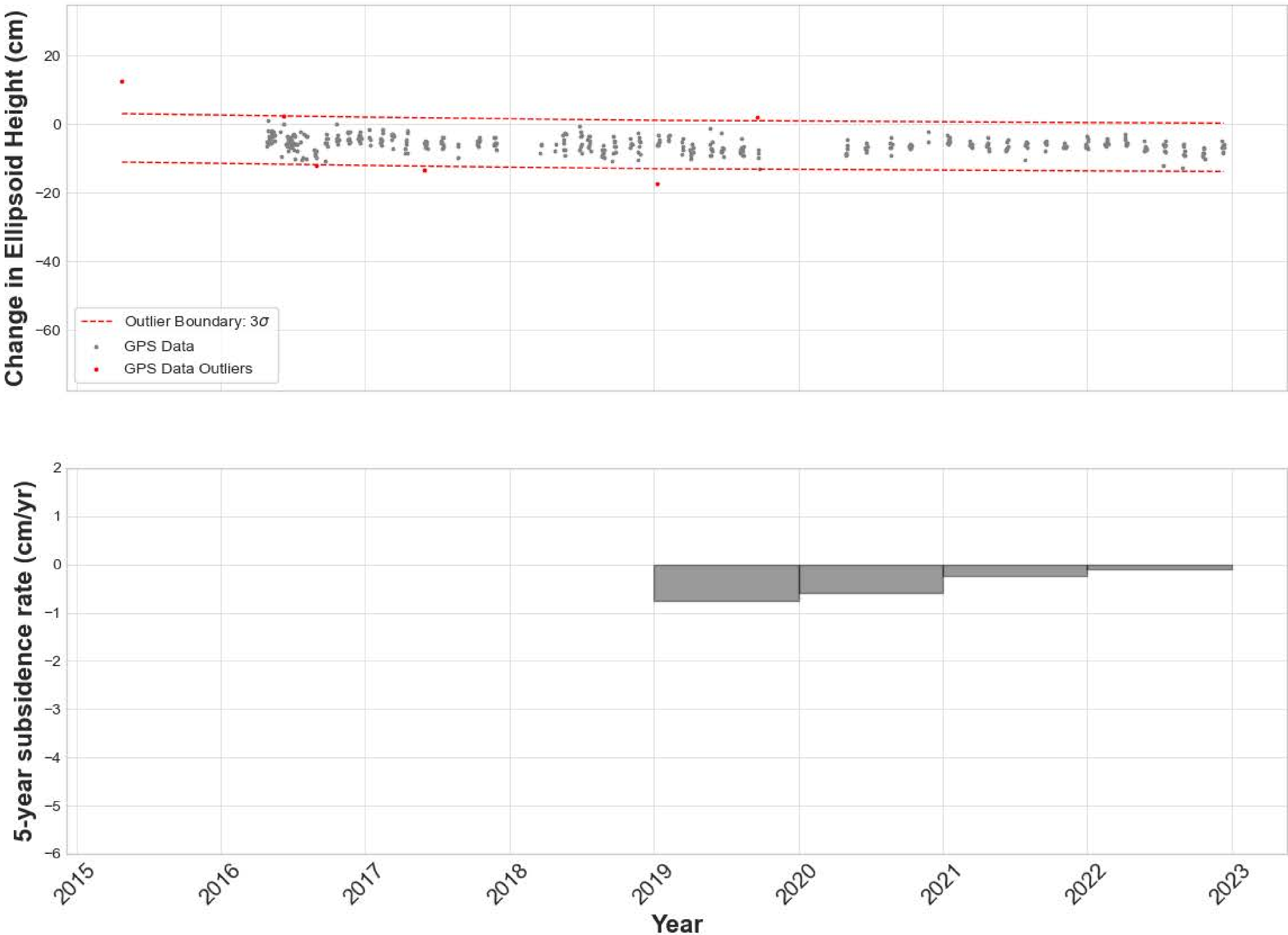

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P091



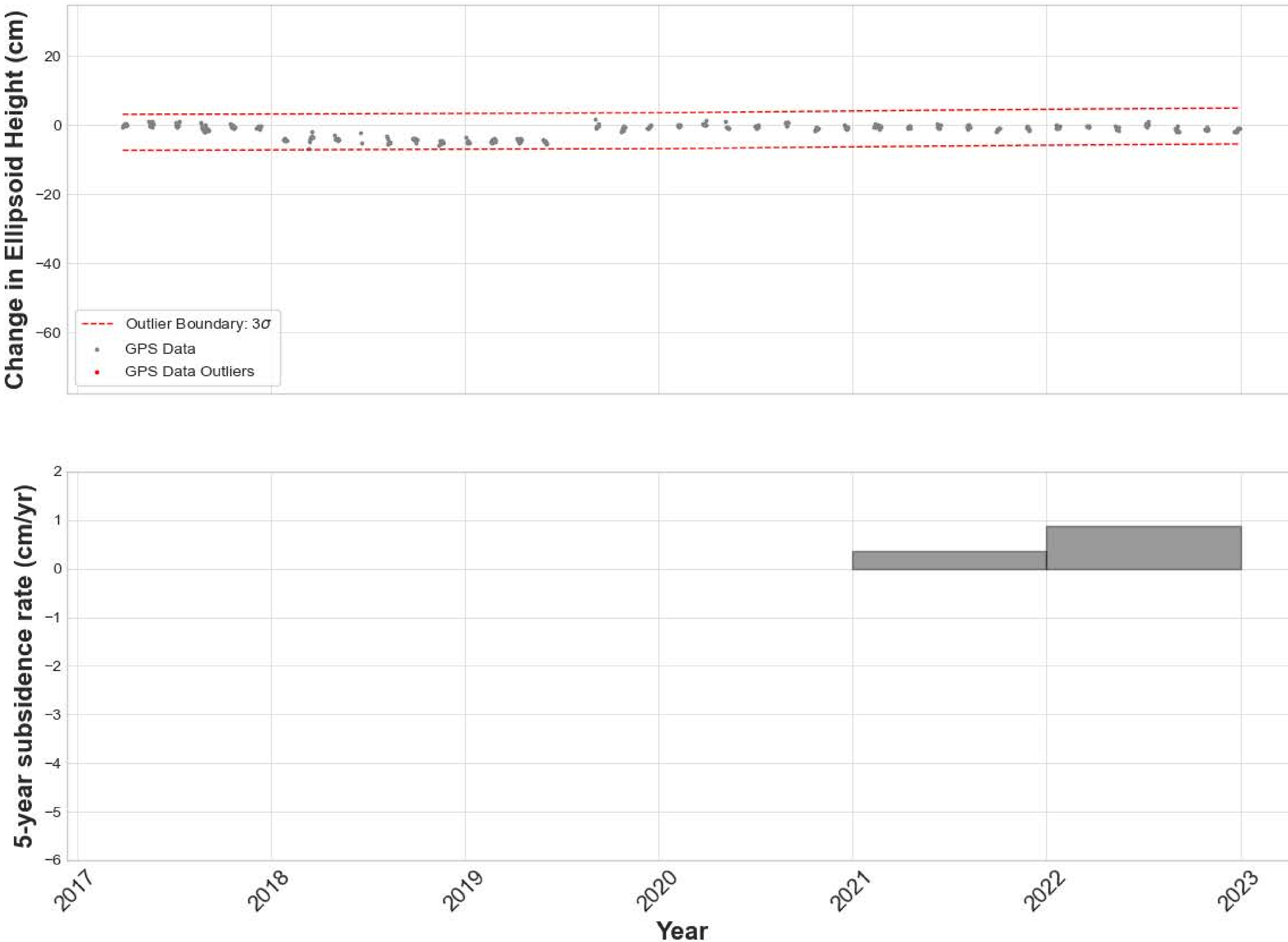

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P092



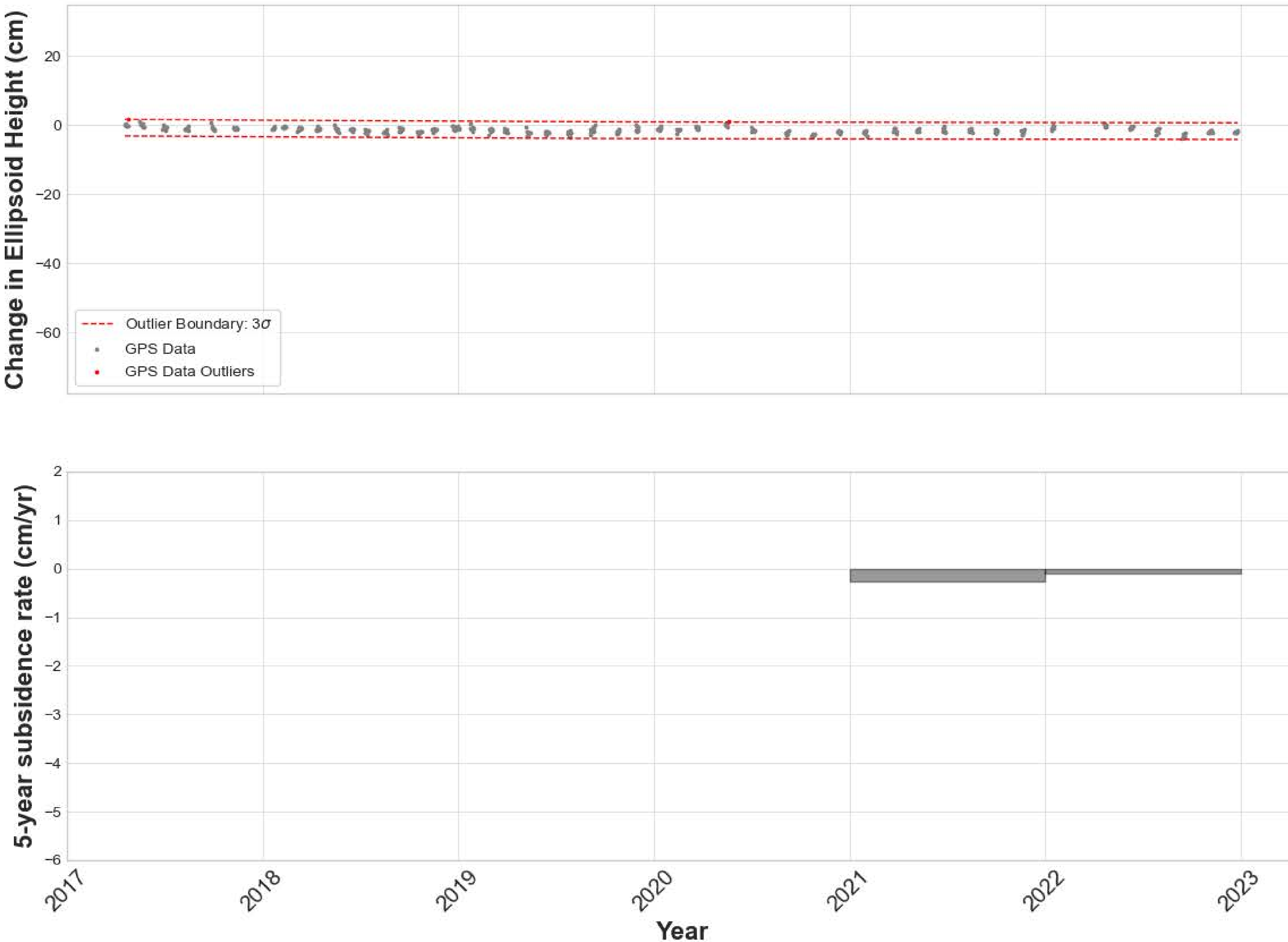

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P093




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P094

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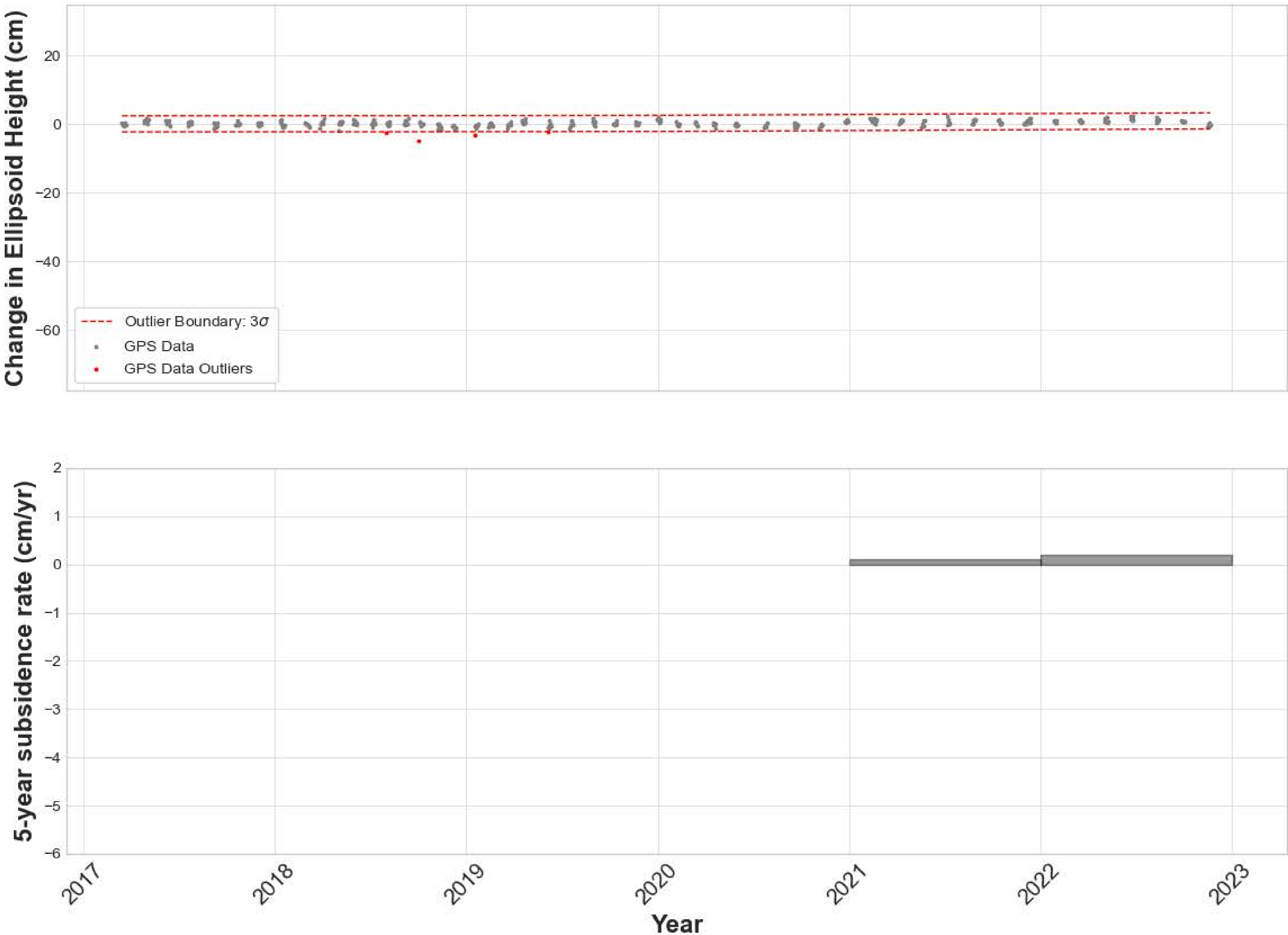
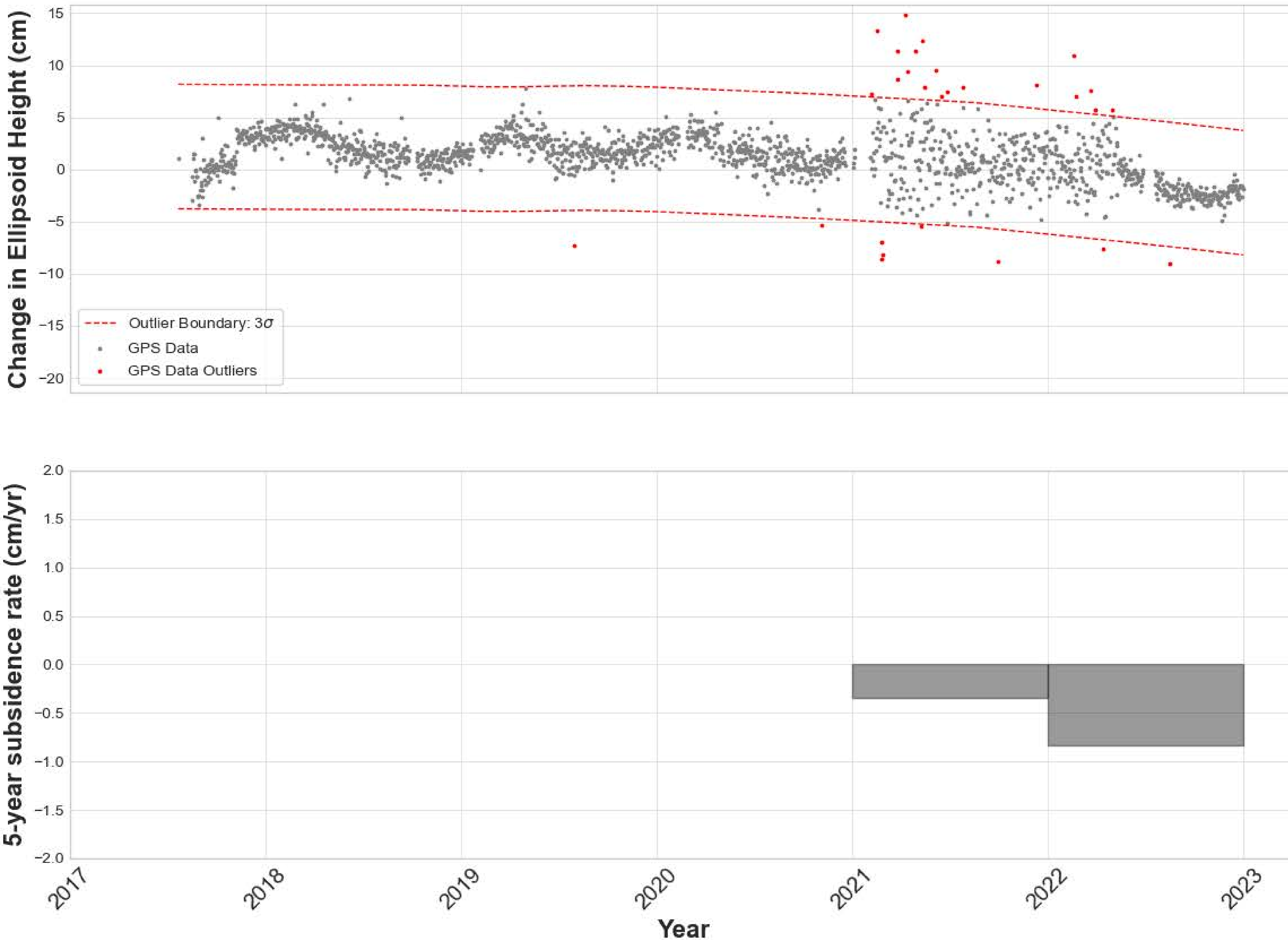
# P095



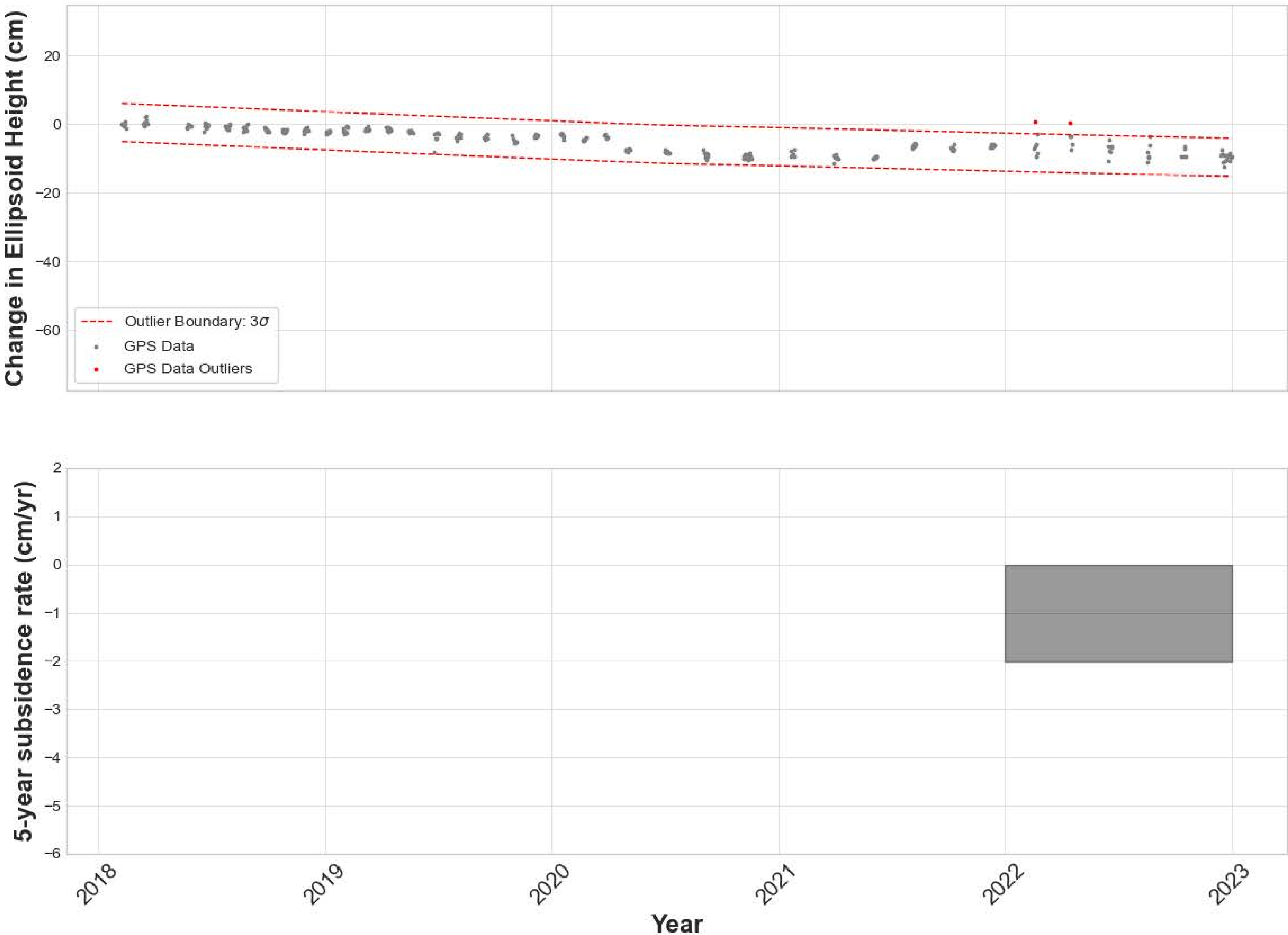

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P096



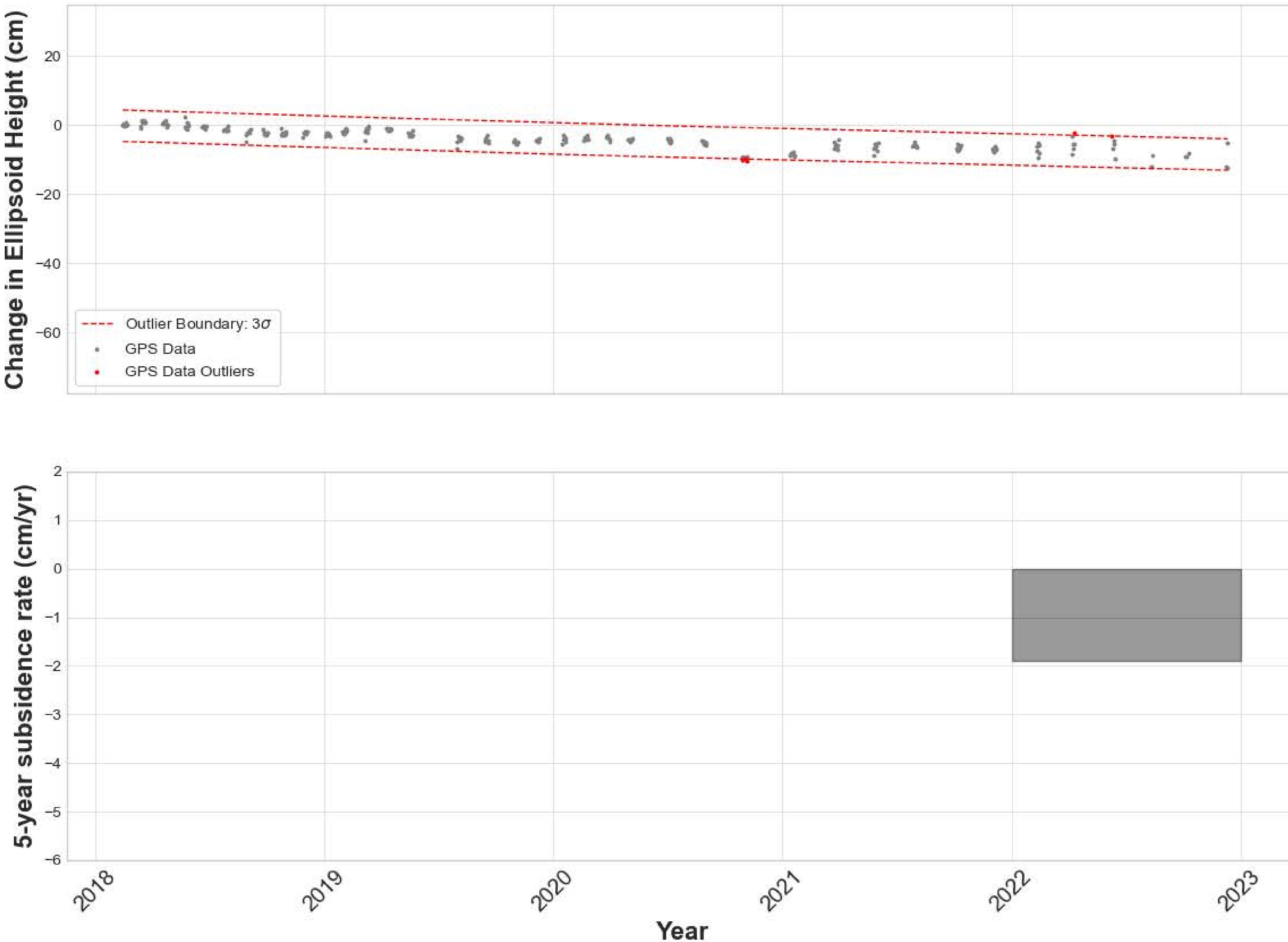

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P097



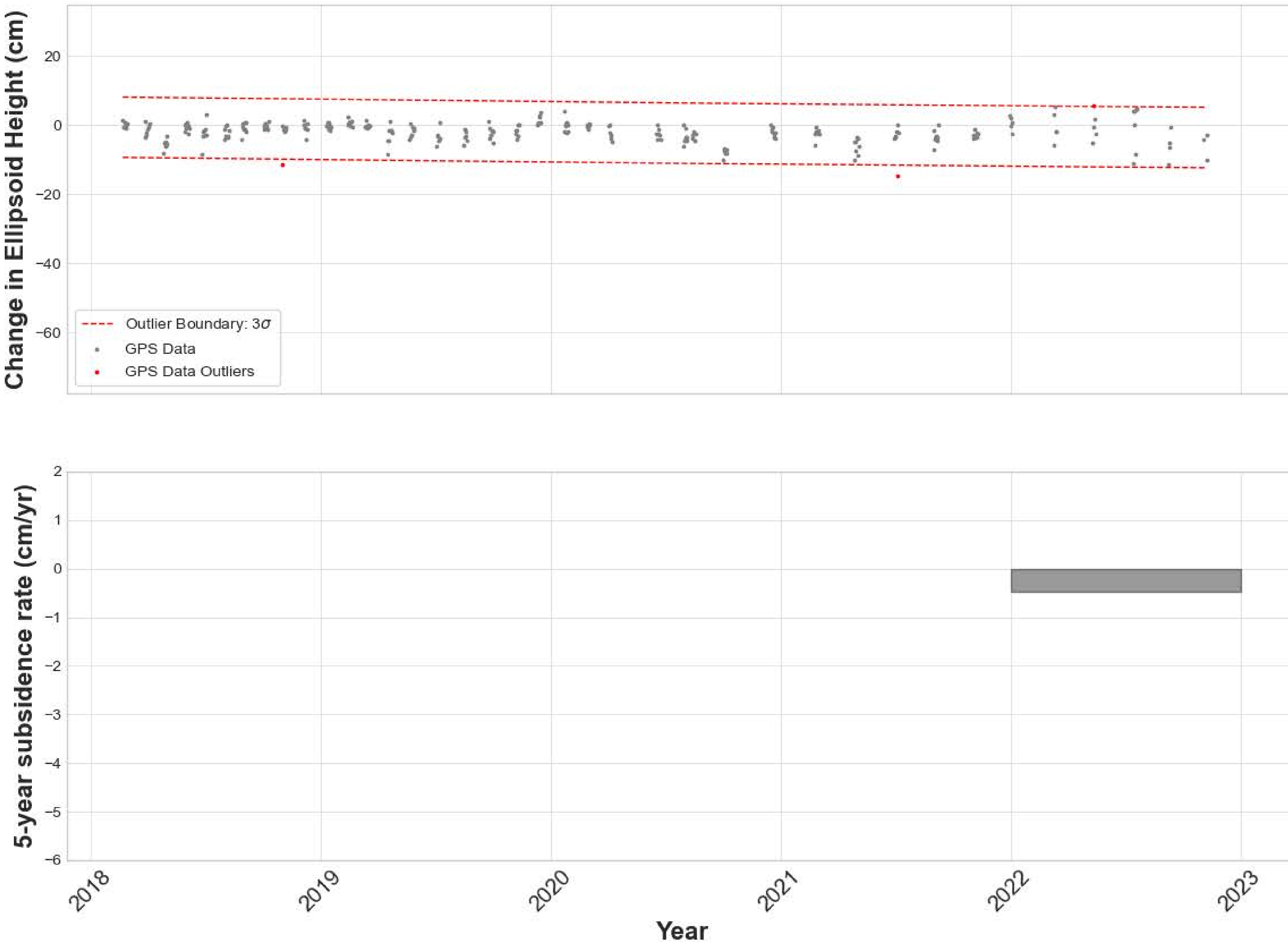

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P098



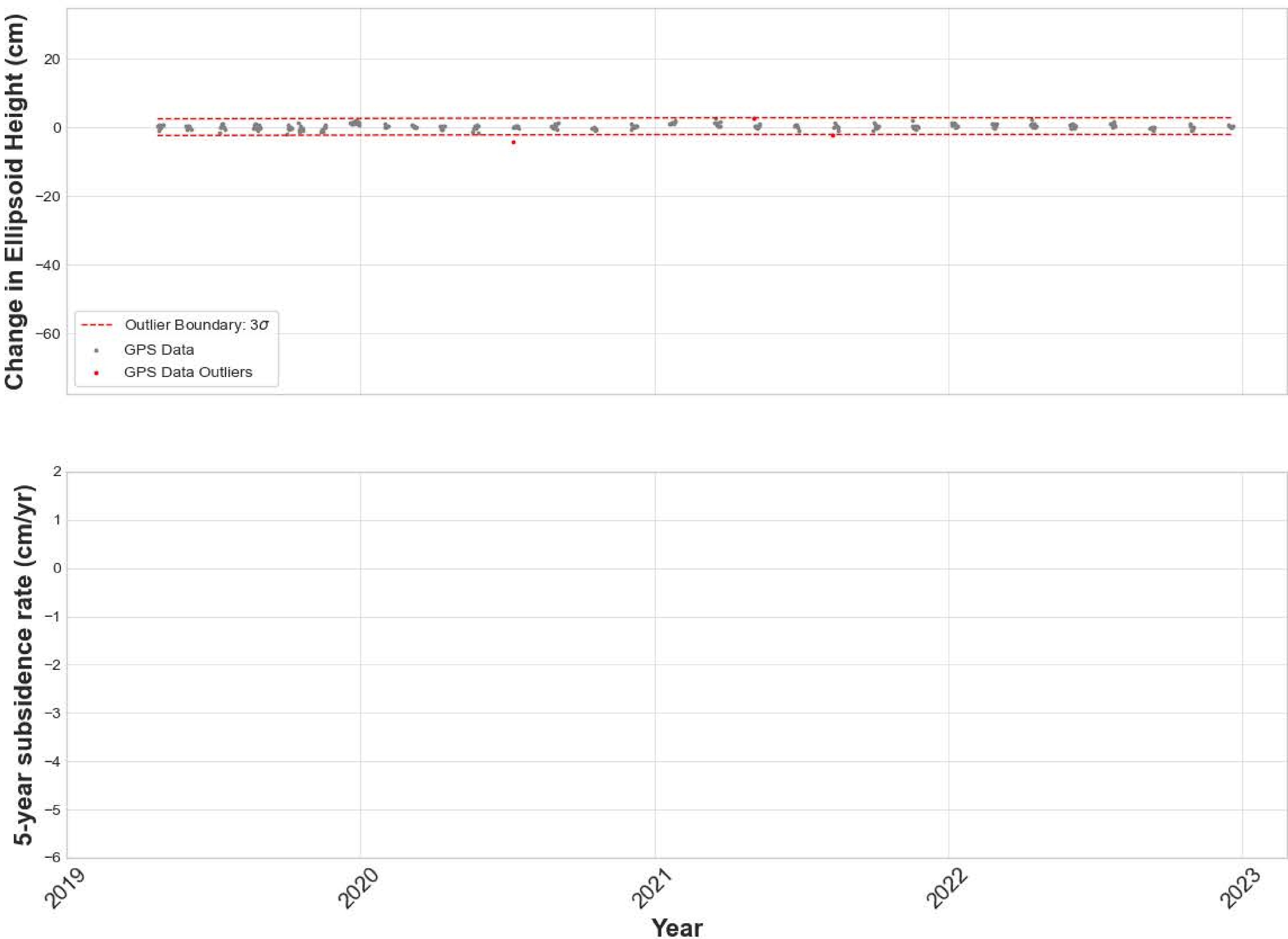

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P099



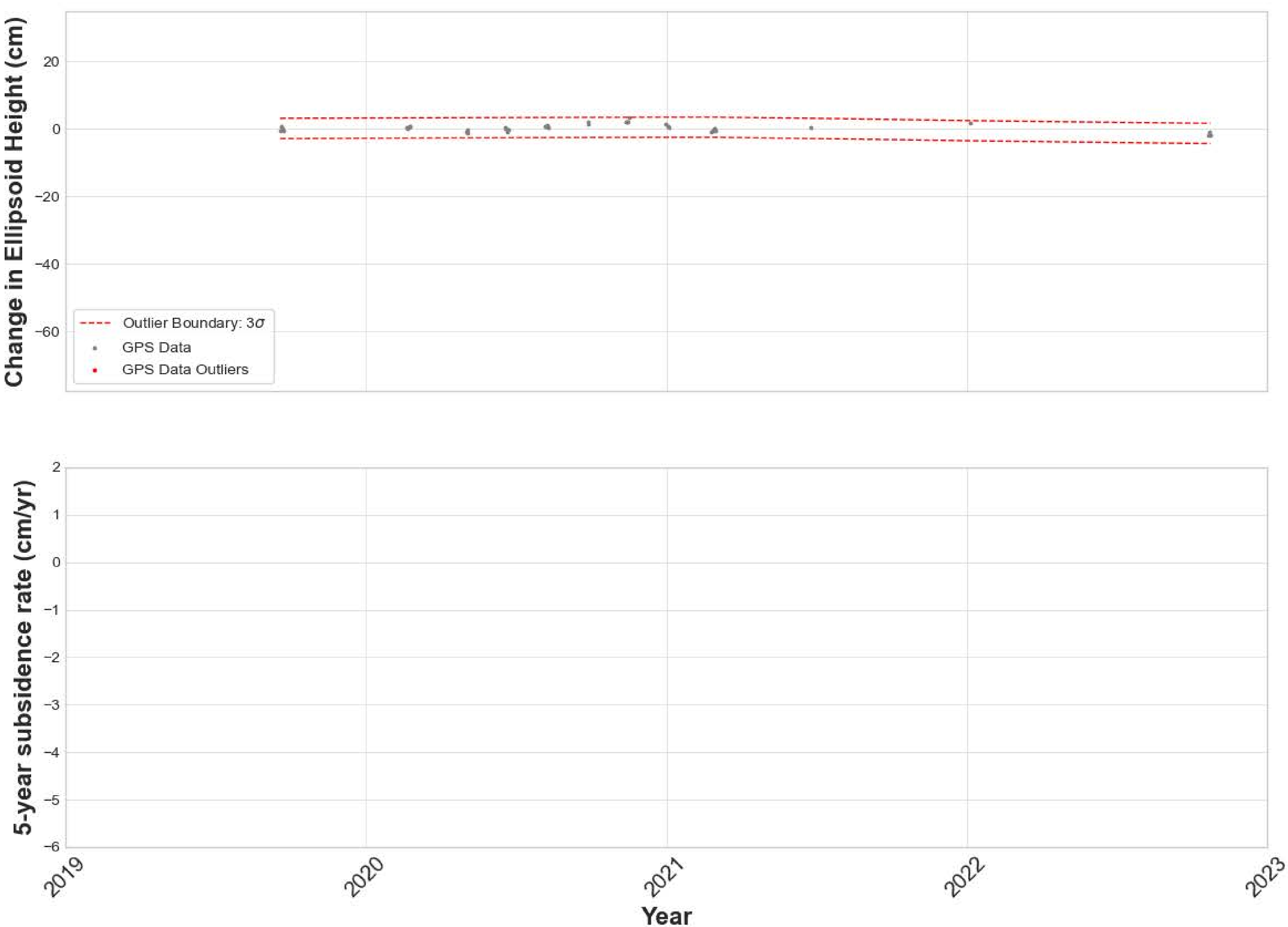

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P100



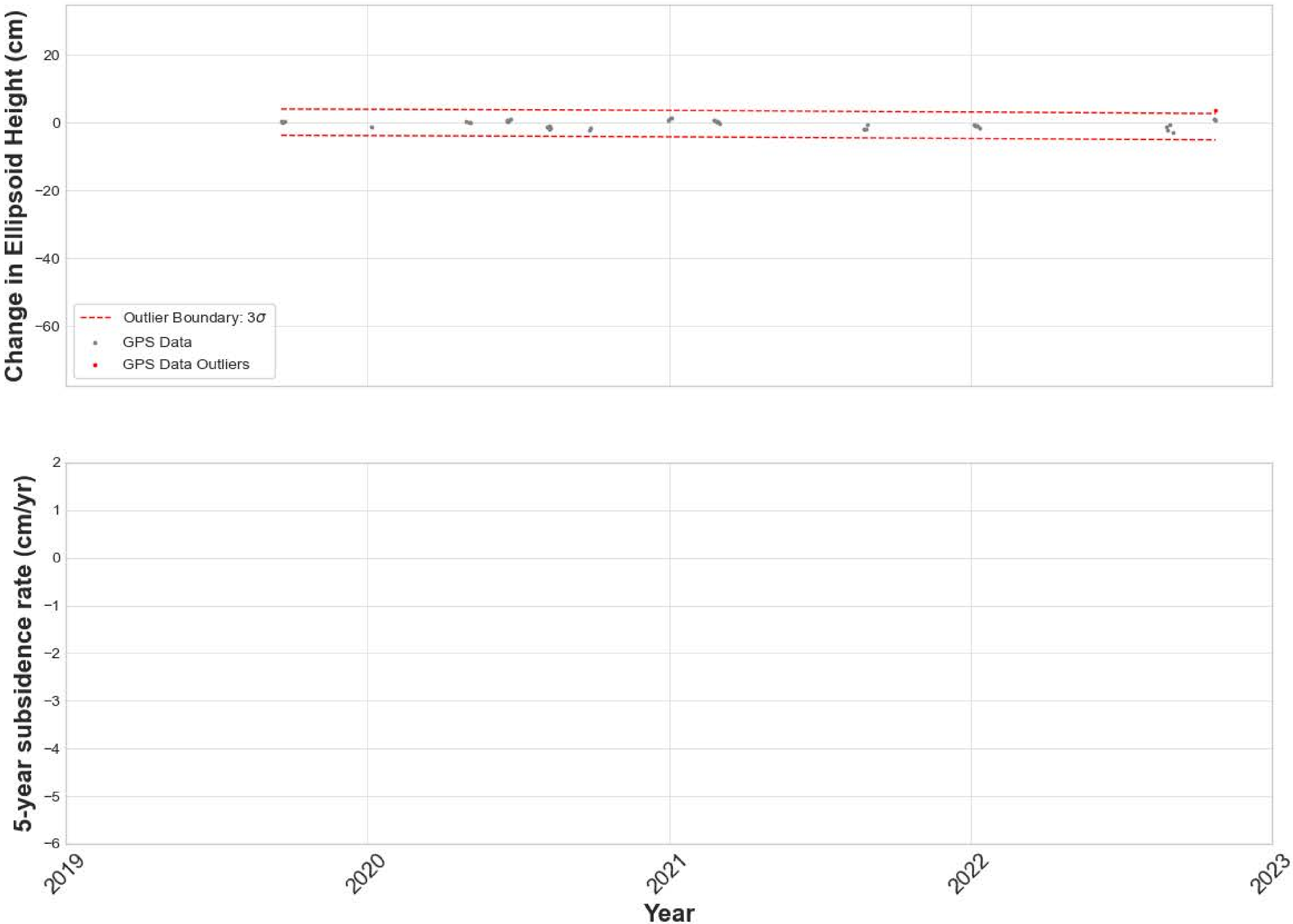

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P101



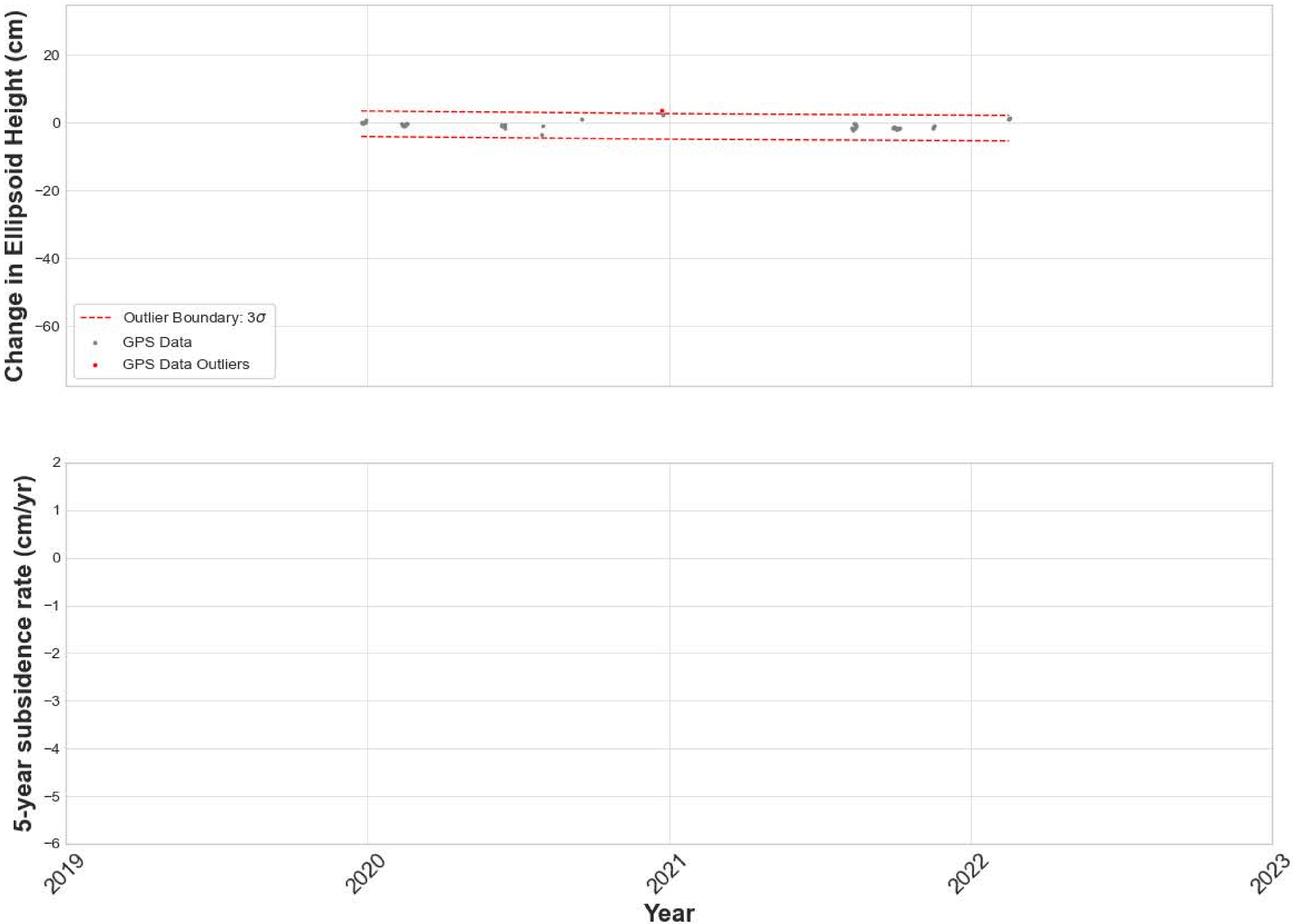

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P103



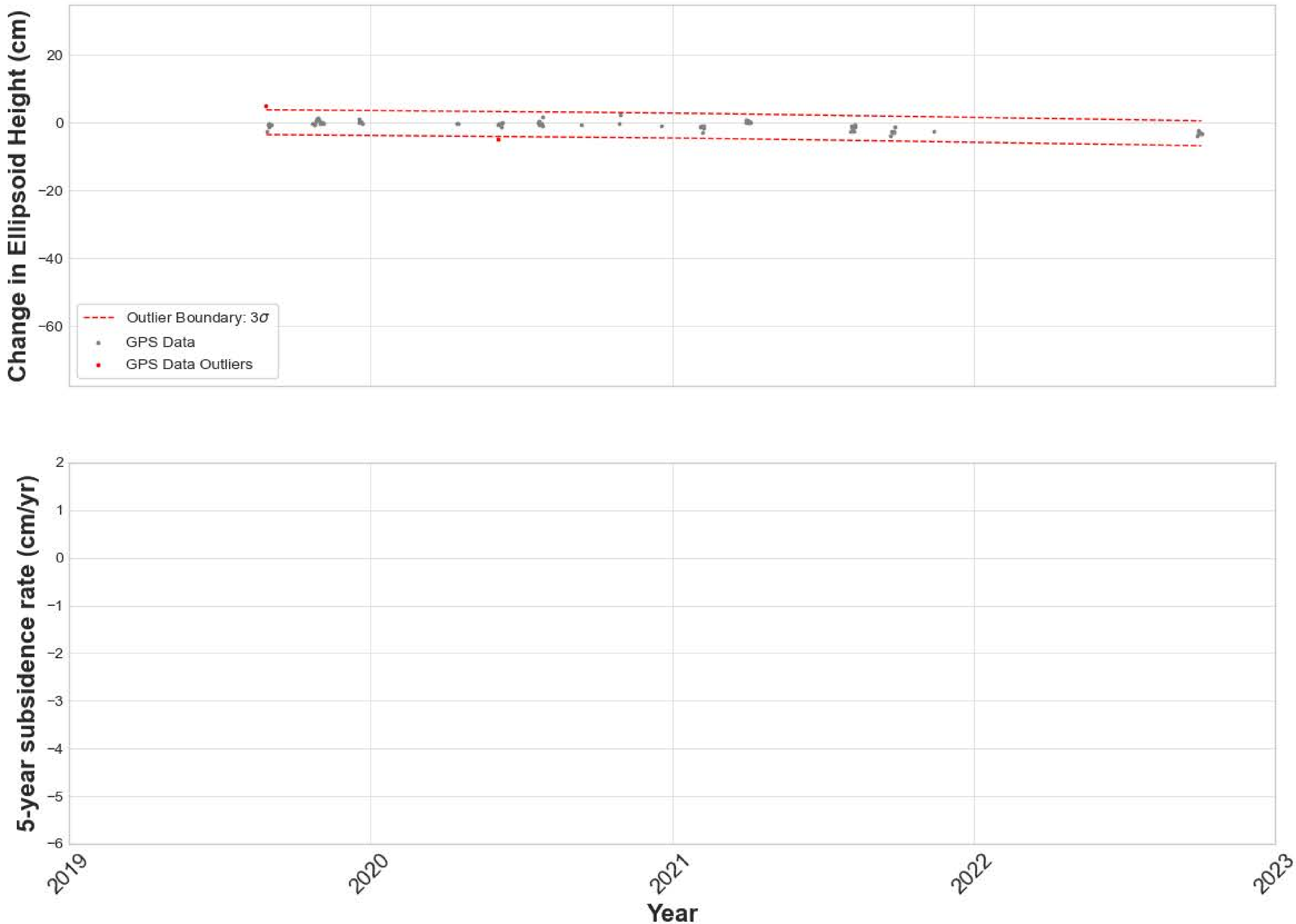

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P104



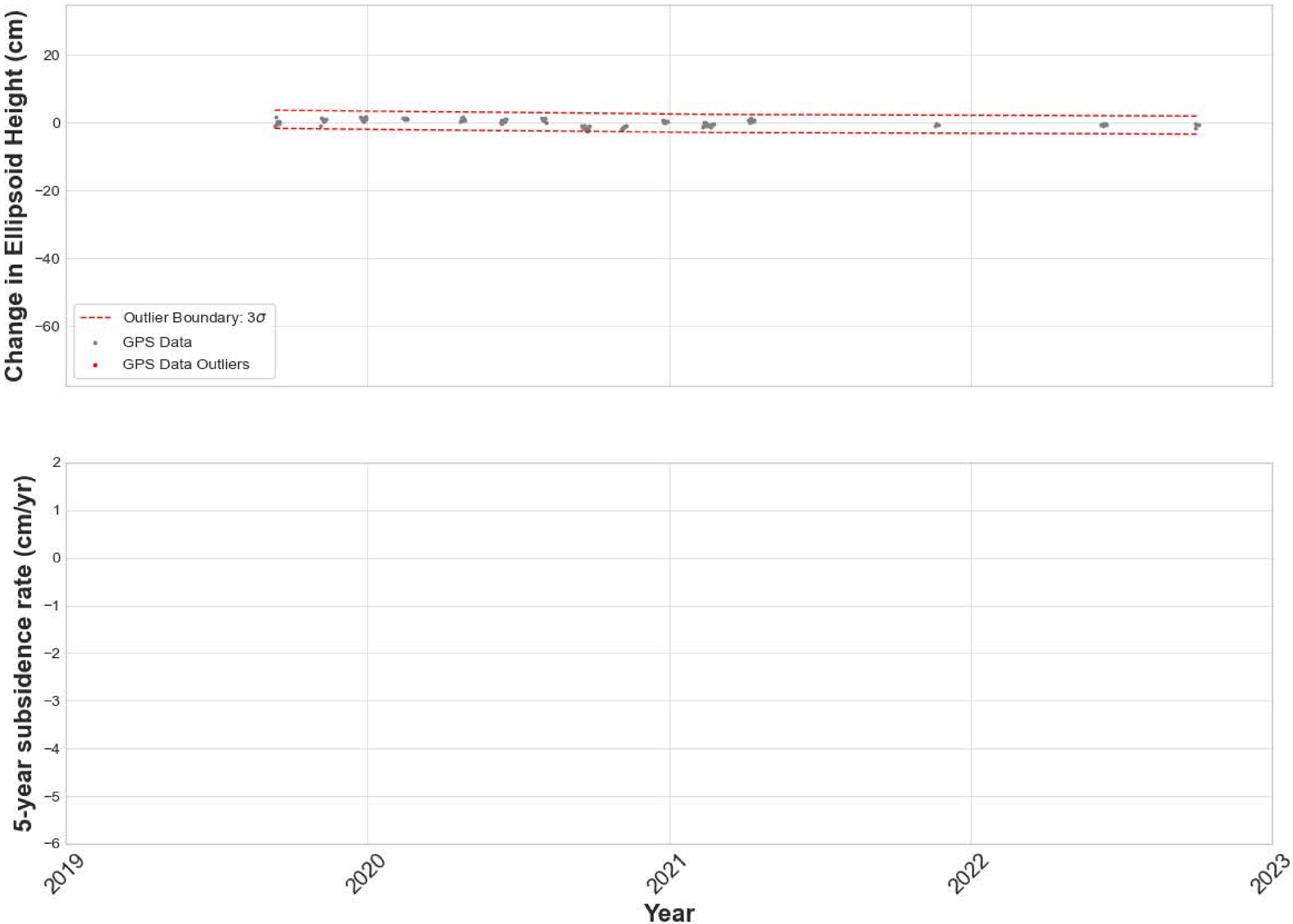

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P105



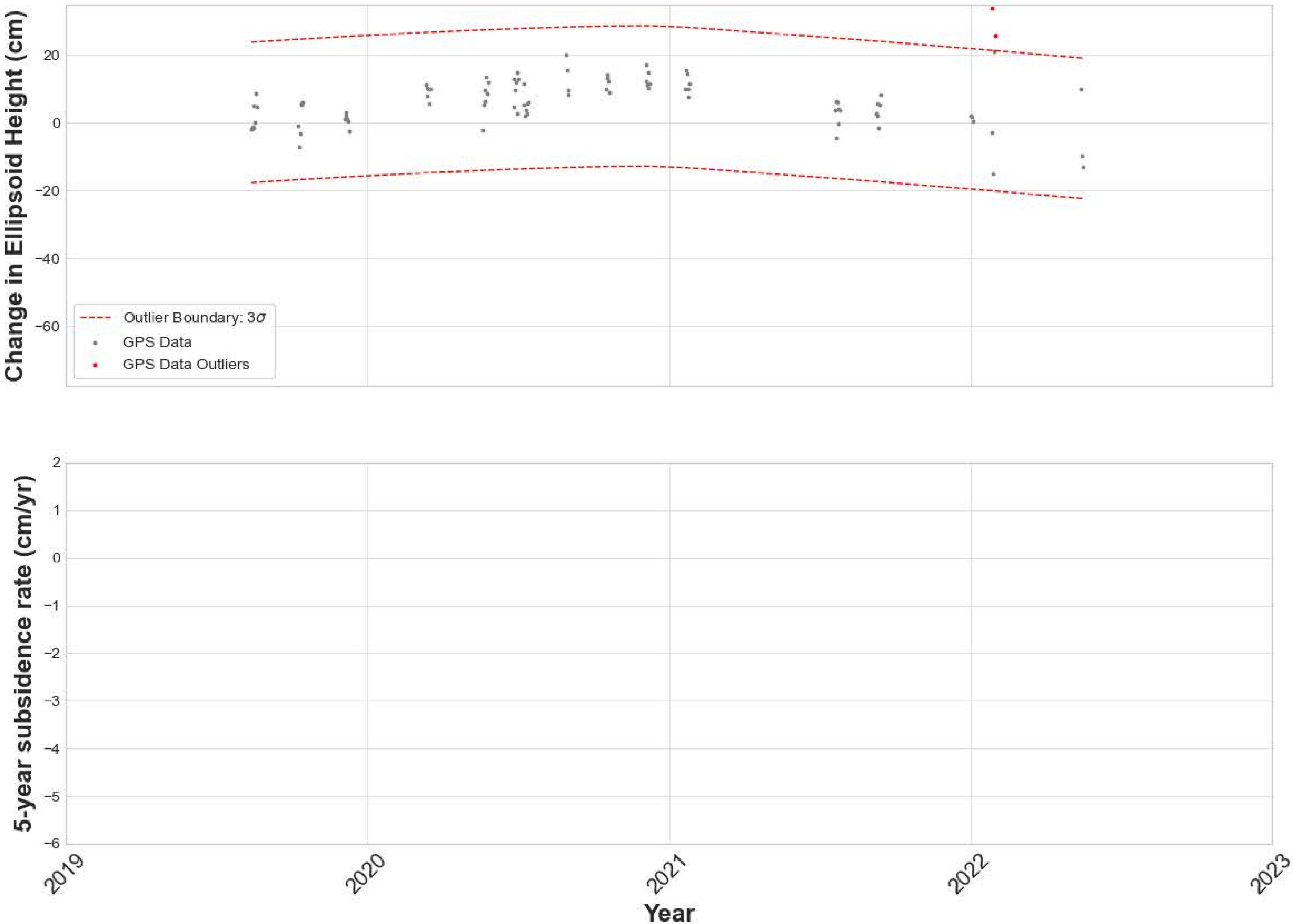

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P106



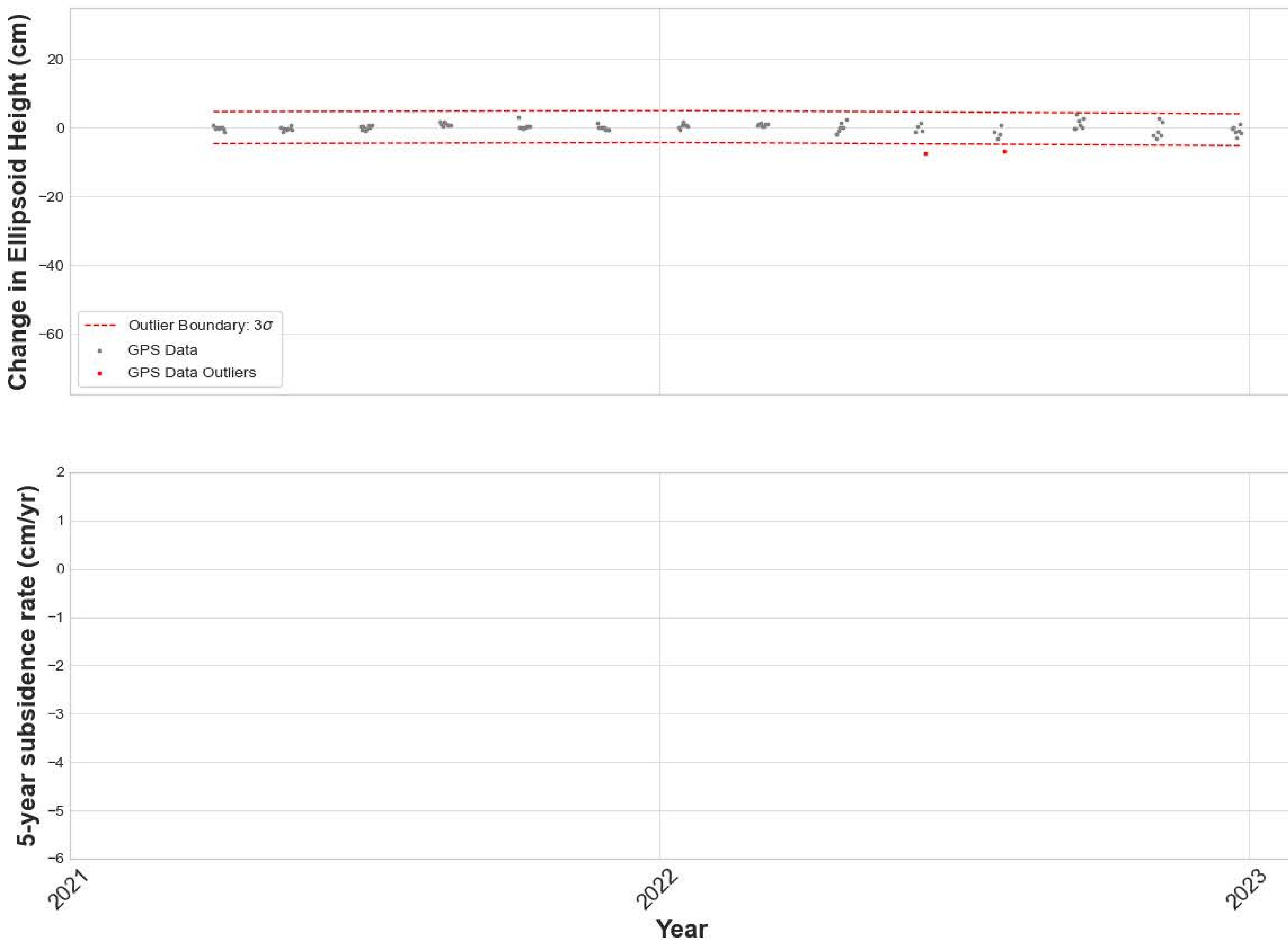

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P107



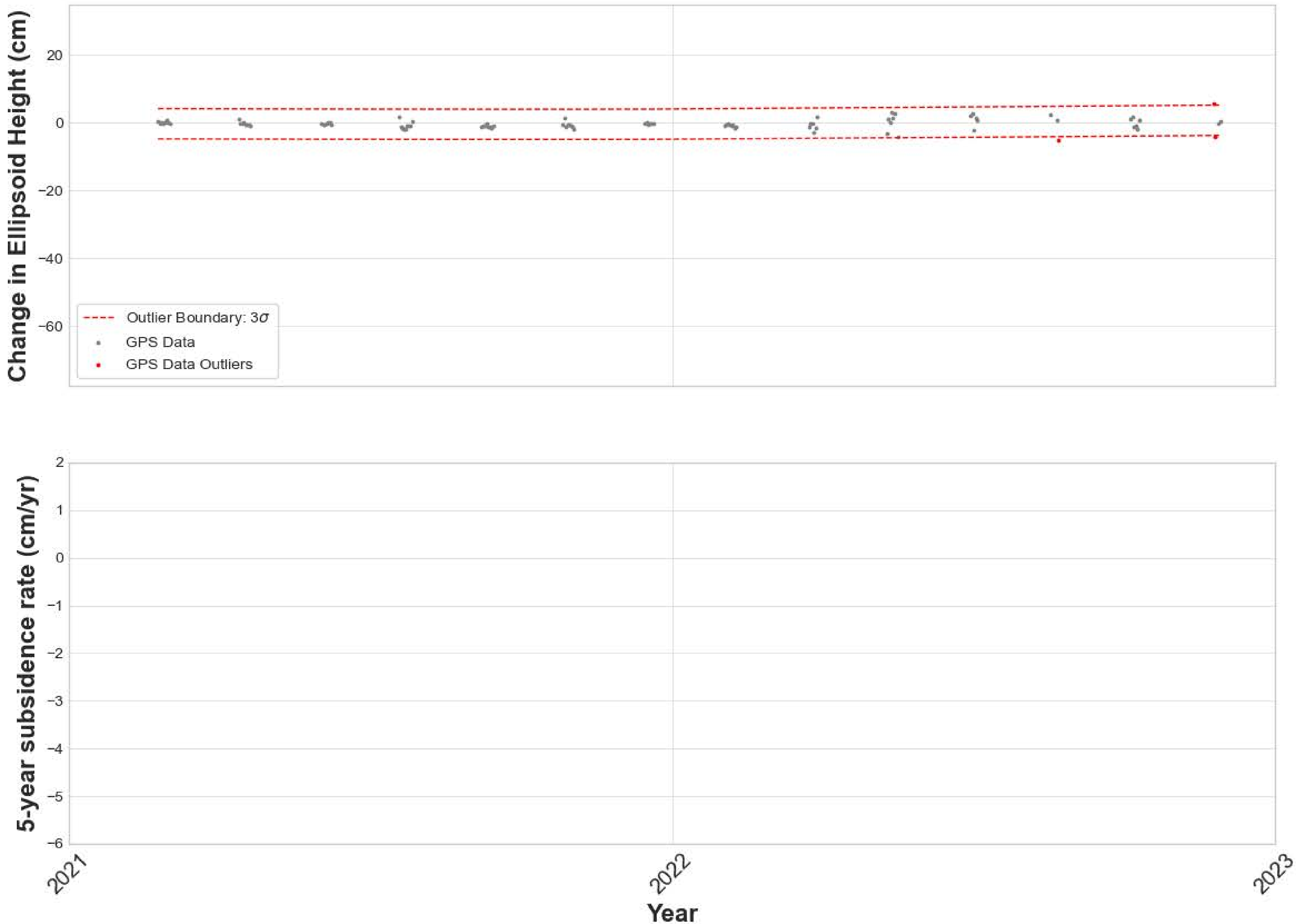

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P108



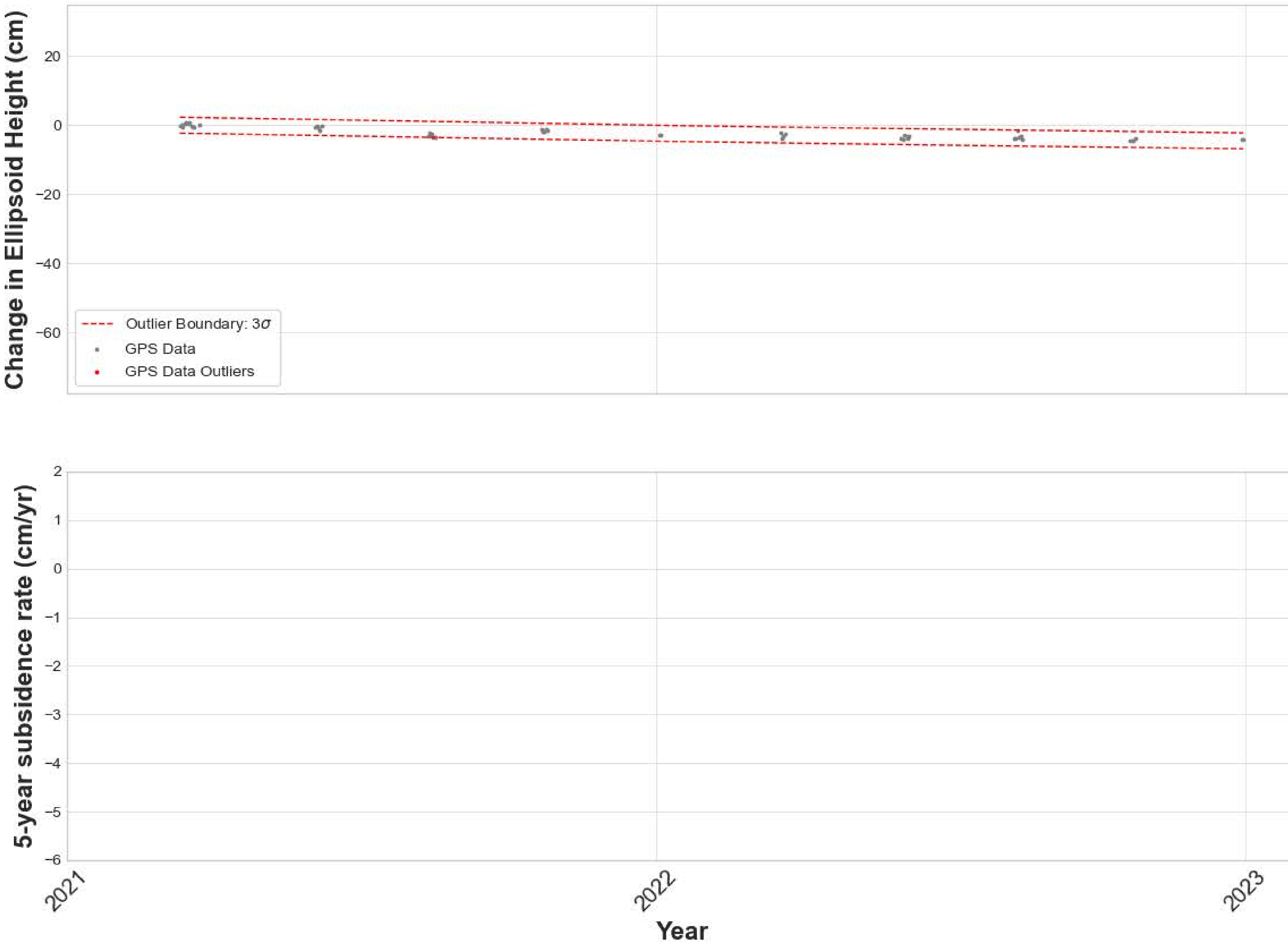

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P109



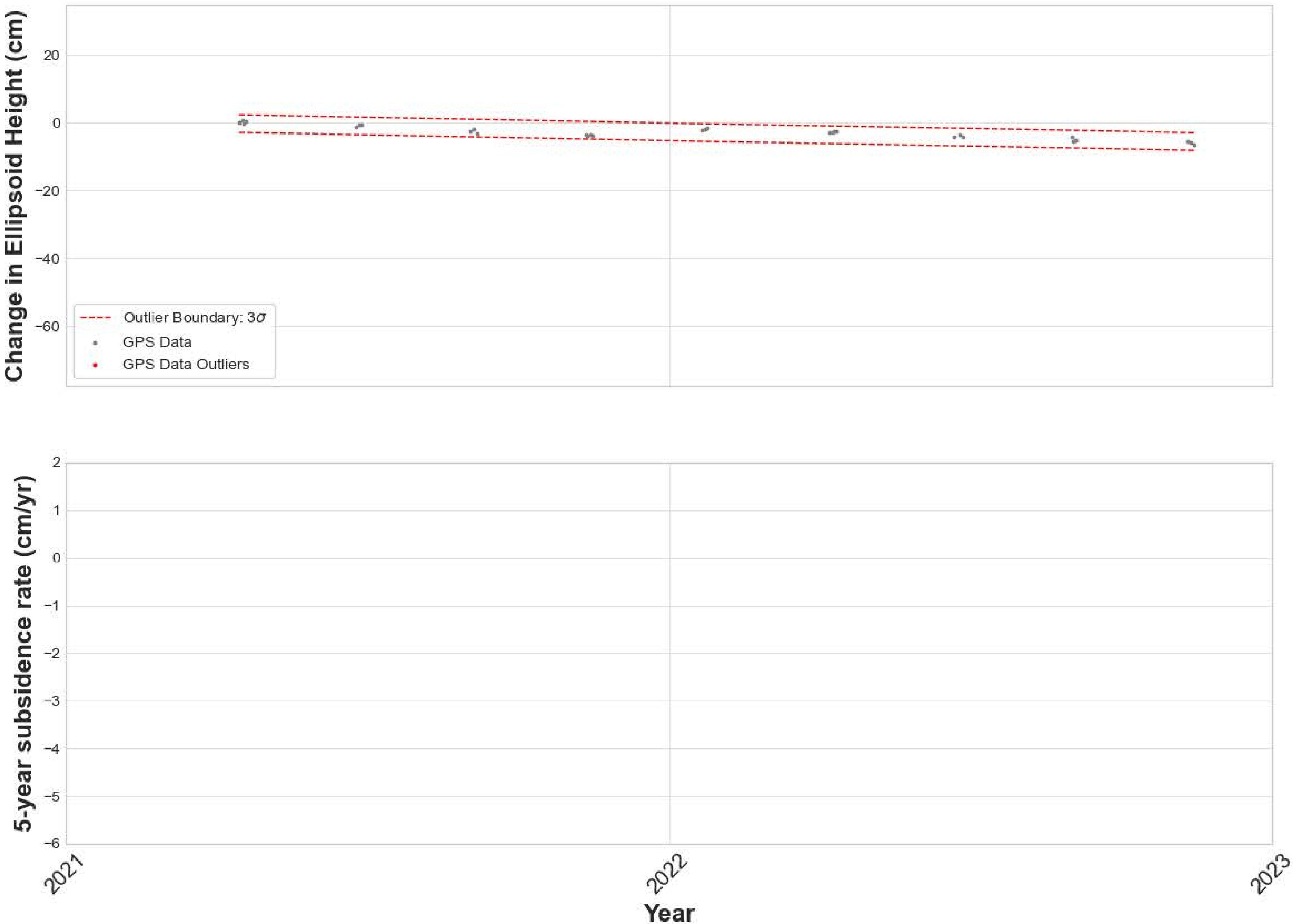

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P110



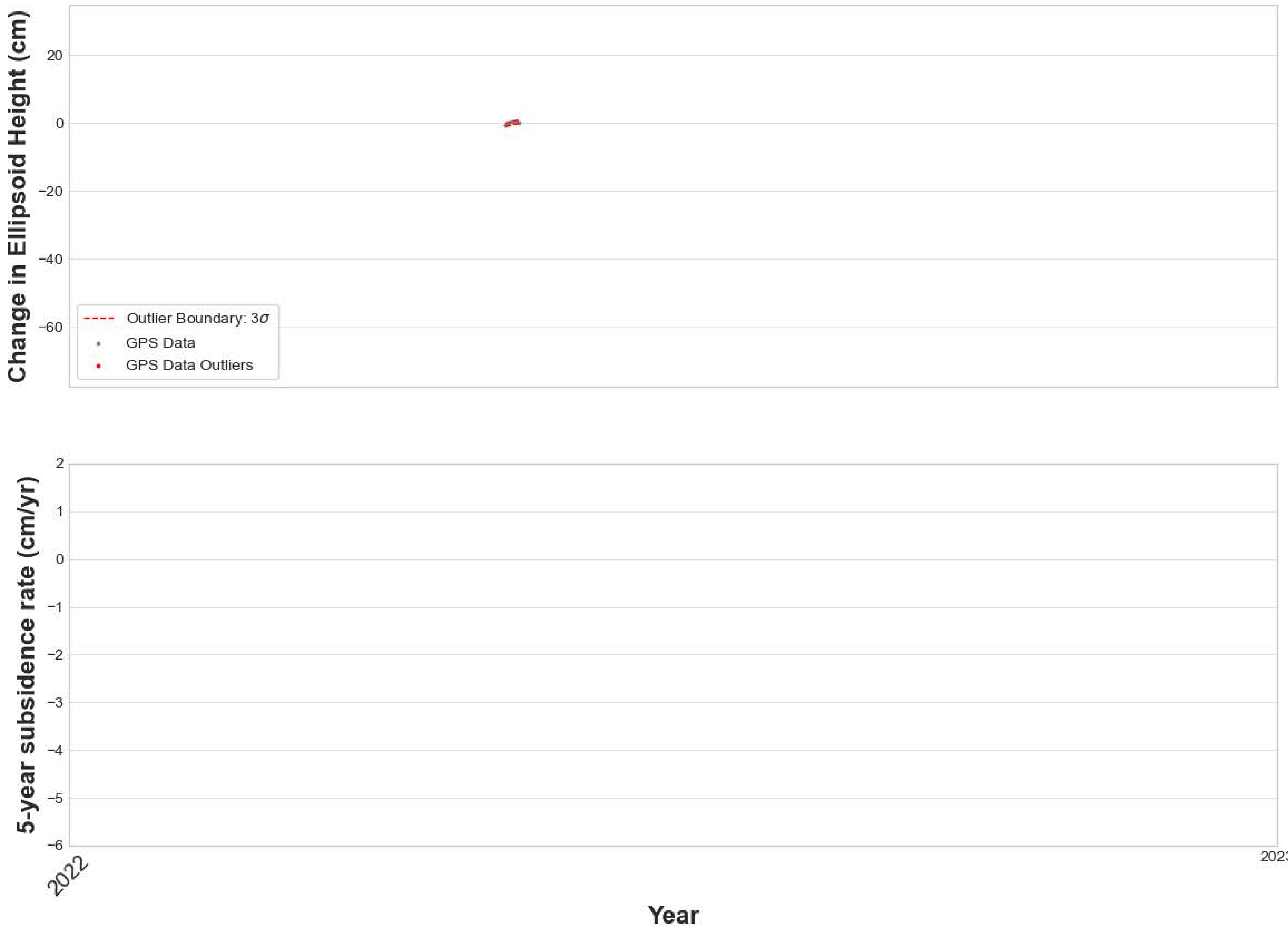

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P111



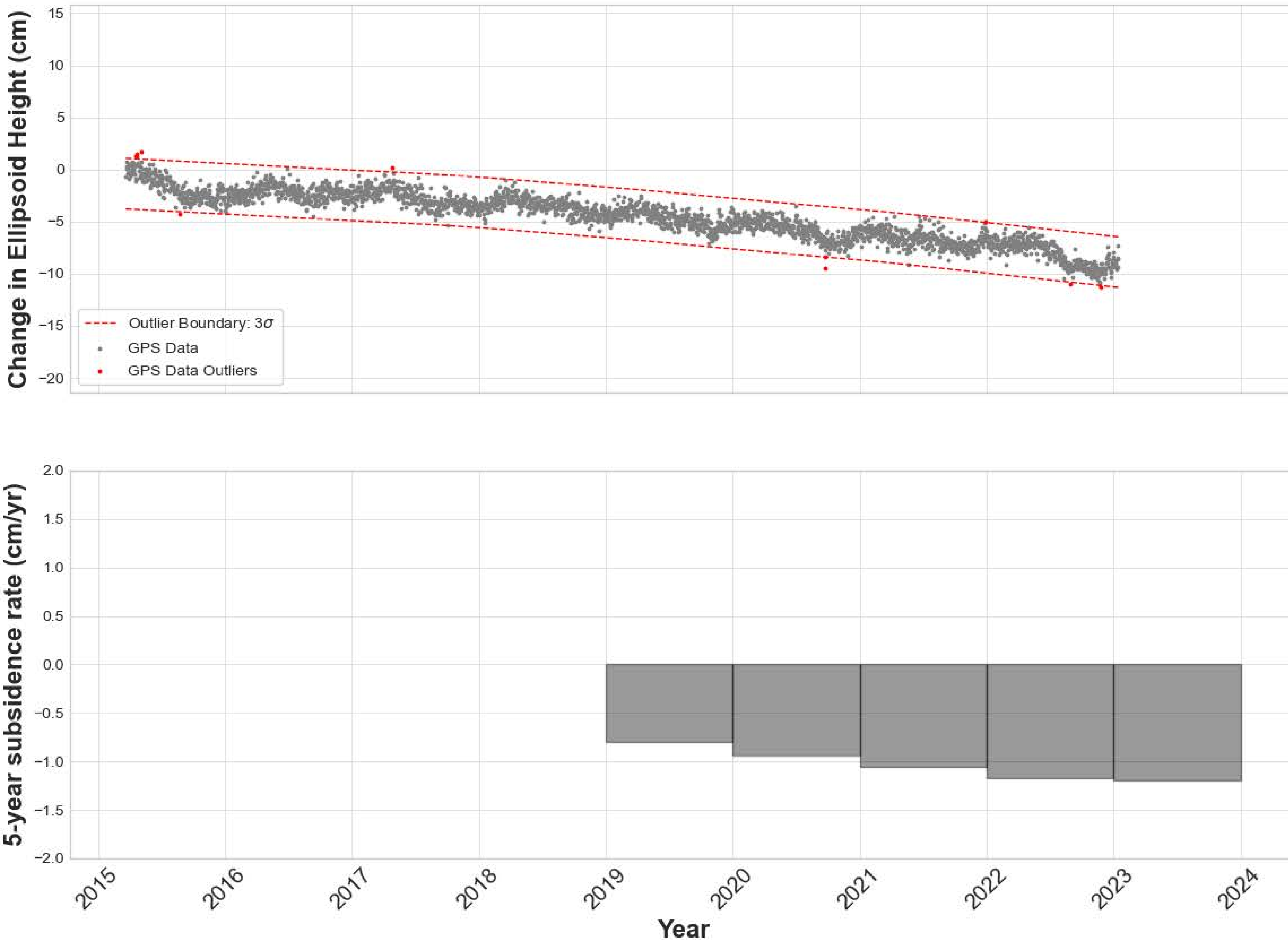

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# P112



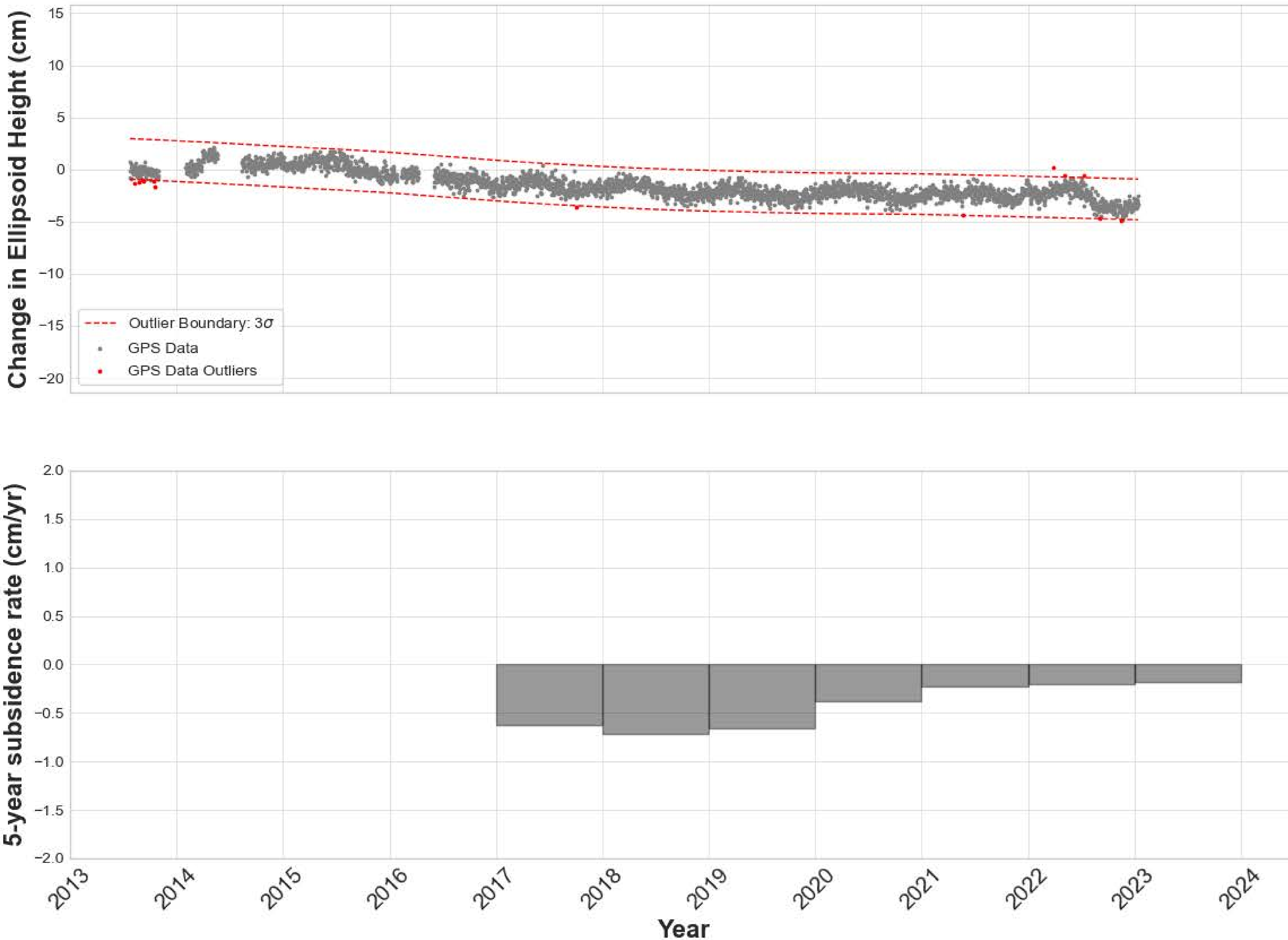

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# PWES



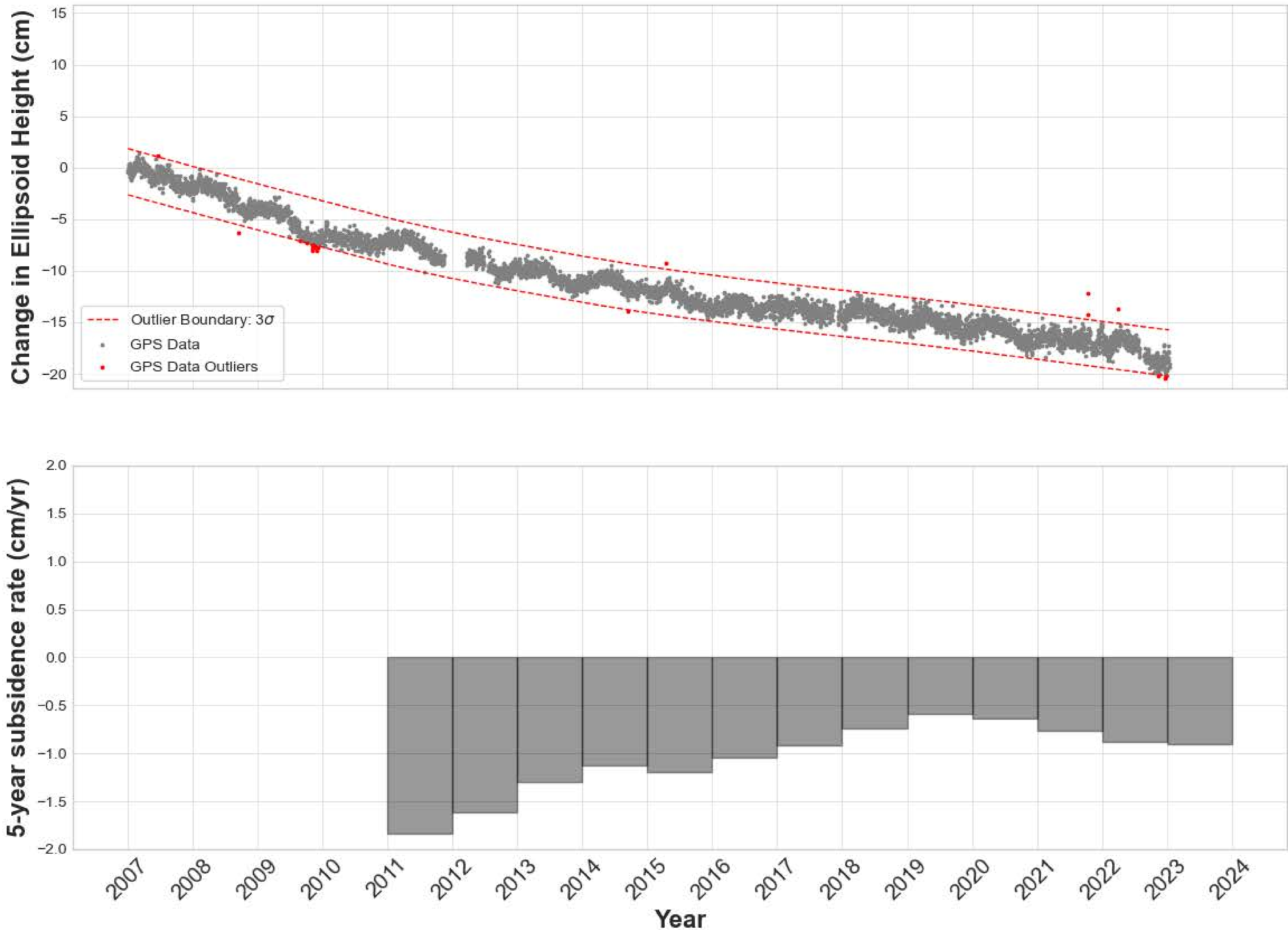

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# RDCT



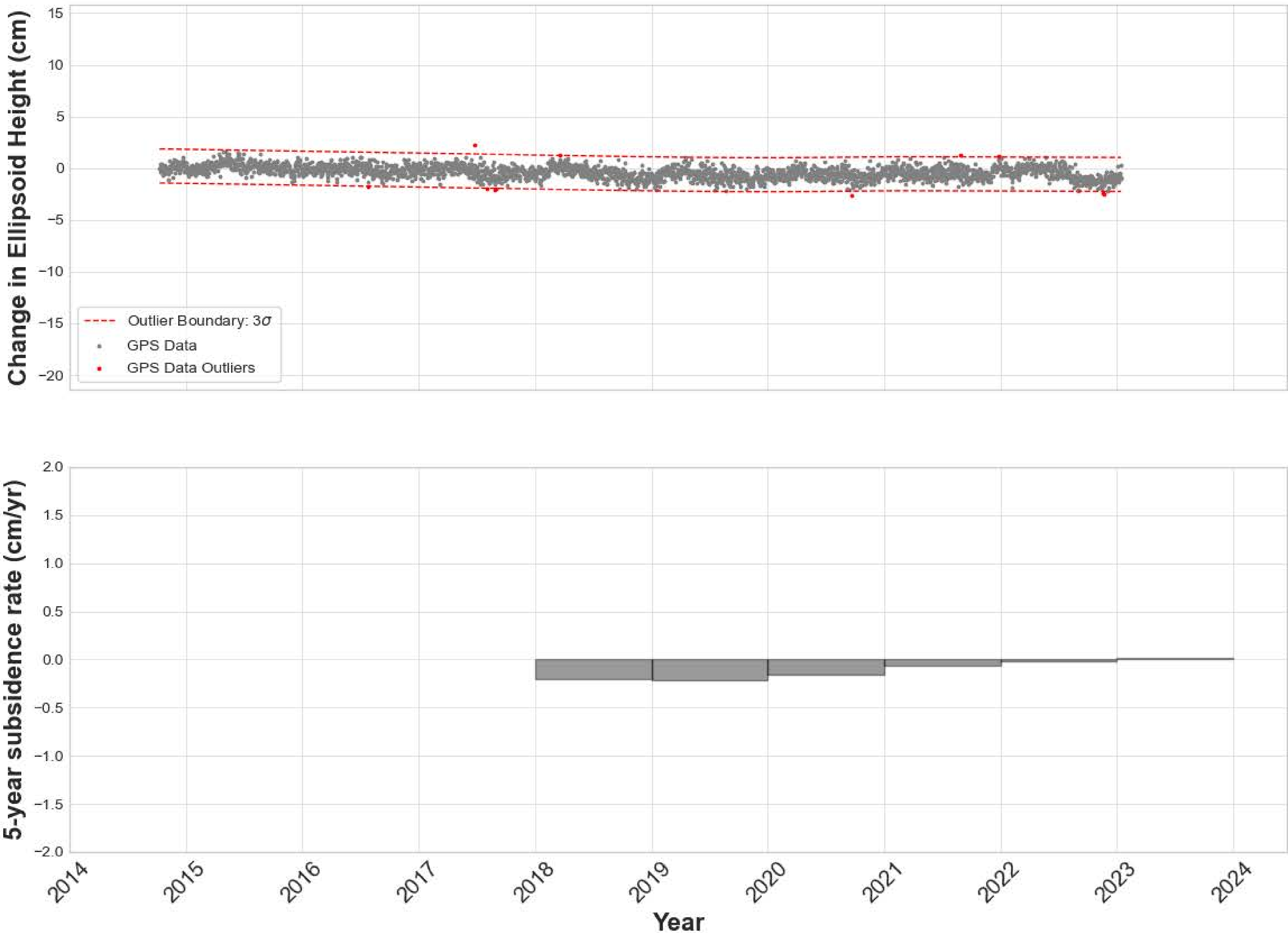

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# ROD1



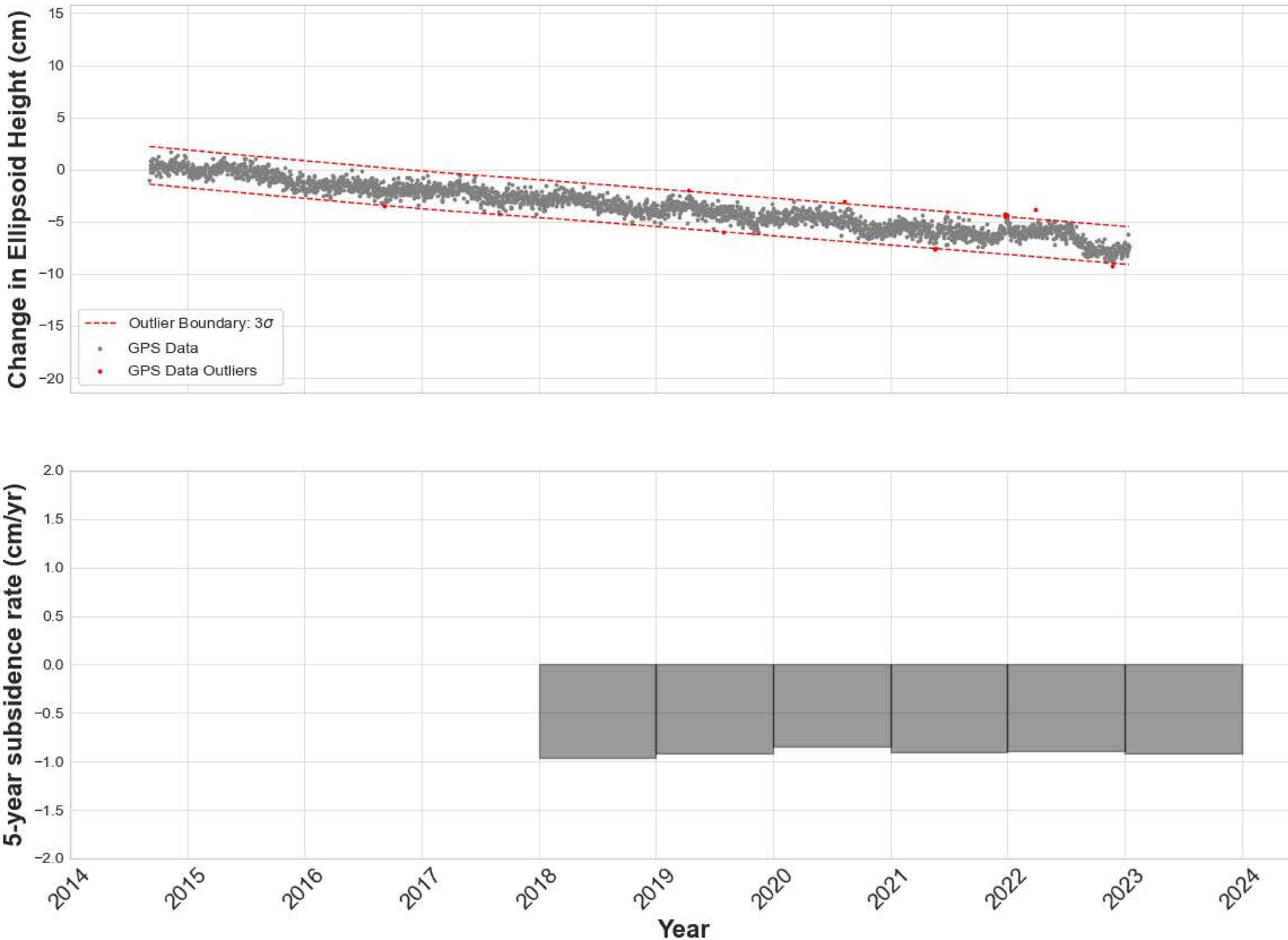

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# RPFB



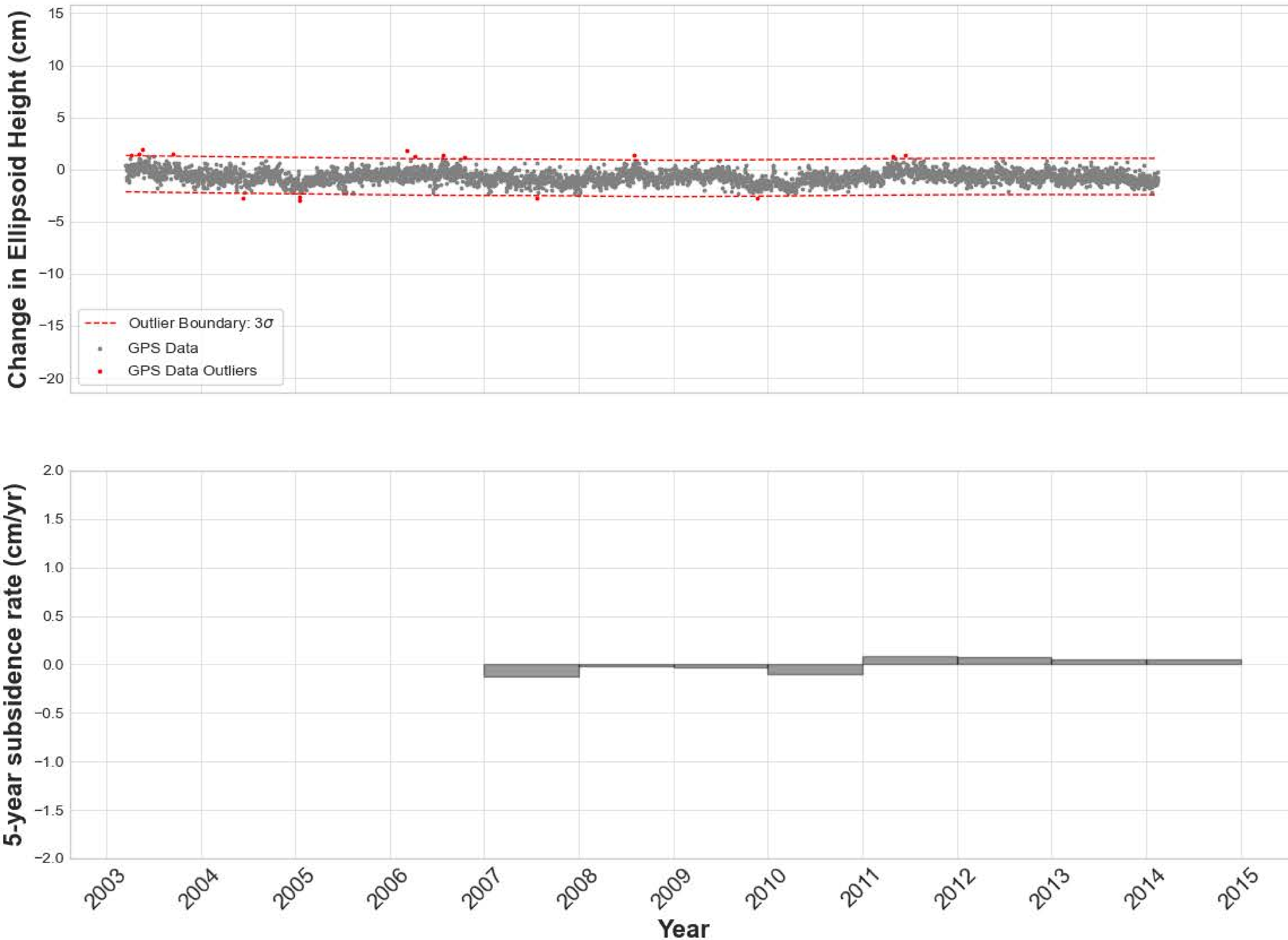

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# SESG



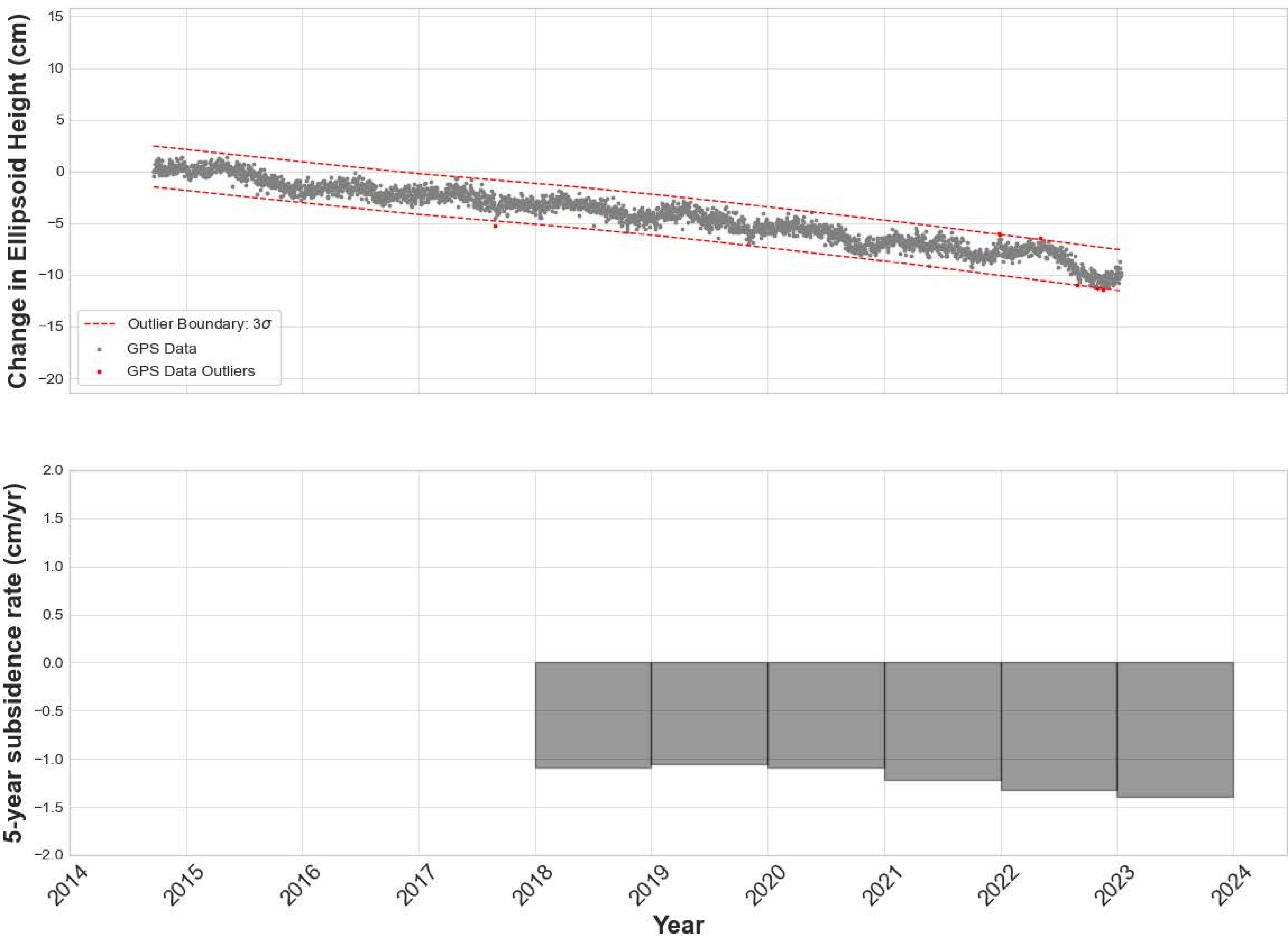

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# SG32

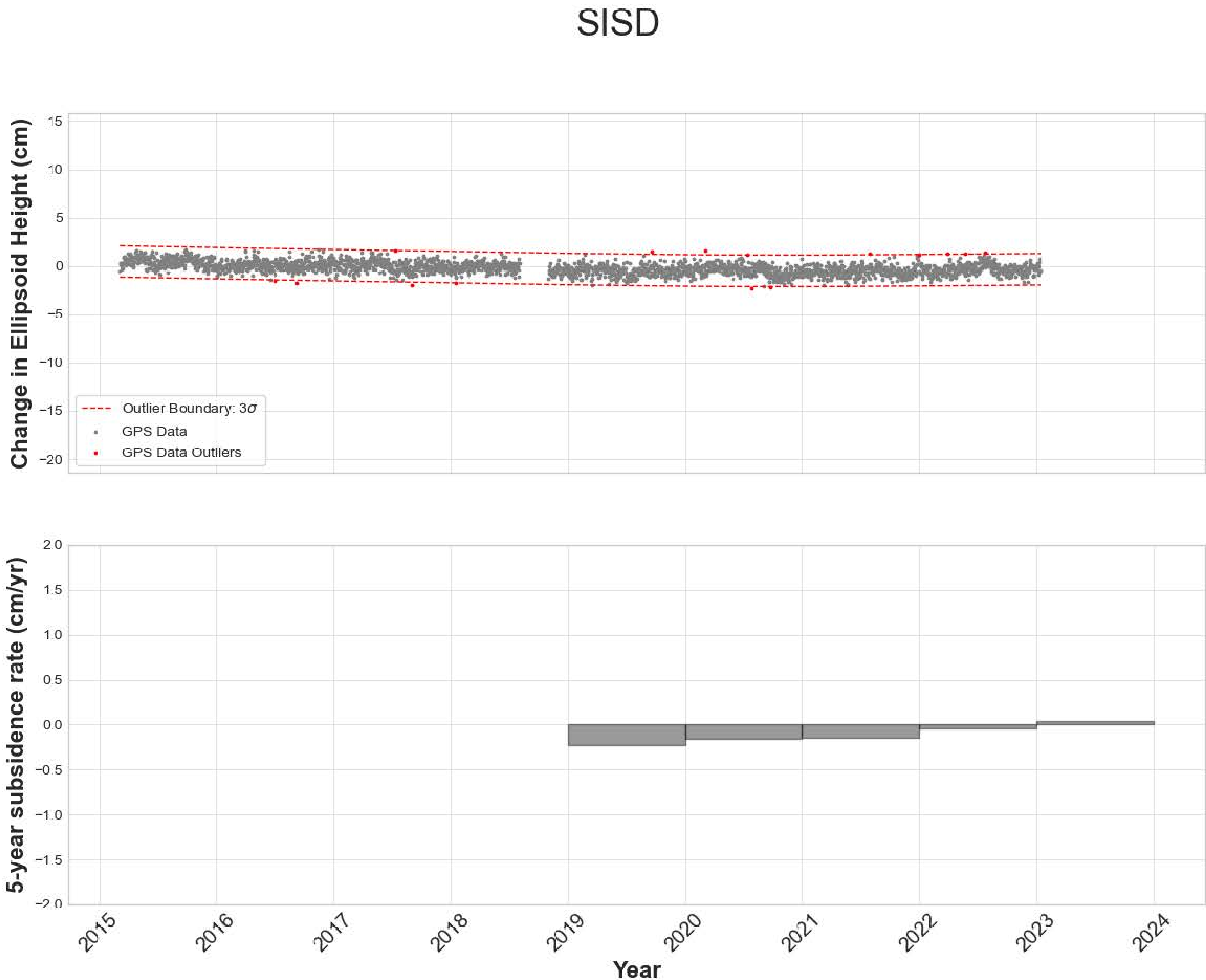



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# SHSG

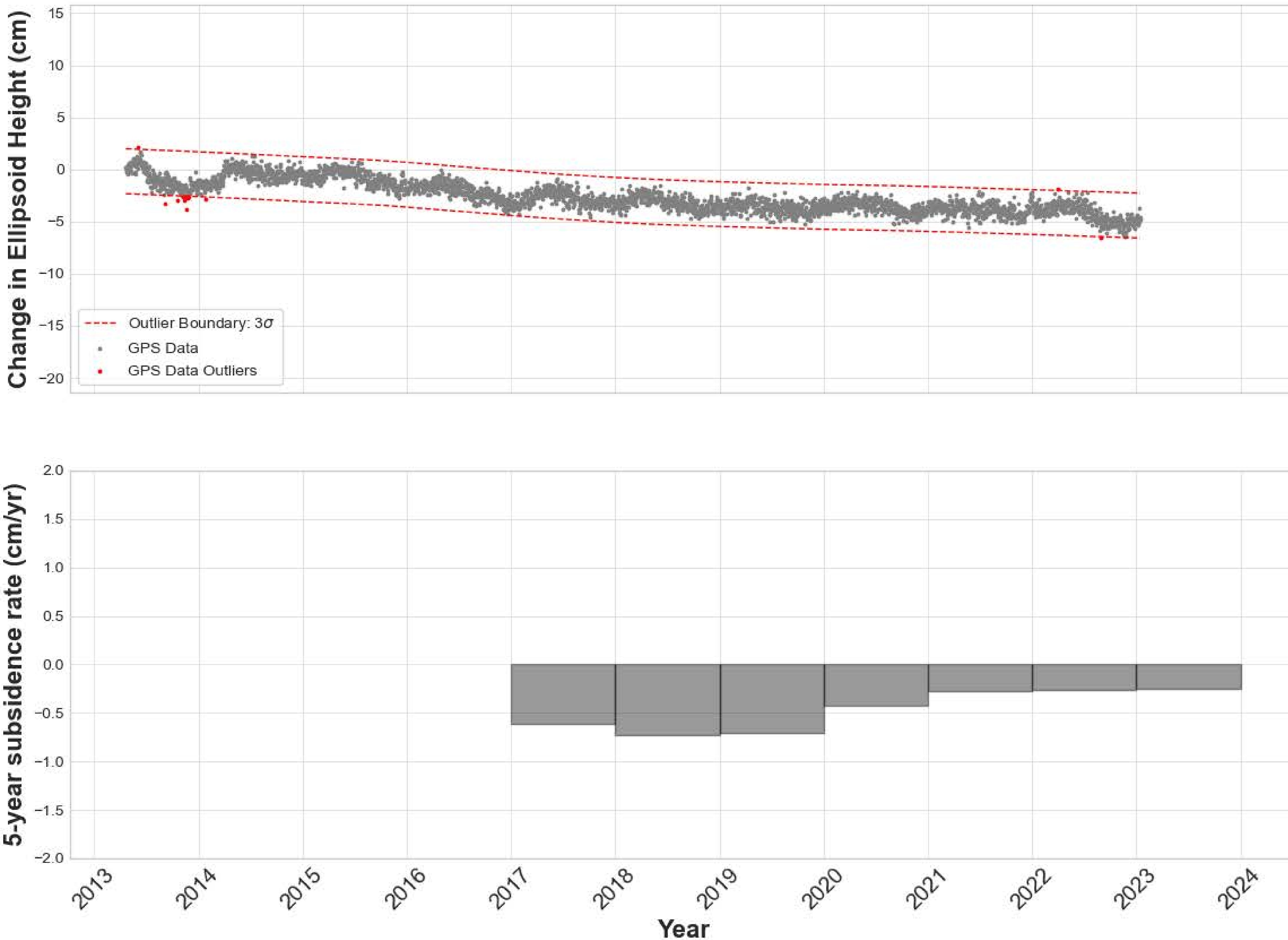



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.



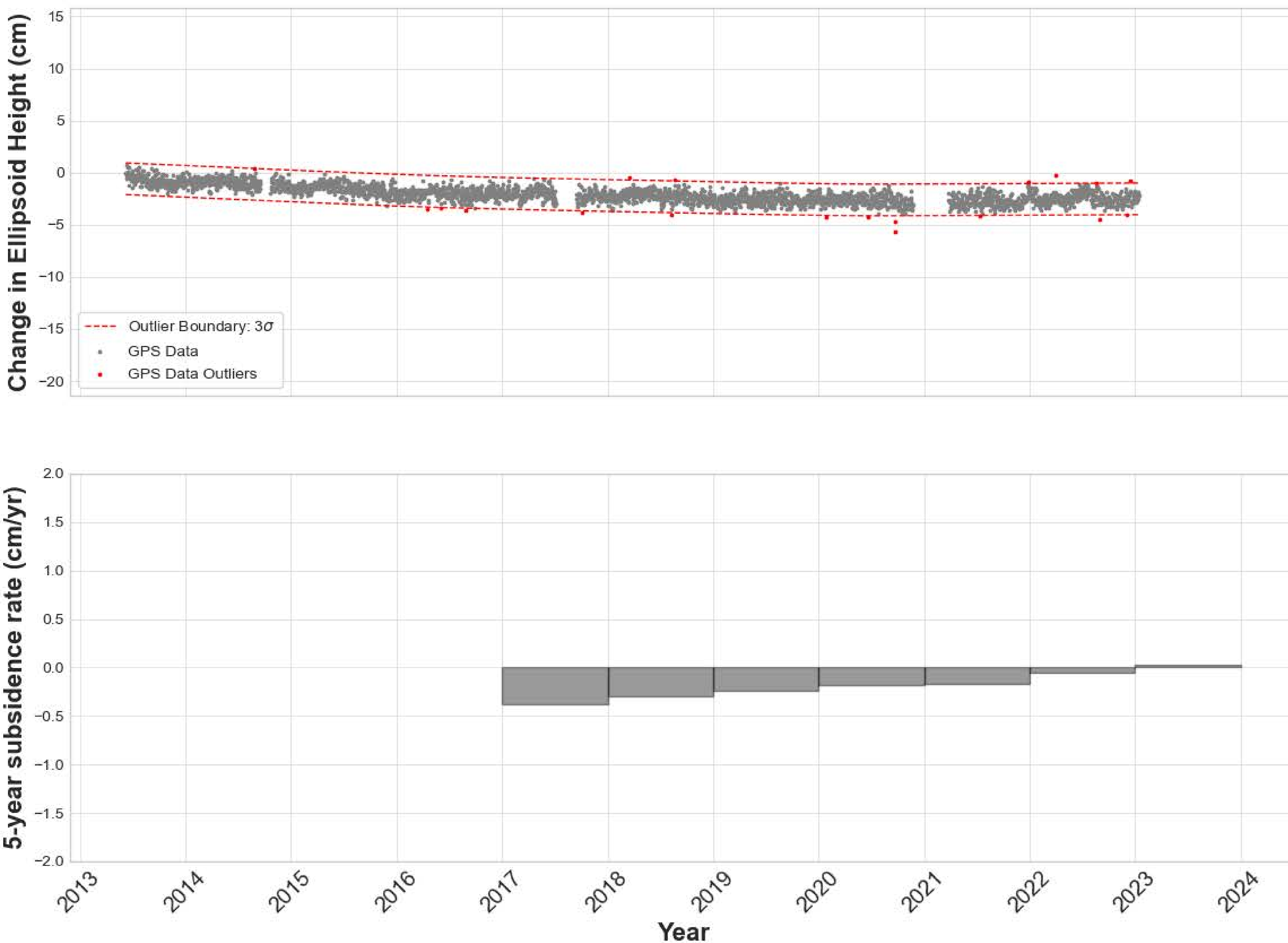

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# SPBH



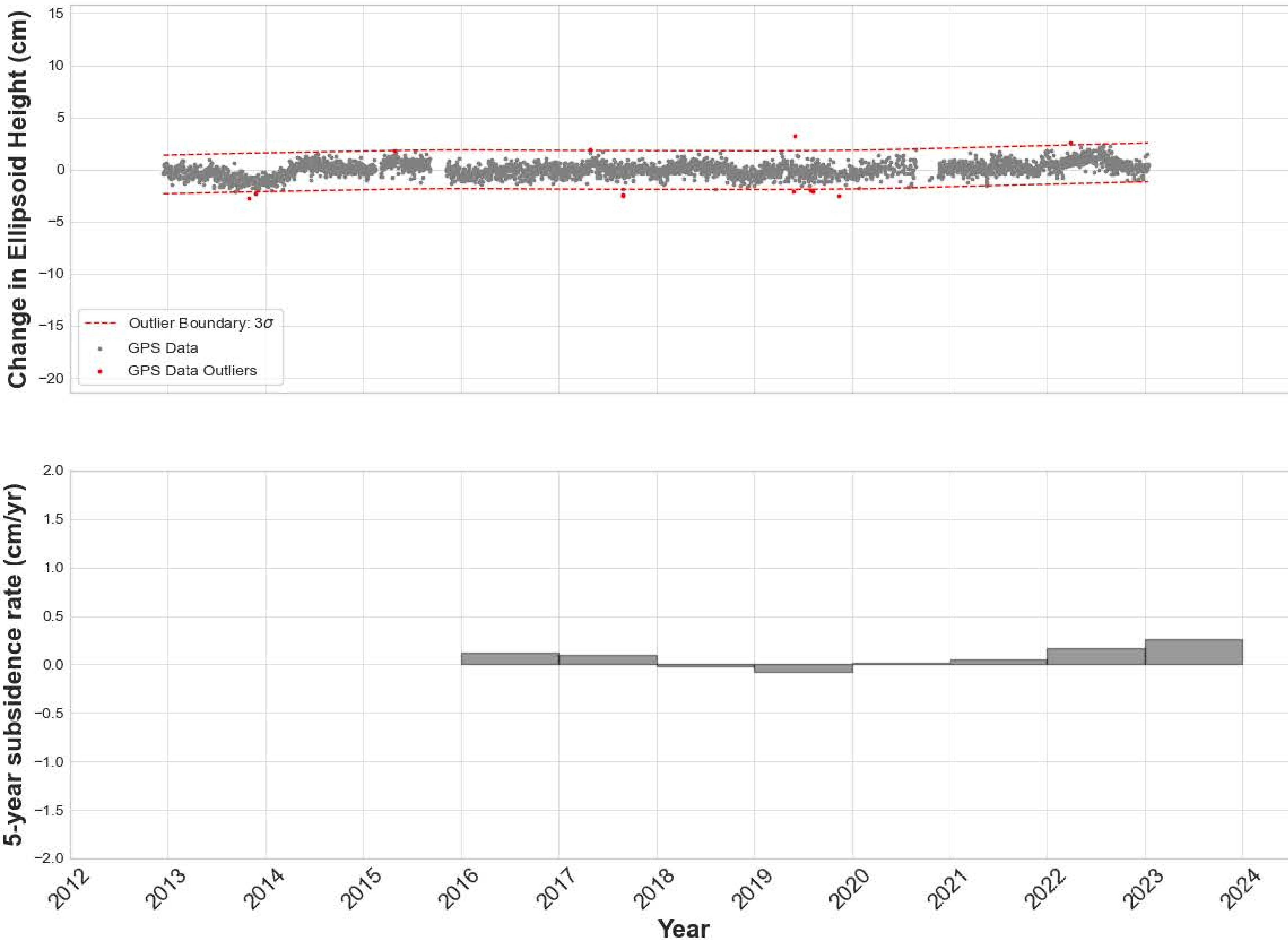

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TDAM



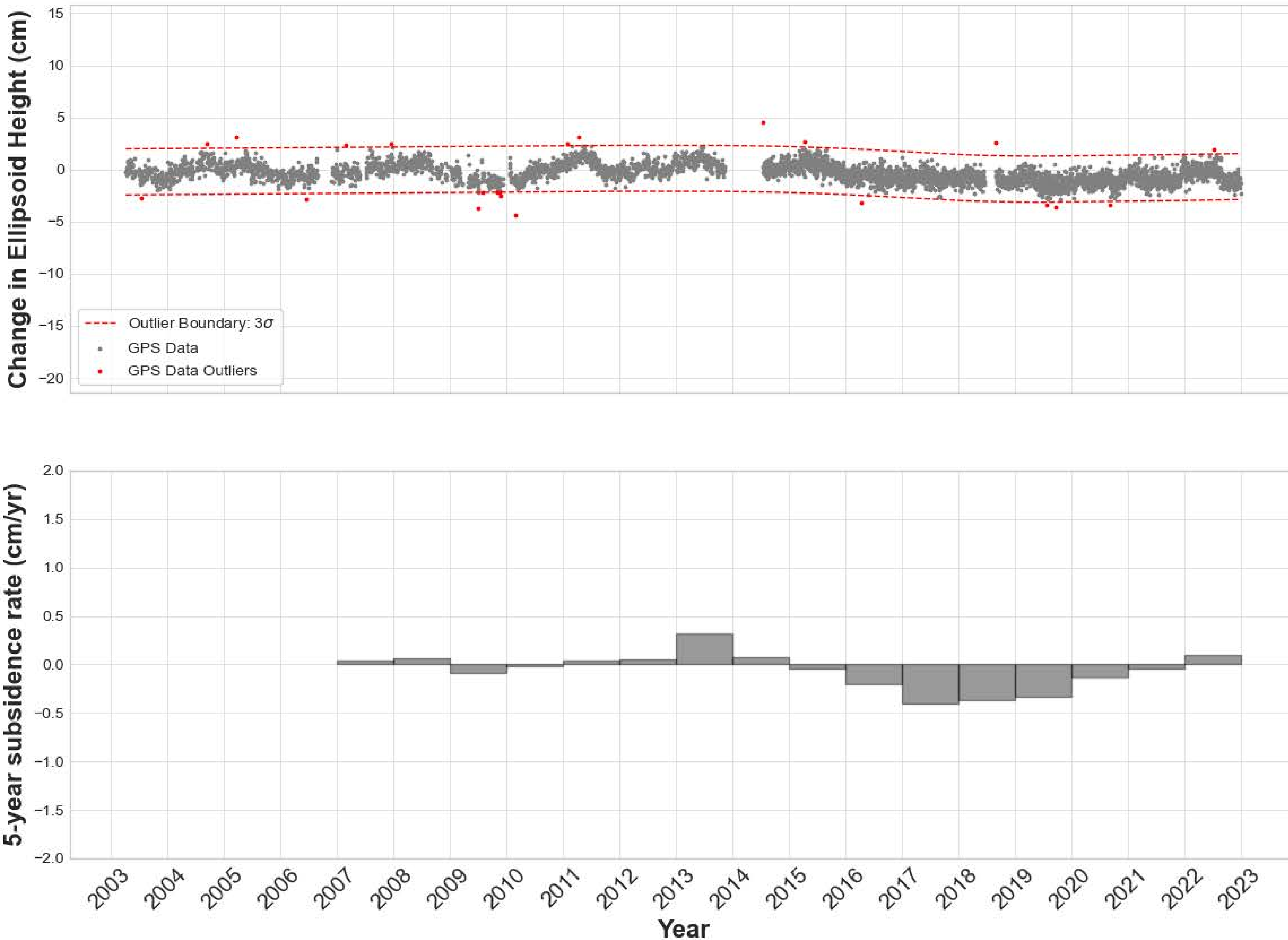

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# THSU



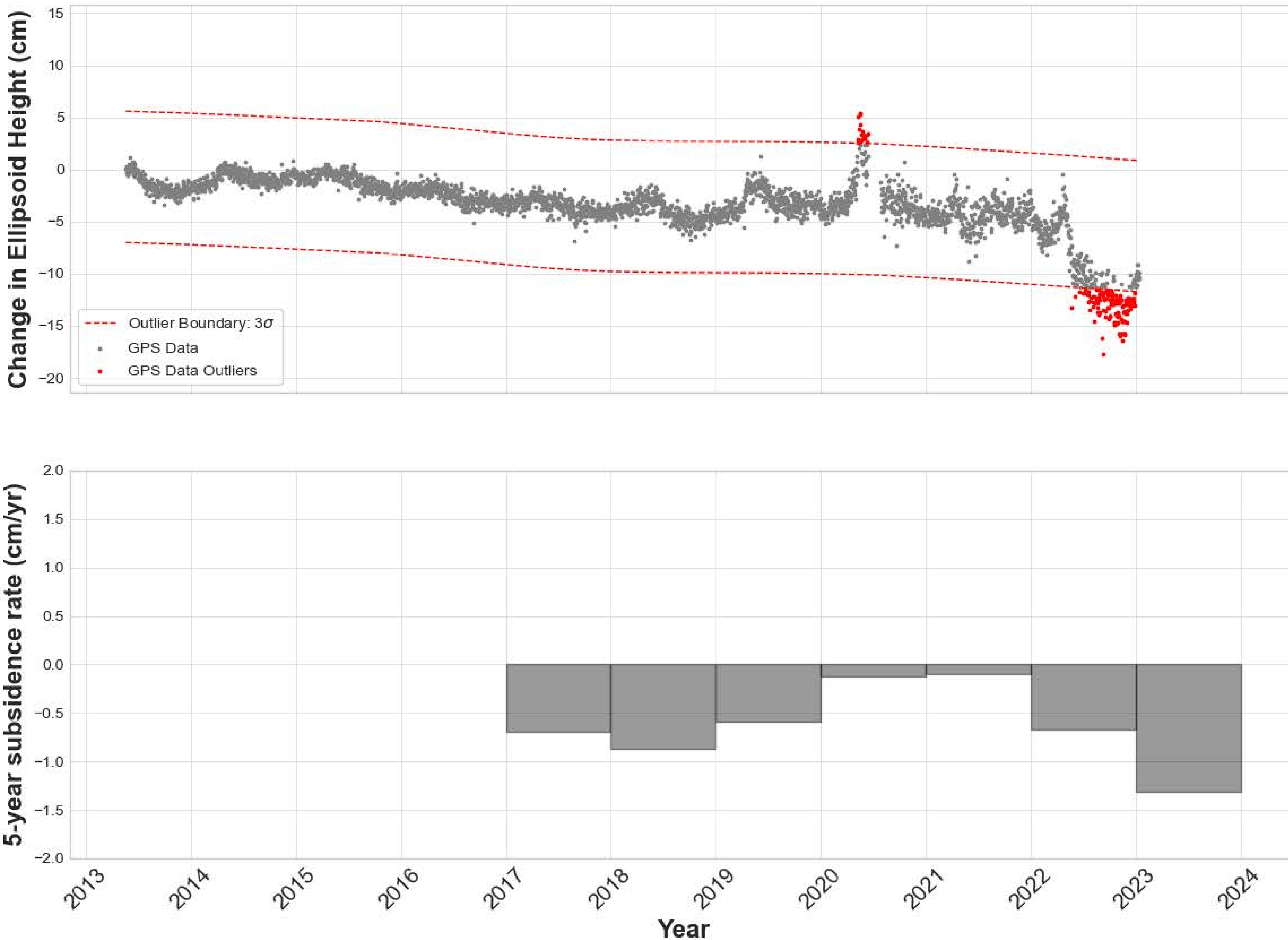

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TMCC



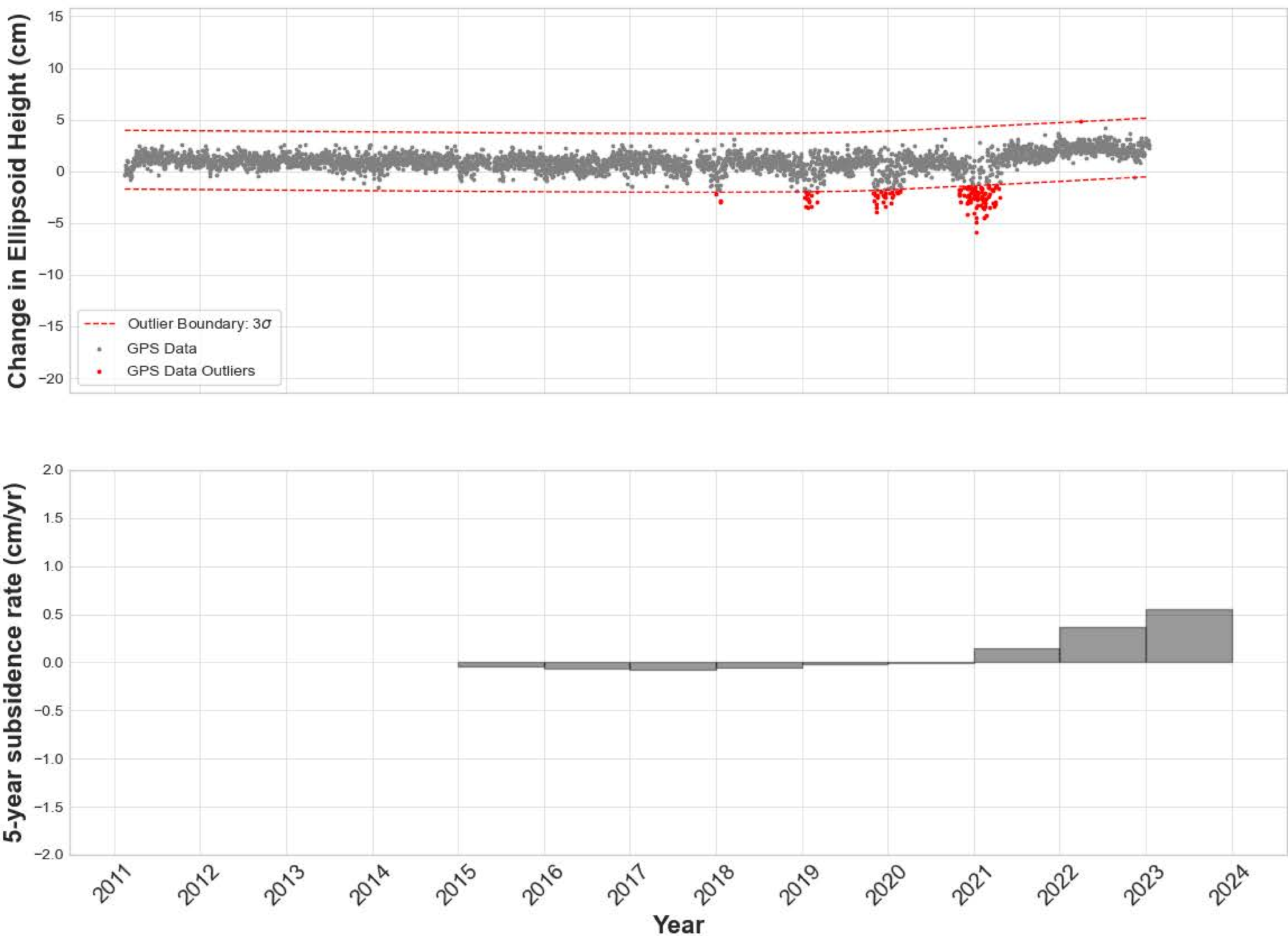

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TSFT



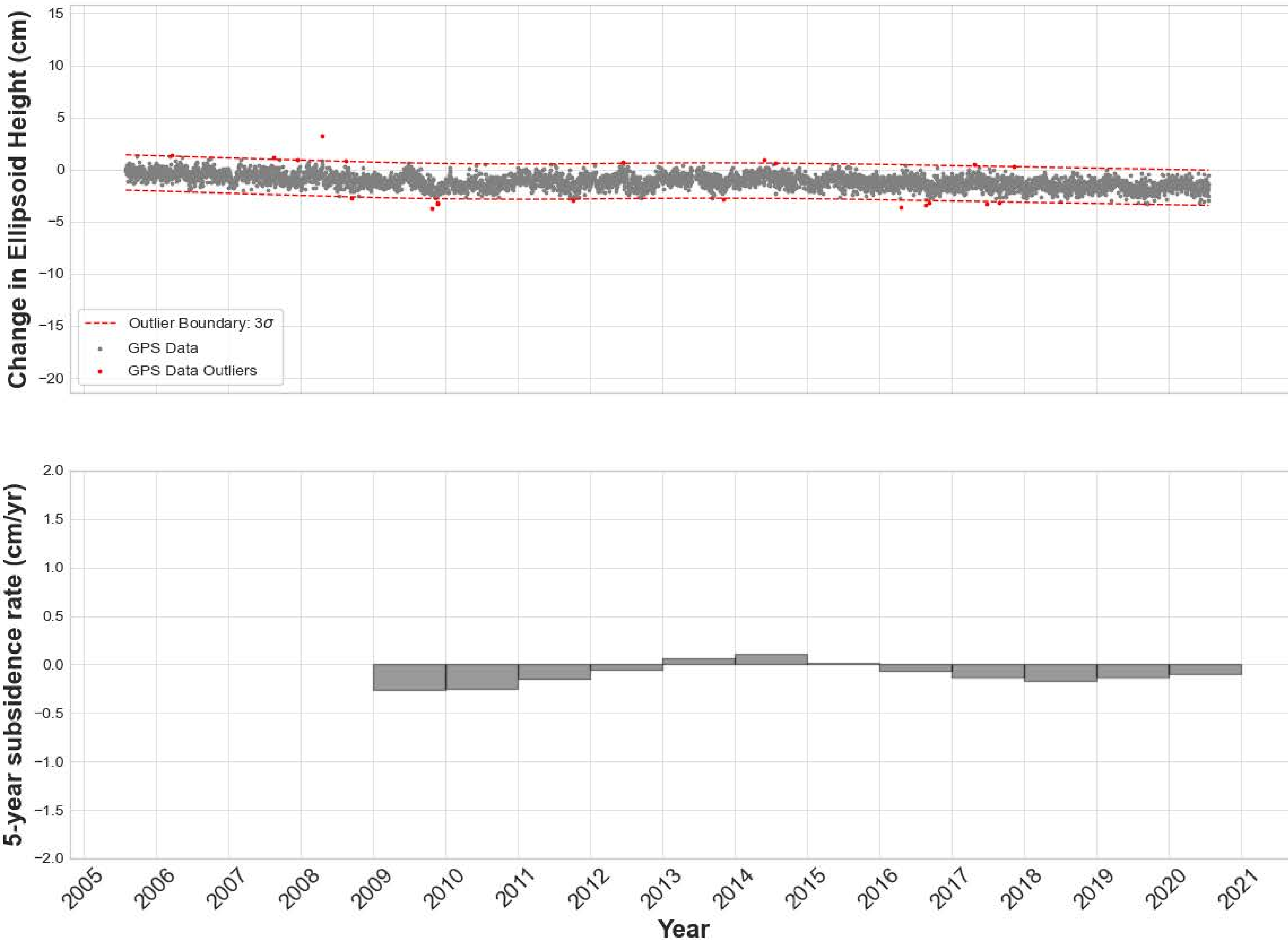

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXAC



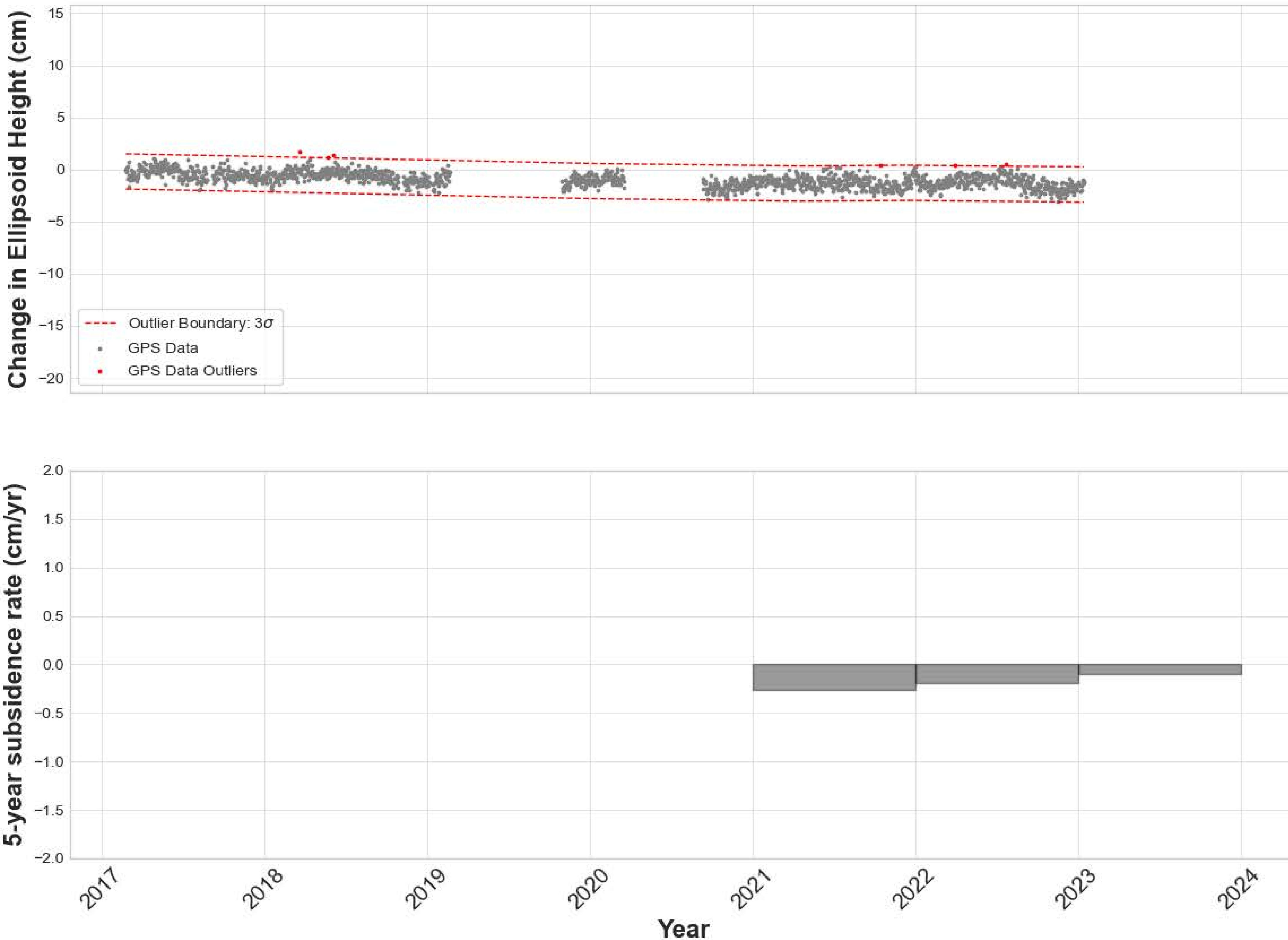

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXAG



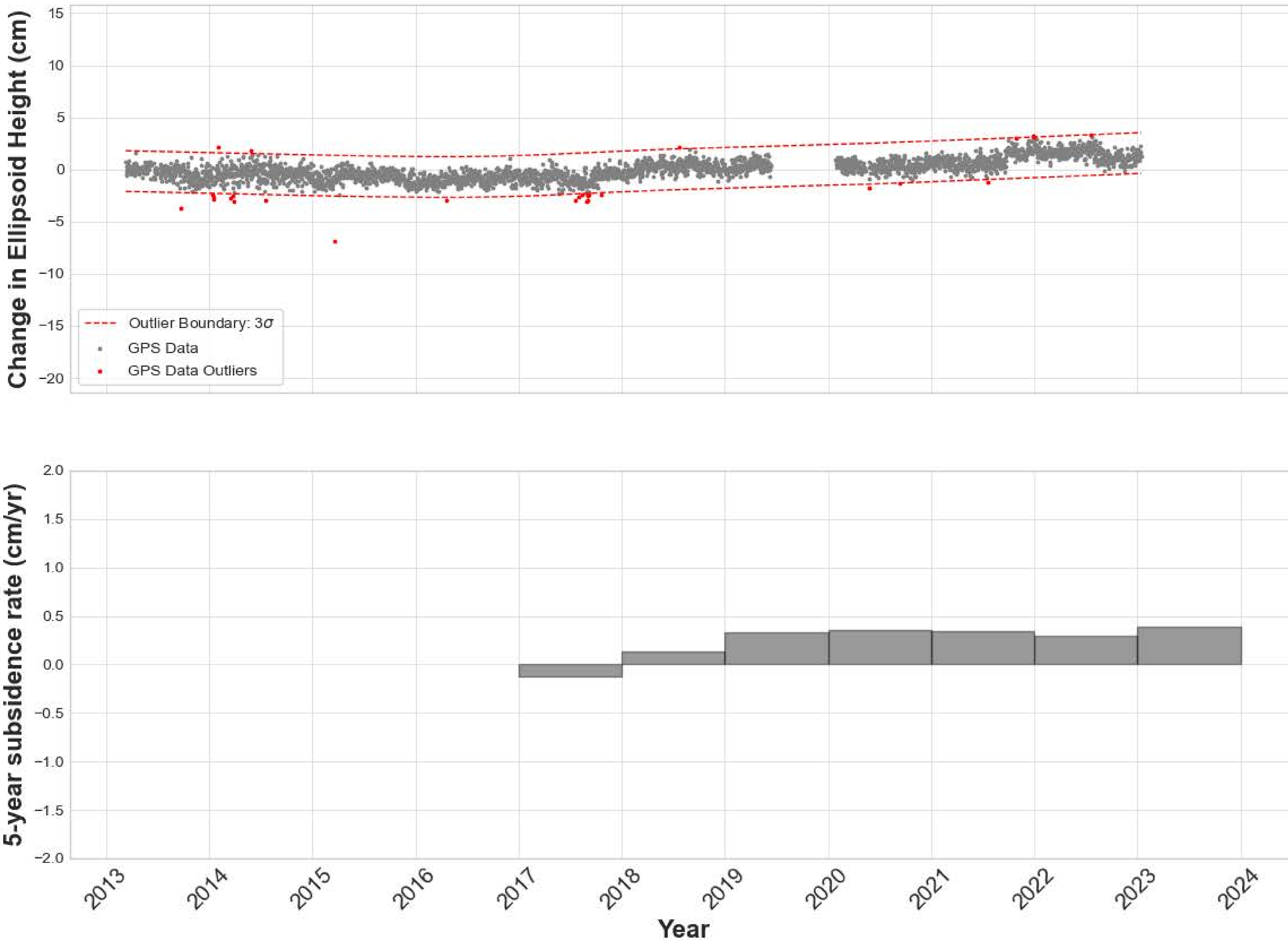

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXAV



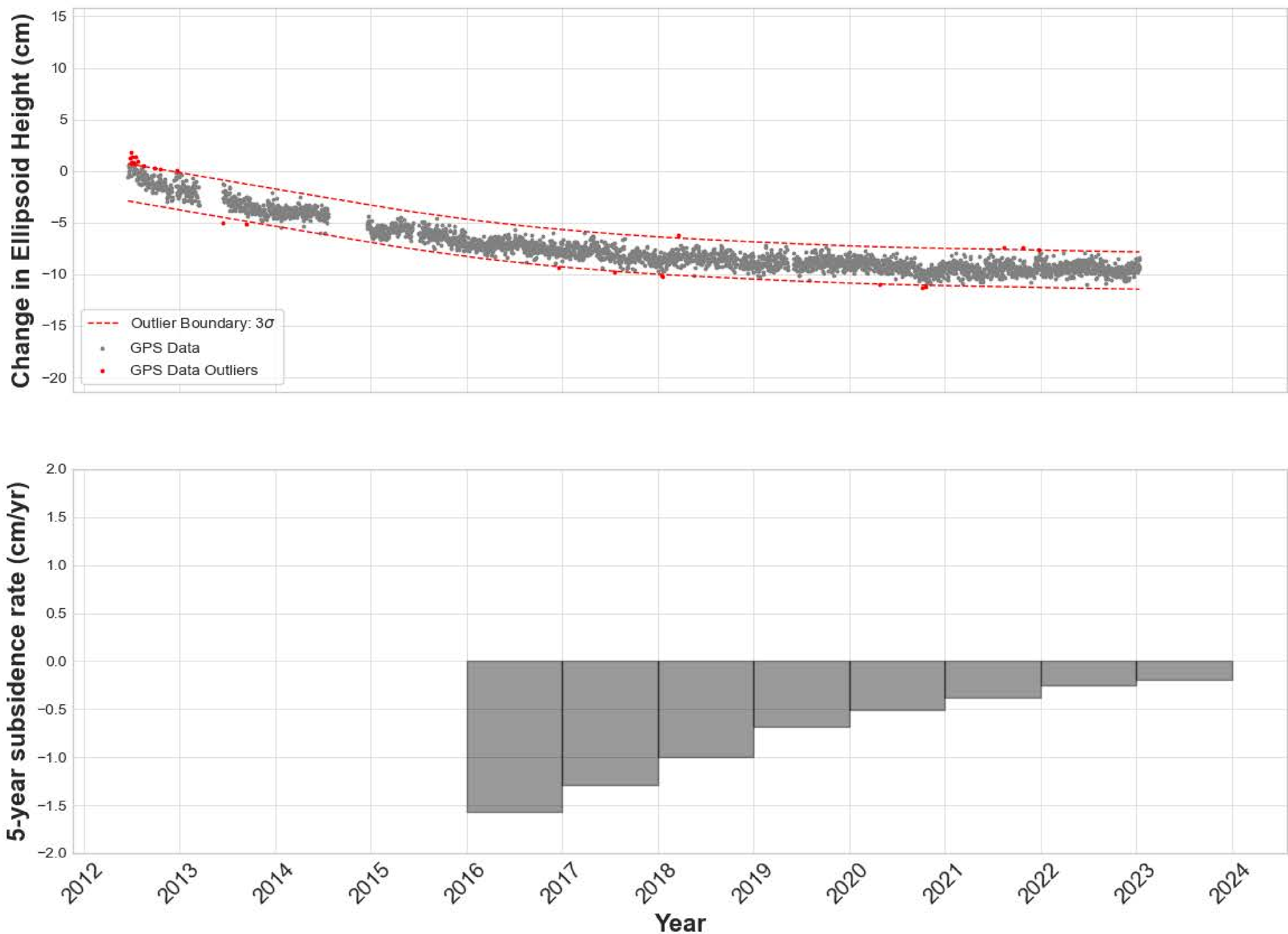

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXB1



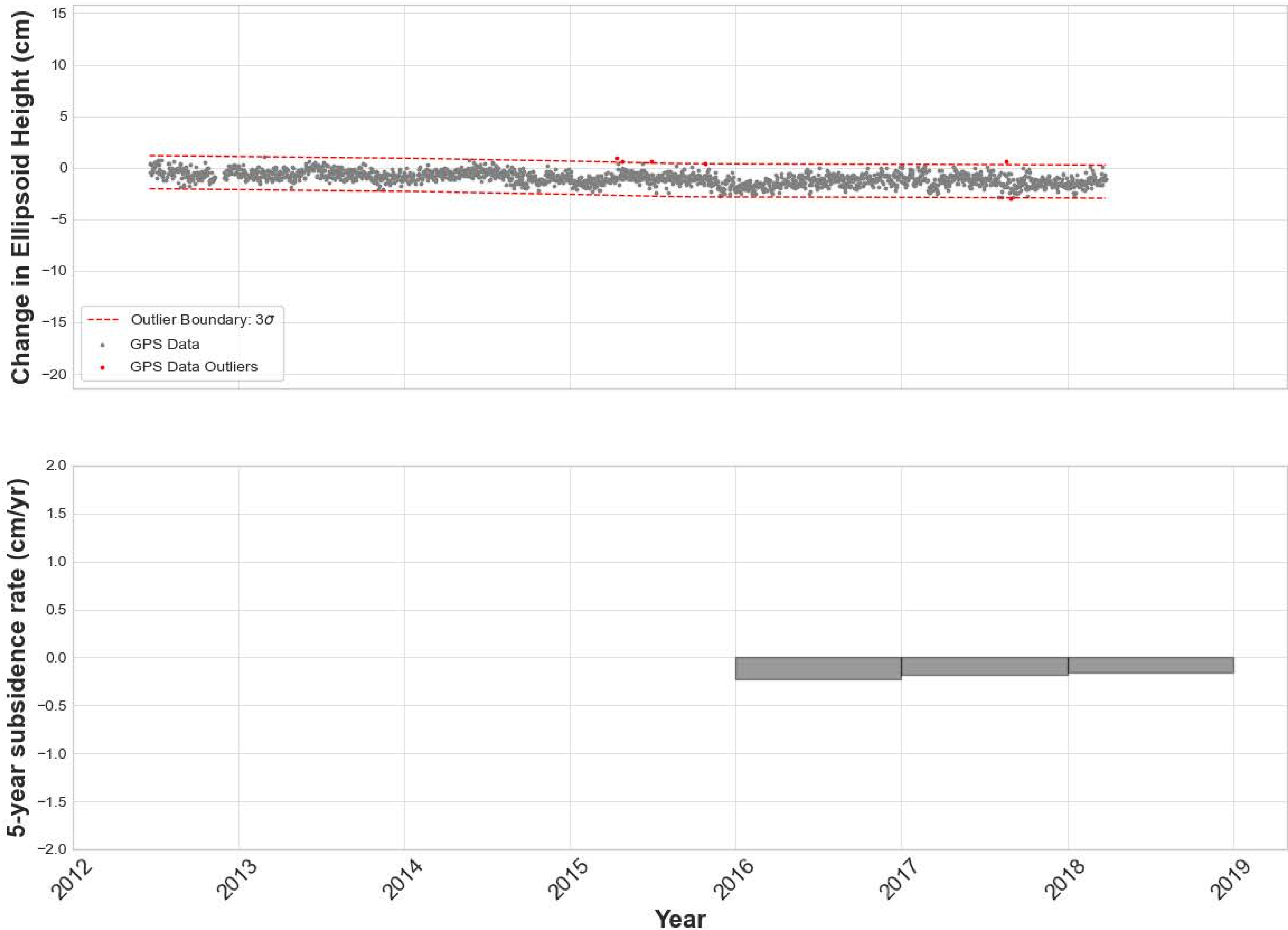

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXB2



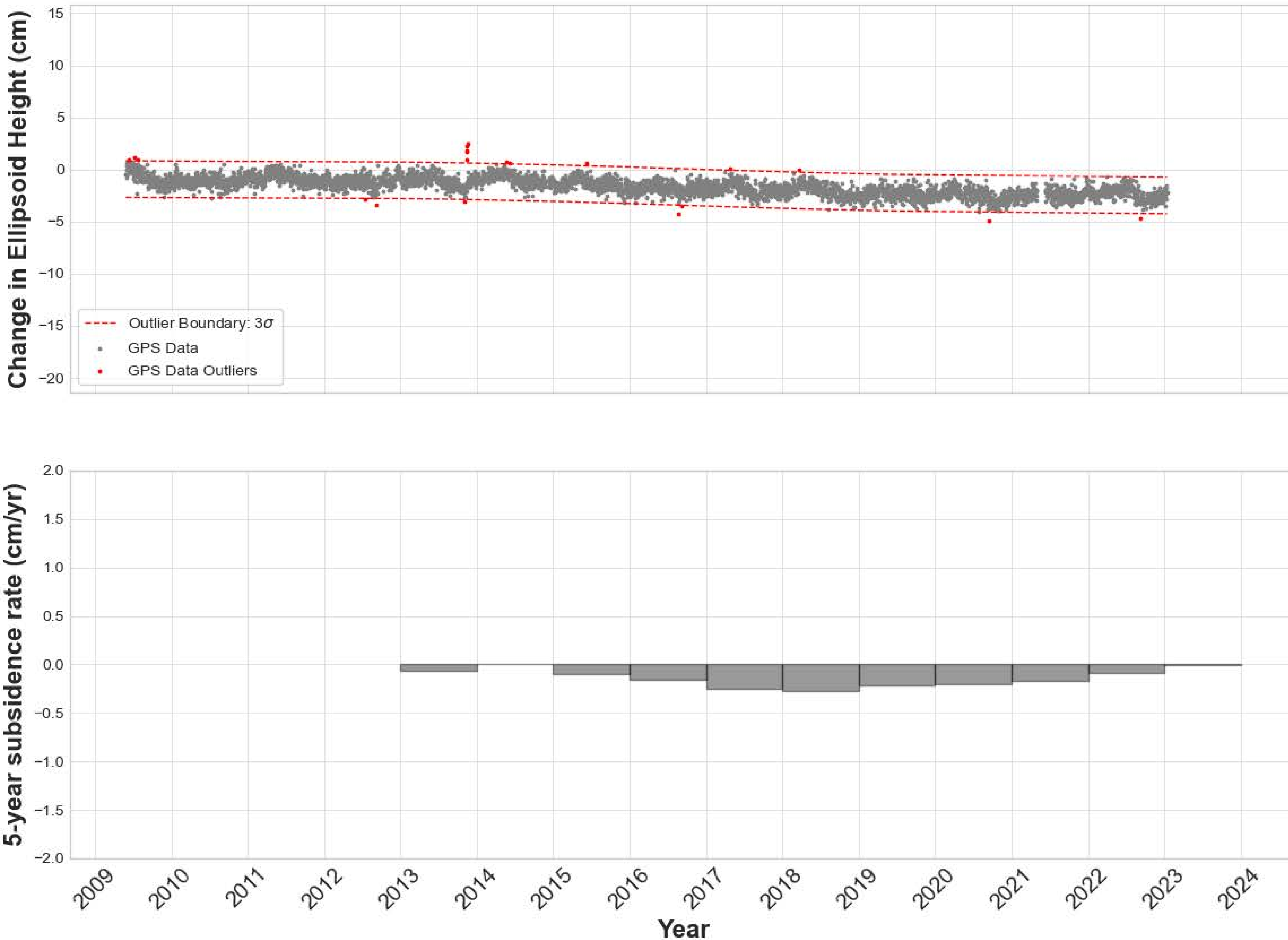

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXB6



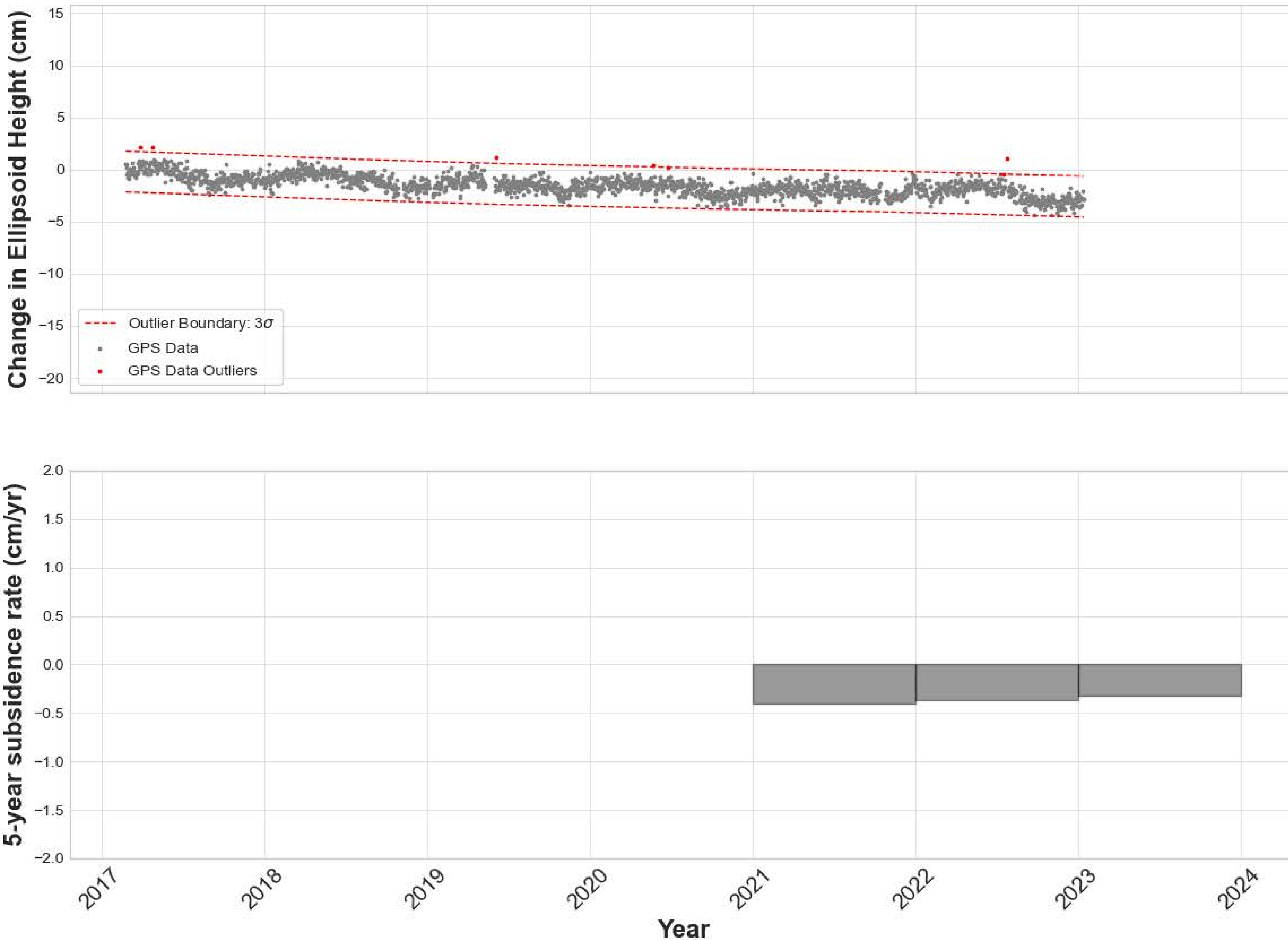

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXBC



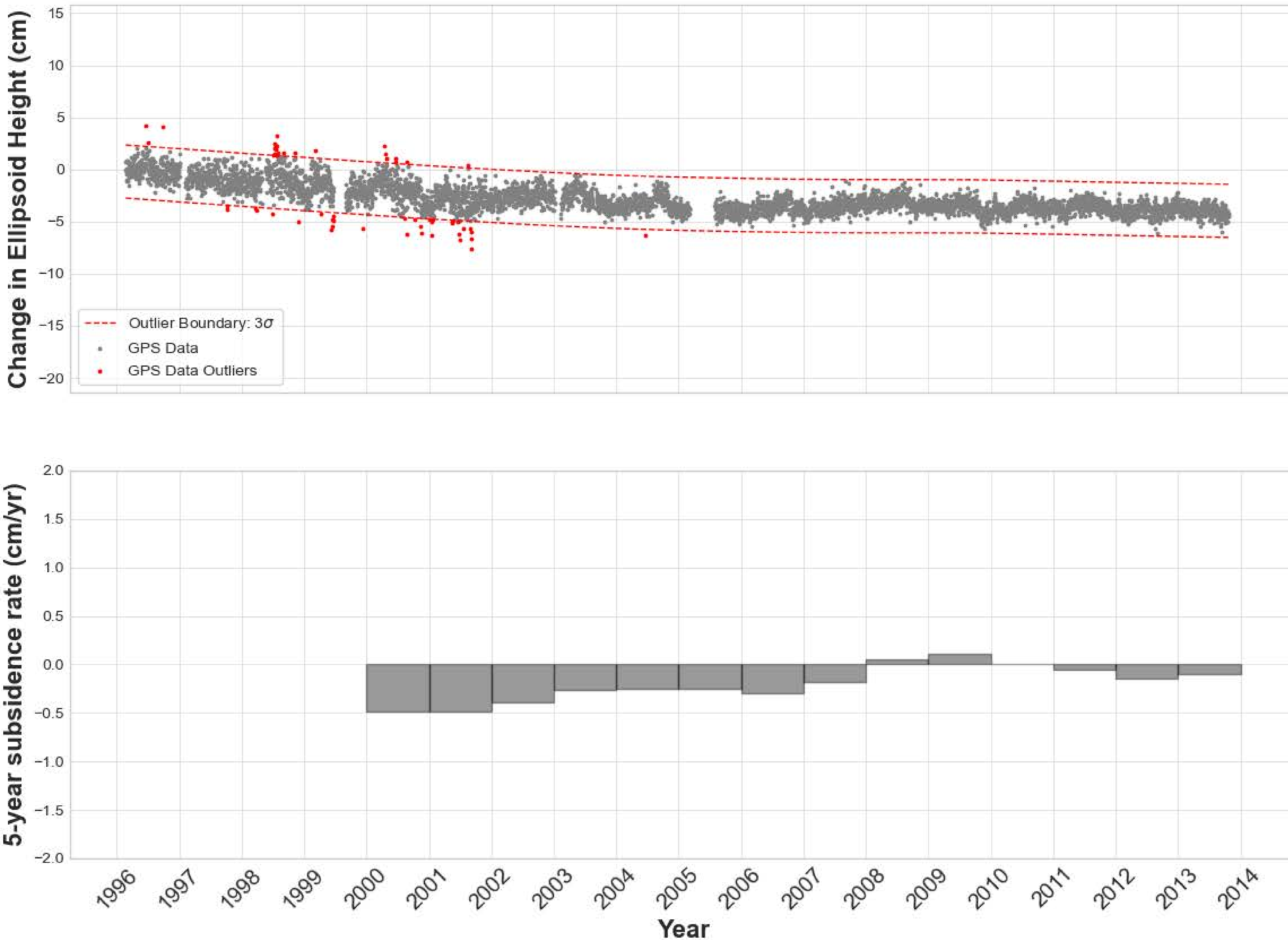

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXBH



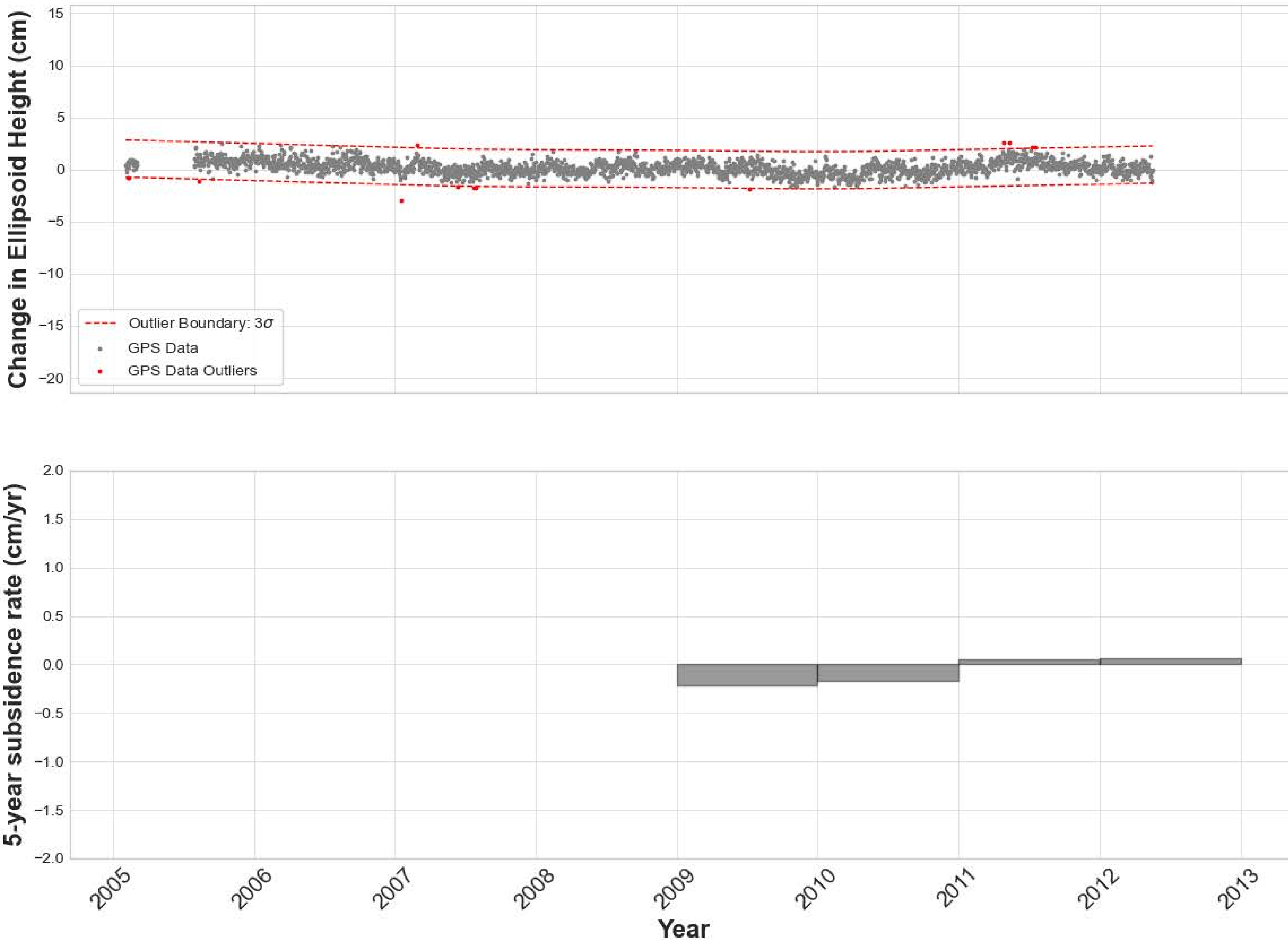

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXBM



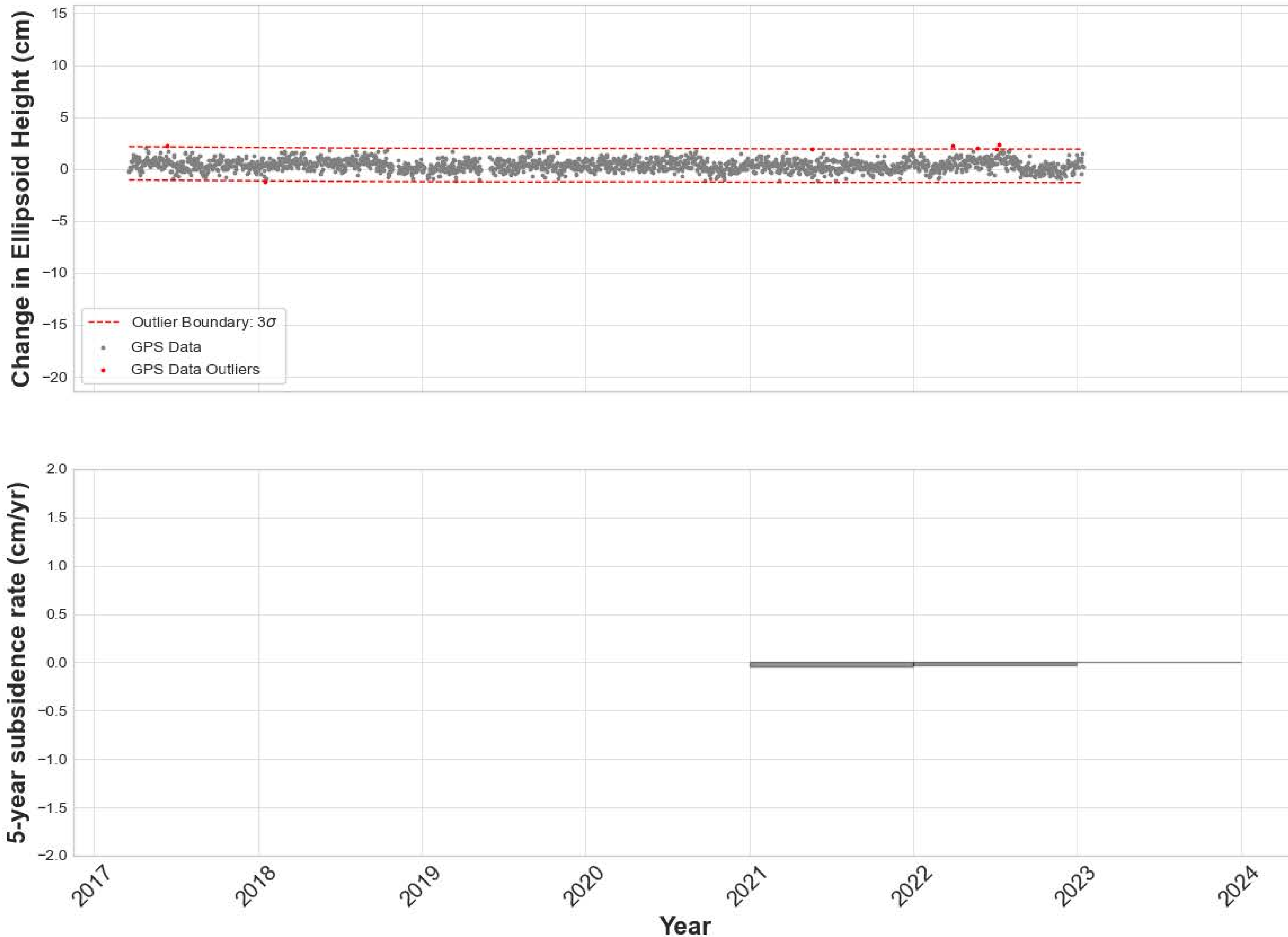

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXBY



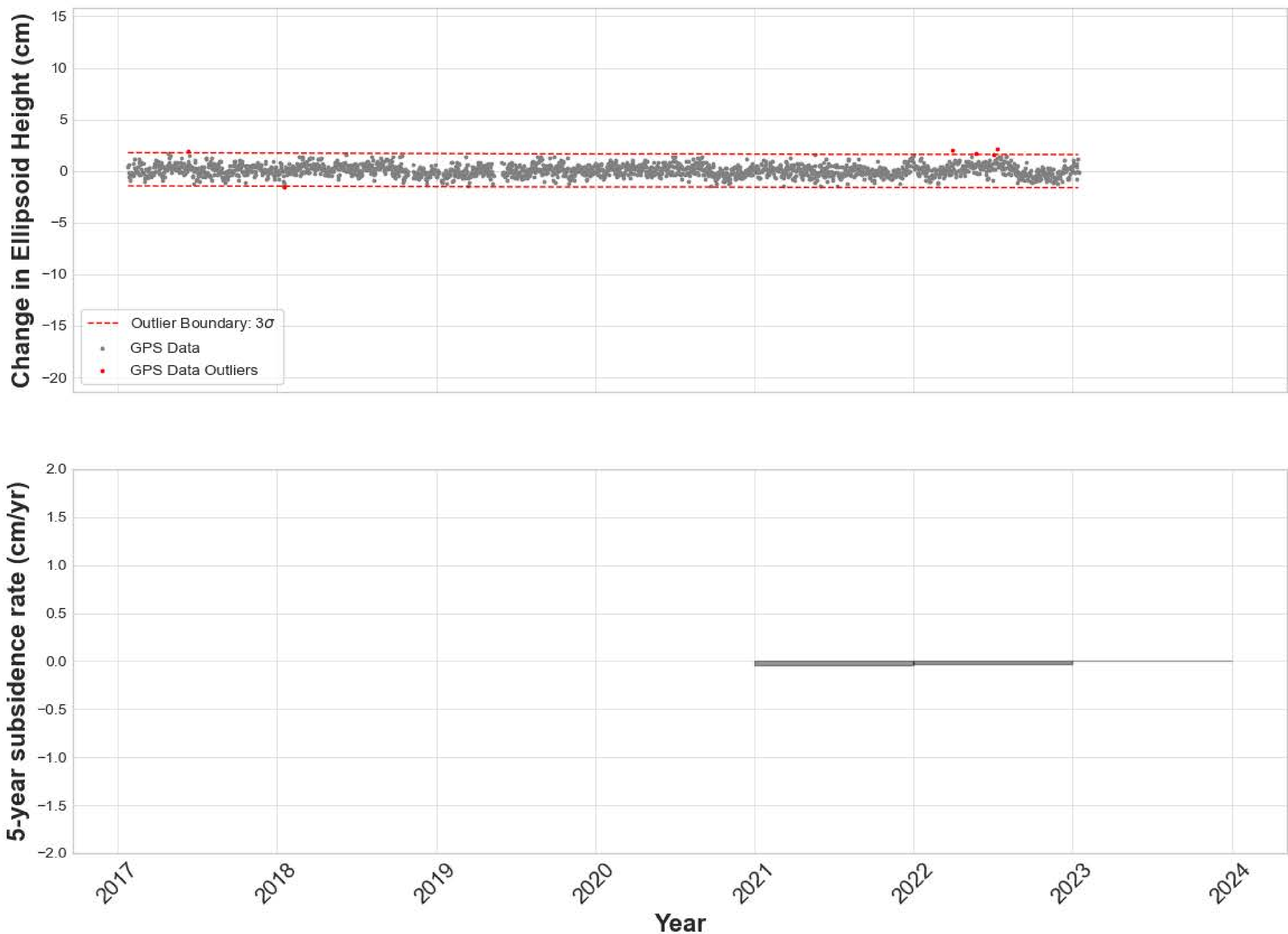

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXC5



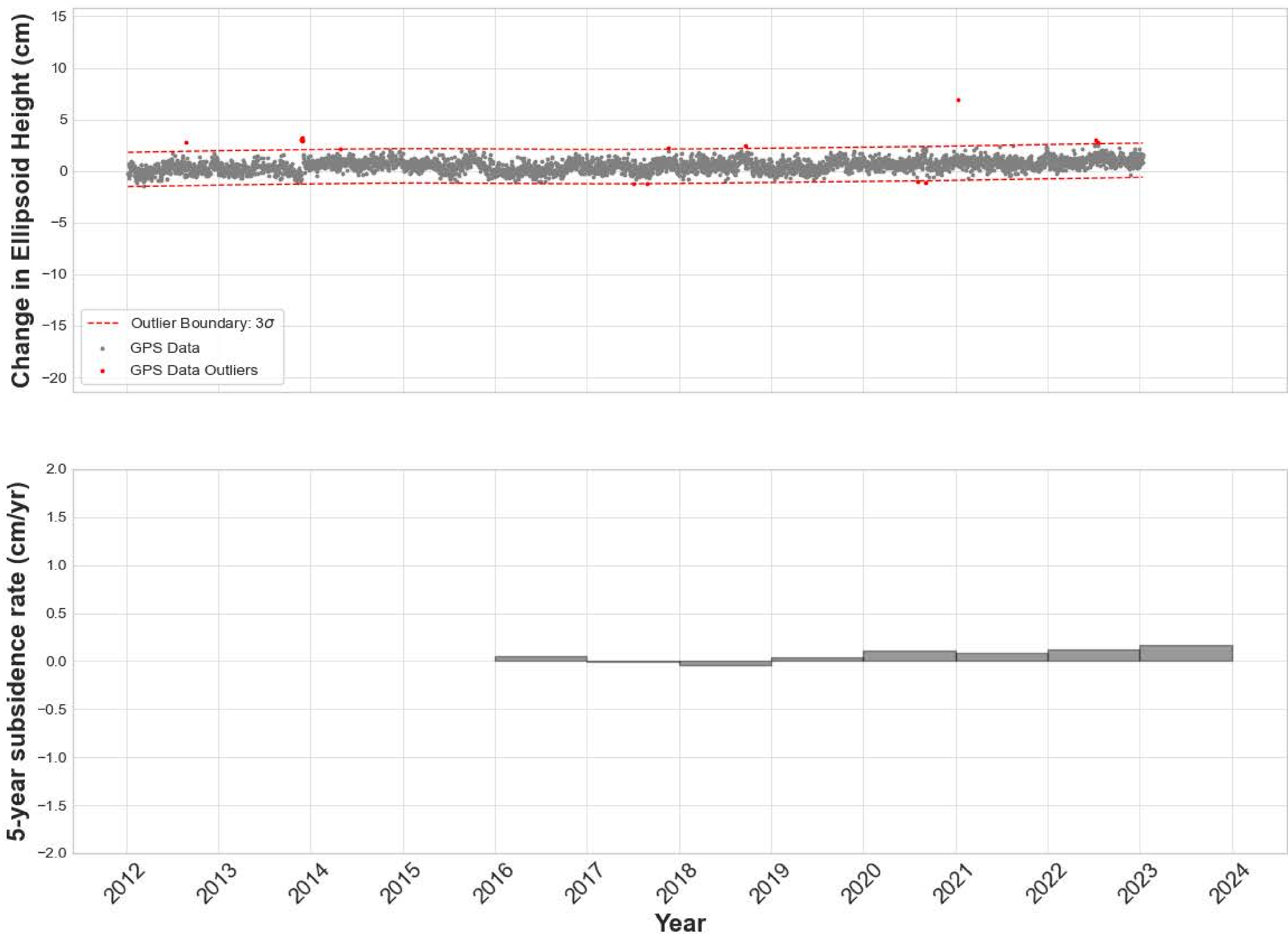

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCF



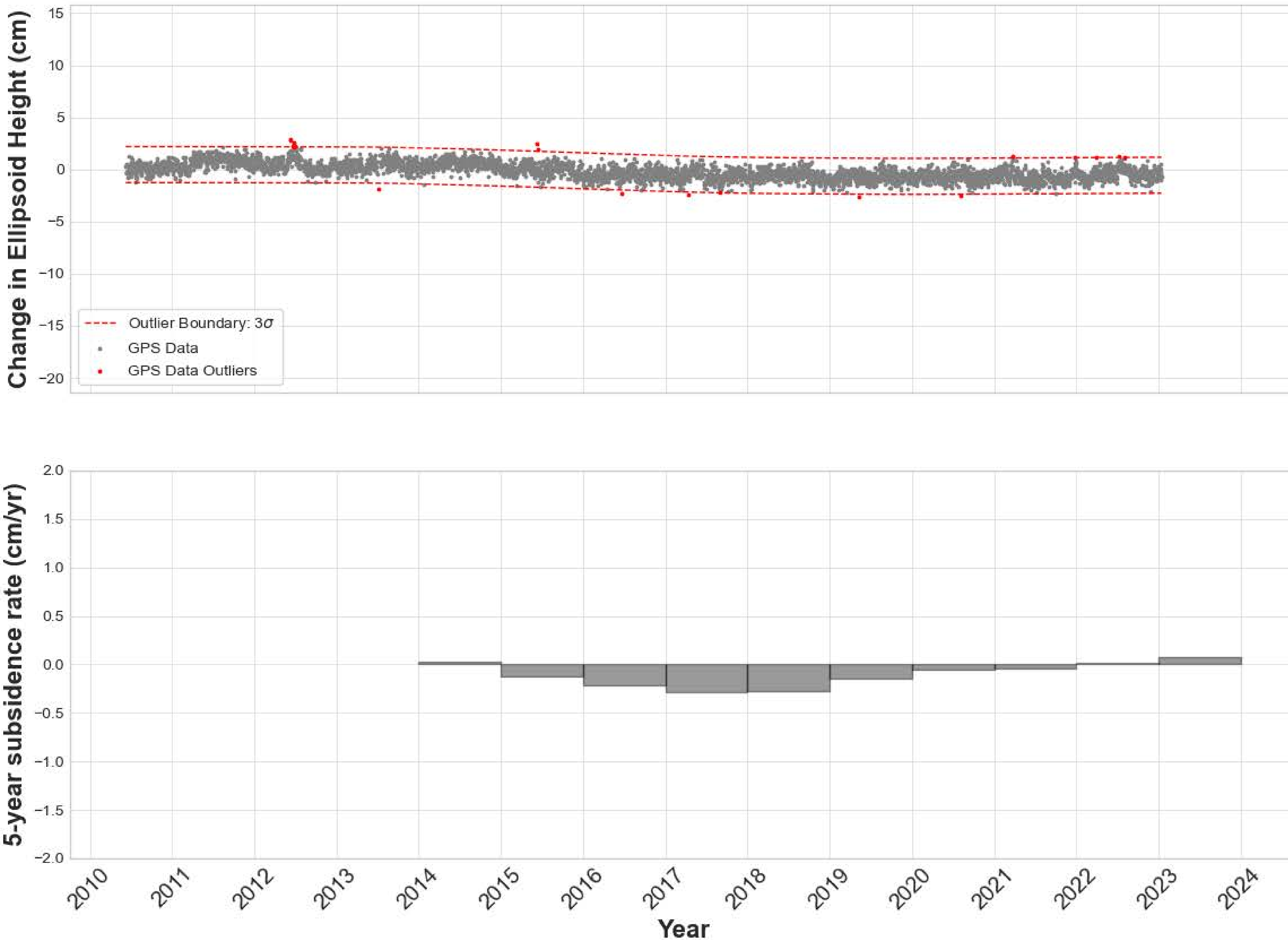

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCK



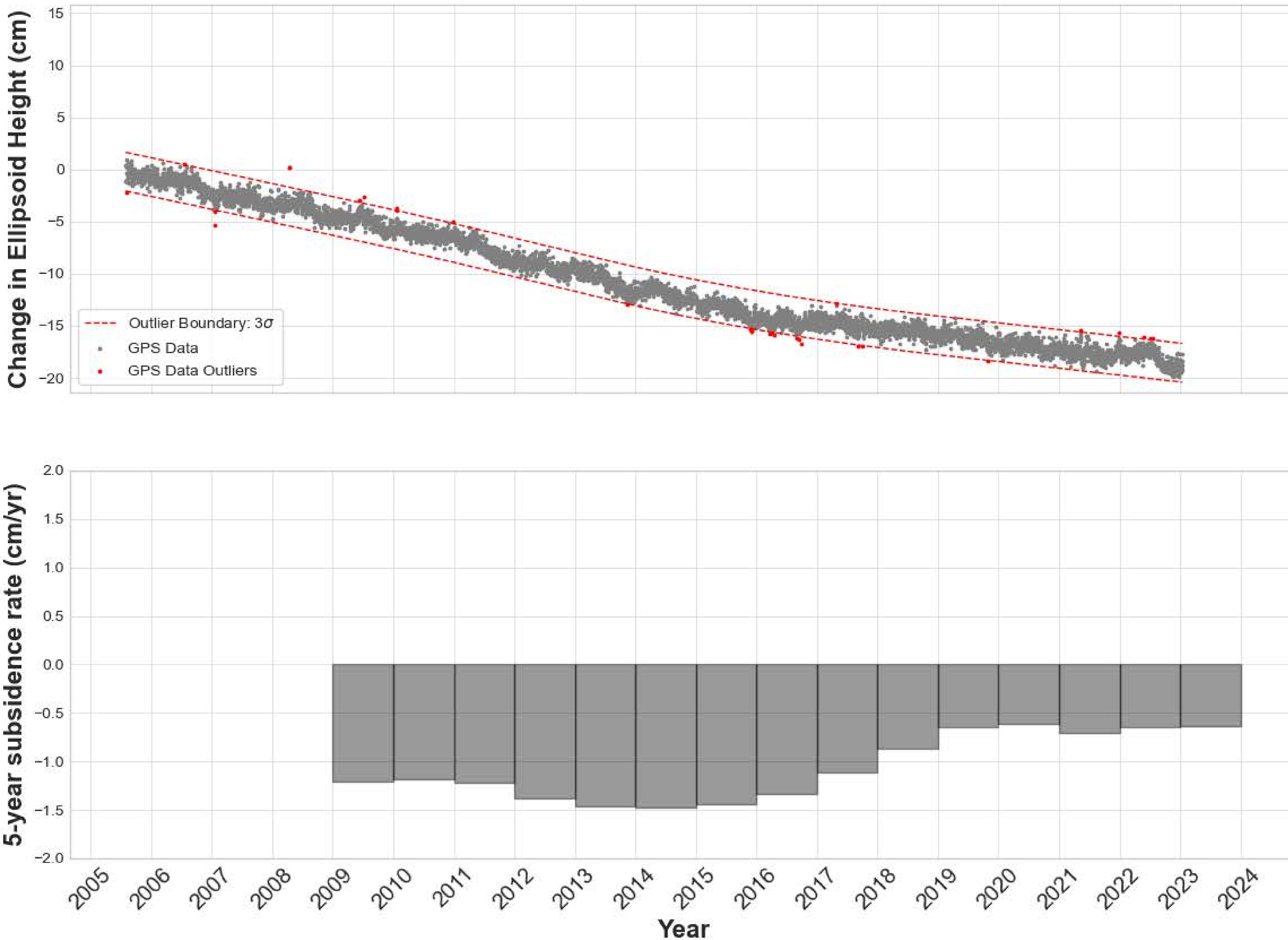

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCM



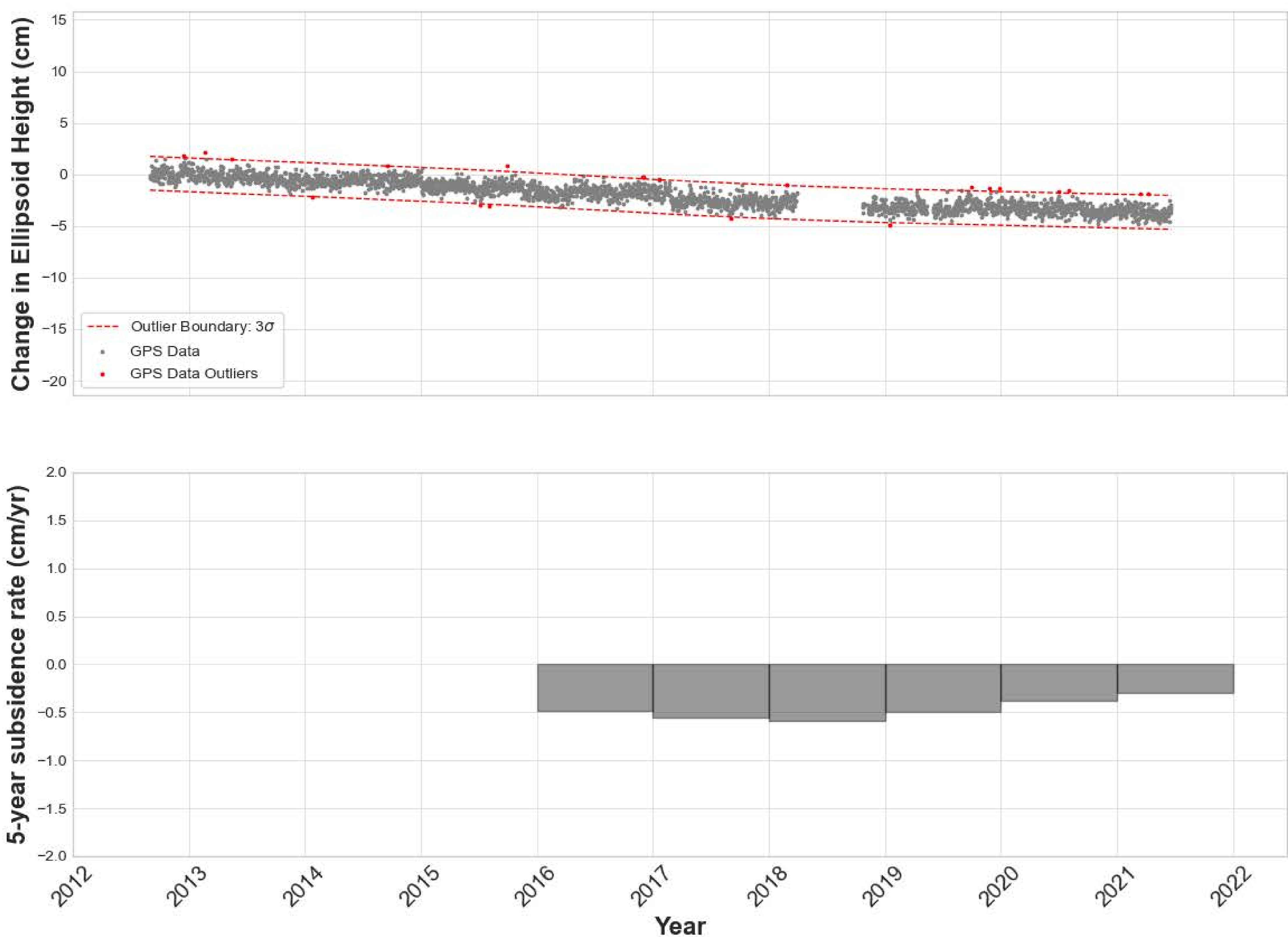

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCN



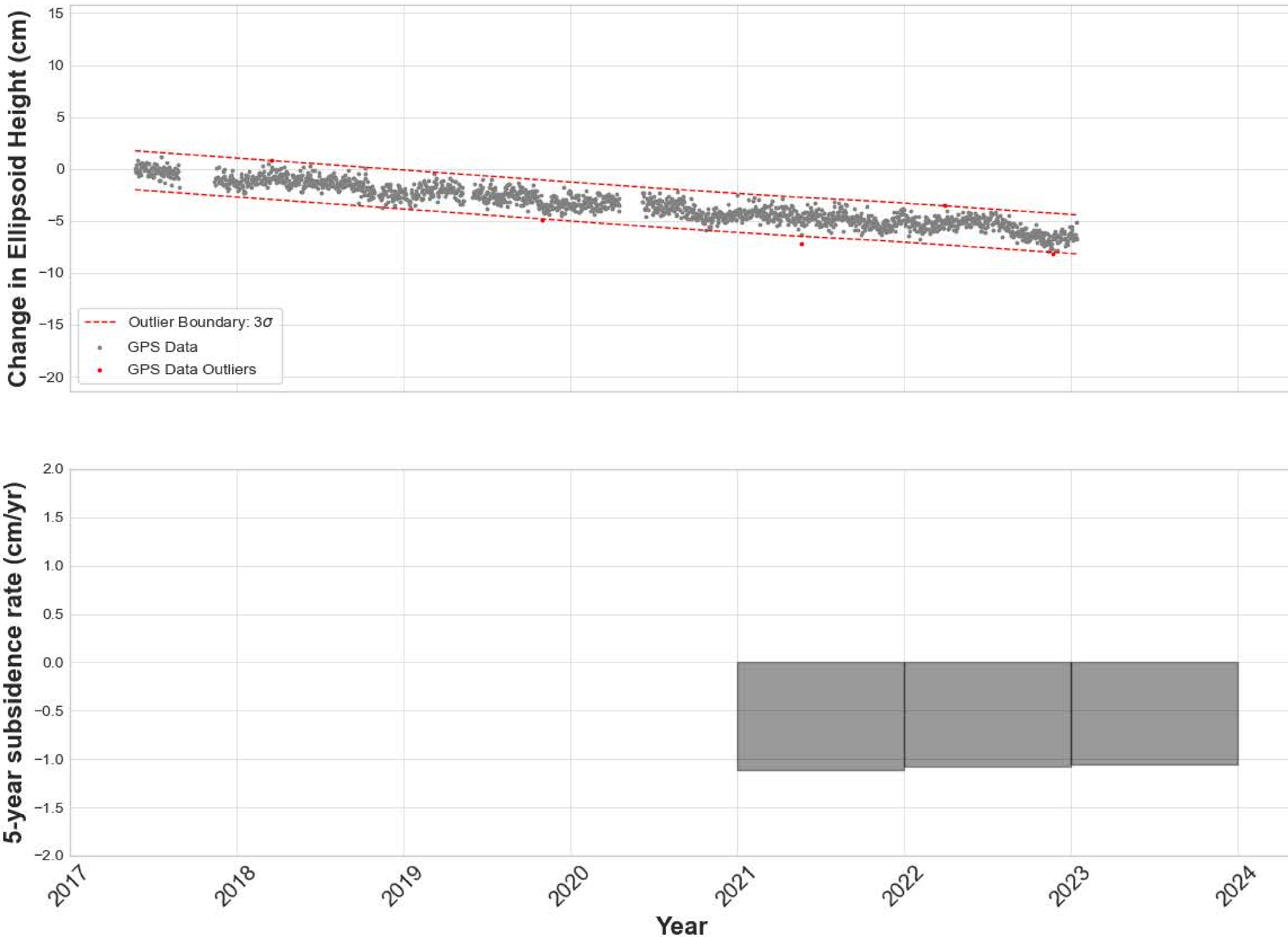

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCV



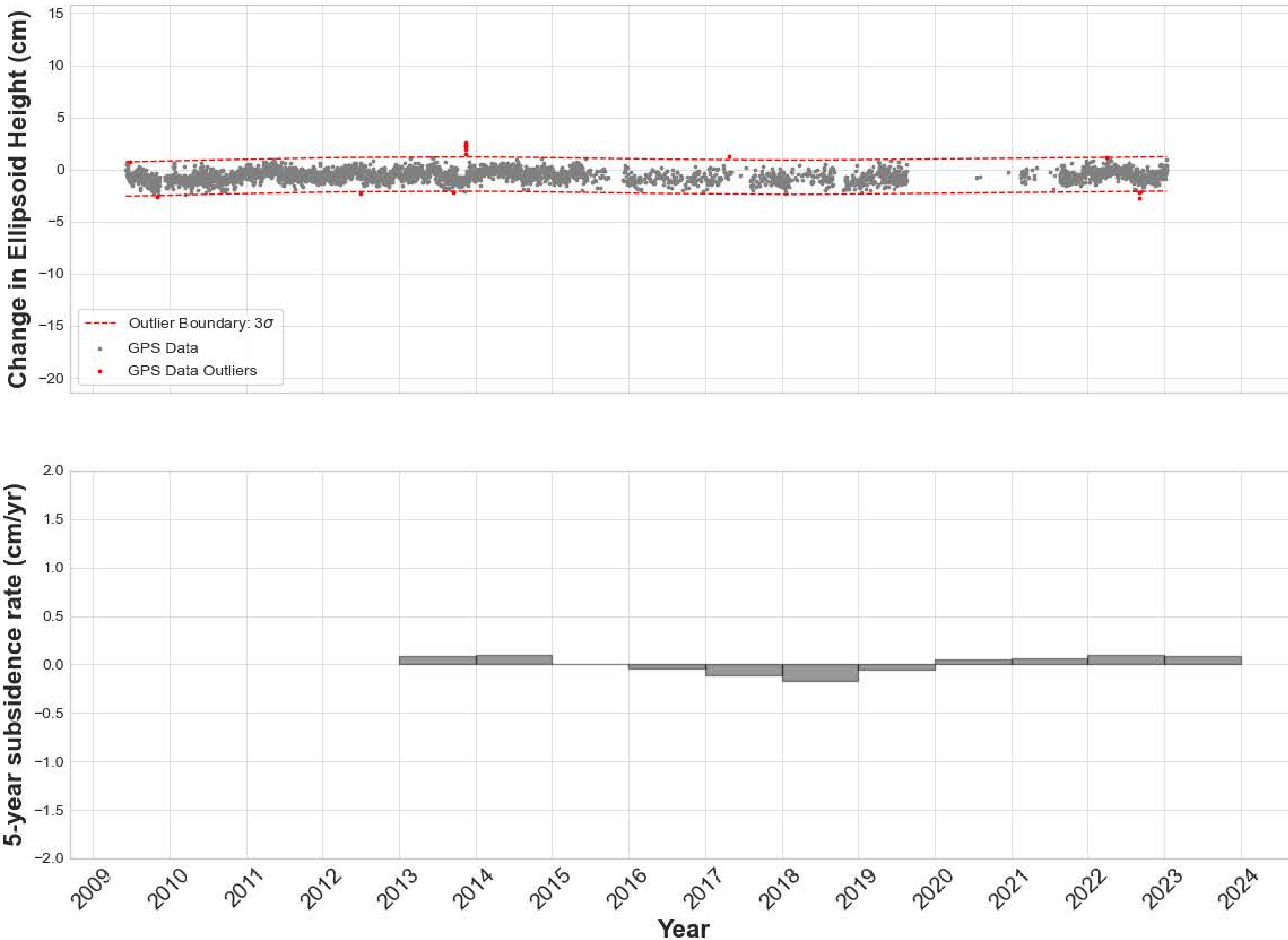

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXCY



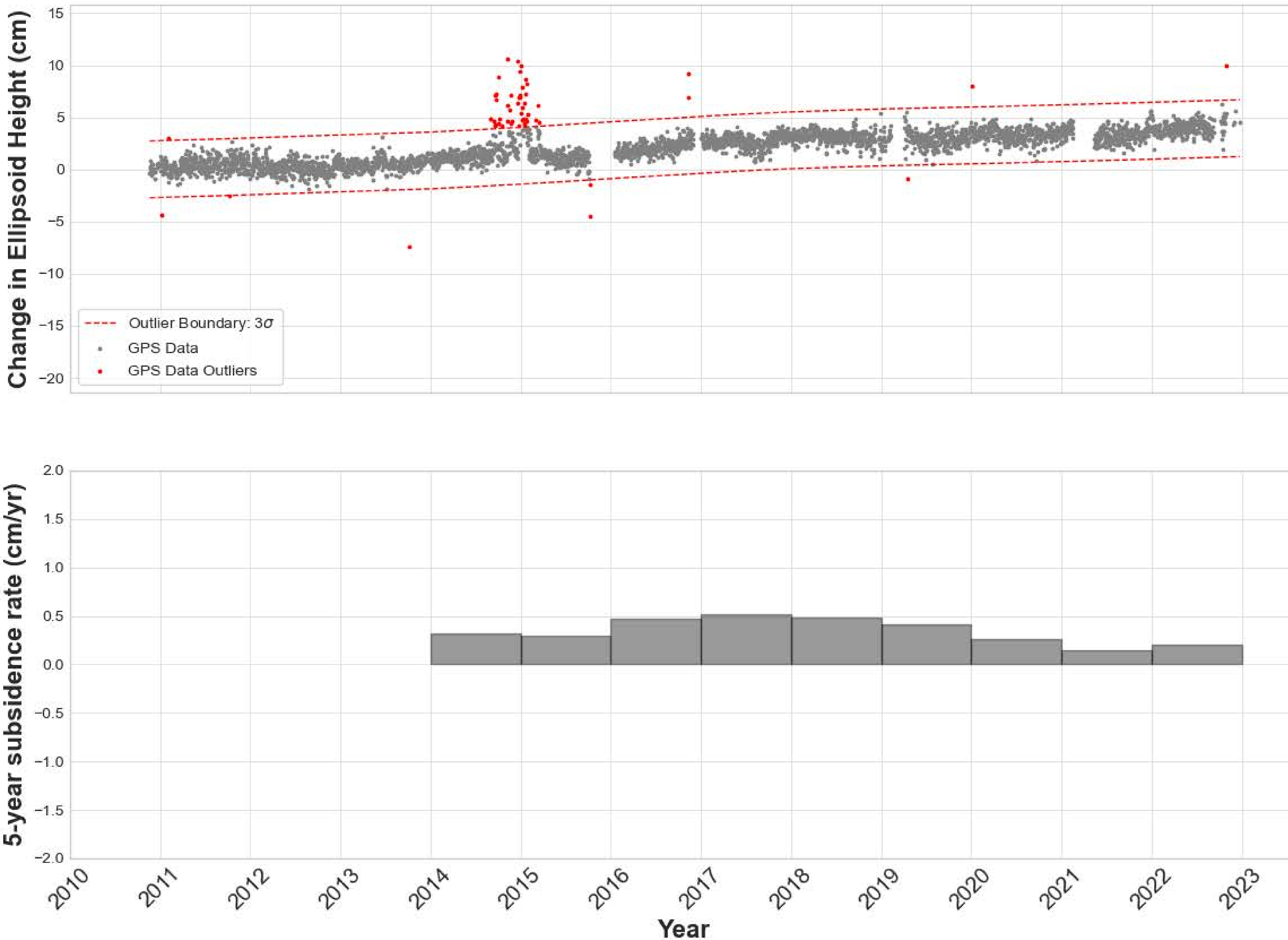

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXED



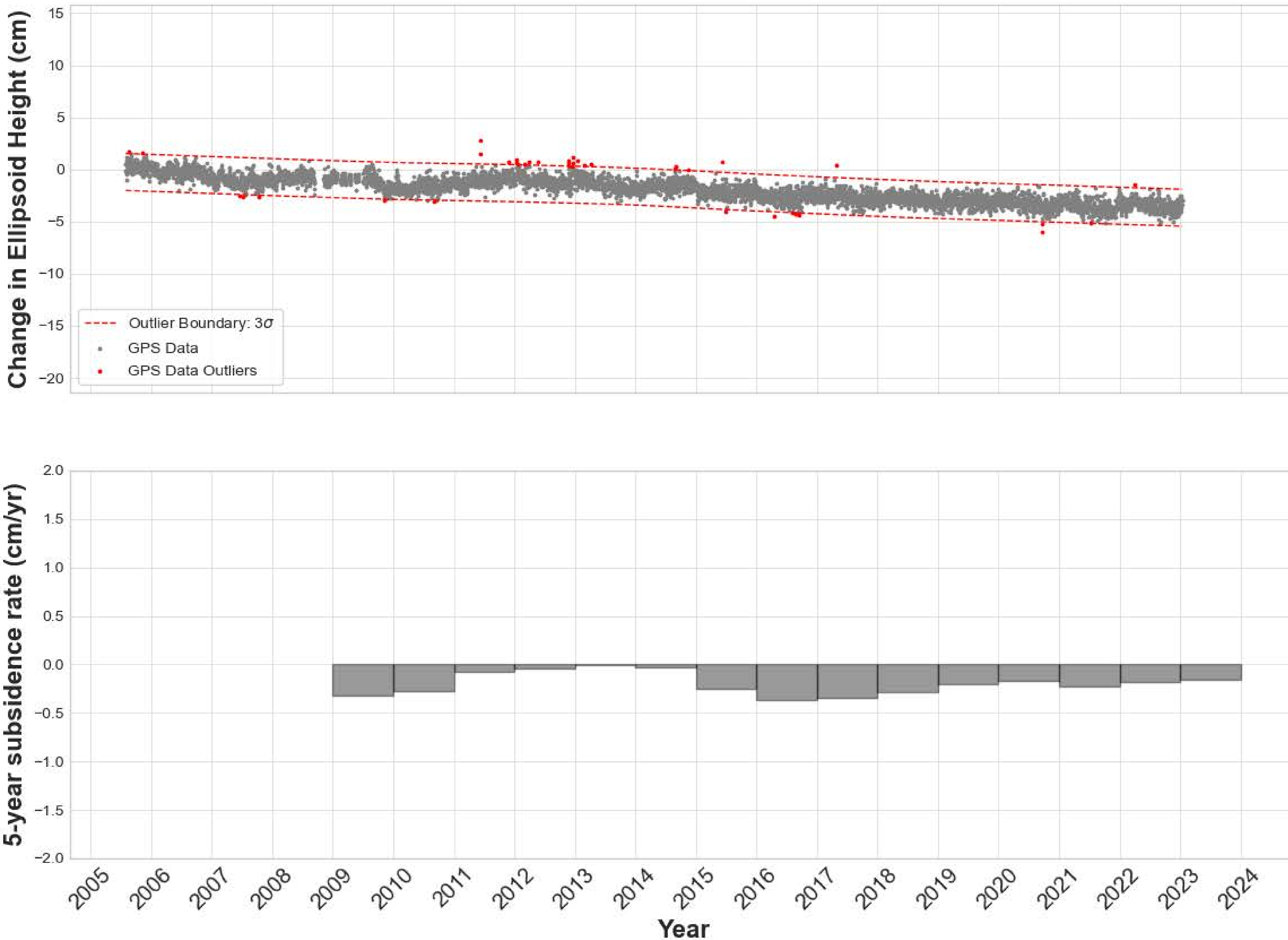

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXEX



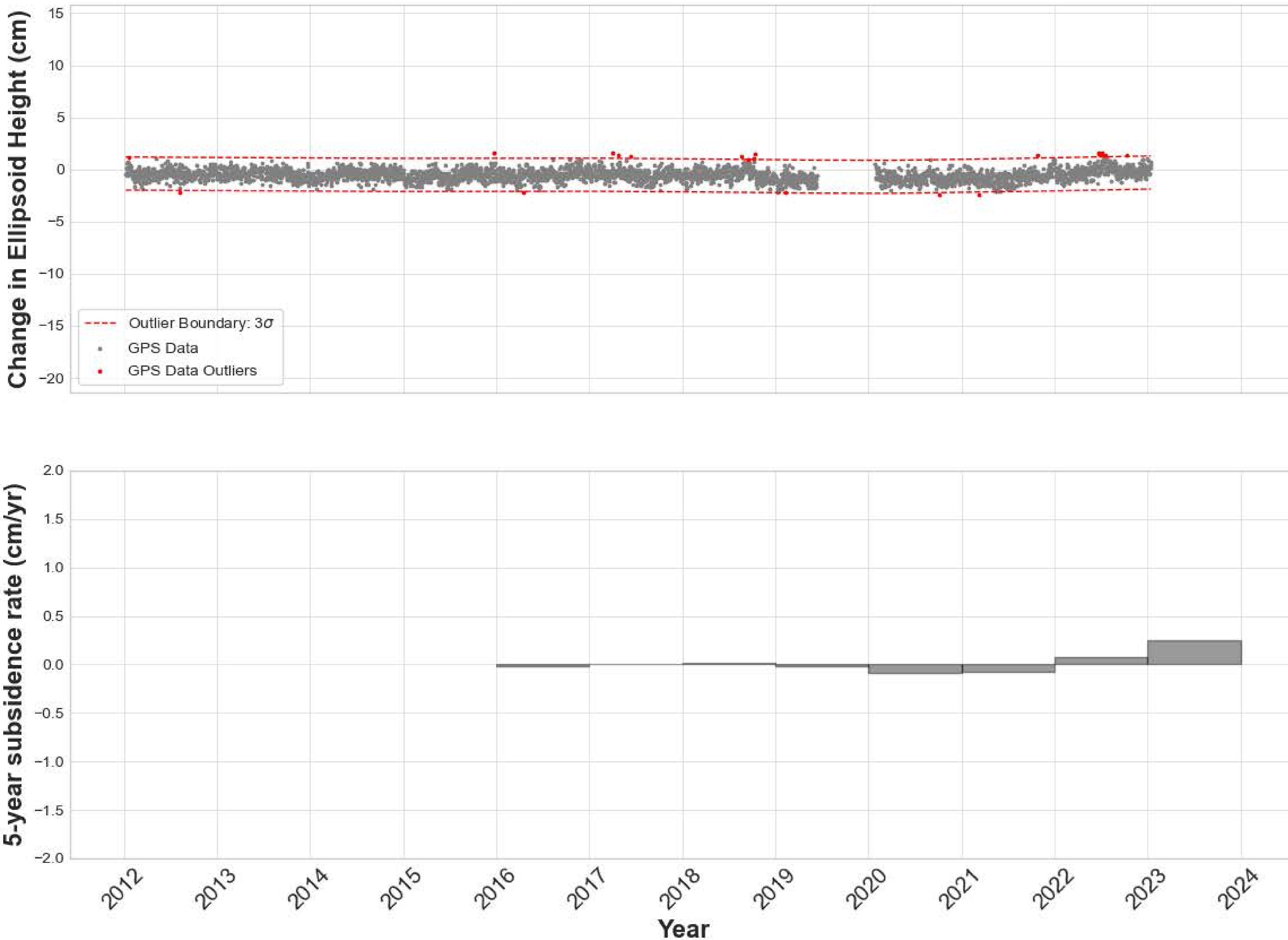

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXGA



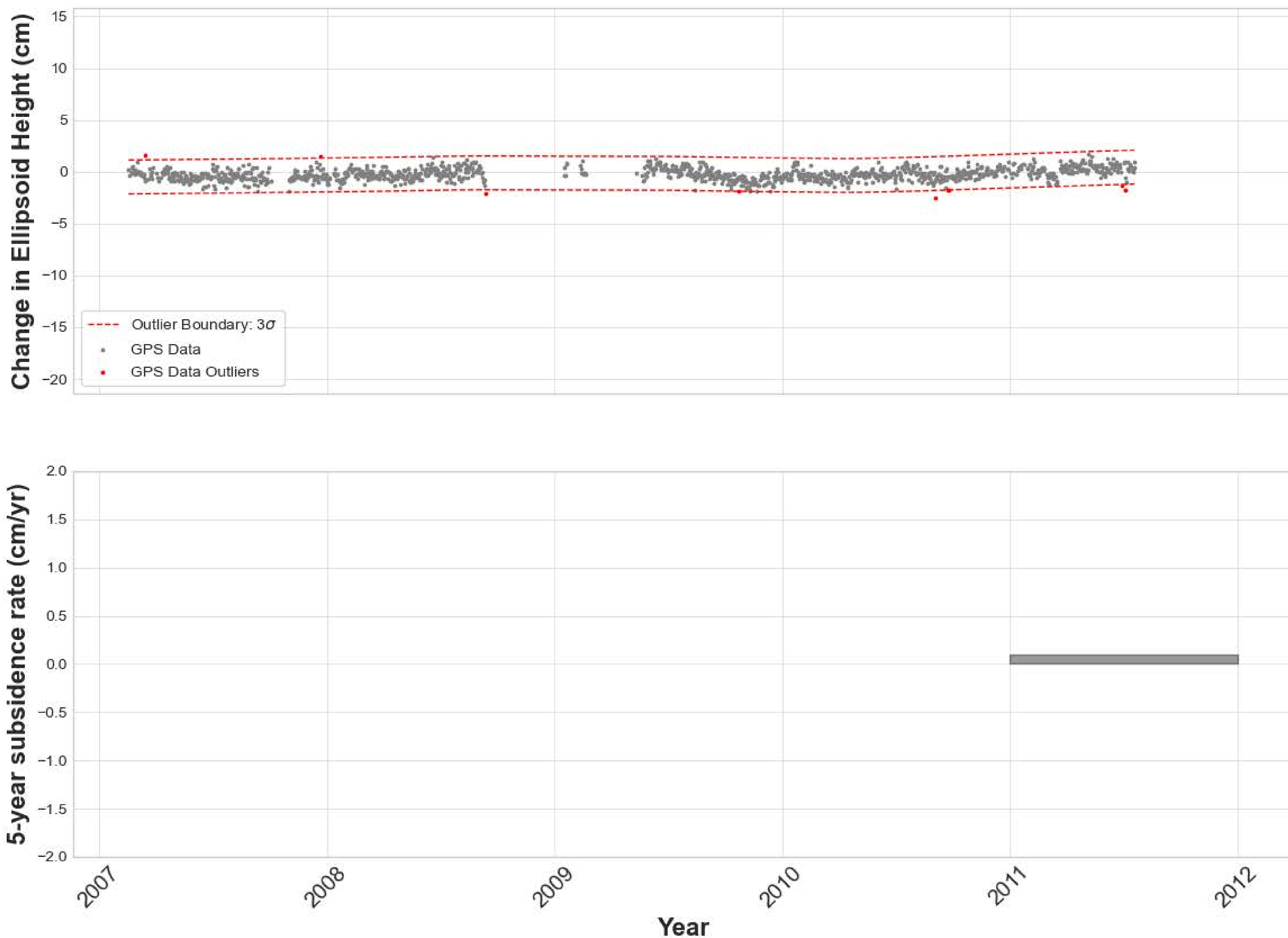

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXGN



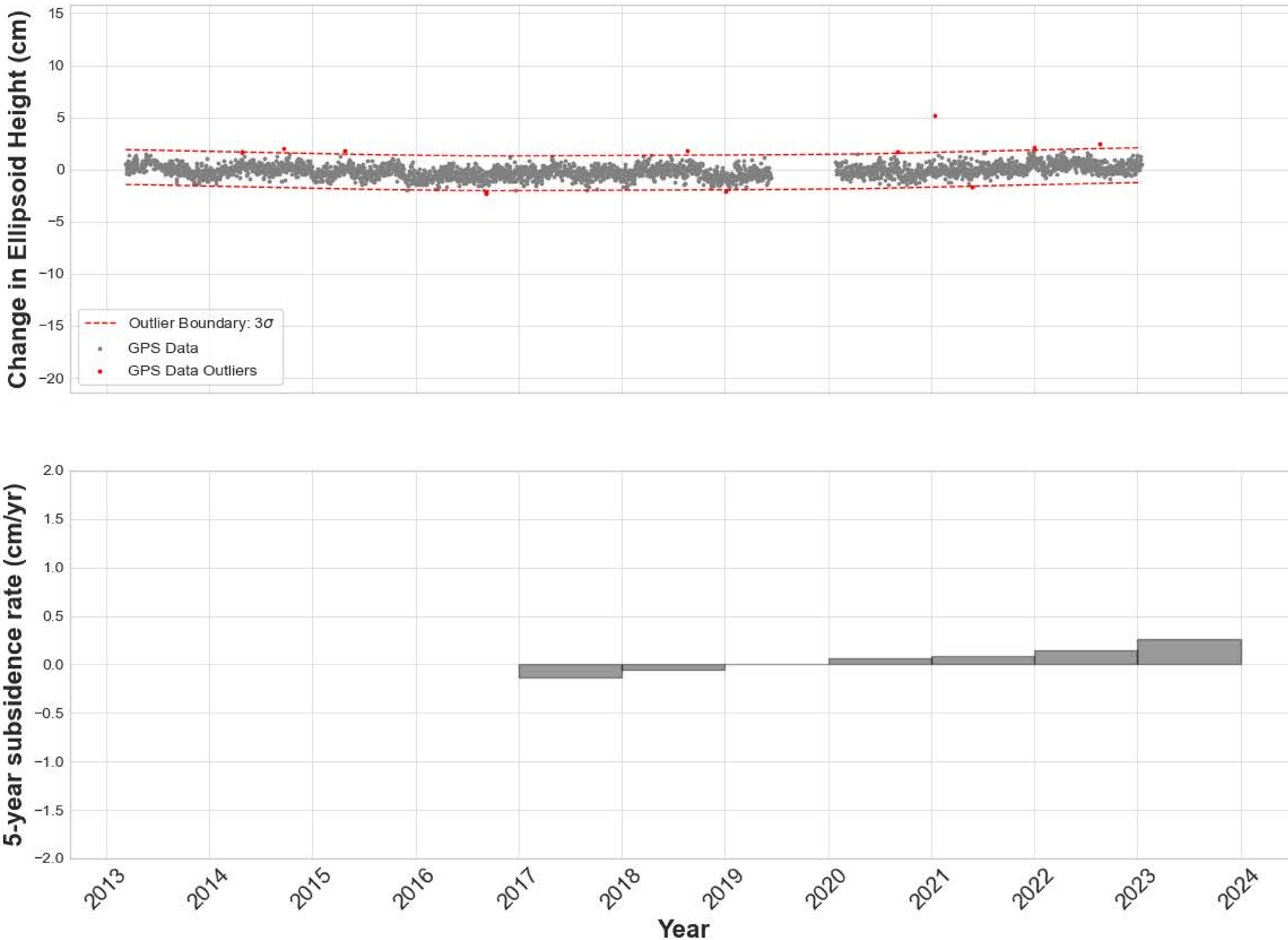

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXGV



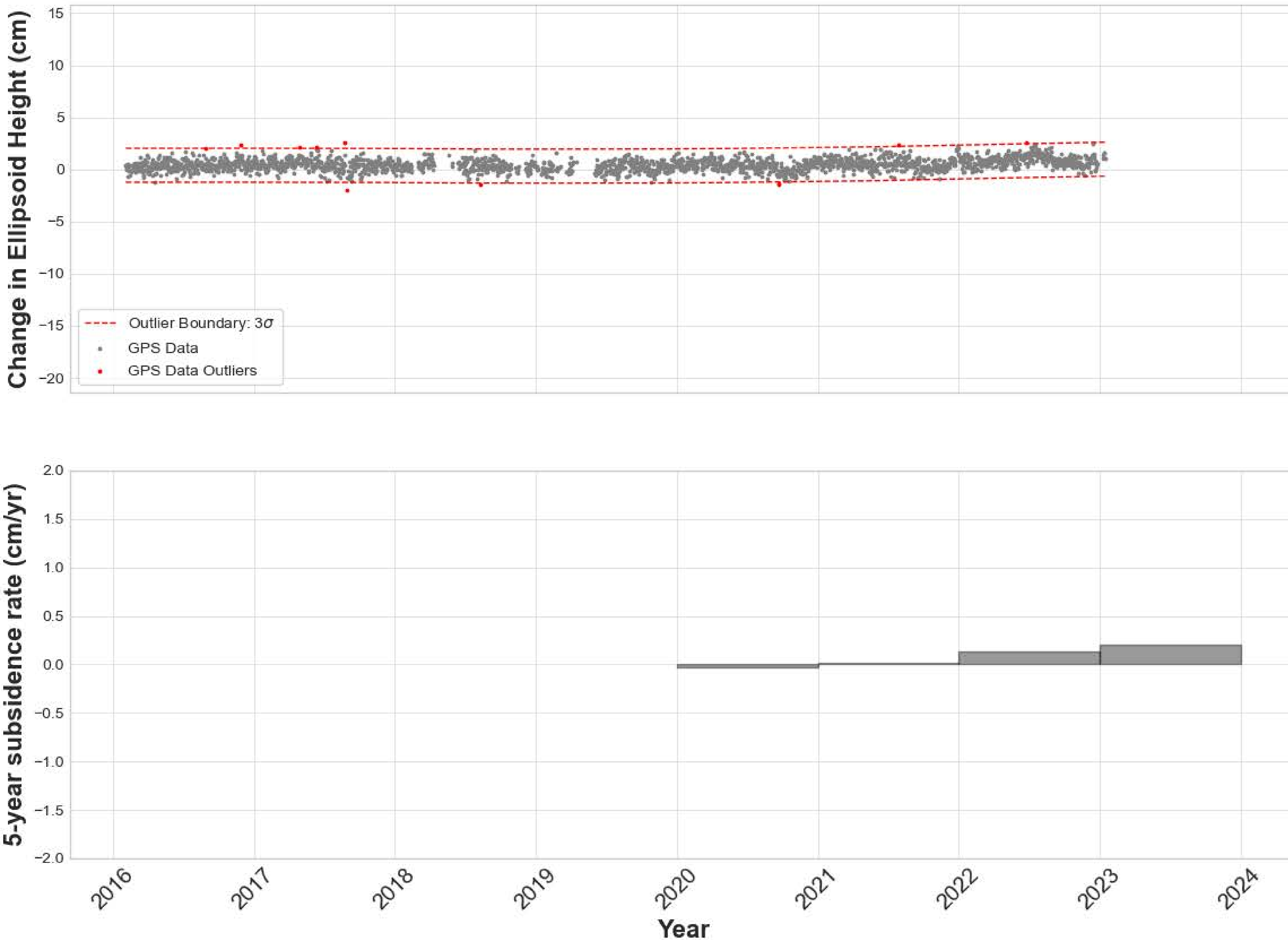

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXH1



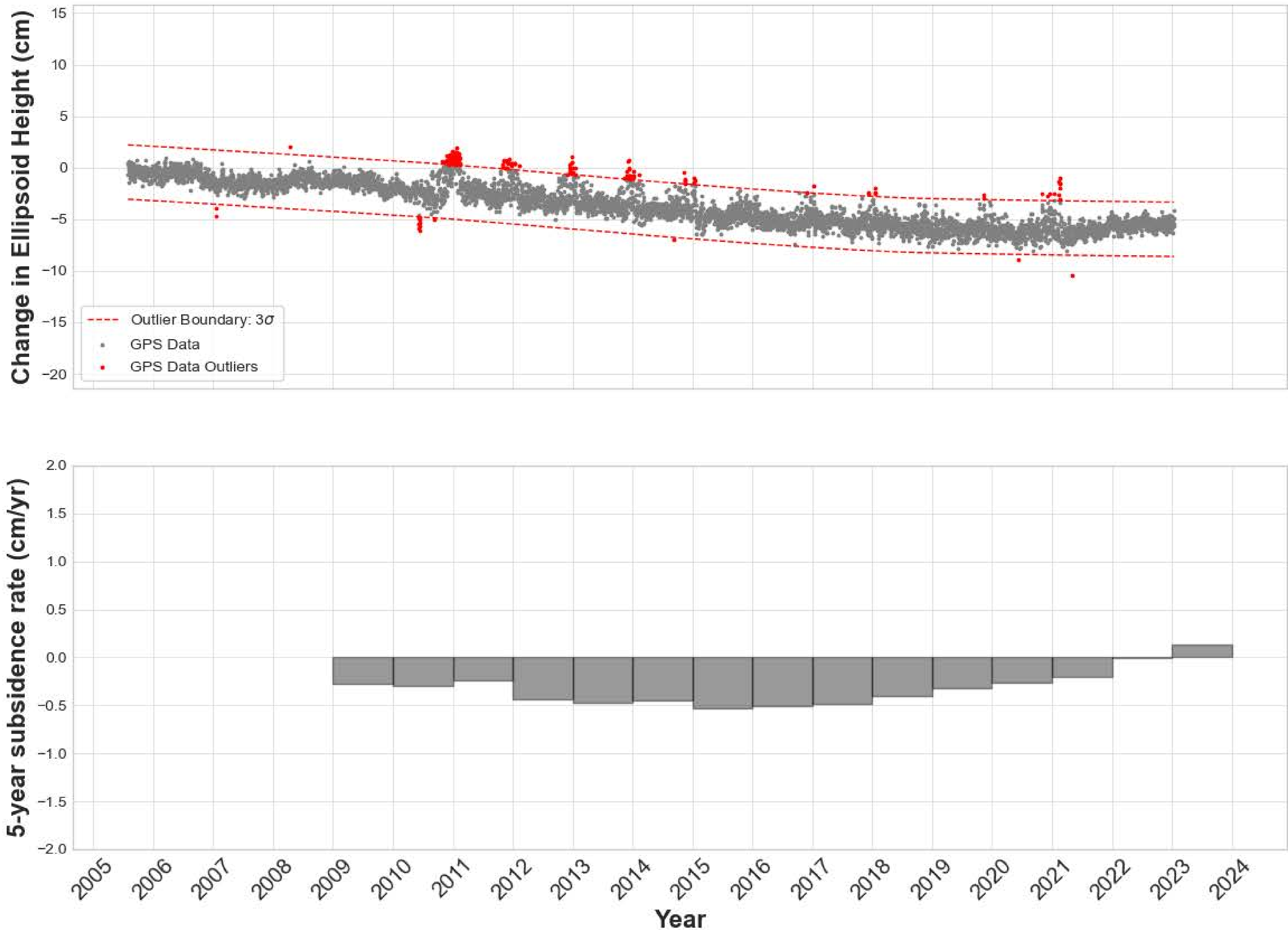

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXH2



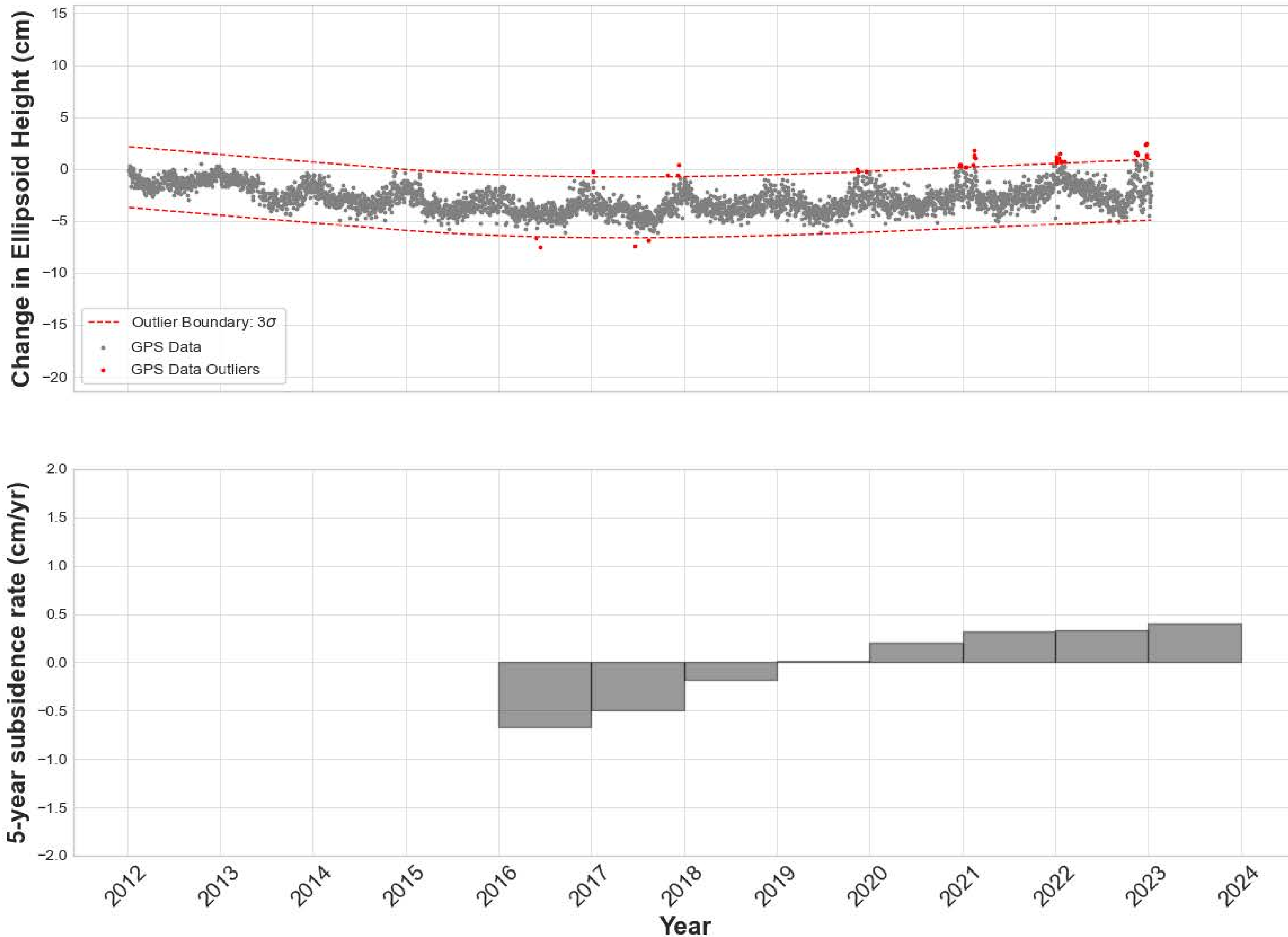

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXHE



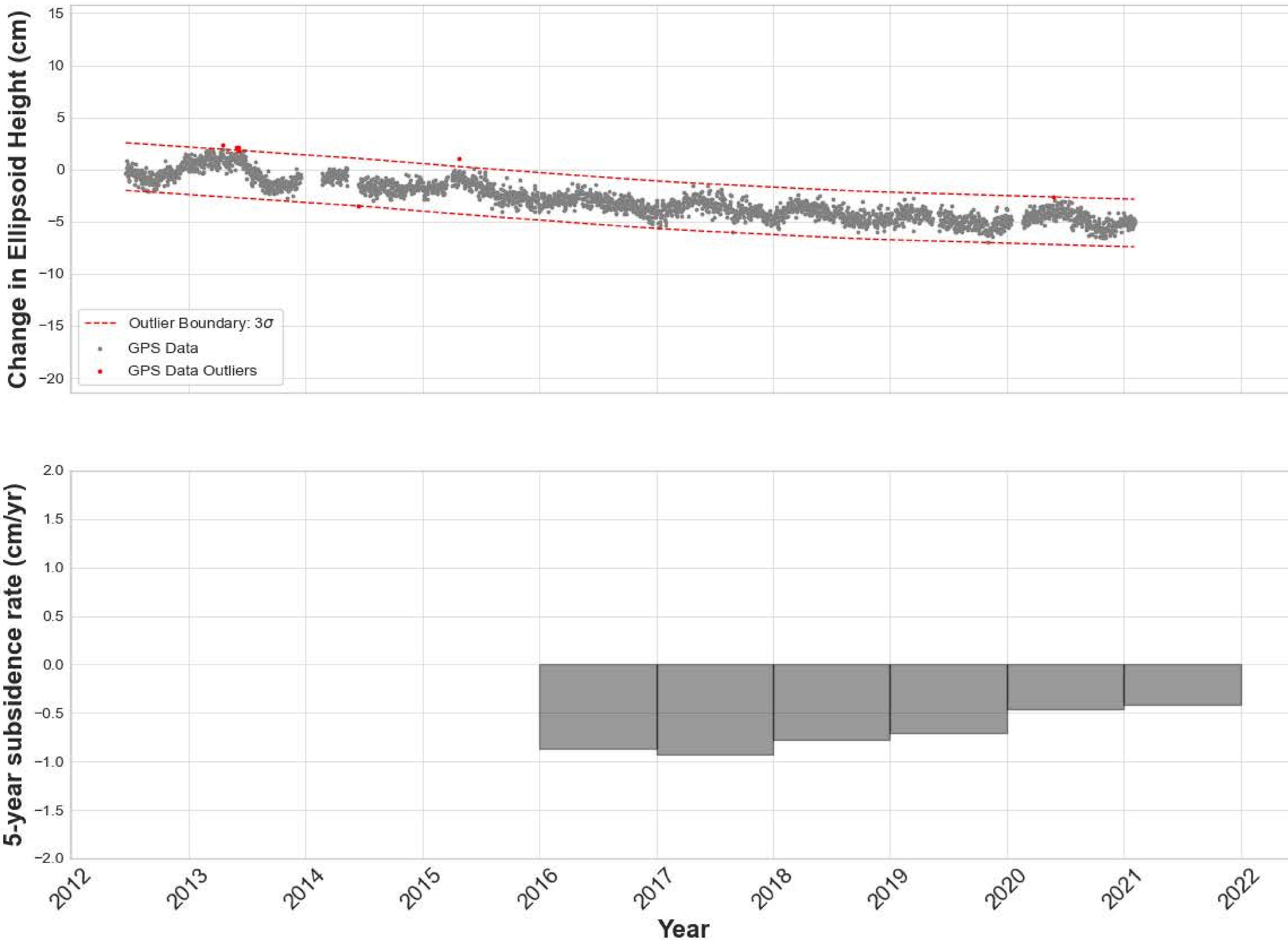

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXHP



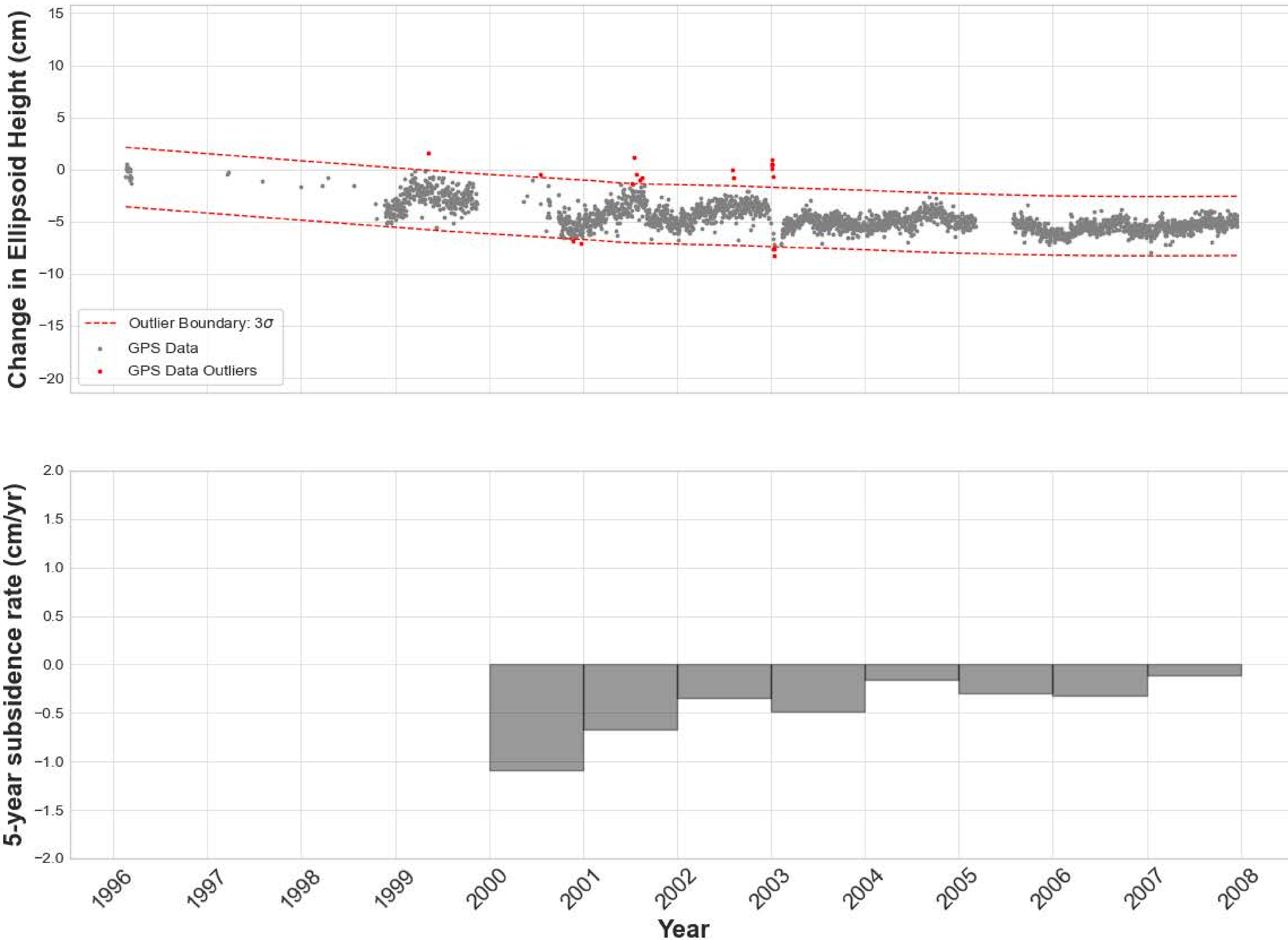

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXHS



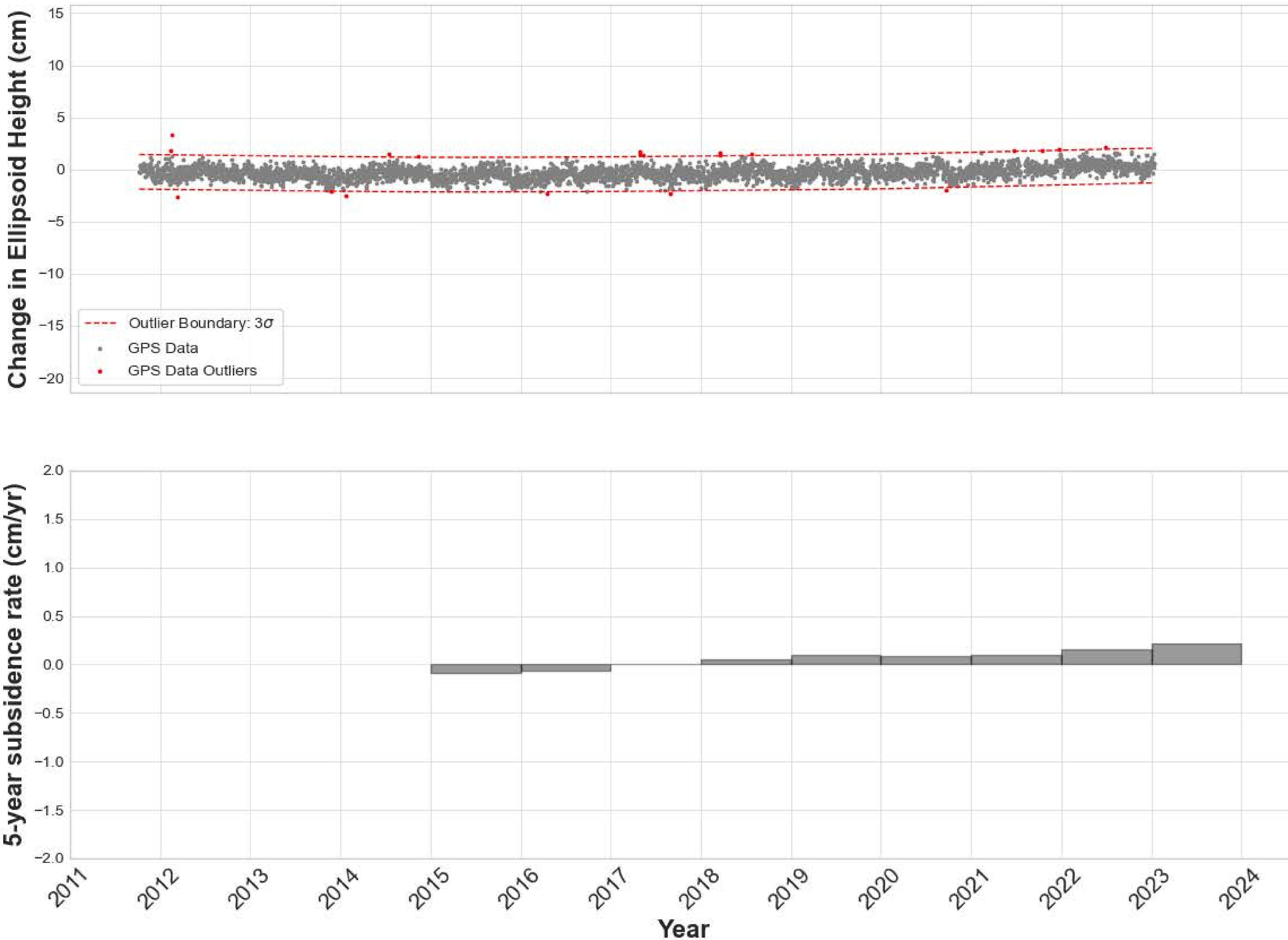

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXHU



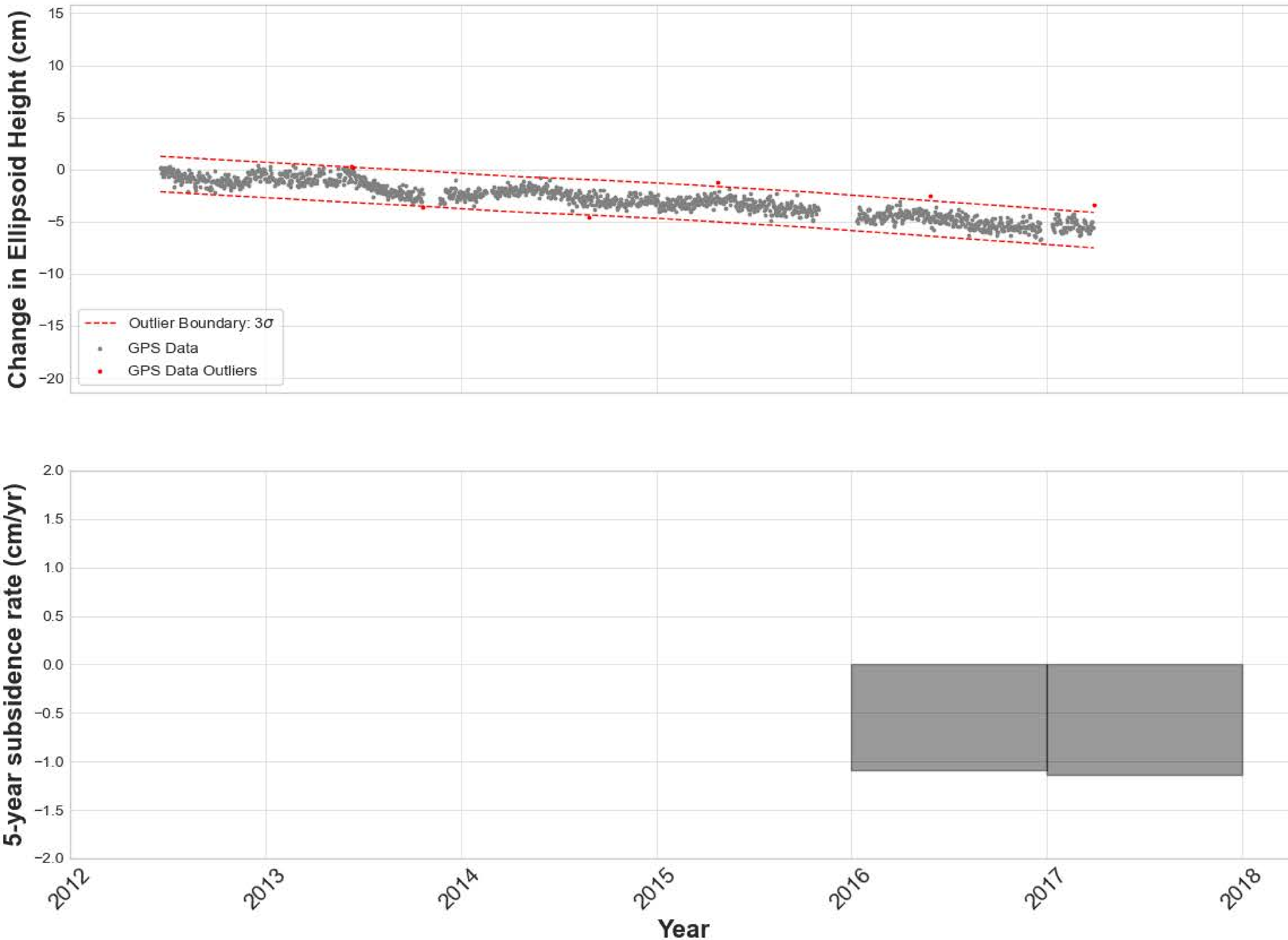

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXKO



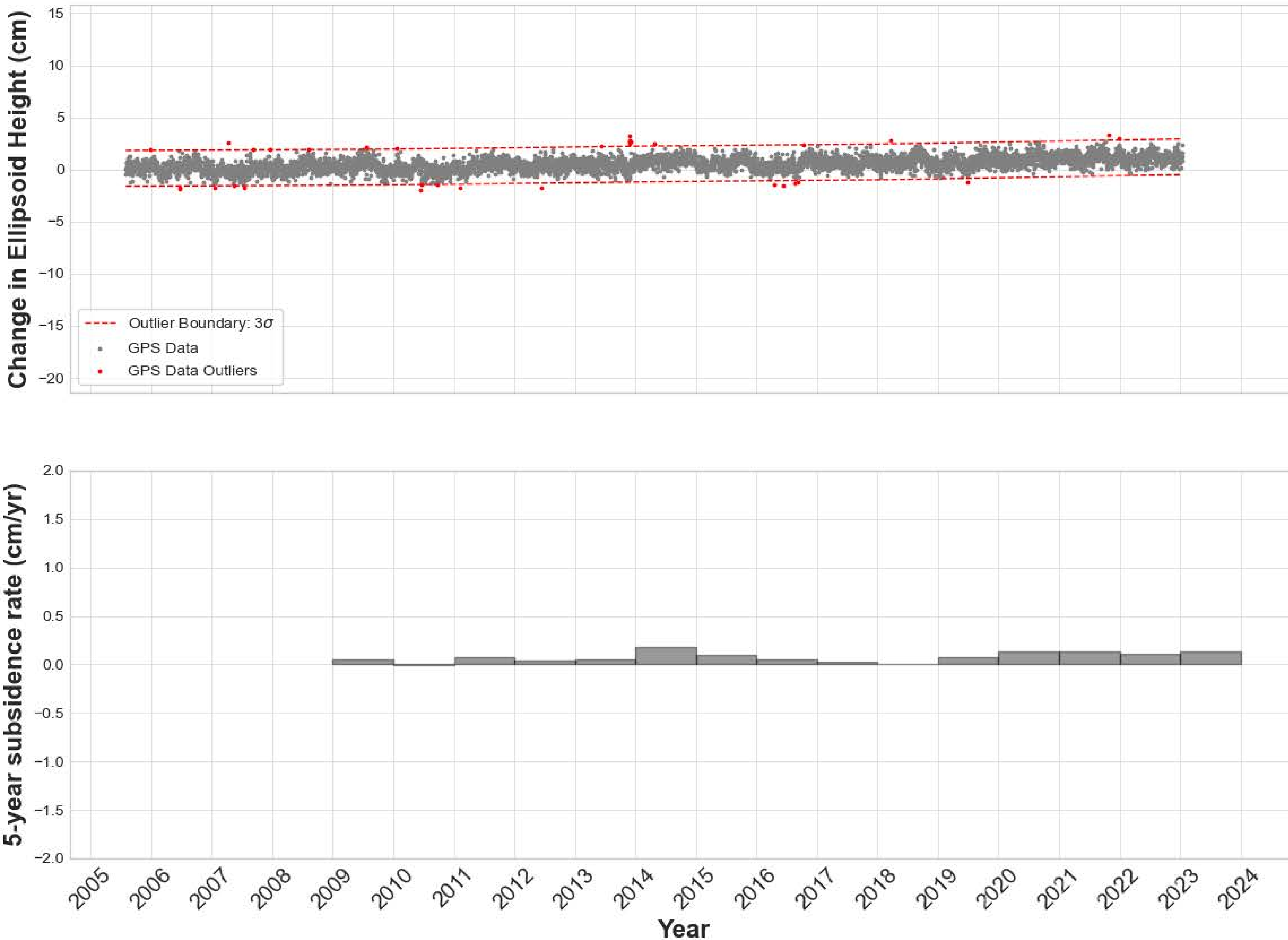

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXKY



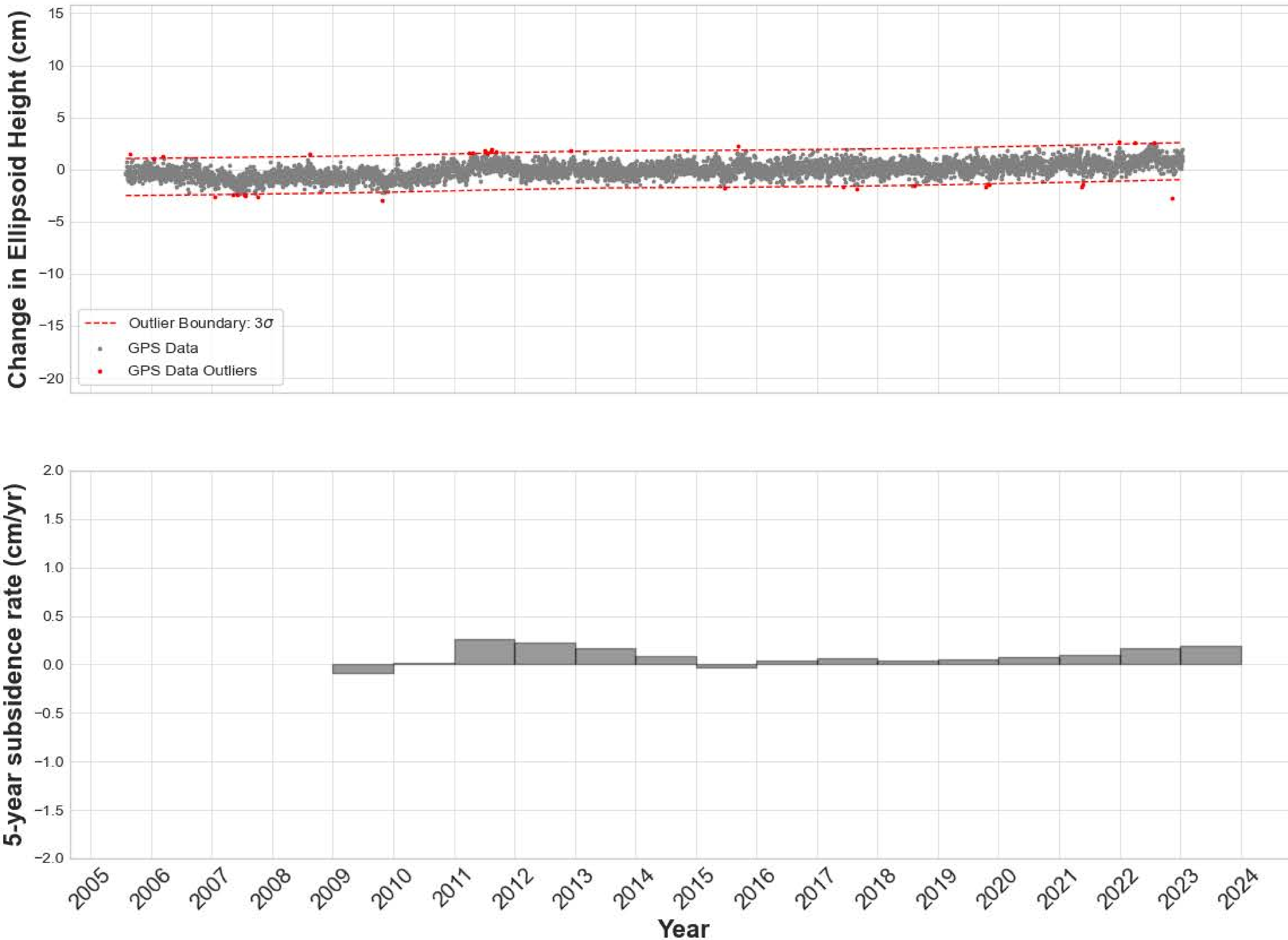

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXLF



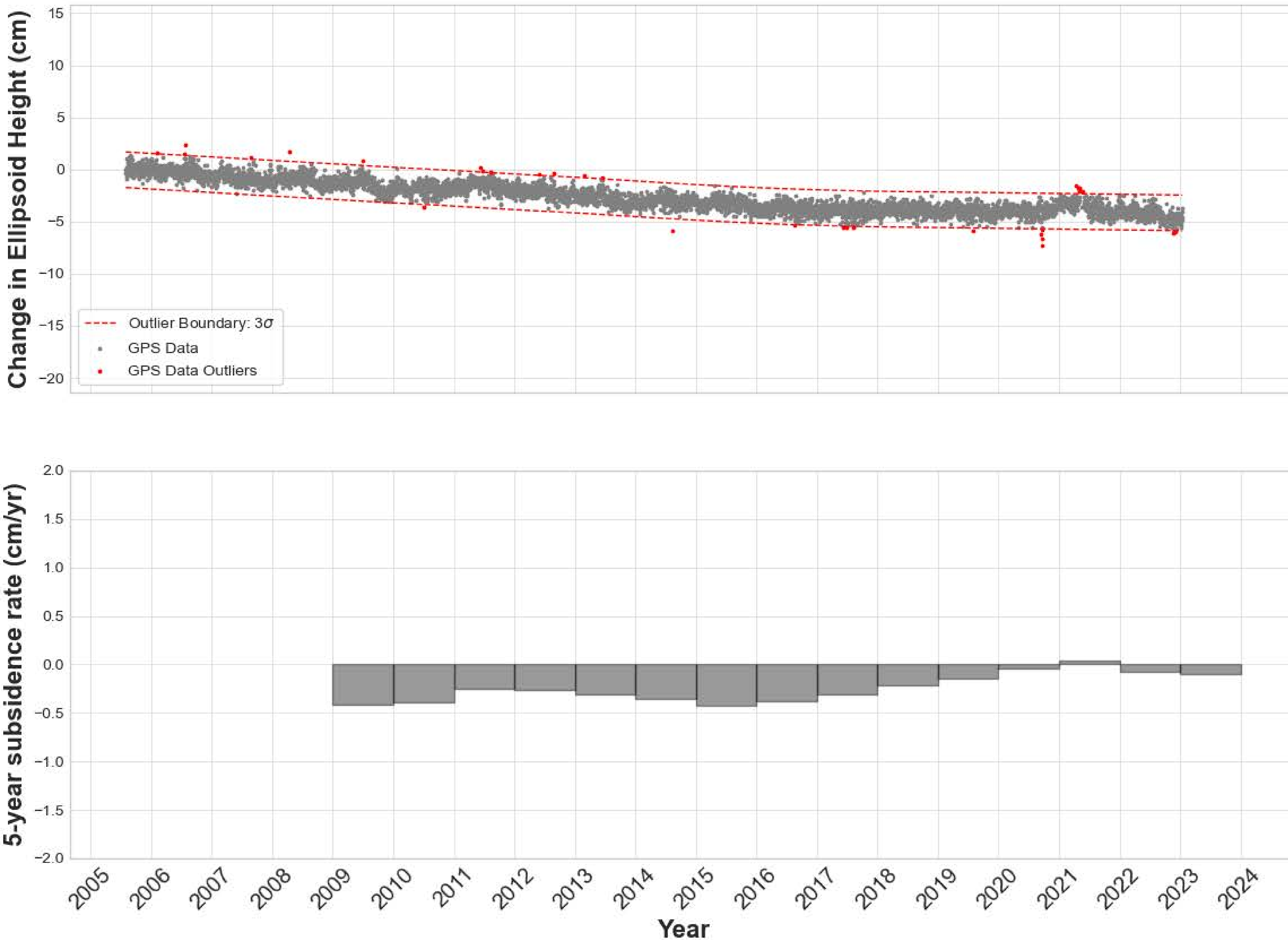

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXLI



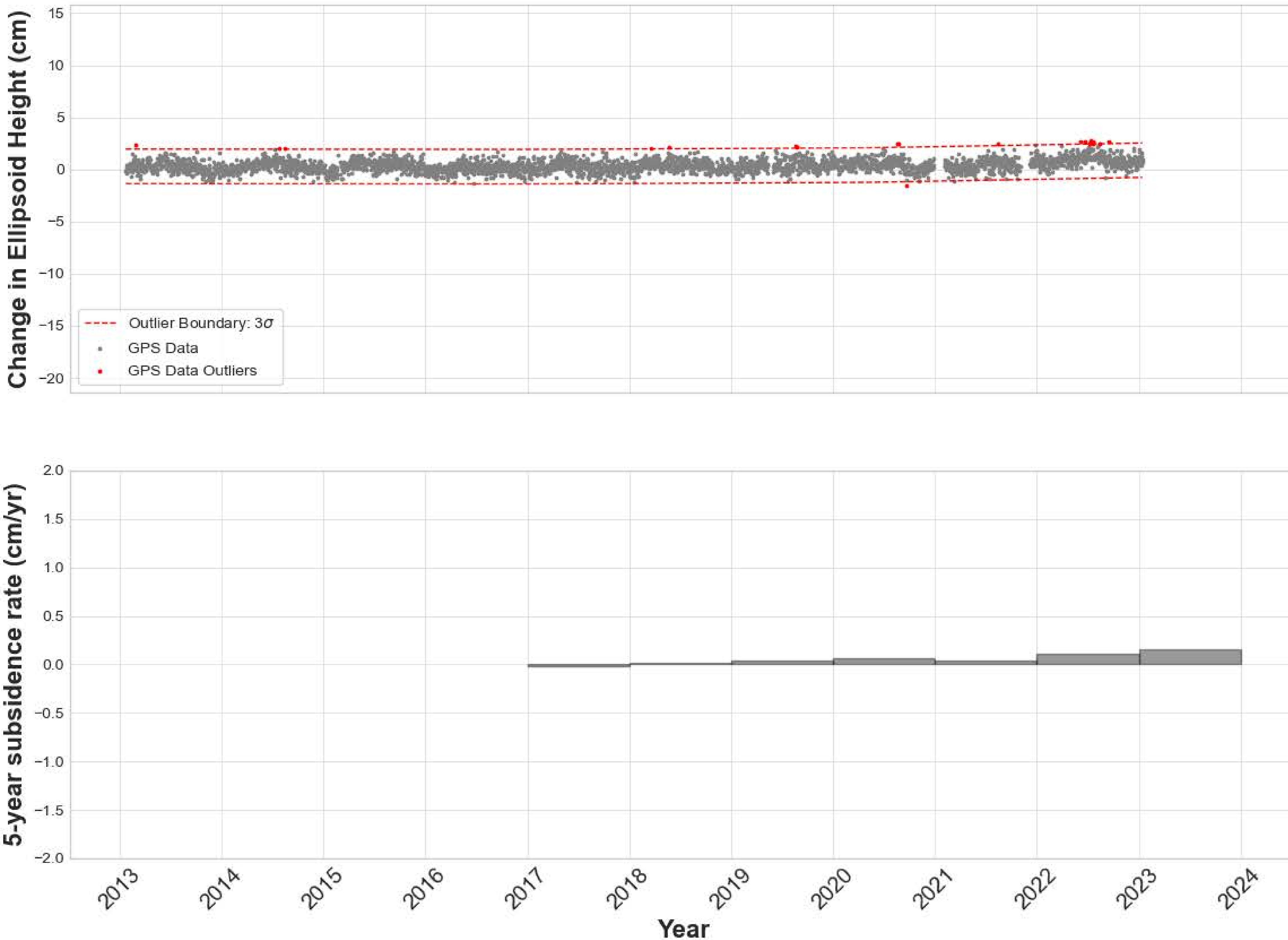

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXLM



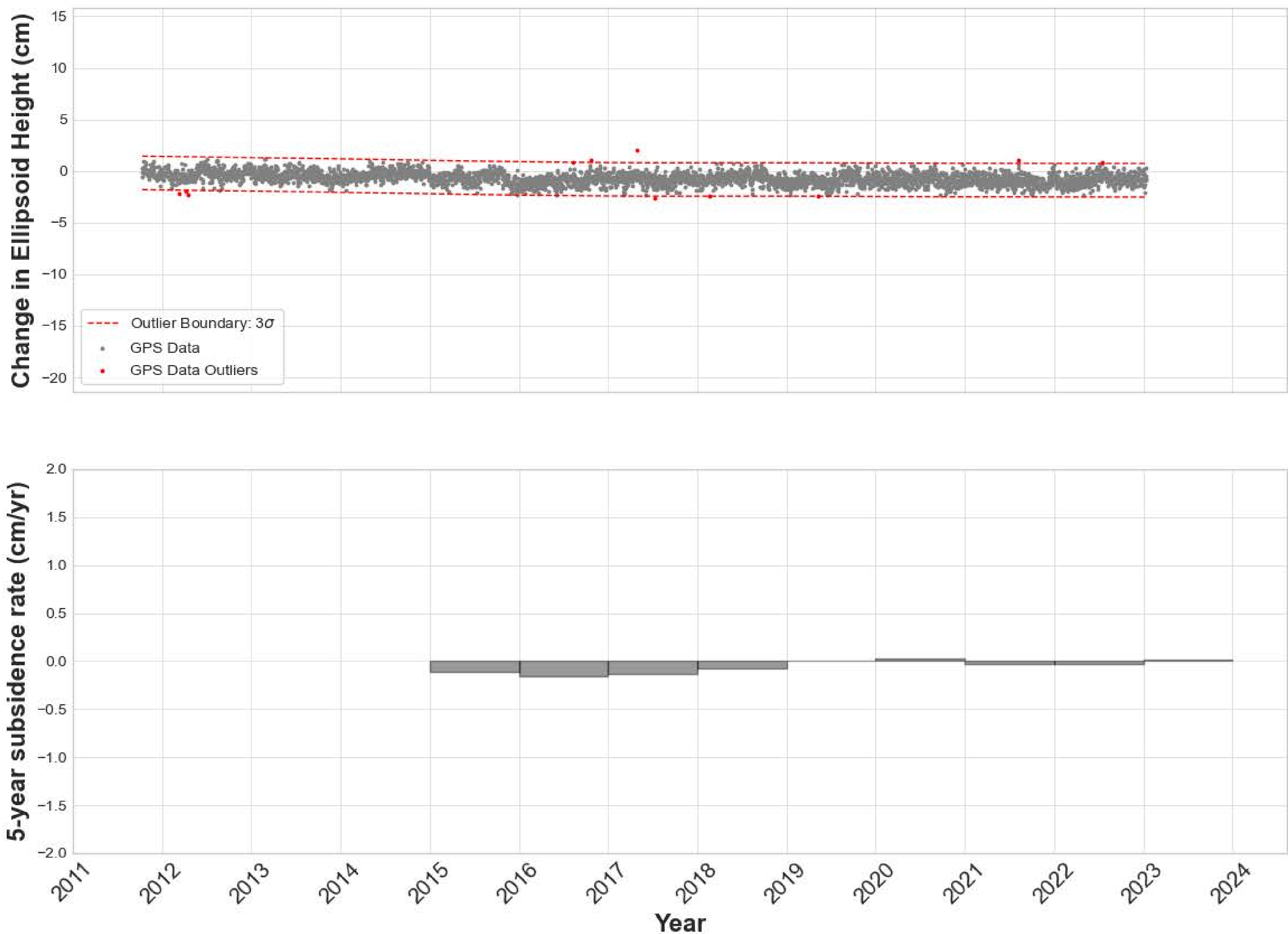

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXLQ



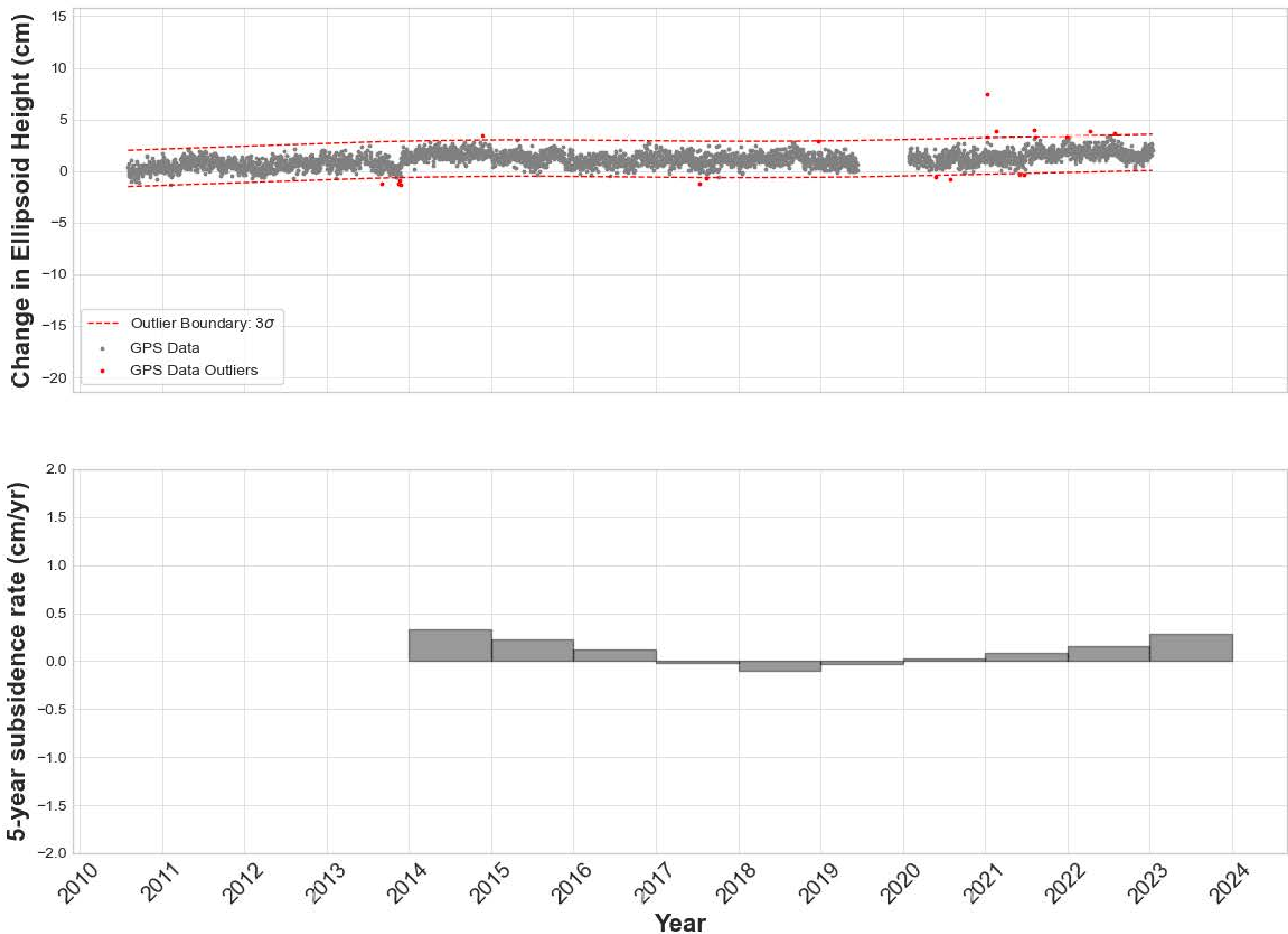

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXLV



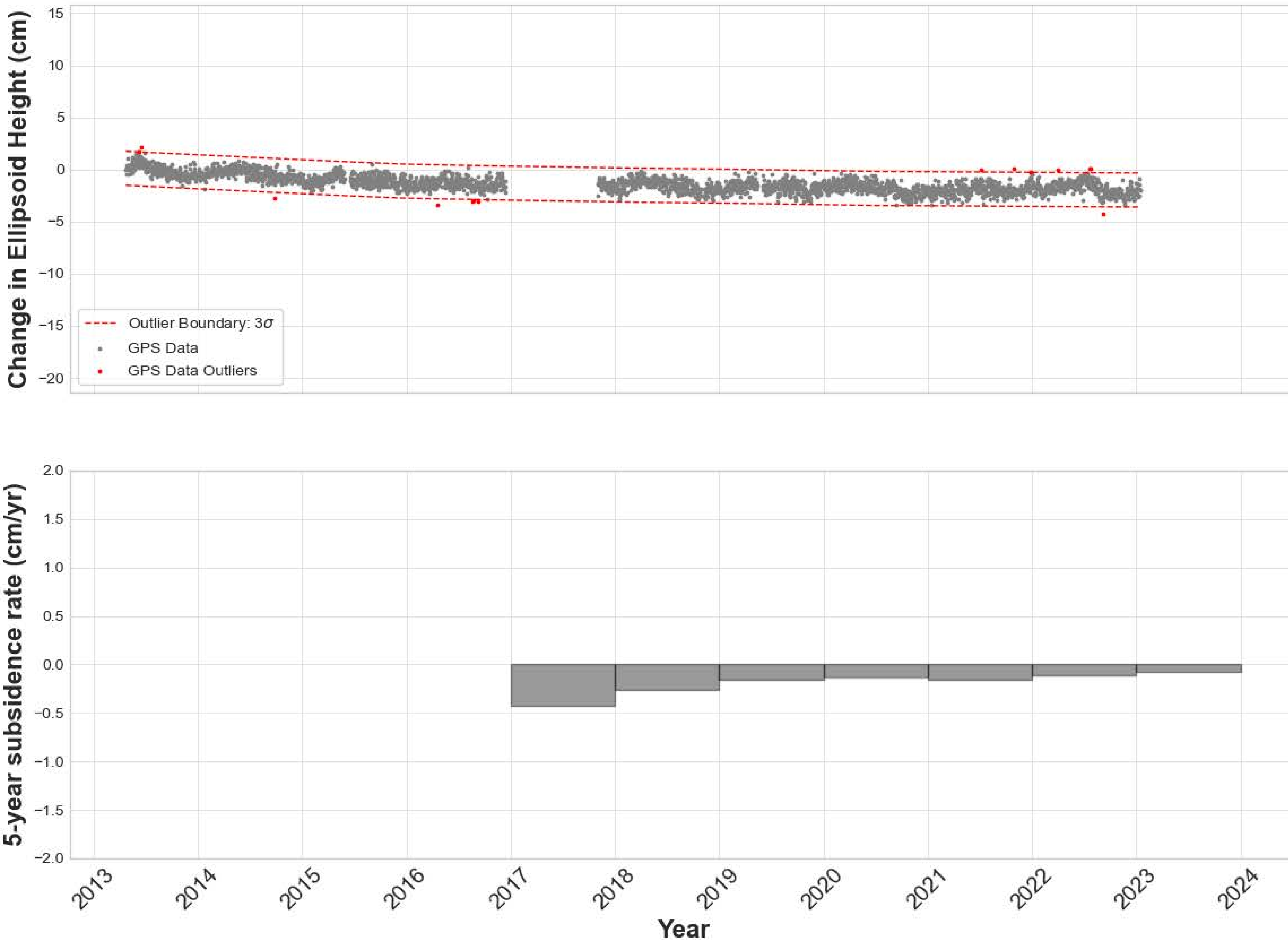

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXMD



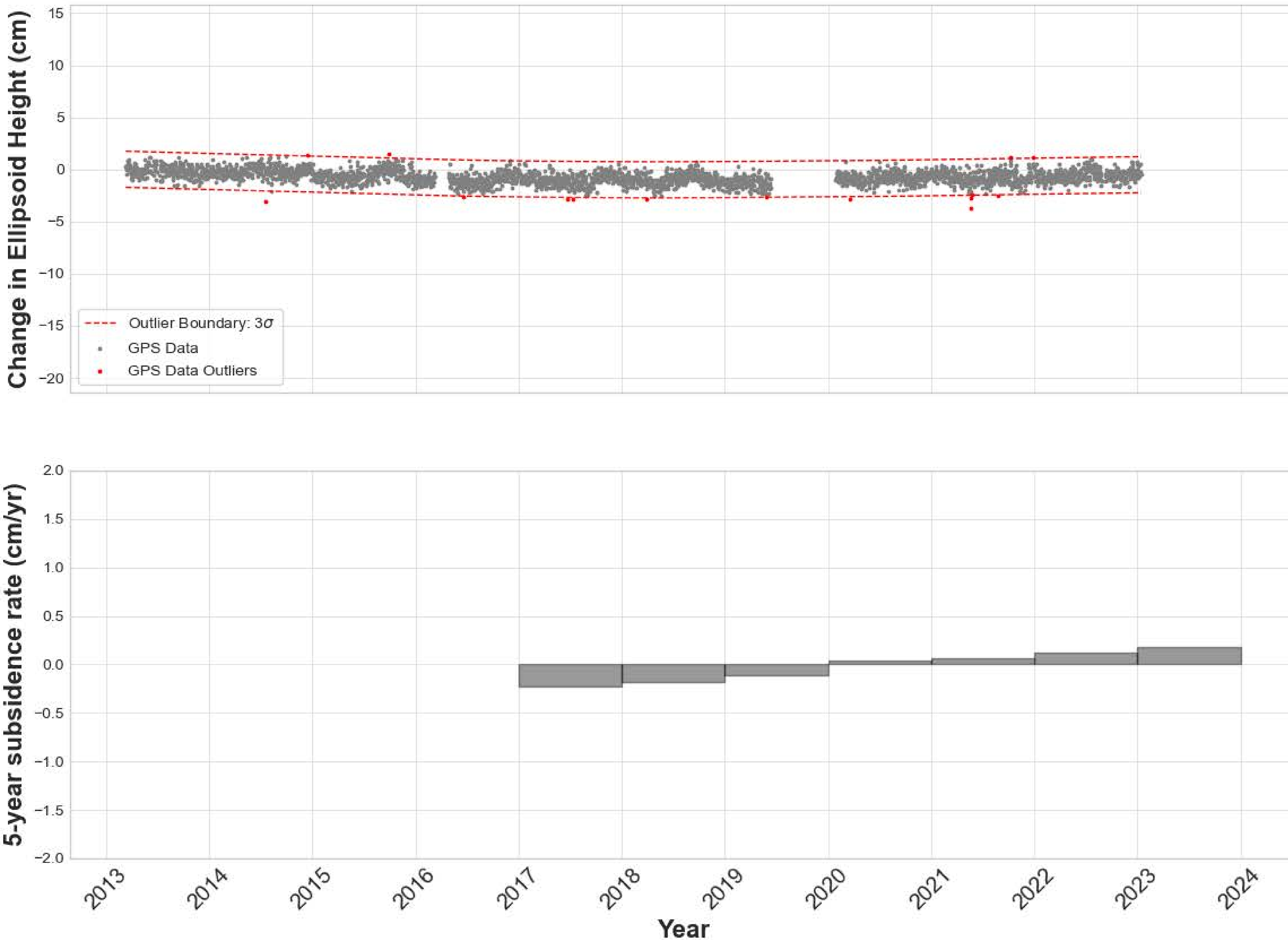

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXMG



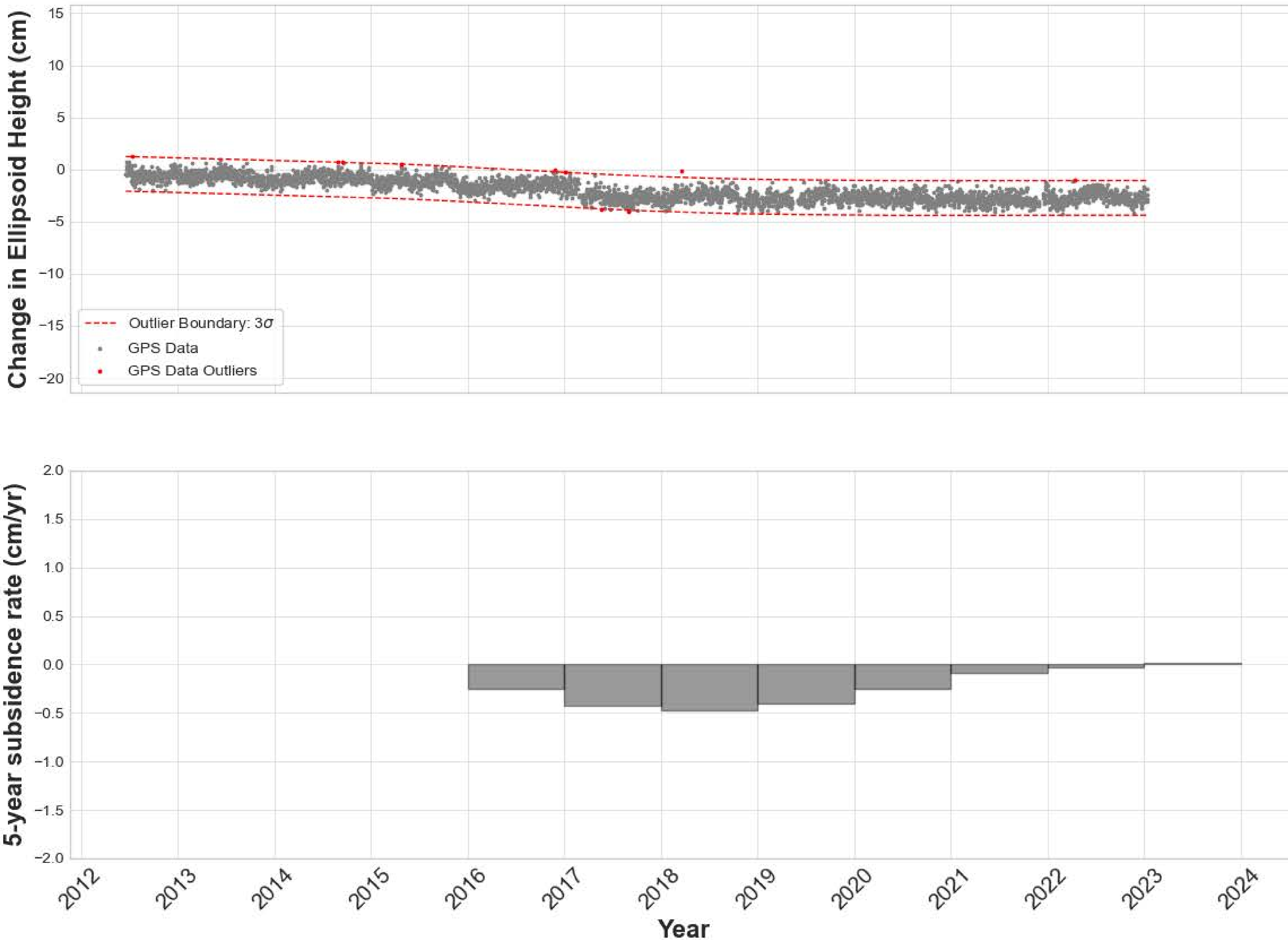

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXNE



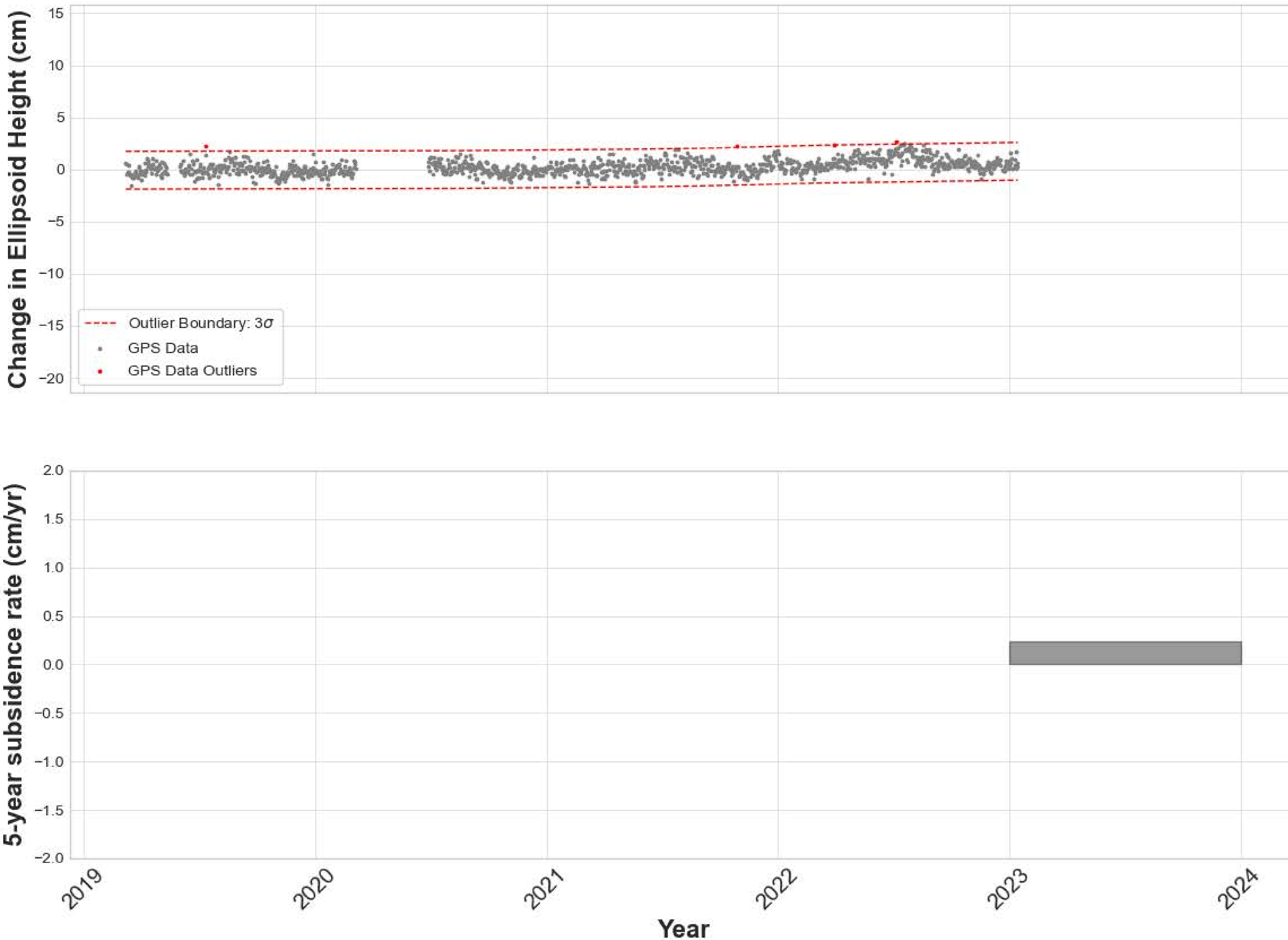

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXNV



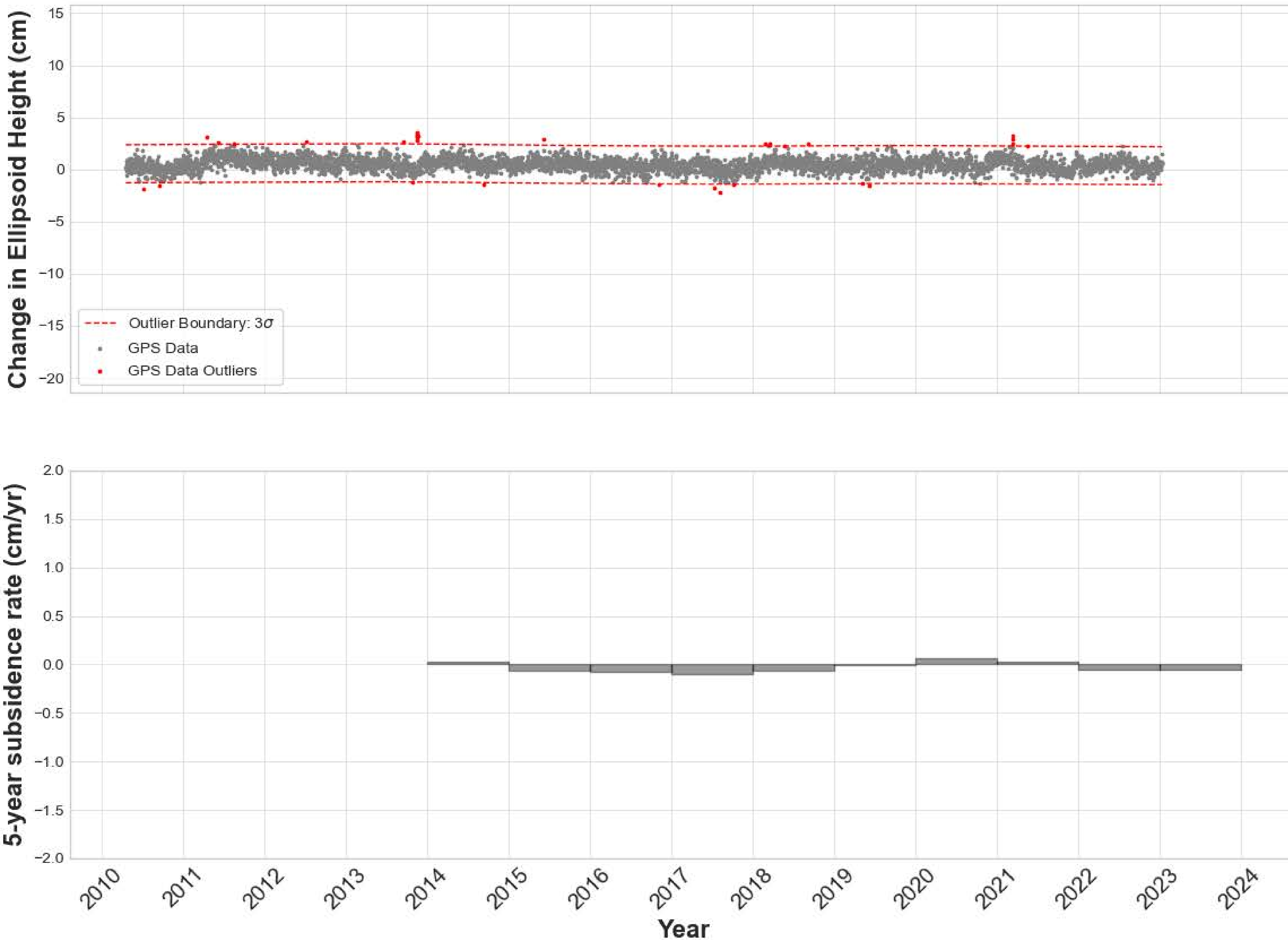

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXP5



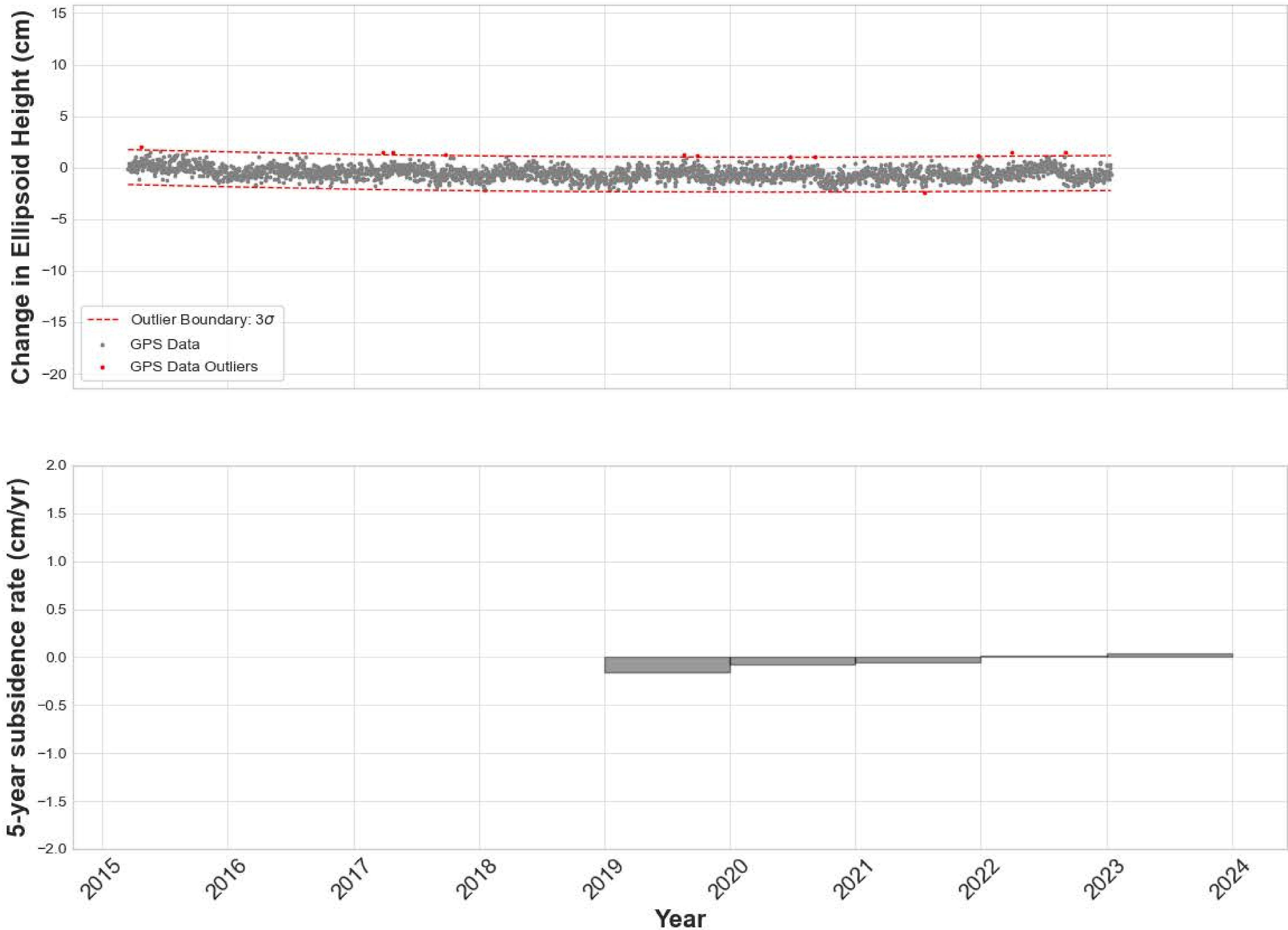

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXPV



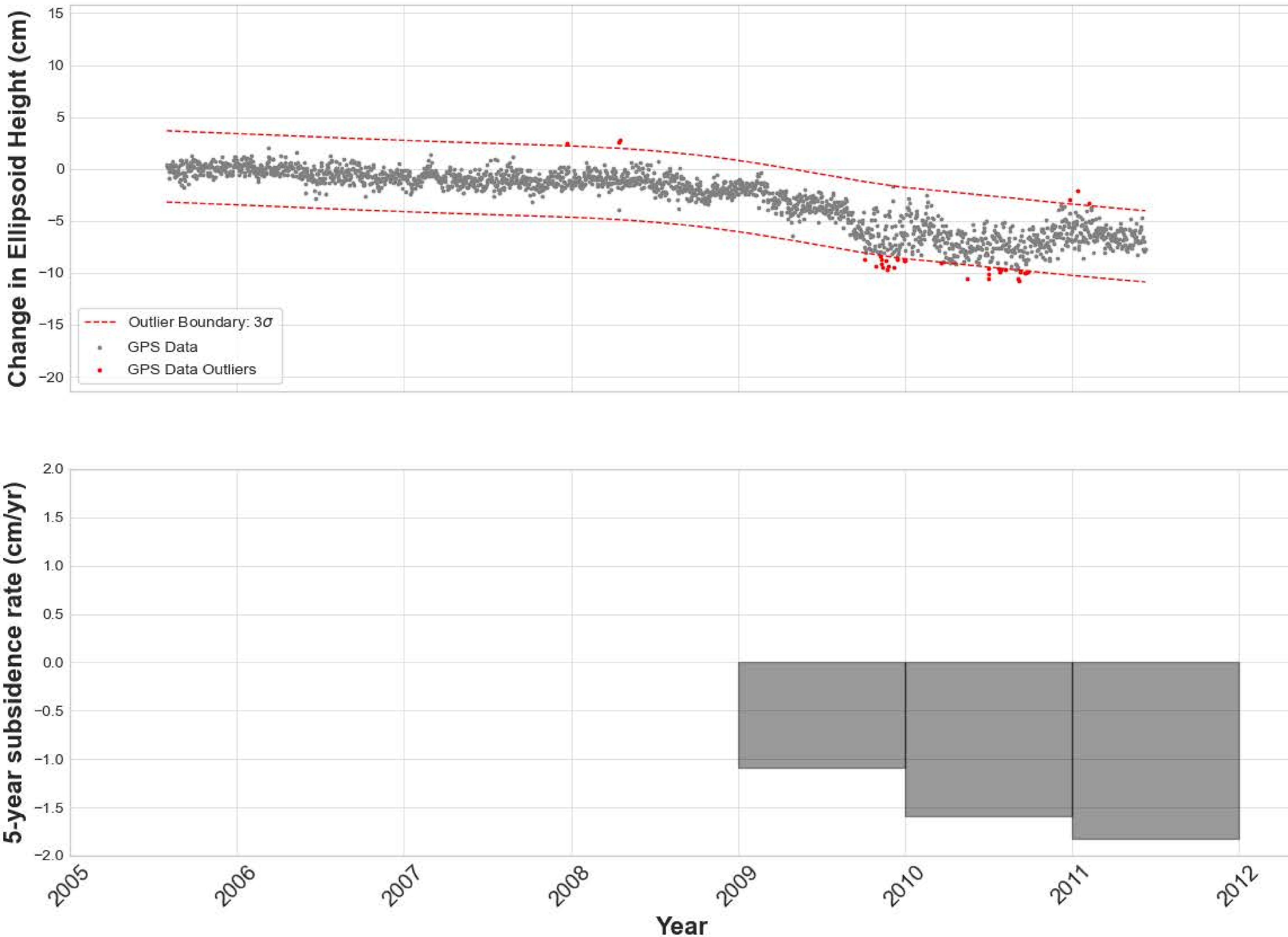

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXRN



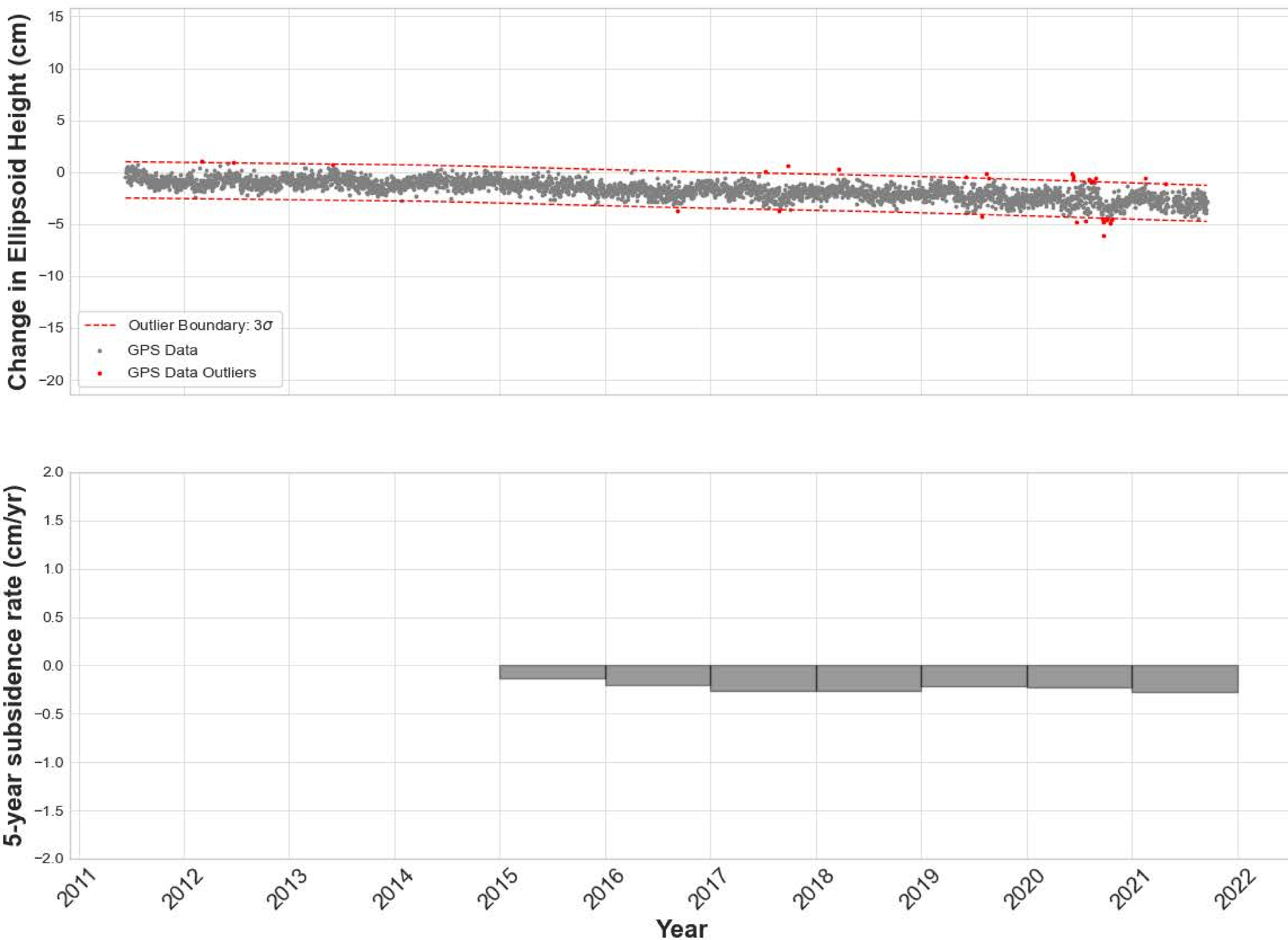

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXRO



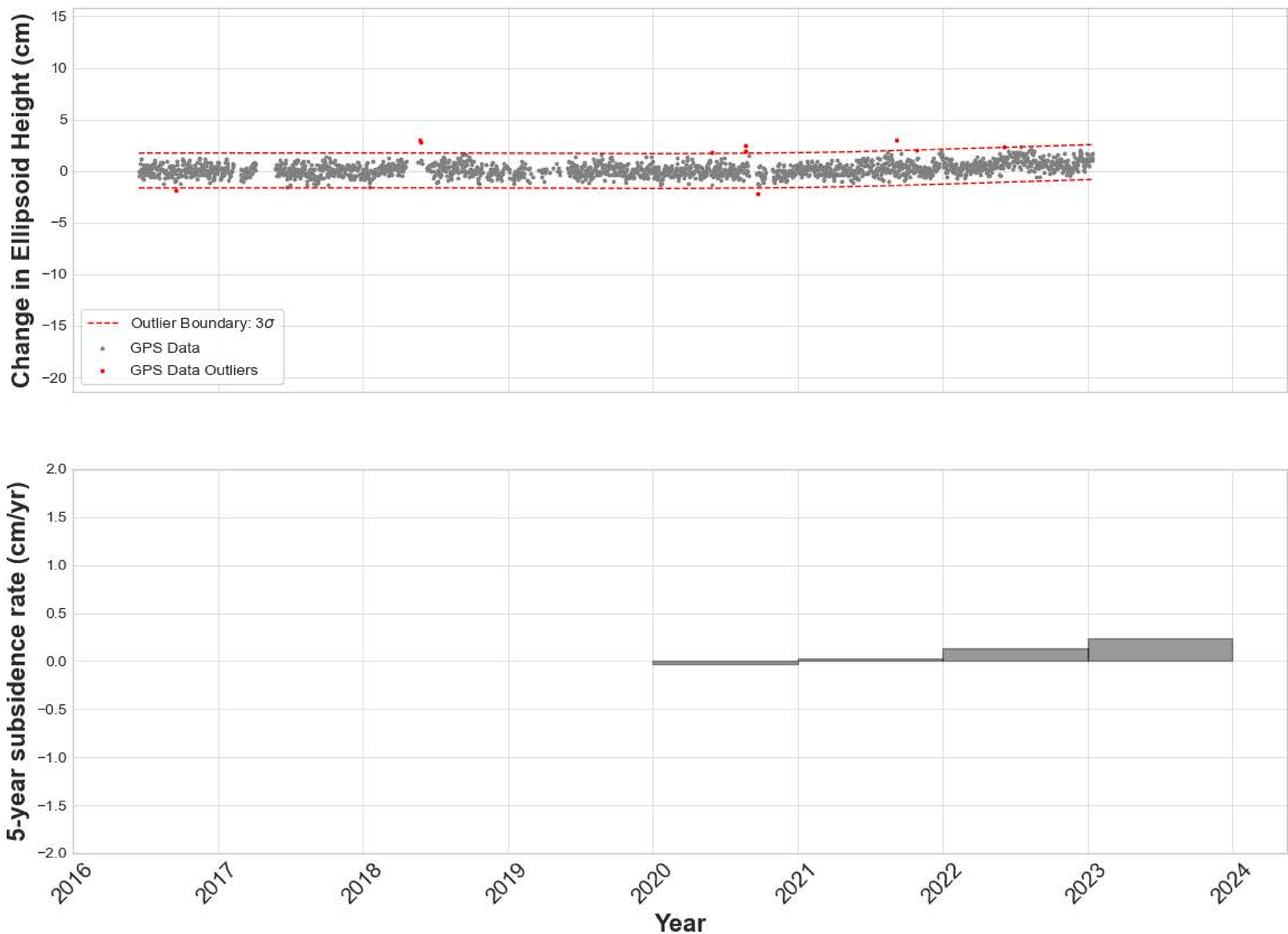

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXRS



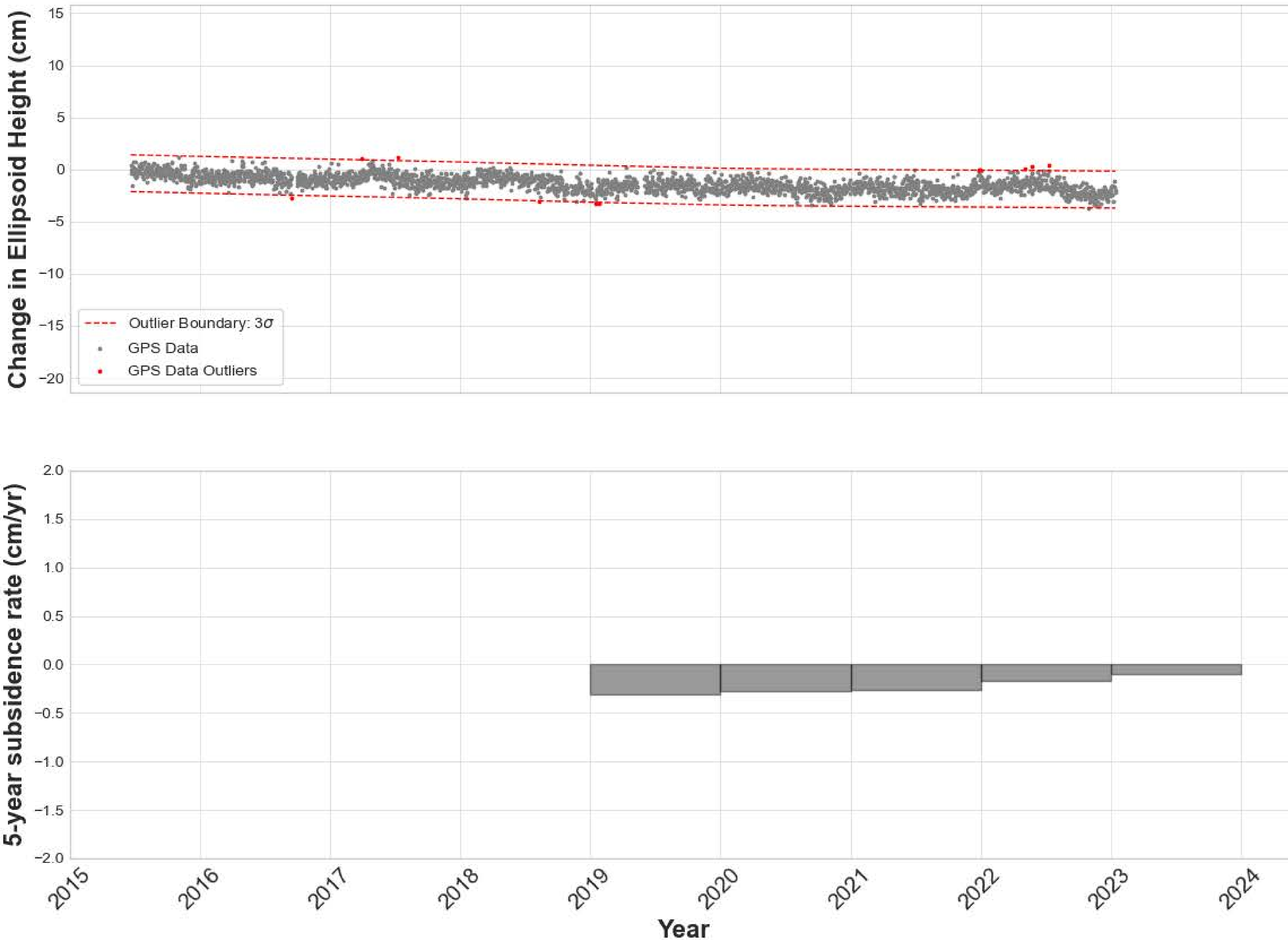

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXSP



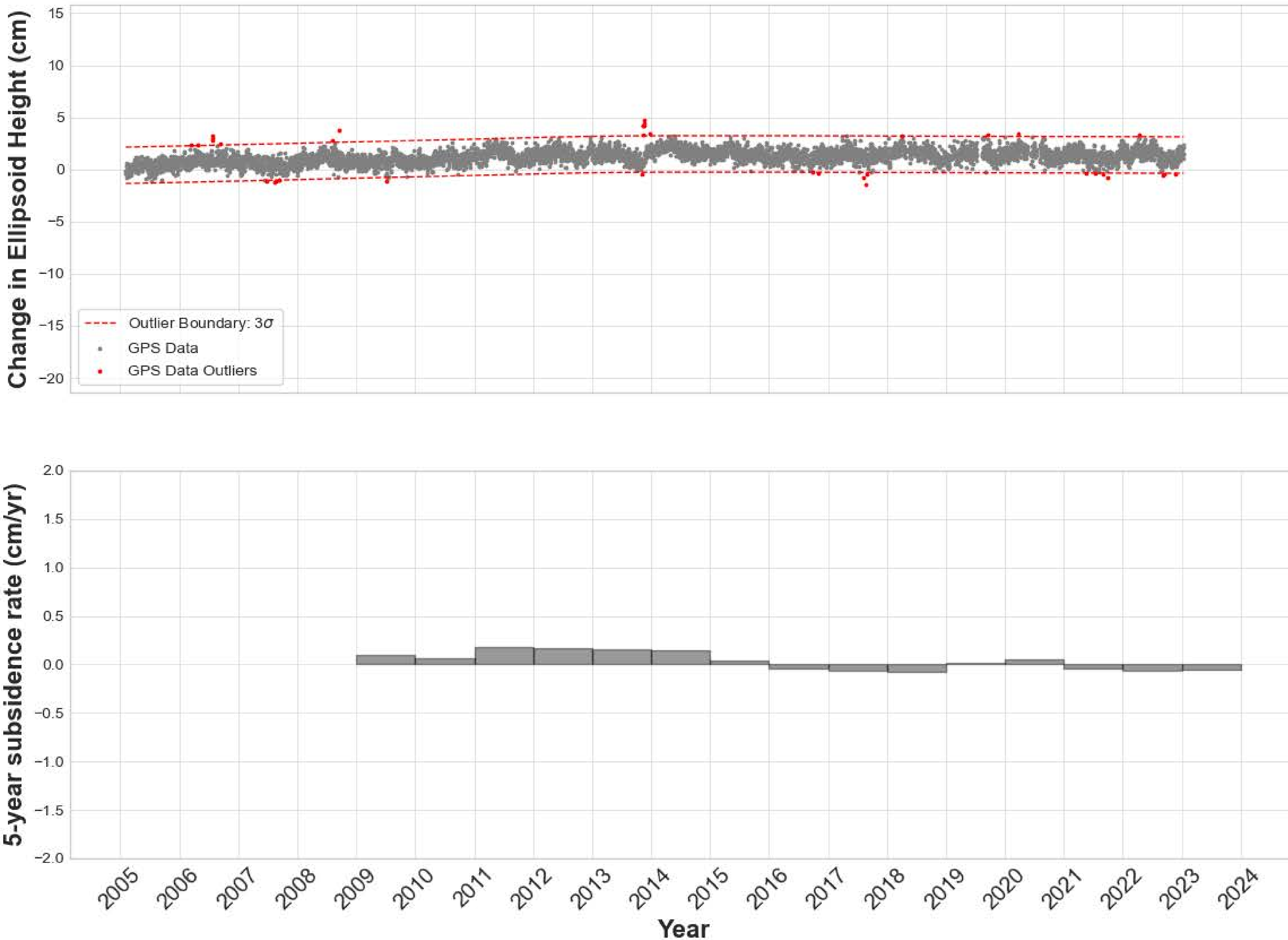

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXTG



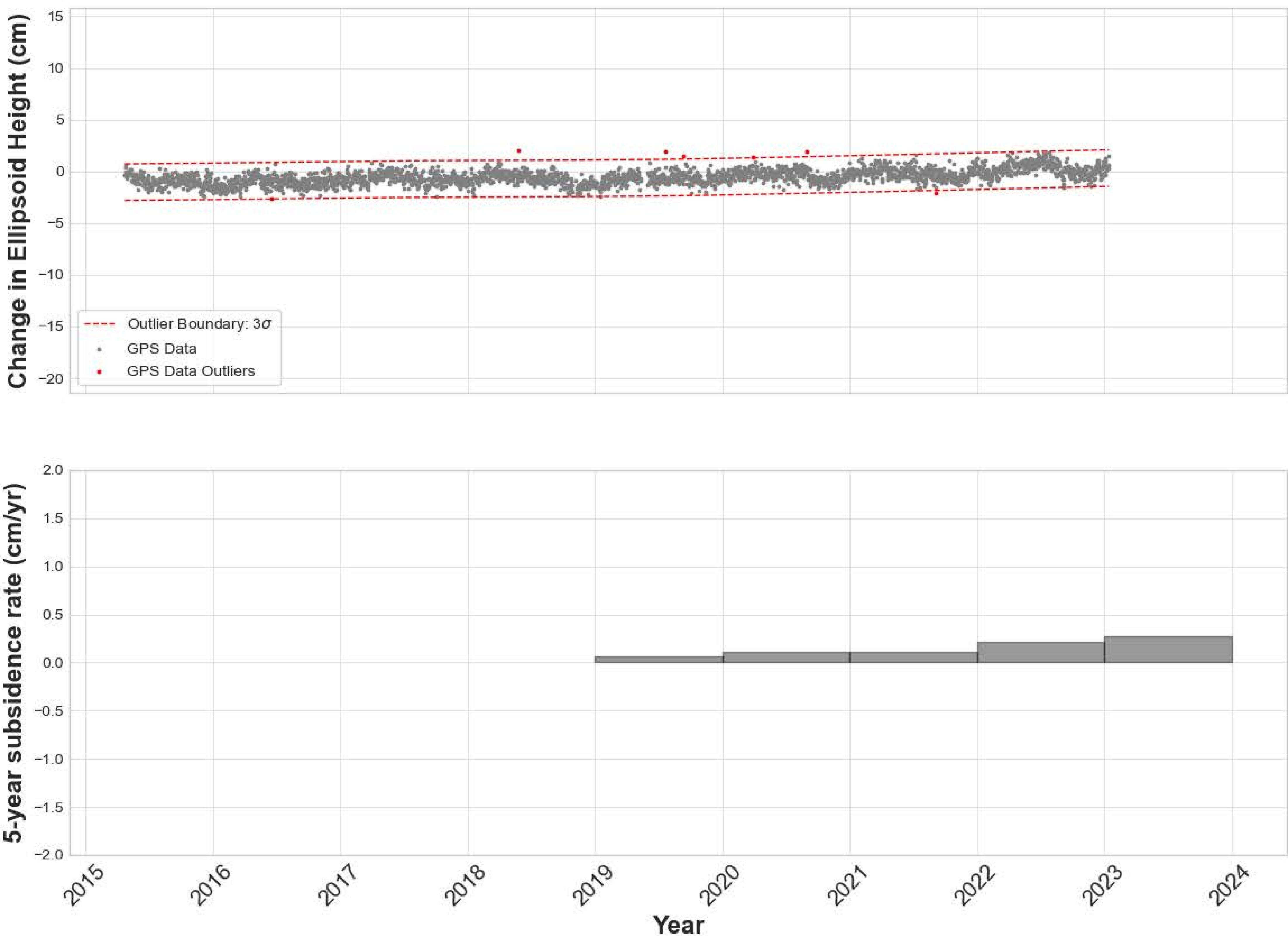

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXVA



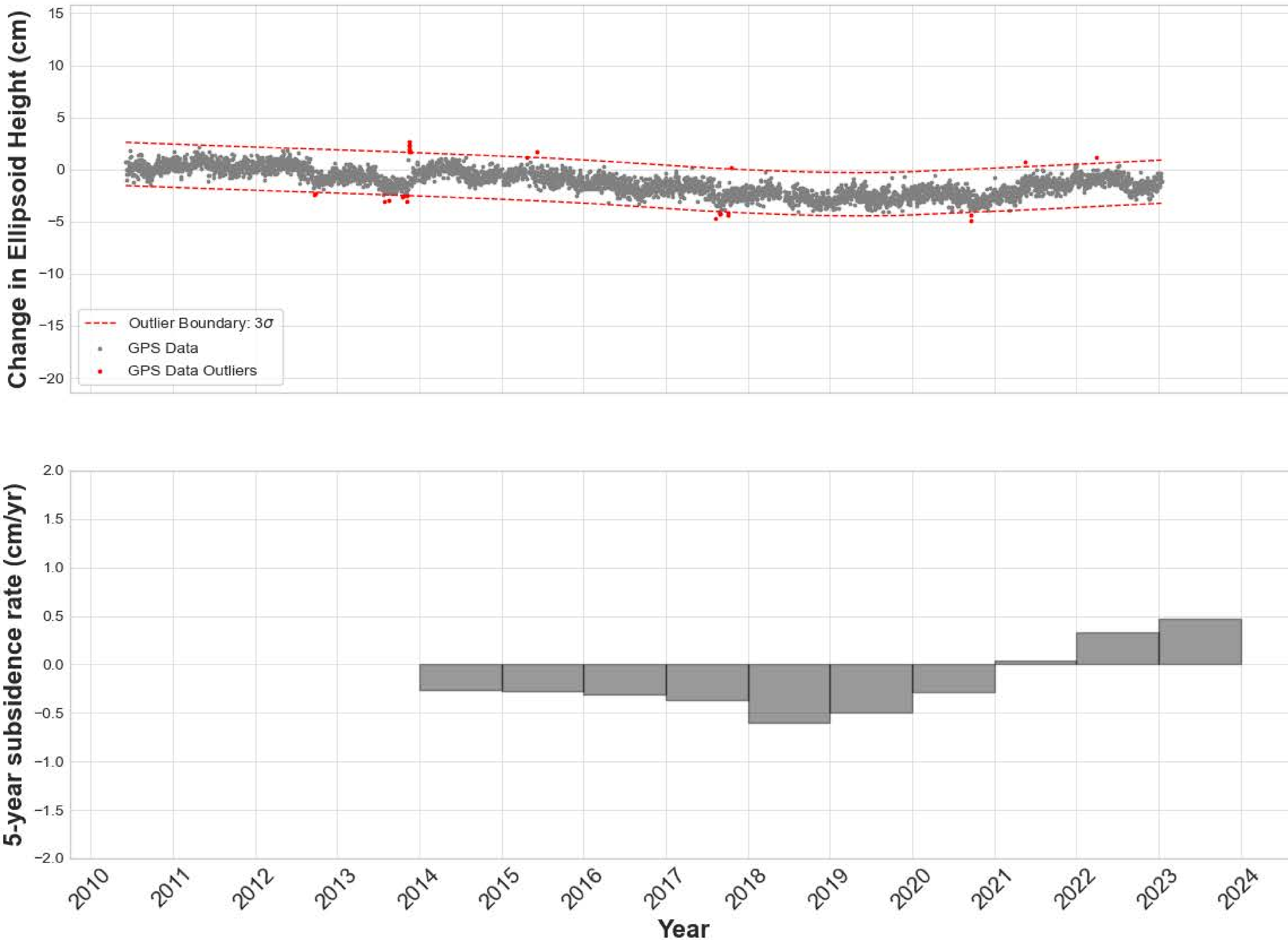

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXVC



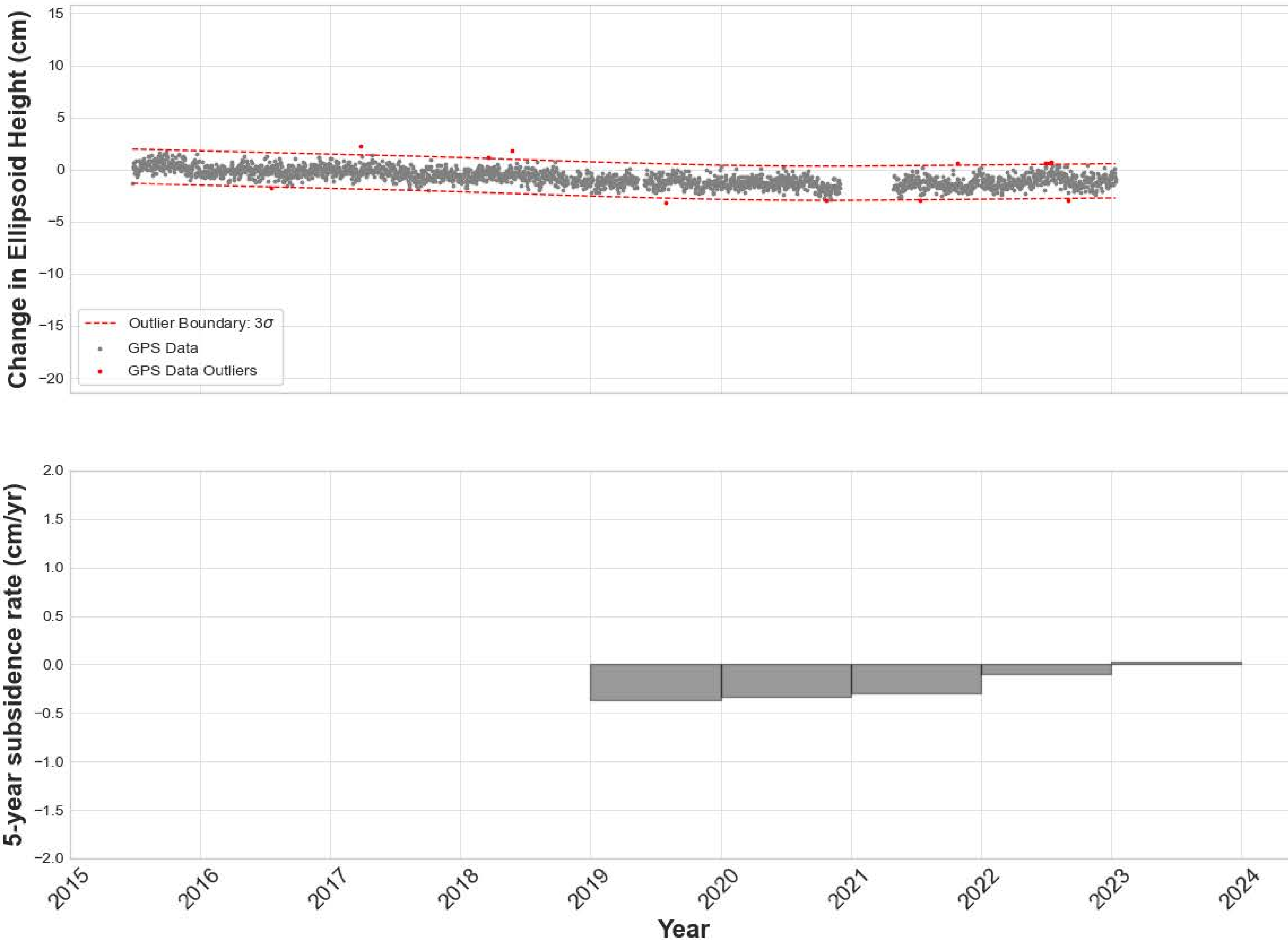

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXWH



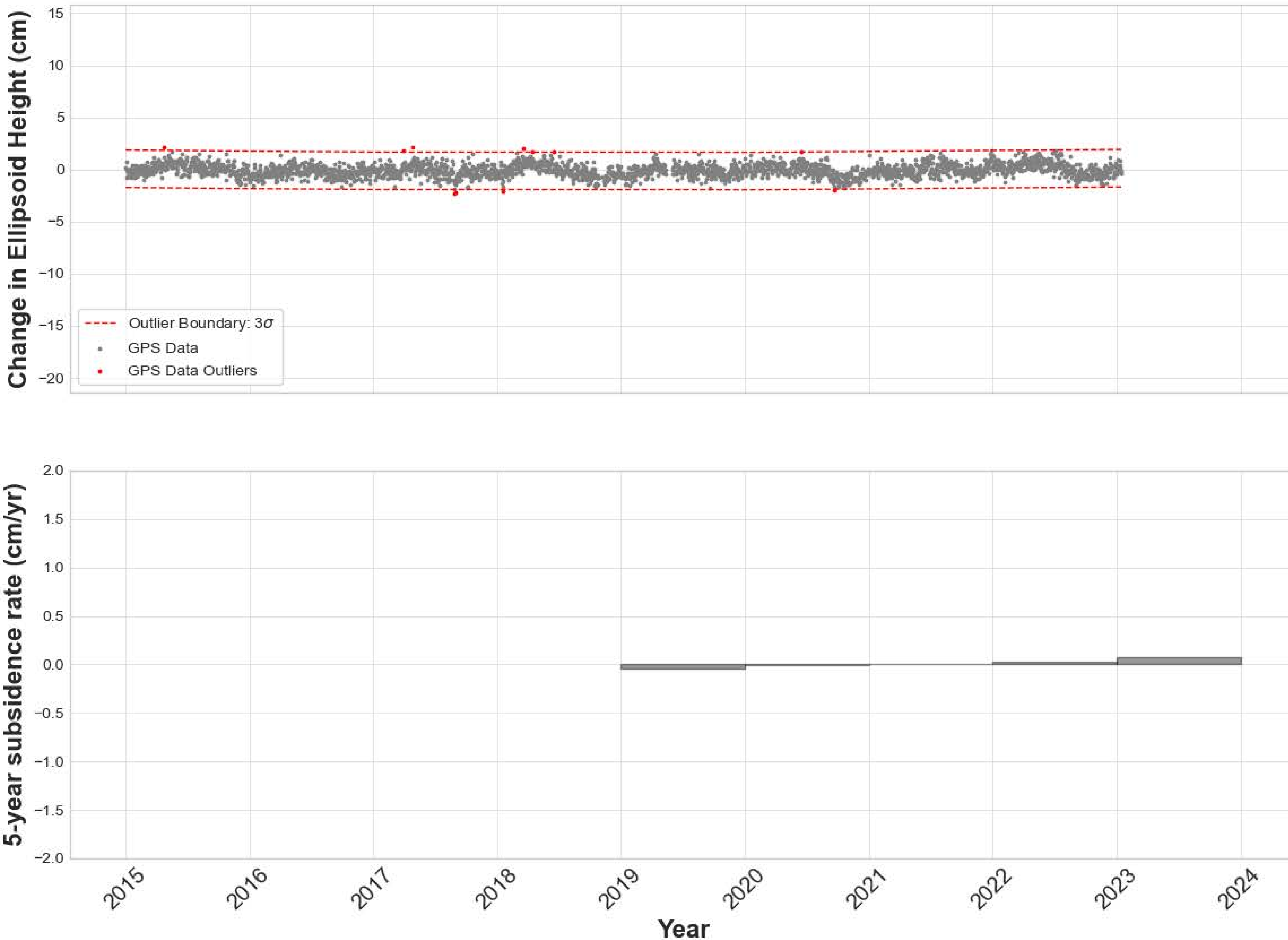

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXWI



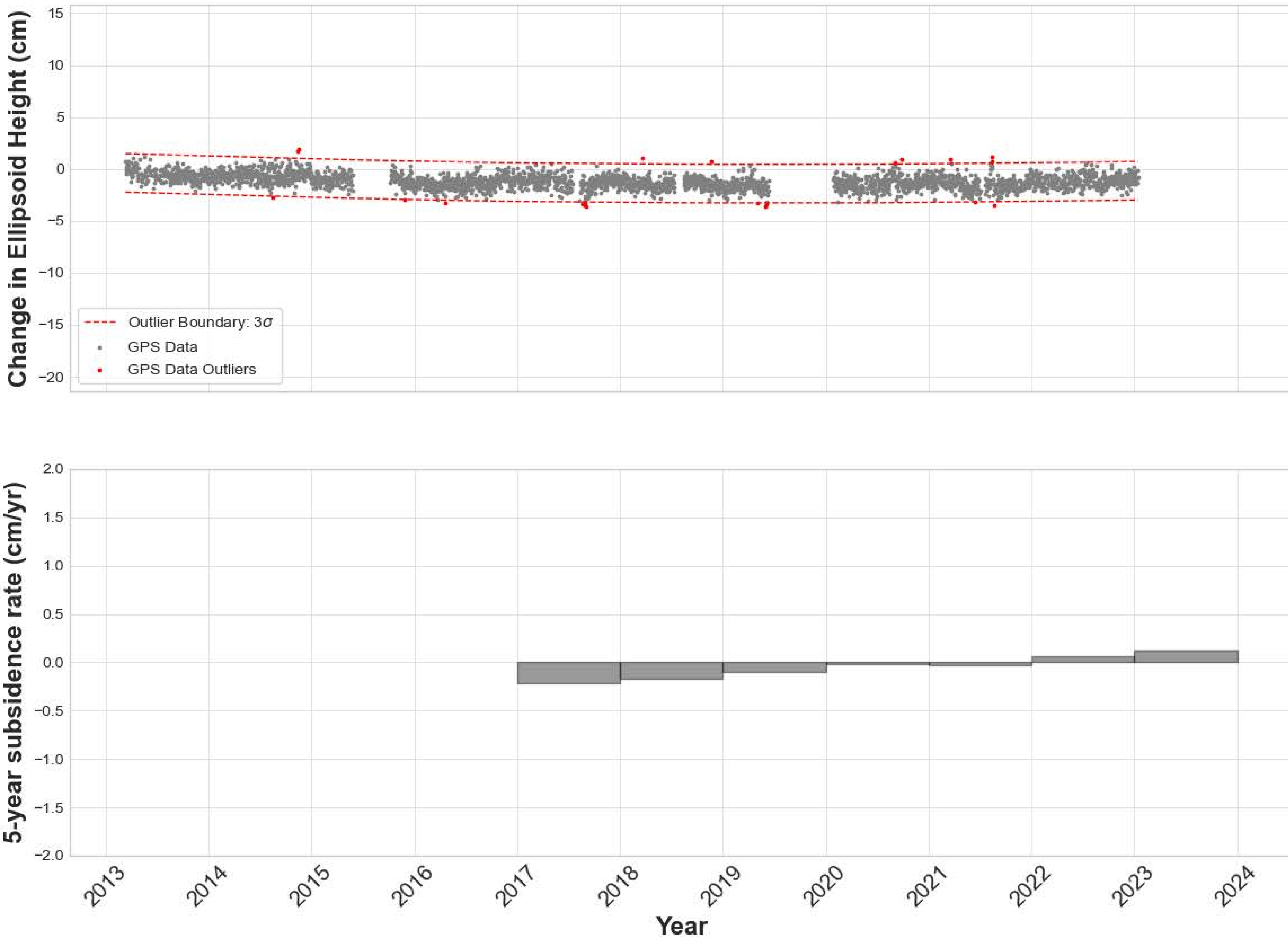

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXWN



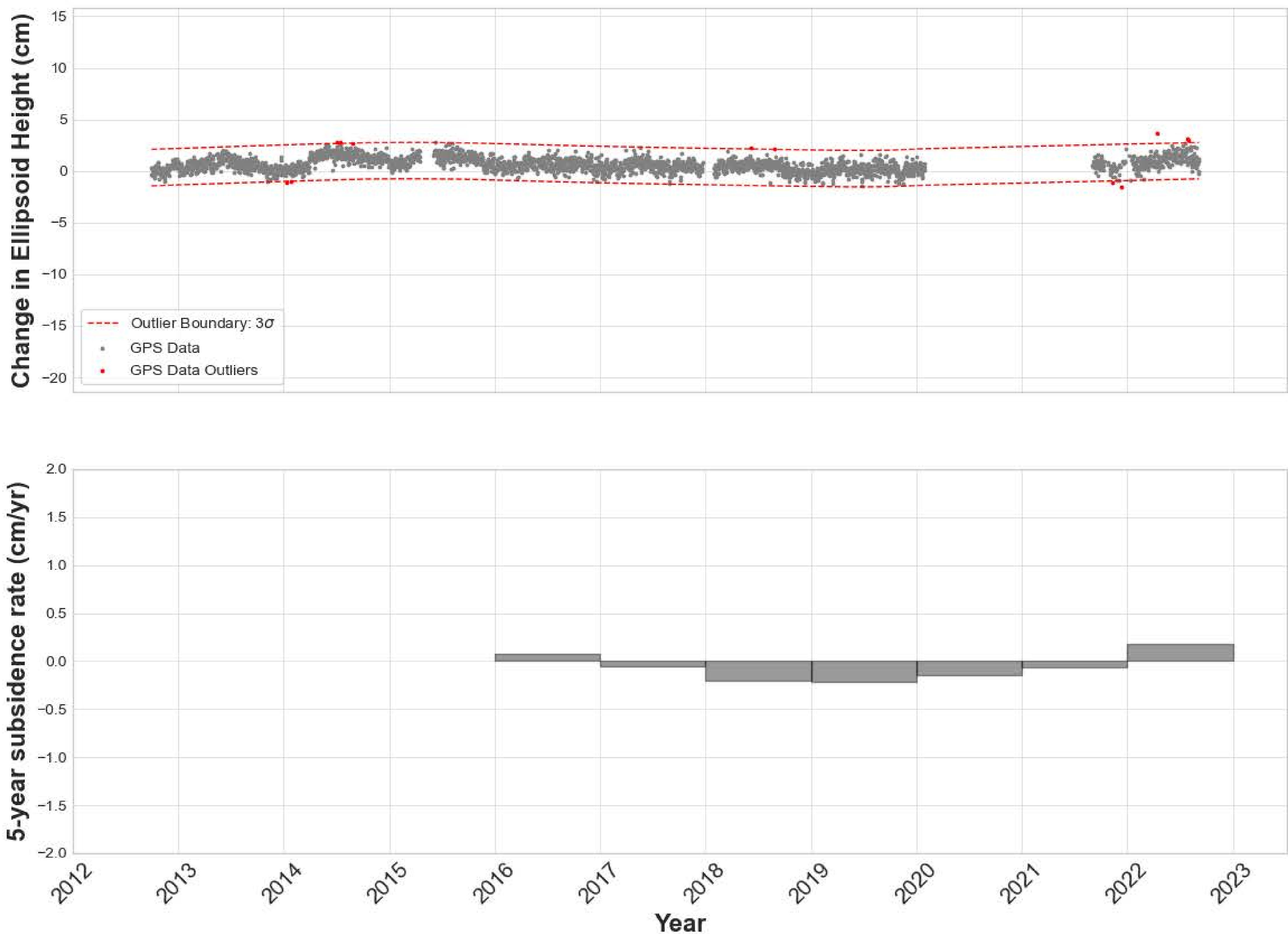

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# TXWO



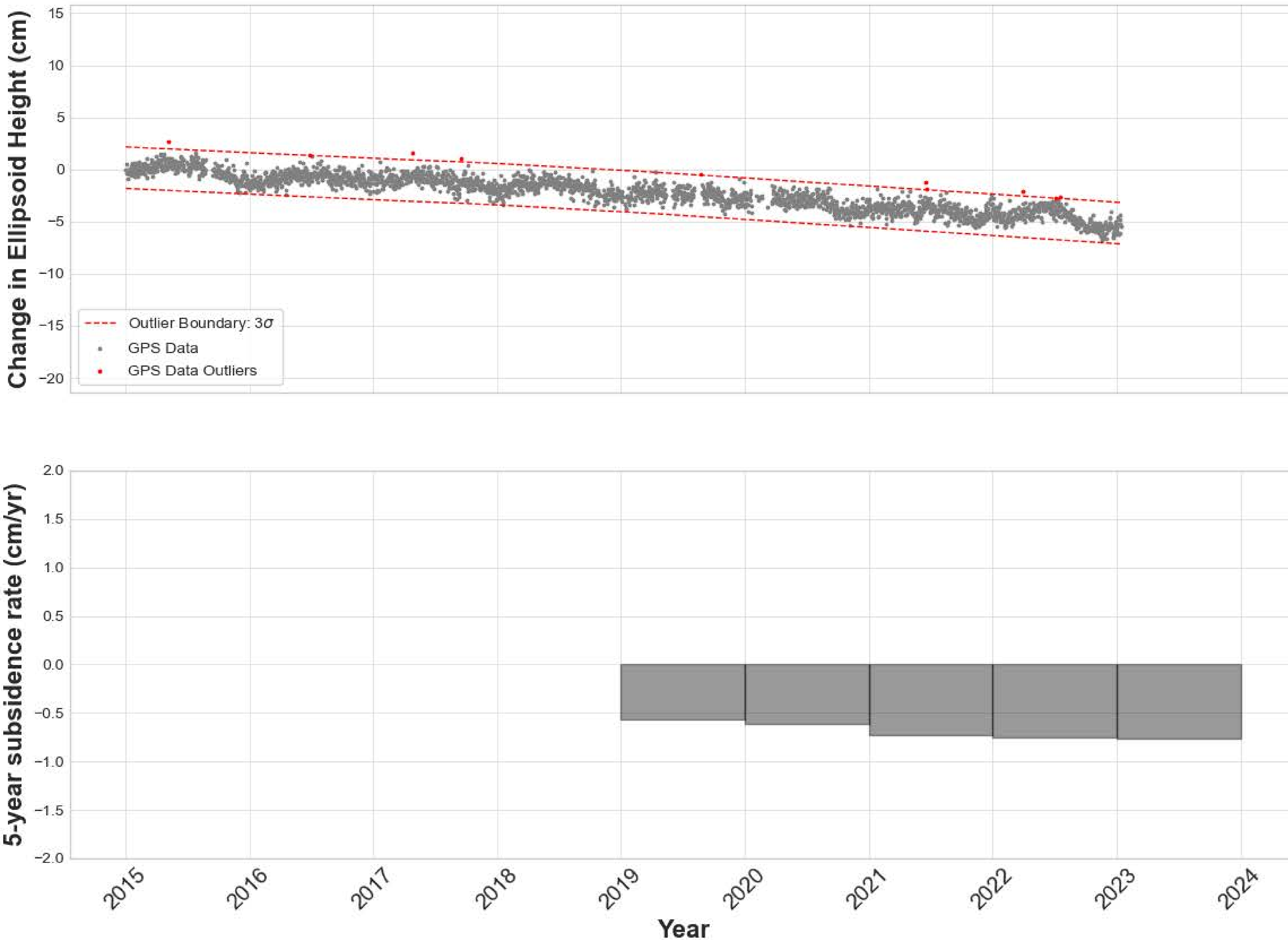

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UH01



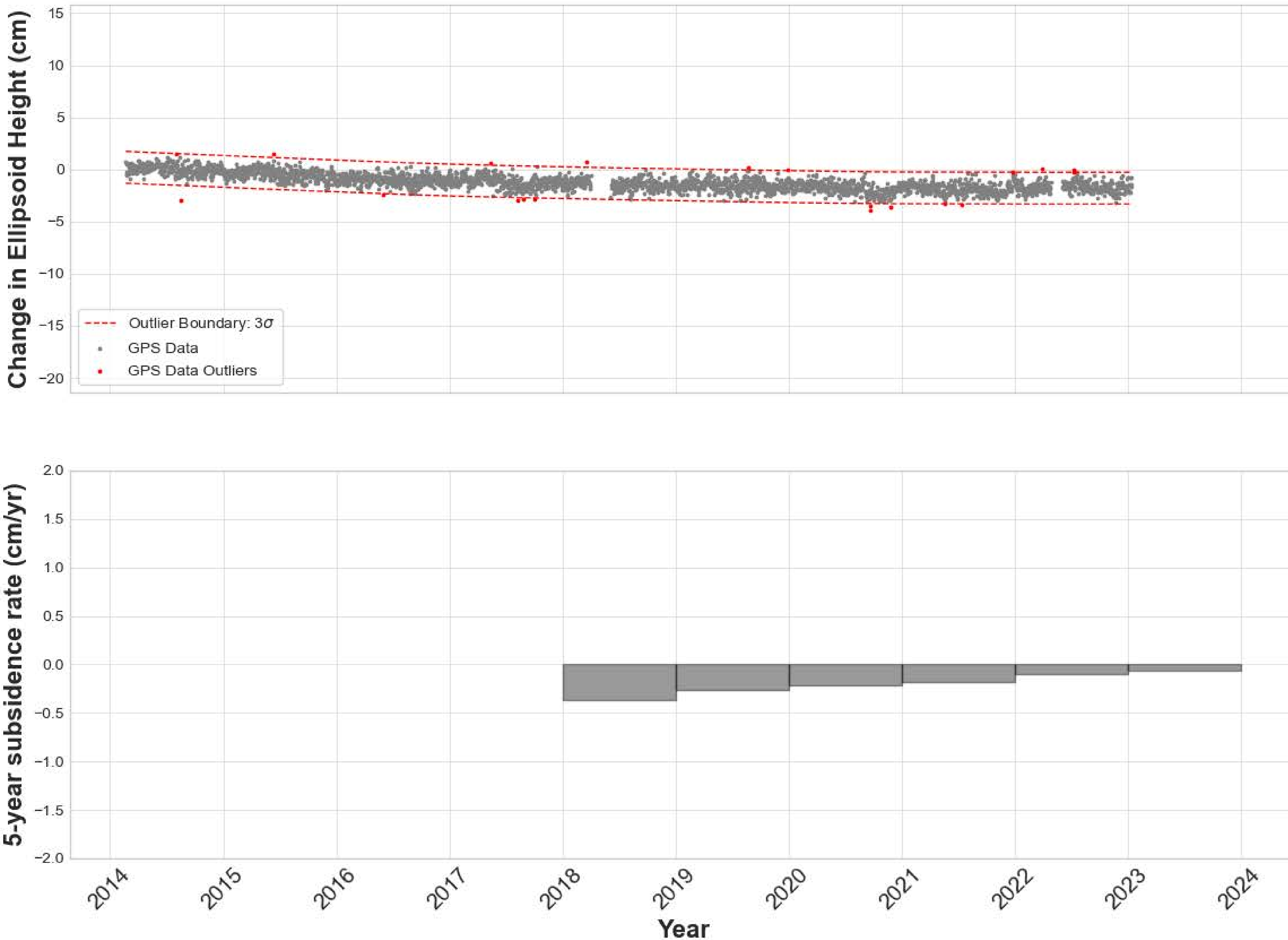

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UH02



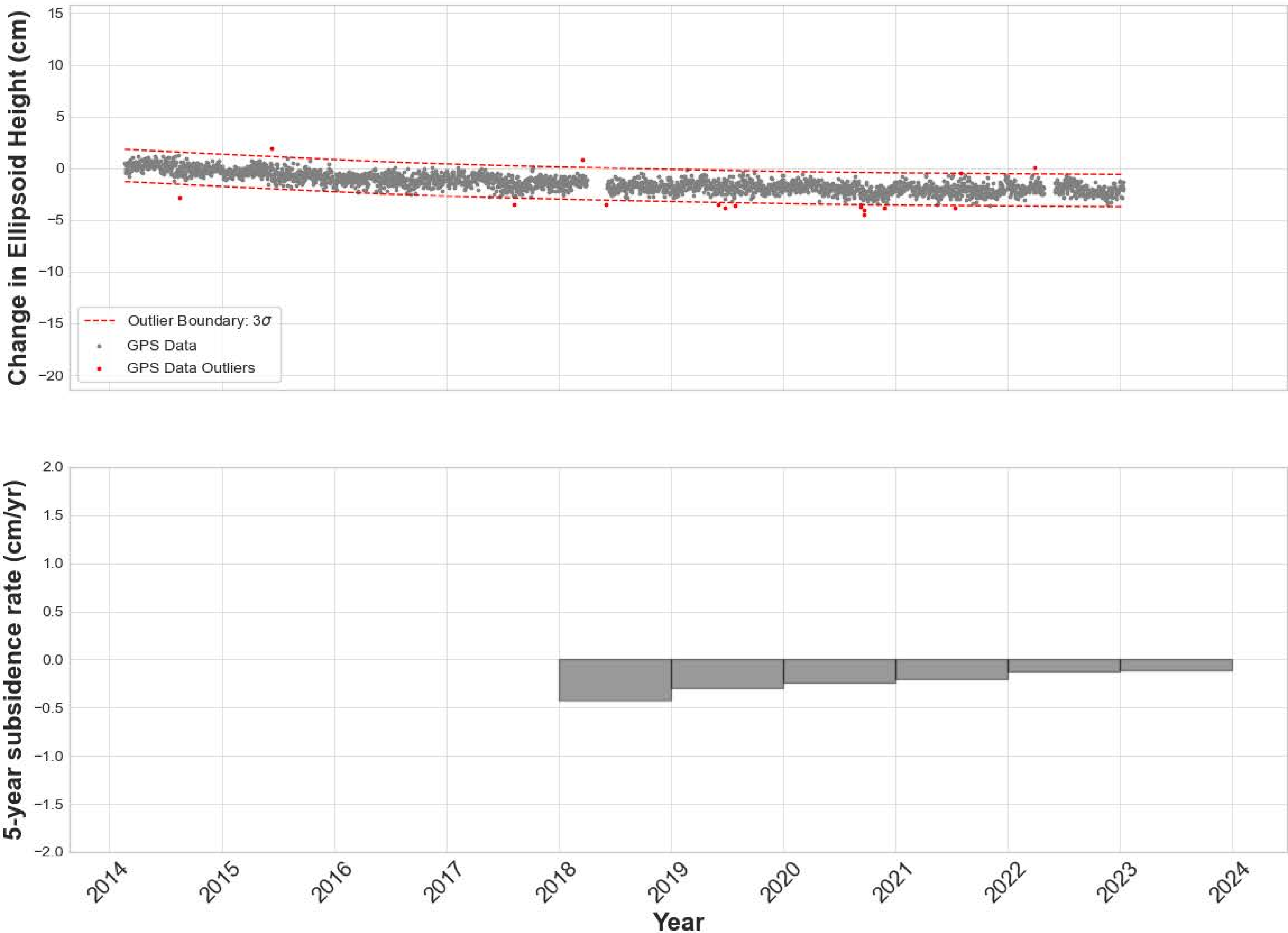

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHC1



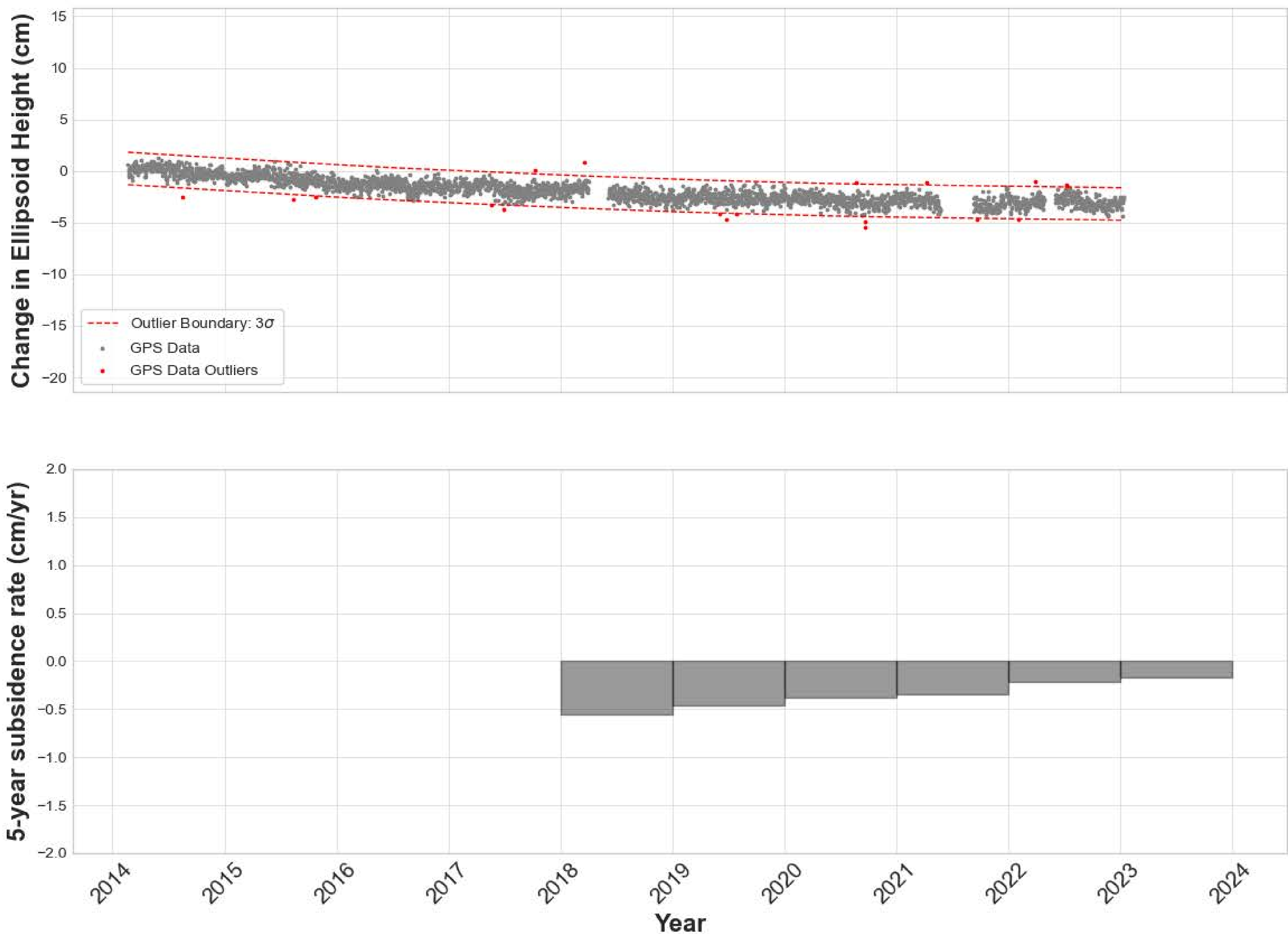

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHC2



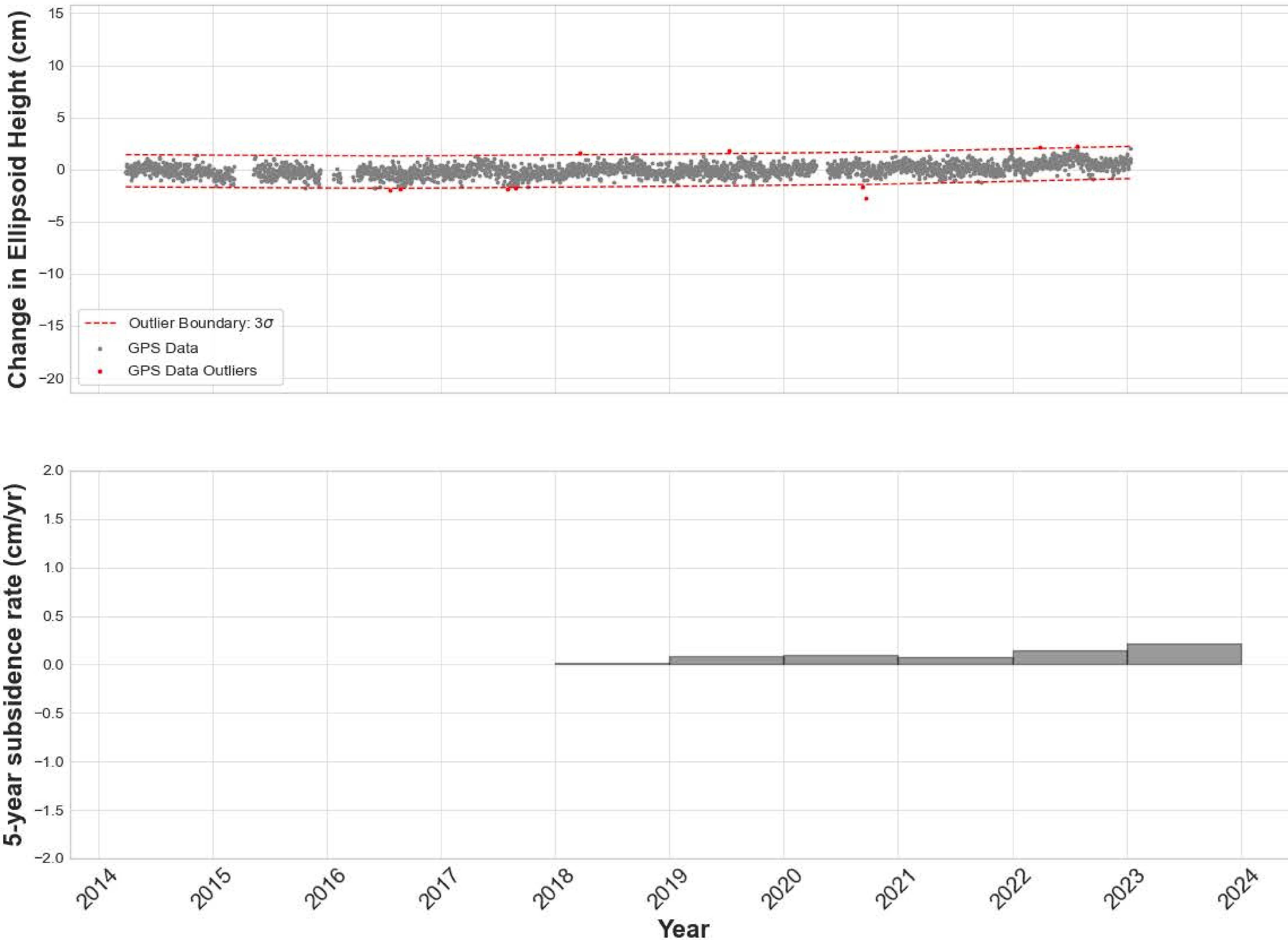

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHC3



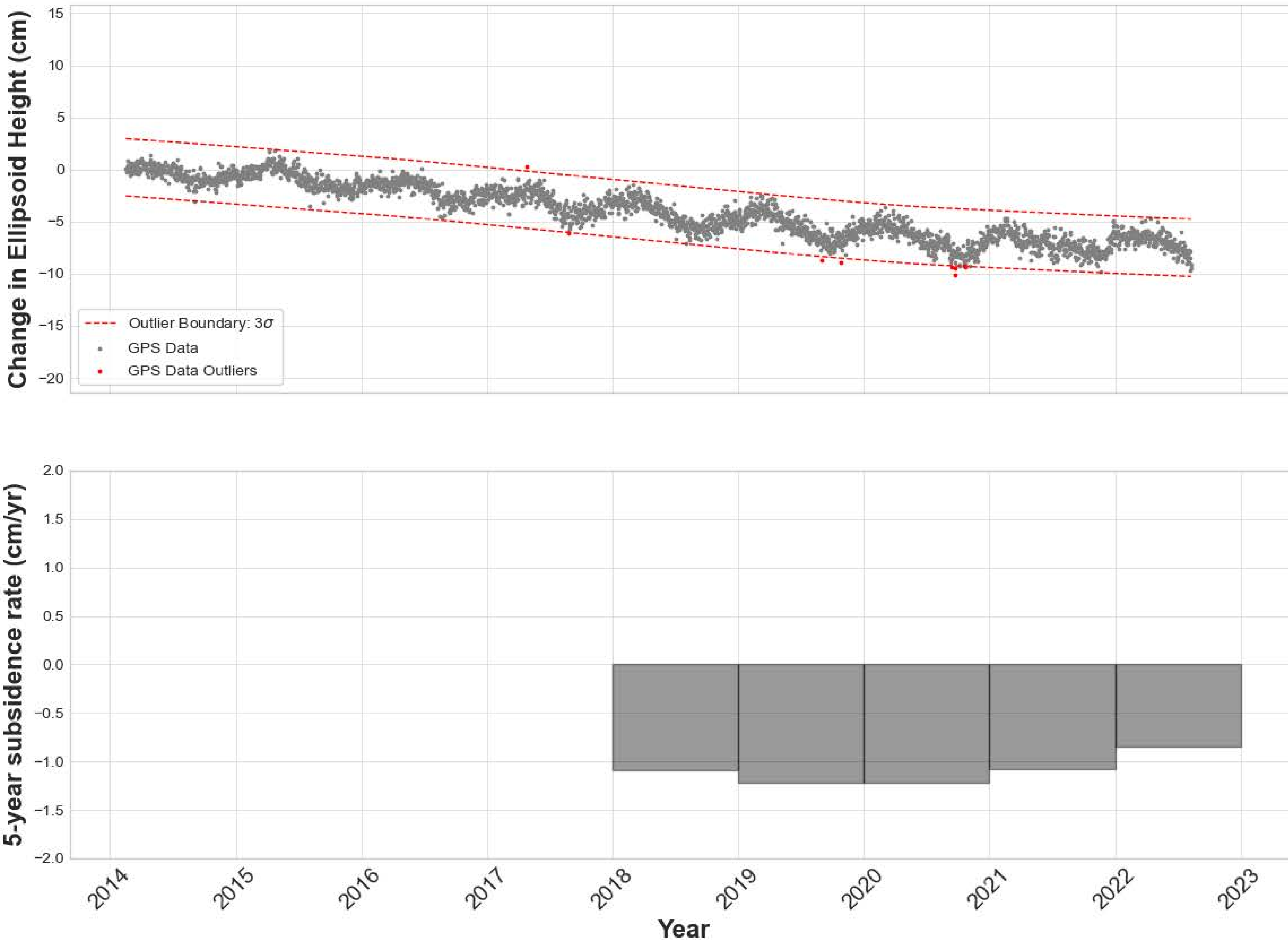

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHCL



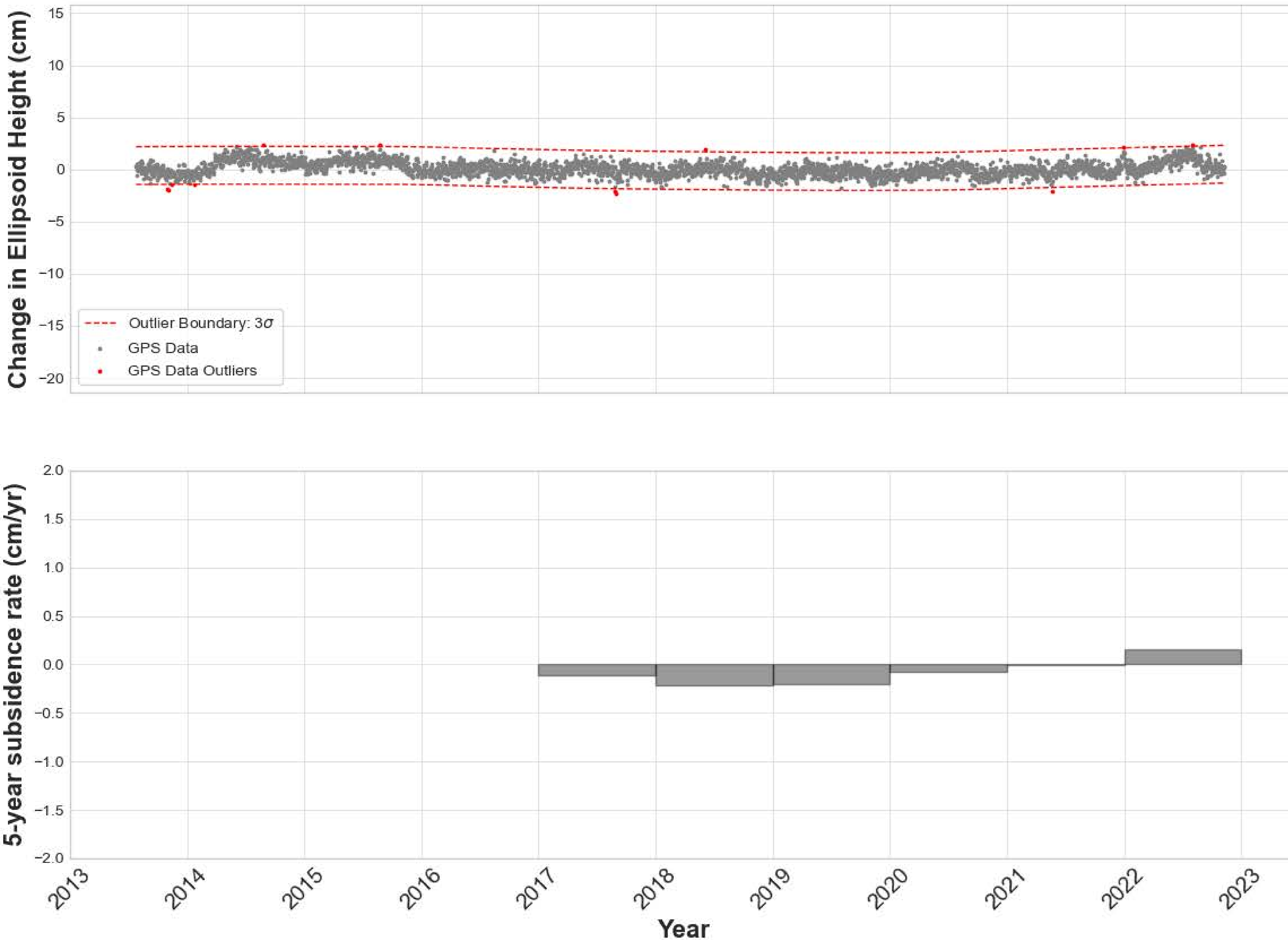

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHCR



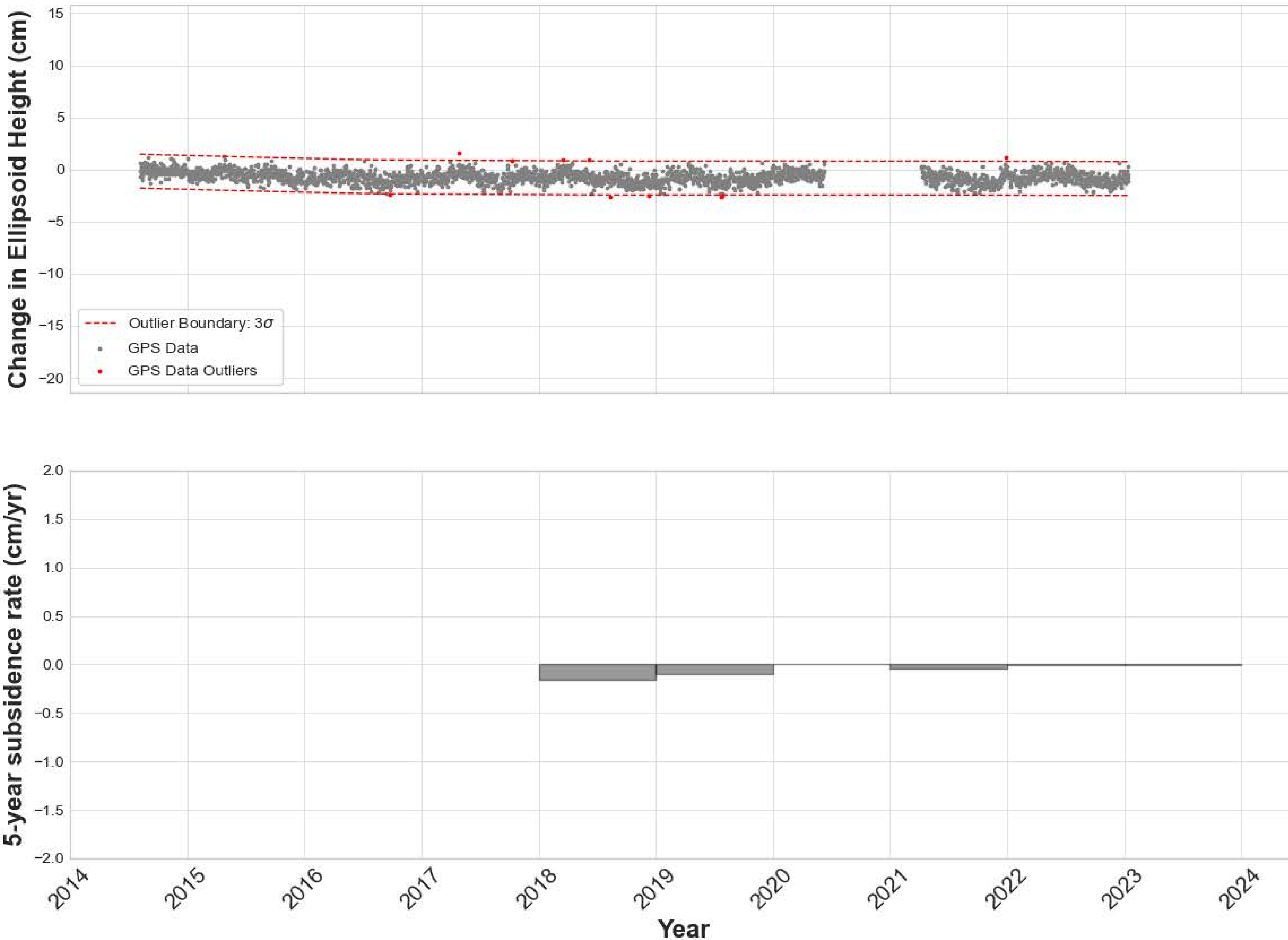

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHDT



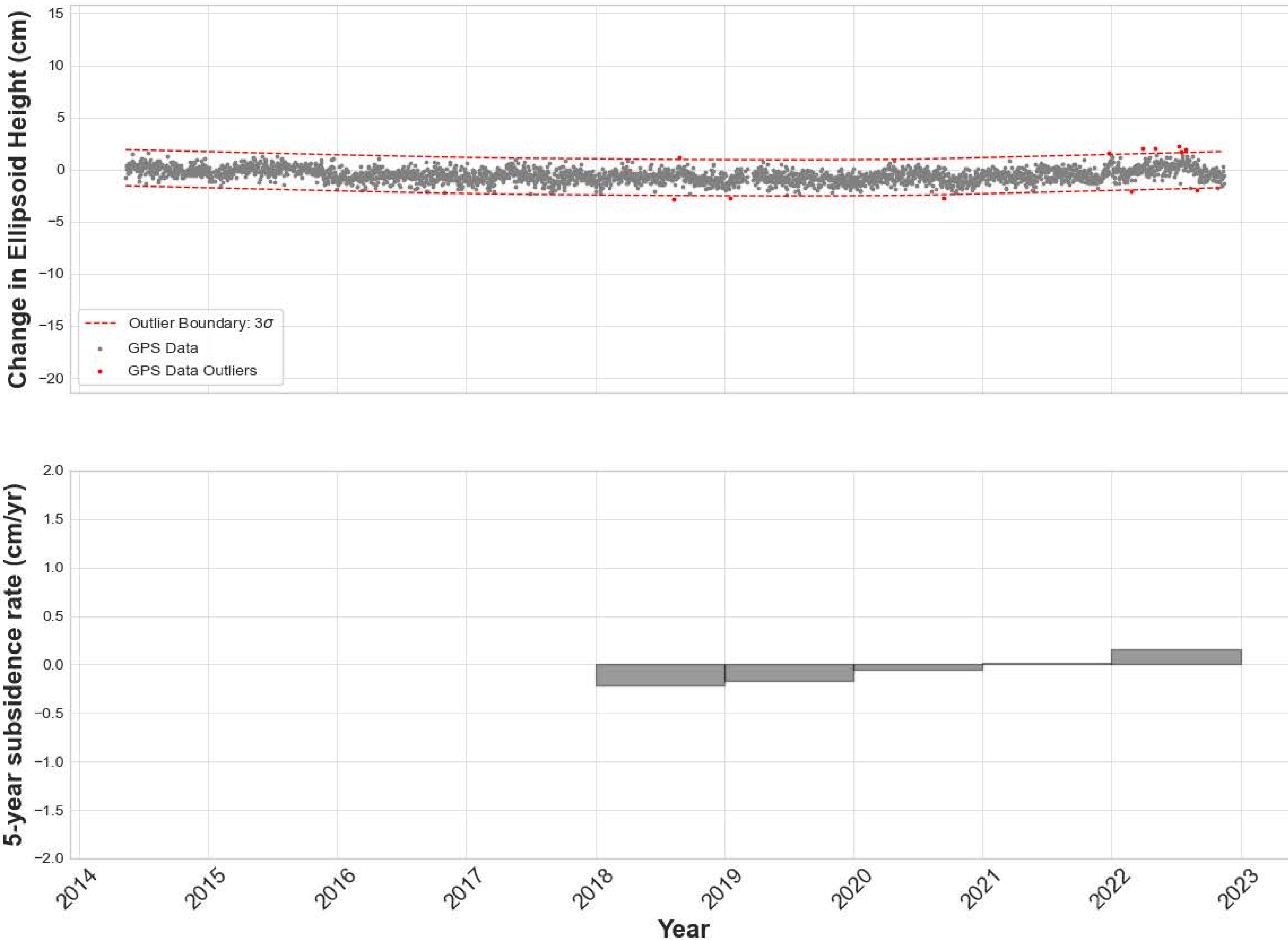

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHEB



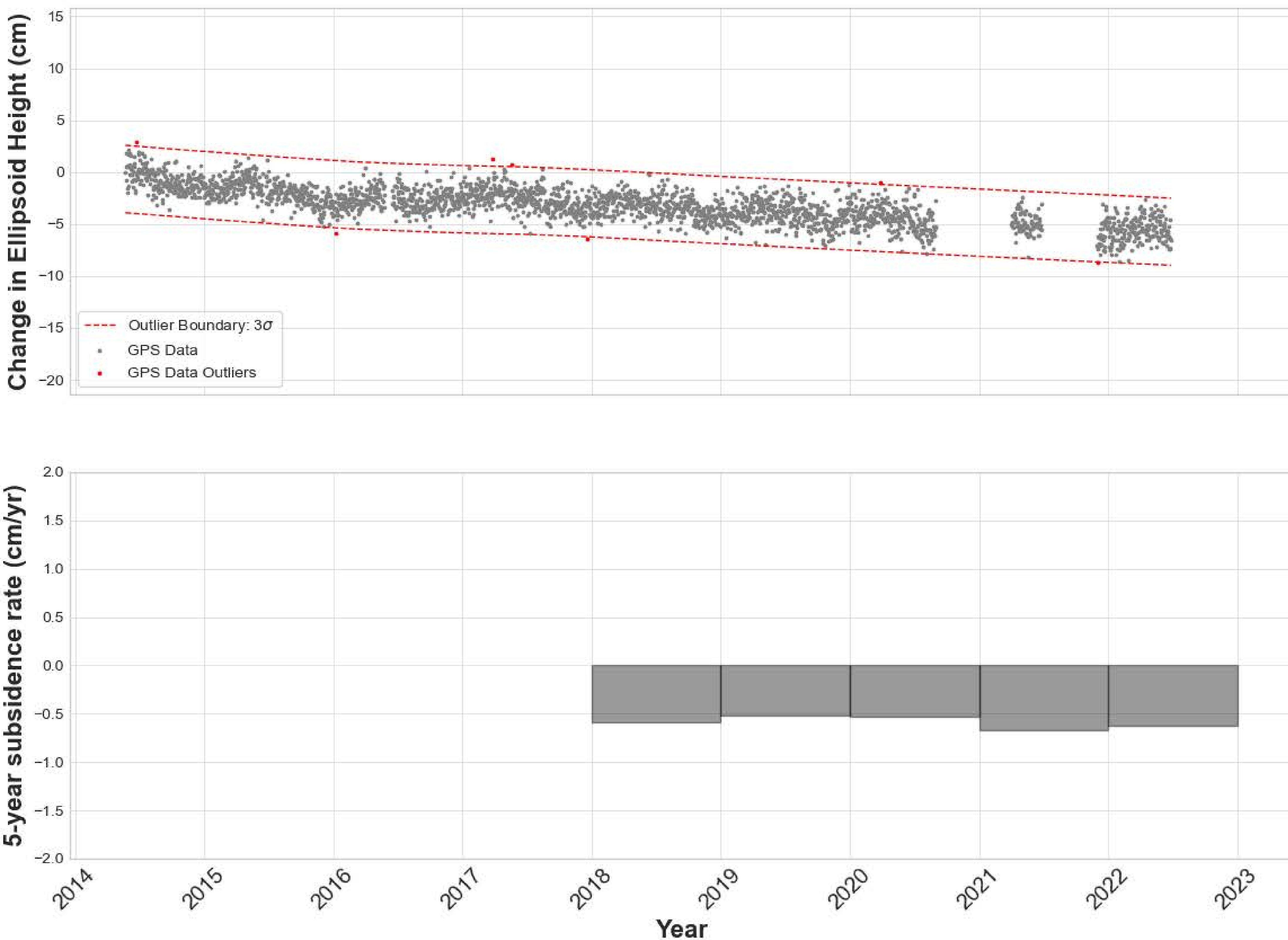

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHEP



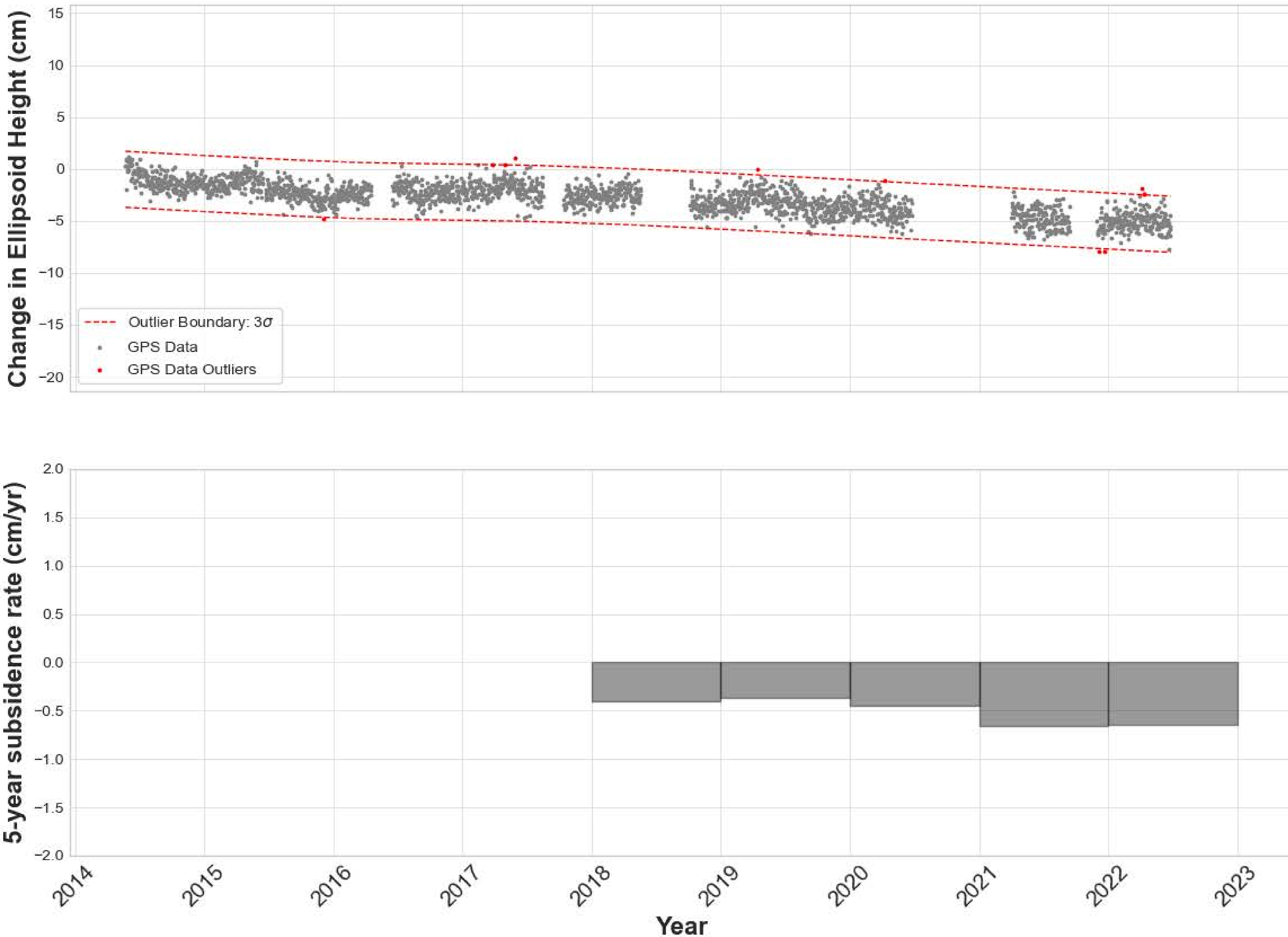

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHF1



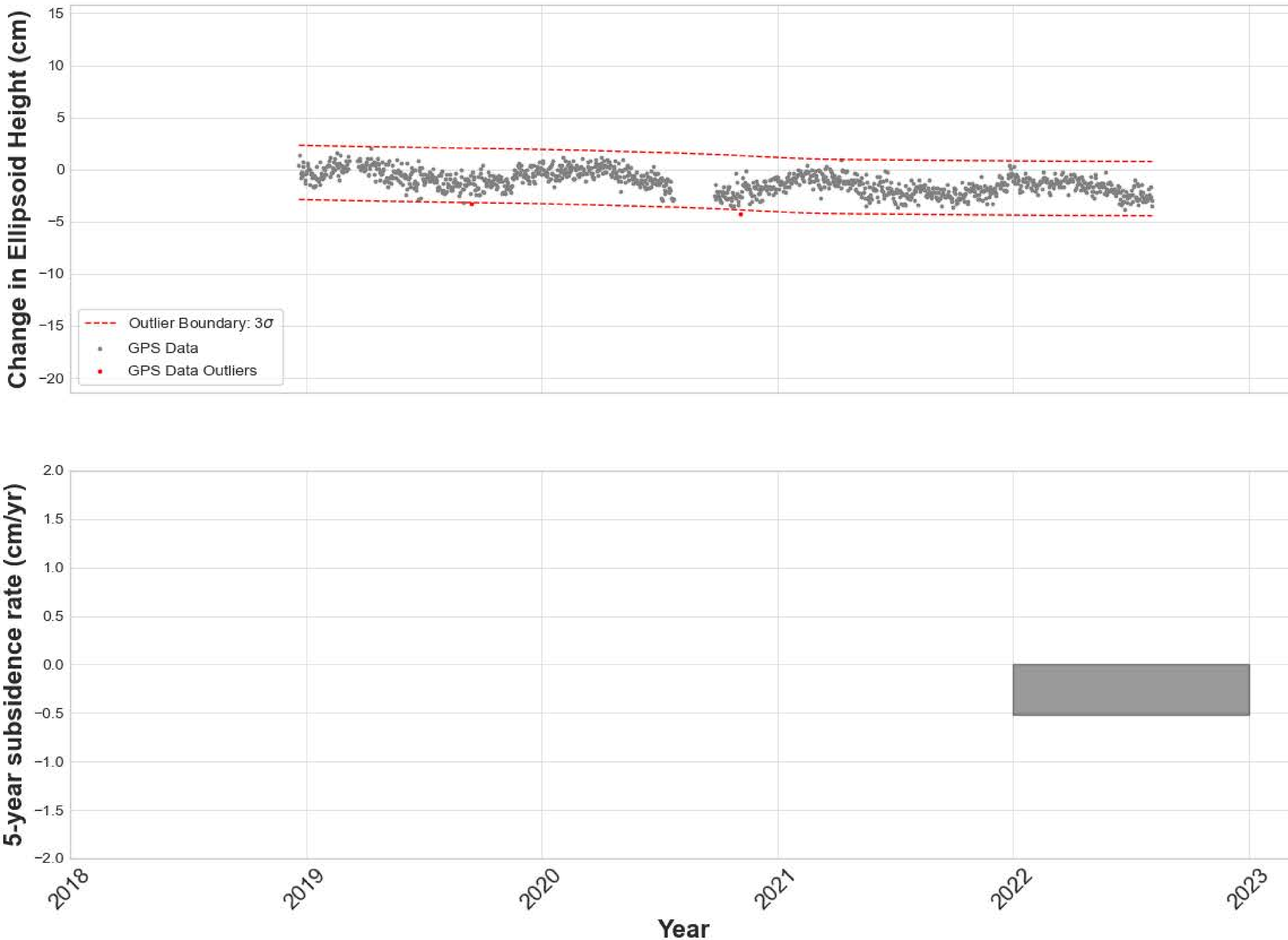

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHJF



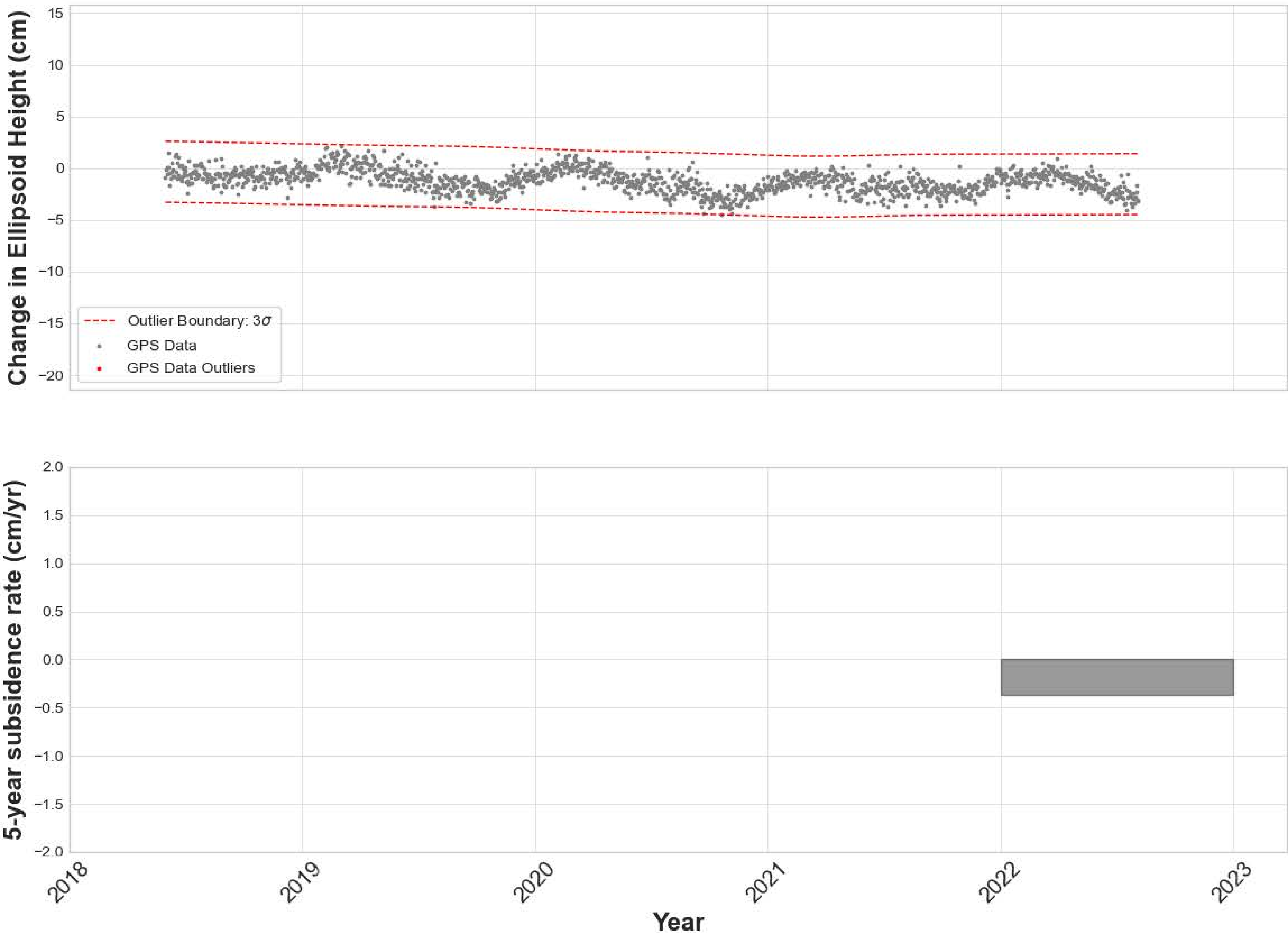

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHKD



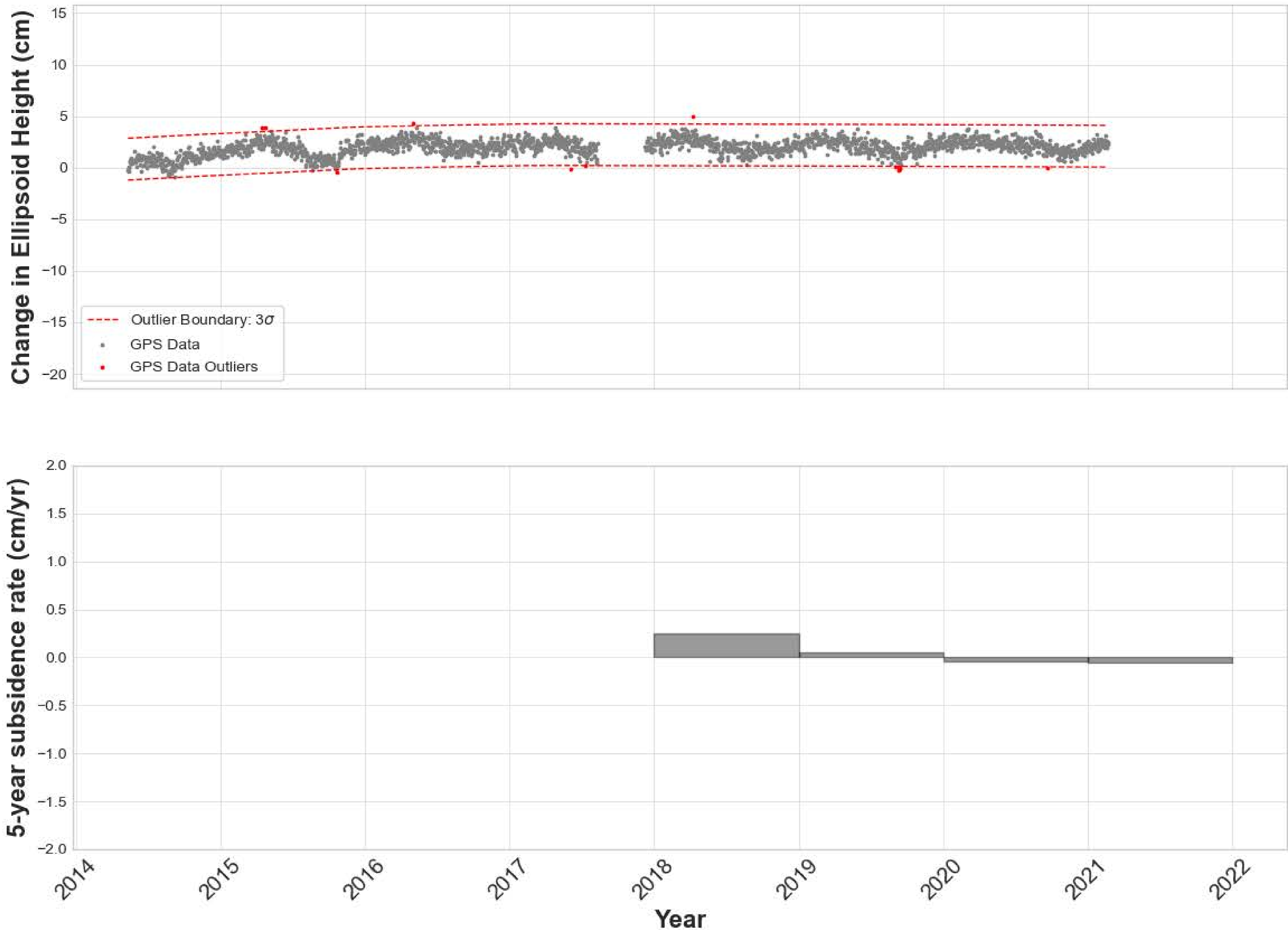

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHKS



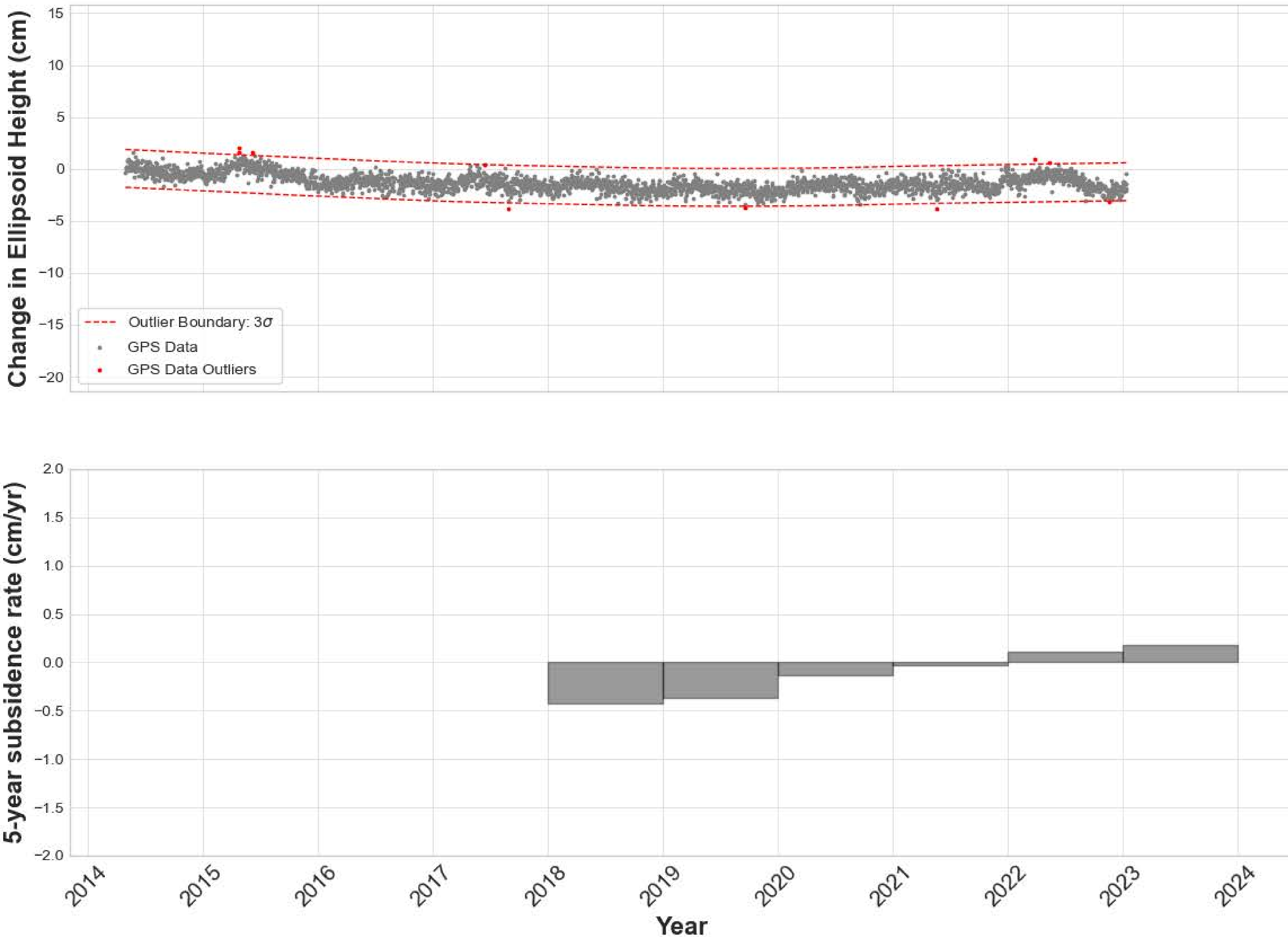

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHL1



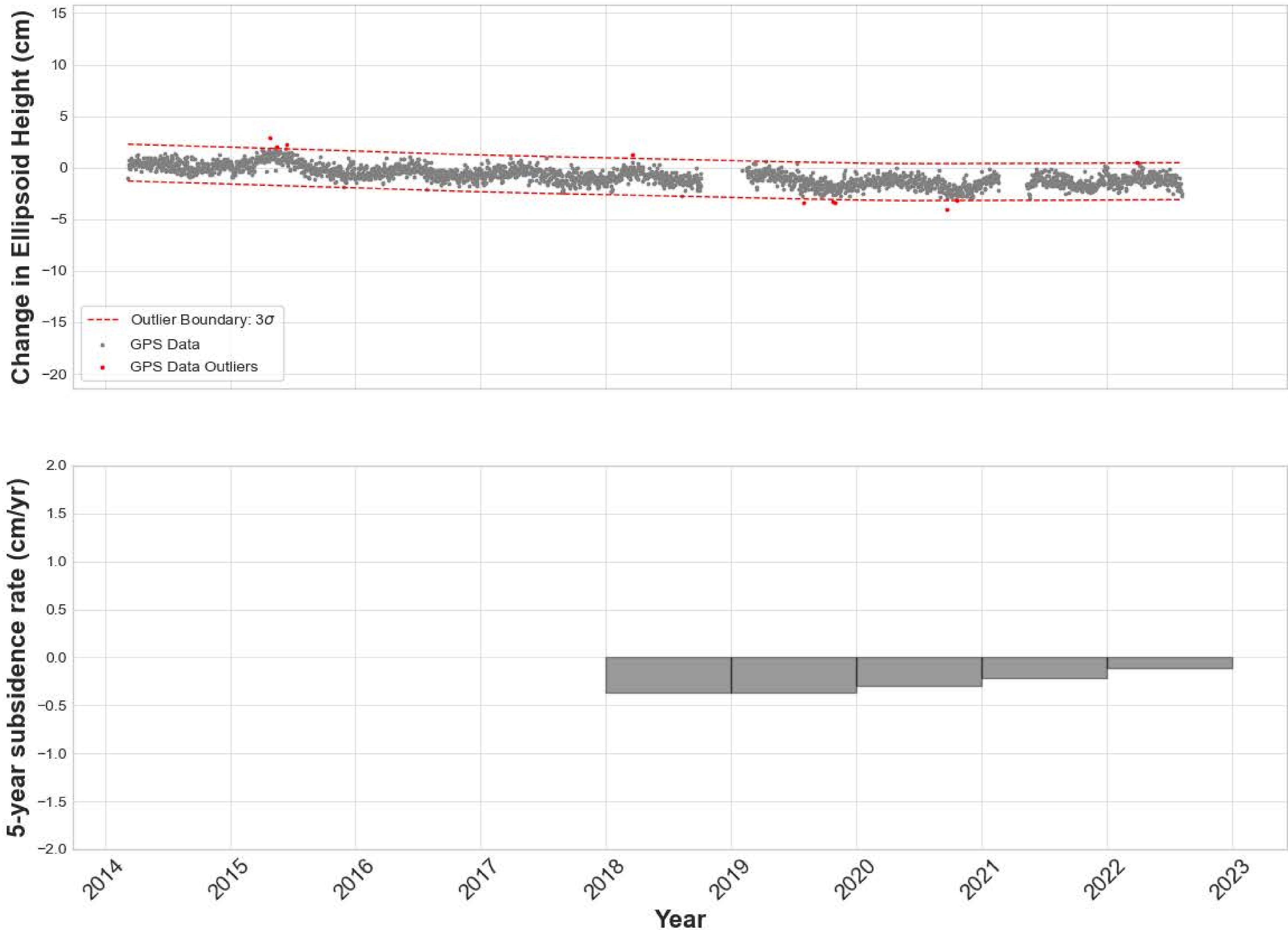

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHRI

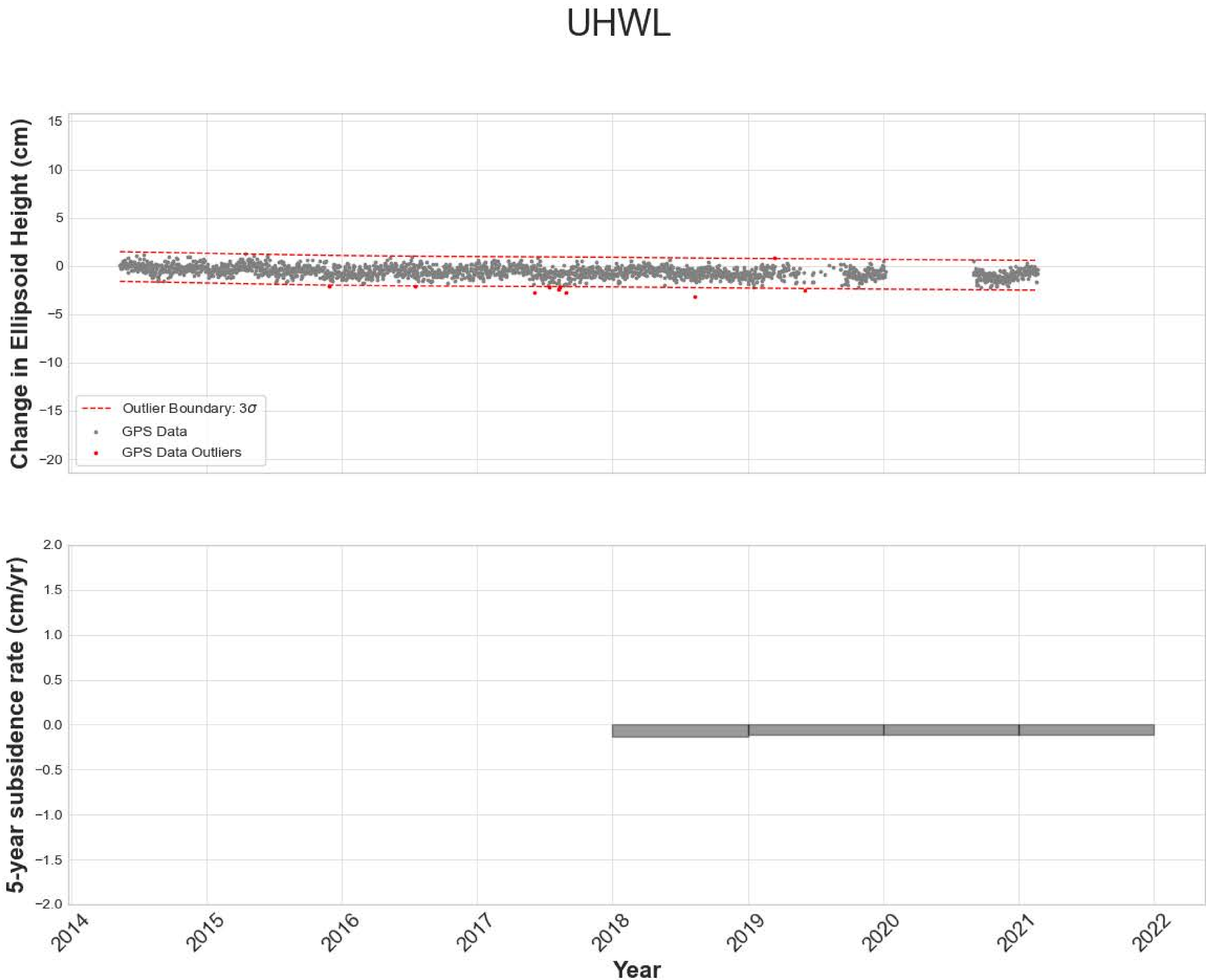



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UHSL

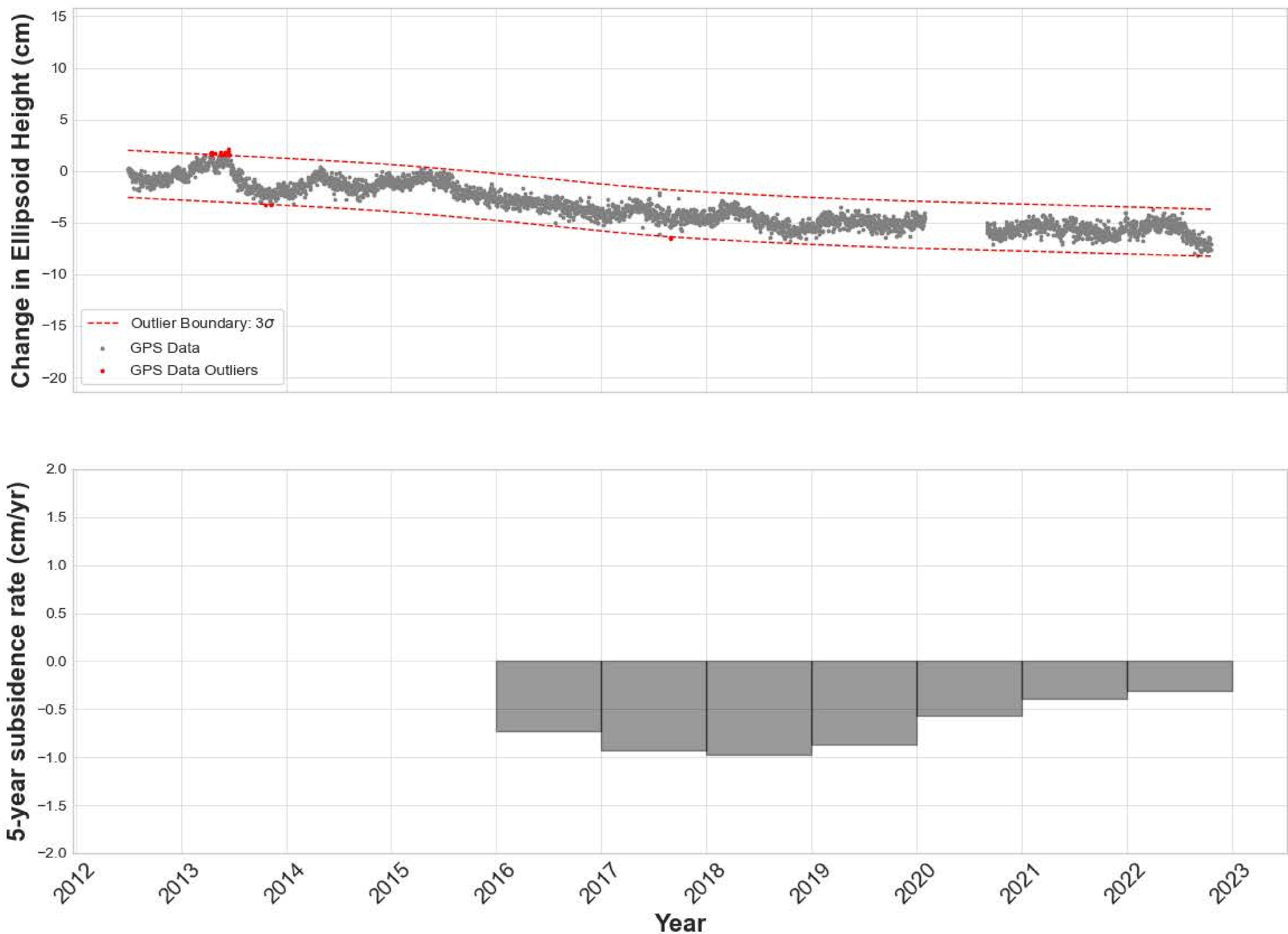



Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.



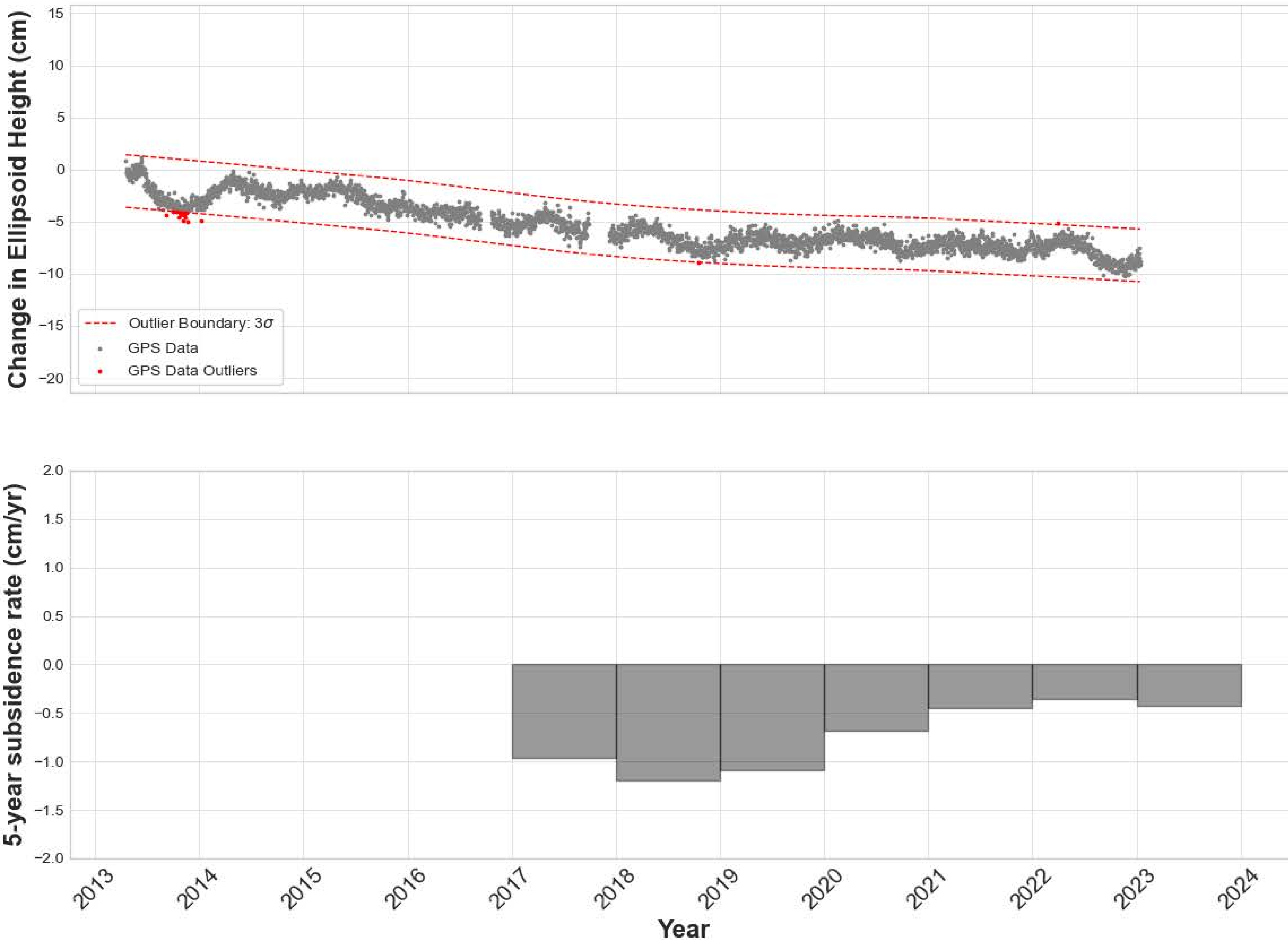

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# UTEX



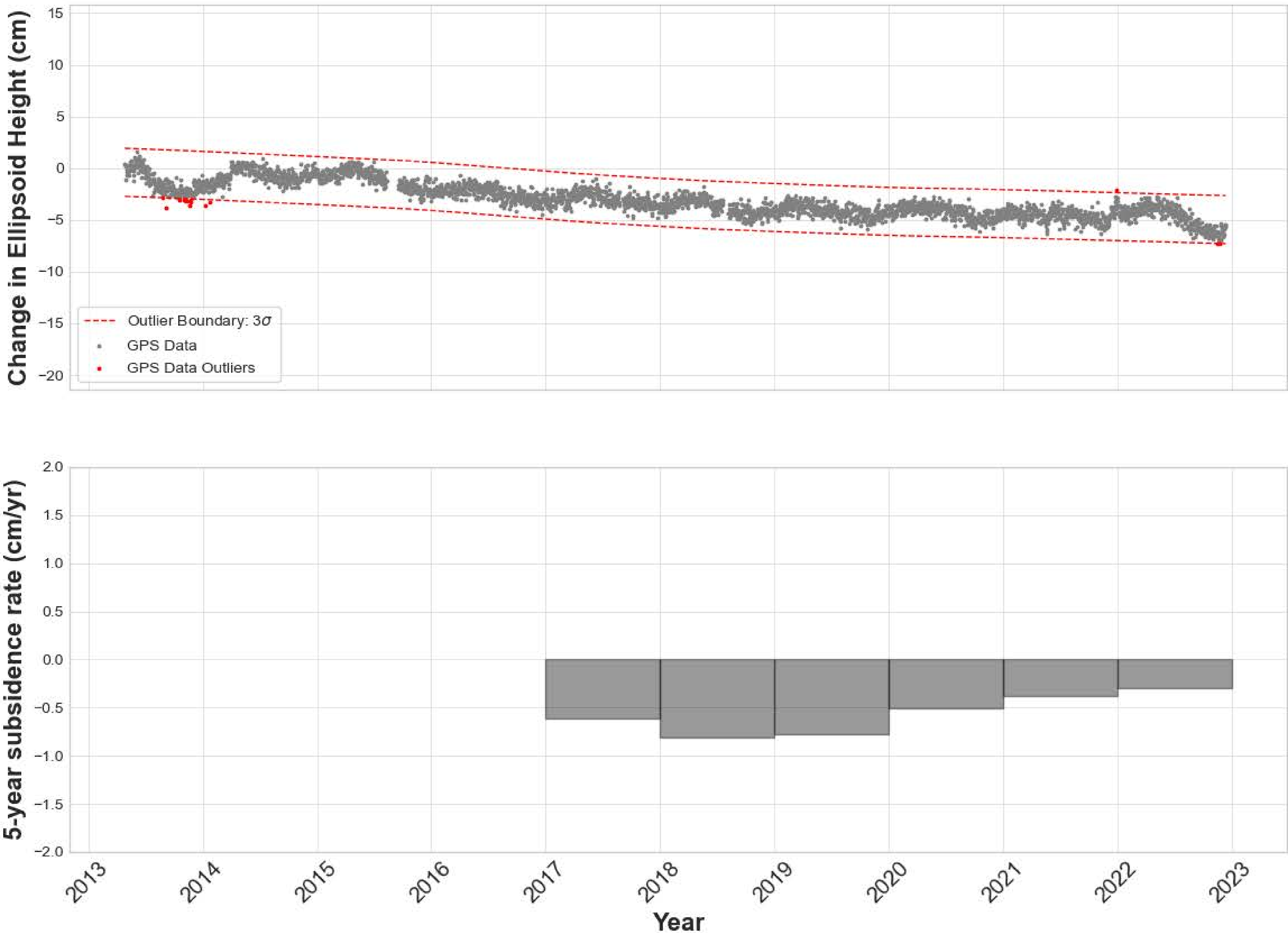

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# WCHT



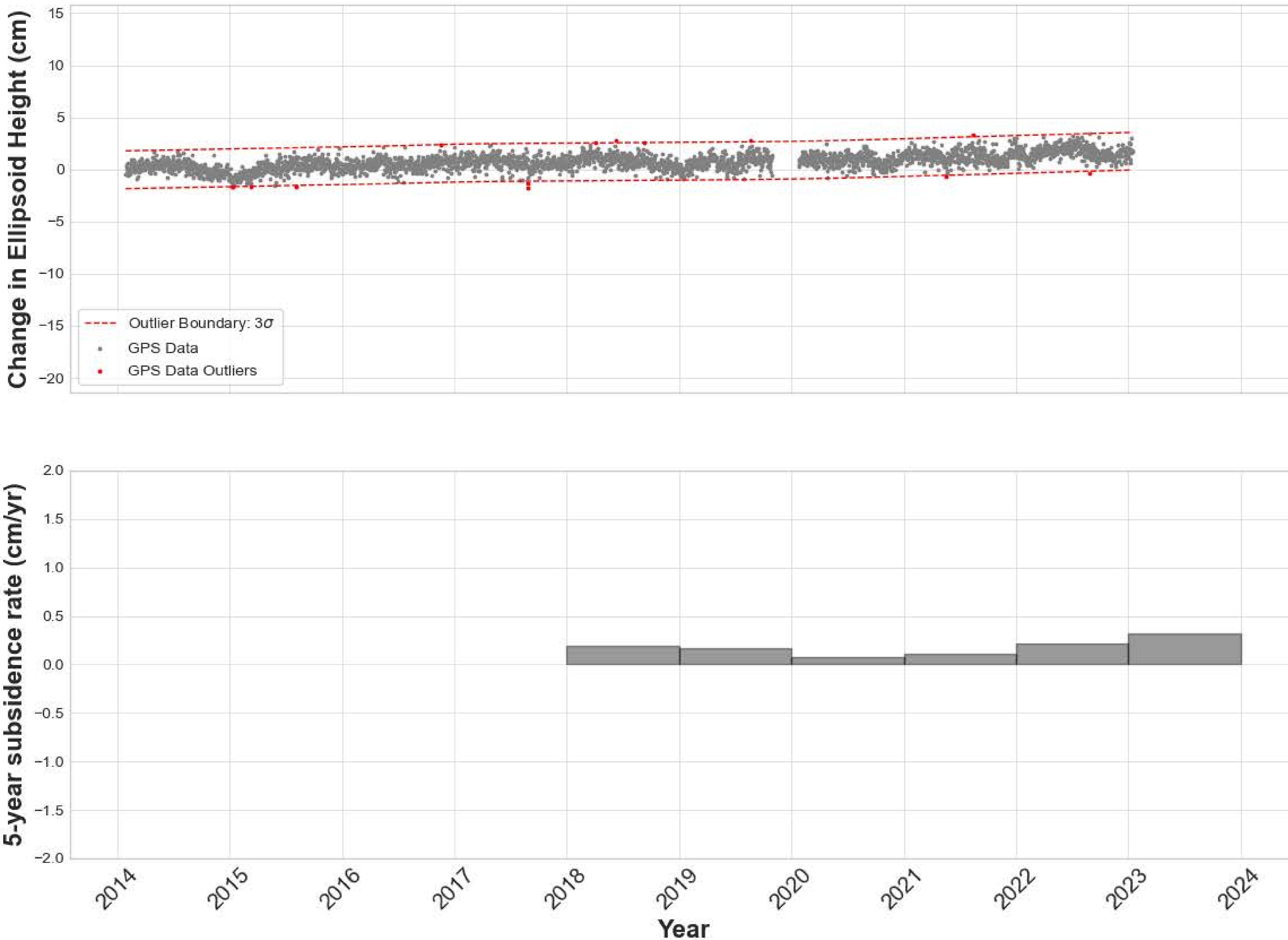

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# WDVW



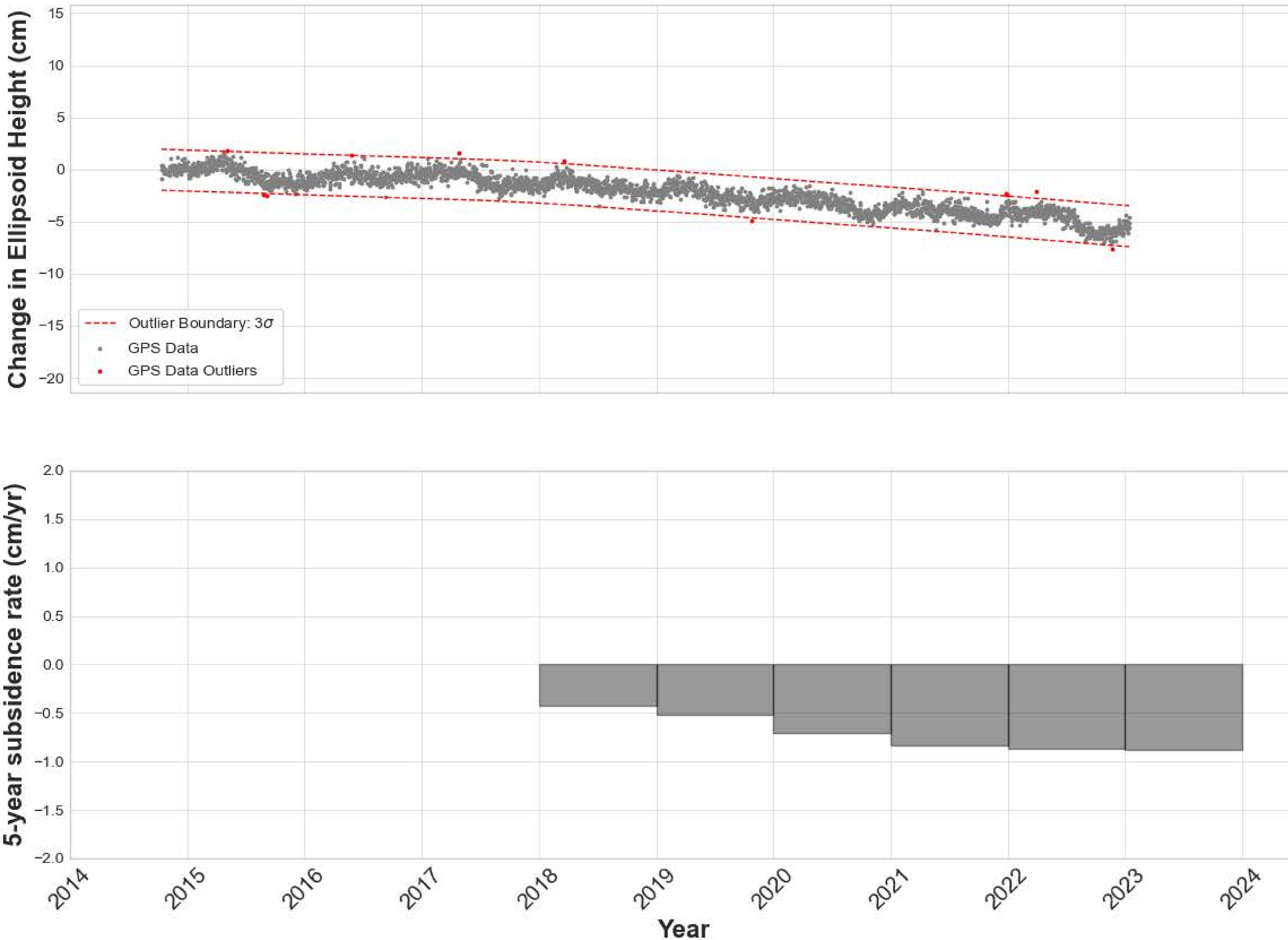

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# WEPD



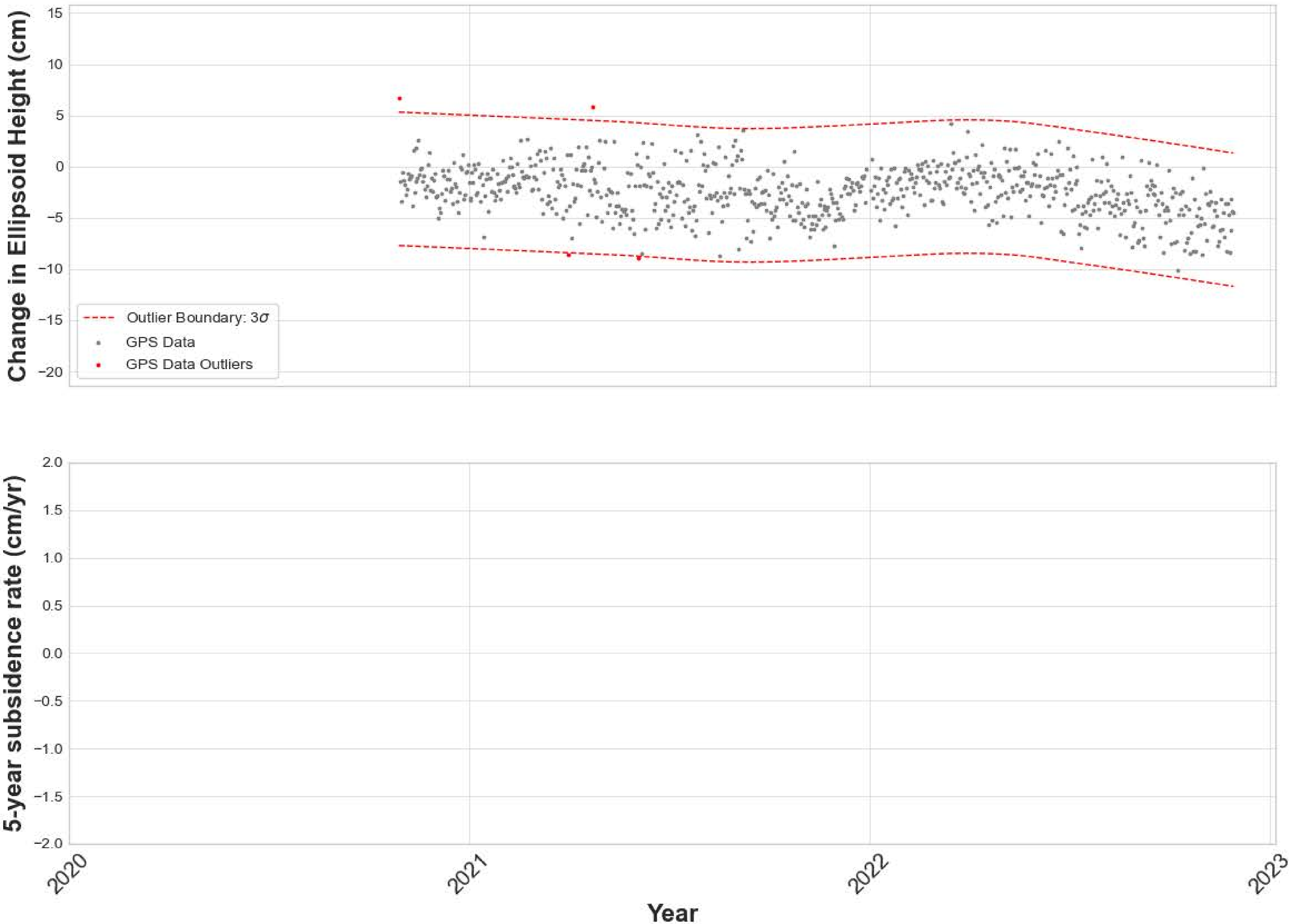

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# WHCR



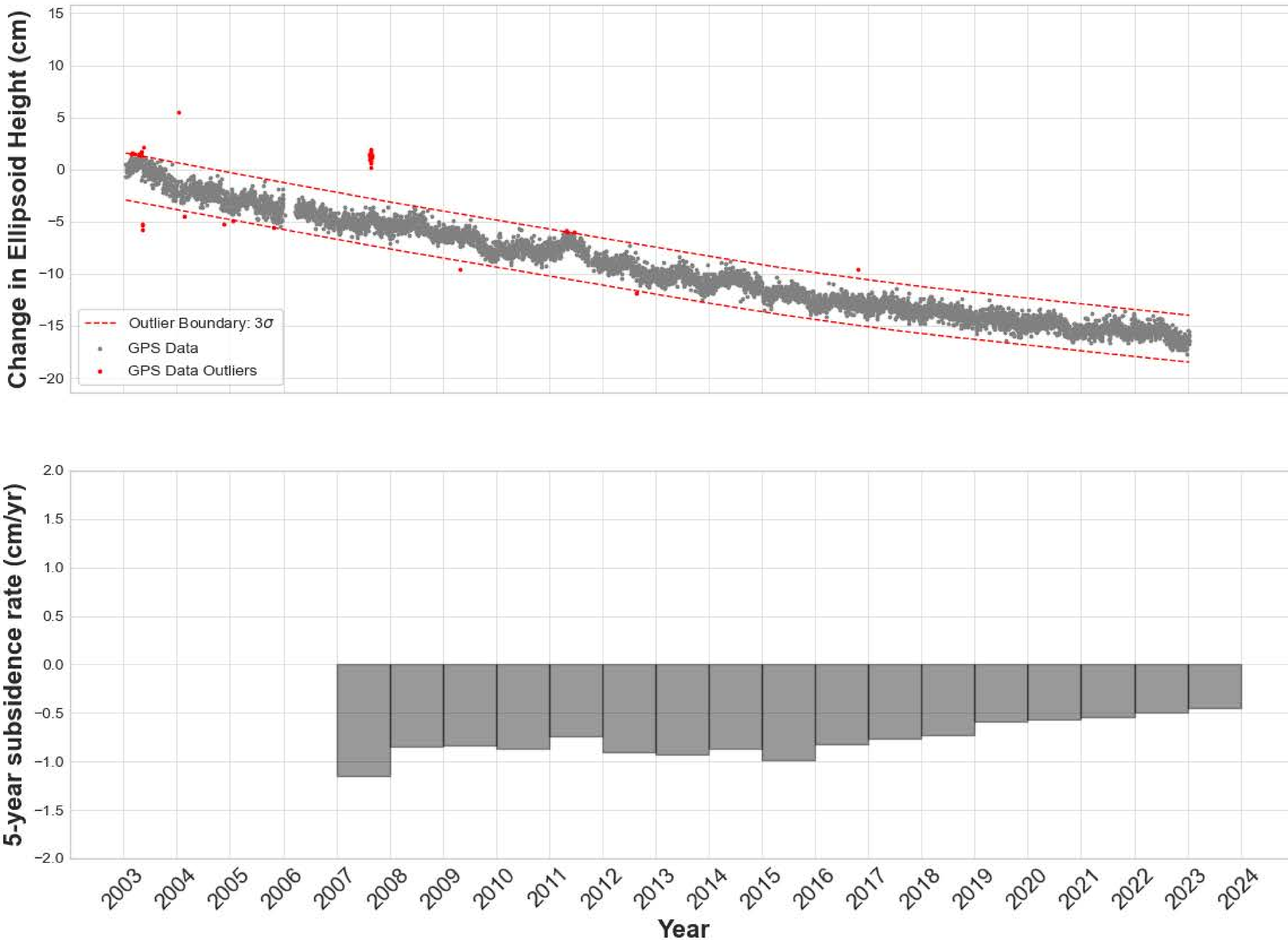

Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# YORS




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# ZHU1




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating subsidence rates and are shown for informational purposes only.

# SMARTER ABOUT WATER

How can I save water at home?

Replacing old water fixtures with EPA WaterSense labeled products can save the average family 700 gallons of water per year.

Download the WaterMyYard app for weekly recommendations on how much water your yard needs.

Reducing your shower time to just 5 minutes can save both water and the energy needed to heat the water.

A leaky faucet can waste more than 3,000 gallons of water per year. Check for leaks by taking the 10-Minute WaterSense Challenge.

VISIT SMARTERABOUTWATER.ORG FOR MORE WATER CONSERVATION TIPS + RESOURCES.

Harris-Galveston Subsidence District Report 2023-01

Harris-Galveston Subsidence District
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www.hgsubsidence.org