HARRIS-GALVESTON SUBSIDENCE DISTRICT

2023 ANNUAL GROUNDWATER REPORT

Groundwater Withdrawal and Subsidence in Harris and Galveston Counties

by Ashley Greuter, P.G.

Harris-Galveston Subsidence District Report 2024-01

Harris-Galveston Subsidence District
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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. In the greater Houston area, subsidence, the lowering of land-surface elevation, is caused by the depressurization of our aquifers due to the 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 48th volume of this important data compilation. This report is intended to exceed the requirements of section 8801.117 of the District's enabling legislation.

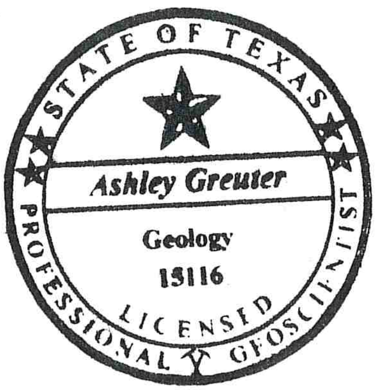
On behalf of the Harris-Galveston Subsidence District Board of Directors, I would like to thank you for your interest in this year's Annual Groundwater Report. We look forward to continuing to provide timely, accurate, high-quality data and research to inform the District's regulatory planning efforts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

Ashley 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.

Signature

05/09/2024

Date

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Acknowledgments

The compilation of the data and analysis contained within this report would not be possible without the concerted effort of many who contributed to the 2023 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, Vanson Truong, Karimah Hasan, Ana Scheffler, Stephanie Lafranca, Denise Ma, and Brian Ladd (Harris-Galveston Subsidence District) for their processing of water use data; Dr. Guoquan Wang (University of Houston) for processing and archiving raw GPS data; and the engineers, staff, and permittees/owners of over 6,200 actively permitted wells in the District that submitted detailed water use information contained in this report.

Public hearing notice was posted on:	March 4, 2024
Draft presentation posted on District website on:	April 24, 2024
Public hearing held on:	April 25, 2024
Hearing Examiner:	Helen Truscott
Hearing record held open for public comment until:	May 3, 2024
Approved by the Board of Directors:	May 8, 2024

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

In the greater Houston region, groundwater was the primary source of water for municipal, agricultural, and industrial users over the last century. The rapid and large population growth in the 1950s led to a dramatic increase in water demand and groundwater withdrawal. The reliance on groundwater and significant subsidence that resulted from this abundant groundwater withdrawal led to the creation of the Harris-Galveston Subsidence District (District) in 1975 by the Texas Legislature. The District's mission is to regulate groundwater use in Harris and Galveston counties to prevent further subsidence.

This report comprises the 48th Annual Groundwater Report for the District. Pursuant to District Resolution No. 2024-1110 passed on February 14, 2024, the Board of Directors held a public hearing at 9:00 a.m. on April 25, 2024, to present climatic conditions, groundwater use, groundwater levels and measured subsidence within the District for the 2023 calendar year. This report provides an overview of the information presented during the public hearing.

Climate

Annual variations in precipitation can significantly impact the amount of water used (i.e., total water demand) in the District. Groundwater use patterns fluctuate based on total rainfall received, which results in changes in aquifer water levels and, potentially, in land subsidence. 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 land subsidence. The 2023 calendar year began with below normal rainfall for half of the National Weather Service (NWS) climate stations analyzed for the region. The year progressed with five out of the eight stations recording below the 1991-2020 average normal precipitation and worsened in the summer months. From August through December, an extreme drought was classified for the region and all climate stations ended 2023 with rainfall accumulations below normal with six stations measuring over 15 inches below normal. This was similar to the drought experienced in 2022 as the majority of analyzed climate stations measured below normal rainfall from the summer through end of year.

Water Use

Since 1976, water users in the District have been working to change their primary source of water from groundwater to alternative water as required by the District's Regulatory Plan to prevent subsidence. The percentage of total water demand sourced from groundwater has decreased from about 61 percent in 1976 to about 24 percent in 2023. The majority of groundwater use, approximately 85 percent, 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 2023 is 258.6 million gallons per day (MGD), which is a two percent increase from 2022. Groundwater used for public supply remains the largest use category at about 237.3 MGD, a two percent increase from the previous year, and accounts for approximately 91 percent of all groundwater used in the District.

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

River Basin and the Trinity River Basin. In 2023, the total alternative water used was 819.1 MGD, with the Trinity River remaining the single largest source of alternative water at 70 percent of the total and provided about 550.4 MGD in surface water supply. Groundwater remains the second largest source of water supply within the District representing approximately 24 percent of the total water demand in 2023. The total water demand for the District was 1,077.7 MGD in 2023, which is about one percent higher than the reported water use in the previous year.

Groundwater Levels

Annually, since 1975, the United States Geological Survey (USGS) has measured the aquifer potentiometric water level (water-level) in hundreds of wells throughout southeast Texas 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 water-level altitude 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 how groundwater pumping may stress the aquifer and its resulting impacts on land subsidence.

The change in water-level in the Chicot-Evangeline (undifferentiated) aquifer from 1977 to 2024 highlights the impact of District regulation on the aquifer. Generally, Regulatory Areas One and Two have seen a substantial rise in the water-level of over 200 feet (60 meters) in the Chicot-Evangeline (undifferentiated) aquifer measured in areas like 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 measured in 2023 were consistently lower than the 1977 benchmark water-levels, with some declines over 320 feet (97.5 meters) in the Chicot-Evangeline (undifferentiated) aquifer in northern Harris County. These areas are growing rapidly and the conversion to alternative sources of water will not be completed until 2035. The highest historical water-level declines were measured in south-central Montgomery County, with over 390 feet (118.9 meters) around The Woodlands.

Subsidence

Since the 1990s, the District has developed a subsidence monitoring network utilizing global positioning system (GPS) technology to monitor land surface deformation within and surrounding the District. This network involves collaboration amongst GPS station operators such as 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 subsidence monitoring network includes over 190 active GPS stations throughout southeast Texas in 2023.

The District estimates the average annual subsidence rate as the linear regression of the change in ellipsoidal height, which represents the vertical movement in the GPS data collected from the GPS stations, from the five most current years (i.e., 2019 through 2023). The subsidence rates observed in Regulatory Areas One and Two are stable, since both areas have reached their full regulatory conversion level, and Chicot-Evangeline (undifferentiated) water-levels have risen. Subsidence rates are generally above 0.5 centimeters per year throughout Regulatory Area Three, as groundwater is still the primary water source in this area, and Chicot-Evangeline (undifferentiated) water-levels have significantly declined. The highest subsidence rates were measured at GPS stations in the Katy and Fulshear area at over two centimeters per year.

Introduction

The greater Houston area 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 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 reliance on groundwater and subsequent subsidence, which was the outcome of this abundant groundwater withdrawal, resulted in the creation of the Harris-Galveston Subsidence District (District) in 1975. The District's mission is to regulate groundwater withdrawal in Harris and Galveston counties to prevent future subsidence that can contribute to flooding and infrastructure damage.

Purpose of Report

This document comprises the 48th Annual Groundwater Report for the District. Pursuant to District Resolution No. 2024-1110, passed on February 14, 2024, the Board of Directors held a public hearing for the Annual Groundwater Report beginning at 9:00 a.m. on April 25, 2024. The public hearing was held at the District office and 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 42 people, including both in-person and virtual participants, members of the USGS staff, members of the District's staff, four HGSD Board Directors, representatives from regional water authorities and cities, and the public. Those giving testimony were Ashley Greuter, P.G., HGSD's Director of Research and Water Conservation, and Jason Ramage, Hydrologist, USGS Texas-Oklahoma Water Science Center, Gulf Coast Programs Office. Ms. Greuter submitted 13 exhibits, including topics of precipitation, groundwater withdrawal, alternative water use, and subsidence data. Mr. Ramage presented 18 exhibits, including topics of water-level altitudes, water-level changes, and aquifer compaction. The record for testimony and public comment was open from April 25, 2024, through May 3, 2024. All testimony, public comments, and questions are provided in **Appendix C**.

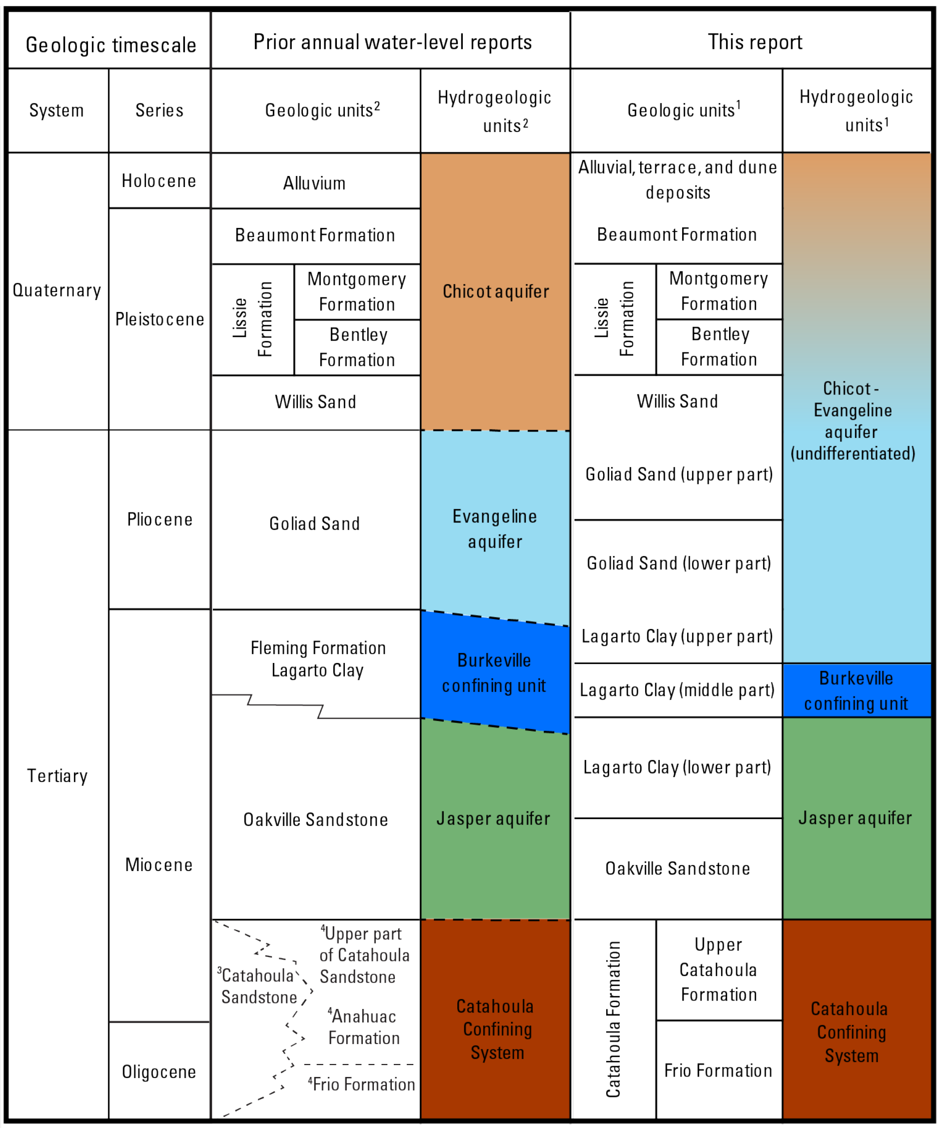
This report provides a general description of the District, which includes hydrogeology, alternative water sources, and regulatory planning, as well as an overview of the information presented during the public hearing, including precipitation, water use, groundwater levels and subsidence within the District from January 1, 2023, through December 31, 2023. **Appendix A** of this report includes the exhibits presented at the public hearing held on April 25, 2024.

Description of Study Area

The following section provides an overview of the conditions within the jurisdiction of the District, including the hydrogeology, hydrology 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. The interbedded sands and clays are indicative of a transgressive-regressive shoreline such that the units are horizontally and vertically discontinuous at large scales and thicken down-dip southeast towards the Gulf of Mexico. From youngest to oldest, these hydrogeologic units include the Chicot-Evangeline (undifferentiated), Burkeville Confining Unit, Jasper, and Catahoula Confining System Aquifers (**Figure 1**).



[1]Modified from Young and Draper (2020) and Young and others (2010; 2012)
[2]Modified from Baker (1979)
[3]Located in the outcrop
[4]Located in the subcrop

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

The two primary water-bearing units located within the District include the Chicot-Evangeline (undifferentiated) aquifer and the Jasper aquifer. The Chicot-Evangeline (undifferentiated) aquifer comprises the shallow portion of the Gulf Coast Aquifer system and is hydrologically connected, allowing for the free flow of water between the Chicot and Evangeline units. Historically in the District, nearly all groundwater production in the Gulf Coast Aquifer system occurred in the Chicot-Evangeline (undifferentiated) aquifer. This aquifer was heavily used because it contains freshwater (i.e., total dissolved solids under 1,000 milligrams per liter) at depths ranging from a few hundred feet to over a thousand feet below the land surface for the majority of the District, with some exceptions of slightly saline (i.e., total dissolved solids ranging from 1,000 to 3,000 milligrams per liter) groundwater in areas within Galveston County in close proximity to the Gulf of Mexico (Anaya, et al., 2016).

The Jasper aquifer is the deepest of the primary water-bearing units and is isolated by the regionally persistent Burkeville confining unit. 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 freshwater.

Most of the subsidence that has occurred in the District can be sourced to clay compaction in the Chicot-Evangeline (undifferentiated) aquifer associated with long-term water use and the decline in the aquifer's water-level. 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).

Surficial Hydrology

The District's Regulatory Plan requires permittees to reduce their reliance on groundwater by converting to alternative water supplies to meet their water needs. The primary alternative water supplies used in the District are surface water sourced from three main river basins: the Brazos River Basin, the San Jacinto River Basin and the Trinity River Basin (**Figure 2**).

The Brazos River Basin is the second largest river basin in Texas, covering over 45,000 square miles (116,550 sq km) (Texas Water Development Board, 2024). 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) (Texas Water Development Board, 2024). Lake Conroe and Lake Houston are the two 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.

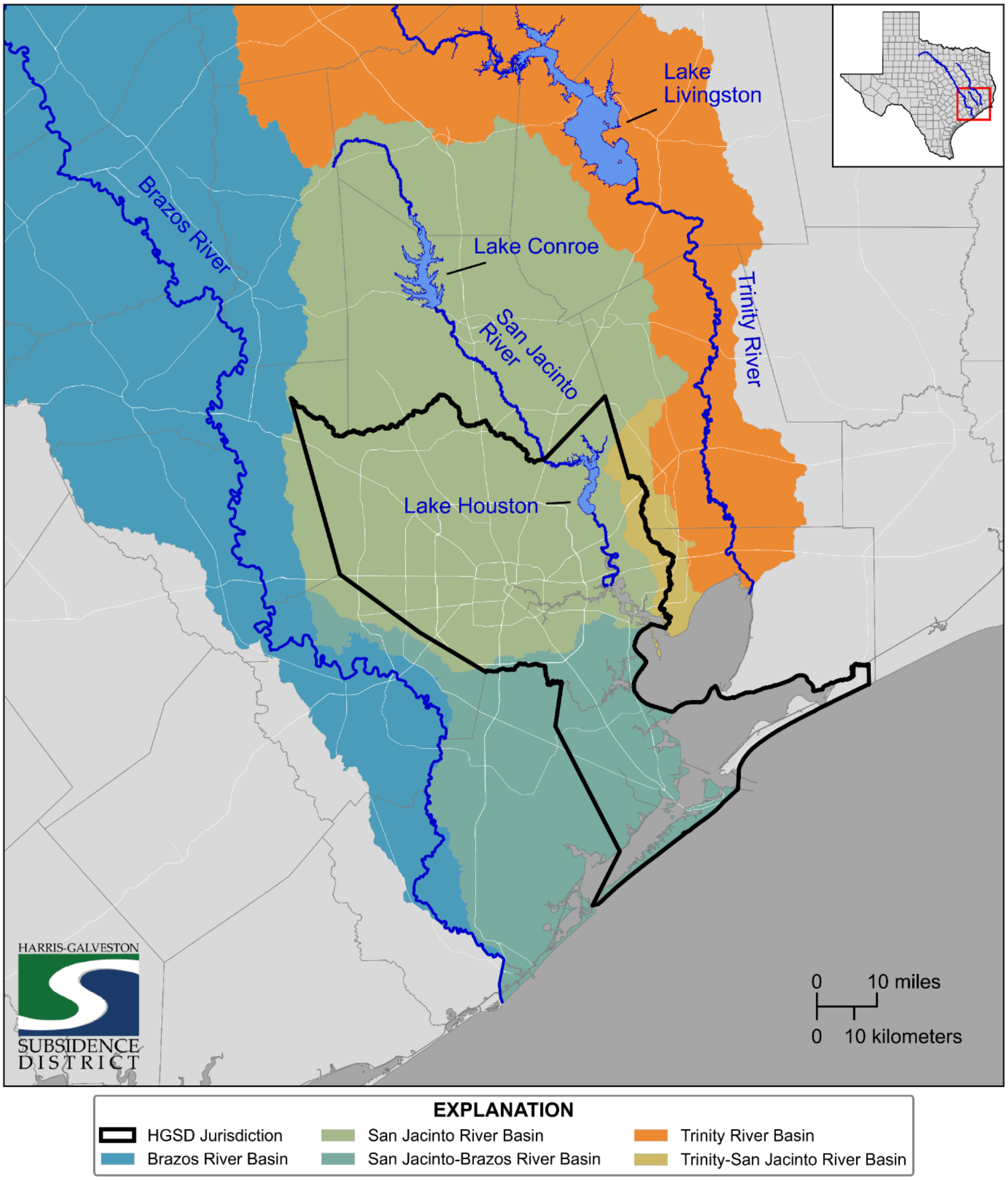


Figure 2: River basins and reservoirs that supply alternative water to Harris and Galveston counties.

The Trinity River Basin covers almost 18,000 square miles (46,619 sq. km), with headwaters of the basin located in north central Texas (Texas Water Development Board, 2024). 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. The Trinity River Basin includes many reservoirs that are owned and operated by several different agencies, such as 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 Subsidence District’s regulatory requirements to convert from groundwater to an alternative water supply, 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 were developed to support the necessary alternative water supply and distribution infrastructure to facilitate the District’s future conversion requirements (**Figure 3**):

- Luce Bayou Interbasin Transfer Project: pumps untreated surface water from the Trinity River through a series of canals and water pipelines along Luce Bayou to Lake Houston. As of 2024, this project is completed and currently supplying water to Lake Houston (Coastal Water Authority, 2024).
- Northeast Water Purification Plant Expansion: will add 320 MGD to the existing surface water treatment plant located on Lake Houston in order to treat the raw surface water conveyed by the Luce Bayou Interbasin Transfer Project (Greater Houston Water, 2024).
- Northeast Transmission Line Project: will provide for the conveyance of the additional treated surface water from Lake Houston into central and northern Harris County (Musku, et al., 2024).
- 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 (Surface Water Supply Project, 2024).

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.

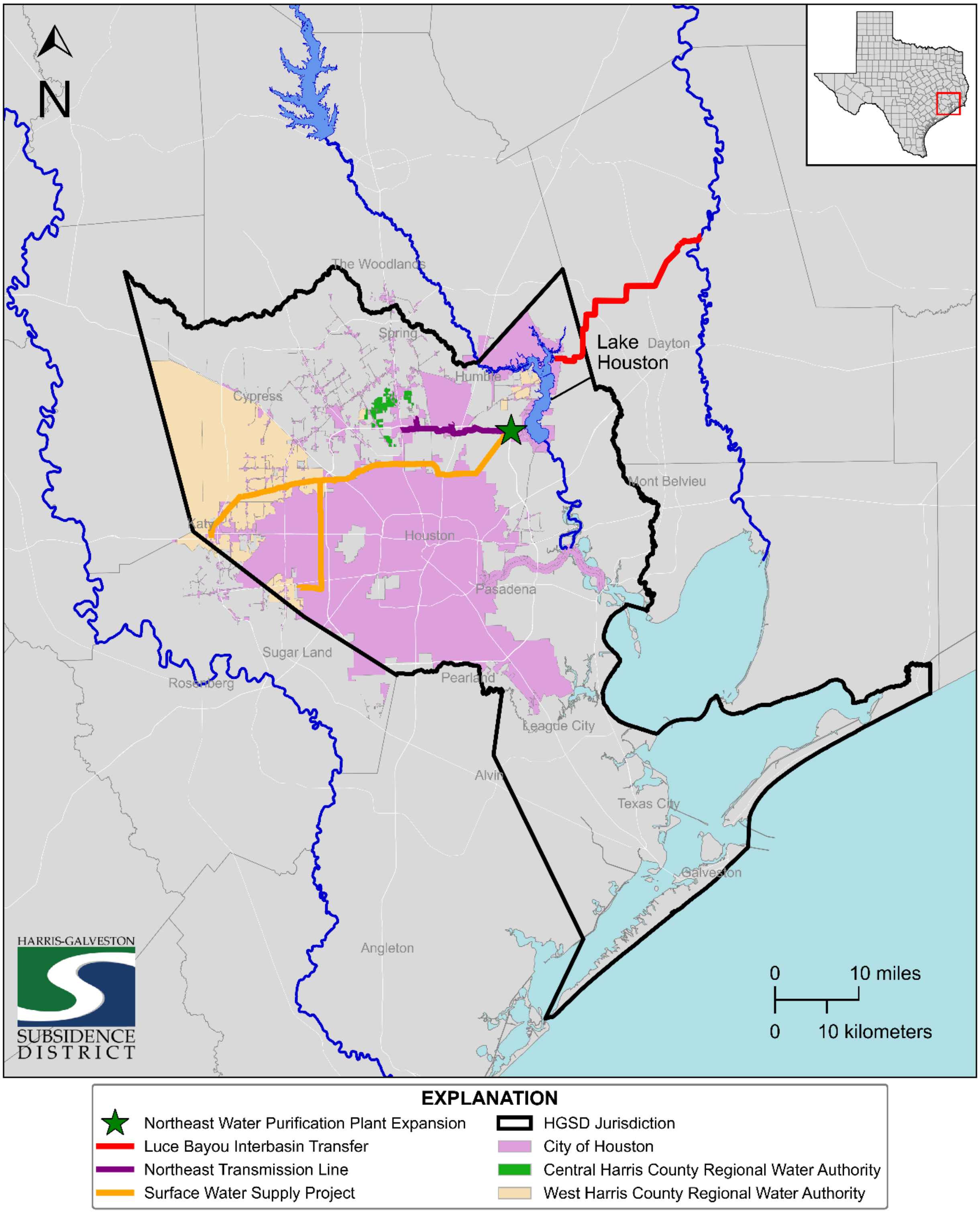


Figure 3: Alternative water supply and infrastructure distribution projects in the District.

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 8, 2013, and April 14, 2021 (Harris-Galveston Subsidence District, Amended 2021).

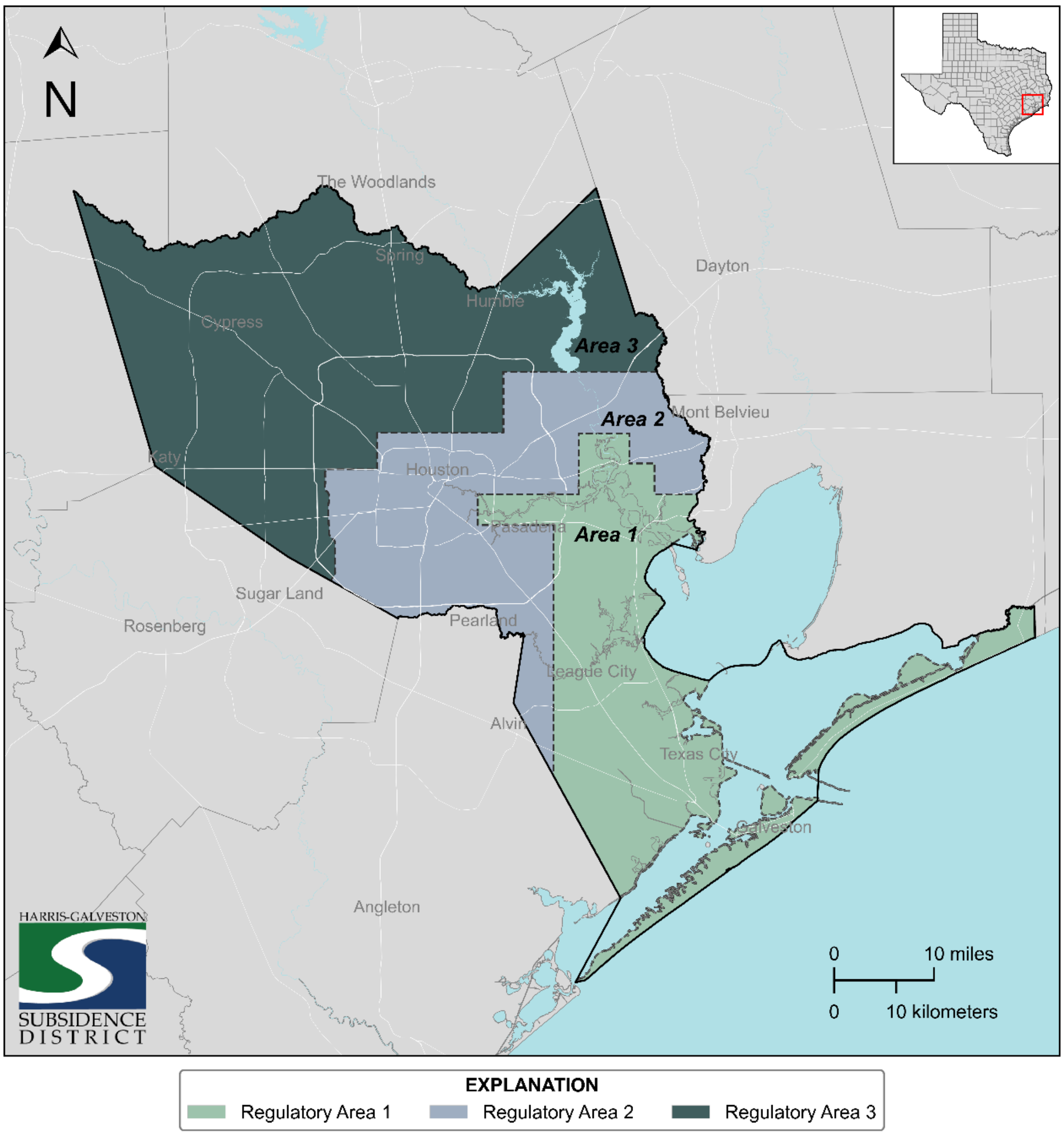


Figure 4. Geographic designation of the Harris-Galveston Subsidence District's Regulatory Areas.

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 percent of their total water demand come from groundwater sources. Permittees in Regulatory Area Two must have no more than 20 percent of their total water demand sourced from groundwater. Reduction in groundwater use for both Regulatory Area One and Two began once the District was created in 1975, and by 2000 most of those areas had been fully converted to using alternative sources of water. Regulatory Area Three is still undergoing conversion from groundwater to alternative water sources. This area completed its first conversion in 2010, reducing groundwater use from 100 percent to 70 percent 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, specifically those without GRPs, in Regulatory Area Three are required to reduce their groundwater withdrawals so that no more than 20 percent of their total water demand is sourced from groundwater.

2023 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's jurisdiction (**Figure 5**). Variation in local precipitation, specifically deviation from historical normal, is important to analyze because it directly impacts the magnitude of the total water demand from water users in the region and can affect 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 times with below normal precipitation, the total water demand of the region will typically increase due to increased need for water mainly used for outdoor irrigation and agricultural needs. 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 aquifer water-levels, compaction of the aquifer materials, and resulting land subsidence.

The cumulative precipitation departure from 1991-2020 normal precipitation is referenced against each NWS climate station displayed in **Figure 6**. The 1991 to 2020 normals represent the average precipitation over that 30-year interval from NWS climate stations. The normals provide the basis for comparing daily, seasonal, to annual climate conditions. When necessary, NOAA compiles data from NWS climate stations to produce normals for the next 30-year period. For example, the last update was performed in 2021 and the 1991-2020 climate normals were officially released (National Centers for Environmental Information, 2024).

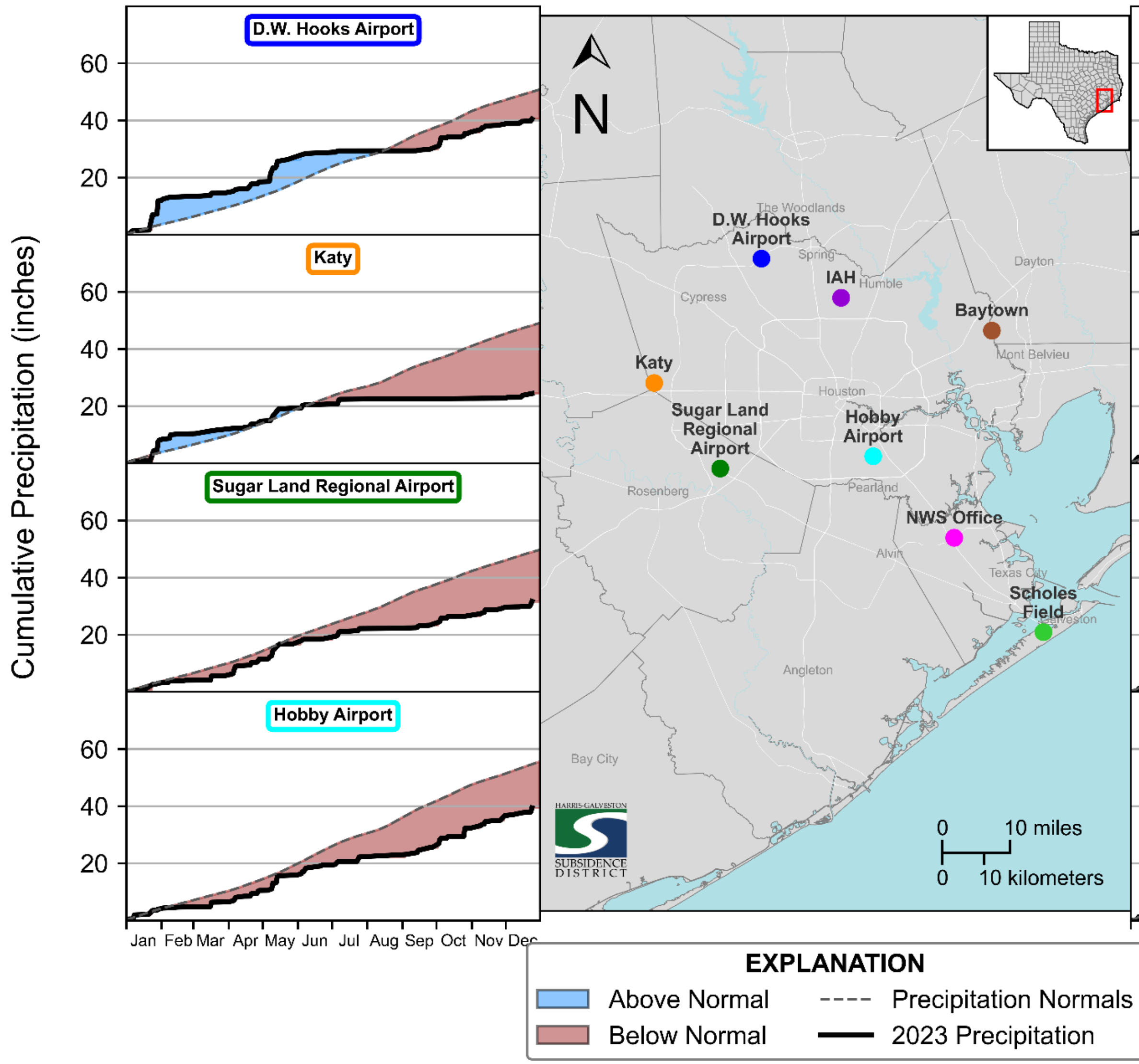


Figure 5. Location of National Weather Service (NWS) climate stations analyzed for the 2023 calendar year. Graphs contain individual station cumulative precipitation, in inches, as the solid black line compared to the 1991-2020 Precipitation Normals shown in the dashed line.

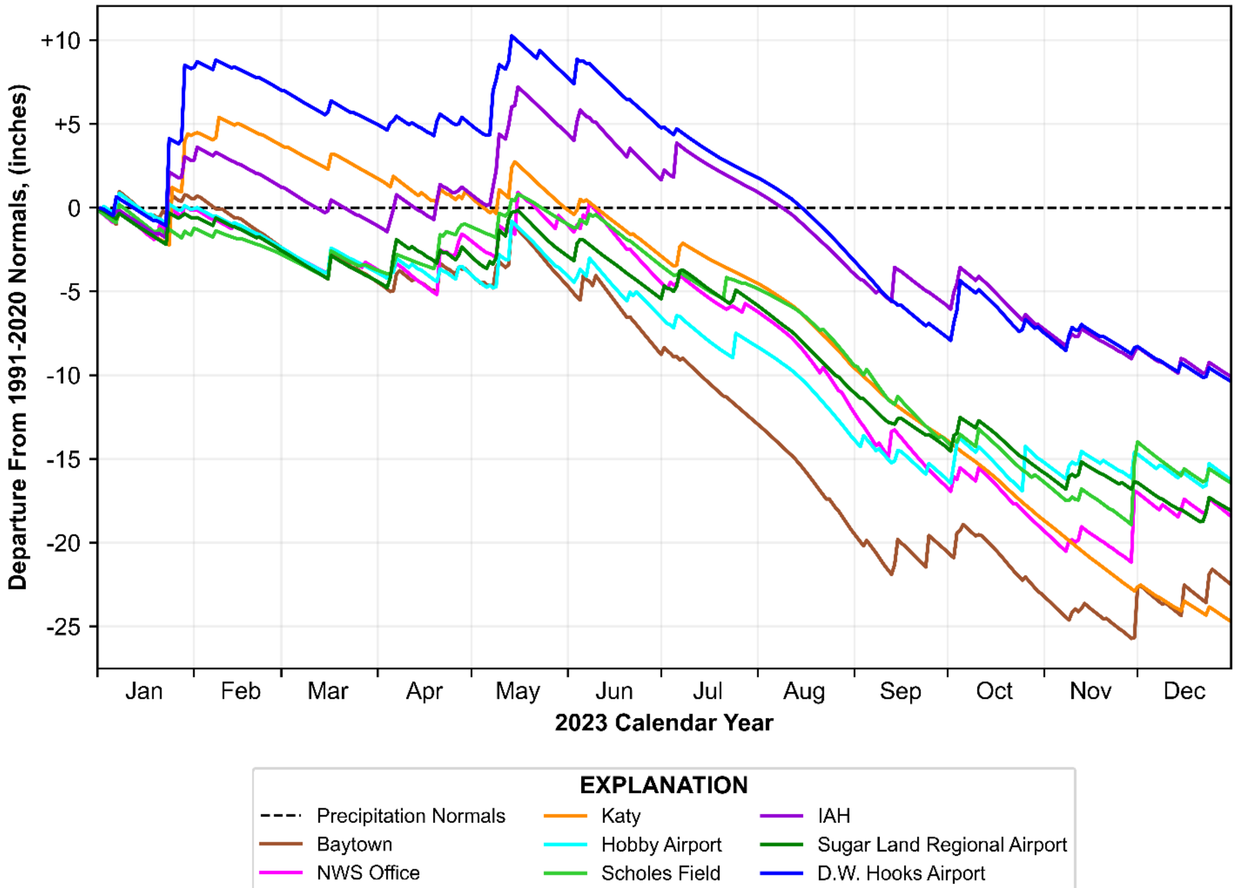


Figure 6. Cumulative 2023 precipitation departure from 1991-2020 normals precipitation, in inches, at select NWS climate stations within and surrounding the District.
Source: https://www.ncei.noaa.gov/access.

The beginning of 2023 is marked by declining rainfall with some intermittent winter storms as shown from stations like D.W. Hooks Airport receiving over five inches above normal. Then another storm event was recorded by all stations in mid-May that helped bring five of the eight stations to have rainfall totals above normal such as Bush intercontinental airport of houston (IAH) jump at over nine inches above normal. Then summer arrived and the drought ensued. Some fall storms provided minor increases for all stations but it wasn't enough to bring any station above normal rainfall for the remainder of 2023.The lowest cumulative precipitation was recorded at Katy with about 24 inches, which is 24.7 inches below normal as represented by the orange line in **Figure 6**. The largest cumulative rainfall was measured at Baytown at 42.2 inches, which is 22.5 inches below normal (**Figure 6**).

2023 Water Use Summary

The District collects groundwater and alternative water supply use annually from permittees. These datasets provide an understanding of the location and quantity of groundwater use, intended use of groundwater withdrawal, as well as perspective on the conversion from groundwater to surface water since the volume and source of alternative water use is obtained.

As of April 2024, the permittees of over 6,200 active water wells in 2023 submitted their annual water use data for the District to compile and use in this report. Estimations for groundwater withdrawals associated with missing reports were based on permitted allocations and amount to approximately 3.0 MGD, which equates to about one percent of the total groundwater withdrawal.

In addition to providing water use data for 2023, this report also provides updated groundwater withdrawal totals for the previously reported year of 2022. 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 2022 groundwater withdrawal total increased by 0.3 MGD to a new total of 253.2 MGD.

The following sections provide a summary of the information presented at the Public Hearing held on April 25, 2024. The exhibits used to provide testimony during the hearing are included in **Appendix A – Exhibits Presented at Public Hearing held on April 25, 2024.**

Groundwater Use for the Entire District

The three primary water use types in the District are public supply, industrial, and irrigation. Trends in the intended use of groundwater withdrawals have changed over time as evident in the reduced use for industrial and agricultural supply when compared from the late 1970s to mid-2000s.

The total amount of groundwater used in 2023 was 258.6 MGD, which is a two percent increase from the previous year. Public supply continues to be the dominant use type in the District at 237 MGD, which is over 90 percent of the total groundwater used in 2023 (**Figure 7**).

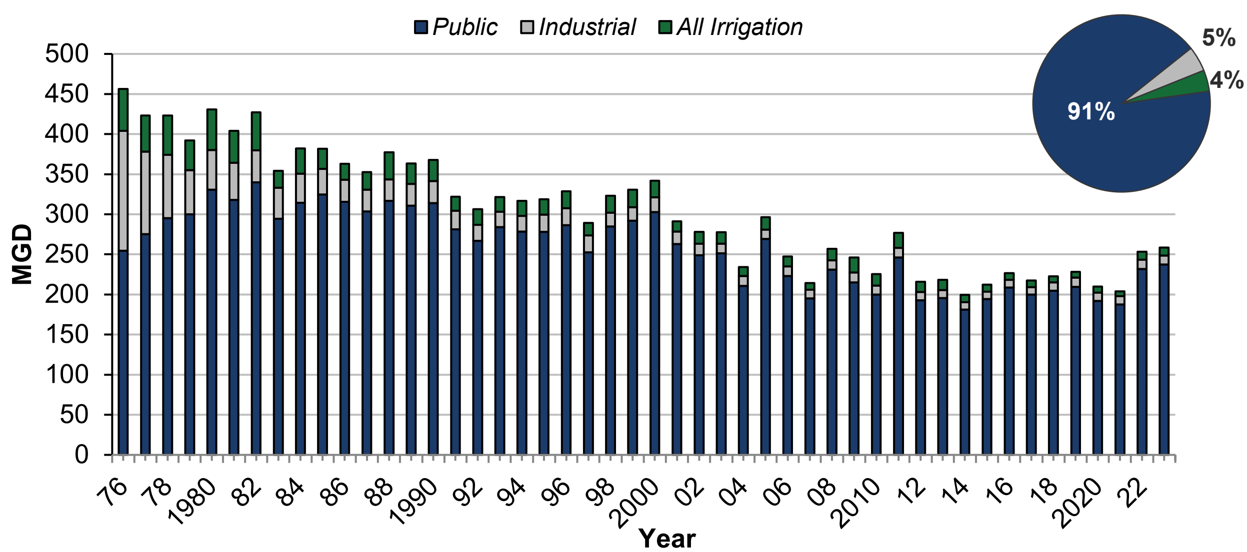


Figure 7: Groundwater withdrawals, in million gallons per day (MGD), by use category from 1976 to 2023. The total groundwater used in the District was 258.6 MGD in 2023, with 91 percent as public supply.

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 total amount of groundwater withdrawal for 2023 is 258.6 MGD, about a two percent increase over 2022 (**Table 1**). As a result of the District's Regulatory Plan, groundwater withdrawals have decreased since the District's inception in 1975, with a 43 percent decline from 456.3 MGD in 1976 to 258.6 MGD in 2023 (**Figure 8**).

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

Regulatory Area	Year	Water Use Category			Total
		Public	Industrial	All Irrigation	
Area 1	2022	2.55	6.58	0.15	9.3
	2023	2.64	5.91	0.23	8.8
	1-Year Change	*4%*	*-10%*	*53%*	*-5%*
Area 2	2022	27.90	2.52	0.78	31.2
	2023	26.63	3.15	1.16	30.9
	1-Year Change	*-5%*	*25%*	*49%*	*-1%*
Area 3	2022	201.32	2.57	8.87	212.8
	2023	207.97	2.24	8.65	218.9
	1-Year Change	*3%*	*-13%*	*-2%*	*3%*

The total groundwater withdrawals, grouped by regulatory area over the history of the District in **Figure 8**, highlight the impact of the District's Regulatory Plan through the conversion from groundwater to alternative water sources with a large decrease in groundwater use. Regulatory Areas One and Two, which have been fully converted according to the Regulatory Plan use significantly less groundwater than Regulatory Area Three, which is still undergoing conversion.

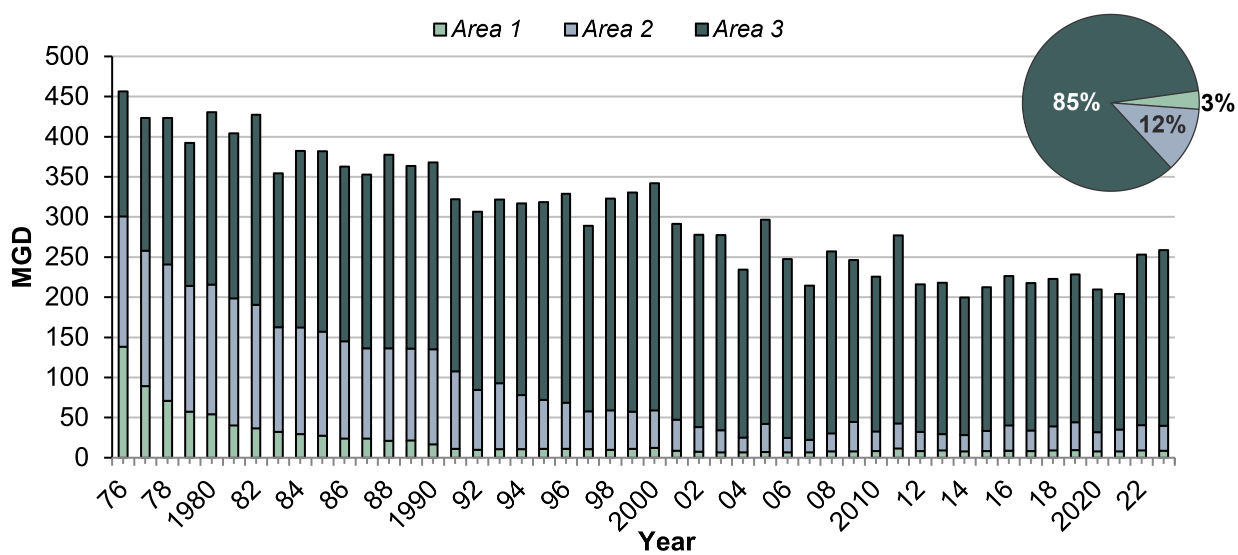


Figure 8: Groundwater withdrawals, in million gallons per day (MGD), by regulatory area from 1976 to 2023. The total groundwater used in the District was 258.6 MGD in 2023 with the majority used in Area Three.

The following sections provide additional information regarding groundwater withdrawals in each Regulatory Area.

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 1980s and early 1990s.

In 2023, total groundwater withdrawal in Regulatory Area One was 8.8 MGD, a five percent decrease from the previous year (**Table 1**). The majority of groundwater use in Regulatory Area One is associated with industrial needs, which comprises 67 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**). All irrigation also increased by 59 percent in 2023 from the previous year, making the largest change in use type for this area. Historically, groundwater withdrawals have declined in Regulatory Area One from a maximum of 138.1 MGD in 1976 to 8.8 MGD in 2023, which represents approximately 94 percent decrease (**Figure 9**).

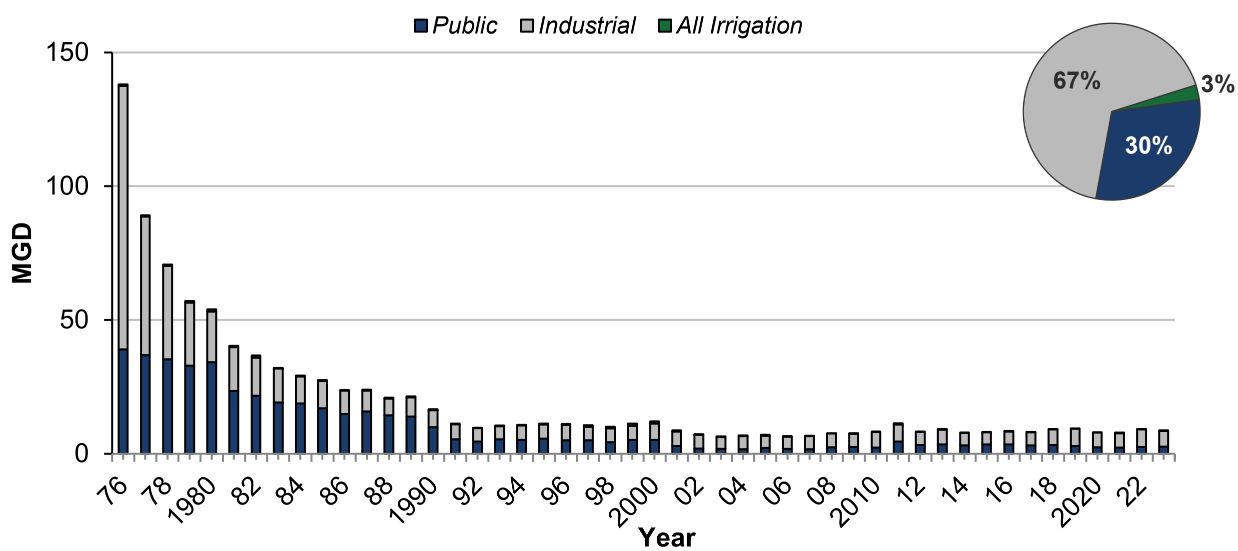


Figure 9: Groundwater withdrawals for Regulatory Area One, in million gallons per day (MGD), by water use category from 1976 to 2023. A total of 8.8 MGD of groundwater was used in Regulatory Area One in 2023, with 67% of the withdrawals being used for industrial purposes.

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 2023, total groundwater withdrawal in Regulatory Area Two was 30.9 MGD, a one percent decrease from the previous year (**Table 1**). Public supply remains the dominant use type at 86

percent of the total and has decreased by 81 percent from the maximum of 143.8 MGD in 1980 to 26.6 MGD in 2023 (**Figure 10**). Overall, groundwater use in Regulatory Area Two has declined from above 160 MGD in the late 1970s to below 40 MGD since 2001. Irrigation had the largest increase of 49 percent, most likely attributed to the extreme drought experienced in the summer.

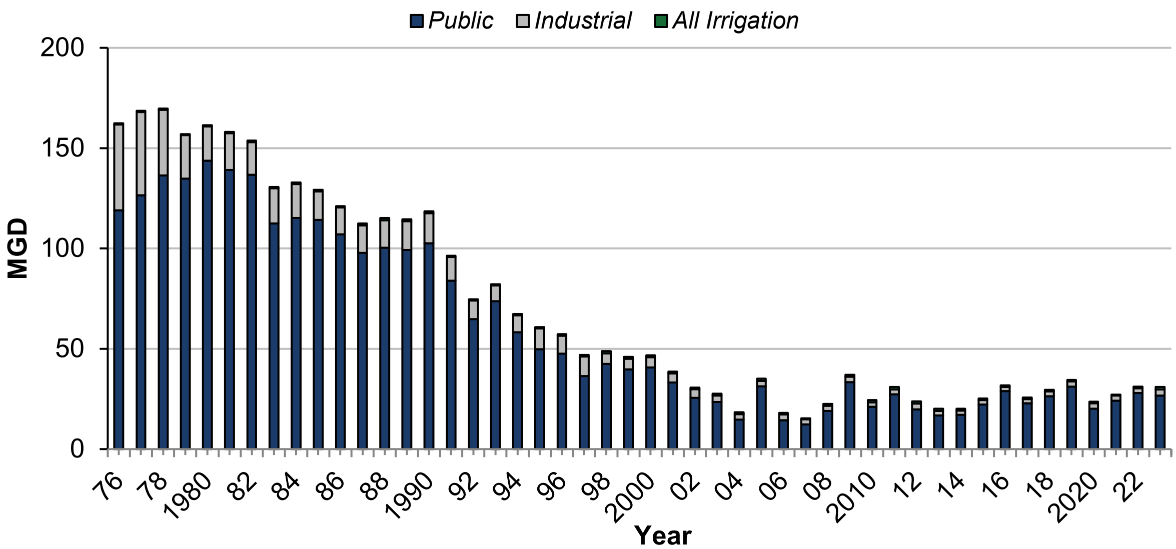


Figure 10: Groundwater withdrawals for Regulatory Area Two, in million gallons per day (MGD), by water use category from 1976 to 2023. A total of 30.9 MGD of groundwater was used in Regulatory Area Two in 2023, with 86% of the withdrawals being used for public supply.

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 2023, total groundwater withdrawal in Regulatory Area Three was 218.9 MGD, a three 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 207.97 MGD and accounts for 95 percent of the total groundwater use in this area (**Figure 11**). Industrial water use has been below 4 MGD since 2010. While all irrigation use has remained below 10 MGD since 2014.

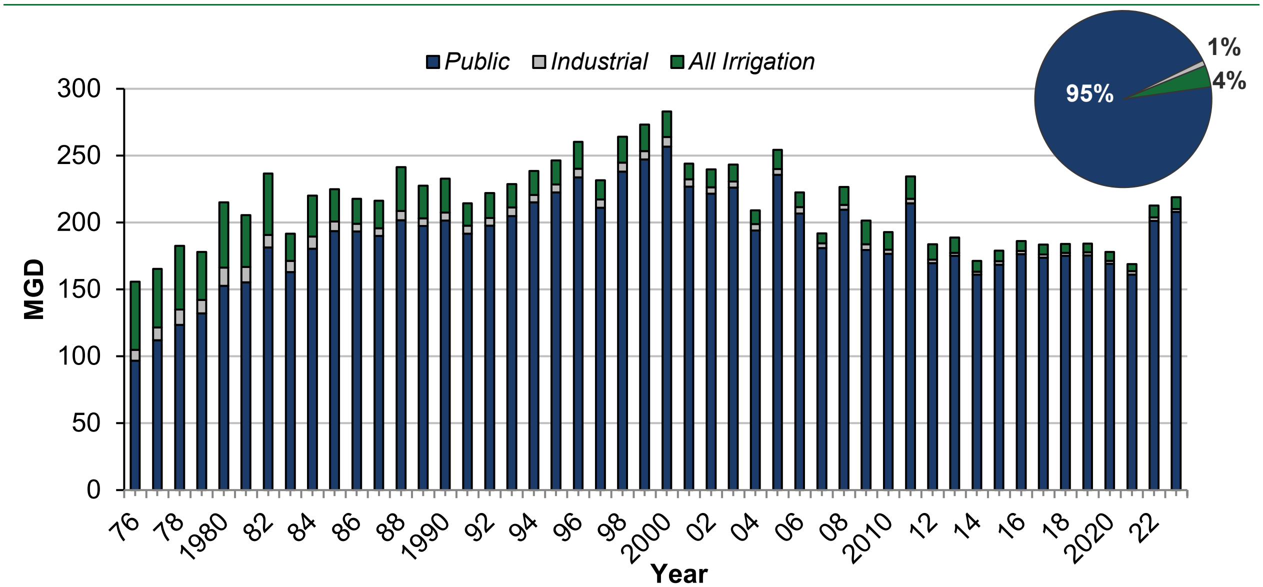


Figure 11: Groundwater withdrawals for Regulatory Area Three, in million gallons per day (MGD), by water use category from 1976 to 2023. A total of 218.9 MGD of groundwater was used in Regulatory Area Three in 2023, with 95% of the withdrawals being used for public supply.

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 the region is surface water sourced from three primary river basins from east to west are the Trinity River Basin, the San Jacinto River Basin and the Brazos River Basin (**Figure 2**). Reclaimed water is another alternative supply that began providing a consistent supply to the District since 1997. Reclaimed water includes metered water from the effluent from treatment plants, captured stormwater runoff, and reuse water from industrial processes.

Table 2. Summary of Reported Alternative Water, Groundwater and Total Water Use (in MGD) for the entire District.

Water Source		2022	2023	1-Year Change
Alternative Water	Brazos River Basin	82.67	79.31	-4%
	San Jacinto River Basin	177.23	184.35	4%
	Trinity River Basin	546.21	550.44	1%
	Reclaimed Water	4.45	5.02	13%
	Alternative Subtotal	810.56	819.12	1%
Groundwater		253.24	258.59	2%
	Total Water Use	**1063.8**	**1077.7**	**1.3%**

Since 1992, the Trinity River Basin continues to be the largest water source used within the District. Groundwater remains the second largest source of water supply within the District as a whole. Compared with 2022, the largest increase, coming in at 13 percent, for alternative supply in 2023 was reclaimed water (**Table 2**). The other sources of alternative supply received relatively small increases and the Brazos River Basin was the only one to receive a decrease of four percent from the previous year.

The total water use for the District was determined to be 1,077.7 MGD in 2023, which is about a one percent increase from 2022 (**Figure 12** and **Table 2**).

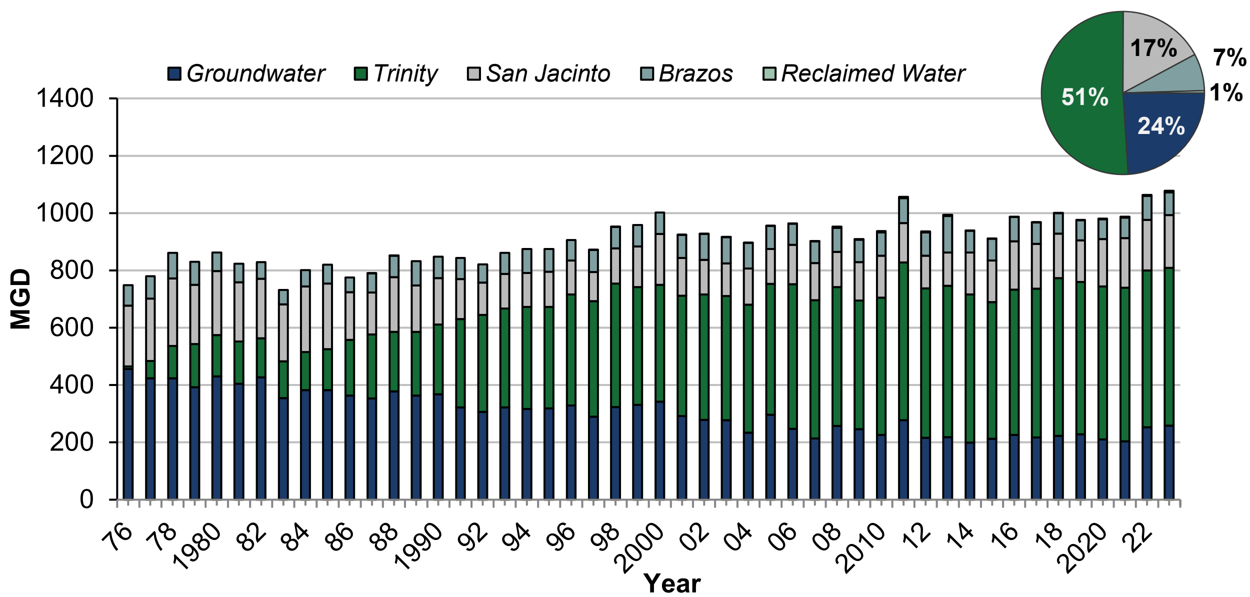


Figure 12: Total water use for the District, in million gallons per day (MGD), by source water, from 1976 to 2023. The reported total water used in the District in 2023 was 1,077.7 MGD.

2023 Groundwater Levels Summary

All groundwater used in the District is sourced from the Gulf Coast Aquifer System, which is composed of two primary water-bearing units. The unit most widely used in the District is the Chicot-Evangeline (undifferentiated) aquifer. The Chicot is the shallowest aquifer in the District which is directly connected to the Evangeline Aquifer immediately beneath it. Additionally, the analysis of new hydrogeologic datasets and advancements in modeling led to modifications of the base of the Chicot aquifer (Young & Draper, 2020). Due to the interconnectedness of these units and recent changes to the hydrostratigraphy, the Chicot and Evangeline aquifers were grouped together and reclassified as the Chicot-Evangeline (undifferentiated) by the USGS (Ramage, et al., 2022). The Burkeville confining unit lies beneath the Evangeline portion of the Chicot-Evangeline (undifferentiated) and isolates the last primary aquifer, the Jasper aquifer. The Jasper aquifer is not widely used in the District but is a primary source of water for counties north of the District such as Montgomery County.

Annually, since 1975, the USGS has measured the potentiometric surface 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 to monitor and provide reports on groundwater level altitude data for the Chicot-Evangeline (undifferentiated) and Jasper aquifers. The potentiometric surface is defined as the level to which water rises in a well (Fetter, 2001). For confined aquifers like the Gulf Coast Aquifer System, the potentiometric surface can be above the top of the aquifer unit in tightly cased wells. Changes in the potentiometric surface (water-level) are primarily caused by external forces, such as pumping groundwater out of wells.

Annual measurements of aquifer water-level, also referred to as the water-level altitude, are essential to understanding the impact that groundwater use has on the aquifer which in turn may impact land subsidence. The 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 associated analyses, such as generating the water-level altitude map, are performed by USGS staff and provided to the District through the joint funding agreement for the purposes of the annual groundwater report.

The 2024 water-level altitude for the Chicot/Evangeline (undifferentiated) aquifer shows the areas of primary stresses, which are the greatest declines in the water-level, occur in western and northern Harris County as well as southern Montgomery County (**Figure 13**). The 2024 water-level map was created using measurements collected from 444 wells across 11 counties in the greater Houston-Galveston region. The black circles in **Figure 13** designate the location of the wells that were measured.

The USGS also uses the annual water-level measurements to compare against past datasets to determine changes in the aquifer over different time periods. The change in water-level in the Chicot/Evangeline (undifferentiated) aquifer since 1977 clearly demonstrates the impact of District regulation on the aquifers (**Figure 14**). Generally, Regulatory Areas One and Two have seen a substantial rise in water-levels with over 200 feet (about 61 meters) in the Chicot-Evangeline (undifferentiated) aquifer in locations like the Houston Ship Channel. The areas of rise are a result of the reduction of groundwater use as required by the District’s Regulatory Plan.

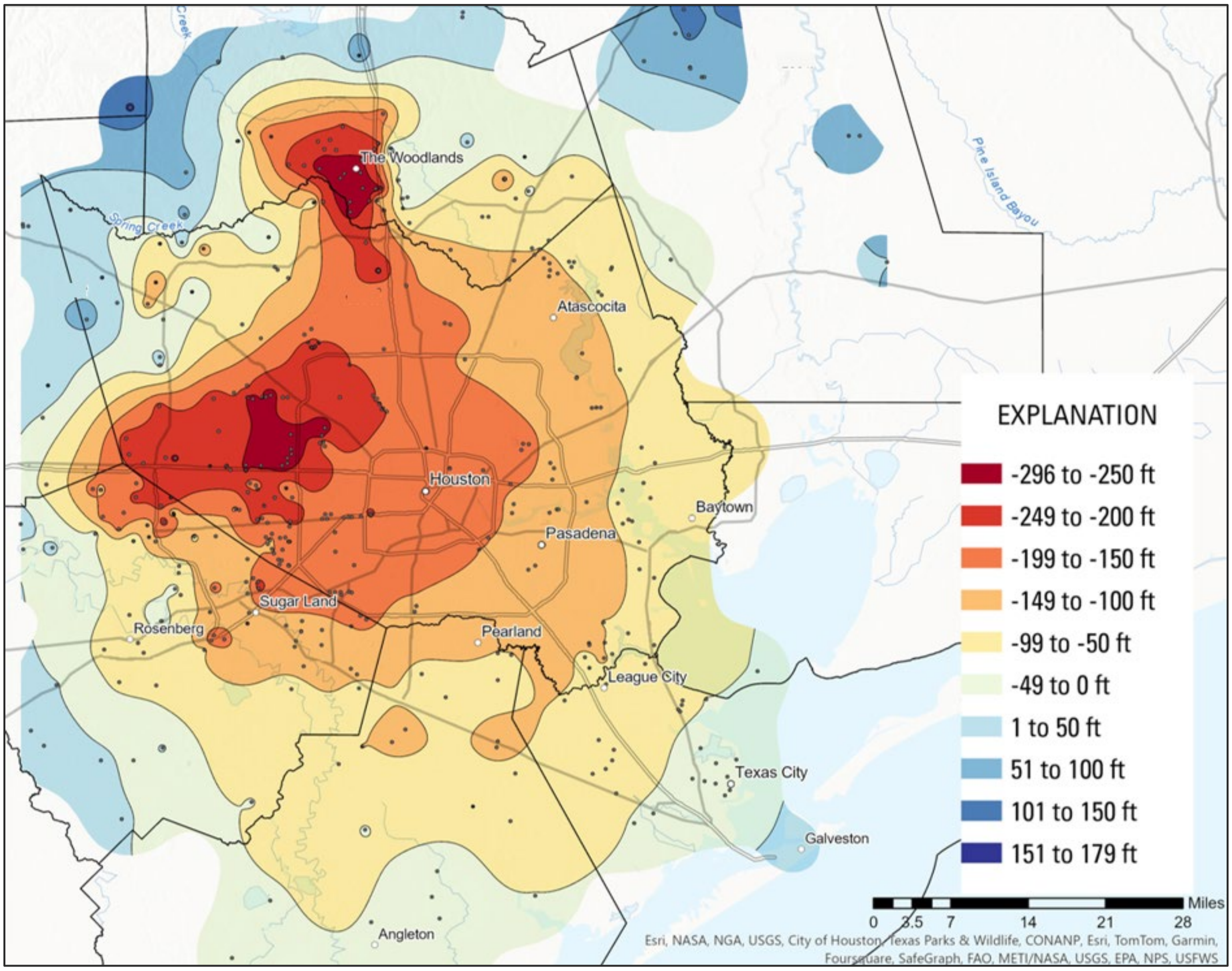


Figure 13: Altitude of the potentiometric surface determined from water-levels measured in tightly cased wells (black circles) screened in the Chicot-Evangeline (undifferentiated) aquifer, Houston region, Texas, 2024 (Source: USGS provisional data – preliminary and subject to change).

Conversely, in Regulatory Area Three, water-levels of the Chicot-Evangeline (undifferentiated) aquifer continue to be significantly lower than the historical benchmark as the population is growing rapidly, and the conversion to alternative sources of water will not be completed in this area until 2035. The maximum decline for the Chicot-Evangeline (undifferentiated) aquifer occurs in The Woodlands within south-central Montgomery County, with as much as 396 feet (120.7 meters) below datum from 1977 to 2024 (**Figure 14**).

Groundwater levels in southern Montgomery County are of particular concern as the greatest water-level declines in the Chicot-Evangeline (undifferentiated) aquifer exists in southern Montgomery County near The Woodlands in both 2024 water-level measurements as shown in **Figure 13** as well as the comparison of changes in the water-level from 1977 to 2024 as displayed in **Figure 14**. The deregulation of groundwater withdrawal in Montgomery County by the LSGCD may impact the groundwater use in this area as the aquifer water-level continues to decline. This area is also 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.

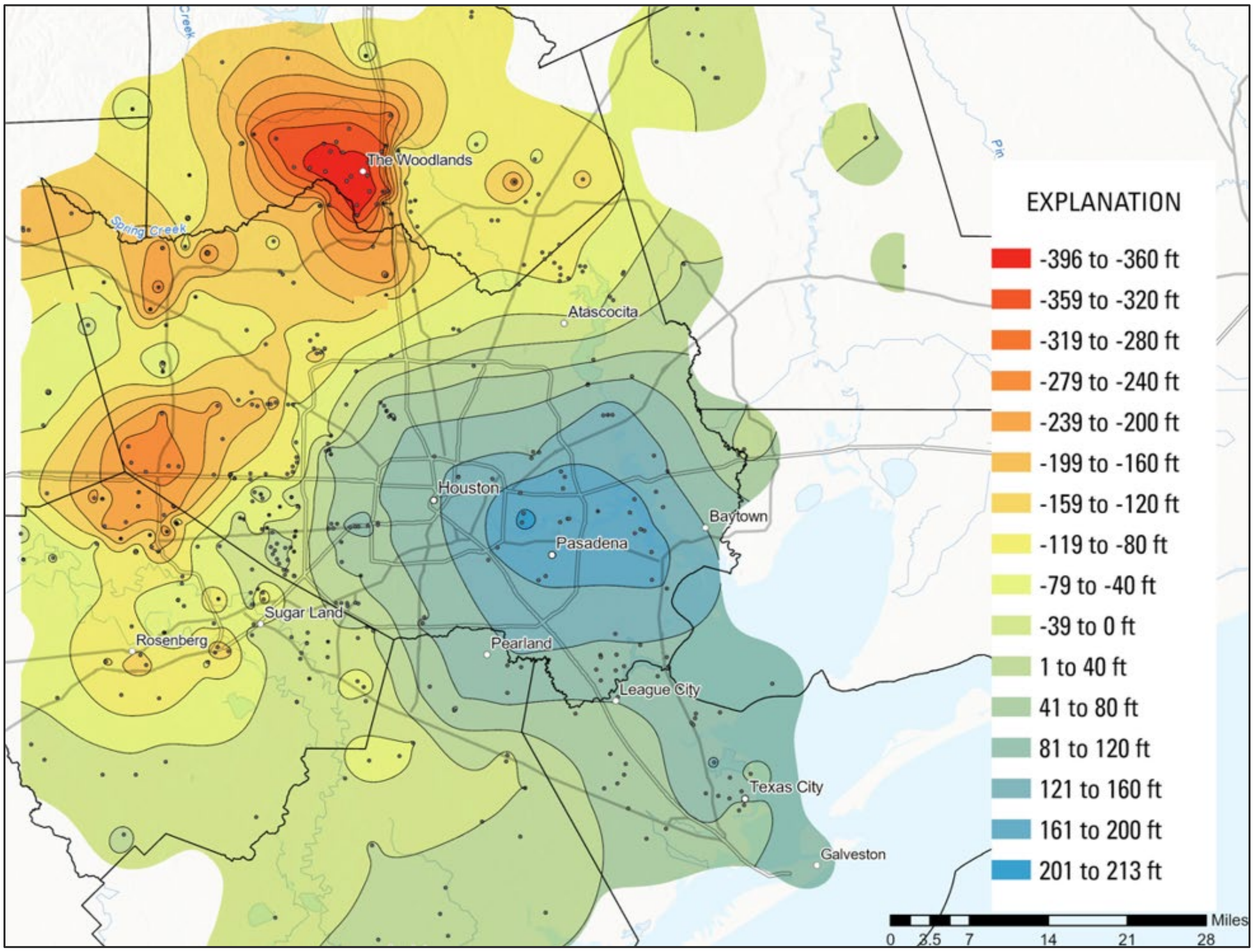


Figure 14: Potentiometric water level change at wells screened in the Chicot-Evangeline (undifferentiated) aquifer, Houston region, Texas, from 1977 to 2024 (Source: USGS provisional data – preliminary and subject to change).

Water-level altitudes in the Jasper aquifer also indicate a decline with as much as 250 feet (76.2 meters) measured in wells near the central border between Harris County and Montgomery County in 2024 (**Appendix A**). Additionally, comparison of the Jasper water-level from 2000 to 2024 show declines over 260 feet (79.2 meters) in northern Harris County. The majority of the groundwater withdrawal from the Jasper aquifer occurs in Montgomery County where the hydrogeologic conditions are more favorable for drinking water.

The information presented for the groundwater levels section is a summary of the provisional data presented at the public hearing held on April 25, 2024, by the USGS. Such exhibits used to provide testimony during the hearing are included in **Appendix A**. A USGS Scientific Investigation Report should be released later in 2024, documenting the status of groundwater level altitudes and the long-term changes in the Chicot-Evangeline (undifferentiated) and the Jasper aquifers. Once released, this report will be available through the USGS website.

2023 Subsidence Summary

Subsidence is the lowering of land surface elevation. In the Houston-Galveston region, subsidence primarily 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 release water thereby depressurizing and can cause compaction through the reorientation of minerals within these fine-grained sediments. This compaction of the aquifer results in the lowering of overlying stratigraphic units and is observed at the land surface as subsidence.

The District has installed and maintained global positioning system (GPS) stations throughout Harris, Galveston, and surrounding counties to monitor the land surface on a routine basis since the mid-1990s. The collection of GPS stations is referred to as the subsidence monitoring network. The subsidence 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 monitoring network has grown to over 190 stations throughout the region. As of 2023, the District operates and maintains 74 GPS stations with approximately 66 stations located in Harris and Galveston counties and the remaining eight stations within Brazoria, Waller, Montgomery, and Chambers counties.

GPS Station Overview

The GPS stations are constructed in different ways based on when they were installed and operator preferences. 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 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 15** depicts a schematic of the District's GPS station design.

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.

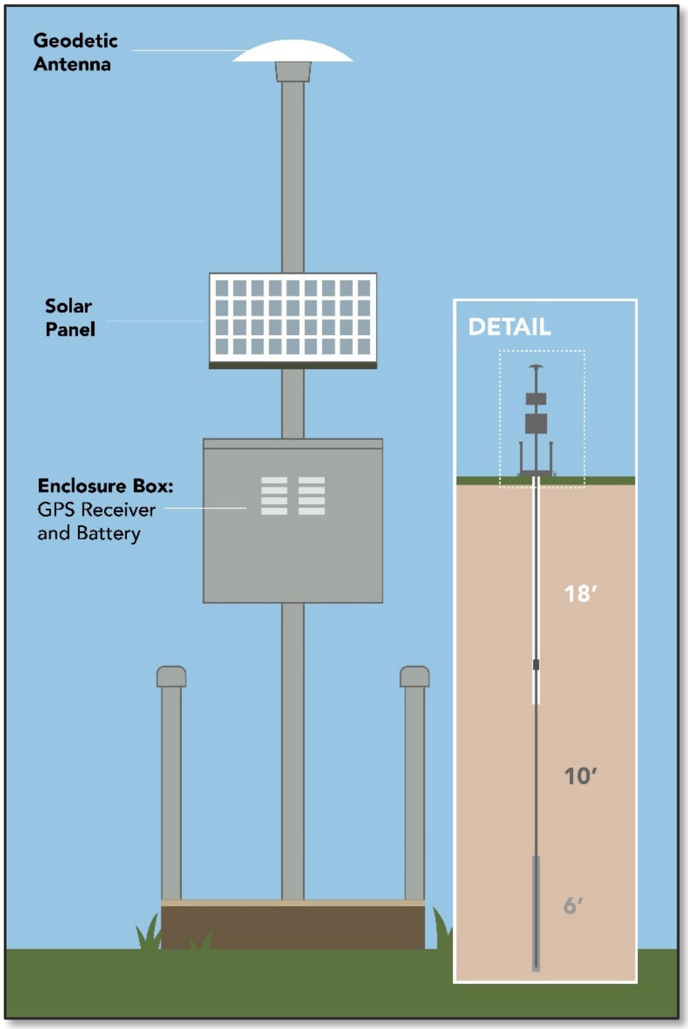


Figure 15: Schematic of the District's GPS station design for a permanent GPS station. Note schematic is not drawn to scale and is intended for visual purposes only. All numbers are provided in US standard measurement.

GPS data are collected at each GPS station on specific monitoring schedules. The District operates both periodic and continuous monitoring GPS stations. Periodic monitoring stations collect GPS data for approximately seven days every two months at the GPS station. These stations are constructed in the District's 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). Operators, such as UH and TxDOT, operate continuous monitoring stations.

GPS Data Processing

Satellite signals are collected every 30 seconds and averaged over 24 hours by global navigation satellite system (GNSS) antenna and receiver into one raw daily data file. The GPS data collected 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 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., 2019-2023), for active 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 five to eight 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.

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.

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. 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 B**.

Average Annual Subsidence Rate

The average annual subsidence rate helps show the recent change in land surface deformation at each GPS station and is calculated by using the linear regression (i.e., the statistically determined best-fit straight line through a scatter plot of data points) of the most recent five (5) years of data for active GPS stations with at least three years of GPS data. **Figure 16** depicts the average annual subsidence rate from 2019 to 2023 for over 190 GPS stations in southeast Texas.

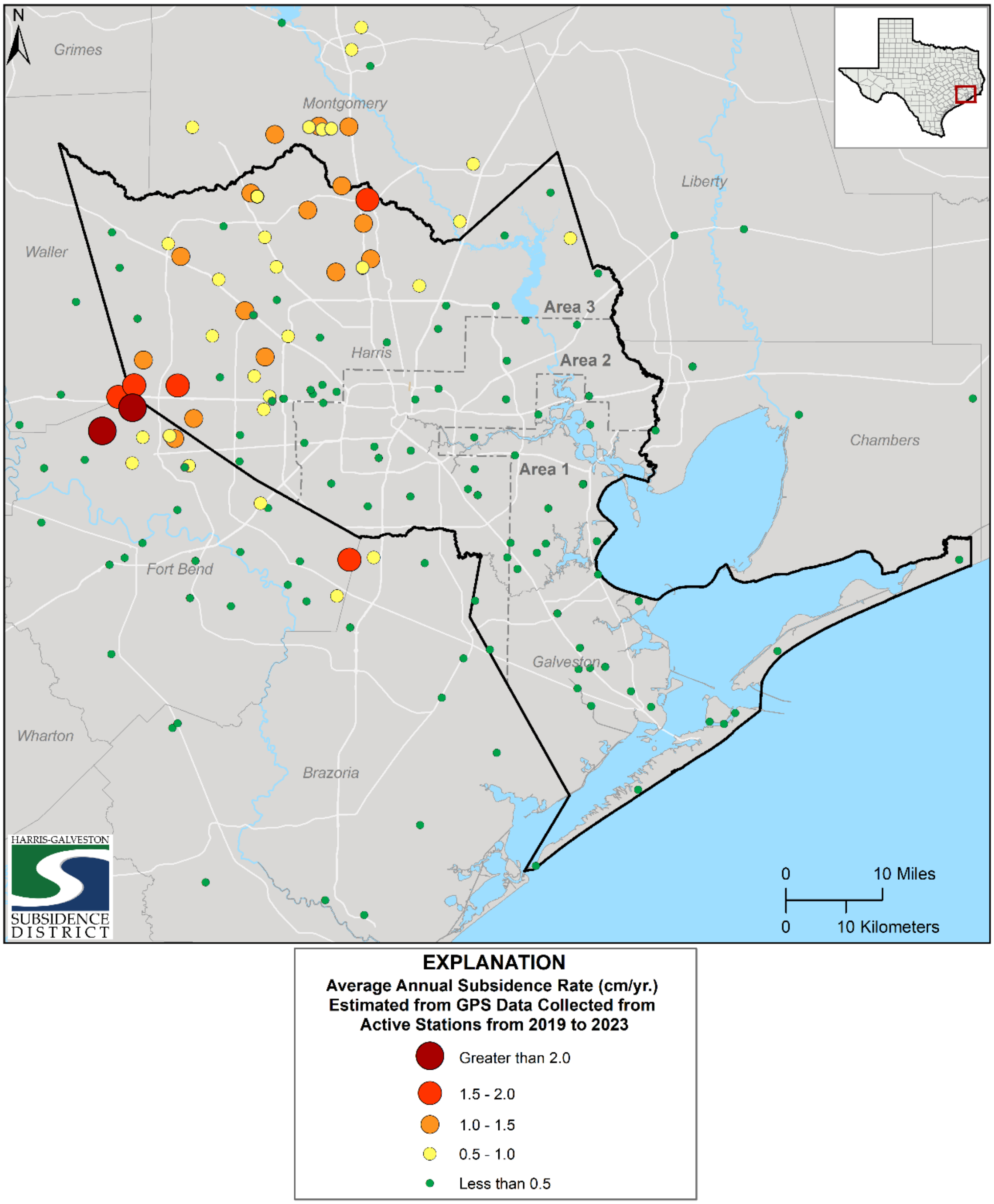


Figure 16: Annual subsidence rate, measured in centimeters per year, from 2019 to 2023, referenced to Houston20 and estimated from three or more years of GPS data collected from active GPS stations in Harris, Galveston, and surrounding counties, Texas.

Regulatory Areas One and Two show stable subsidence rates at less than half a centimeter per year as noted by the small green circle in **Figure 16** since both areas have been fully converted and USGS groundwater level data show that water-levels have risen. All GPS stations in Regulatory Areas One and Two show little to no subsidence and even some uplift is observed, such as GPS station P024, which is located in La Porte (**Figure 17**).

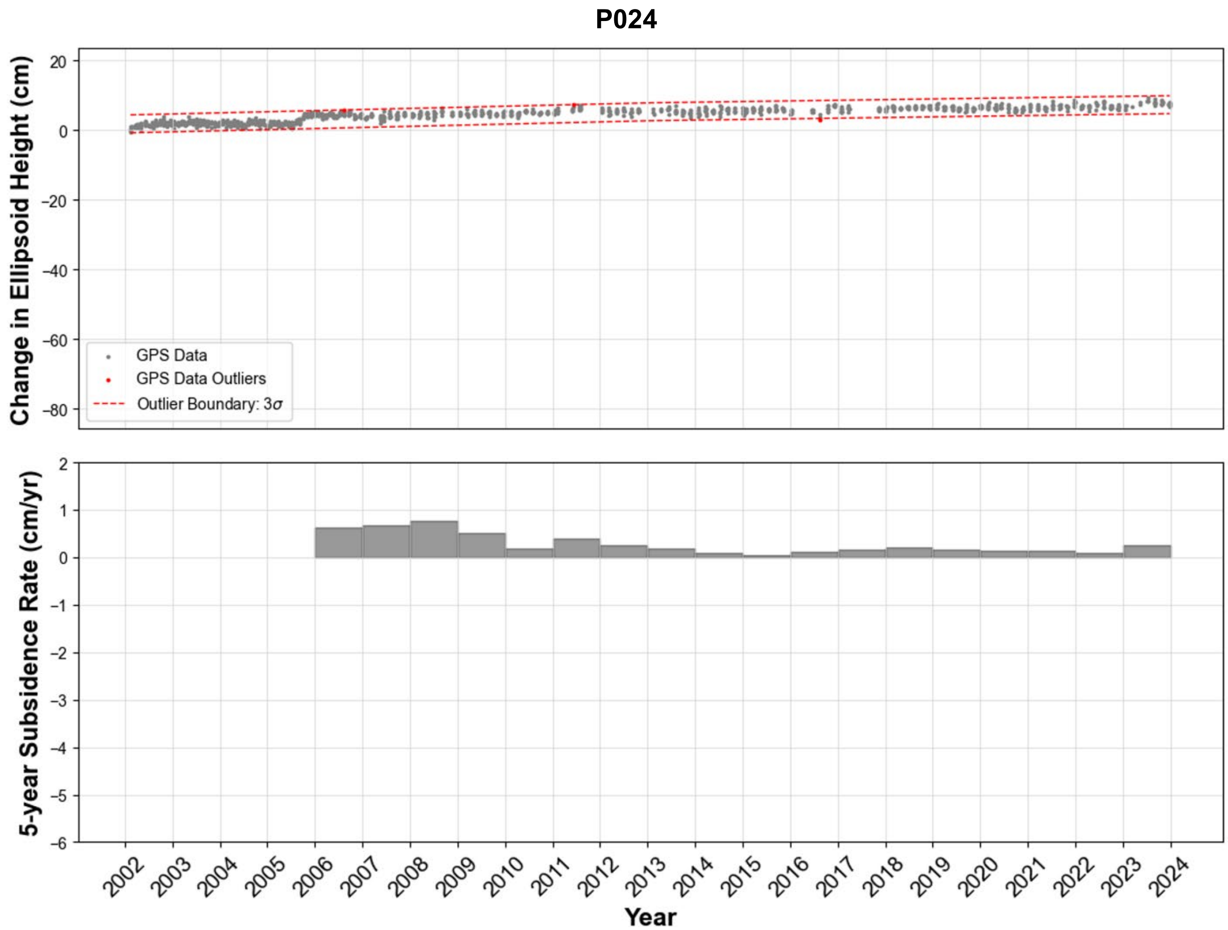


Figure 17: Period of record data from GPS station P024 located in La Porte, 2002 to 2023. P024 has recorded approximately 7 cm of uplift over 22 years of monitoring. The 2019-2023 rate is 0.27 cm/yr. of uplift. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered when calculating subsidence rates and are shown for informational purposes only.

The highest subsidence rates (i.e., 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 P111, located near Fulshear within Fort Bend County, has the highest subsidence rate estimated at 3.18 centimeters per year. Other GPS stations near P111 in the Katy area also show high subsidence rates greater than 1.5 centimeters per year, such as GPS station P098, located in Katy within Waller County (**Figure 18**).

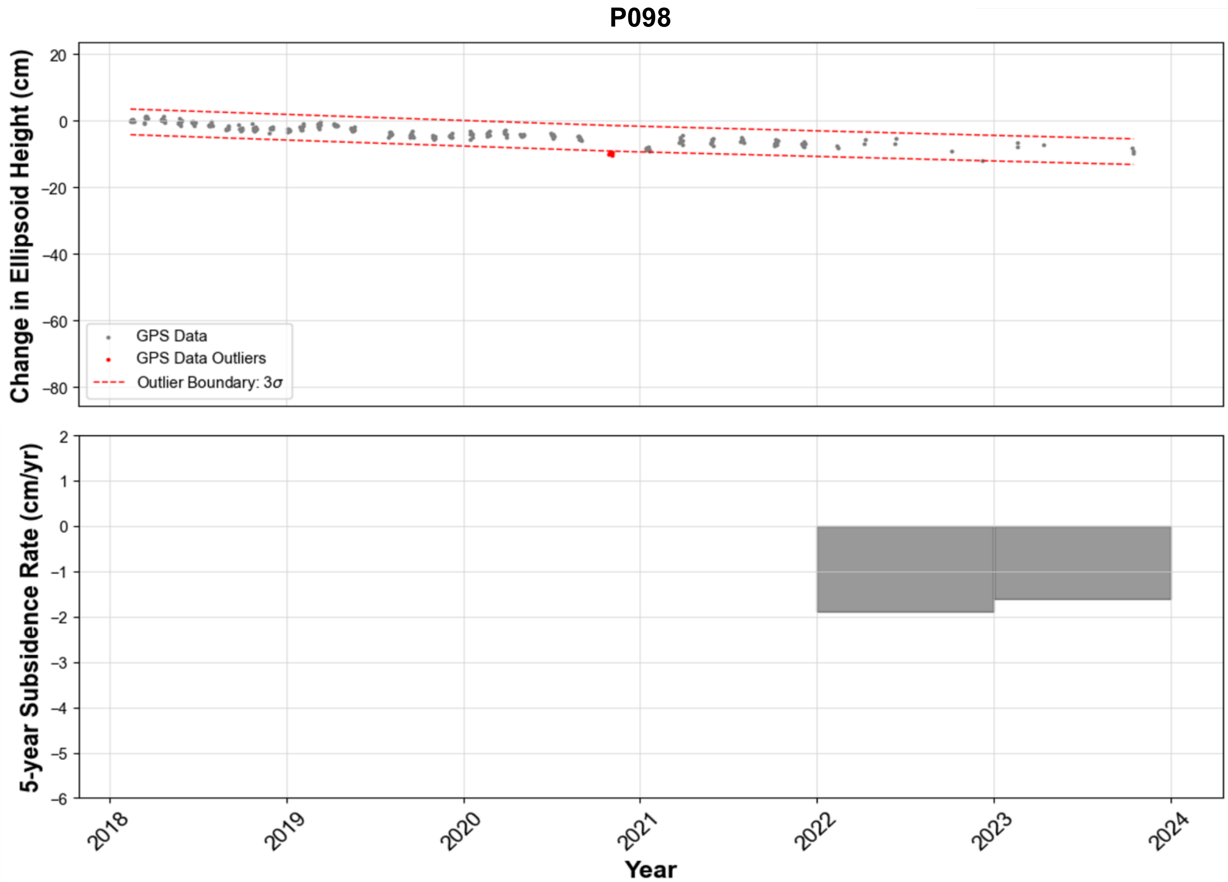


Figure 18: Period of record data from GPS station P098 located in Katy, Texas, 2021-2023. P098 has recorded approximately 8.7 cm of subsidence since 2018. The 2019-2023 subsidence rate is 1.77 cm/yr. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when 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.

Other areas in Regulatory Area Three, such as Cypress and Tomball, as well as areas in southern Montgomery County like The Woodlands and in southeastern Fort Bend County like Fresno have subsidence rates greater than one centimeter per year. Based on the GPS data collected and analyzed in the subsidence monitoring network, subsidence is occurring in Regulatory Area Three, as this area is still undergoing conversion to alternative water supplies.

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Appendix A – Exhibits Presented at Public Hearing held on April 25, 2024

Welcome to the Public Hearing for the 2023 Annual Groundwater Report

IN-PERSON ATTENDEES

- Check to make sure your mobile devices are muted.
- This board room is equipped with microphones that will be recording throughout the entirety of the hearing. Please be mindful of this to not disturb the audio for our virtual attendees.
- Public testimony and Q&As will be available at the end of this hearing.

VIRTUAL ATTENDEES

- Virtual attendees will be muted for the entirety of the hearing.
- The webinar will be recorded, including all chat between participants.
- For audio/visual issues, please chat with the organizer.

HARRIS-GALVESTON SUBSIDENCE DISTRICT

2023 Annual Groundwater Report

Public Hearing - April 25, 2024

Harris-Galveston Subsidence District

The Harris-Galveston Subsidence District (HGSD) is a special-purpose district created by the Texas Legislature in 1975 to prevent further land subsidence in Harris and Galveston counties.

GROUNDWATER REGULATION

- Collaborating with local groundwater conservation districts, regional water providers, and other water agencies to manage groundwater use through water planning and well permitting.

SCIENCE & RESEARCH

- Utilizing the highest quality data and research to monitor groundwater usage, aquifer characteristics, and land surface changes as well as analyzing the best-available predictive models.

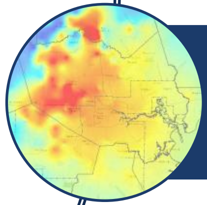
WATER CONSERVATION

- Equipping permittees, residents, businesses, and educators with water conservation tools and resources to reduce water usage and empower the community to value water.

Agenda

Climate

Water Use



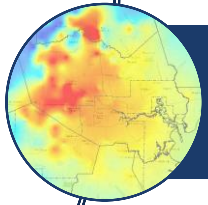
Groundwater Levels

Subsidence

Agenda

Climate

Water Use



Groundwater Levels

Subsidence

Exhibit 1

Location of National Weather Service (NWS) climate stations used for rainfall data for the 2023 calendar year.

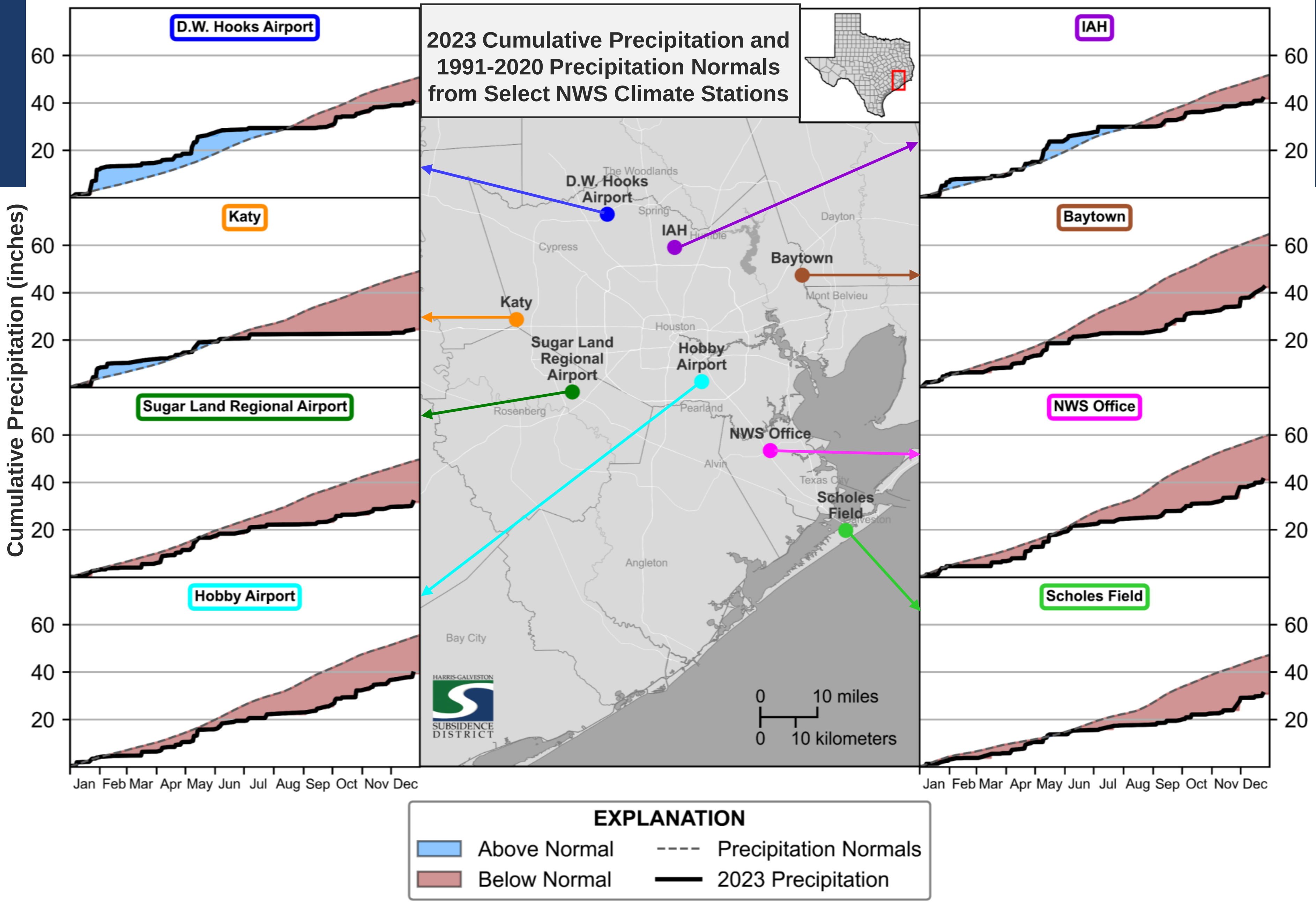
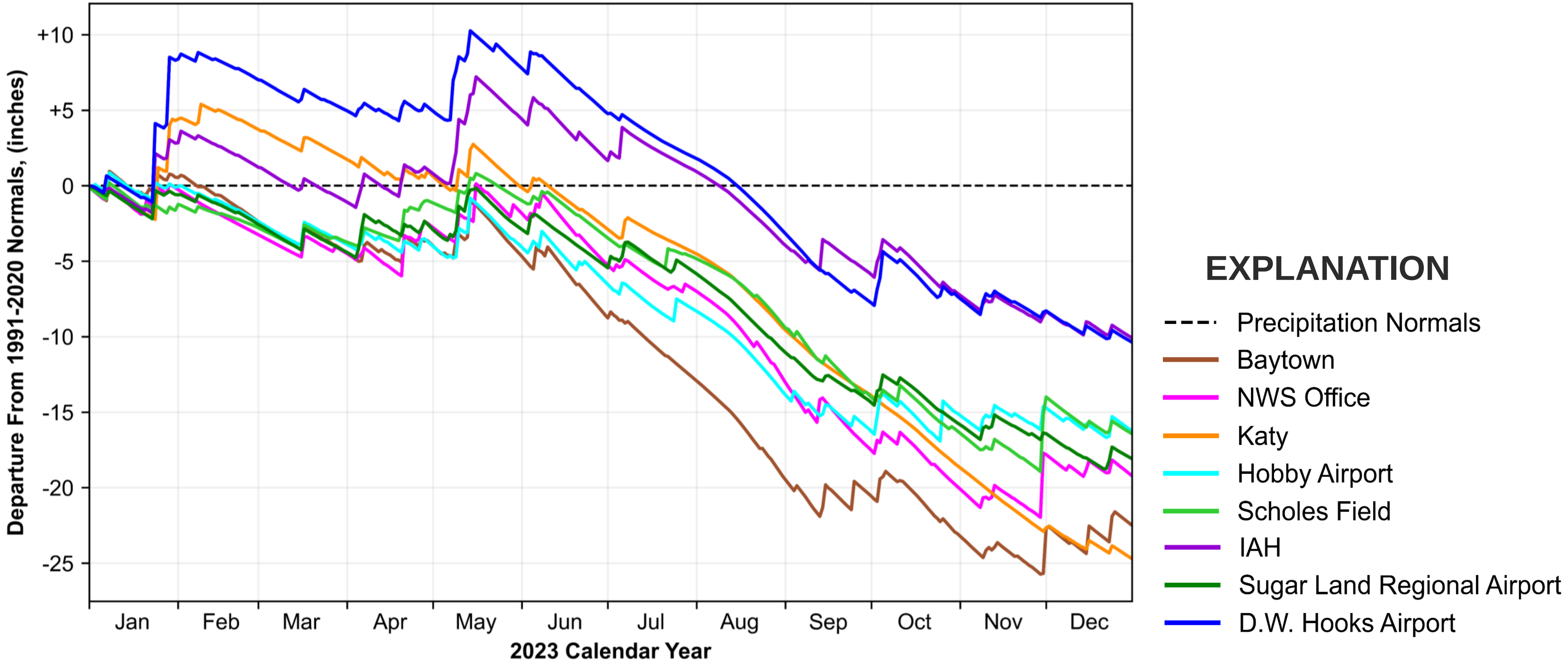


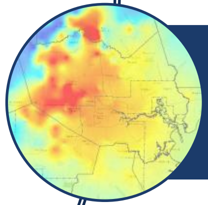
Exhibit 2 | 2023 Precipitation Data



Agenda

Climate

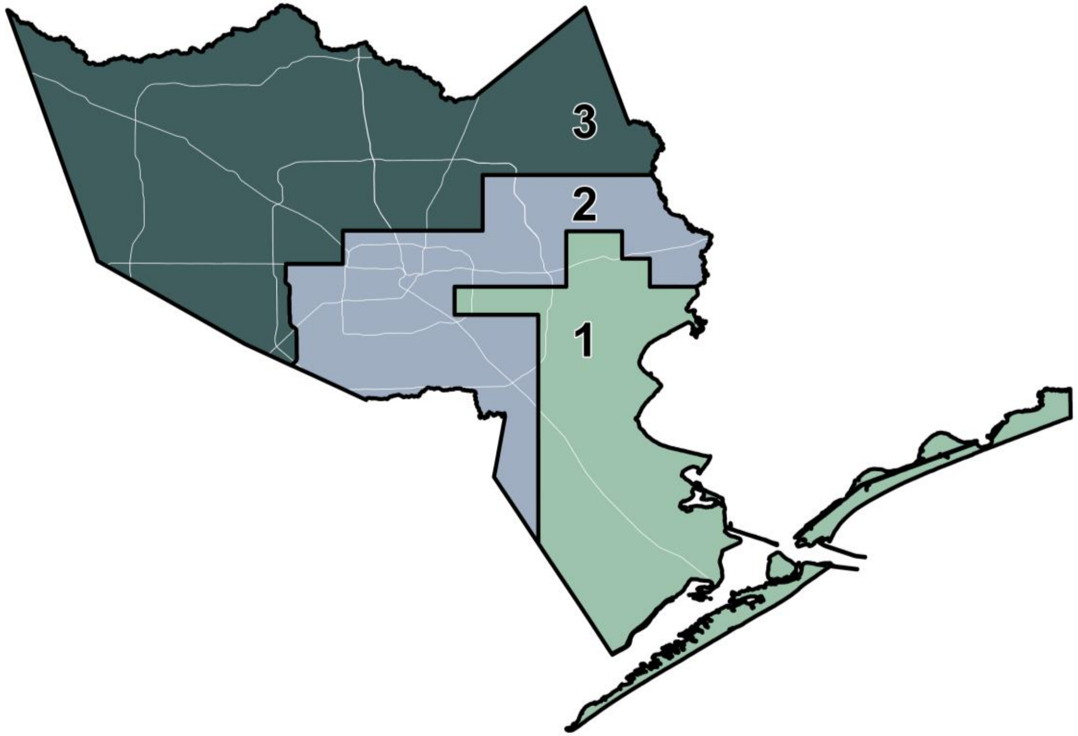
Water Use



Groundwater Levels

Subsidence

HGSD Regulatory Areas



Area 1: no more than 10% of Total Water Demand (TWD) may be sourced from groundwater.

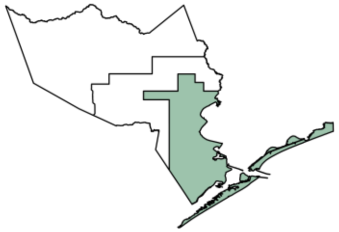
Area 2: no more than 20% of TWD may be sourced from groundwater.

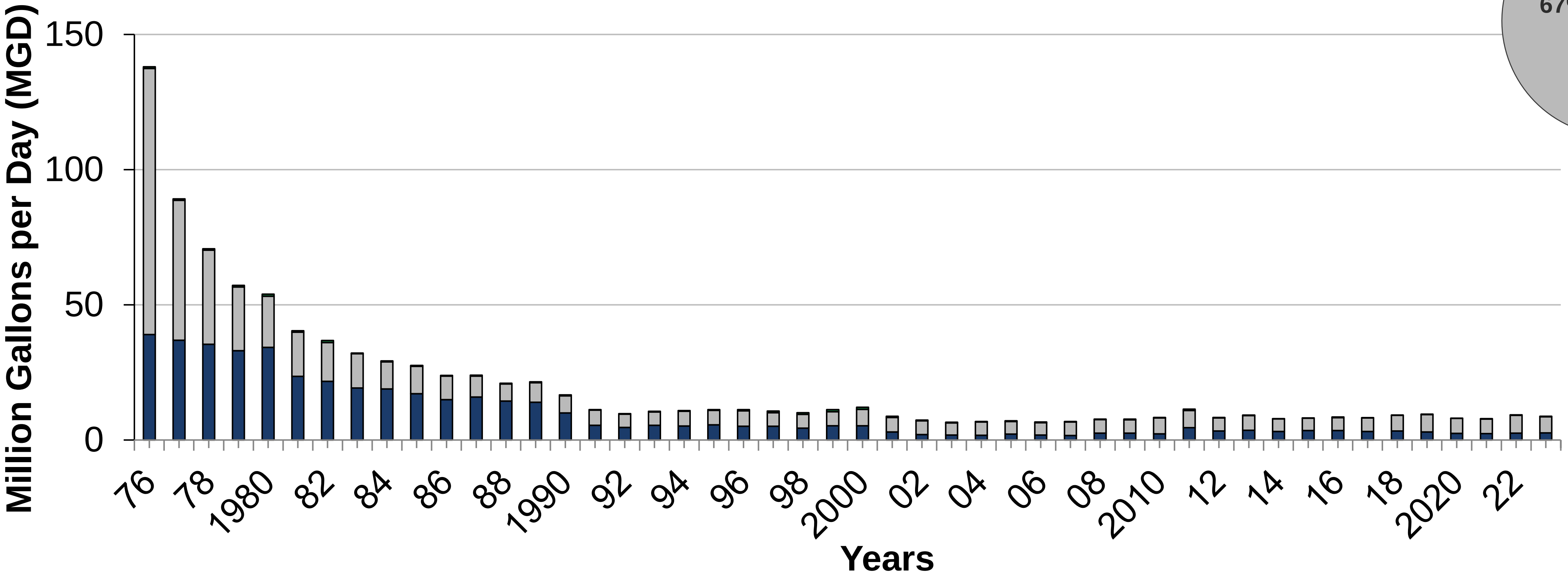
- Groundwater Reduction Plan (GRP) may be approved with conditions.

Area 3: no more than 20% of TWD may be sourced from groundwater.

- Permittees operating within an approved GRP have the following requirements:
  - 2010 – no more than 70% of TWD from groundwater
  - 2025 – no more than 40% of TWD from groundwater
  - 2035 – no more than 20% of TWD from groundwater

Exhibit 3 | Regulatory Area 1





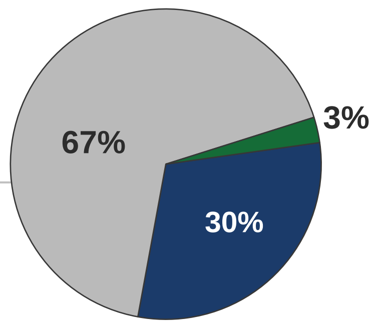
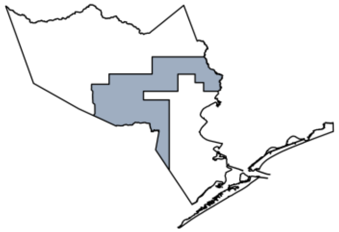
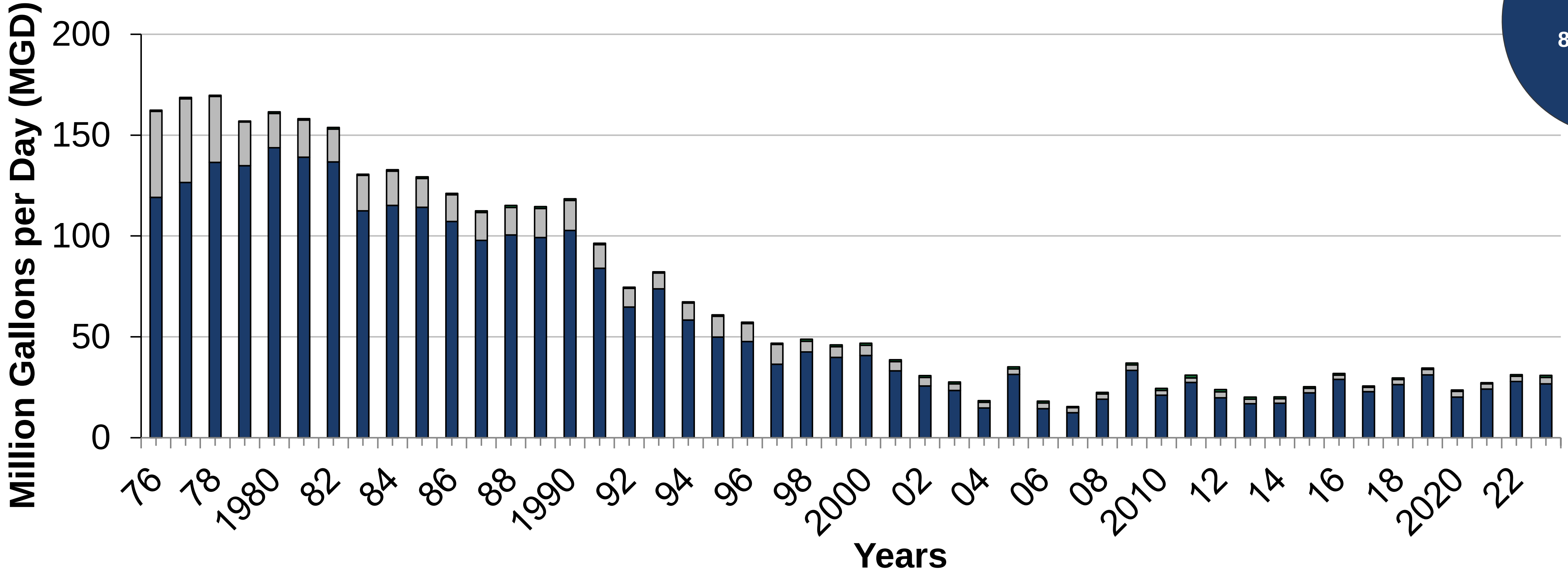


Exhibit 4 | Regulatory Area 2





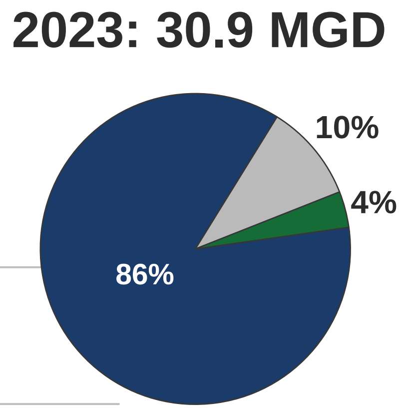
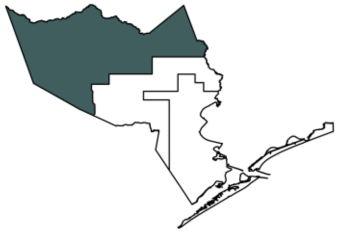
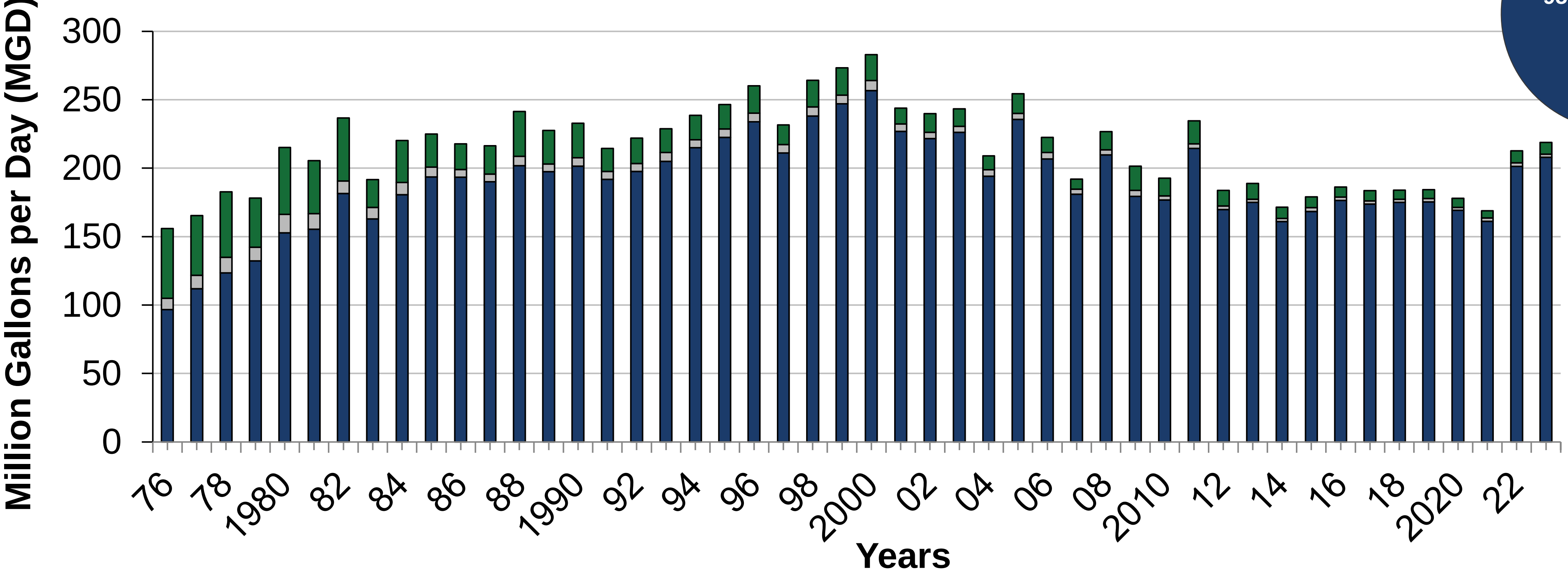


Exhibit 5 | Regulatory Area 3





2023: 212.8 MGD

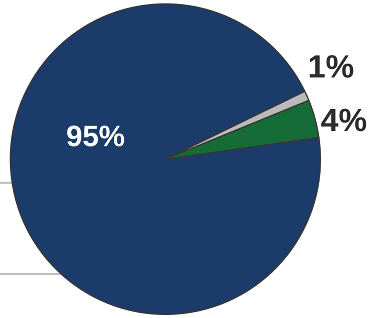


Exhibit 6 | Entire District

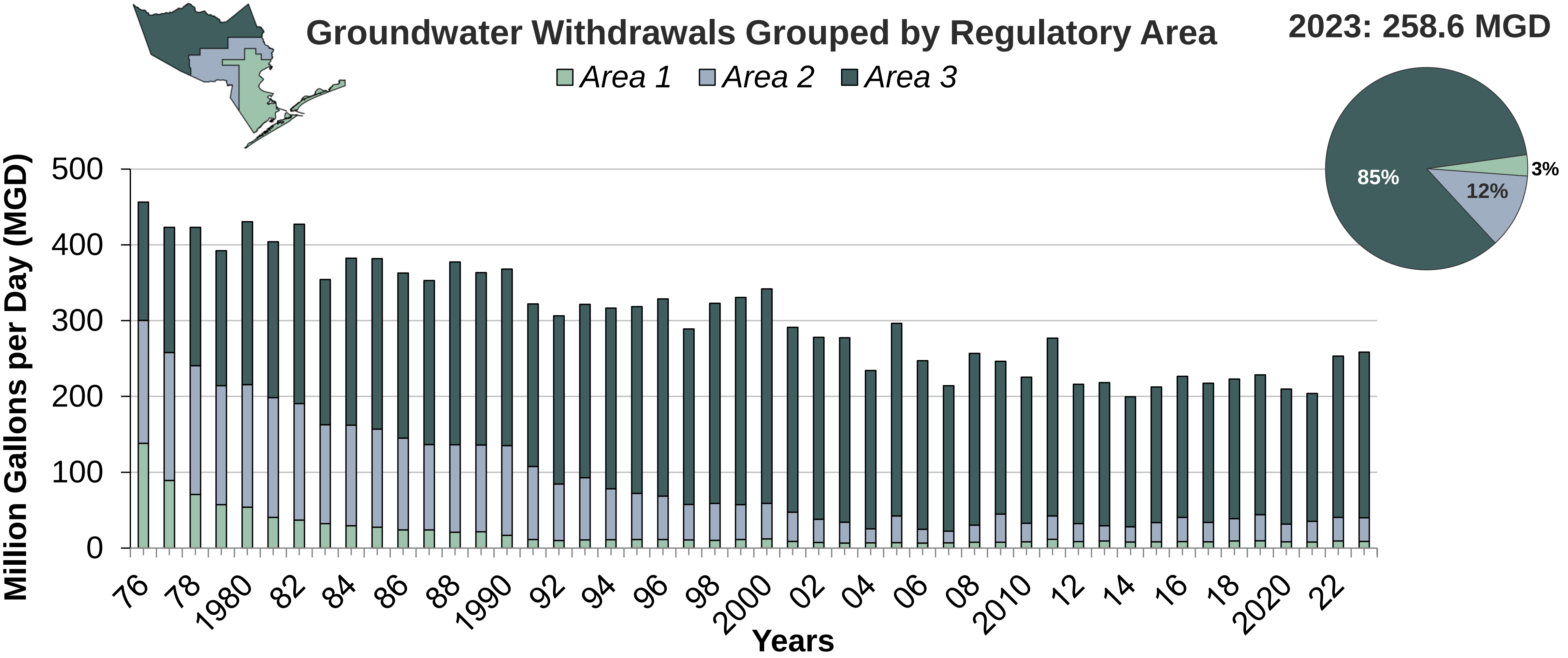
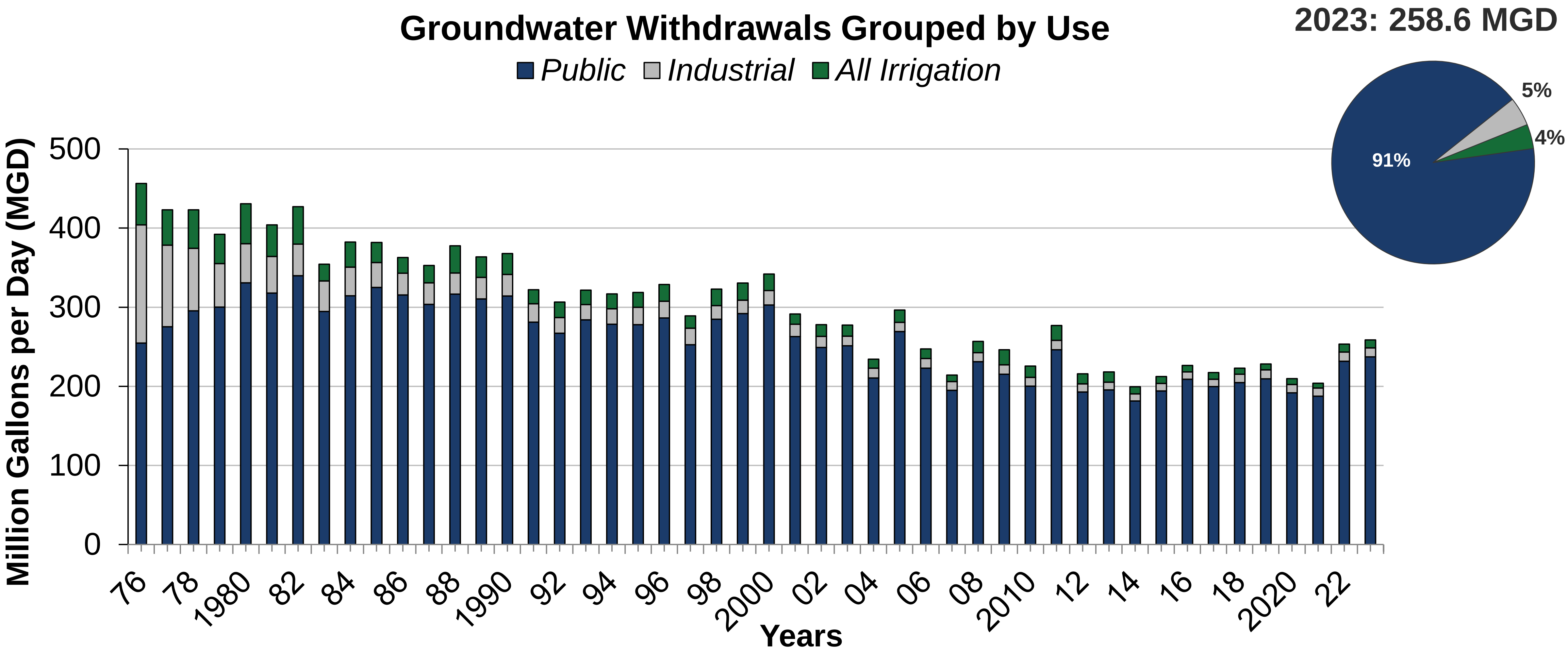


Exhibit 7 | Entire District



Alternative Water Sources

Surface water sources:

- Trinity River
- San Jacinto River
- Brazos River

Reclaimed water is also utilized throughout the District.

EXPLANATION

- HGSD Jurisdiction
- Brazos River Basin
- San Jacinto River Basin
- San Jacinto-Brazos River Basin
- Trinity River Basin
- Trinity-San Jacinto River Basin

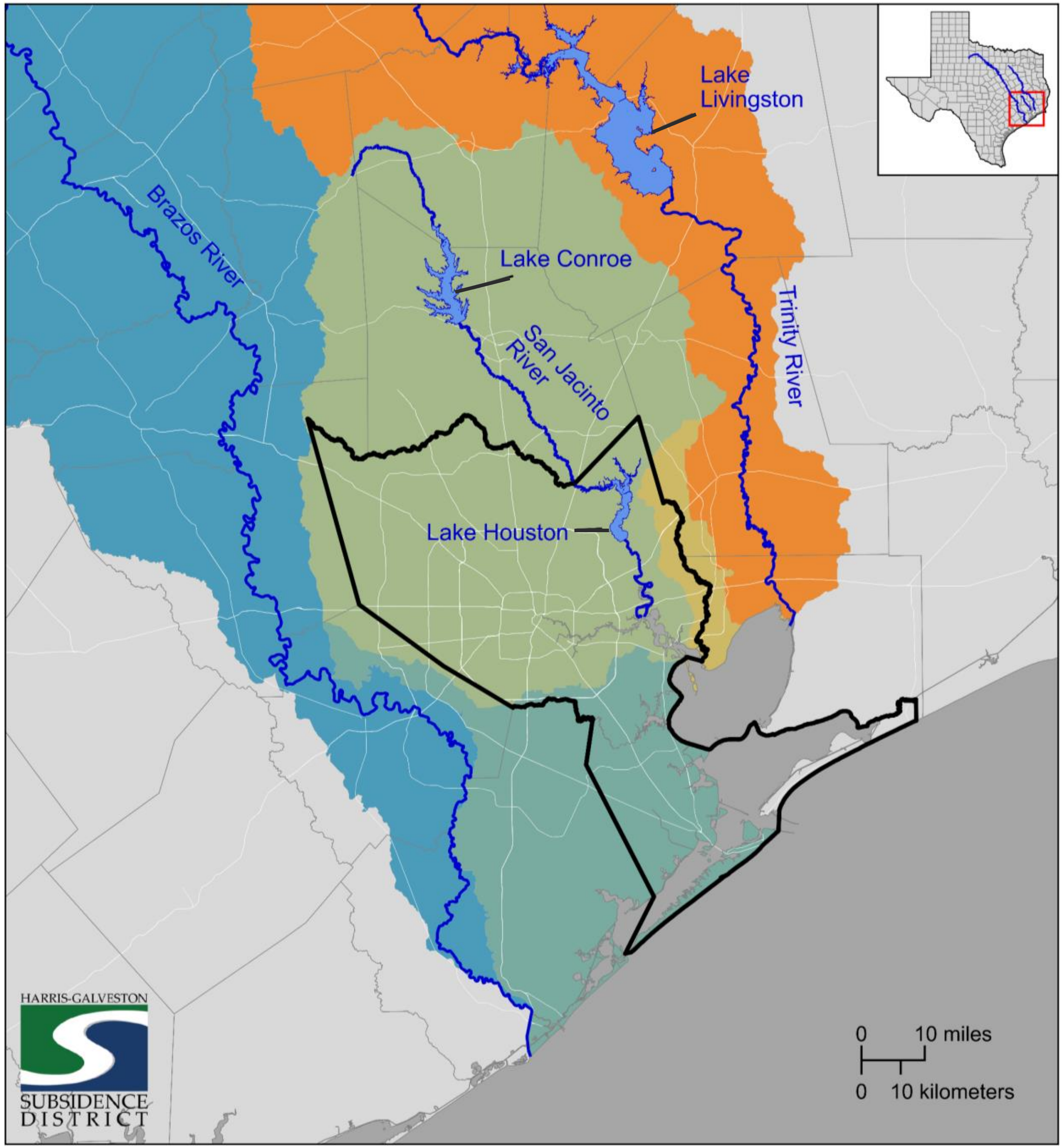
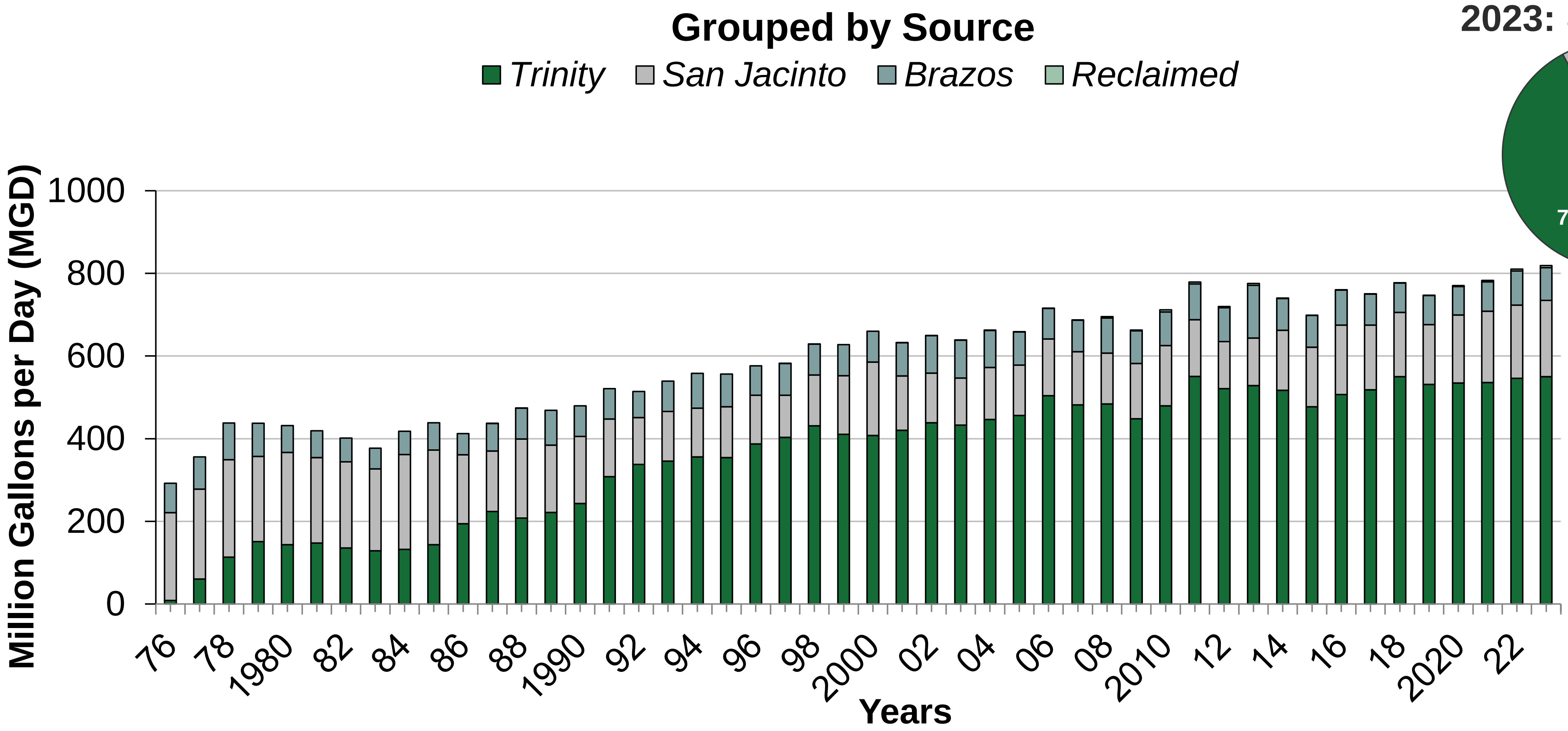


Exhibit 8 | Alternative Water Used for Entire District



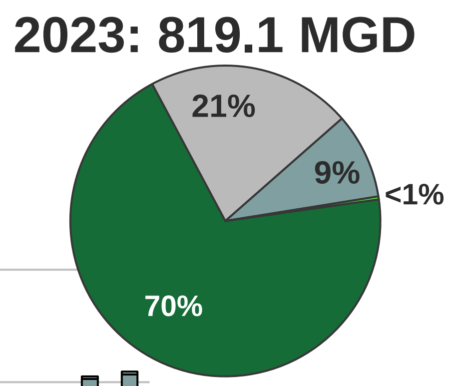
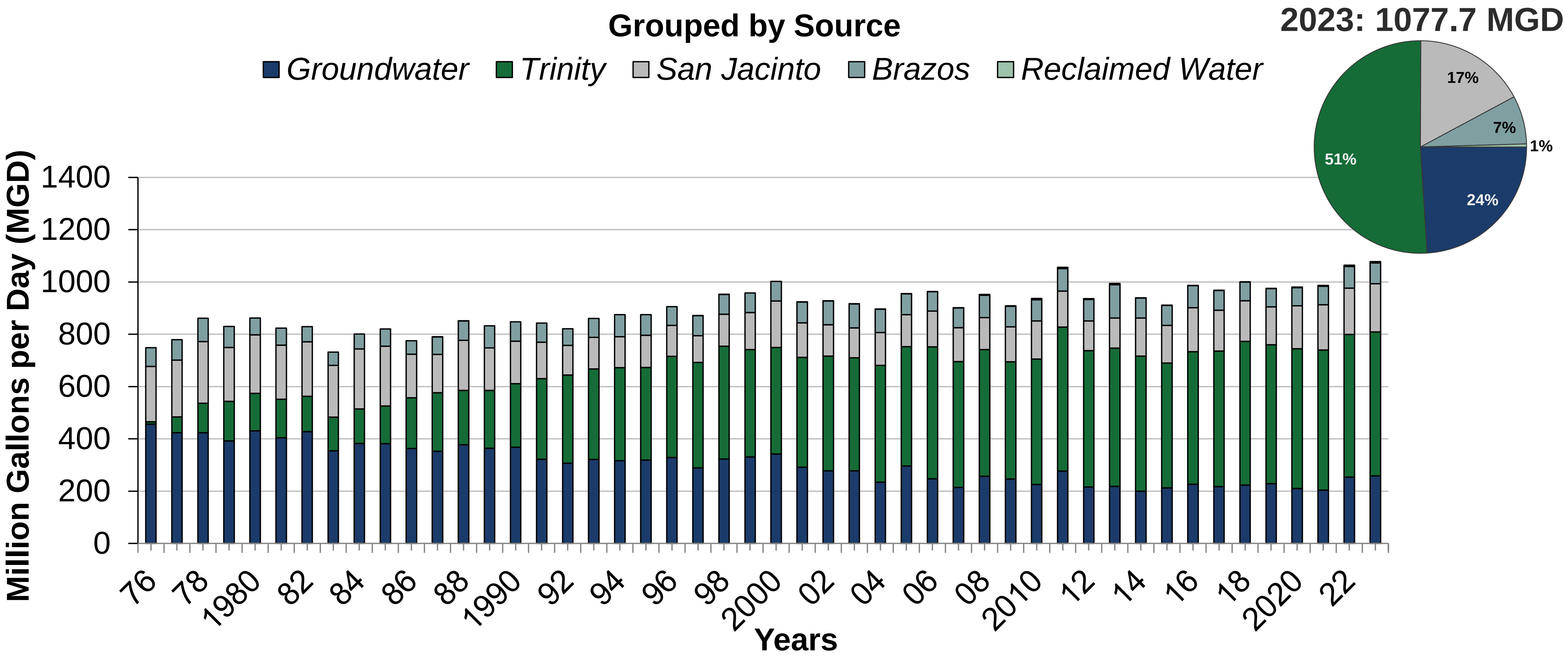


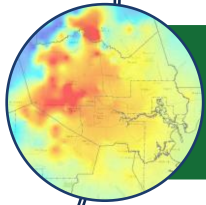
Exhibit 9 | Total Water Demand



Agenda


Climate


Water Use


Groundwater Levels


Subsidence

USGS
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HARRIS-GALVESTON SUBSIDENCE DISTRICT

FORT BEND SUBSIDENCE DISTRICT

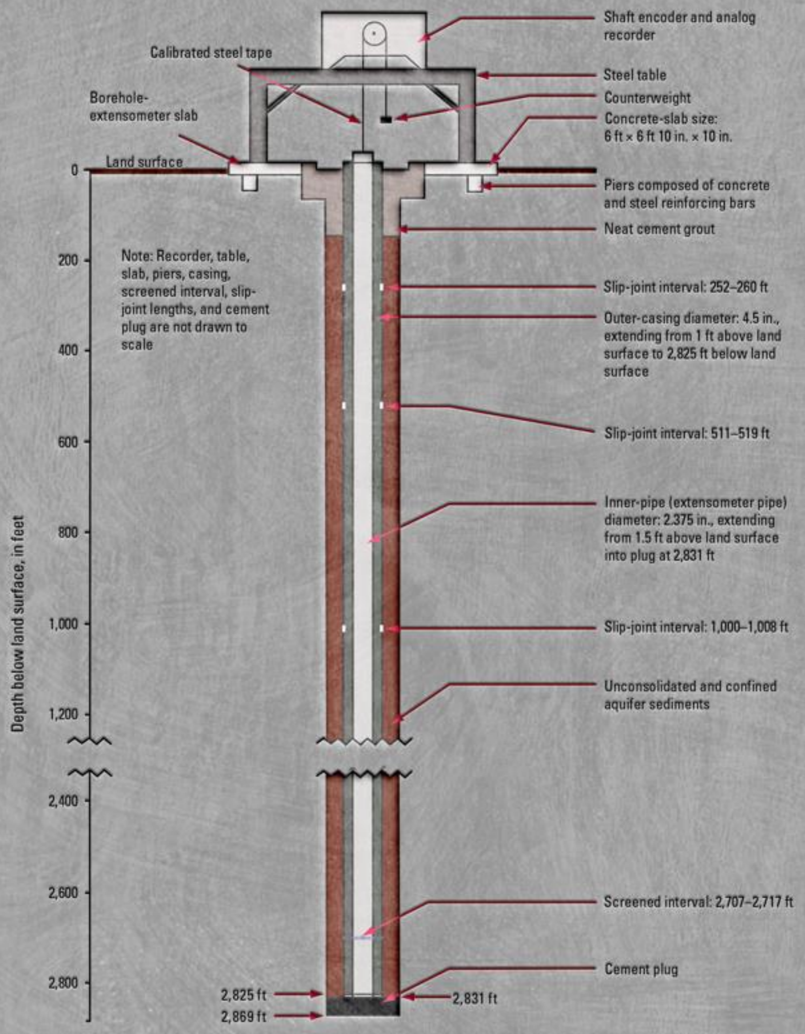


Diagram of a Borehole extensometer

Groundwater-level Altitudes, Long-Term Change & Compaction

Chicot/Evangeline and Jasper aquifers

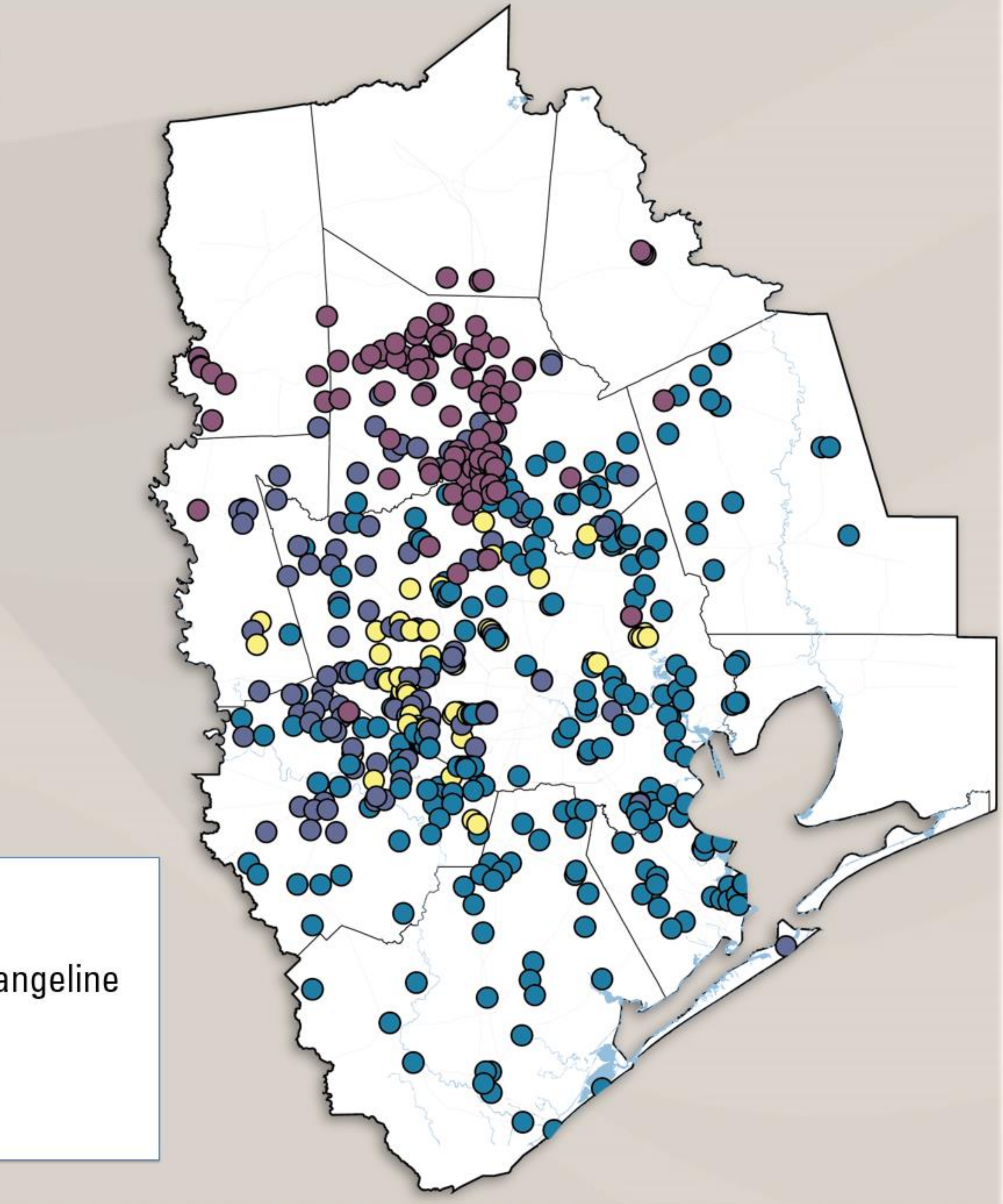
Research in cooperation with the Harris–Galveston & Fort Bend Subsidence Districts Brazoria Groundwater Conservation District, The City of Houston and Lone Star Groundwater Conservation District

2024 Water-Level Map Series

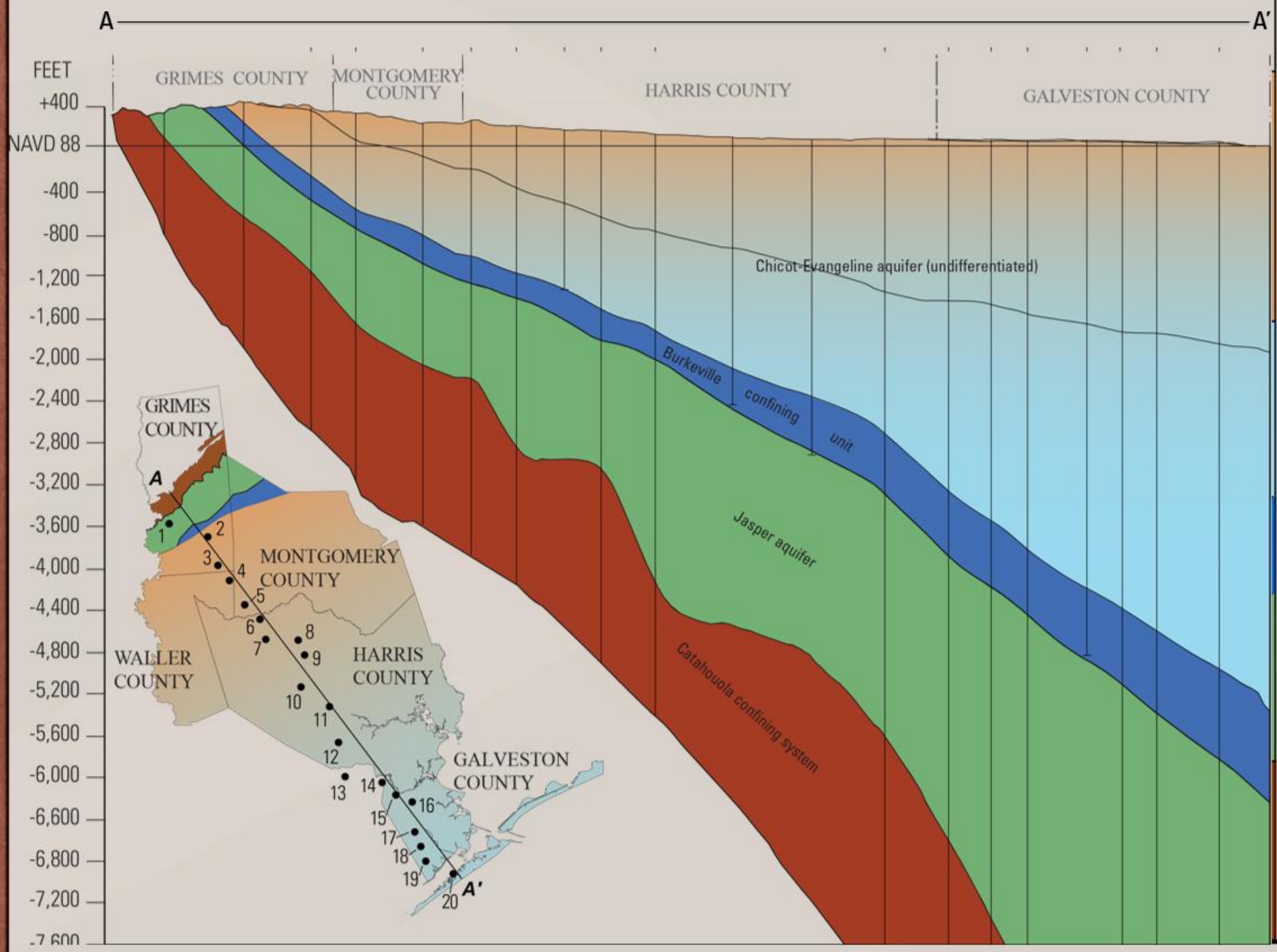
- Chicot and Evangeline Aquifers (undifferentiated)
  - 2024 Water-Level Altitude
  - 2023 to 2024 Water-Level Change
  - 2019 to 2024 Water-Level Change
  - 1990 to 2024 Water-Level Change
  - 1977 to 2024 Water-Level Change

- Jasper Aquifer
  - 2024 Water-Level Altitude
  - 2023 to 2024 Water-Level Change
  - 2019 to 2024 Water-Level Change
  - 2000 to 2024 Water-Level Change

- Compaction 1973 to 2023
  - Compaction Data from 14 Extensometers



Geology and Hydrology



In 2021 and Moving Forward		
Geologic units[1]		Hydrogeologic units[1]
Alluvial, terrace, and dune deposits		Chicot - Evangeline aquifer (undifferentiated)
Beaumont Formation		
Lissie Formation	Montgomery Formation	
	Bentley Formation	
Willis Sand		
Goliad Sand (upper part)		
Goliad Sand (lower part)		
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	

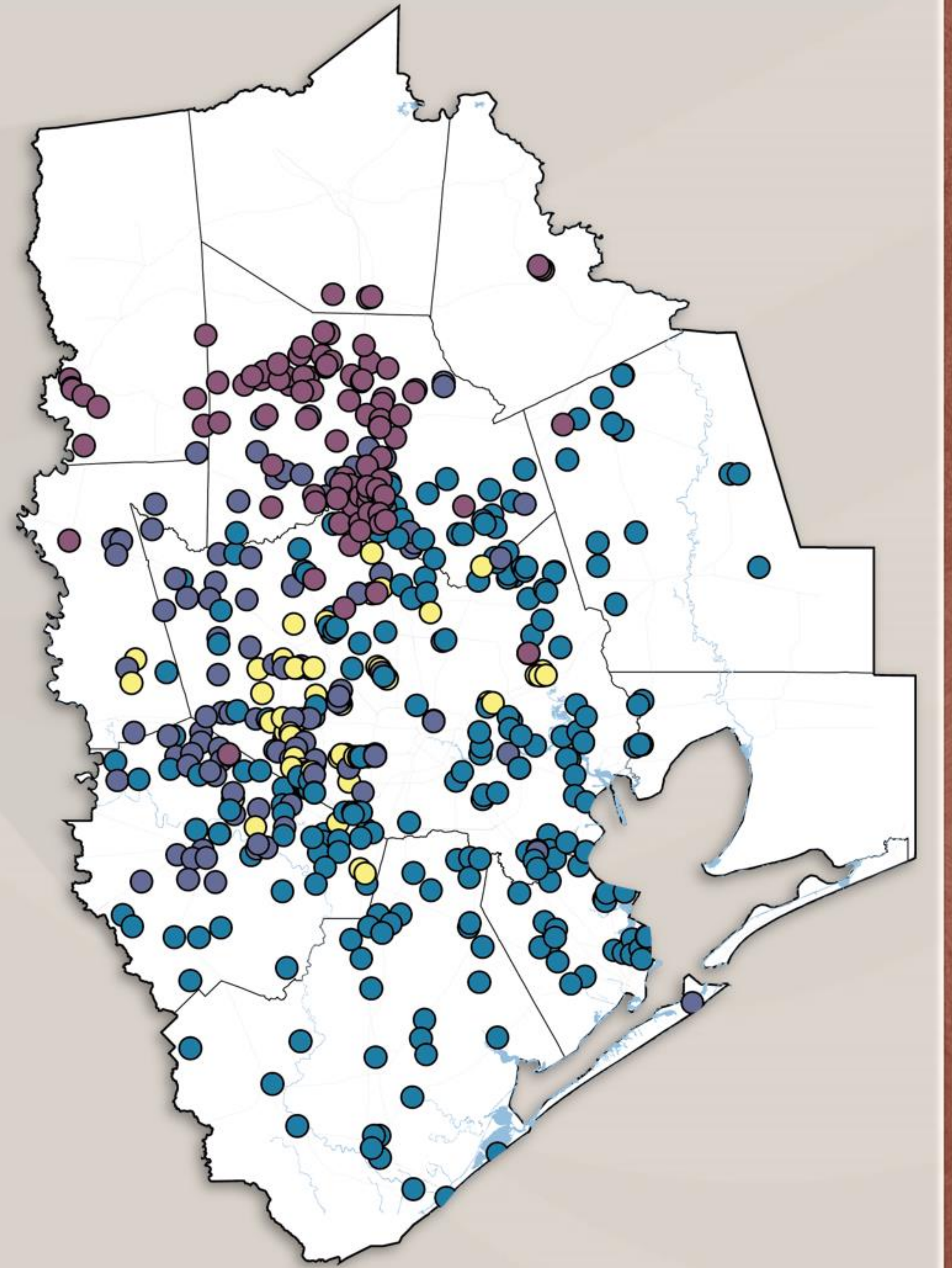
- Chicot and Evangeline aquifers (undifferentiated)
  - combined for annual regional-scale assessments
  - Updated aquifer tops and bases*
  - Chicot thickened across much of southeast Harris County
  - Distribution of Evangeline wells changed significantly

*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 12-12-2023 to 3-07-2024
- Well Types:
  - Public Supply, Irrigation, Industrial, Observation
- Chicot and Evangeline (undifferentiated) water-levels: **478**
- Jasper water-levels: **88**
- Number of wells used to create the 2024 altitude maps
  - Chicot and Evangeline (undifferentiated): *444*
  - Jasper: *84*



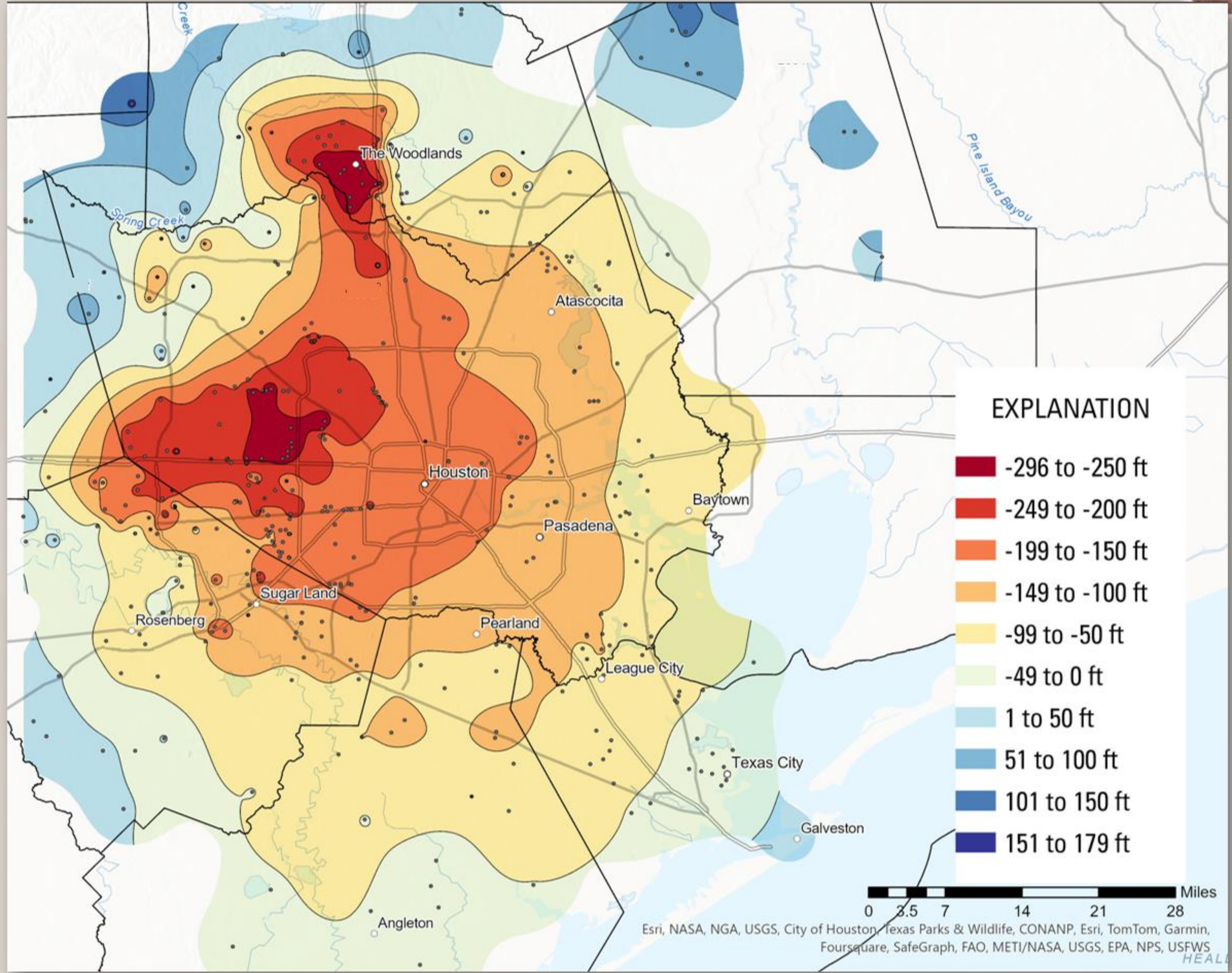
Water-Level Altitude

Chicot and Evangeline (undifferentiated)

Altitudes are referenced from NAVD 88

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

Highest altitudes in portions of south-eastern Grimes County, and northern Liberty County



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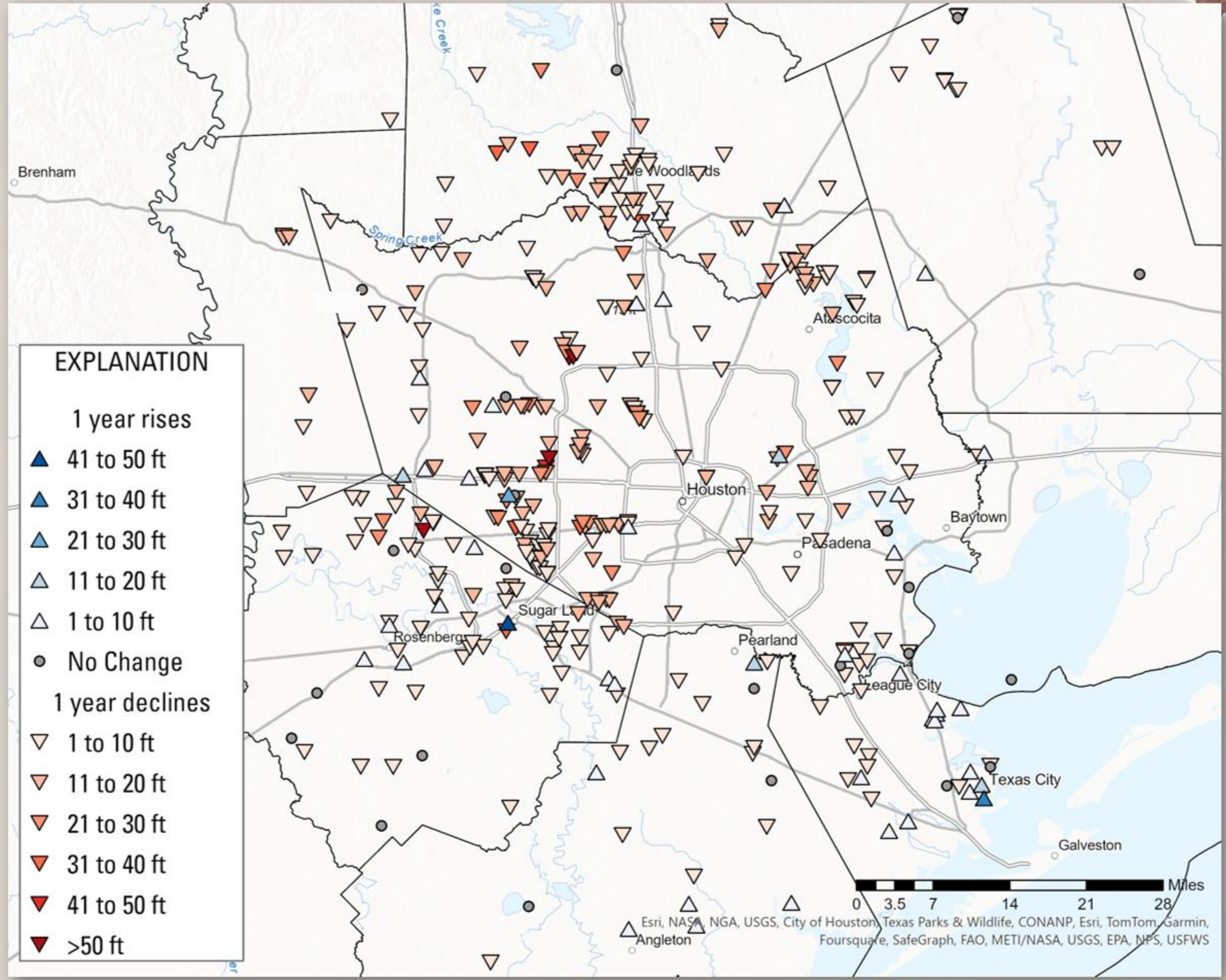
2023 to 2024 Water-Level Change

Chicot and Evangeline (undifferentiated)

- 416 water-level pairs
  - Mostly declines
    - Over half (52.5%) are declines of less than 10 ft.
  - Largest declines (>50 ft):
    - portions of northwestern, southwestern and western Harris County
    - 1 in Fort Bend County
  - Largest rises (> 40 ft):
    - 1 in Fort Bend County



USGS science for a changing world

2023 to 2024 Water-Level Change

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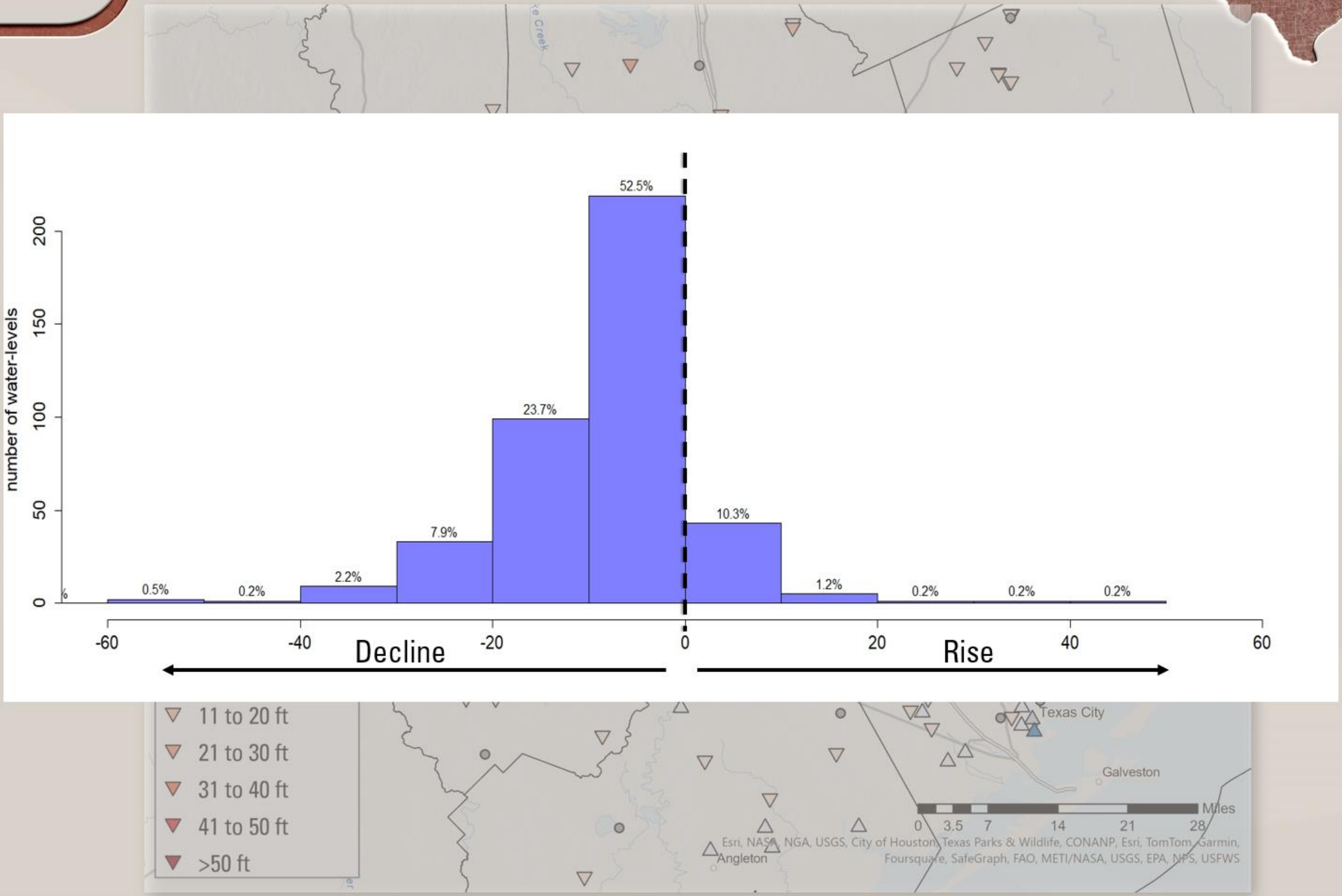
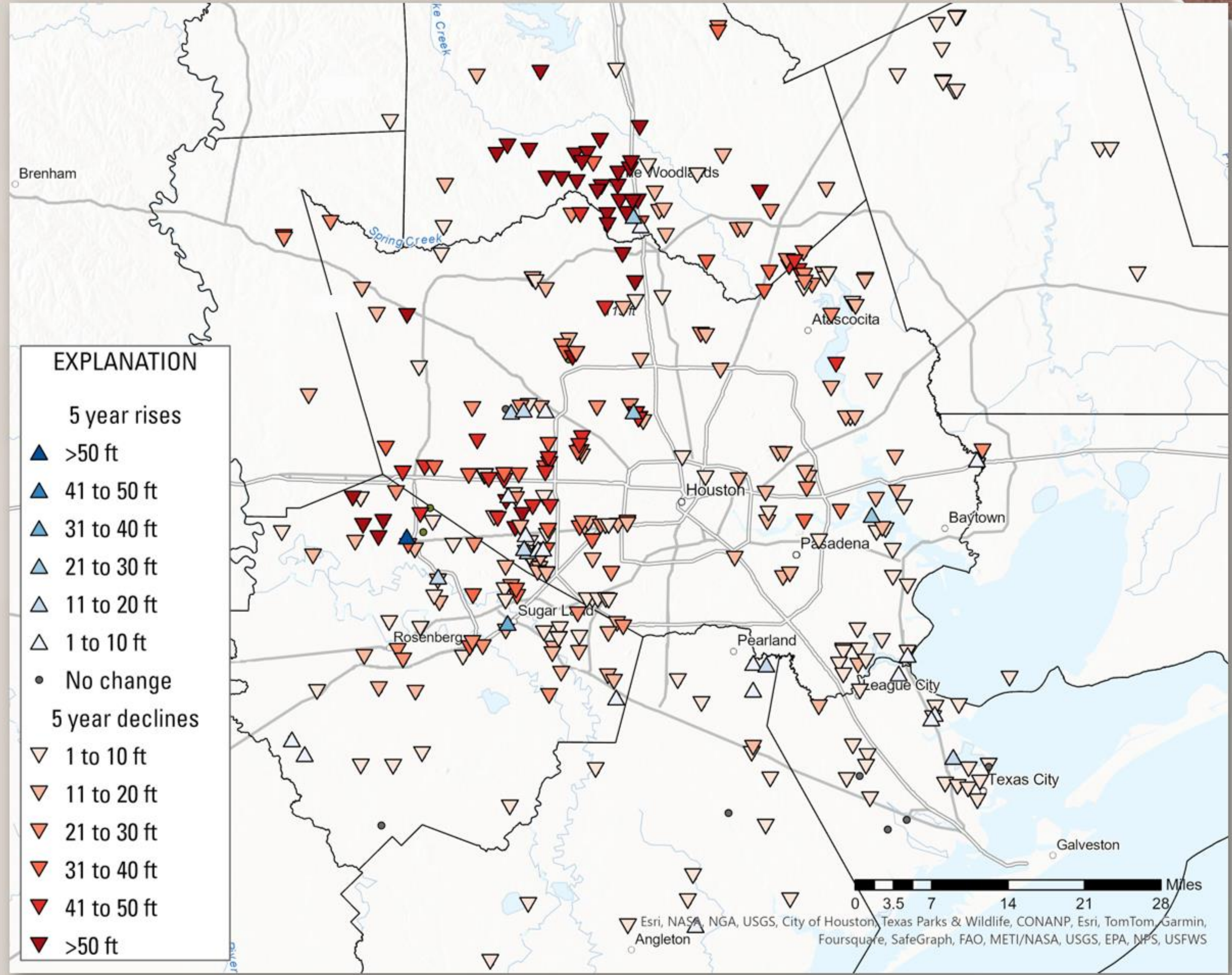


USGS
science for a changing world

2019 to 2024 Water-Level Change

Chicot and Evangeline (undifferentiated)

- 385 water-level pairs
  - Mostly declines
    - More than a third (33.4%) are declines of less than 10 feet.
  - Largest declines (>50 ft):
    - portions of south-western, north-western and northern Harris county
    - northern Fort Bend County
    - south-central Montgomery County
  - Largest rises (> 50 ft):
    - 1 in Fort Bend County



USGS
science for a changing world

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    - south-central Montgomery County
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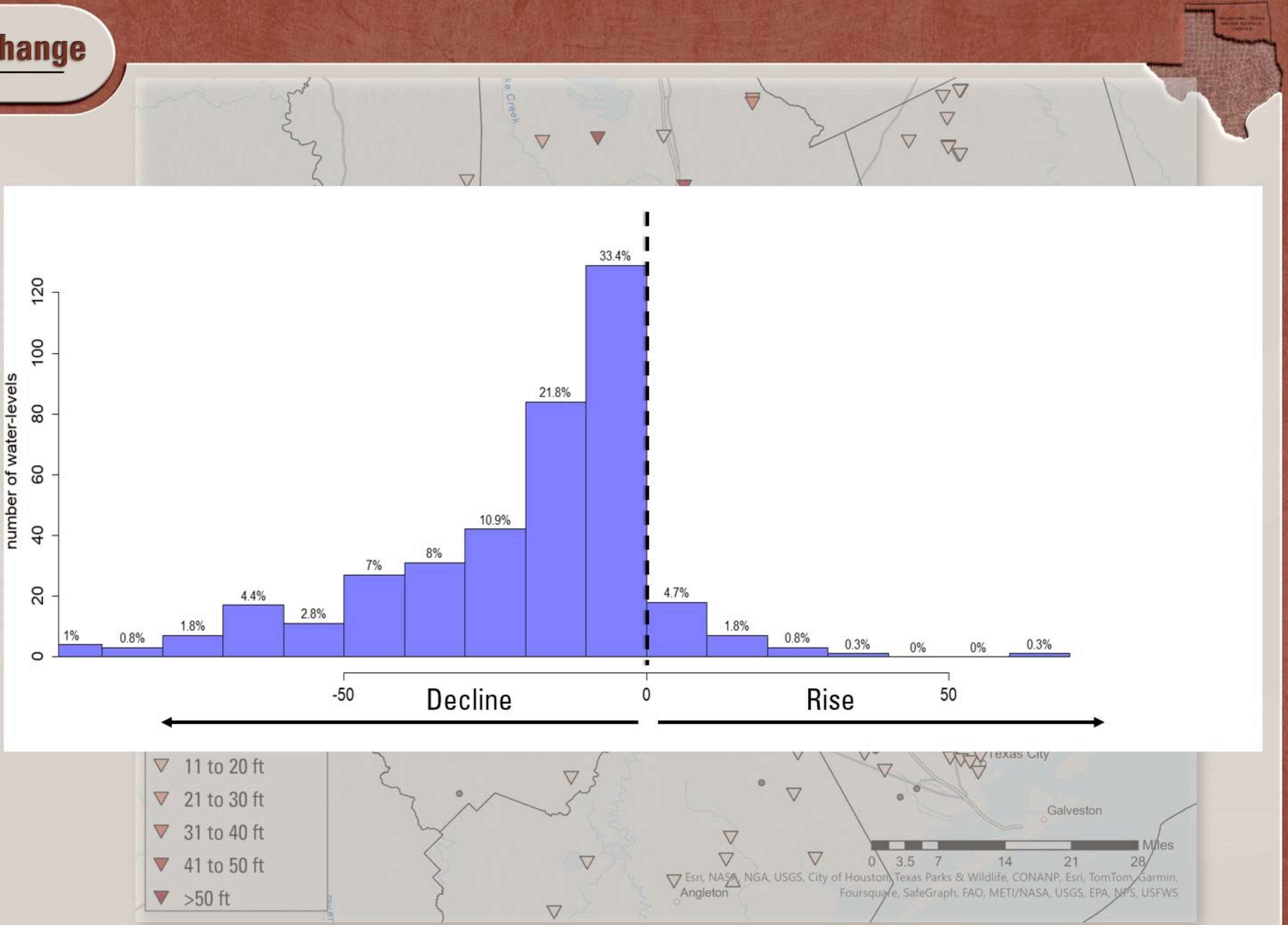


Long term change

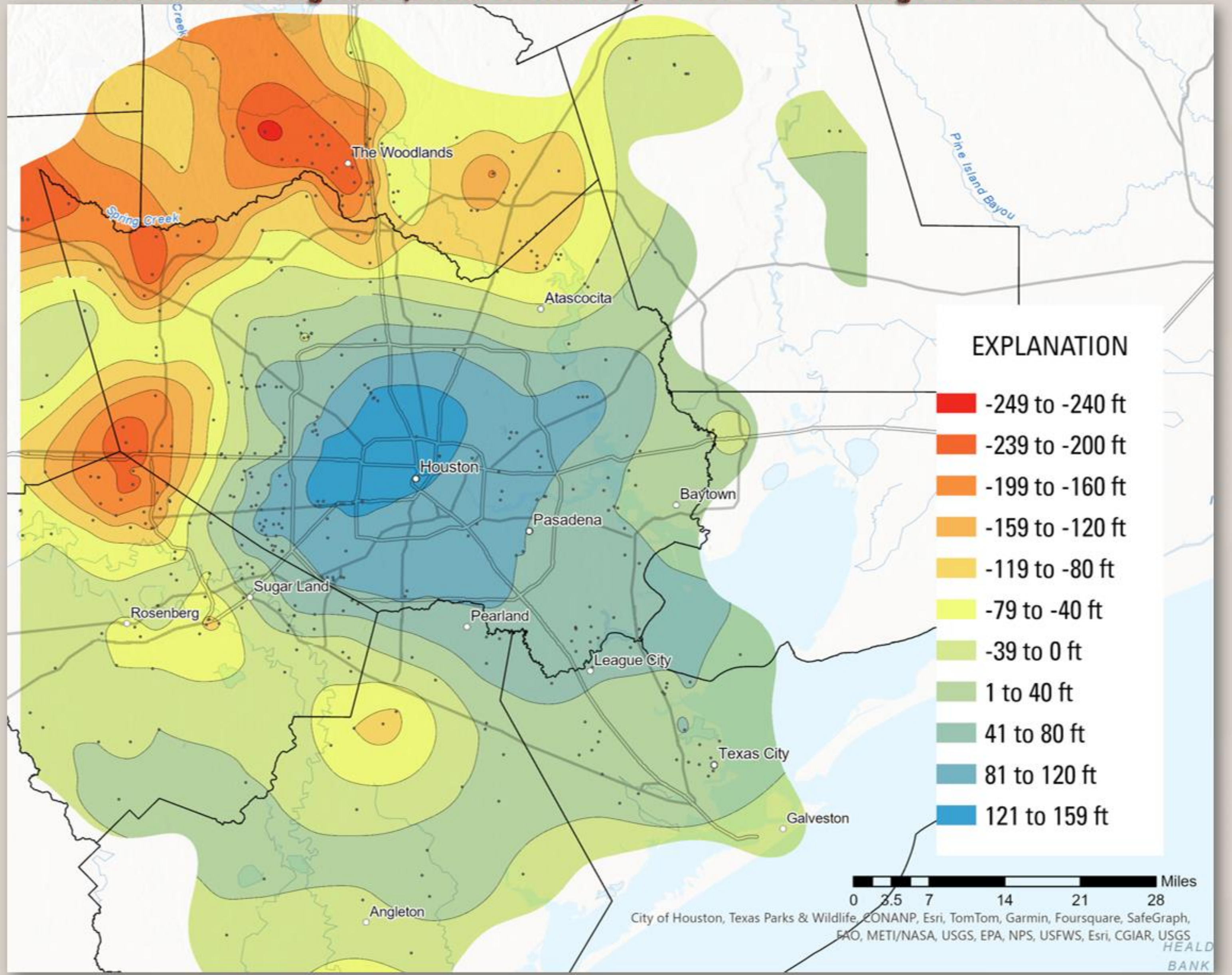
Water level rises (blues):

- most of central and eastern Harris County
- portions of Galveston County
- portions of Liberty, Chambers, Brazoria, and Fort Bend Counties

Water-level declines (yellows and reds):

- central Brazoria County
- northern Fort Bend County
- western and NW Harris County
- portions of Waller County
- portions of Montgomery County

Chicot and Evangeline (undifferentiated) Water-Level Change 1990 to 2024



Long term change

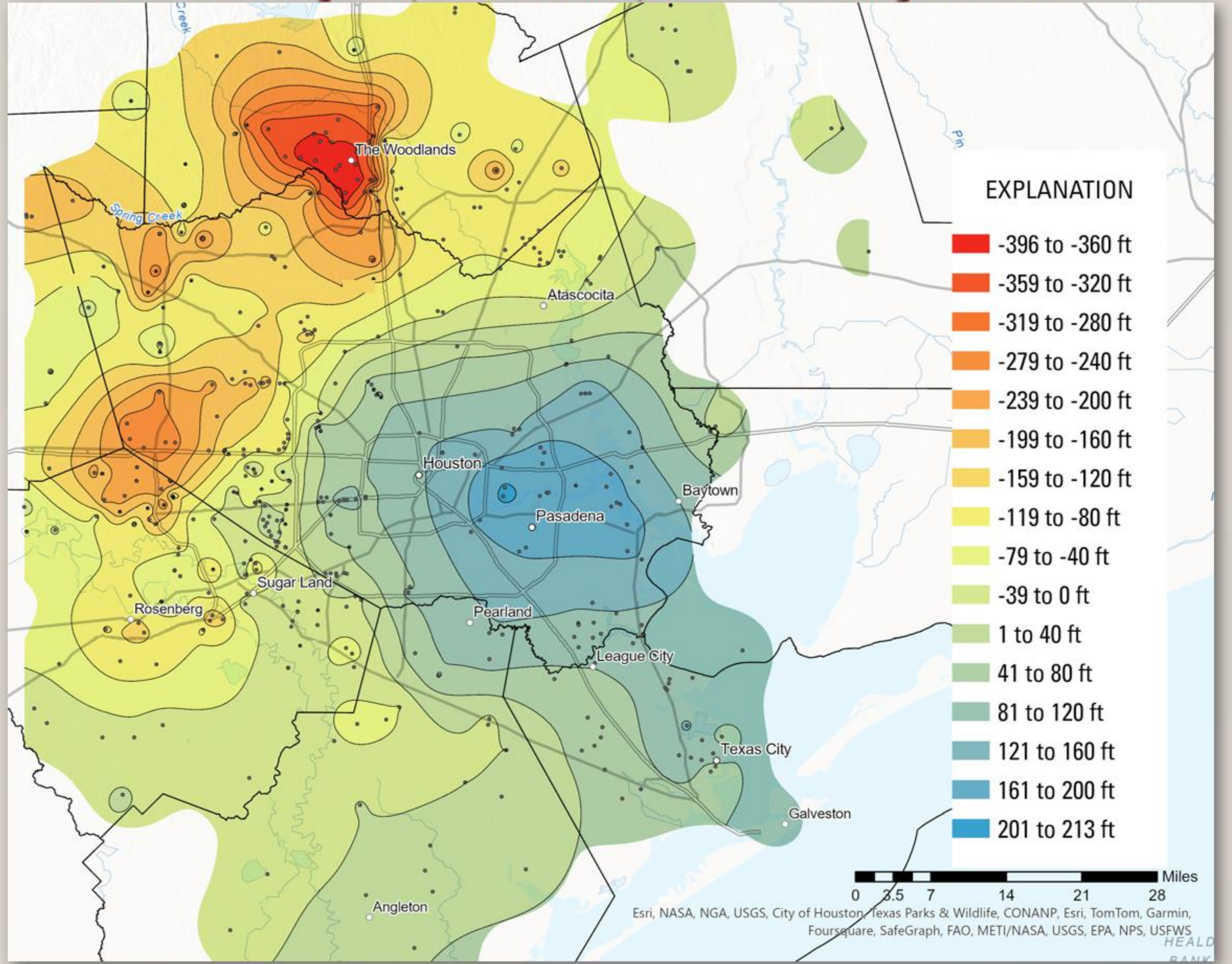
Water-level rises (blues):

- most of central and eastern Harris County
- Galveston County

Water-level declines (yellows and reds):

- western Brazoria County
- much of Fort Bend County
- western and NW Harris County
- portions of Waller County
- portions of Montgomery County

Chicot and Evangeline (undifferentiated) Water-Level Change 1977 to 2024



USGS science for a changing world

Water-Level Altitude

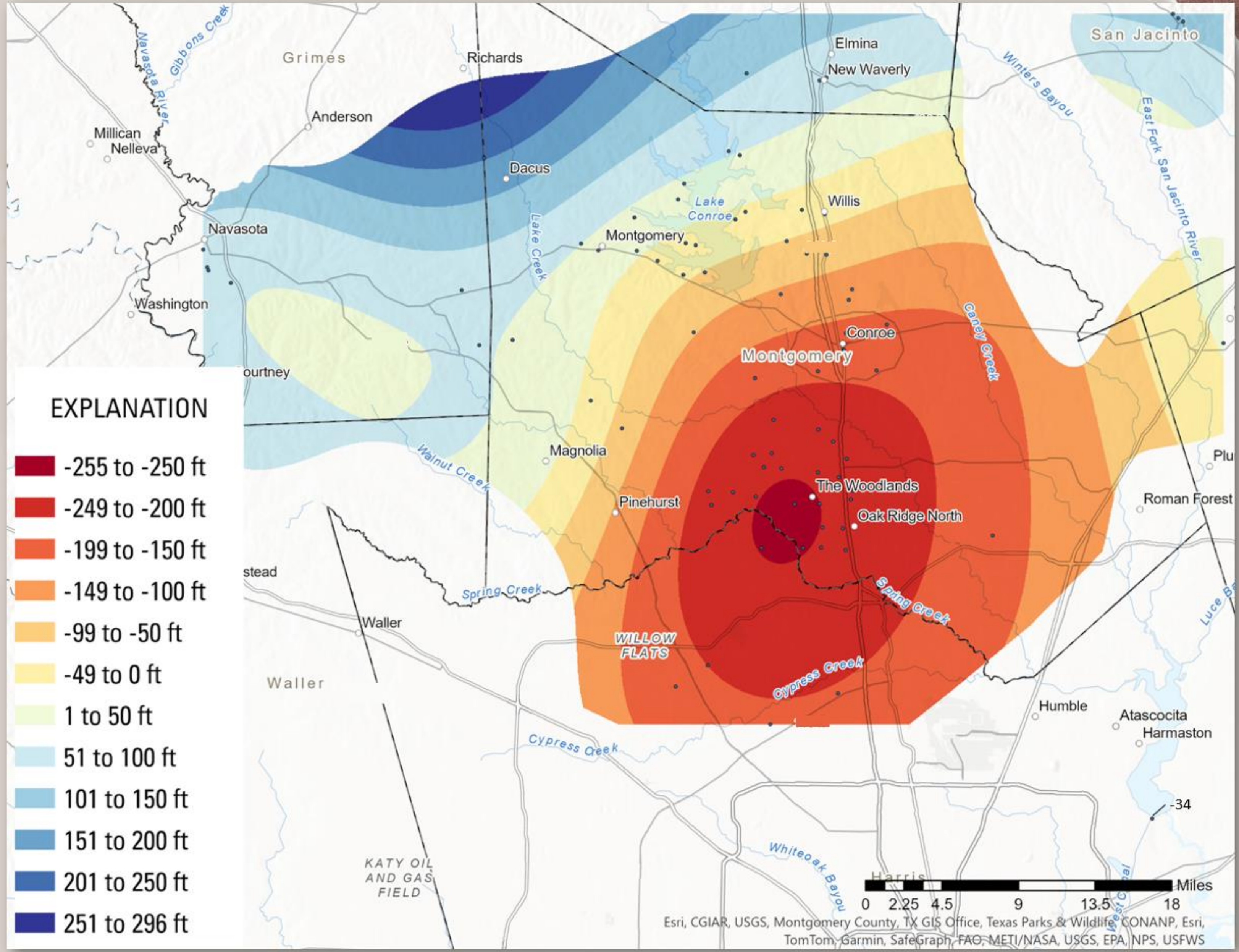
Jasper

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

Cinco Mud (Fort Bend County) – 36.9 ft above NAVD 88



USGS
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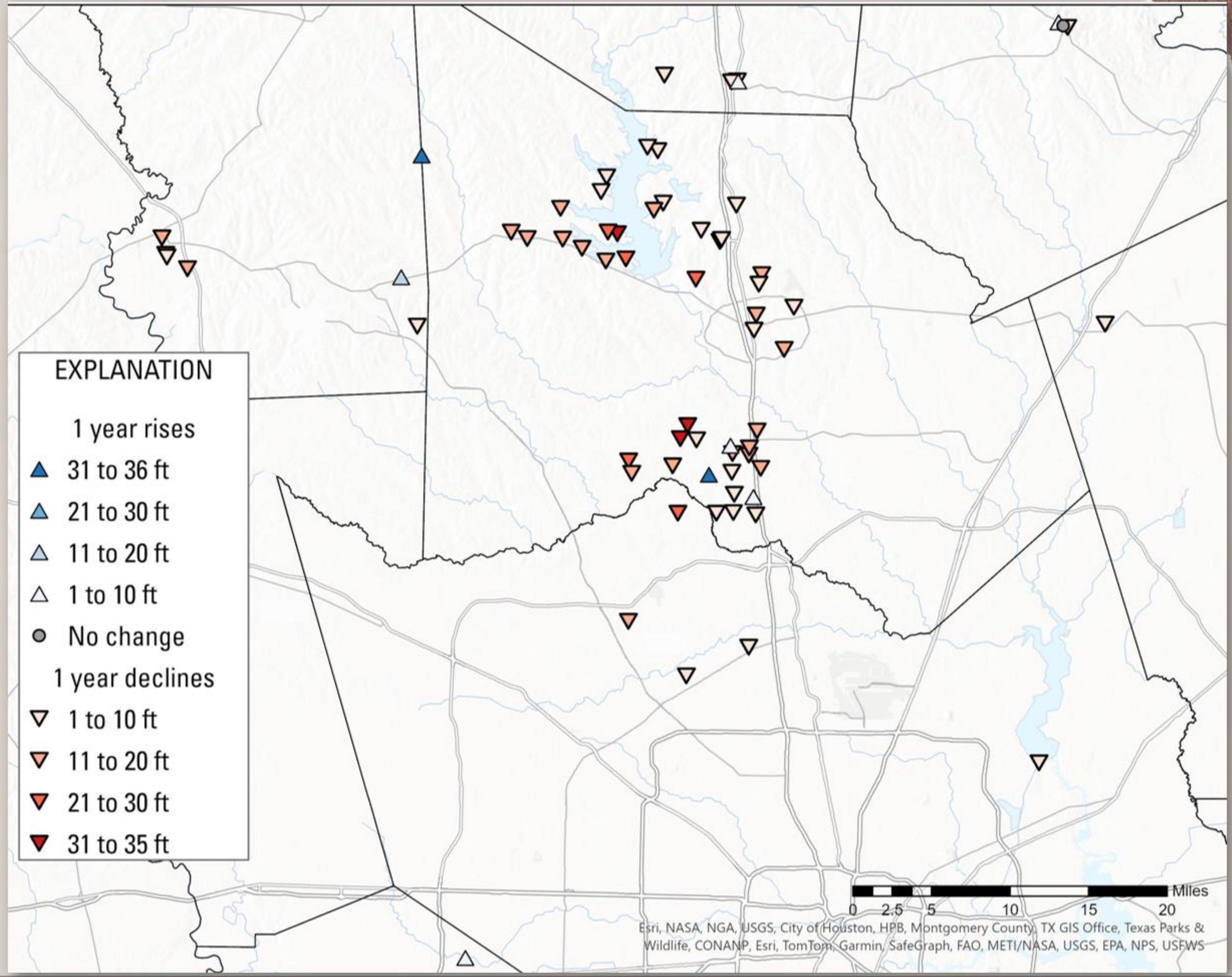
2023 to 2024 Water-Level Change

Jasper

- 67 water-level pairs
  - Mostly declines (~88%)
    - About 75% were between 1 and 20 feet of decline
  - Largest declines (>30 ft):
    - 2 in south-central Montgomery County
    - 1 in central Montgomery County
  - Largest rises (> 30 ft):
    - 1 in west-central Montgomery County
    - 1 in south-central Montgomery County



USGS science for a changing world

2023 to 2024 Water-Level Change

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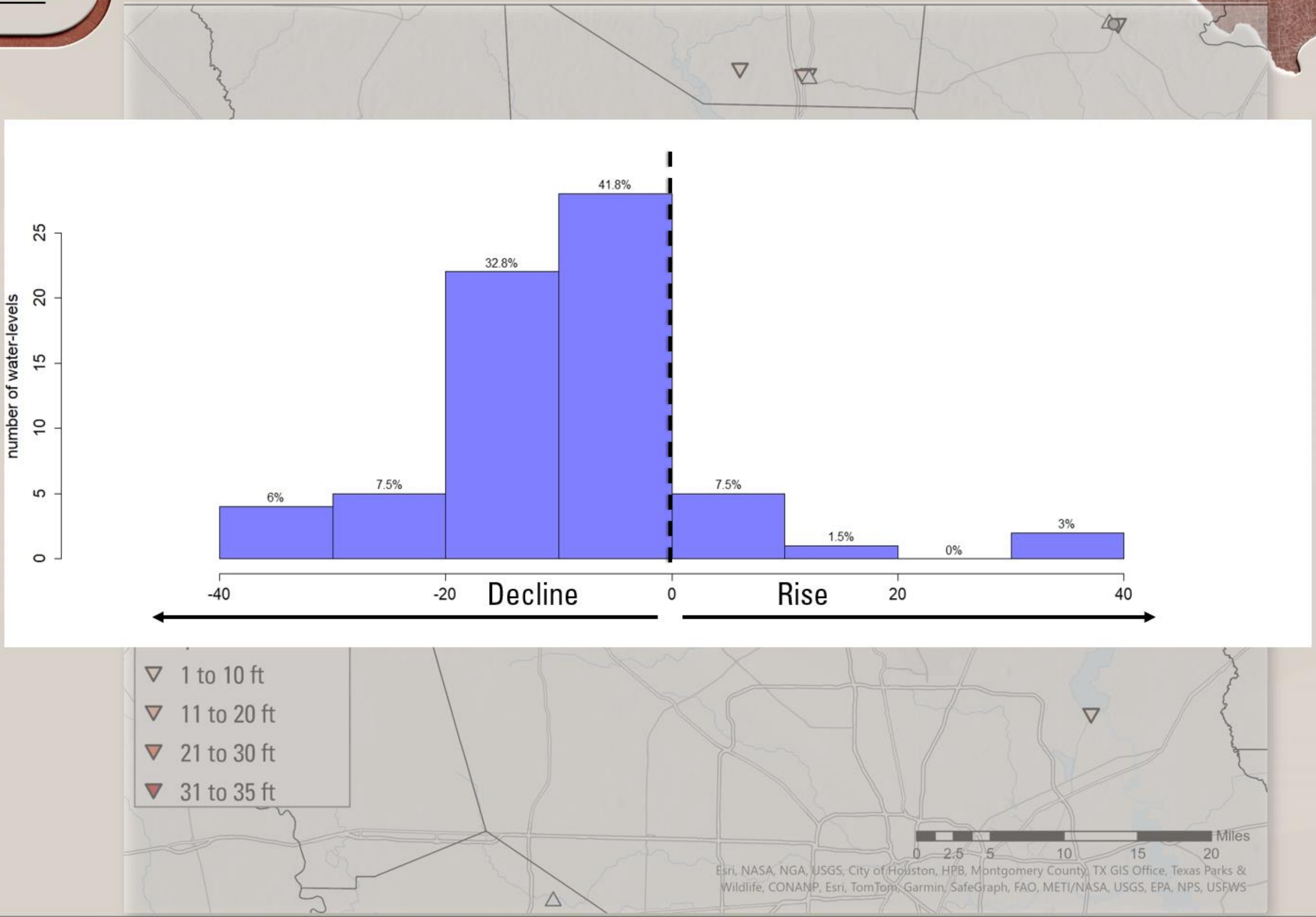
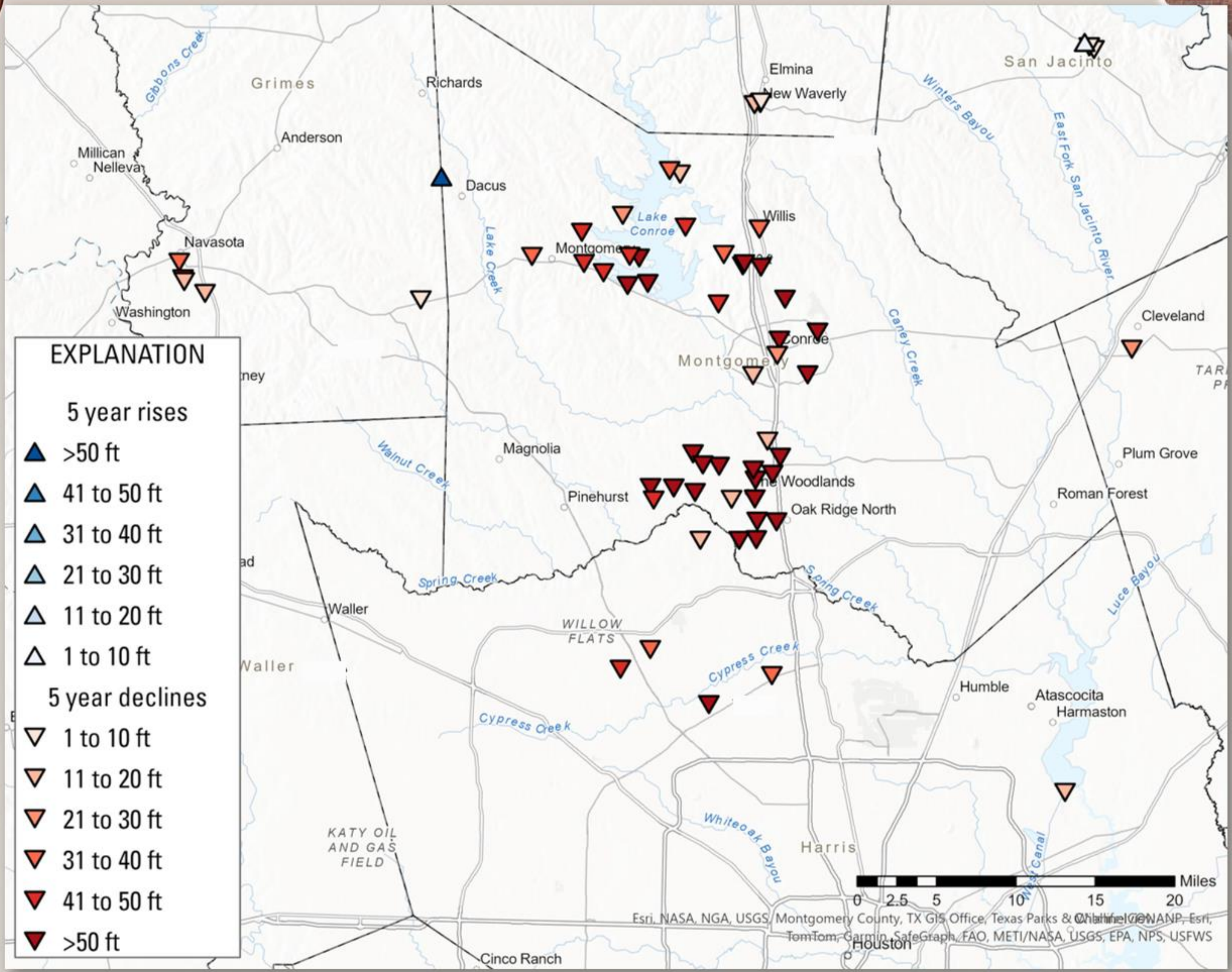


2019 to 2024 Water-Level Change

Jasper

- 62 water-level pairs
  - Mostly declines
    - Only 2 rises
  - Declines >50 ft across much of central and southern Montgomery County



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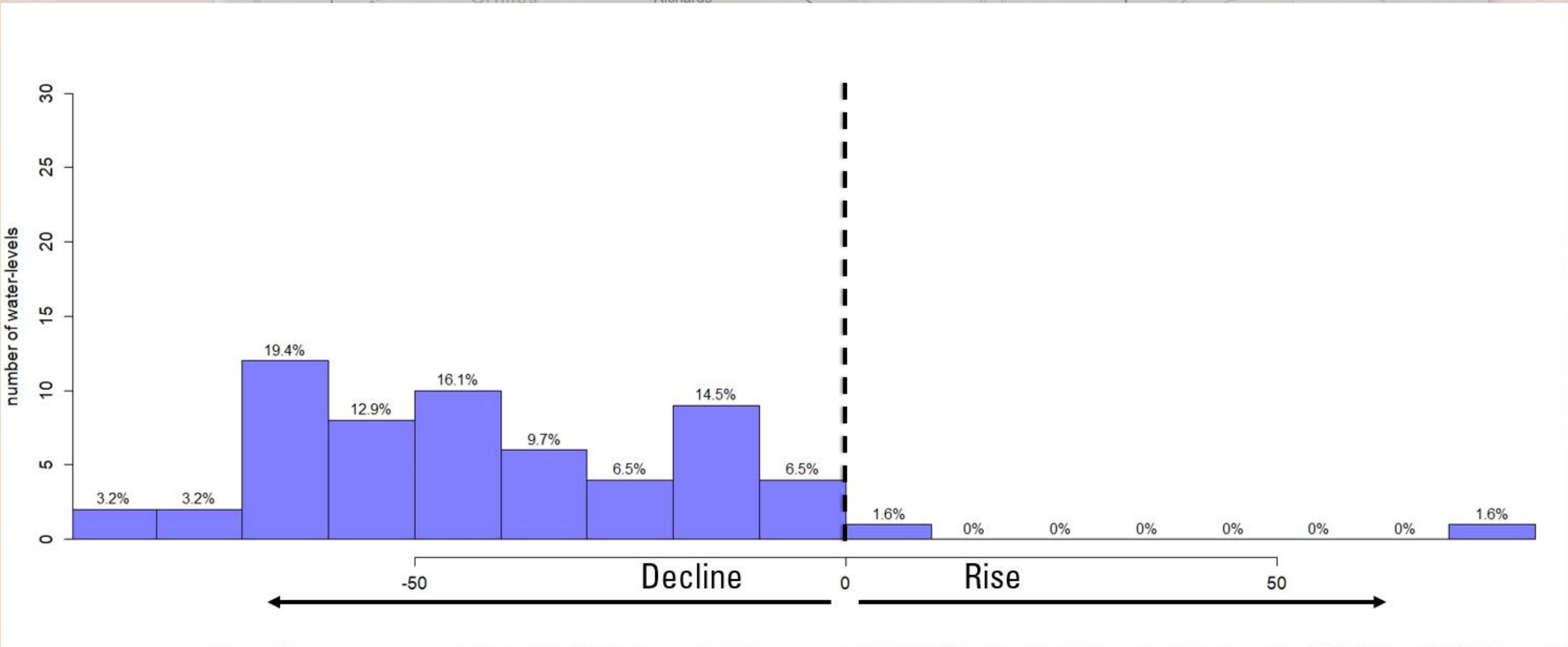
science for a changing world

2019 to 2024 Water-Level Change

Jasper

- 62 water-level pairs
  - Mostly declines
    - Only 2 rises
  - Declines >50 ft across much of central and southern Montgomery County



Long term change

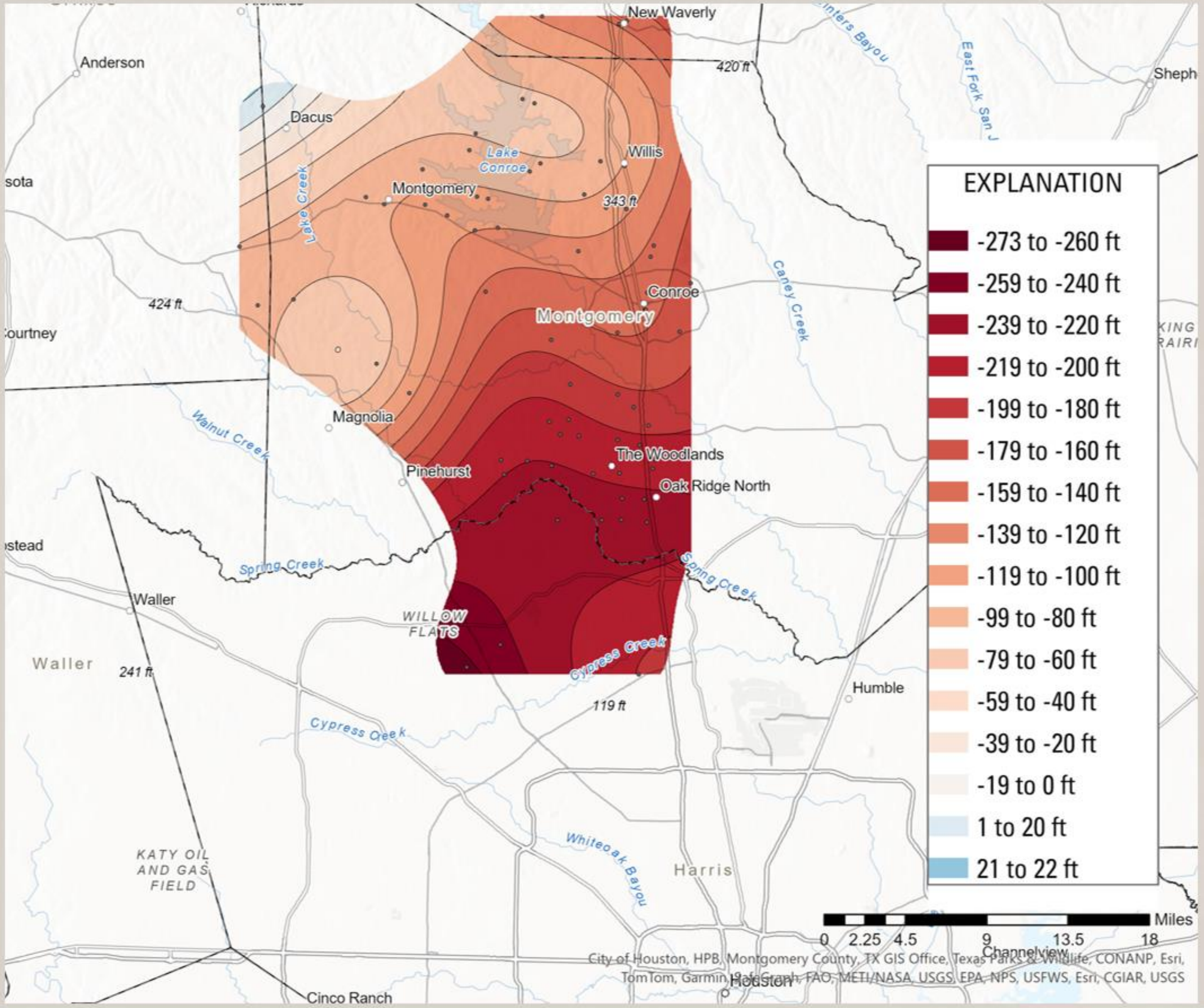
Water-level rises (blues):

- slight rises in northwestern Montgomery County and small portion of Grimes County

Water-level declines (reds):

- Most of Montgomery County – declines increasing in general down-dip direction into northern Harris County

Jasper Water-Level Change 2000 to 2024



USGS science for a changing world

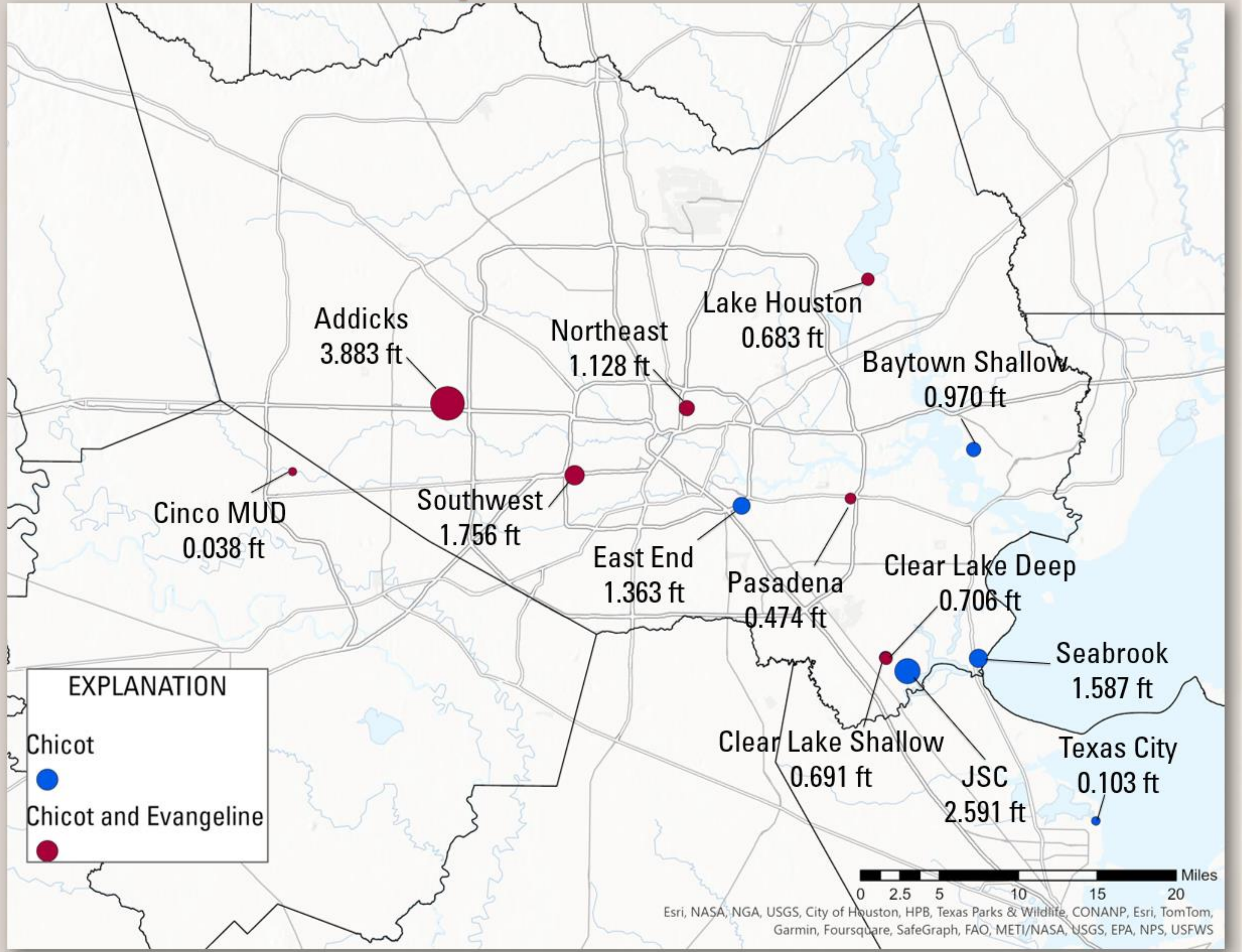
Compaction Interval:
Chicot

1. 1973 | Baytown Shallow 0.970 ft.
2. 1973 | East End 1.363 ft.
3. 1973 | Johnson Space Center 2.591 ft.
4. 1973 | Seabrook 1.587 ft.
5. 1973 | Texas City 0.103 ft.
6. 1976 | Clear Lake Shallow 0.691 ft.

Compaction Interval:
Chicot and Evangeline

7. 1973 | Baytown Deep --- ft.
8. 1974 | Addicks 3.883 ft.
9. 1974 | Pasadena 0.474 ft.
10. 1976 | Clear Lake Deep 0.706 ft.
11. 1980 | Lake Houston 0.683 ft.
12. 1980 | Northeast 1.128 ft.
13. 1980 | Southwest 1.756 ft.
14. 2017 | Cinco MUD 0.038 ft.

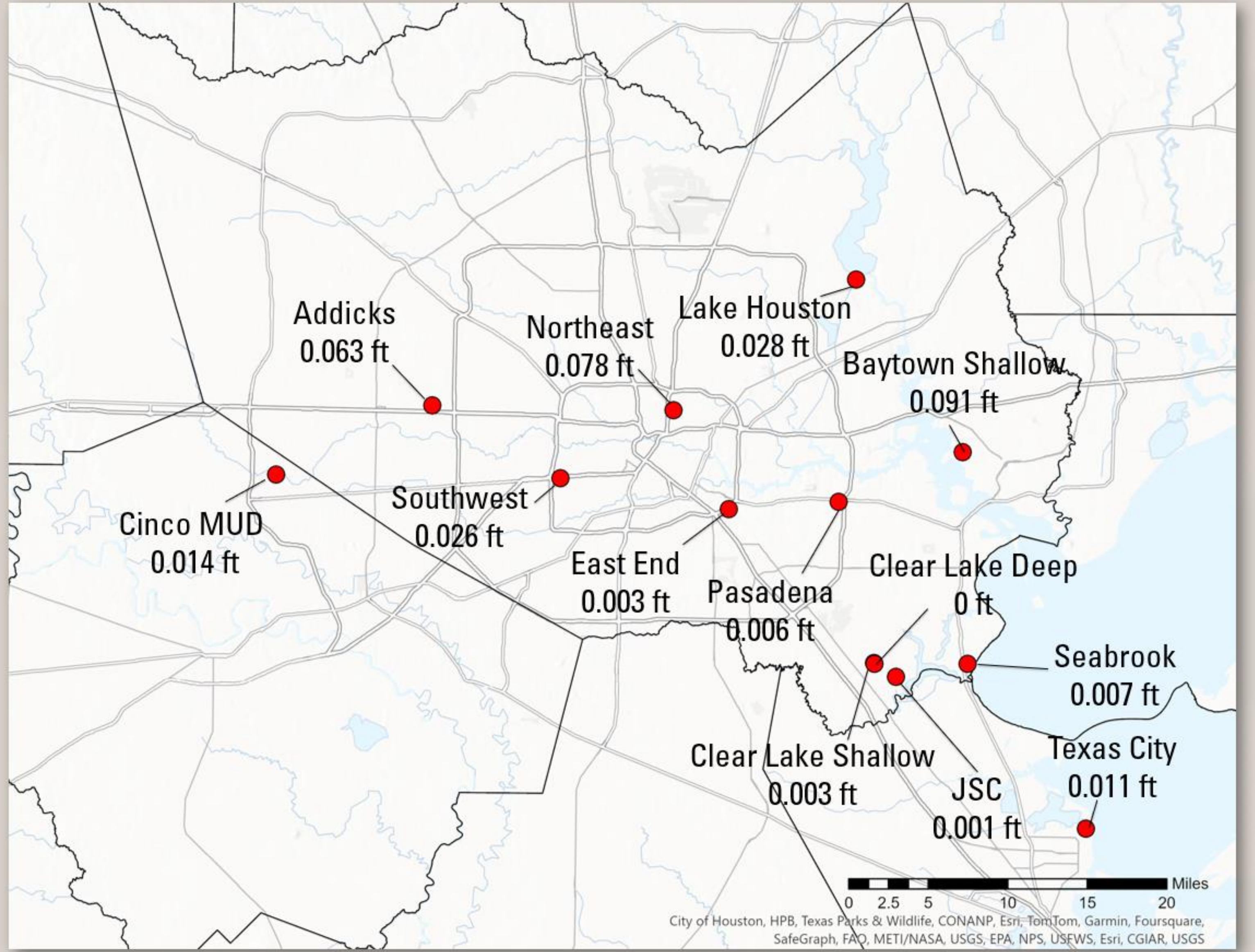
Compaction 1973 - 2023



2023 Compaction Summary

- No sites recorded expansion for the period
- Compaction ranged from 0.000 ft to 0.078 ft

Compaction December 2022 to December 2023

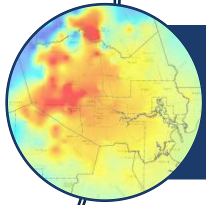


USGS science for a changing world

Agenda

Climate

Water Use



Groundwater Levels

Subsidence

Subsidence Monitoring

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

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

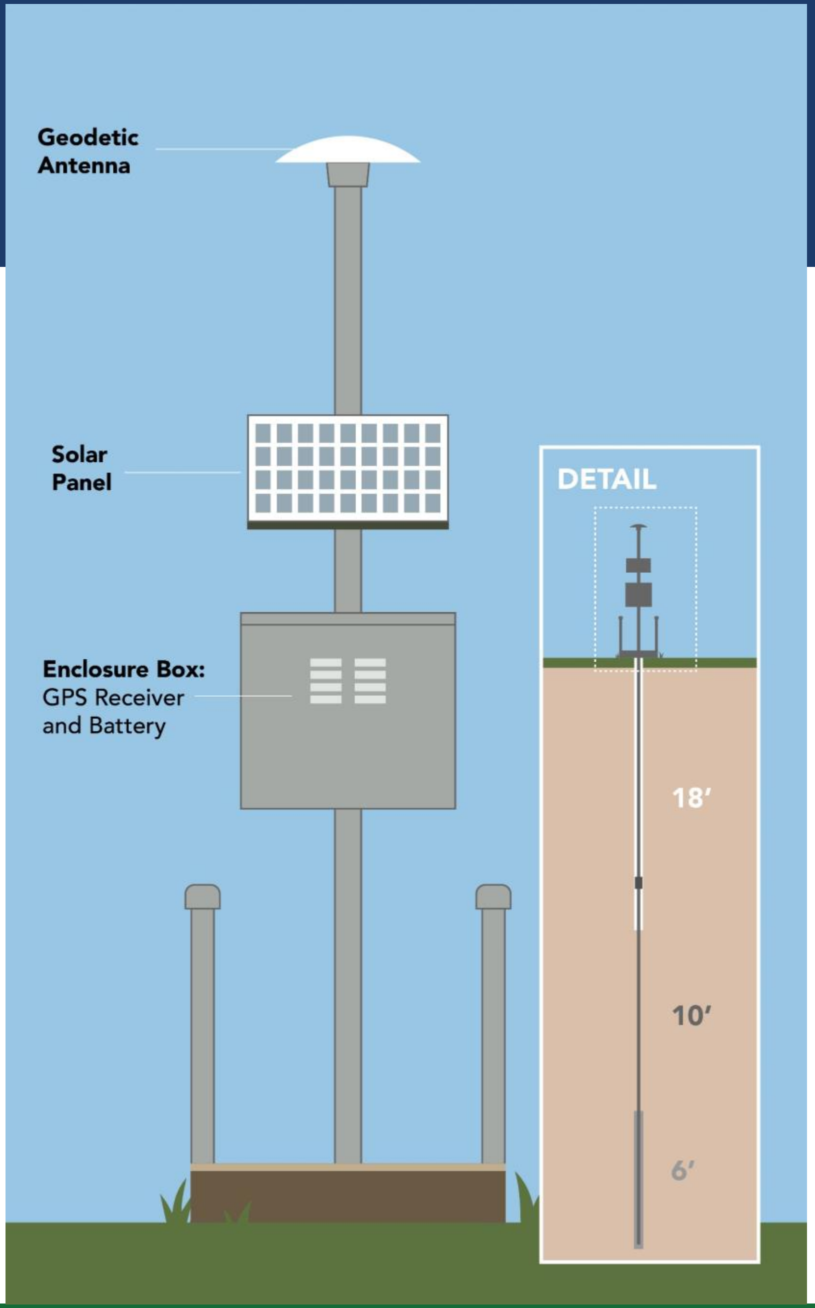


Exhibit 10 | Subsidence Monitoring Network

Location and operator of GPS stations that monitor land surface deformation periodically or continuously within southeast Texas in 2023.

EXPLANATION

- HGSD Jurisdiction
- Harris-Galveston Subsidence District
- Fort Bend Subsidence District
- University of Houston
- Texas Department of Transportation
- Brazoria County Groundwater Conservation District
- Lone Star Groundwater Conservation District
- Other Operators

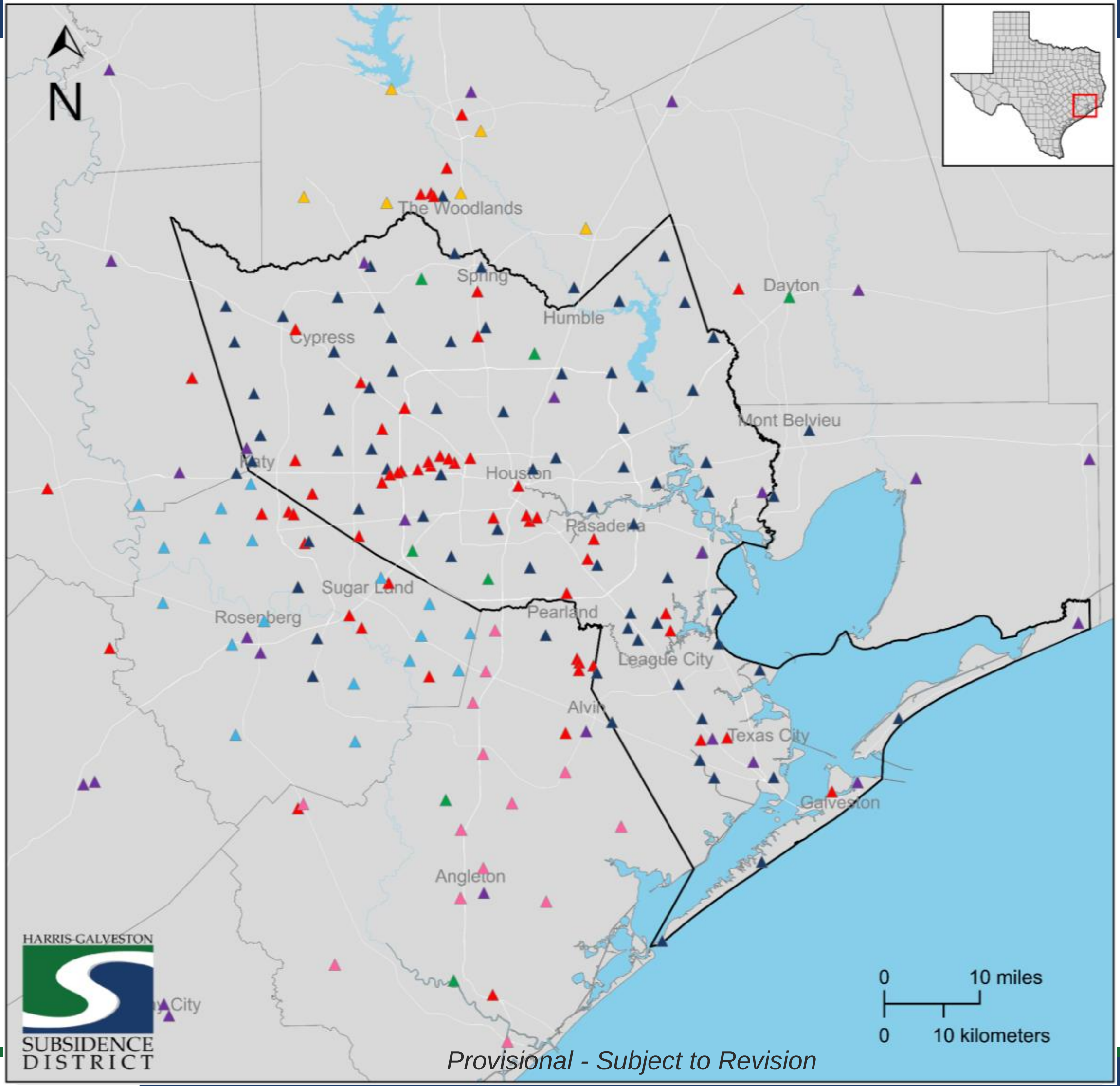


Exhibit 11 | Subsidence Rates

Annual subsidence rate, in centimeters per year (cm/yr.), estimated from GPS data collected at active stations with three or more years of data averaged from 2019 to 2023.

EXPLANATION

Average Annual Subsidence Rate (cm/yr.) Estimated from GPS Data Collected from Active Stations from 2019 to 2023

- Greater than 2.0
- 1.5 - 2.0
- 1.0 - 1.5
- 0.5 - 1.0
- Less than 0.5

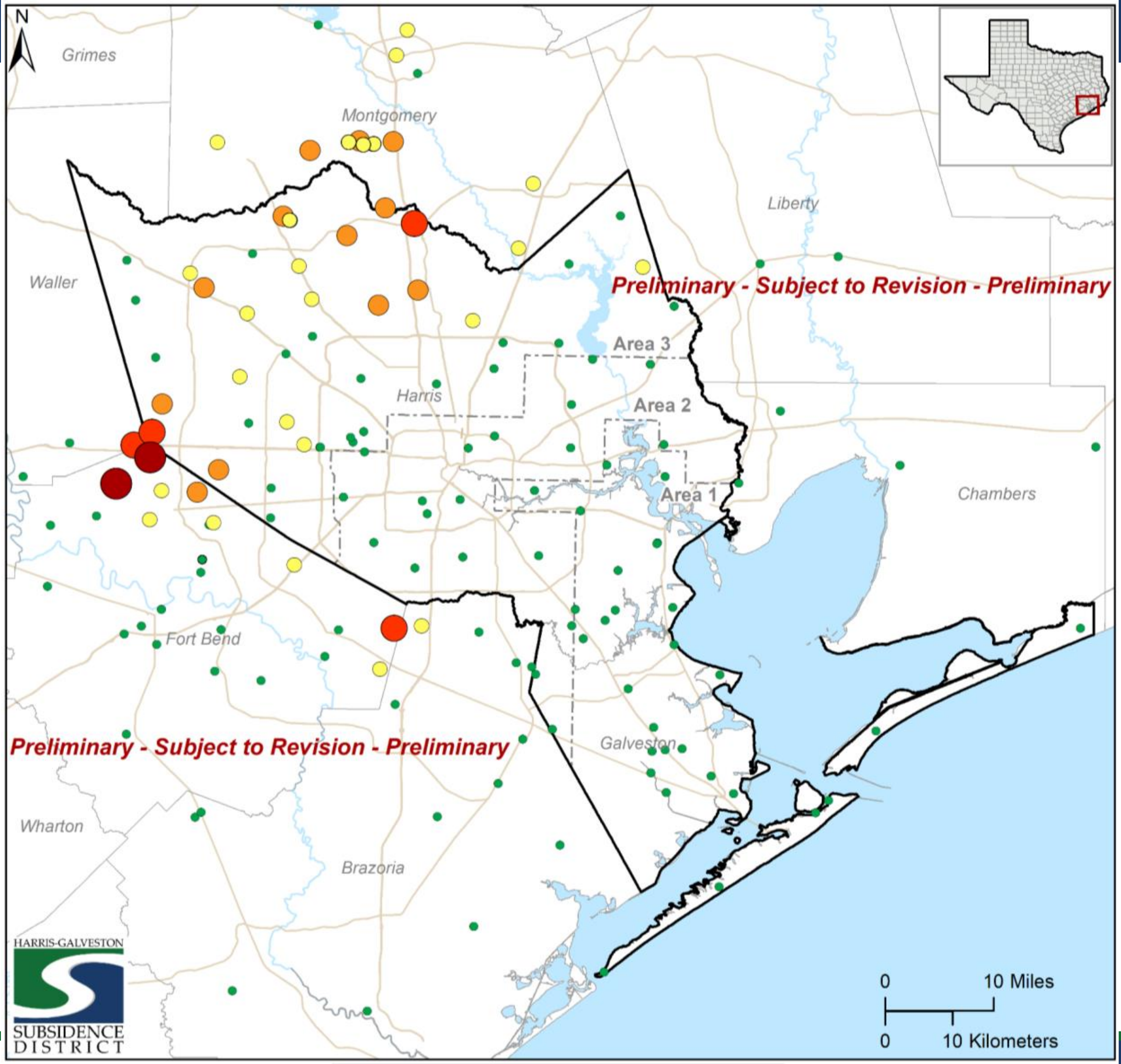
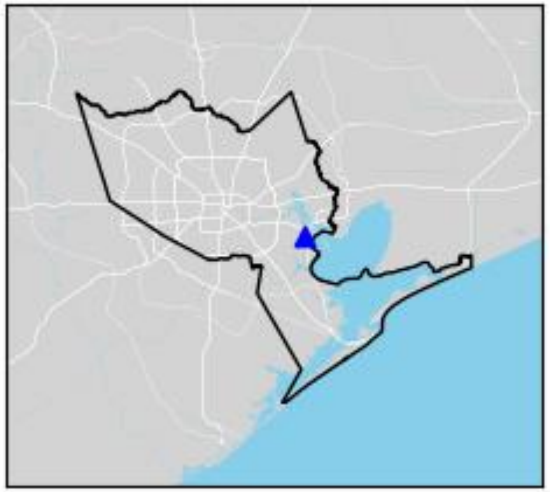
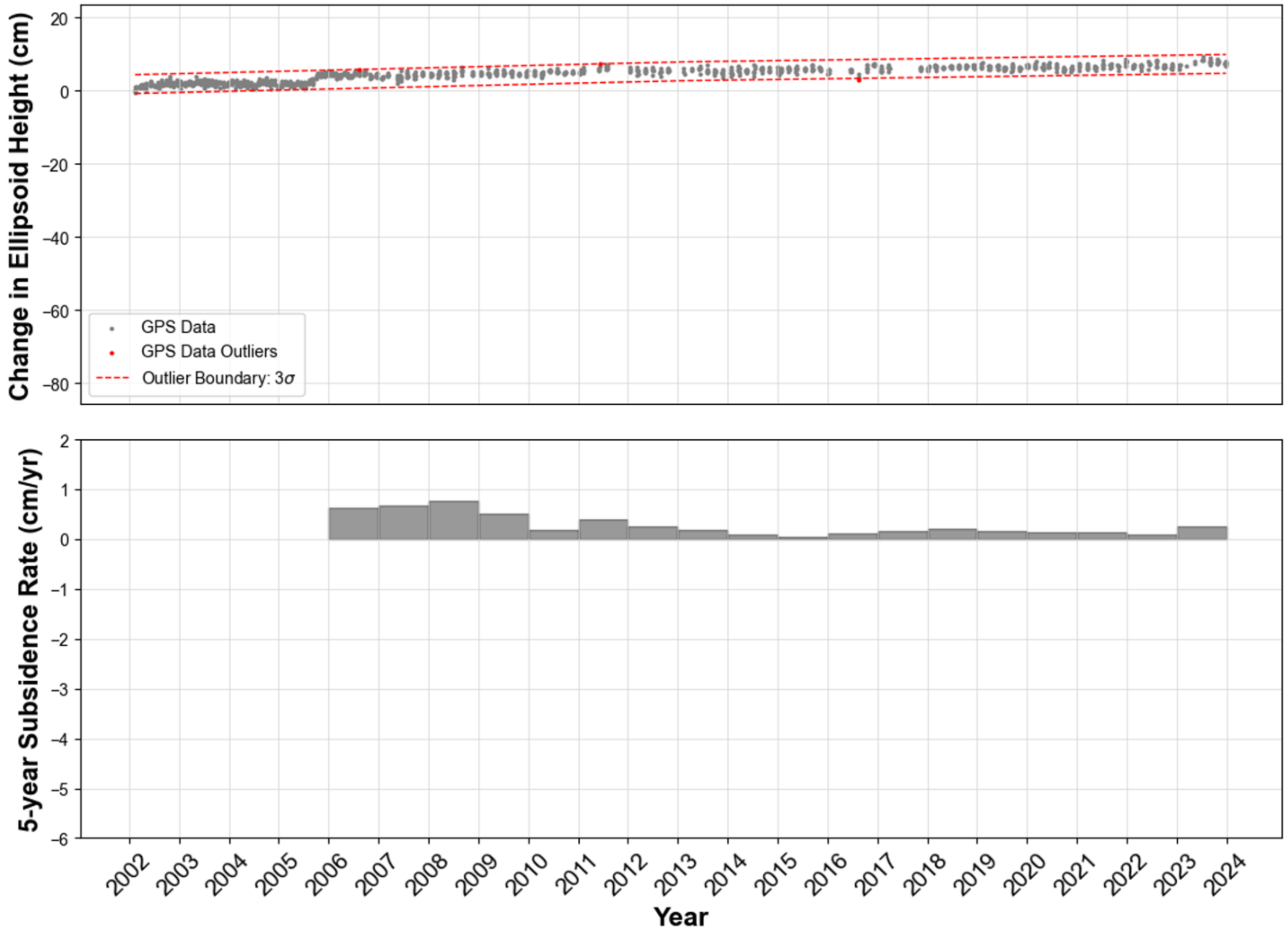


Exhibit 12 | Subsidence Data in La Porte

GPS station P024, located in La Porte, has measured a total of about 7 cm of uplift since 2002.

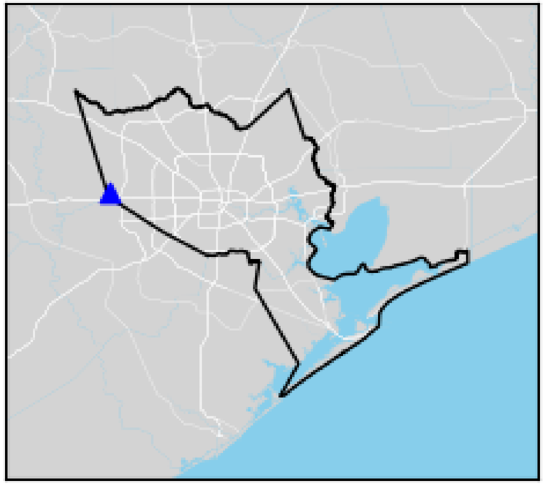


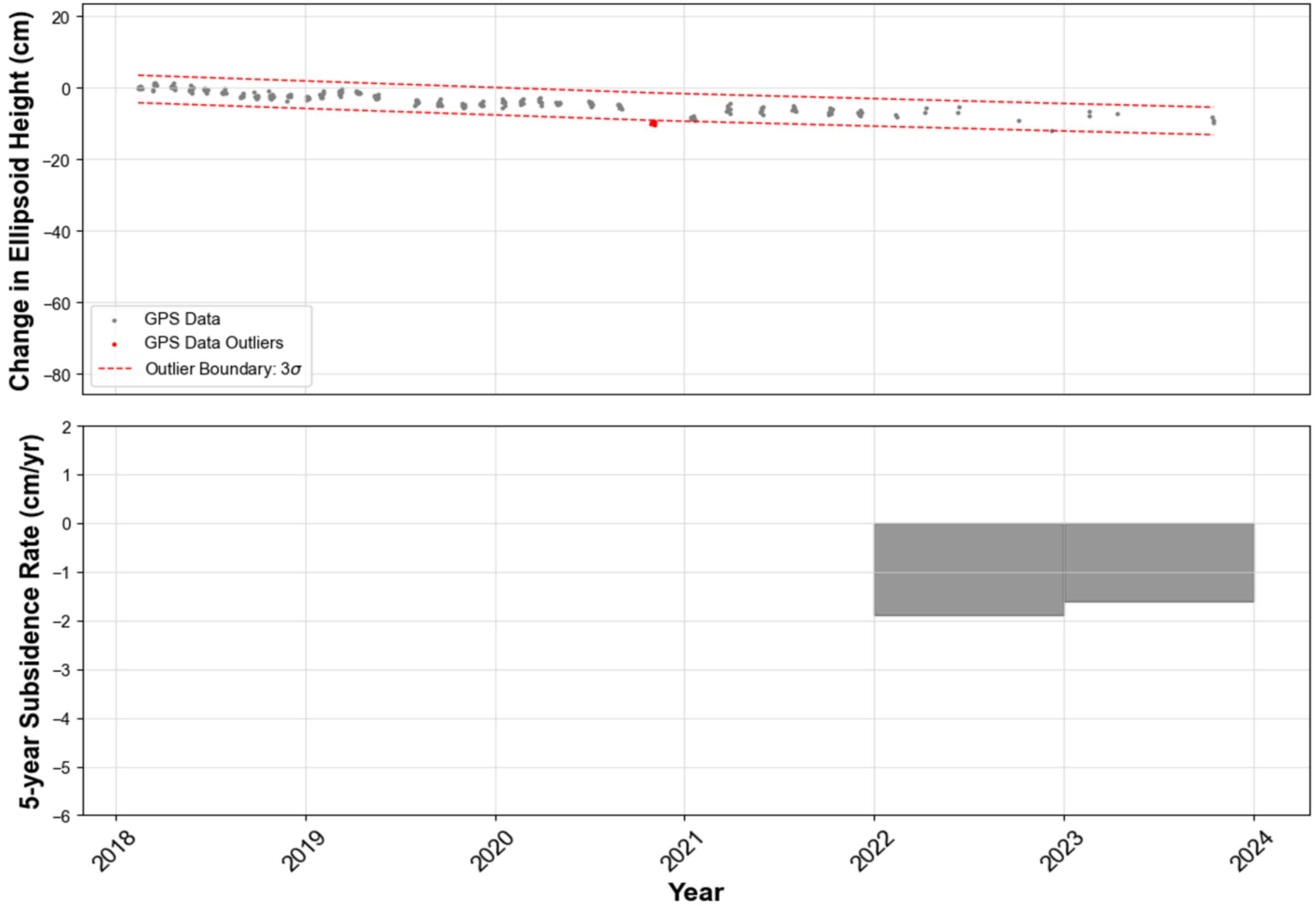


Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown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

Exhibit 13 | Subsidence Data in Katy

GPS station P098, located in Katy, has measured a total of about 8.7 cm of subsidence since 2018.





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.

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 2023 Annual Groundwater Report

- Record will be open until **May 3, 2024**. You may provide comments by sending an email to **info@subsidence.org**.
- The 2023 Annual Groundwater Report will be presented to the Harris-Galveston Subsidence District Board of Directors on **May 8, 2024**.
- The 2023 Annual Groundwater Report will be posted on HGSD’s website at **www.hgsubsidence.org** upon approval from HGSD’s Board of Directors.

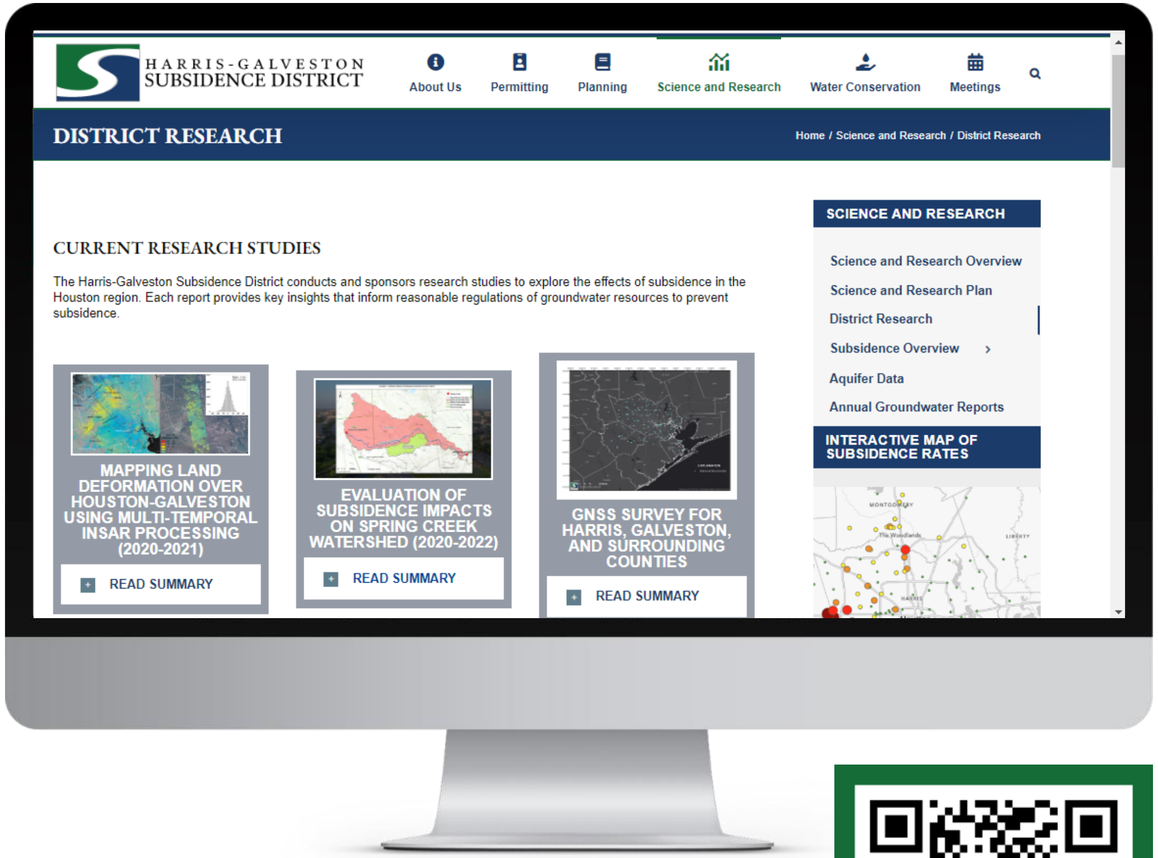
Additional HGSD Research & Publications

Subsidence Monitoring

- InSAR
- Benchmark Surveys
- GPS Data Processing

Subsidence Impacts

- Aquifer Storage and Recovery Assessment
- Brackish Groundwater Investigations



HARRIS-GALVESTON
SUBSIDENCE DISTRICT

Contact Information

Connect with us!

(281) 486-1105

info@subsidence.org

www.hgsubsidence.org

1660 W. Bay Area Blvd.
Friendswood, TX 77546

Appendix B – 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 (i.e., subsidence rate) from 2019 to 2023. A period of record time-series plot and a five-year subsidence rate graph are 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	29.791	-95.586	1993.520	2023.999	30.479	9124	-2.6	-0.08
ALEF	29.692	-95.635	2014.259	2023.674	9.416	3421	-6.6	-0.47
AULT	29.998	-95.745	2015.557	2023.395	7.838	2795	-8.7	-1.10
CFHS	29.919	-95.632	2015.595	2023.674	8.079	2884	-12.5	-1.08
CFJV	29.882	-95.556	2015.773	2023.674	7.901	2869	-7.9	-0.74
CMFB	29.681	-95.729	2014.409	2023.674	9.265	3339	-5.8	-0.43
COH2	29.629	-95.412	2009.005	2023.058	14.053	4441	-3.3	0.18
COH6	30.040	-95.185	2004.249	2023.777	19.528	3259	-9.3	-0.31
COTM	29.394	-94.998	2015.097	2023.674	8.578	2864	-1.4	-0.01
CSTE	29.796	-95.511	2015.387	2023.450	8.063	2942	-3.5	-0.19
DISD	29.289	-95.740	2015.480	2023.524	8.044	2778	1.7	0.27
DMFB	29.623	-95.584	2014.771	2023.672	8.901	3239	-5.6	-0.24
DWI1	29.014	-95.404	2009.399	2023.529	14.130	4765	-1.5	0.11
FSFB	29.556	-95.630	2014.371	2023.674	9.303	3252	-2.3	-0.31
GSEC	30.197	-95.528	2015.756	2024.033	8.277	2588	-6.2	-0.91
HCC1	29.788	-95.561	2012.914	2023.674	10.760	3905	-7.6	-0.44
HPEK	29.755	-95.716	2014.396	2023.636	9.240	2237	-13.7	-1.44
HSMN	29.800	-95.470	2013.298	2023.672	10.374	3762	-4.3	-0.16
JGS2	30.045	-94.891	2012.463	2023.529	11.066	3750	0.5	0.34
KKES	29.850	-95.595	2015.598	2023.395	7.797	2428	-9.4	-1.09
KPCD	29.926	-95.924	2016.441	2023.996	7.556	2760	-3.3	-0.22
KPCS	29.926	-95.924	2016.441	2023.646	7.205	2176	-2.6	-0.15
LCBR	30.182	-96.602	2010.538	2023.529	12.991	3075	-1.1	-0.04
LGC1	30.045	-94.075	2013.531	2024.033	10.502	3258	0.5	0.04
LKHU	29.913	-95.146	1994.731	2023.999	29.268	9870	1.2	0.15
MDWD	29.771	-95.595	2013.303	2023.672	10.368	3722	-8.3	-0.54
MEPD	29.658	-95.240	2014.040	2023.672	9.632	3404	1.6	0.23
MRHK	29.804	-95.745	2014.396	2023.672	9.276	3266	-16.8	-1.65
N301	29.311	-94.792	2018.530	2024.071	5.541	1930	-0.4	0.15
NASA	29.552	-95.096	2014.201	2023.069	8.868	3016	0.4	0.17
NETP	29.791	-95.334	1993.517	2023.999	30.482	8782	-0.3	-0.08
OKEK	29.725	-95.803	2014.576	2023.395	8.819	3149	-7.2	-0.92
P100	29.934	-95.198	2019.309	2023.813	4.504	283	-0.8	-0.06
P101	28.945	-95.378	2019.717	2023.276	3.559	88	-0.7	-0.10
P103	29.151	-95.311	2019.712	2023.279	3.567	94	-0.7	-0.27
P106	29.552	-95.400	2019.695	2023.832	4.137	127	-2.0	-0.58
P108	29.772	-95.121	2021.244	2023.966	2.723	158	-0.9	-0.19
P109	29.986	-95.022	2021.148	2023.890	2.742	157	2.3	1.43
P110	29.548	-95.442	2021.189	2023.851	2.663	104	-4.6	-1.92
P111	29.733	-95.873	2021.285	2023.950	2.665	100	-8.2	-3.18
P112	29.201	-95.420	2022.361	2023.142	0.781	11	-0.0	9999.00
P113	29.388	-95.642	2023.337	2023.813	0.476	23	-0.1	9999.00
P114	29.592	-95.513	2023.411	2023.871	0.460	24	-0.8	9999.00
P000	29.539	-95.152	1996.003	2023.890	27.887	1765	-1.3	-0.01
P001	29.912	-95.617	1994.164	2023.547	29.383	2253	-72.2	-0.15
P002	30.001	-95.416	1994.318	2023.986	29.668	2230	-67.0	-1.14
P003	29.821	-95.613	1994.328	2023.849	29.520	1773	-56.8	-0.61
P004	29.630	-95.597	1994.660	2023.909	29.249	2055	-31.3	-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.)
P005	29.791	-95.586	1996.698	2023.906	27.208	1793	-34.7	-0.61
P006	29.818	-95.672	2014.276	2023.849	9.572	459	-8.3	0.02
P007	29.936	-95.577	1999.115	2023.928	24.813	1593	-58.7	0.19
P008	29.980	-95.476	1999.610	2023.986	24.375	1486	-43.5	-1.14
P009	30.038	-95.071	1999.345	2023.903	24.559	1539	-4.8	-0.56
P010	29.566	-95.799	1999.266	2023.537	24.271	1736	-6.4	0.31
P011	30.032	-95.865	1999.345	2023.104	23.759	1571	-9.7	0.19
P012	30.060	-95.263	2000.895	2023.791	22.896	1490	-12.7	-0.99
P013	30.195	-95.490	2000.914	2023.999	23.085	1408	-27.5	-0.78
P014	29.474	-95.644	2000.879	2023.832	22.953	1282	-5.4	0.07
P016	29.544	-95.527	2000.860	2023.860	23.000	1335	-5.8	-0.09
P017	30.091	-95.615	2000.895	2023.909	23.014	1302	-37.6	-0.60
P018	29.965	-95.678	2000.862	2022.170	21.307	1286	-34.4	-0.74
P019	29.841	-95.805	2000.892	2023.999	23.107	1267	-22.2	-1.23
P020	29.533	-95.013	2002.047	2023.944	21.898	1313	1.9	0.44
P021	29.545	-95.312	2002.082	2023.871	21.788	1231	0.3	0.47
P022	29.335	-95.021	2002.041	2023.931	21.890	1259	-4.6	0.05
P023	29.335	-94.918	2002.060	2023.931	21.871	1344	1.7	0.26
P024	29.669	-95.041	2002.118	2023.988	21.871	1288	7.0	0.27
P026	29.210	-94.938	2002.194	2023.999	21.805	3115	-0.7	0.10
P027	29.583	-95.016	2002.367	2023.966	21.600	1278	-4.5	0.10
P028	29.751	-94.918	2002.194	2023.988	21.794	1273	1.1	0.08
P029	29.769	-95.822	2007.320	2023.931	16.610	737	-28.0	-2.03
P030	29.689	-95.902	2007.350	2023.950	16.600	736	-7.6	-0.43
P031	29.398	-95.848	2007.350	2023.813	16.463	725	3.1	0.40
P032	29.541	-95.707	2007.350	2023.786	16.435	744	-0.8	0.10
P033	29.490	-95.224	2006.323	2023.871	17.548	926	-1.9	-0.09
P034	29.422	-95.042	2010.356	2023.988	13.632	4594	-3.6	0.32
P035	29.473	-95.082	2006.621	2023.887	17.266	782	3.9	0.37
P036	29.494	-94.942	2006.966	2023.947	16.981	807	0.0	0.71
P037	29.631	-95.101	2007.383	2023.966	16.583	669	2.8	0.54
P038	29.649	-95.223	2007.356	2023.999	16.643	849	4.4	0.19
P039	29.645	-95.339	2011.093	2023.999	12.906	641	-1.0	-0.02
P040	29.493	-95.462	2007.353	2023.851	16.498	680	-9.8	-0.50
P041	29.662	-95.476	2007.337	2023.928	16.591	843	-10.8	-0.29
P042	29.732	-95.635	2007.331	2023.906	16.575	792	-11.0	-0.11
P043	29.093	-95.111	2006.545	2023.999	17.454	2949	-1.0	0.03
P044	29.880	-95.687	2007.320	2023.871	16.550	775	-20.1	-0.62
P045	29.876	-95.385	2007.331	2023.964	16.633	834	-5.5	-0.23
P046	30.030	-95.600	2007.323	2023.884	16.561	787	-24.8	-0.76
P047	30.090	-95.424	2007.339	2023.999	16.660	799	-30.5	-1.83
P048	30.045	-95.672	2007.320	2023.914	16.594	765	-16.8	-0.32
P049	29.422	-94.702	2006.279	2023.999	17.720	2434	-2.4	-0.32
P050	29.848	-94.856	2006.835	2023.988	17.153	874	-2.1	-0.15
P051	29.933	-95.284	2007.339	2023.813	16.474	812	-10.0	-0.49
P052	29.852	-95.177	2007.339	2023.966	16.627	798	-1.4	-0.04
P053	29.908	-95.057	2007.339	2023.756	16.416	757	-3.9	-0.27
P054	29.801	-95.034	2006.816	2023.871	17.055	870	-0.9	-0.10

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.)
P055	29.794	-95.177	2006.799	2023.944	17.145	823	2.7	0.02
P056	29.903	-95.817	2007.320	2023.964	16.643	683	-6.6	0.27
P057	29.684	-95.722	2009.137	2023.890	14.753	629	-7.5	-0.51
P058	29.485	-95.715	2010.591	2023.794	13.203	596	-2.8	-0.02
P059	29.617	-95.740	2010.572	2023.756	13.183	592	-3.1	-0.13
P060	29.686	-95.820	2012.071	2023.931	11.860	487	-8.8	-0.58
P061	29.675	-95.972	2011.129	2023.966	12.838	582	-4.3	0.07
P062	29.593	-95.974	2011.126	2023.999	12.873	533	-4.7	-0.06
P063	29.508	-95.547	2011.432	2023.832	12.400	557	-2.2	0.11
P065	30.106	-95.107	2012.432	2023.909	11.476	559	-6.4	0.19
P066	30.017	-95.767	2011.167	2023.944	12.777	593	-15.0	-0.59
P067	29.532	-95.855	2011.109	2023.999	12.890	564	-3.3	0.07
P068	30.185	-95.587	2011.799	2023.999	12.200	729	-13.7	-1.19
P069	30.199	-95.459	2011.747	2023.909	12.161	736	-14.2	-1.09
P070	30.291	-95.424	2011.761	2023.947	12.186	683	-6.1	-0.09
P071	30.353	-95.579	2011.780	2023.966	12.186	760	-5.7	-0.37
P072	30.147	-95.242	2011.994	2023.808	11.814	568	-9.3	-0.64
P073	30.193	-95.730	2012.052	2023.988	11.936	747	-10.5	-0.79
P074	29.736	-95.231	2011.972	2023.944	11.973	565	3.1	0.42
P075	29.758	-95.031	2012.432	2023.871	11.438	587	-0.1	0.37
P076	29.361	-95.045	2012.643	2023.909	11.266	535	-5.3	-0.27
P077	29.979	-95.850	2013.197	2023.966	10.769	465	-2.3	0.34
P078	29.739	-96.016	2014.331	2023.966	9.635	452	-3.3	-0.03
P079	29.035	-95.471	2014.827	2023.999	9.172	2616	-1.6	-0.16
P080	29.578	-95.165	2014.862	2023.999	9.137	3177	0.4	0.22
P081	29.556	-95.170	2014.854	2023.999	9.145	3145	-0.8	0.02
P082	29.296	-95.731	2016.109	2023.813	7.704	277	1.1	0.18
P083	29.262	-95.182	2016.014	2023.854	7.841	241	-1.8	0.01
P084	29.297	-95.370	2016.052	2022.698	6.646	304	3.7	0.90
P085	29.343	-95.278	2016.033	2023.871	7.838	271	0.6	-0.03
P087	29.058	-95.677	2016.090	2023.931	7.840	264	-1.0	-0.06
P088	29.446	-95.438	2016.131	2023.846	7.715	261	-3.3	-0.45
P089	29.566	-95.799	2015.766	2023.756	7.989	338	-0.5	0.04
P090	29.710	-95.160	2015.975	2023.988	8.014	500	1.8	0.09
P091	29.783	-95.493	2016.320	2023.887	7.567	486	-4.0	0.12
P092	29.881	-95.501	2016.320	2023.887	7.567	454	-5.4	-0.28
P093	29.417	-95.197	2017.238	2023.909	6.671	355	-0.7	0.48
P094	29.722	-95.524	2017.298	2023.928	6.630	417	-3.0	-0.10
P095	29.808	-95.294	2017.200	2023.964	6.764	438	-0.7	0.10
P096	29.724	-95.748	2017.553	2023.999	6.446	2191	-3.0	-1.33
P097	29.785	-95.847	2018.104	2023.638	5.534	341	-9.4	-1.56
P098	29.803	-95.820	2018.120	2023.999	5.879	341	-8.7	-1.77
P099	29.986	-95.579	2018.140	2023.873	5.734	330	-1.9	-0.68
PWES	30.199	-95.511	2015.220	2024.033	8.813	3031	-11.5	-1.31
RDCT	29.810	-95.495	2013.563	2023.655	10.092	3345	-3.3	-0.21
ROD1	30.072	-95.527	2007.003	2024.071	17.068	5910	-21.0	-1.08
RPFB	29.484	-95.514	2014.773	2023.658	8.884	3145	-1.0	-0.01
SANJ	30.507	-95.289	2022.419	2023.964	1.545	379	-1.2	9999.00

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.)
SESG	29.987	-95.430	2014.678	2023.666	8.988	3152	-8.7	-0.94
SHSG	30.054	-95.430	2014.721	2023.658	8.936	3163	-11.1	-1.42
SISD	29.762	-96.174	2015.176	2023.116	7.940	2810	-0.6	0.04
SPBH	29.802	-95.515	2013.303	2023.655	10.352	3682	-5.2	-0.29
TDAM	29.314	-94.817	2013.435	2023.658	10.223	3364	-2.0	0.06
THSU	29.714	-95.340	2012.953	2023.658	10.705	3514	0.8	0.22
TMCC	29.702	-95.395	2003.271	2023.835	20.564	5225	-2.5	0.03
TXAC	29.778	-94.671	2011.124	2024.071	12.947	4669	2.2	0.55
TXAV	29.403	-95.242	2017.147	2023.526	6.379	1853	-1.0	-0.10
TXB1	30.161	-94.181	2013.191	2024.071	10.880	3653	1.0	0.27
TXB2	30.090	-94.192	2012.463	2023.529	11.066	3691	-9.9	-0.15
TXBC	29.000	-95.972	2009.405	2024.071	14.667	5286	-2.7	-0.06
TXBH	29.786	-95.946	2017.150	2023.504	6.354	2244	-2.2	-0.32
TXC5	29.704	-96.573	2017.213	2023.526	6.313	2261	0.0	0.04
TXCF	29.704	-96.573	2017.065	2023.381	6.316	2242	0.4	0.03
TXCK	31.323	-95.436	2012.022	2024.071	12.049	4328	1.1	0.15
TXCM	29.703	-96.577	2010.437	2024.071	13.635	4938	-0.3	0.08
TXCN	30.349	-95.441	2005.580	2024.071	18.491	6721	-19.9	-0.78
TXCY	30.096	-95.626	2017.391	2023.526	6.136	2072	-6.6	-1.08
TXED	28.968	-96.634	2009.429	2024.071	14.642	3701	-0.2	0.05
TXEX	29.564	-95.119	2010.881	2023.999	13.118	4278	3.4	0.24
TXGA	29.328	-94.773	2005.580	2024.071	18.491	6542	-3.6	-0.12
TXGN	31.061	-95.136	2012.022	2024.027	12.005	4043	0.7	0.27
TXH1	30.893	-96.602	2013.191	2024.071	10.880	3649	-0.1	0.19
TXH2	29.563	-94.391	2016.090	2023.504	7.414	2386	1.5	0.24
TXHE	30.099	-96.063	2005.580	2024.071	18.491	6719	-5.3	0.08
TXHP	31.334	-93.865	2012.022	2024.071	12.049	4331	4.7	0.46
TXKO	30.395	-94.332	2011.770	2024.071	12.301	4442	-0.0	0.16
TXLF	31.356	-94.718	2005.580	2024.071	18.491	6712	1.0	0.08
TXLI	30.056	-94.771	2005.580	2024.071	18.491	6673	1.1	0.13
TXLM	29.392	-95.024	2005.580	2024.071	18.491	6710	-5.6	-0.39
TXLQ	29.358	-94.953	2013.059	2023.526	10.467	3678	1.3	0.19
TXLV	30.745	-94.922	2011.778	2024.071	12.293	4460	-0.9	0.00
TXMD	30.960	-95.915	2010.584	2024.071	13.487	4581	1.7	0.18
TXMG	28.983	-95.964	2013.309	2023.526	10.218	3334	-1.6	-0.05
TXNE	30.848	-93.775	2013.191	2024.071	10.880	3557	-0.6	0.14
TXNV	30.382	-96.067	2012.463	2023.529	11.066	3949	-2.3	0.03
TXP5	29.668	-95.042	2019.181	2023.526	4.345	1448	1.7	0.25
TXPV	28.638	-96.619	2010.292	2024.071	13.780	4998	0.2	0.00
TXRN	29.543	-95.829	2015.206	2023.526	8.320	2992	-0.6	0.04
TXSP	29.731	-93.897	2016.454	2023.526	7.072	2304	1.2	0.28
TXTG	29.898	-95.297	2015.466	2023.529	8.063	2873	-1.8	-0.11
TXVA	28.835	-96.910	2005.092	2024.071	18.979	6751	1.5	-0.03
TXVC	28.834	-96.958	2015.310	2023.526	8.216	2955	1.1	0.31
TXWH	29.325	-96.112	2010.426	2024.071	13.646	4924	-1.3	0.37
TXWI	29.806	-94.371	2015.480	2023.529	8.049	2742	-0.4	0.09
TXWN	29.329	-96.092	2015.003	2023.526	8.523	3052	0.2	0.06
TXWO	30.782	-94.424	2013.191	2024.071	10.880	3432	-0.9	0.11

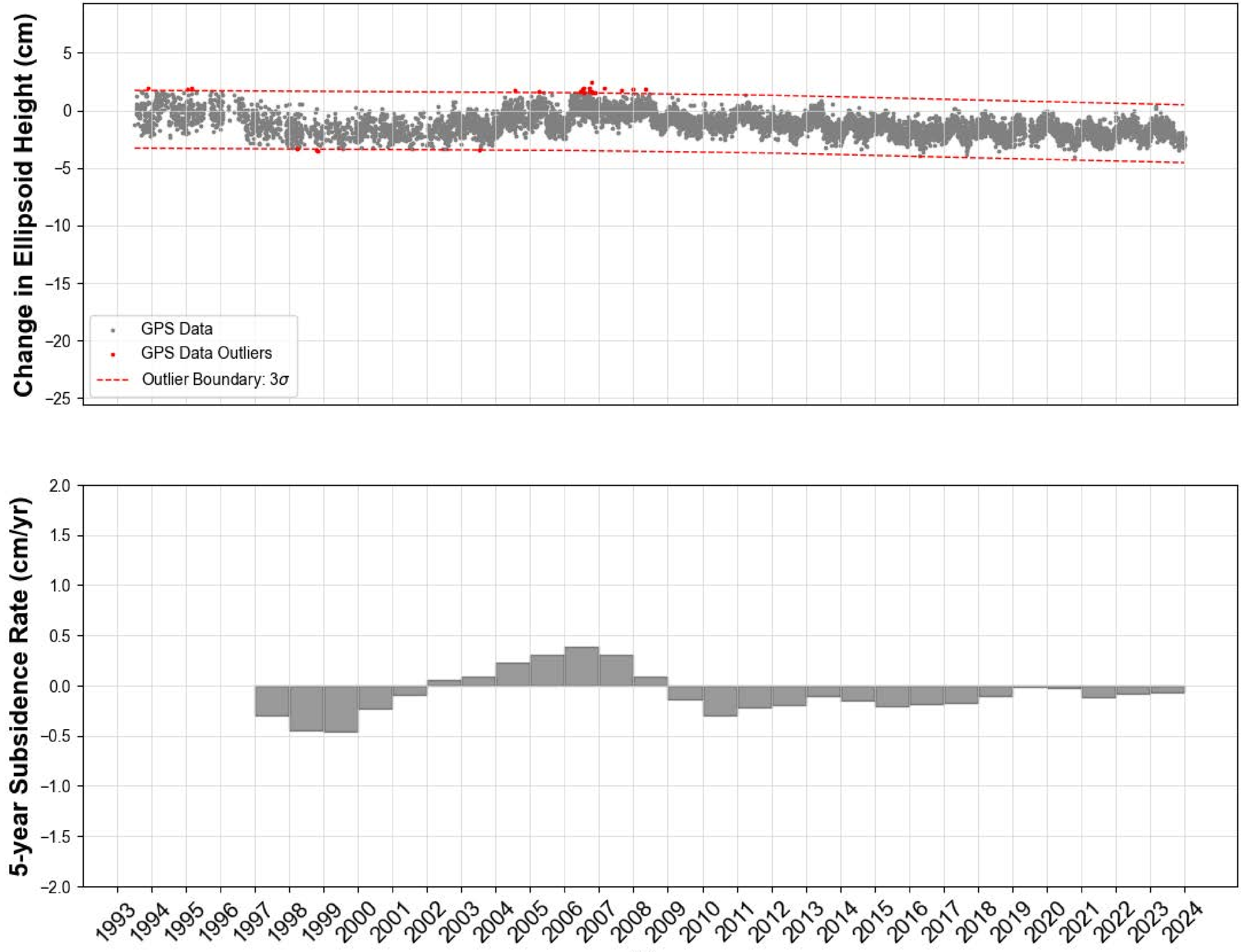
Site Name	Latitude (Decimal degrees)	Longitude (Decimal degrees)	Start of POR (Decimal year)	End of POR (Decimal Year)	Length of POR (Years)	Number of Samples (Days)	Total Vertical Displacement over POR (cm)	Annual Rate of Change in Ellipsoidal Height 2018-2022 (cm/yr.)
UH02	30.315	-95.457	2015.003	2023.381	8.378	2879	-5.0	-0.80
UHC1	29.390	-95.044	2014.137	2023.876	9.739	3453	-2.5	-0.06
UHC2	29.390	-95.044	2014.137	2023.881	9.745	3456	-2.7	-0.08
UHC3	29.390	-95.044	2014.137	2023.881	9.745	3344	-3.7	-0.15
UHC4	29.390	-95.044	2023.884	2024.068	0.184	71	1.8	9999.00
UHC5	29.390	-95.044	2023.786	2024.074	0.288	106	0.1	9999.00
UHCL	29.578	-95.104	2014.242	2024.033	9.791	3194	0.5	0.20
UHCR	29.728	-95.757	2014.125	2023.140	9.016	3288	-8.3	-0.94
UHEB	29.526	-96.066	2014.595	2023.086	8.490	2800	-0.7	0.00
UHRI	29.719	-95.403	2014.330	2023.888	9.558	3330	-3.4	0.08
WCHT	29.783	-95.581	2013.295	2023.658	10.363	3567	-8.6	-0.46
WEPD	29.688	-95.229	2014.075	2023.658	9.583	3307	2.0	0.29
WHCR	30.194	-95.505	2014.779	2024.019	9.240	3214	-7.3	-0.95
YORS	30.110	-95.469	2020.827	2023.986	3.159	1151	-3.9	-1.29
ZHU1	29.962	-95.331	2003.042	2024.071	21.029	7311	-18.0	-0.61

Notes:

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

ADKS

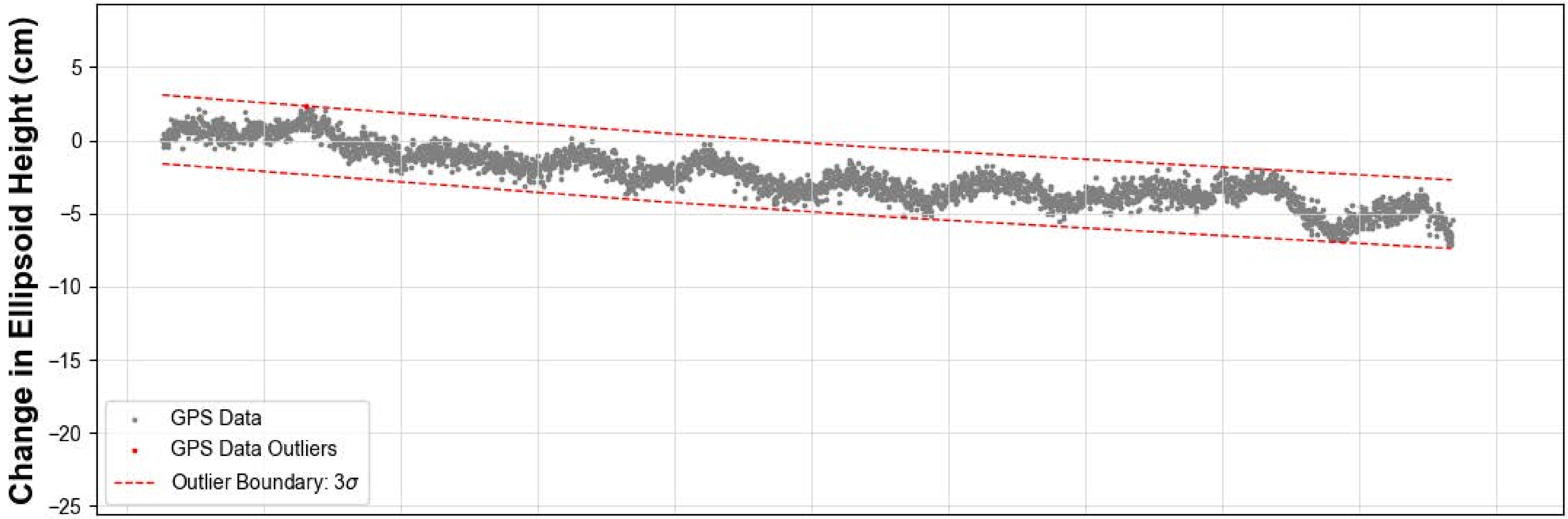
Houston, TX

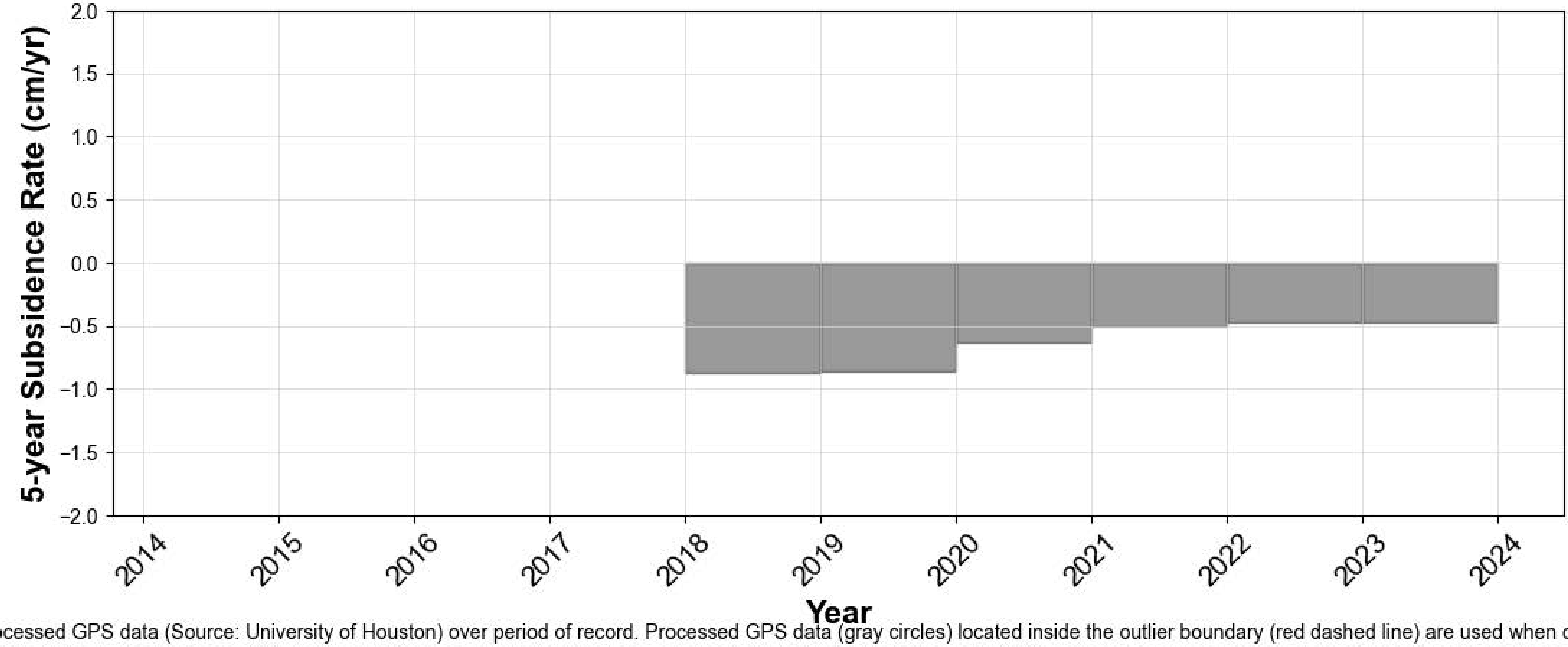


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

ALEF

Houston, TX





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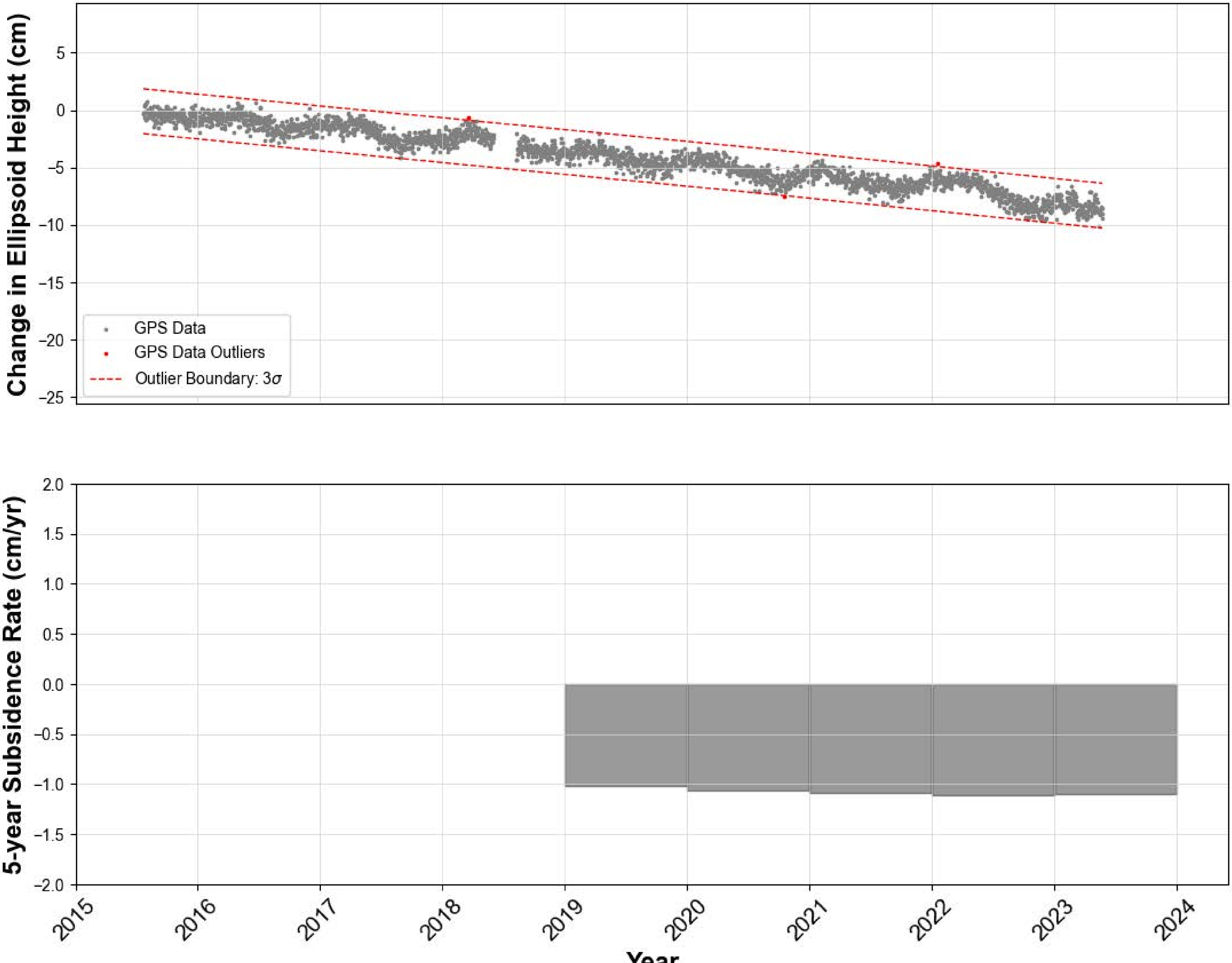
AULT

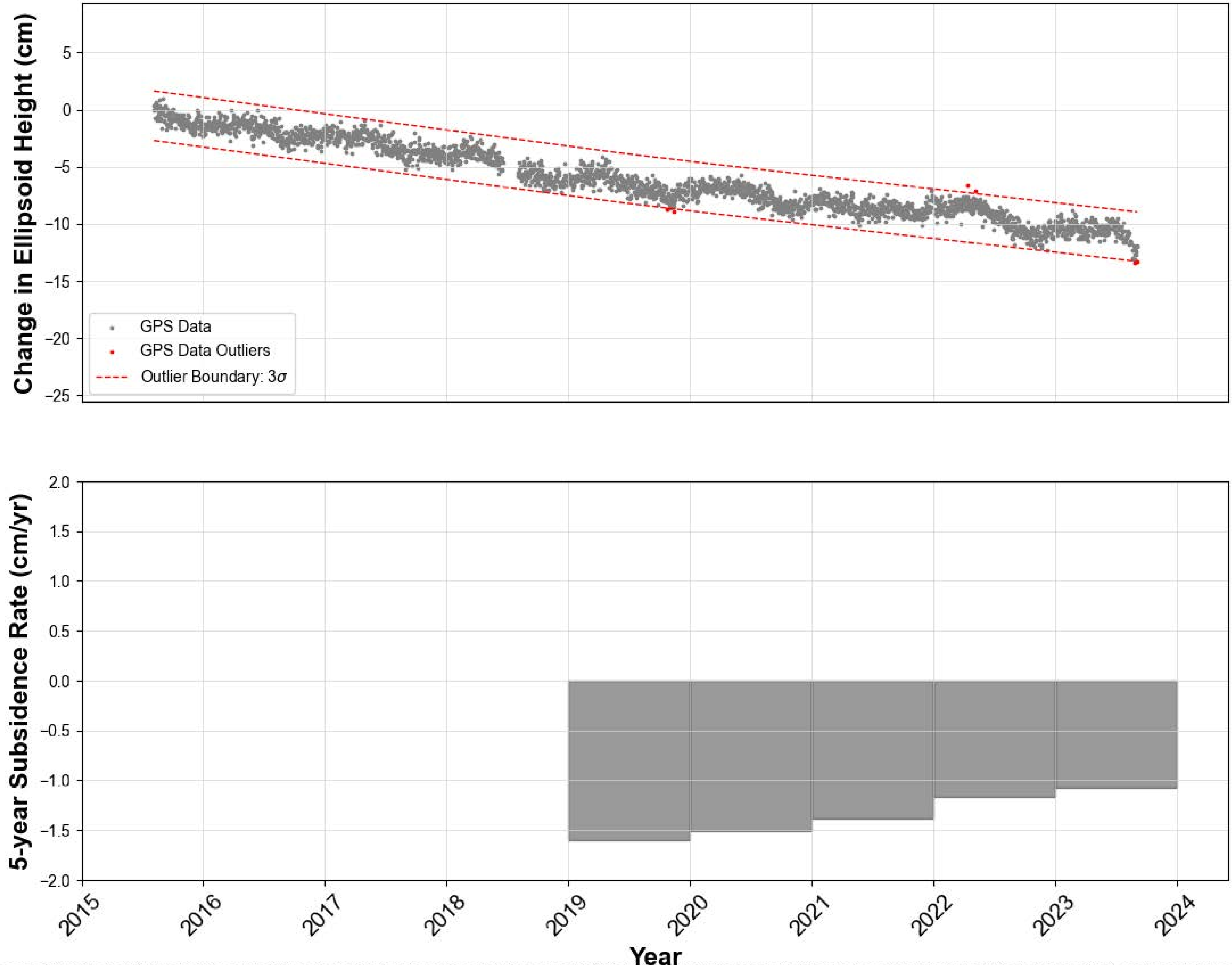
Cypress, TX



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

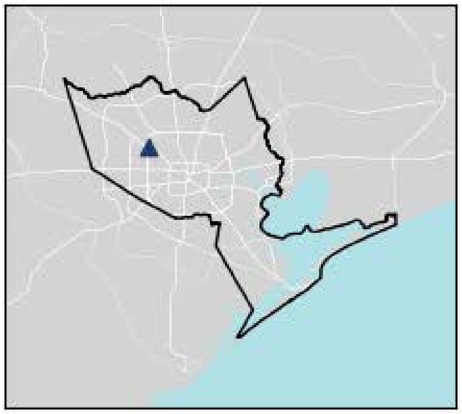
Houston, TX

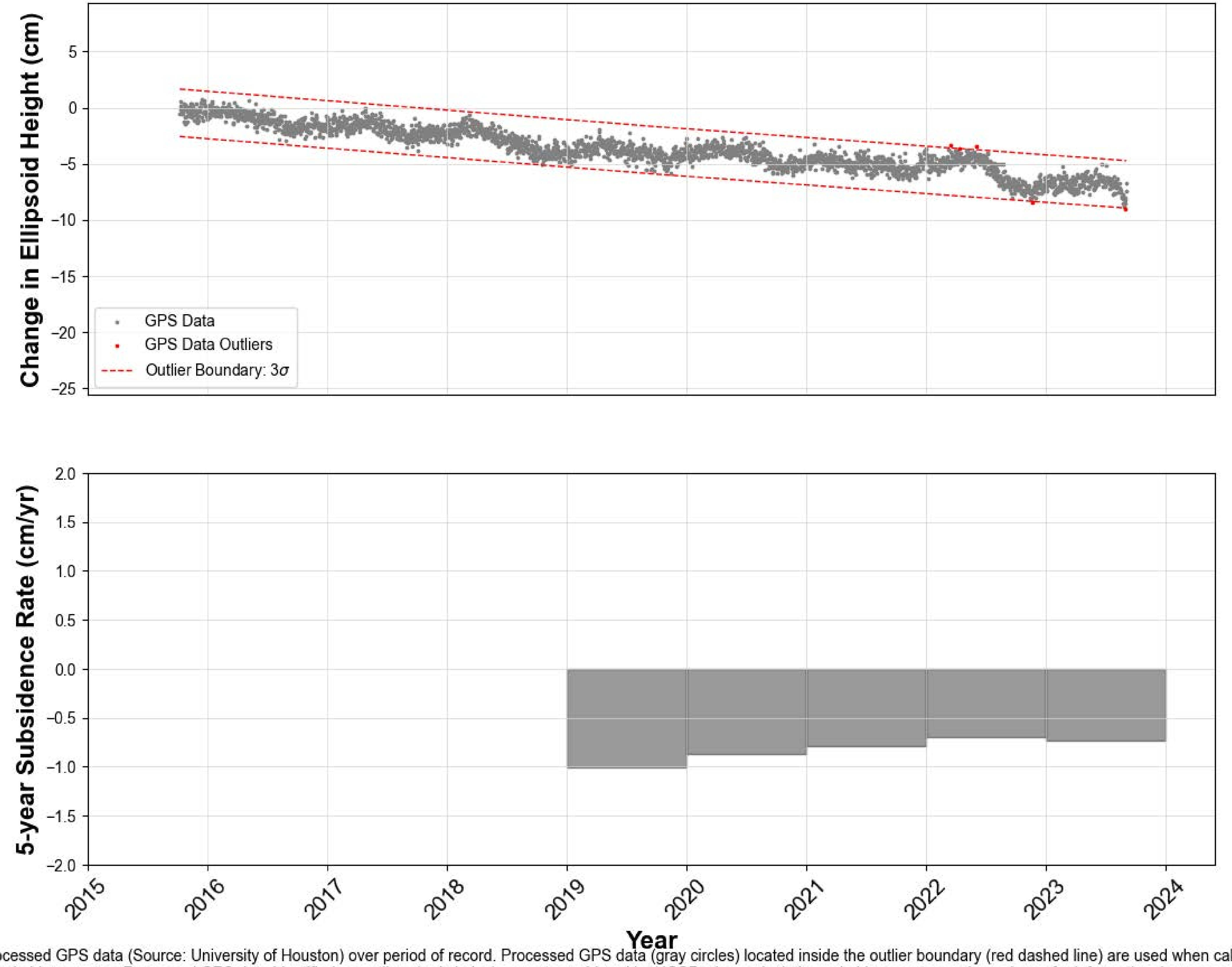


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

CFJV

Jersey Village, TX

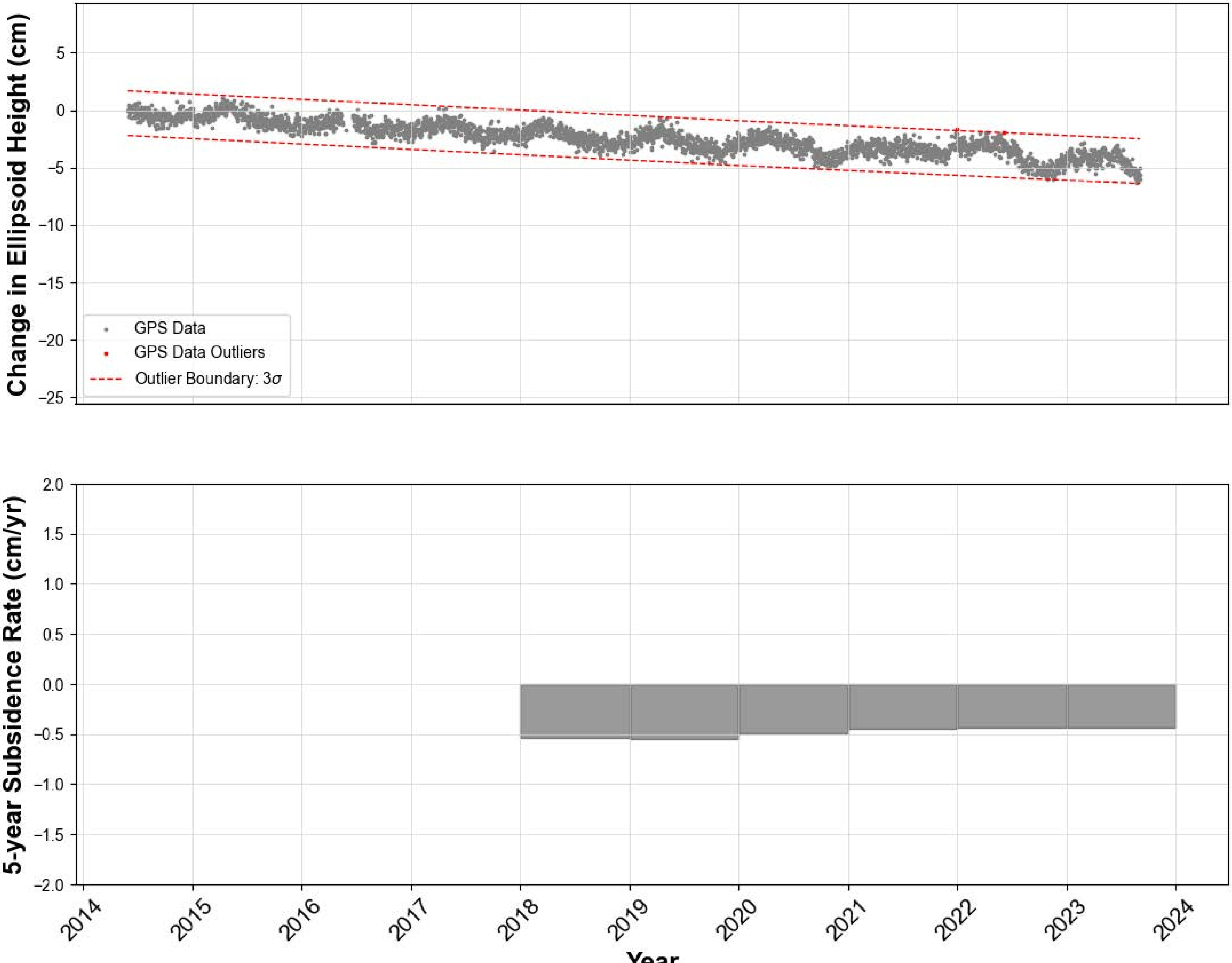




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

CMFB

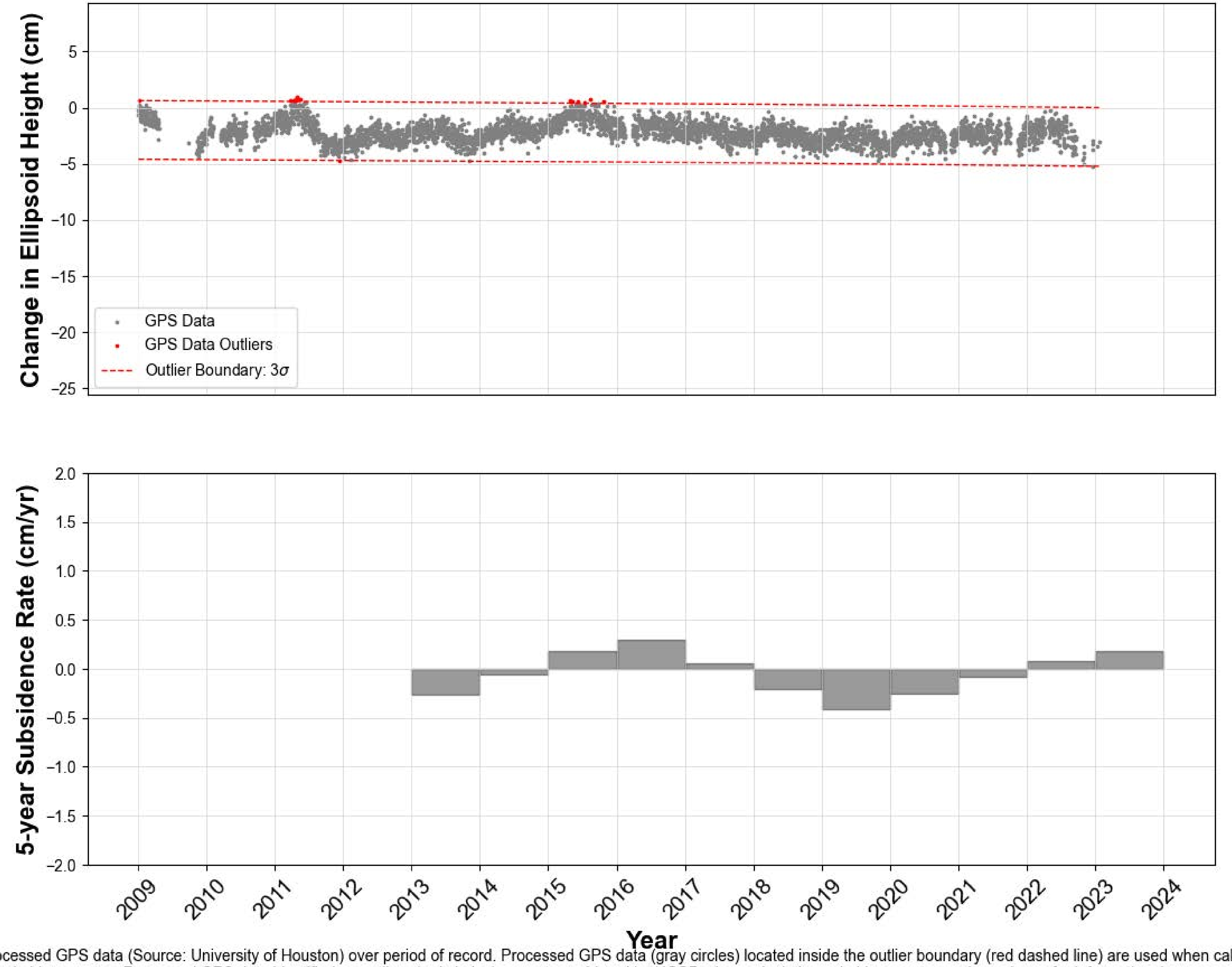
Richmond, TX



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

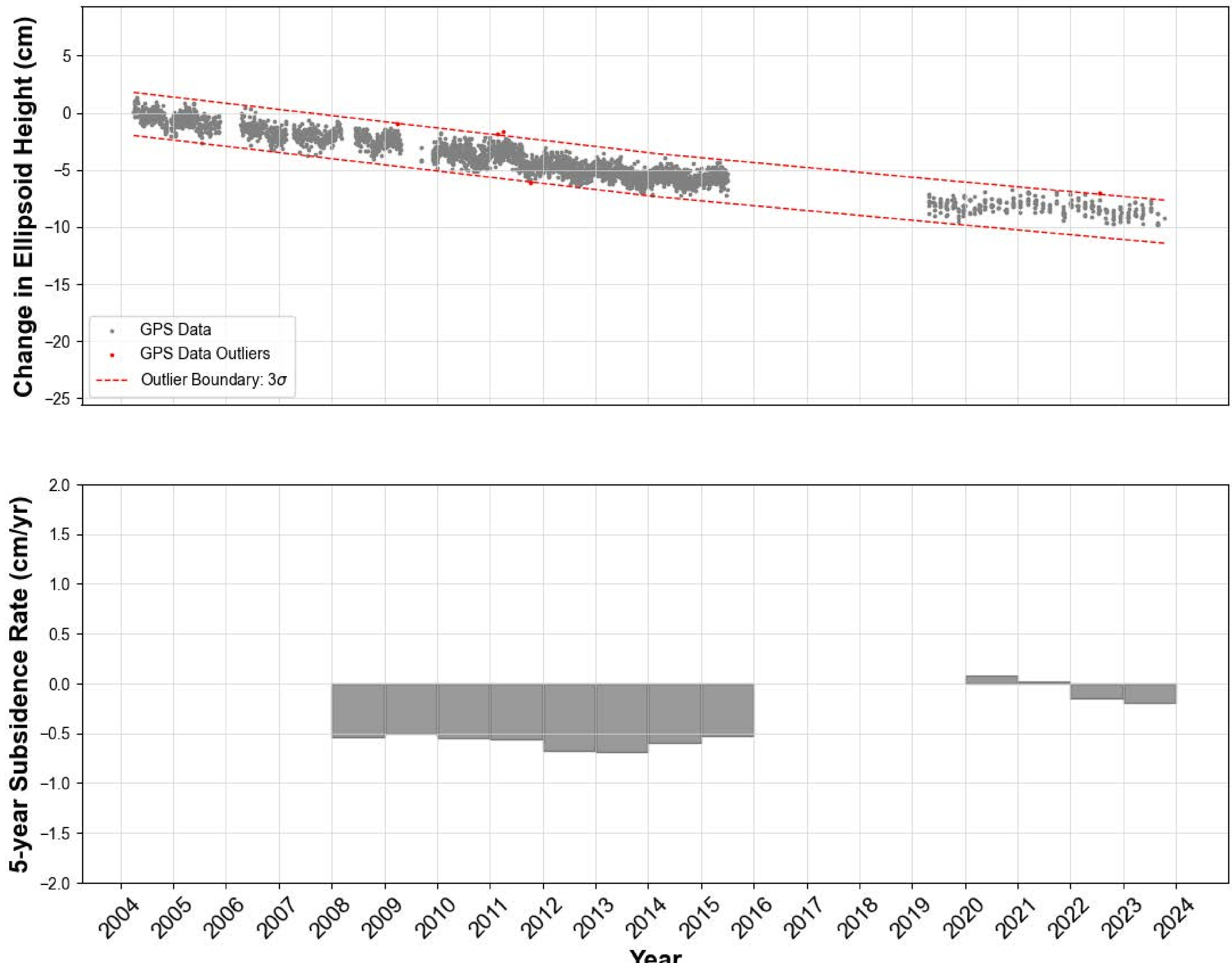
Houston, TX



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

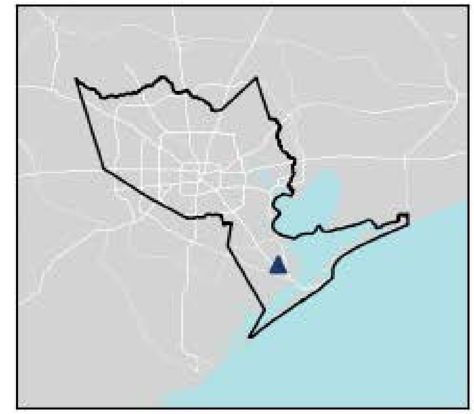
Humble, TX

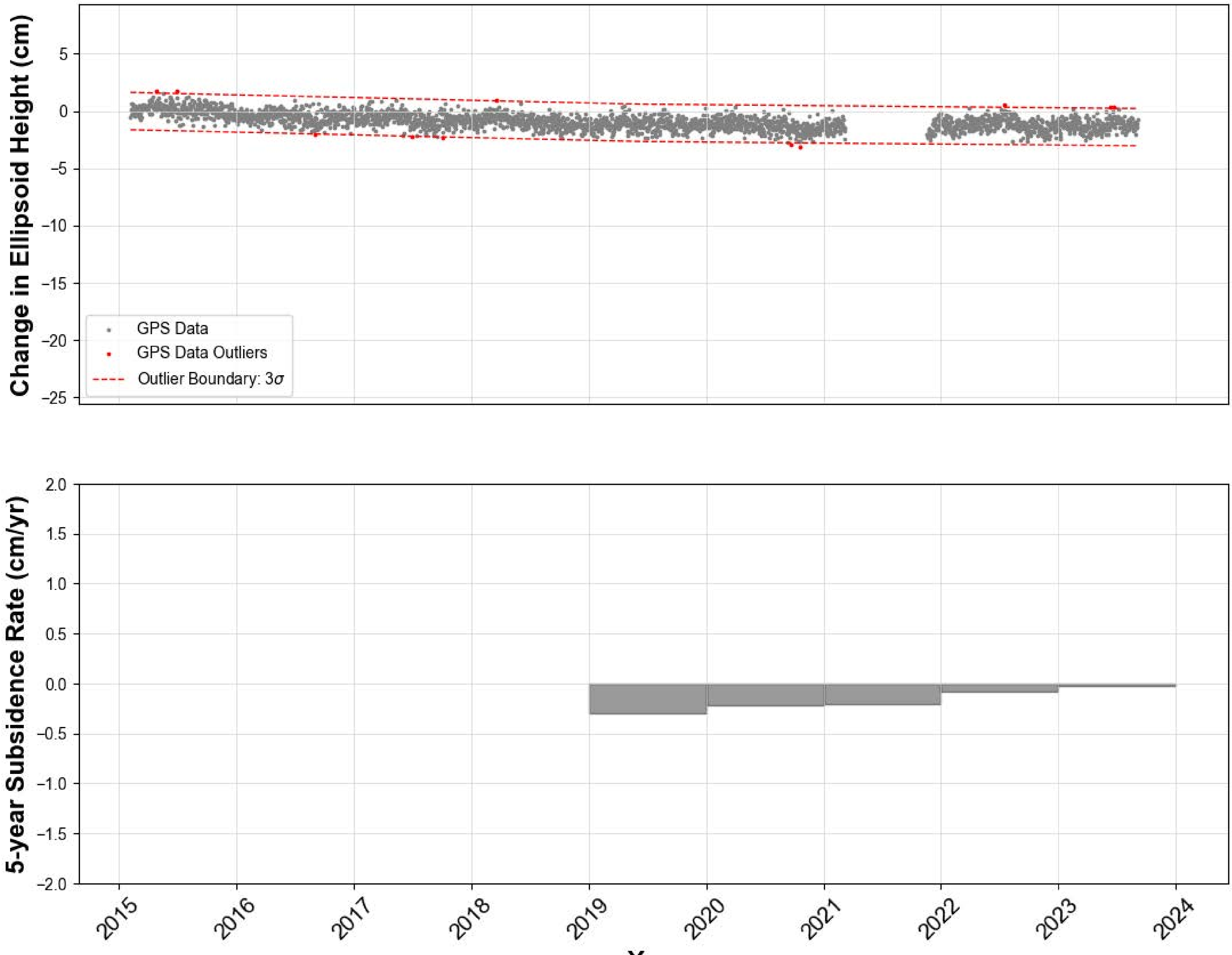


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

COTM

Texas City, TX

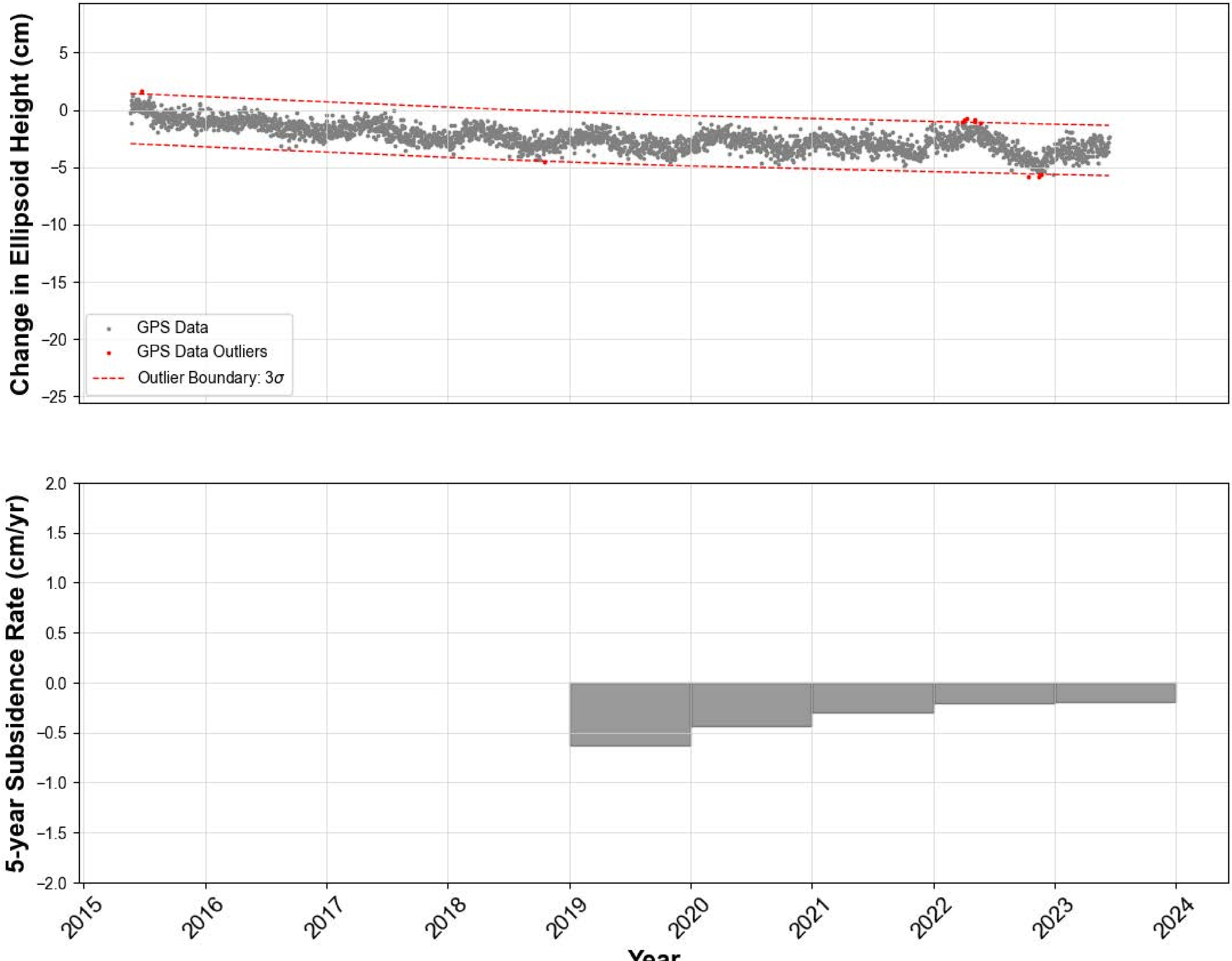




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

CSTE

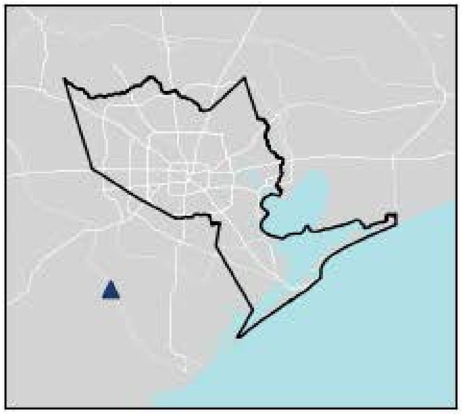
Houston, TX

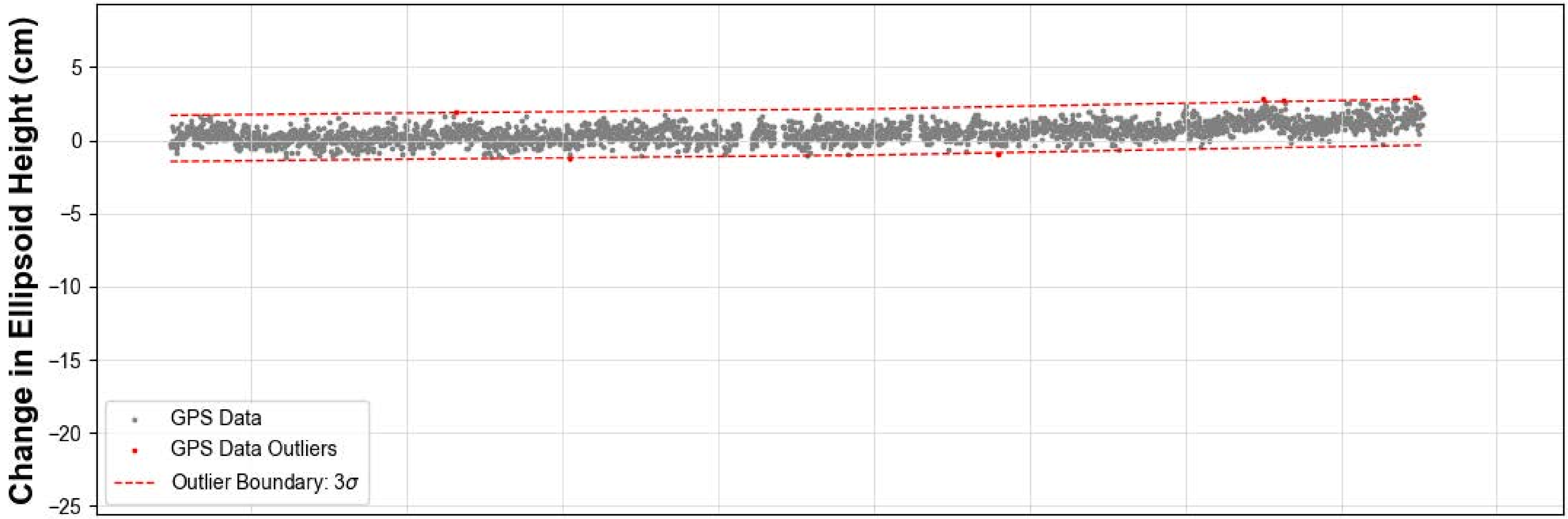


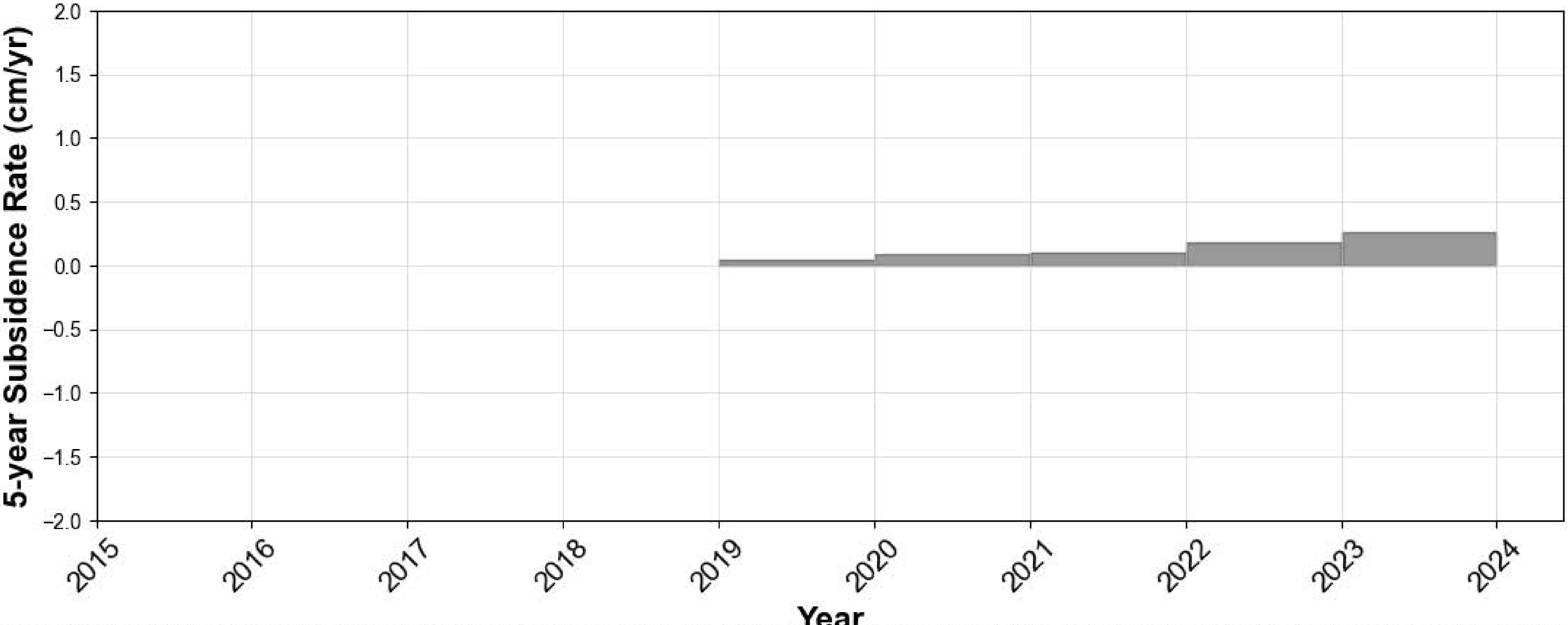
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

DISD

Damon, TX



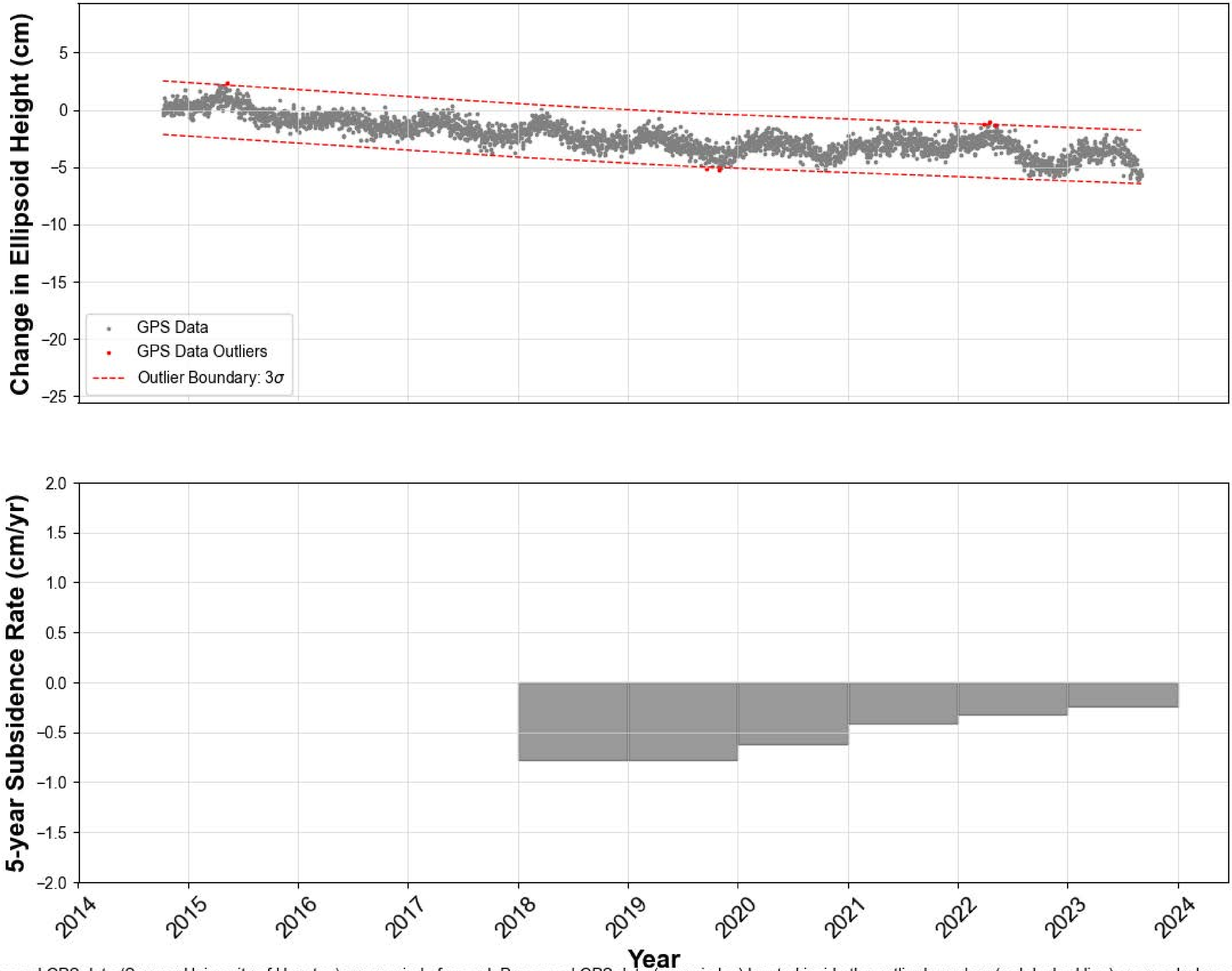




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

DMFB

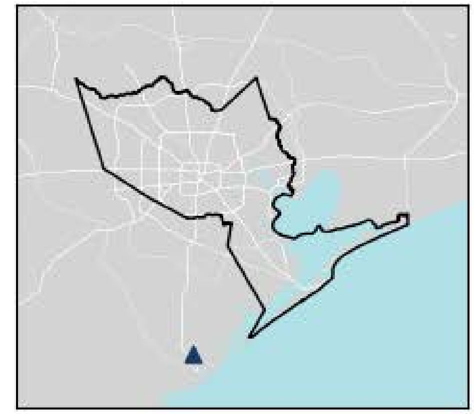
Sugar Land, TX

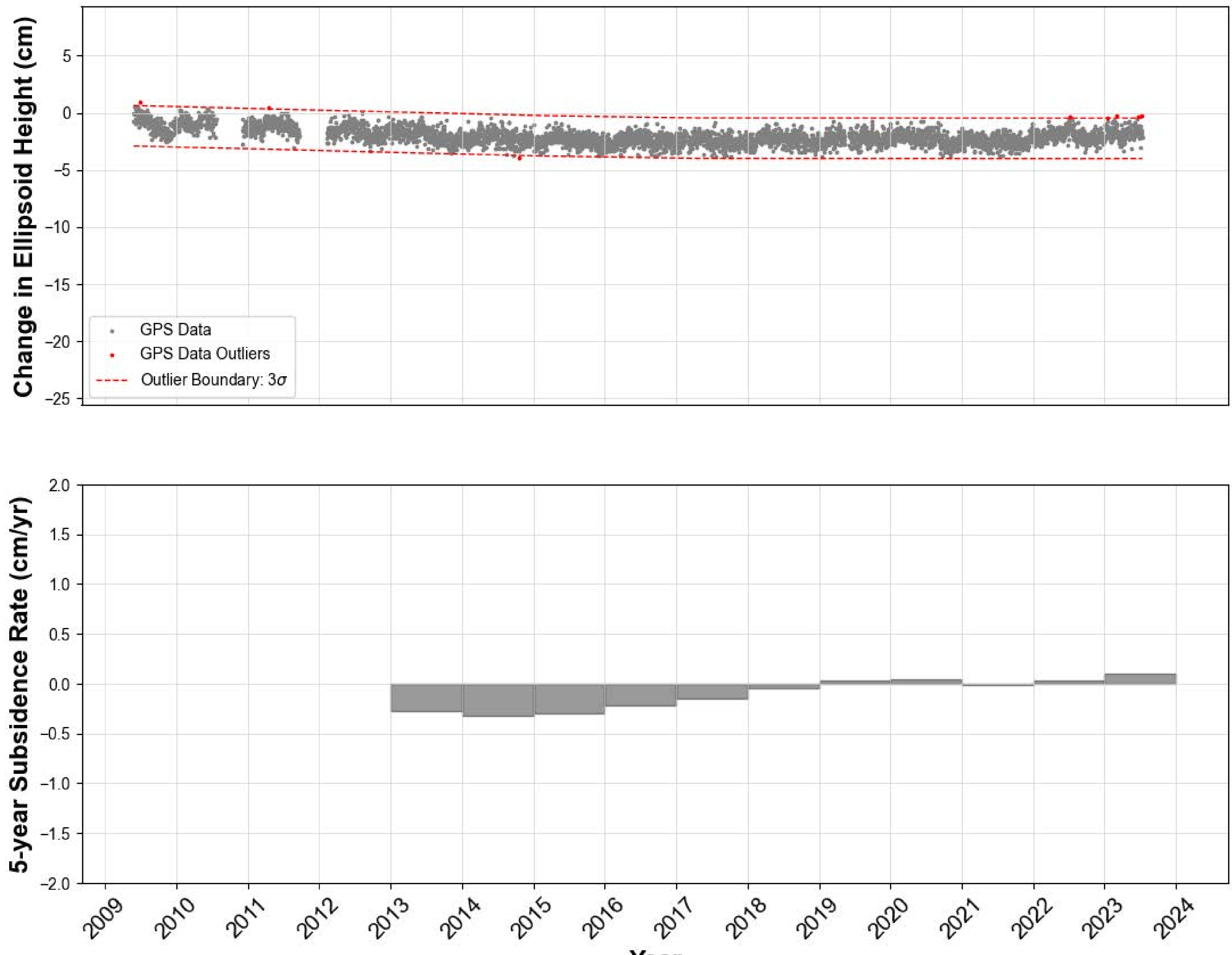


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

DWI1

Clute, TX

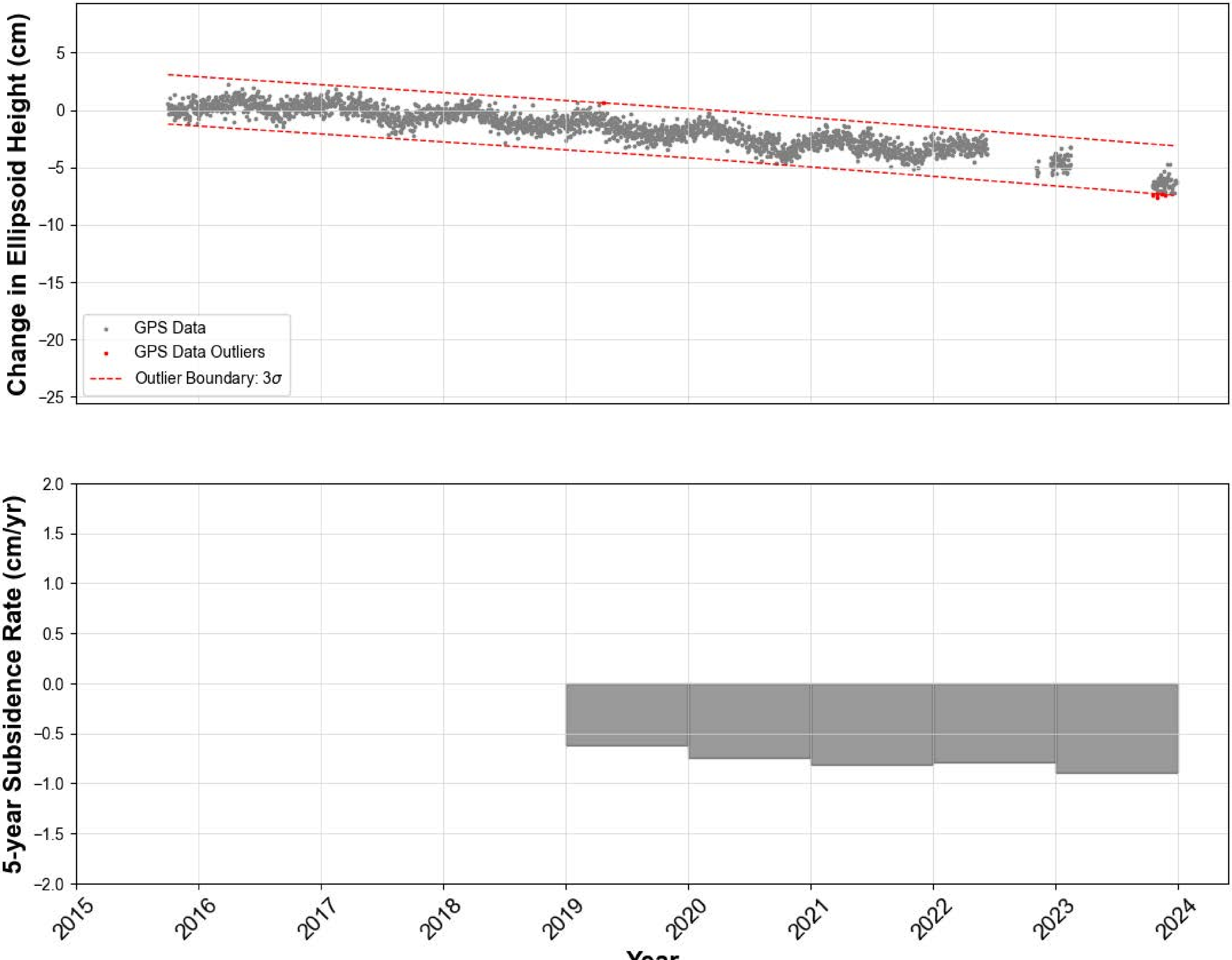




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

GSEC

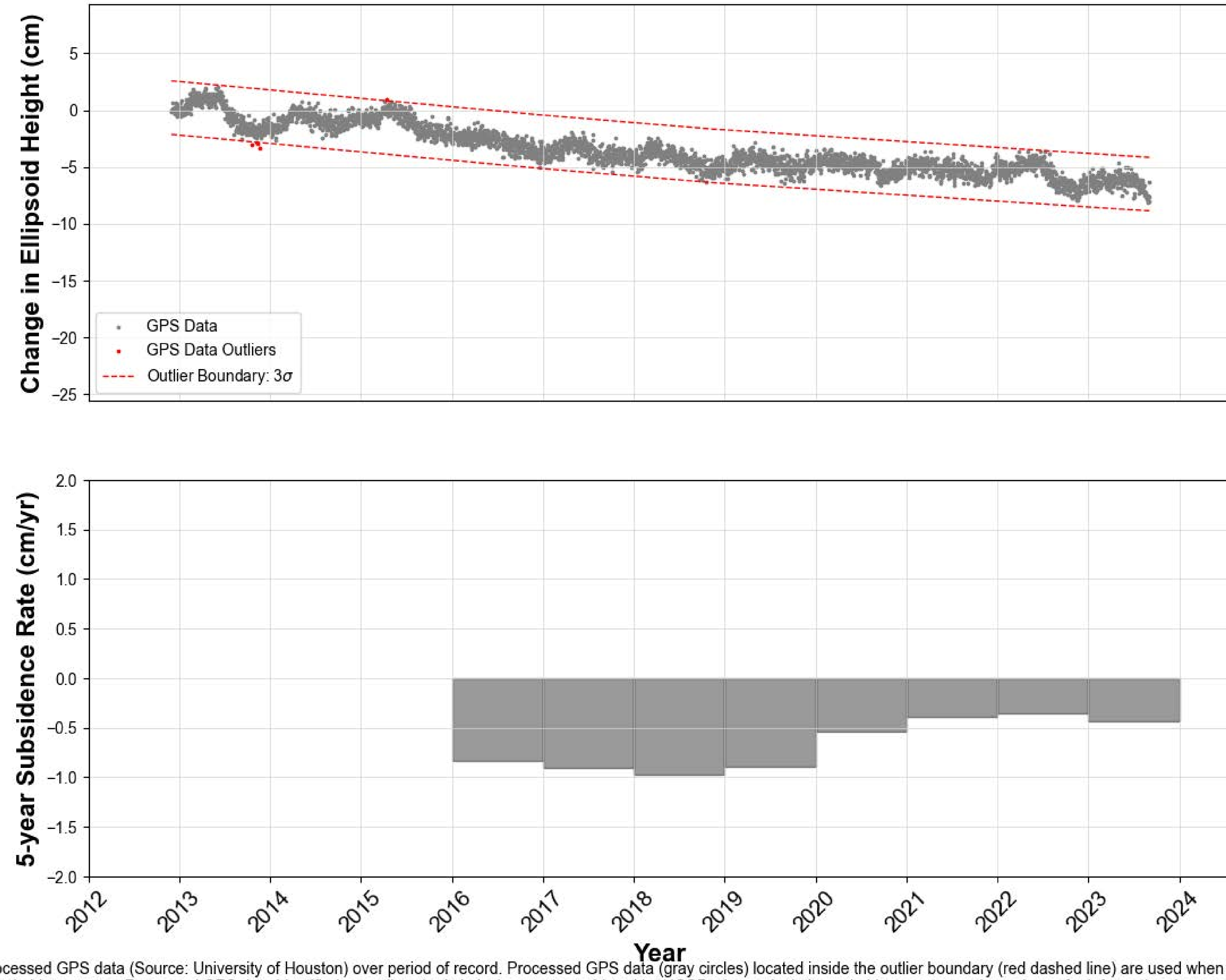
Spring, TX



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

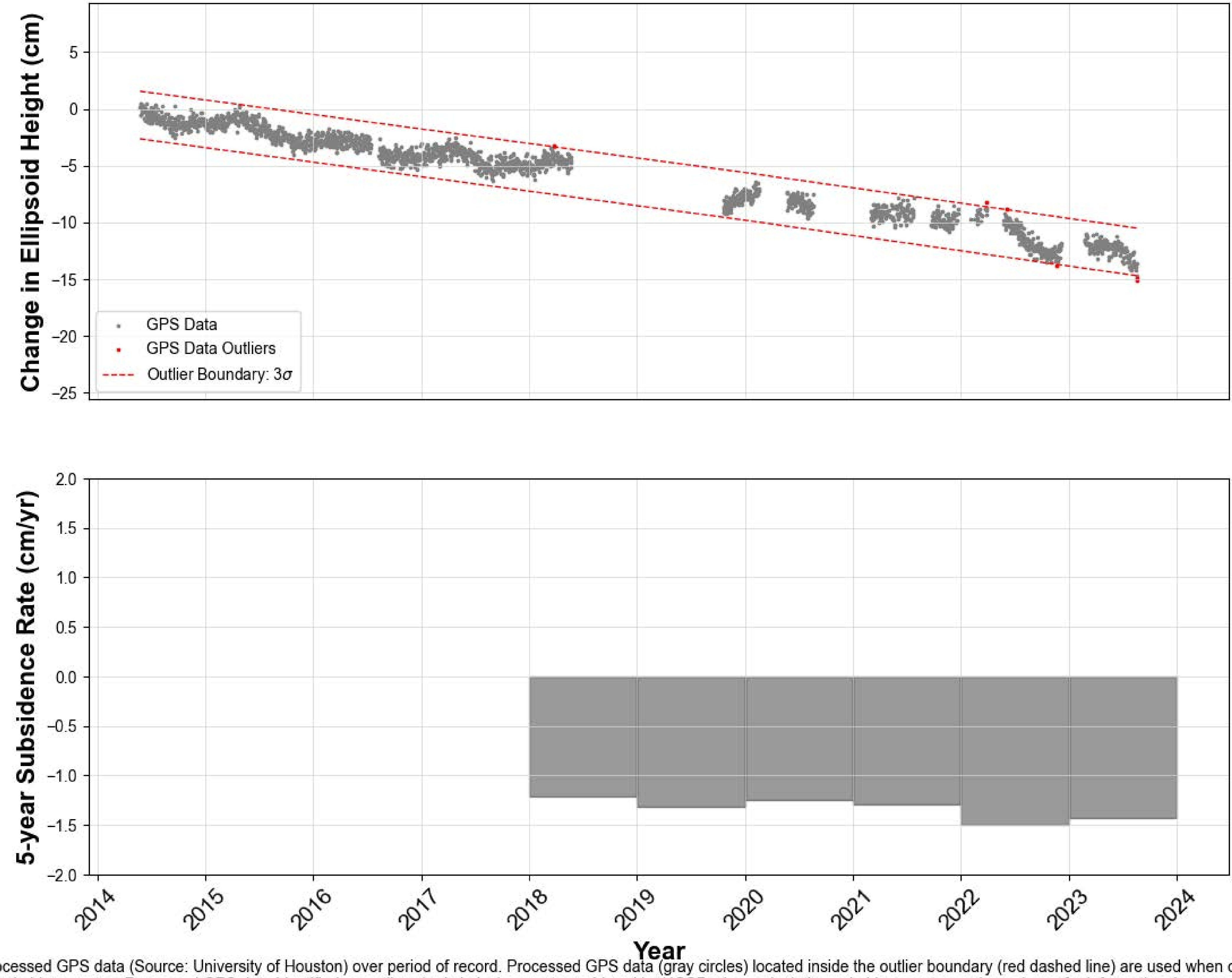
Houston, TX



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

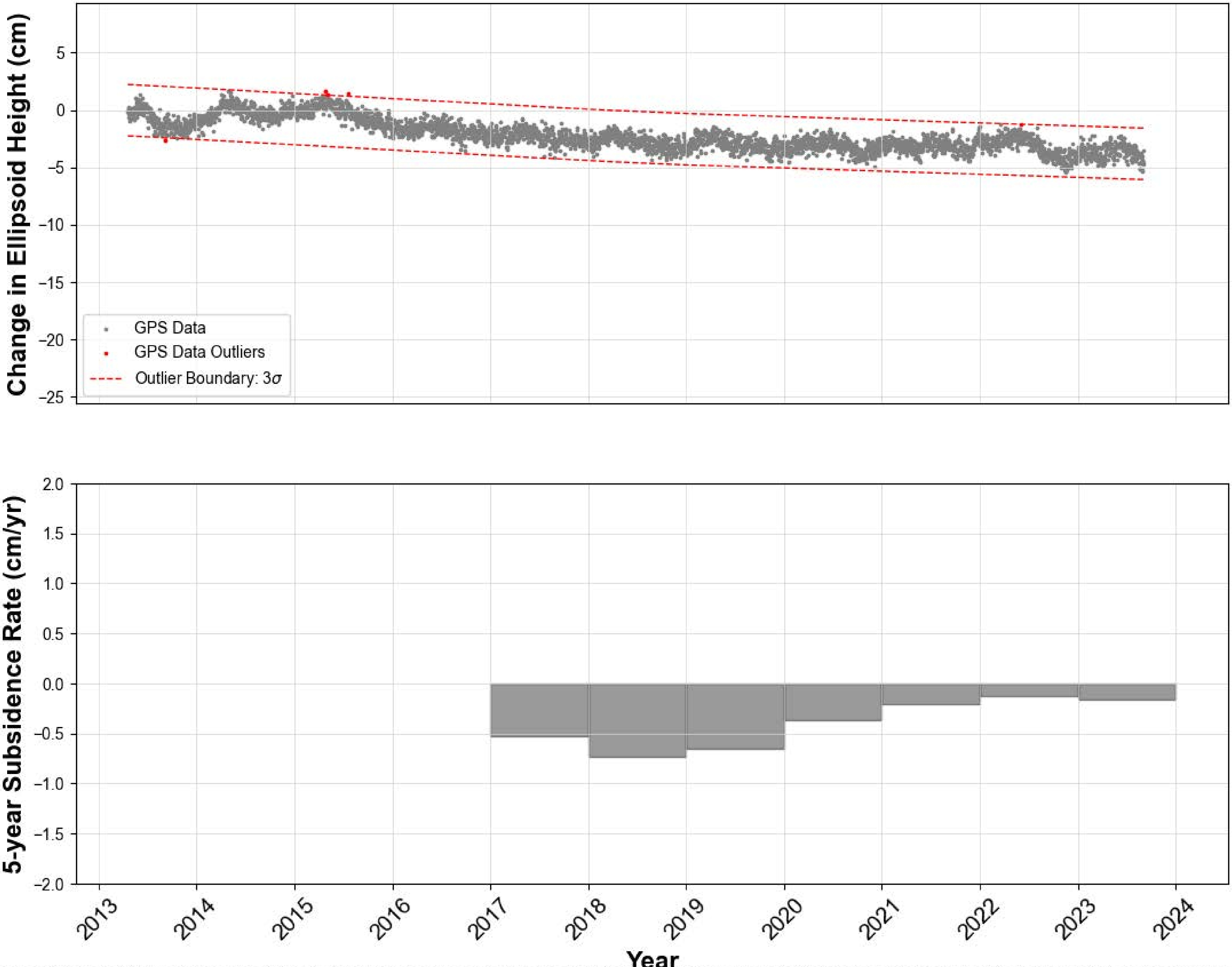
Katy, TX



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

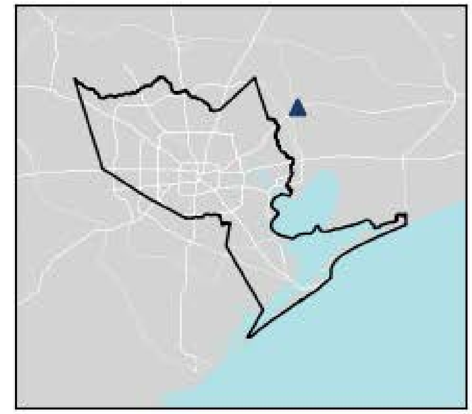
Houston, TX

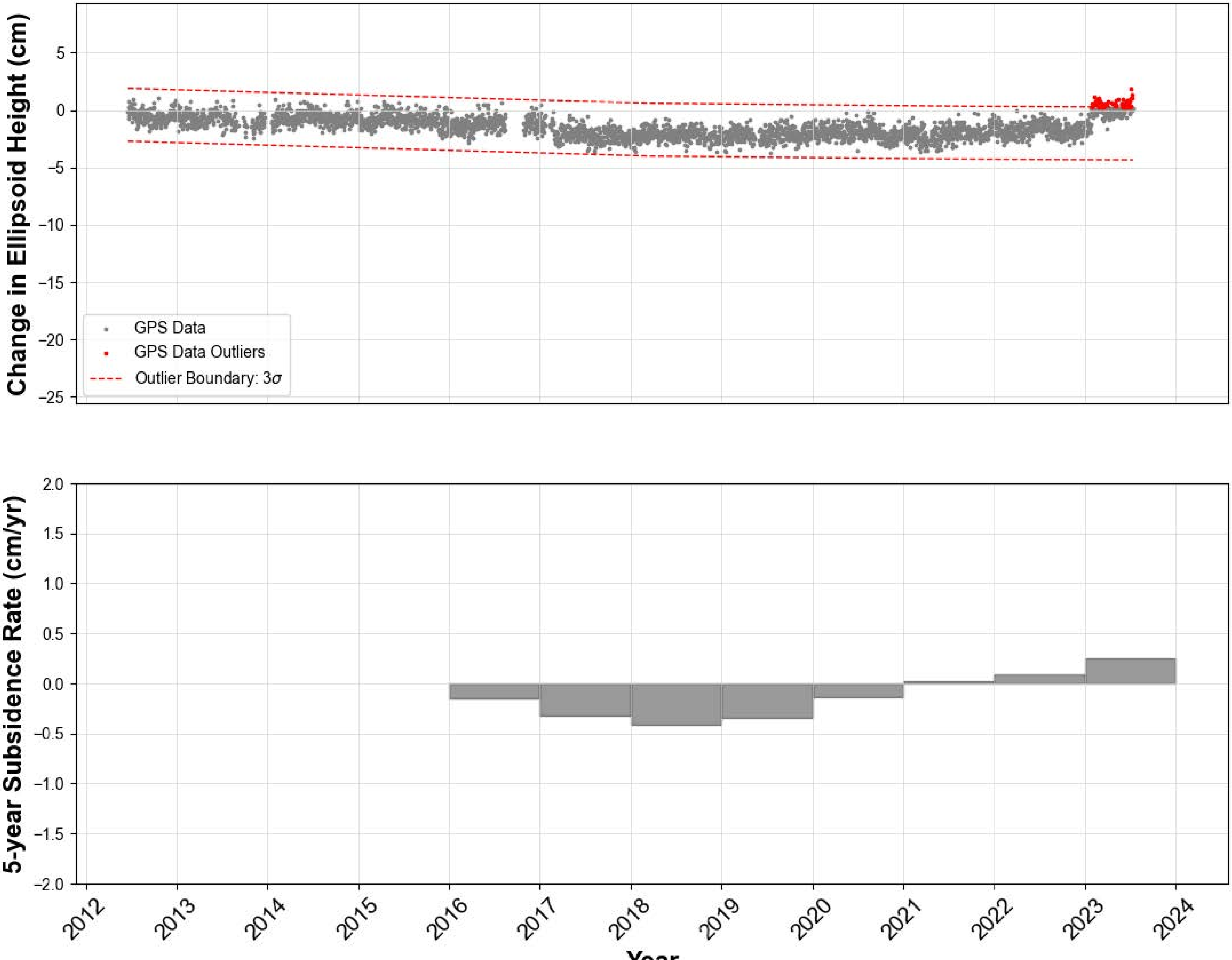


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

JGS2

Dayton, TX





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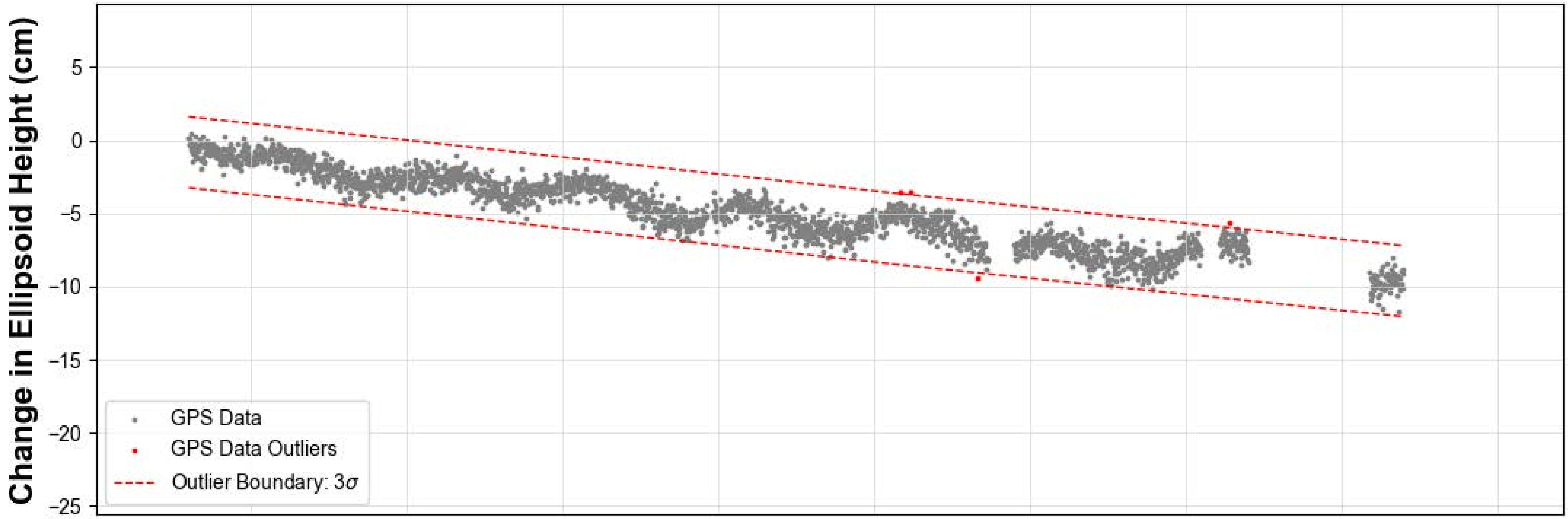
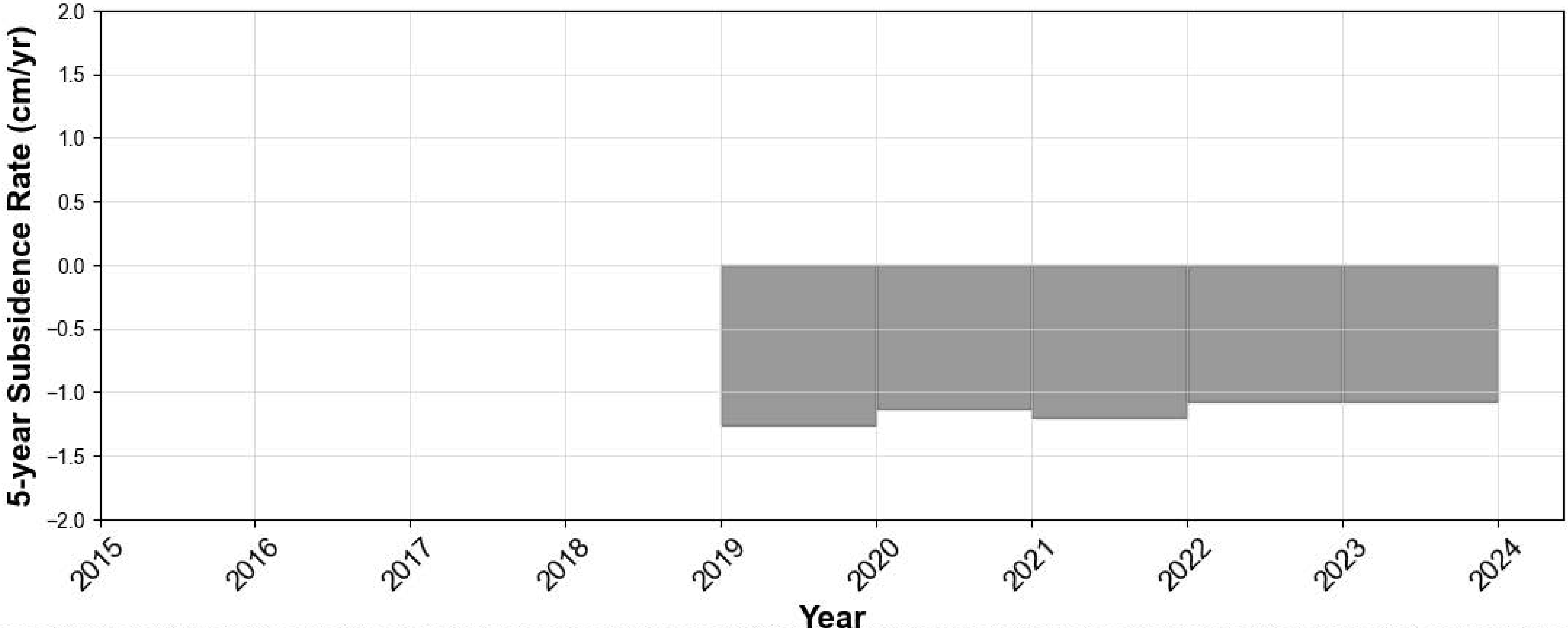
KKES

Houston, TX

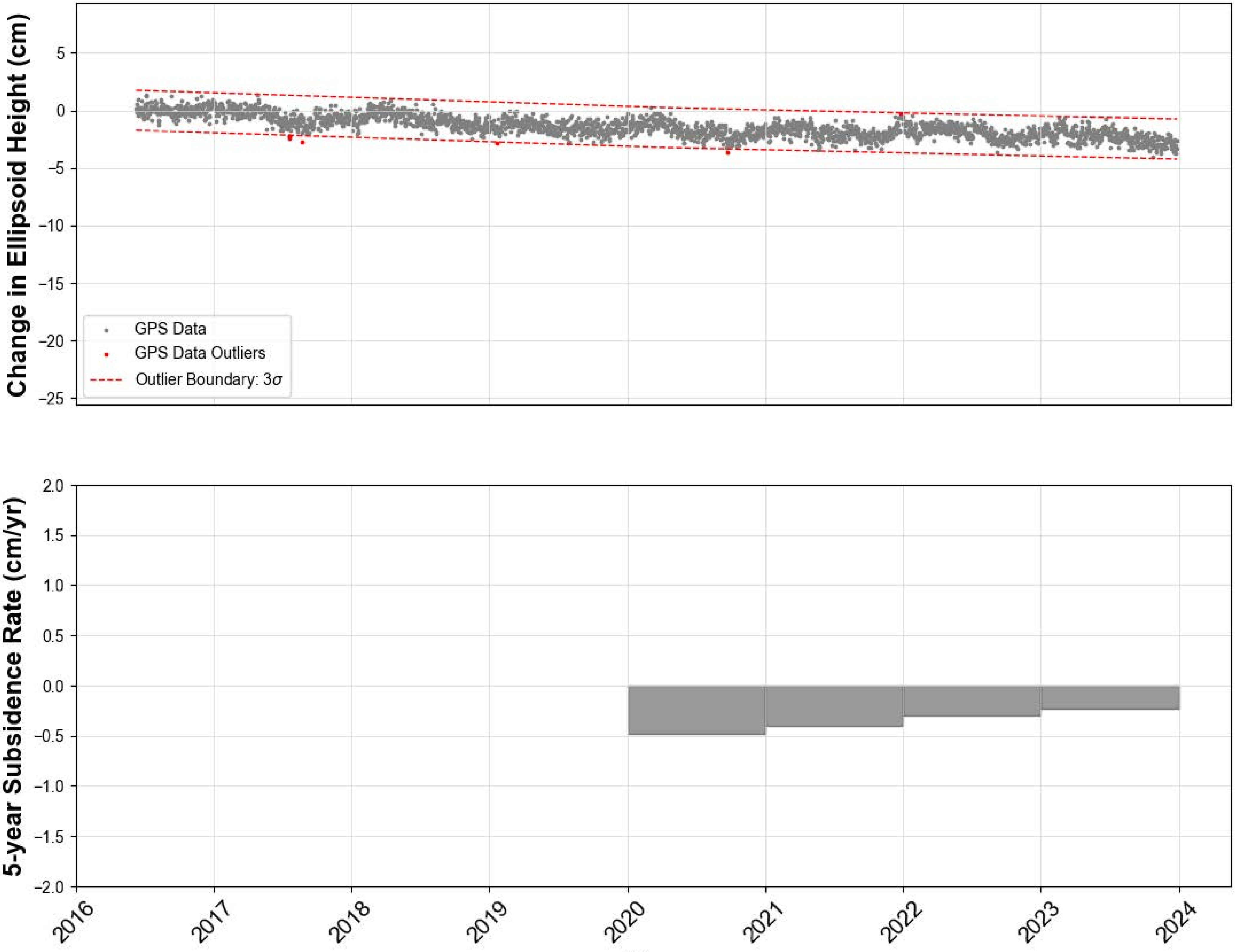




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

KPCD

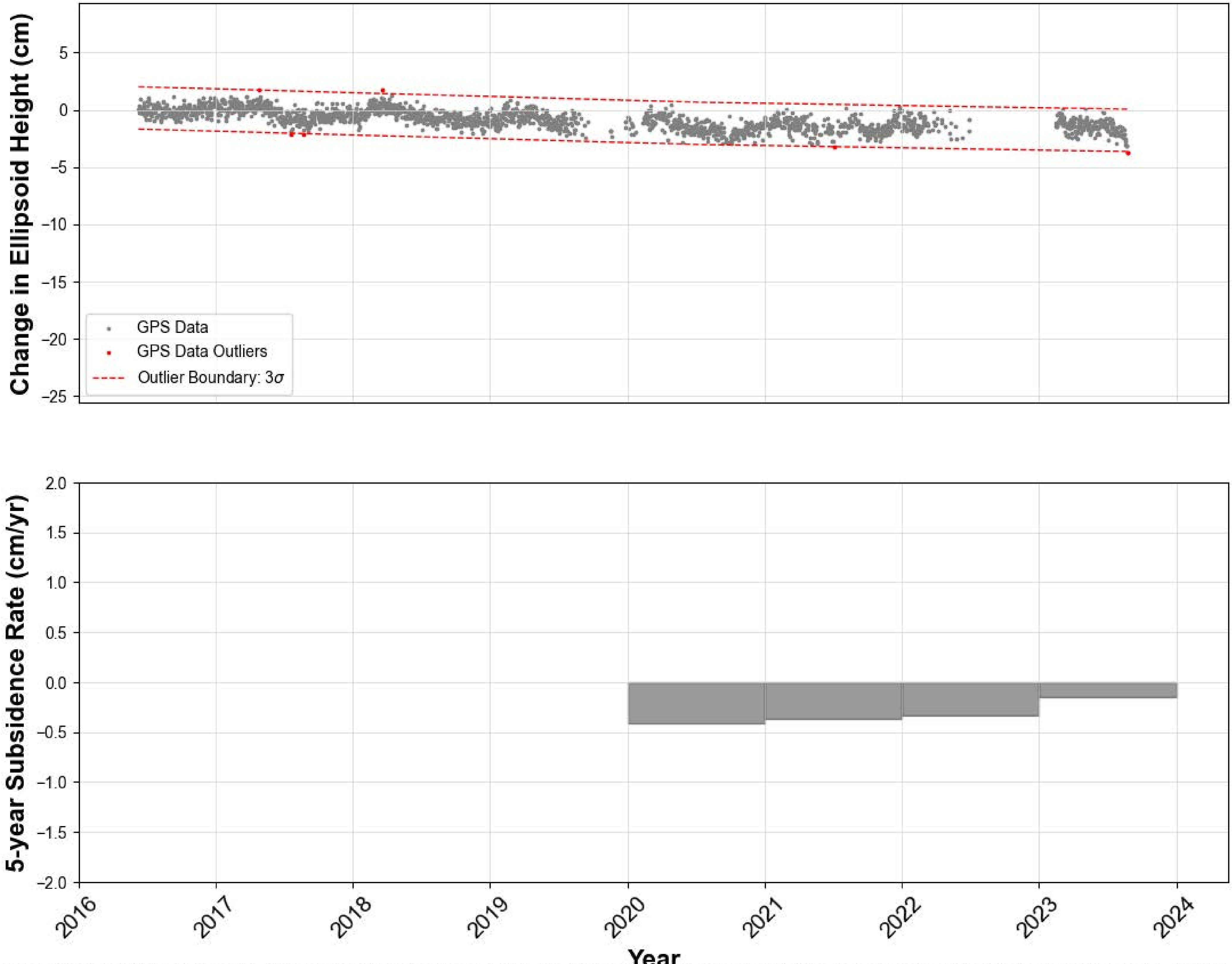
Pattison, TX



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

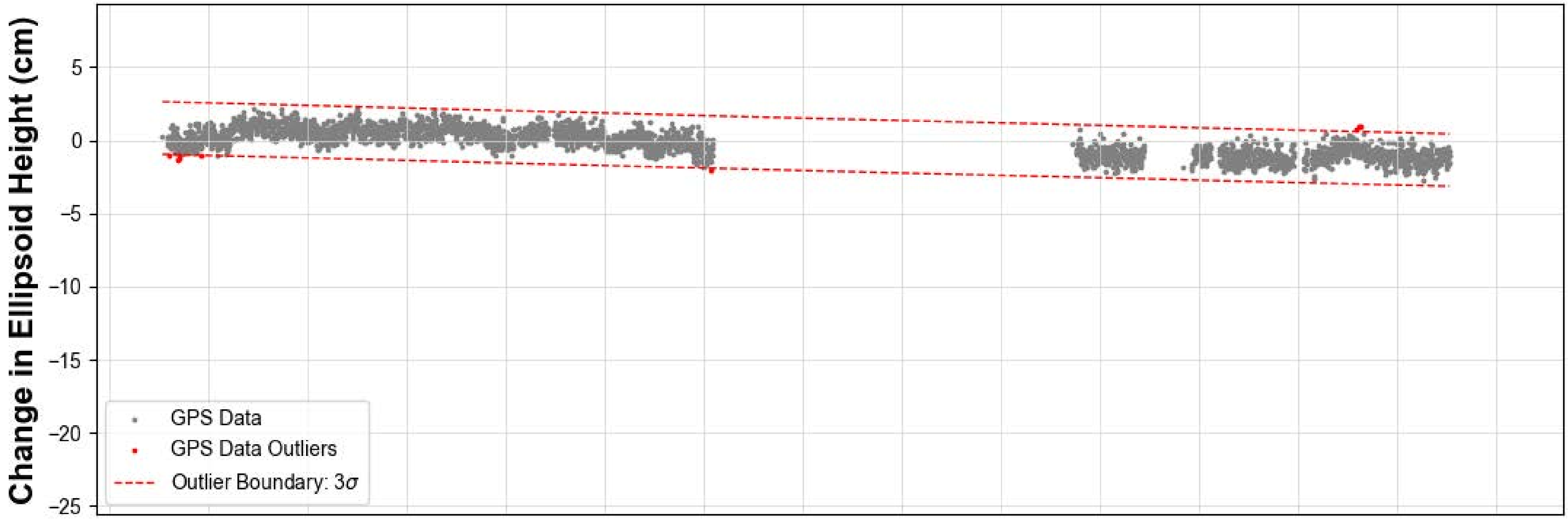
Pattison, TX

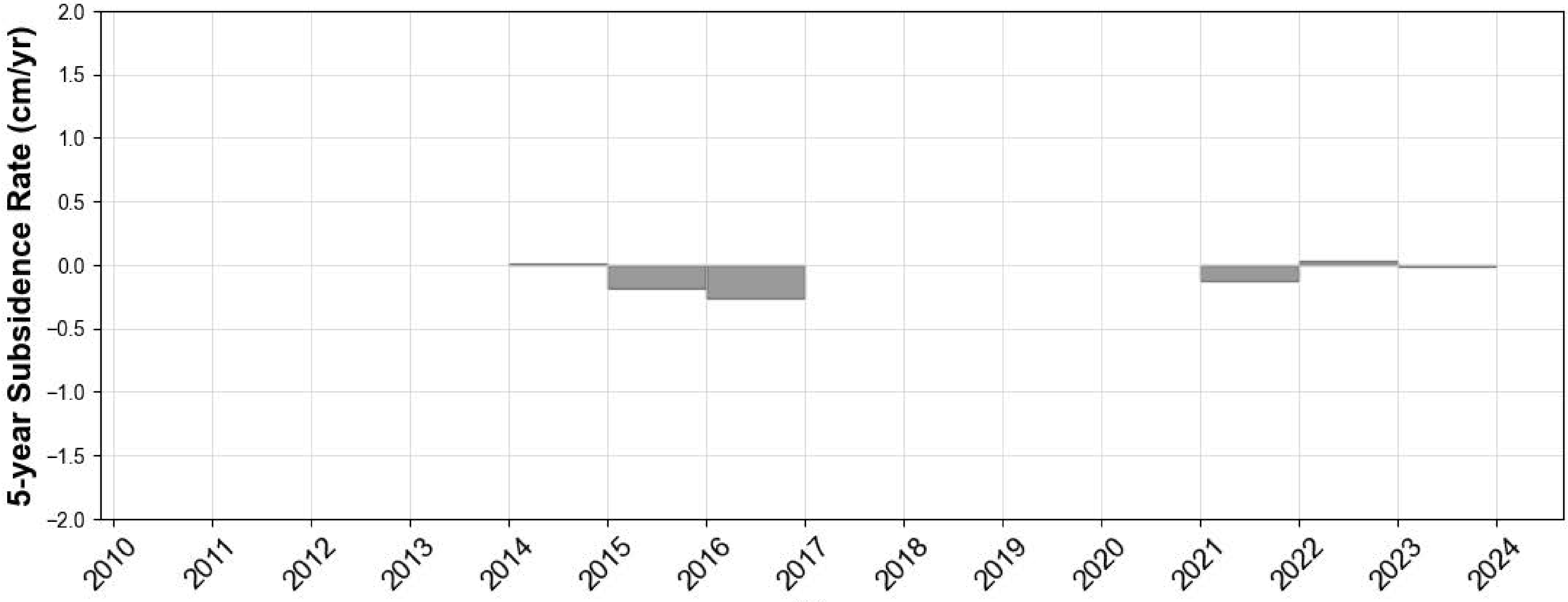


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

LCBR

Burton, TX

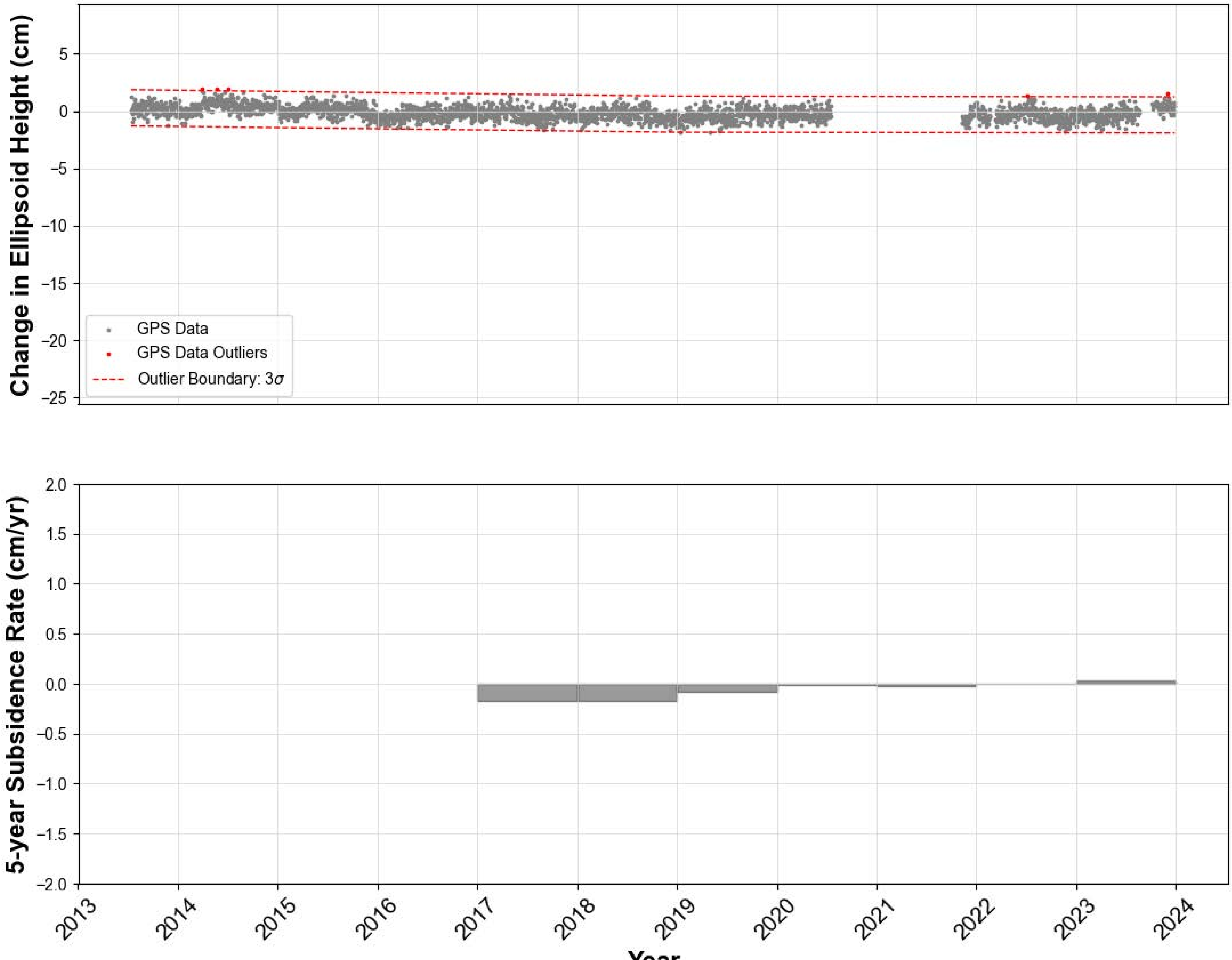




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

LGC1

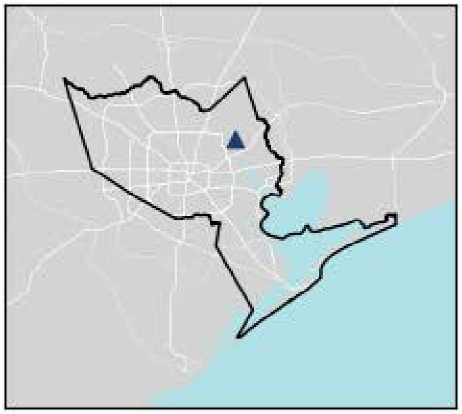
Beaumont, TX

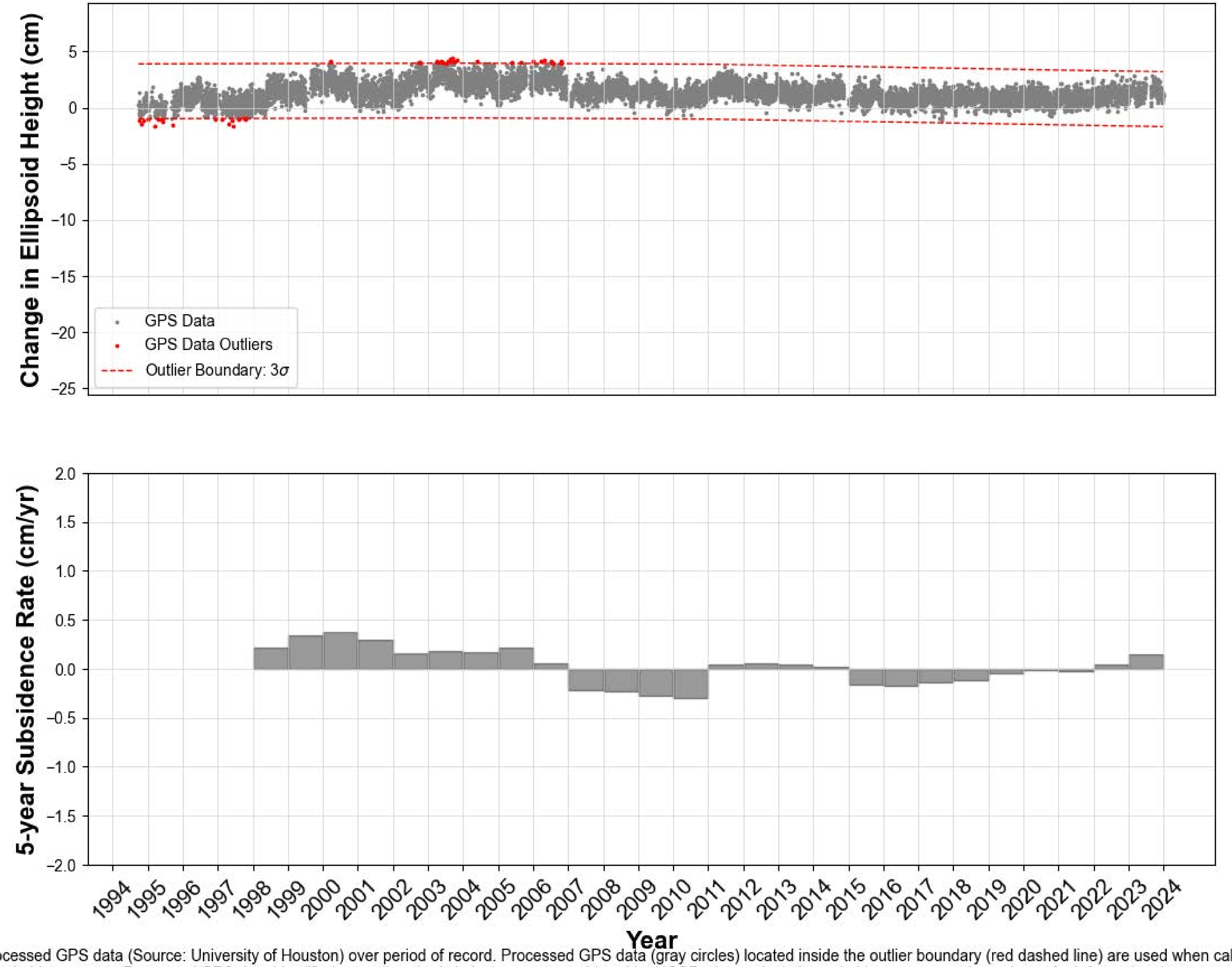


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

LKHU

Houston, TX

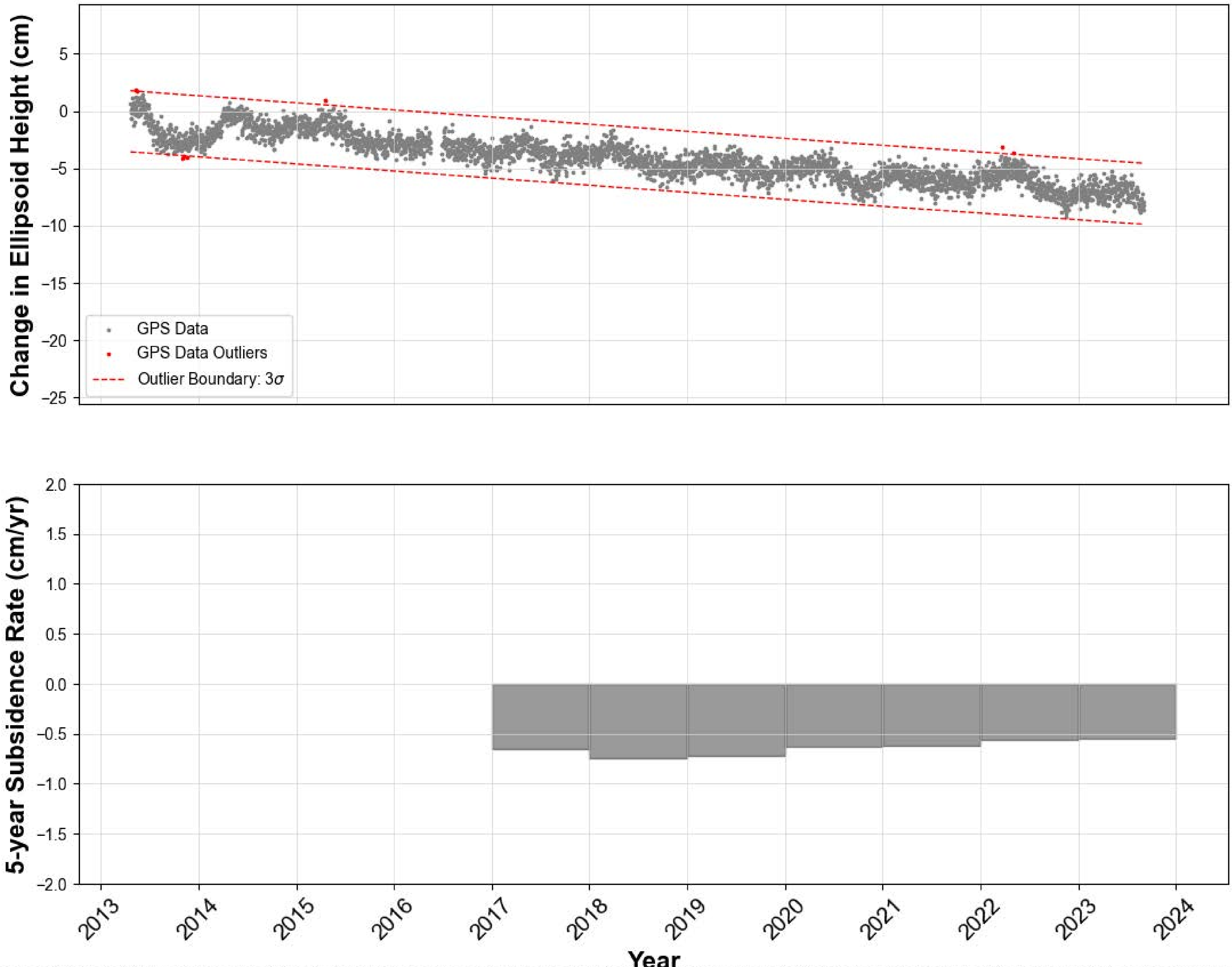




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

MDWD

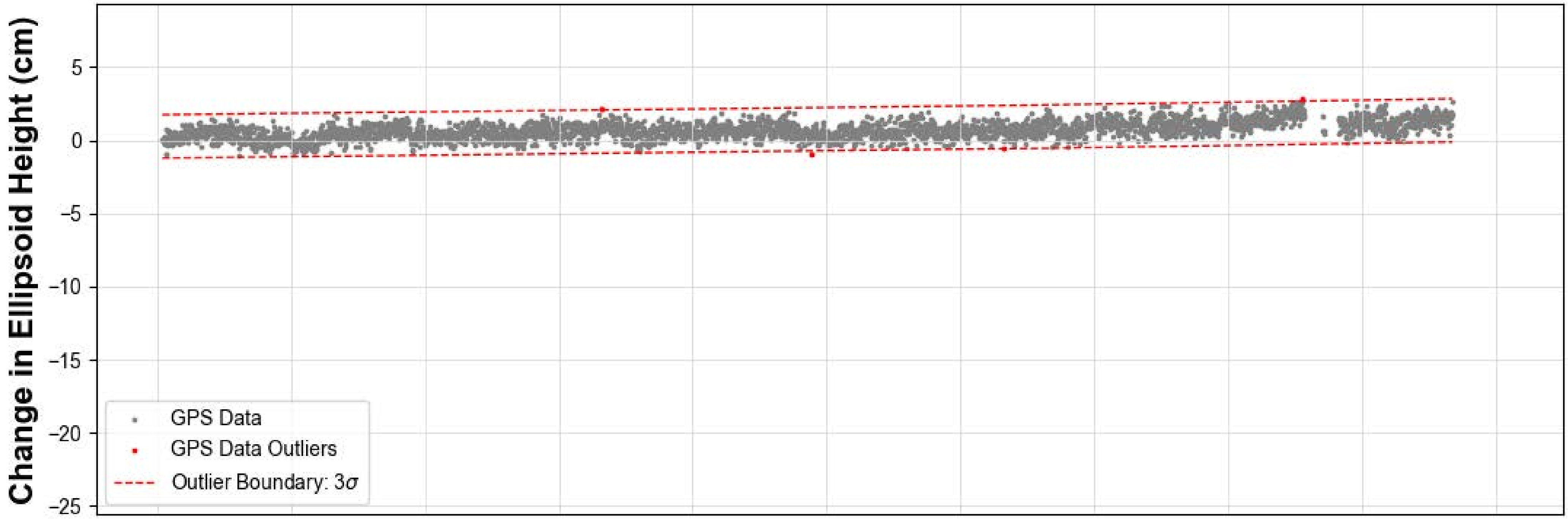
Houston, TX

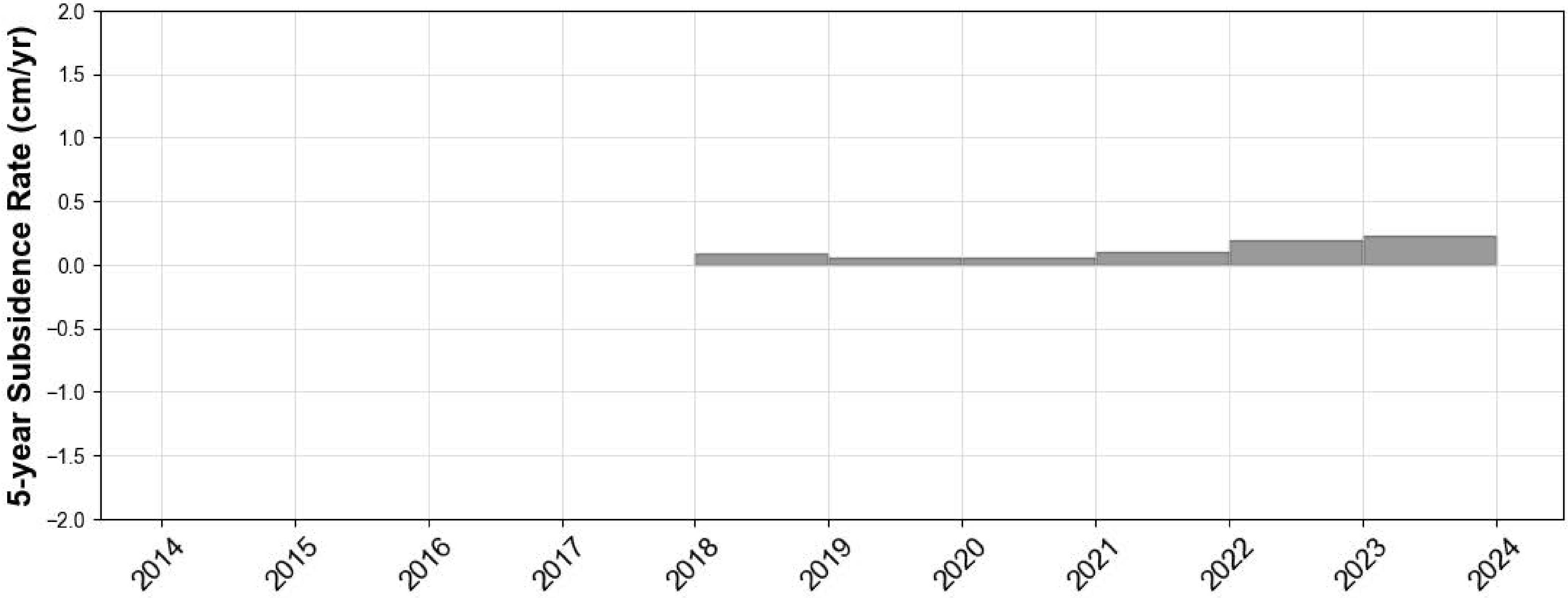


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

MEPD

South Houston, TX

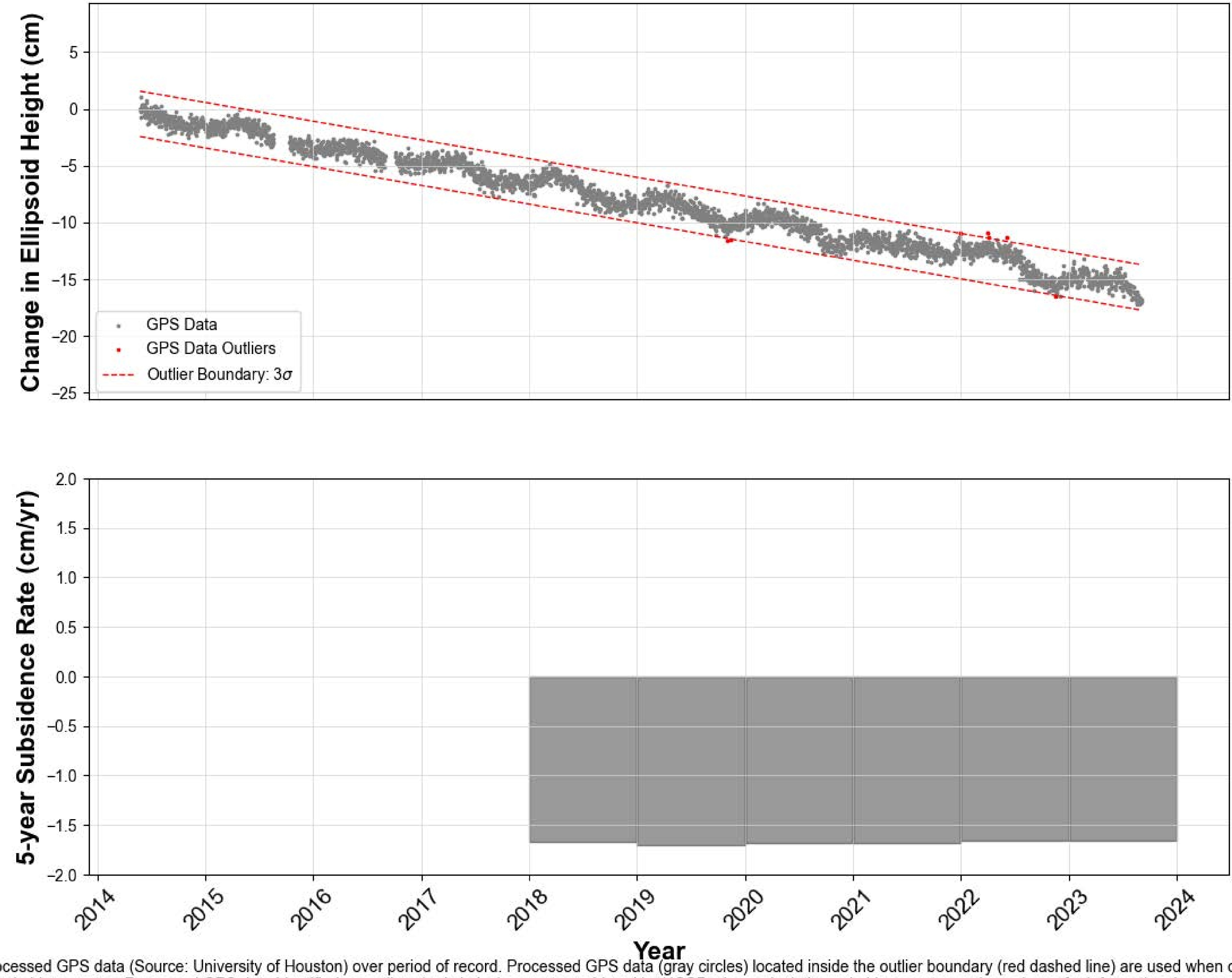




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

MRHK

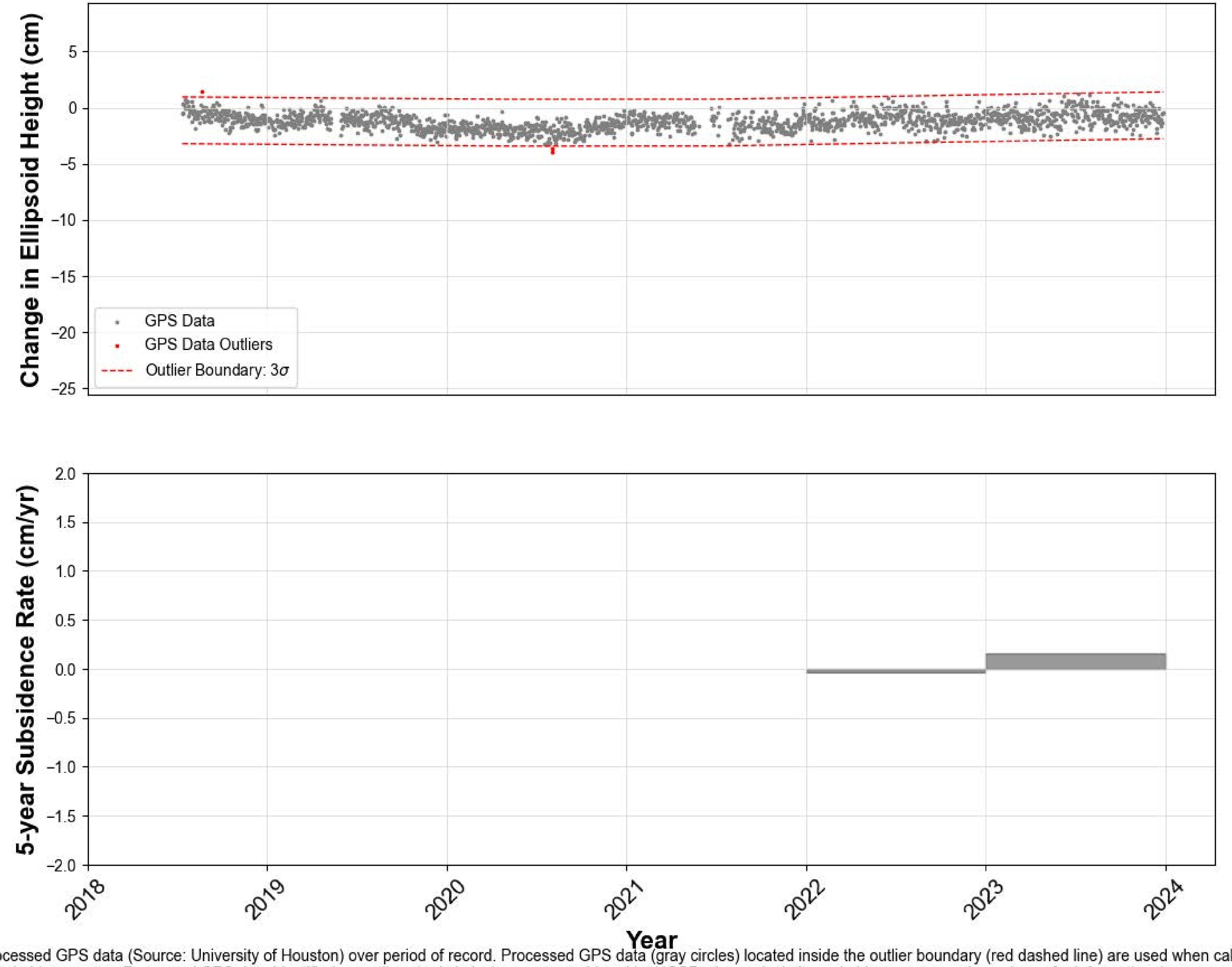
Katy, TX



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

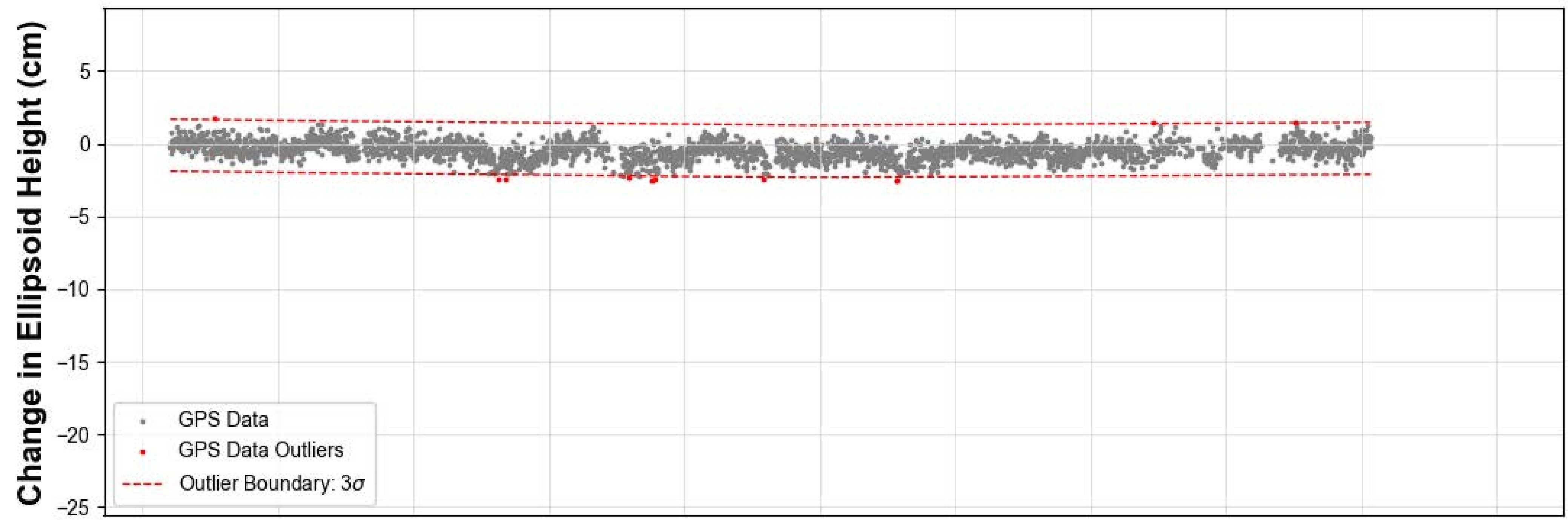
Galveston, TX

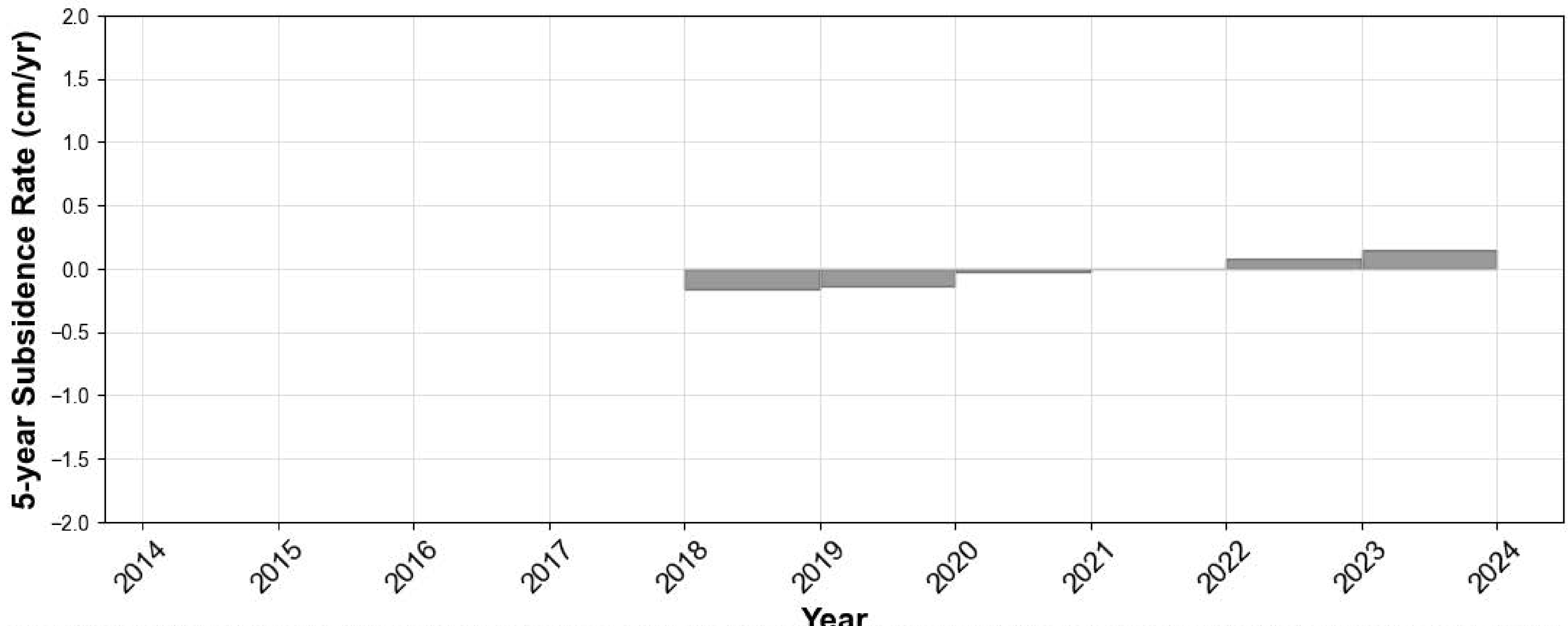


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

NASA

Houston, TX

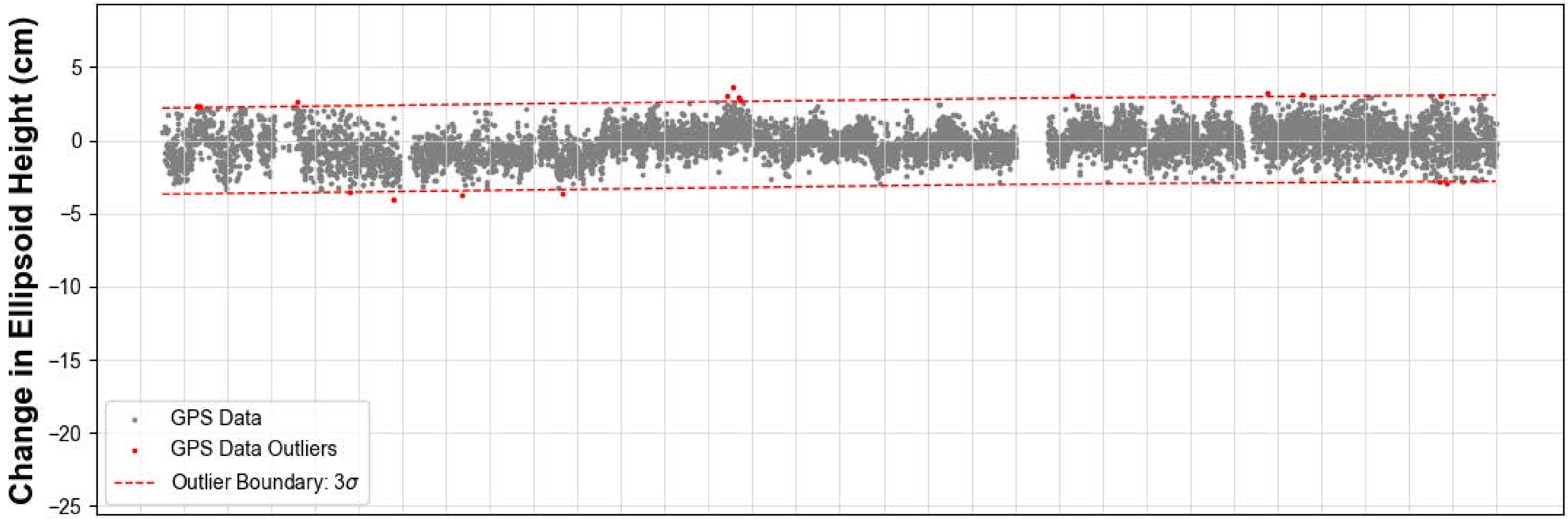


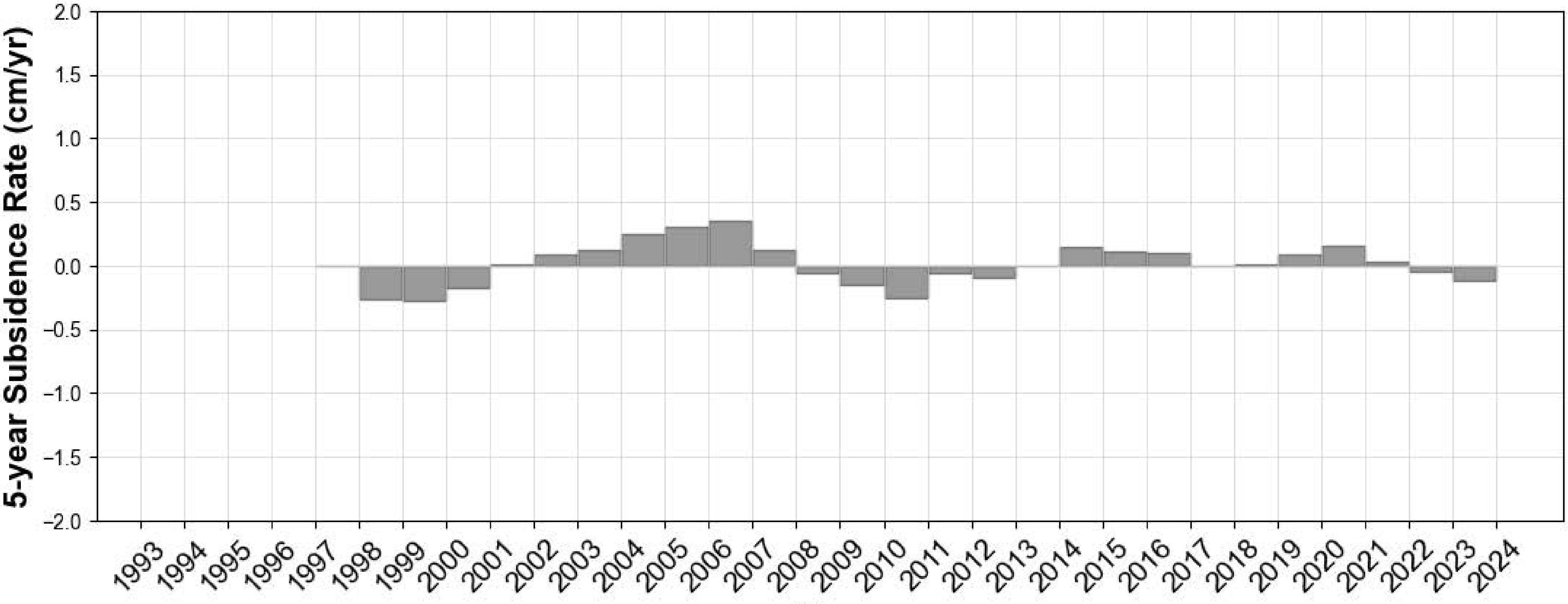


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

NETP

Houston, TX

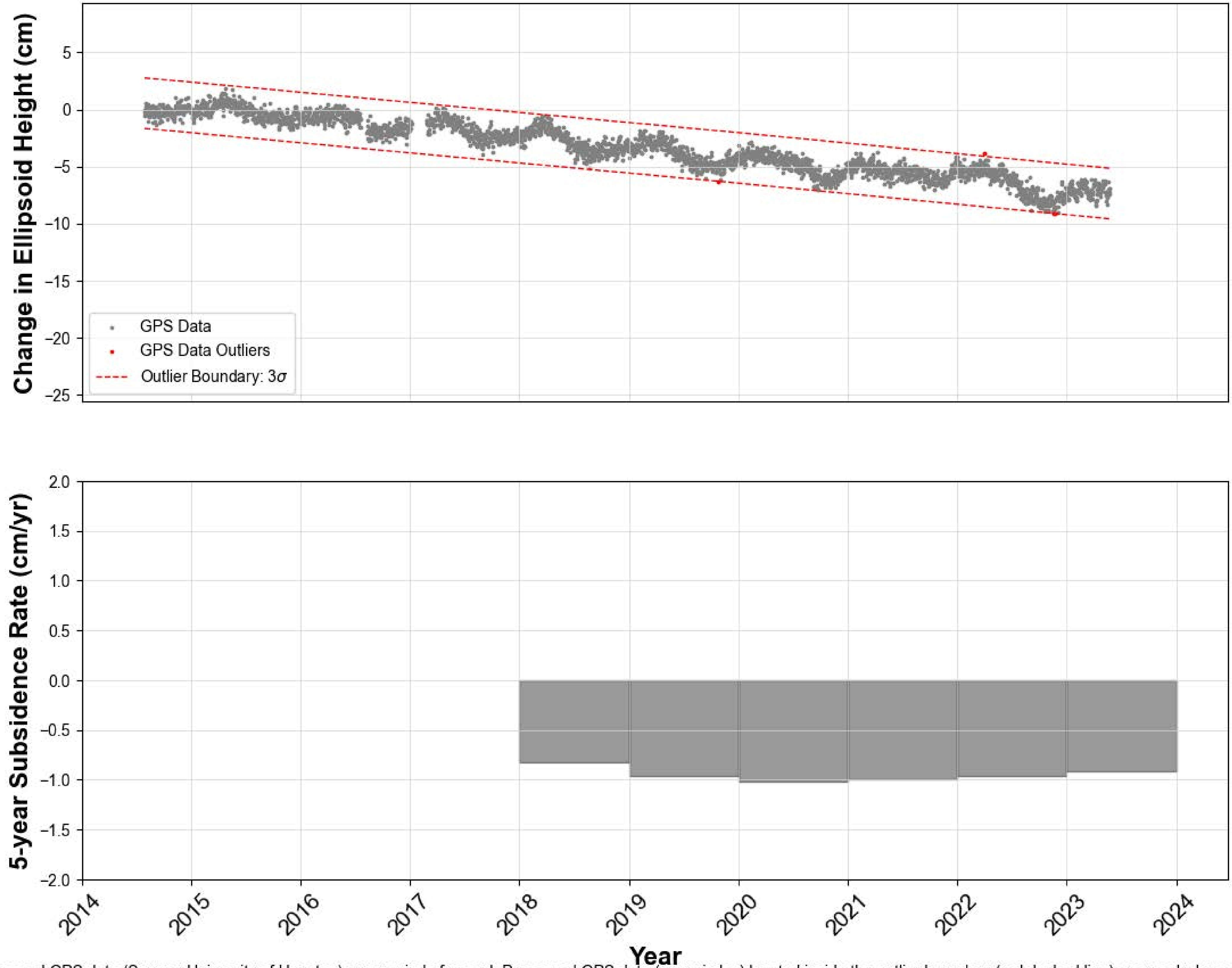




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

OKEK

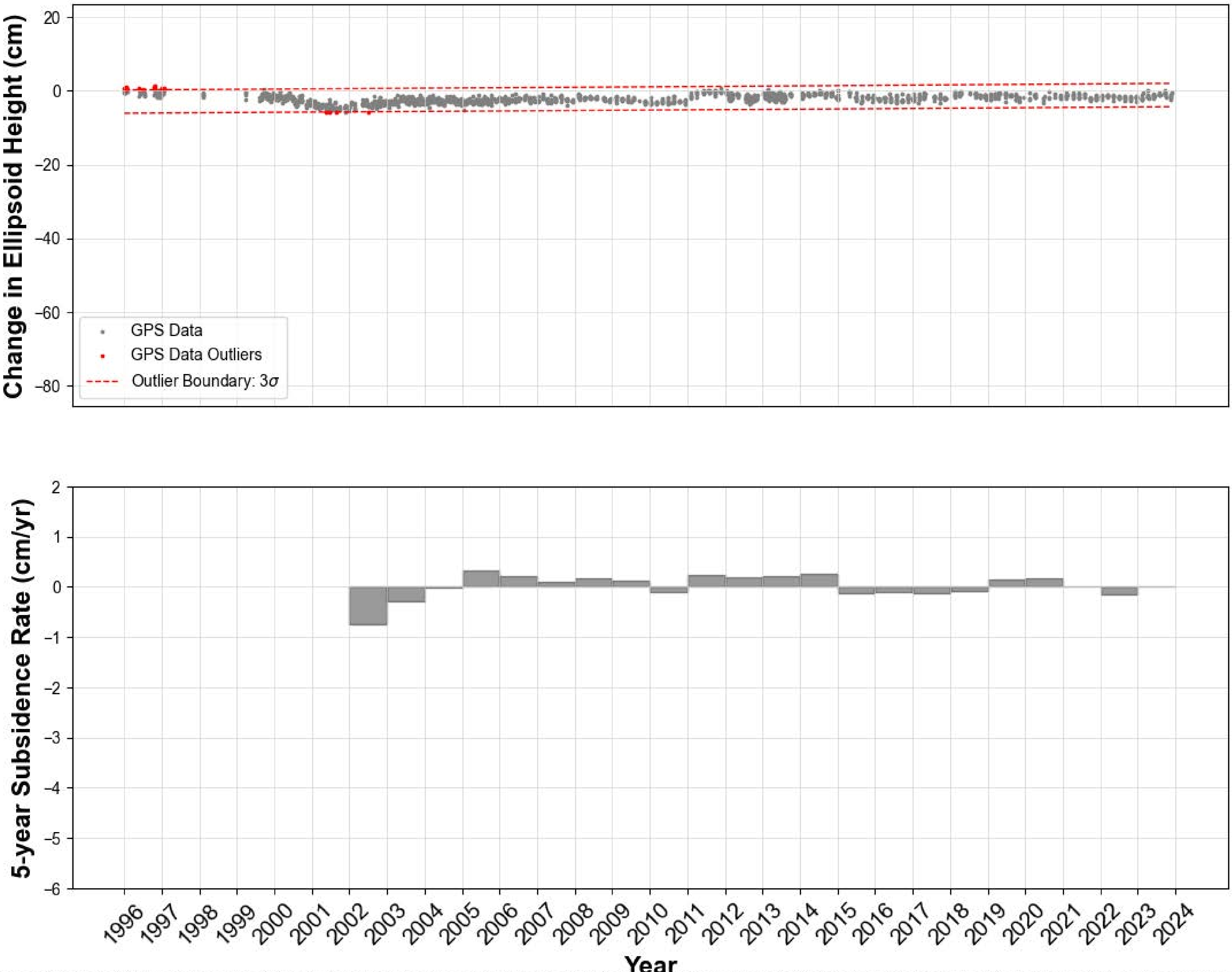
Katy, TX



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

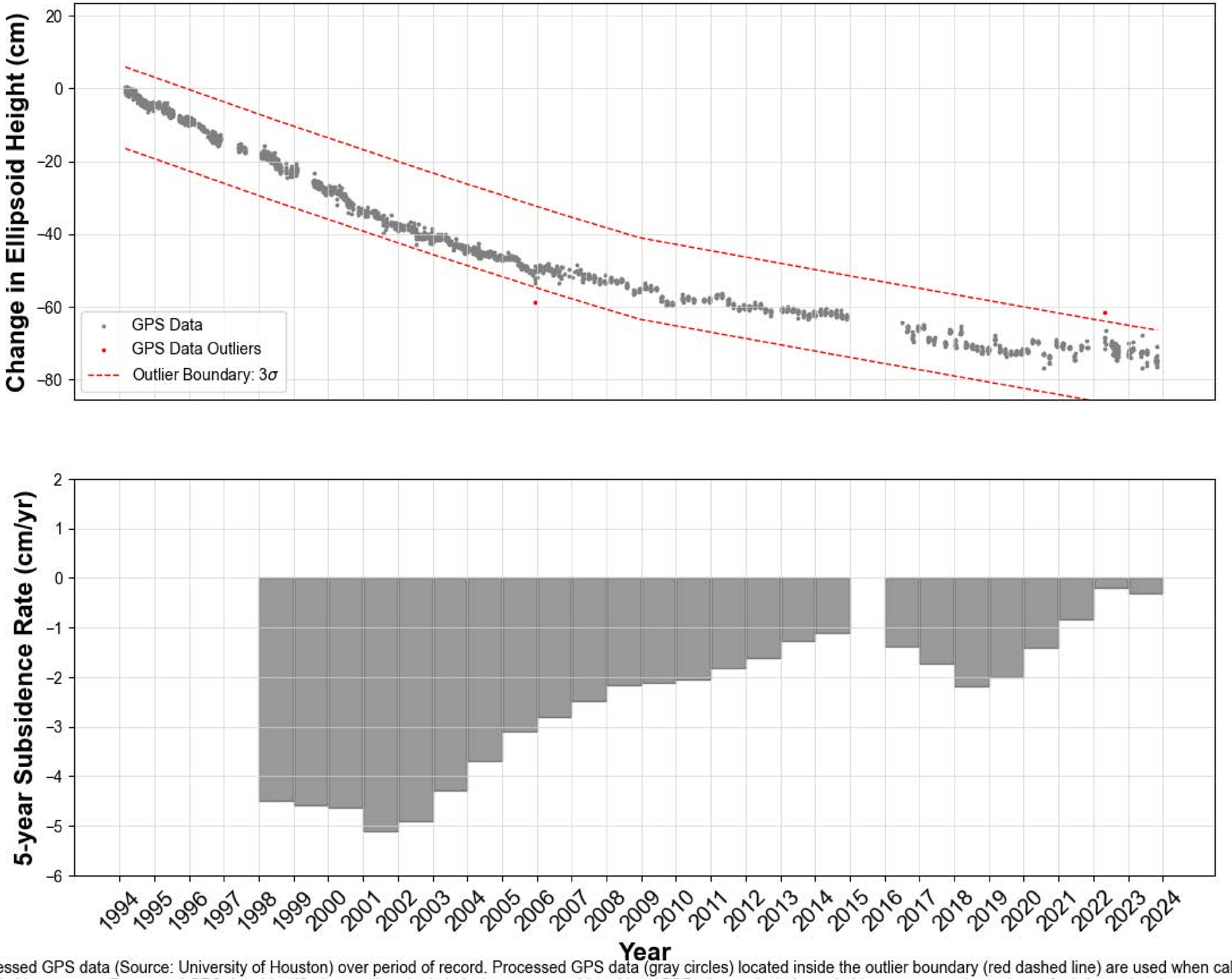
Friendswood, TX



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

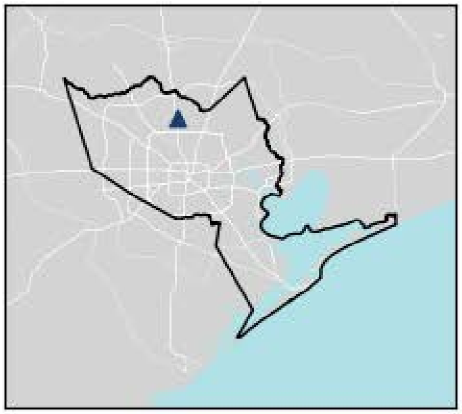
Houston, TX

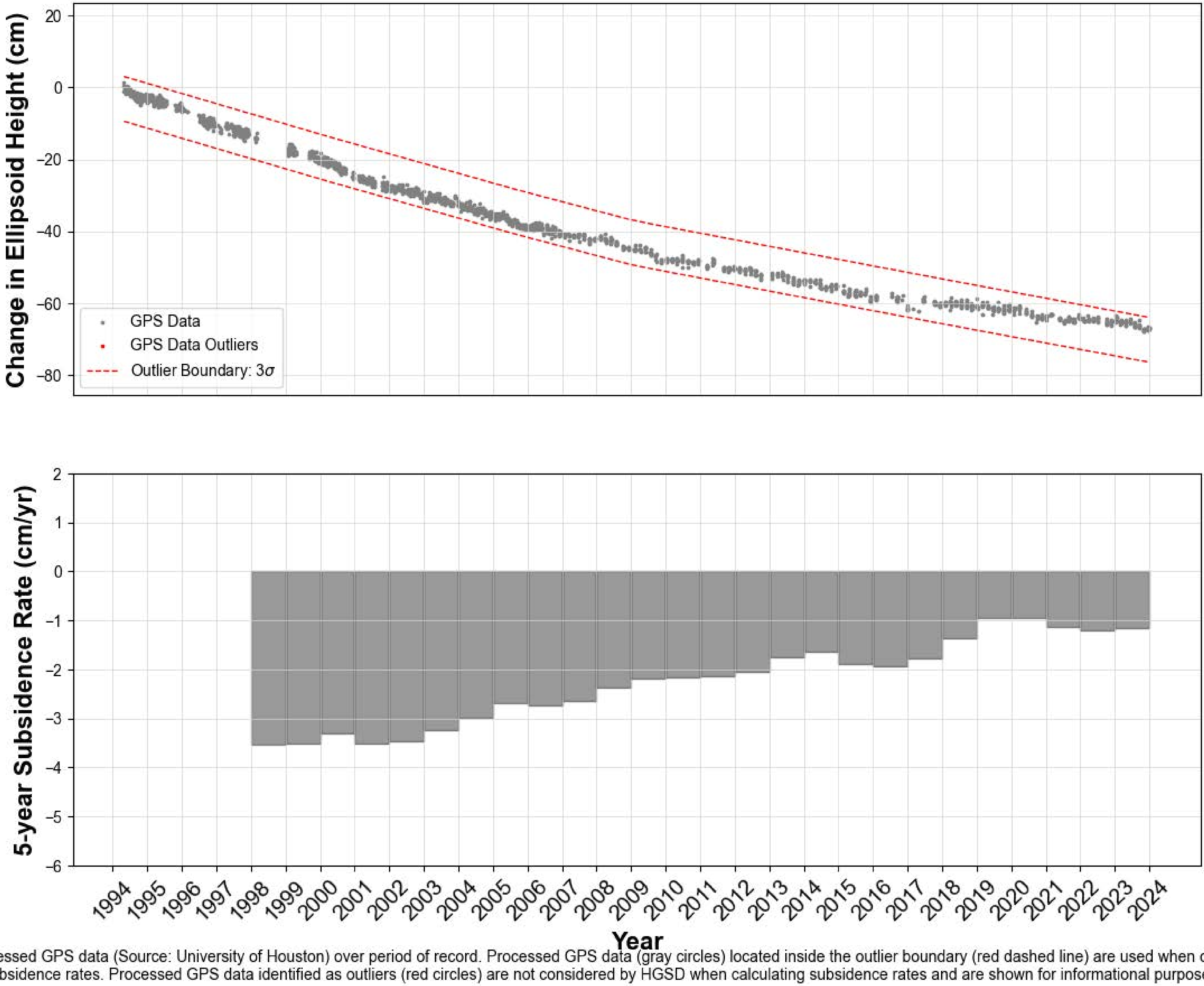


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P002

Houston, TX

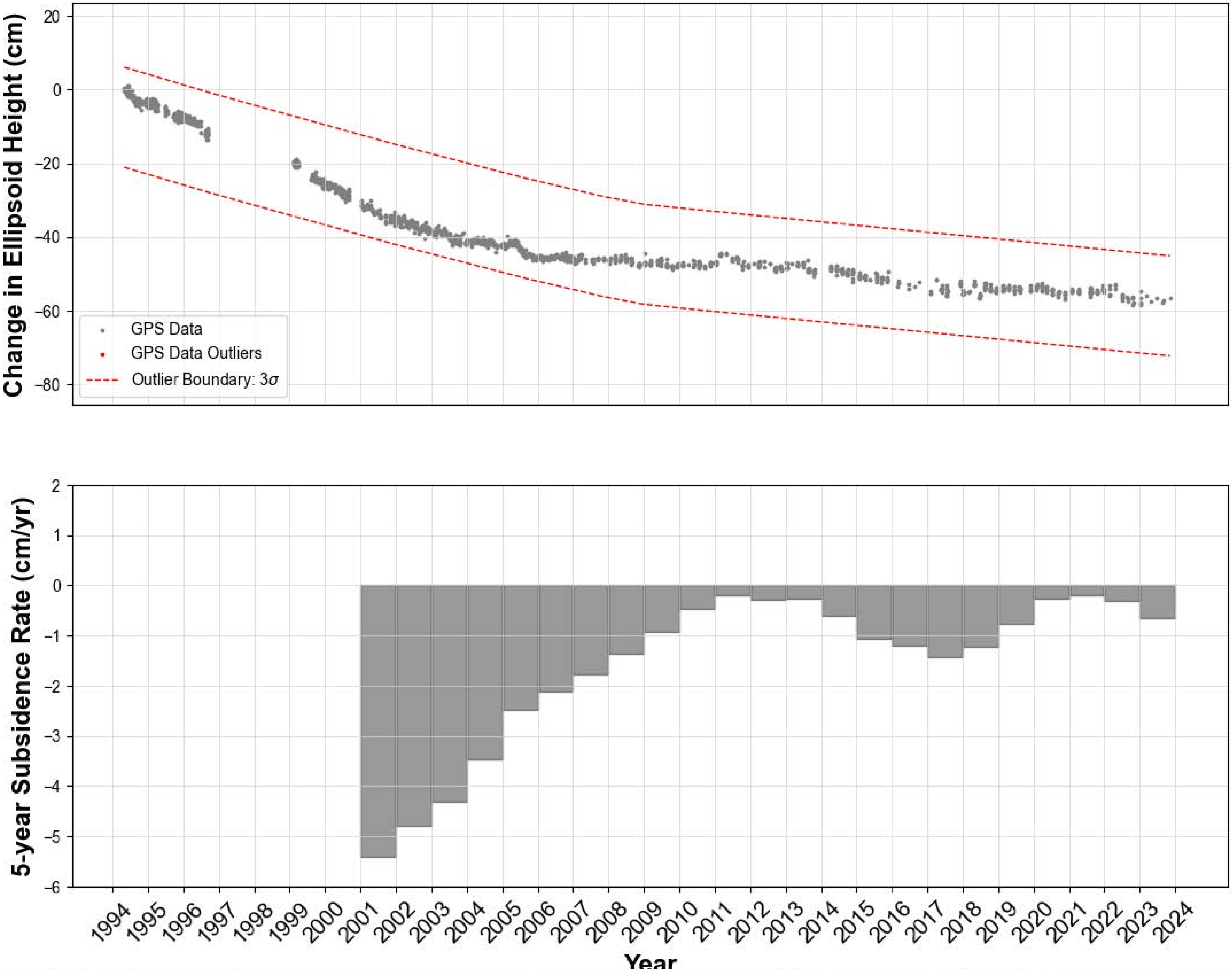




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P003

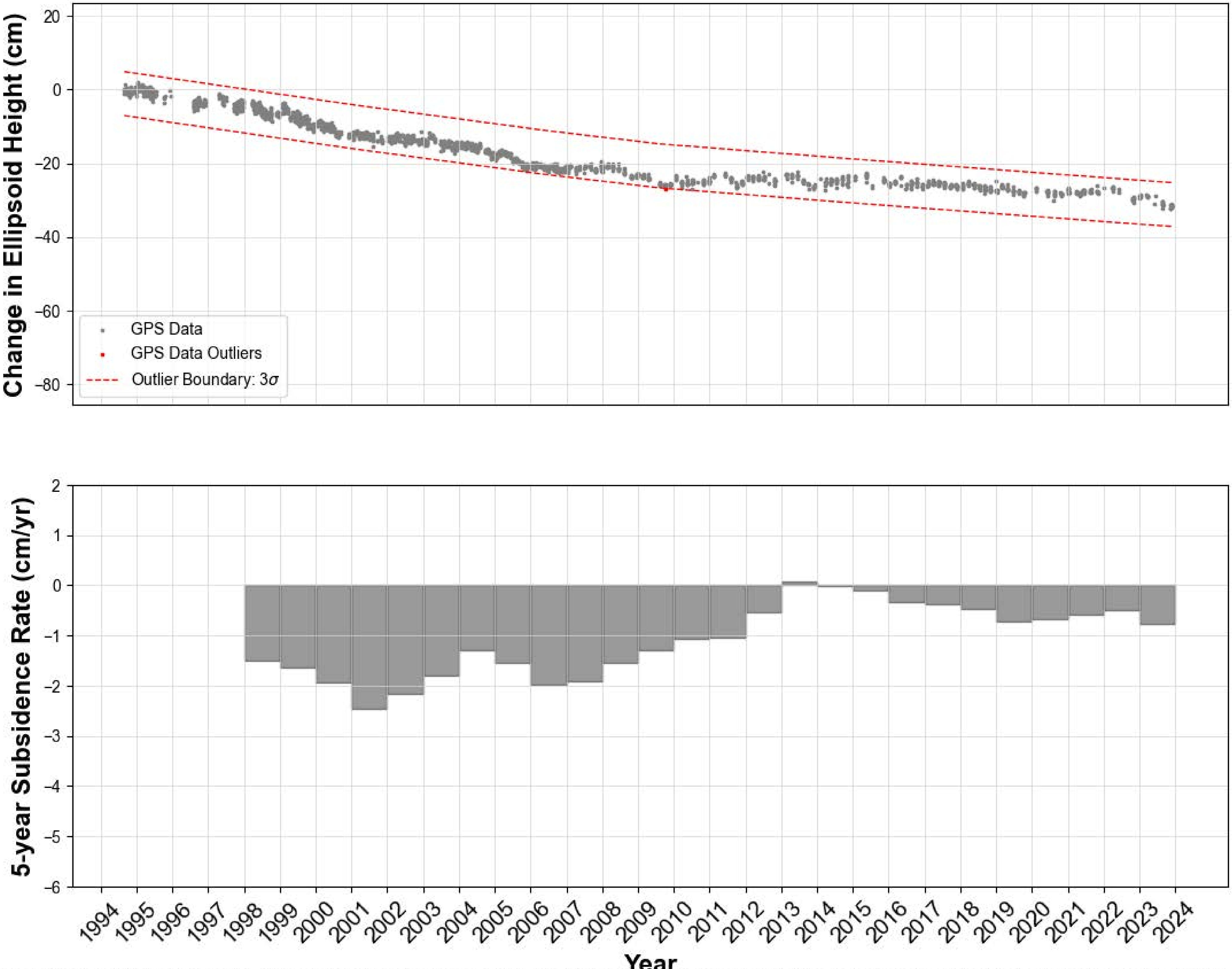
Houston, TX



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

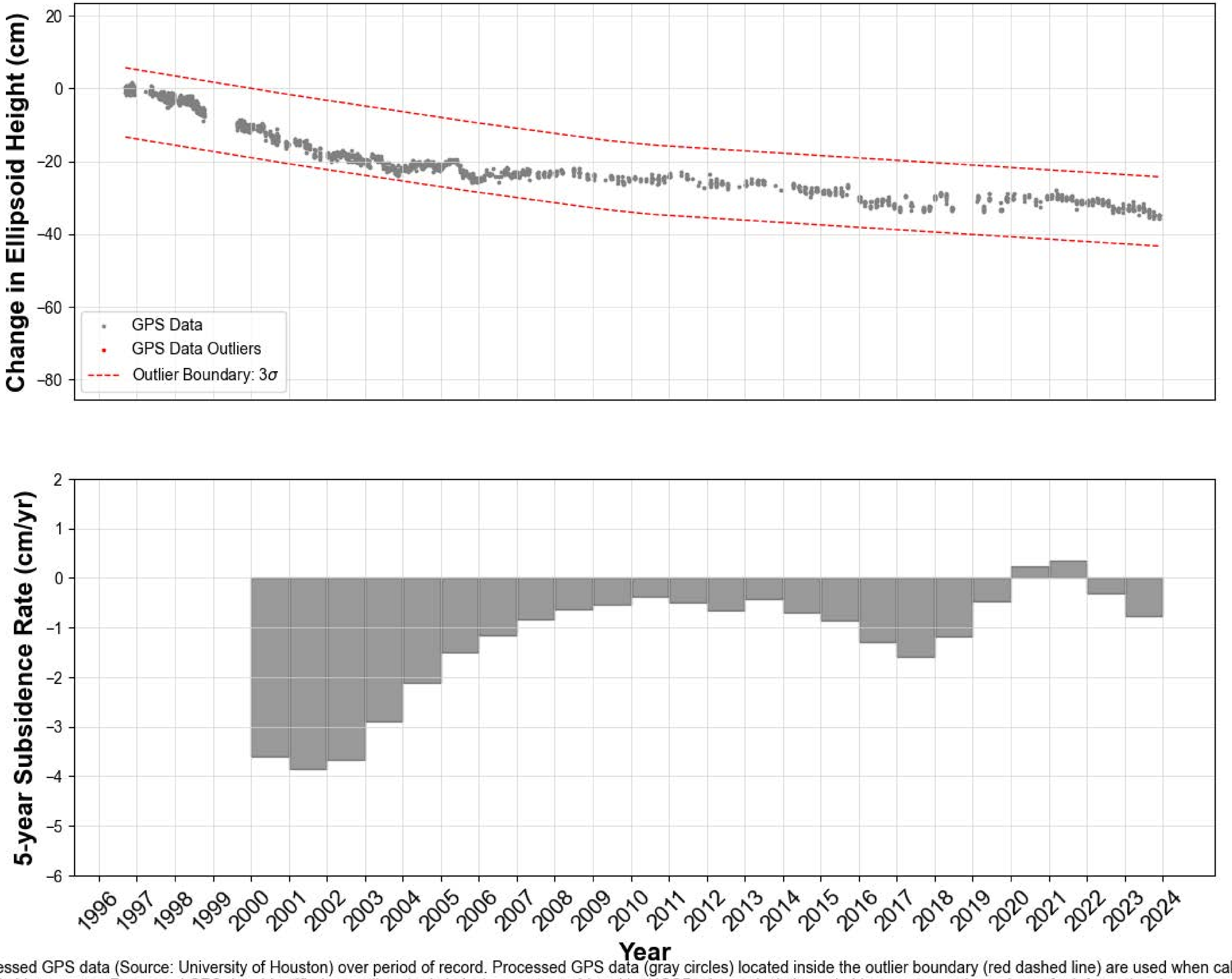
Sugar Land, TX



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

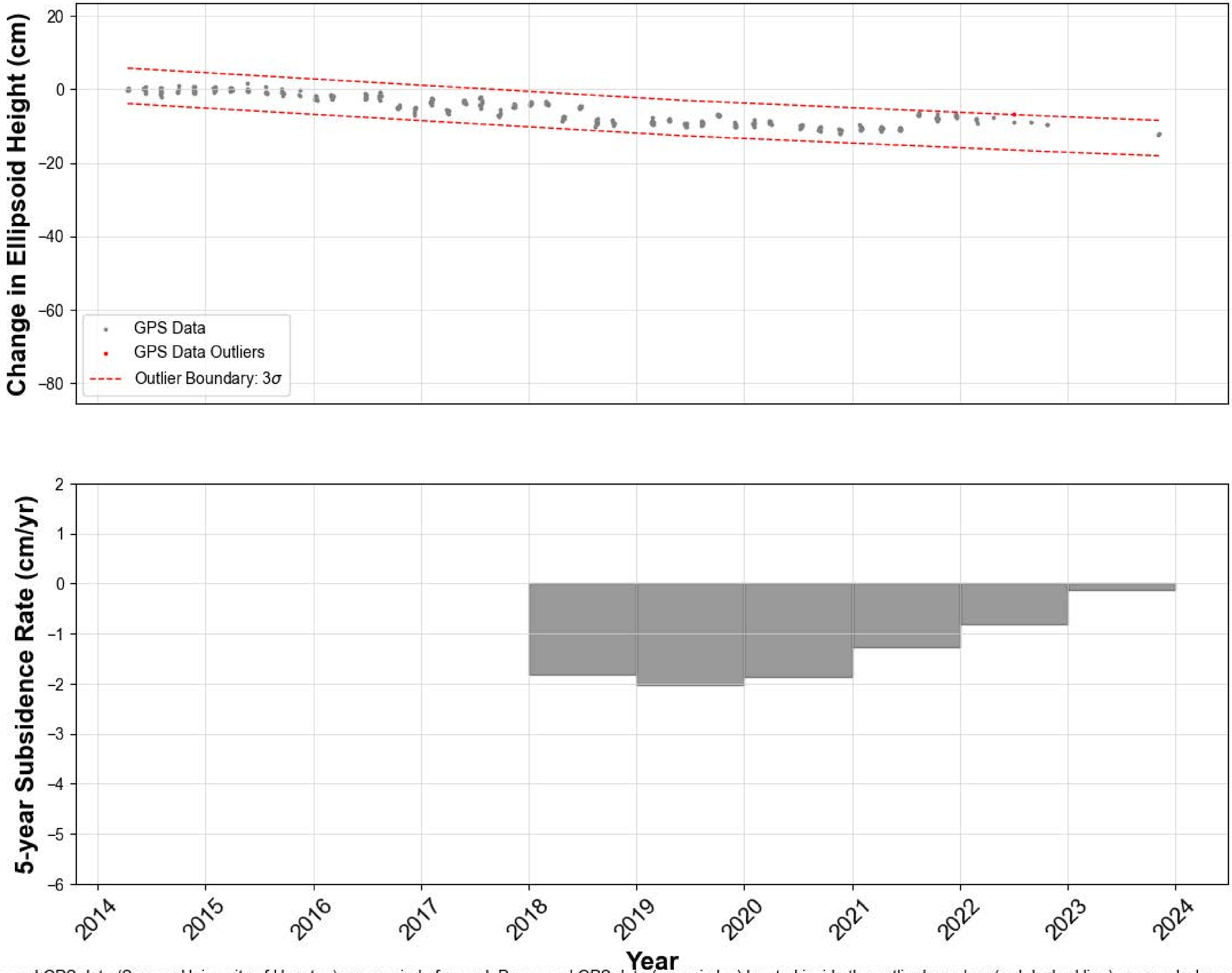
Houston, TX



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

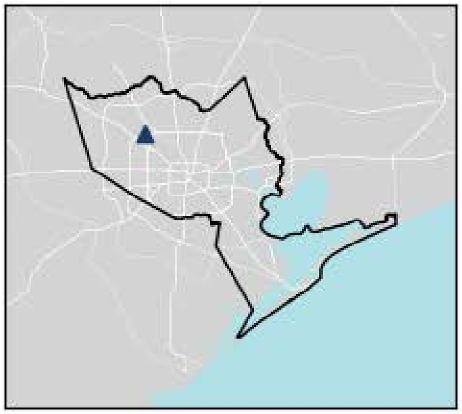
Houston, TX

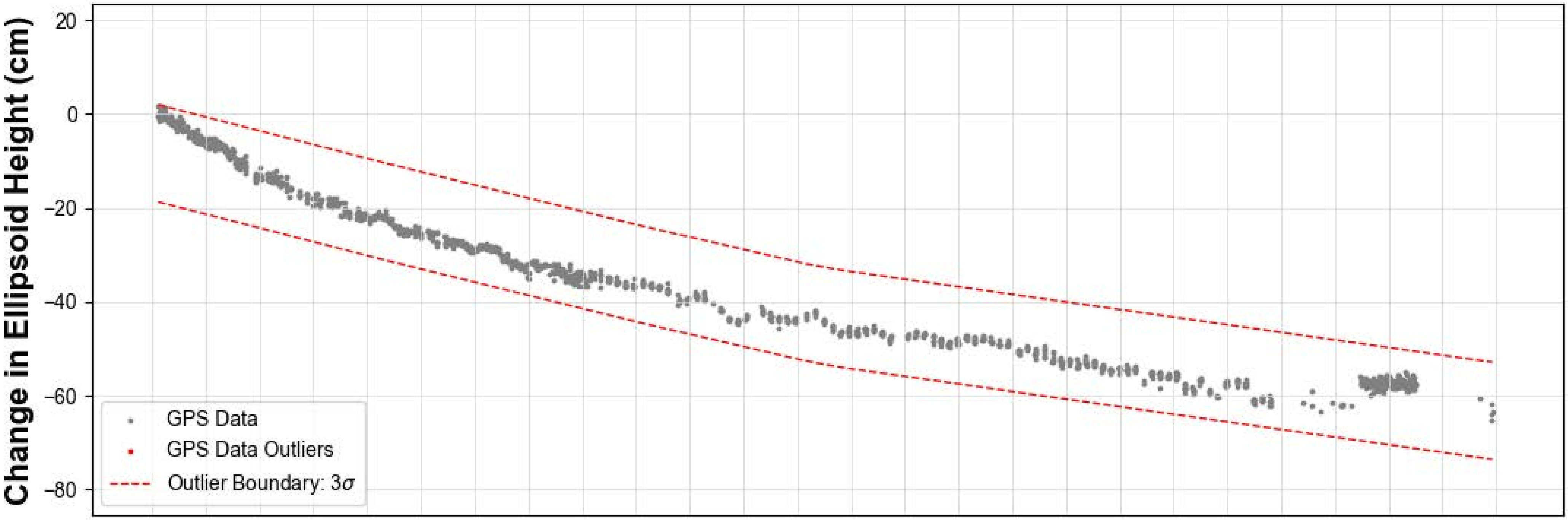


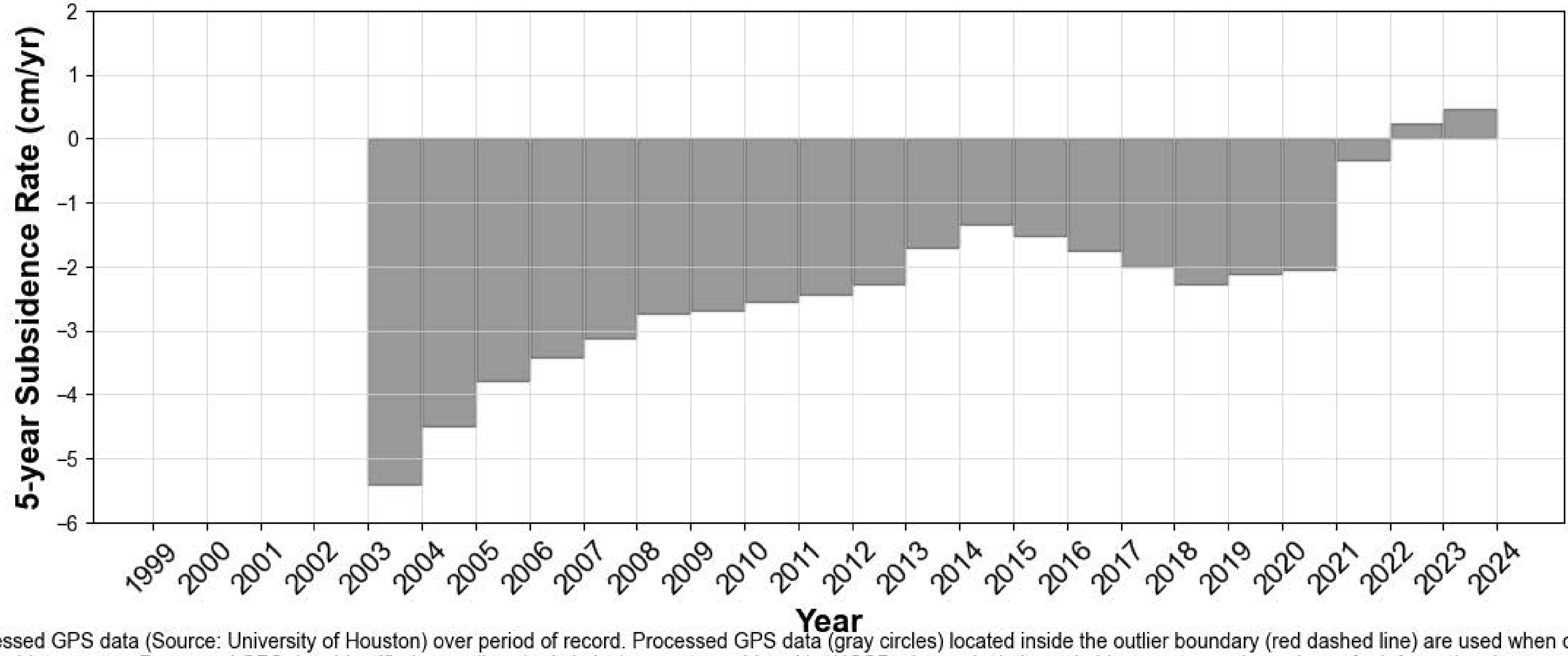
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P007

Houston, TX



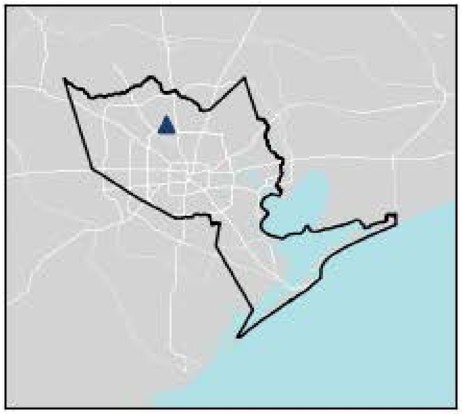


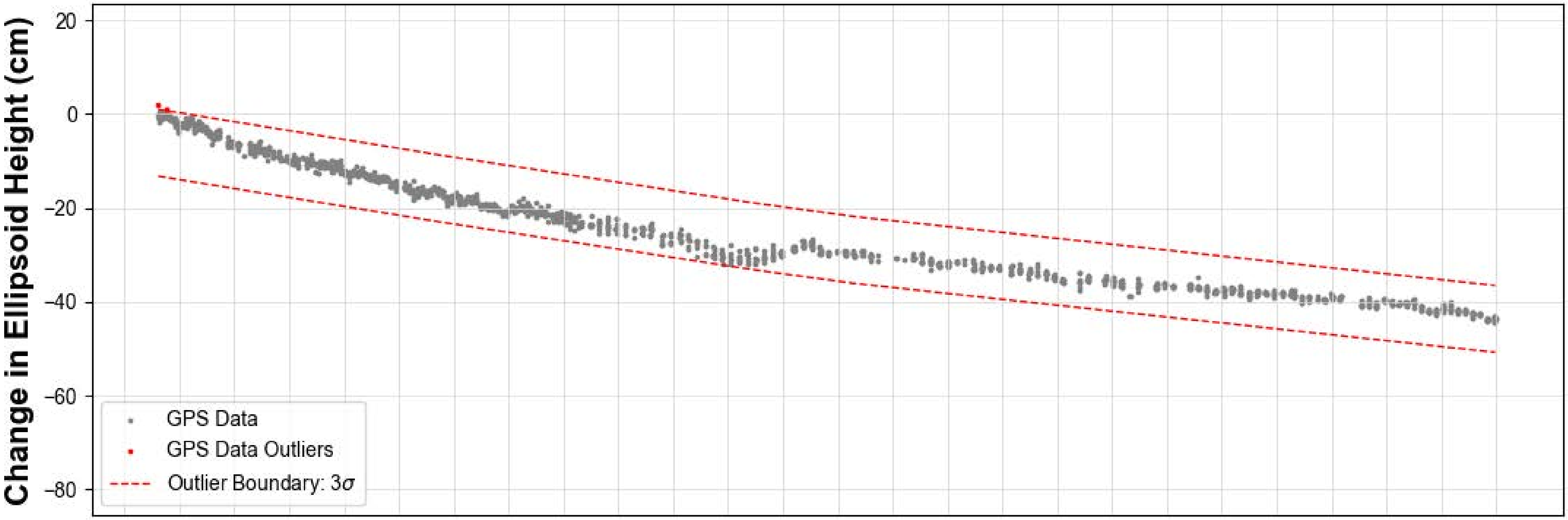


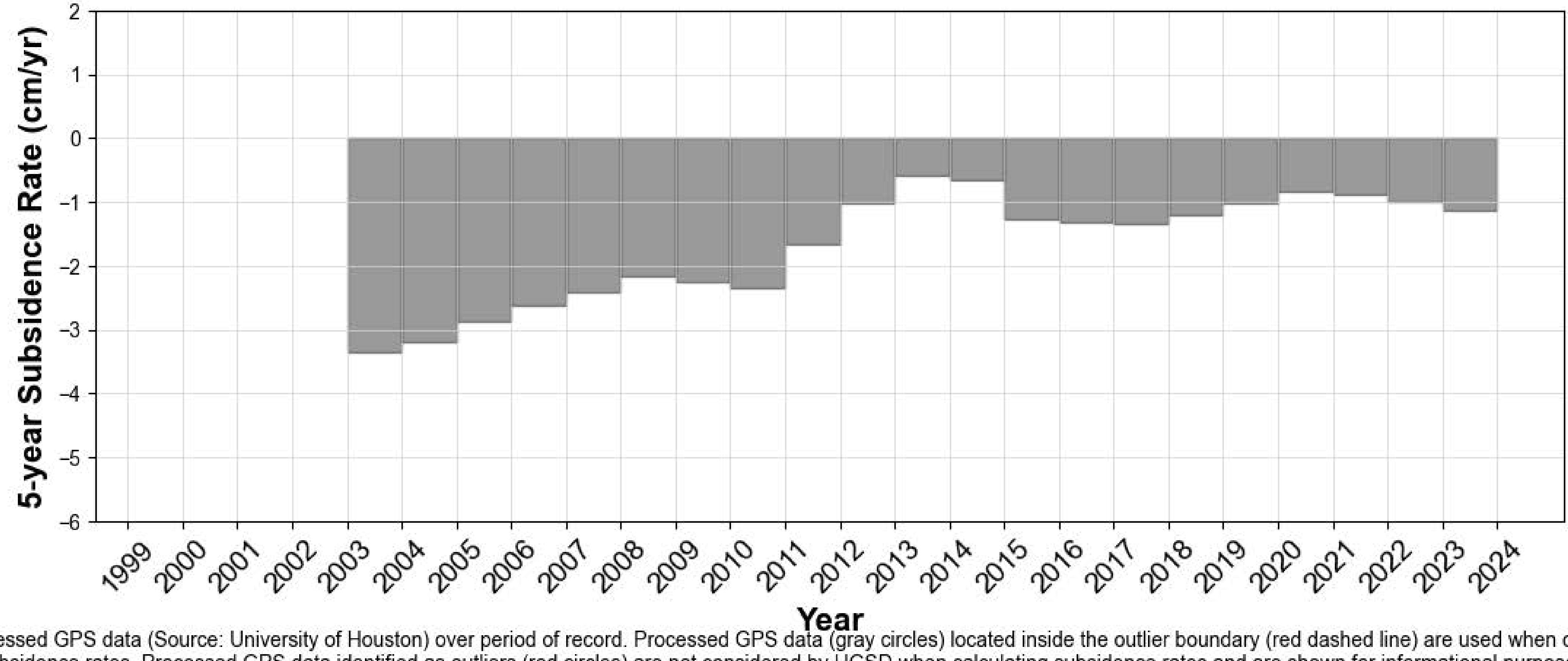
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P008

Houston, TX



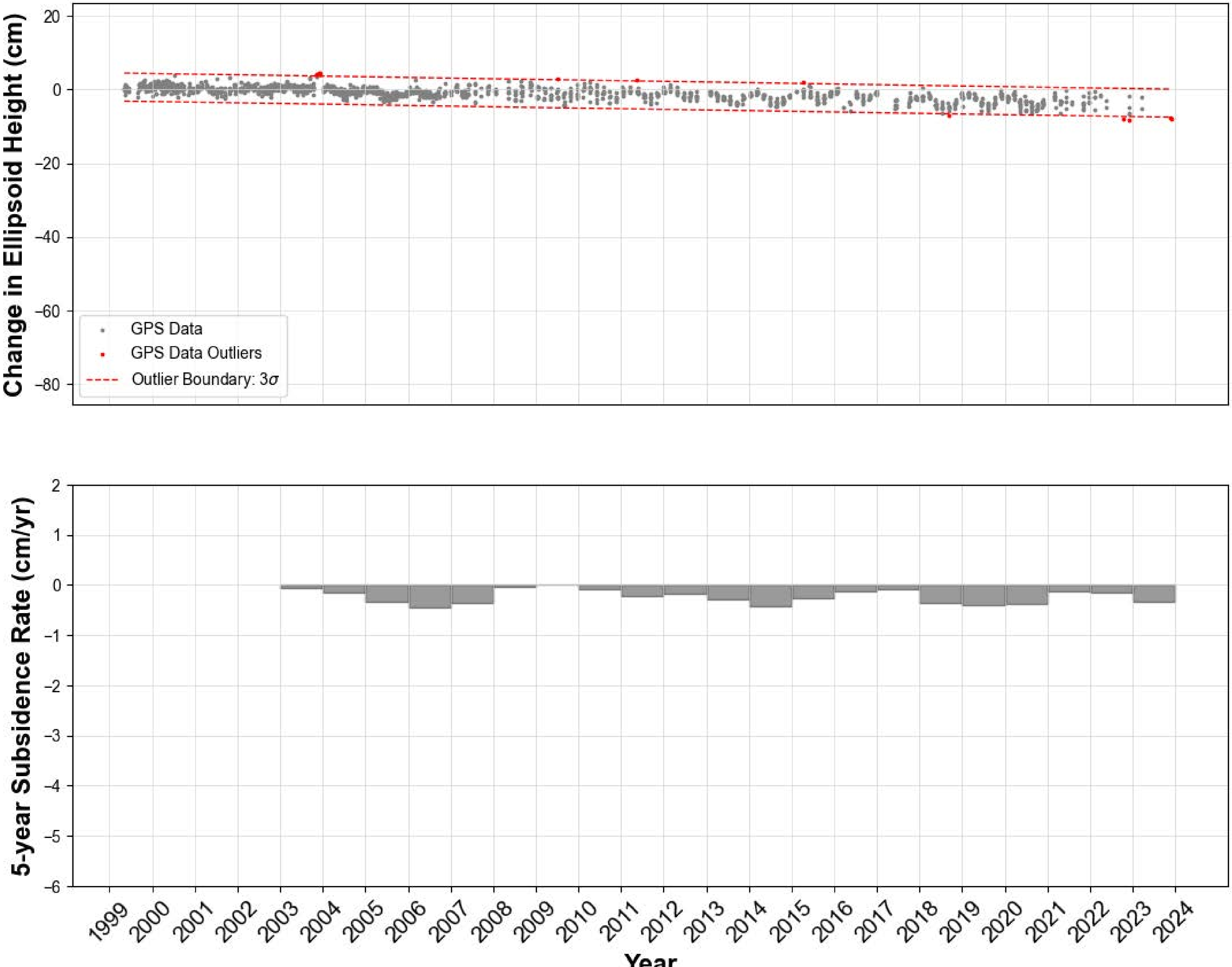




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P009

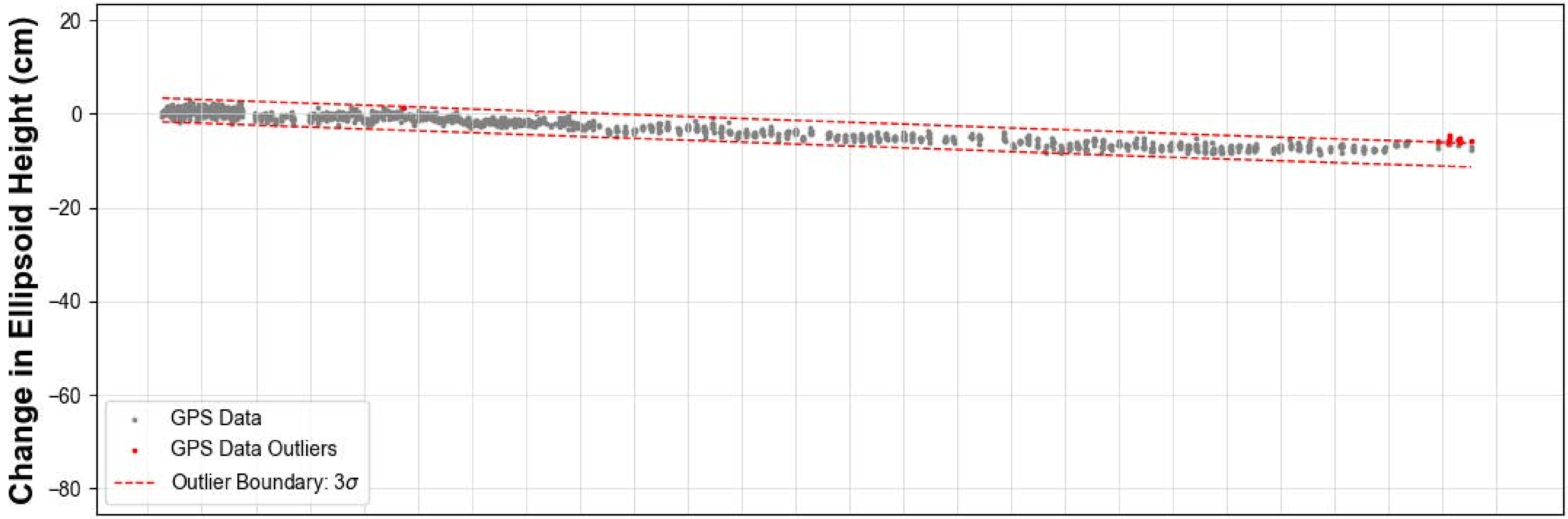
Huffman, TX

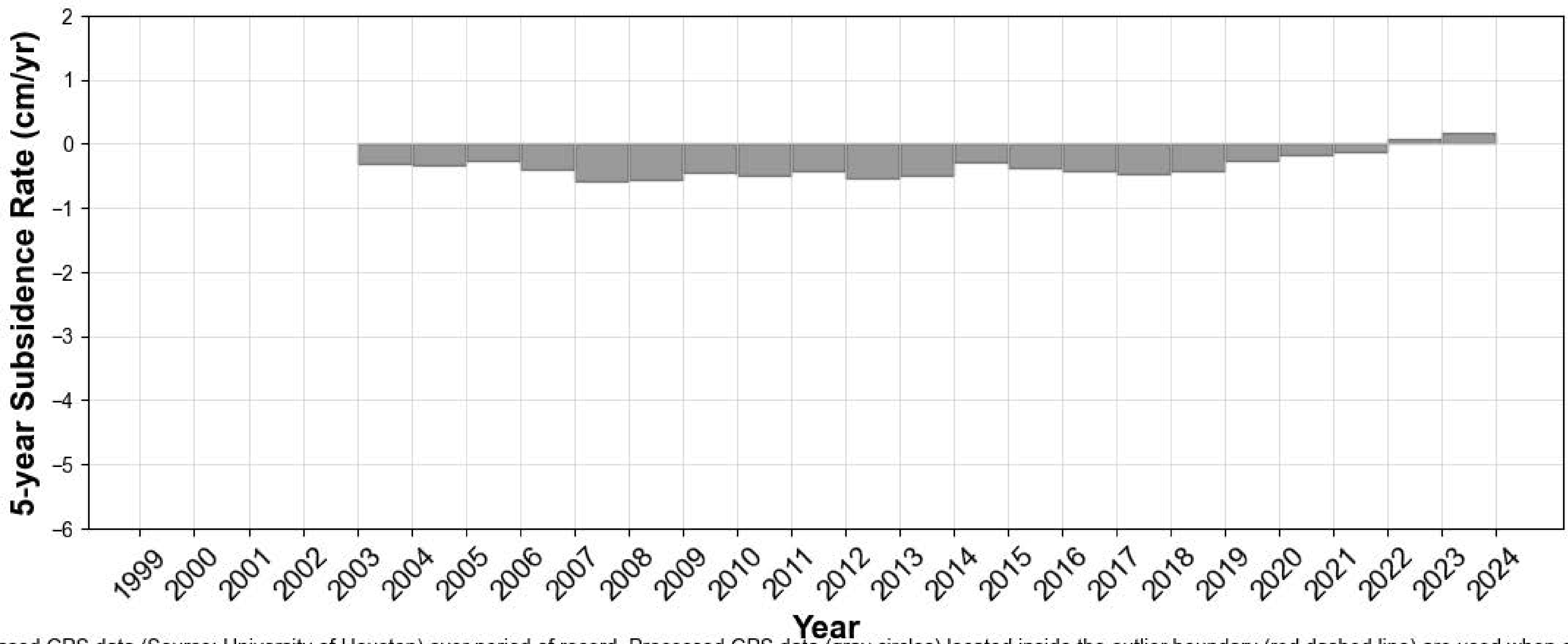


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P010

Rosenberg, TX

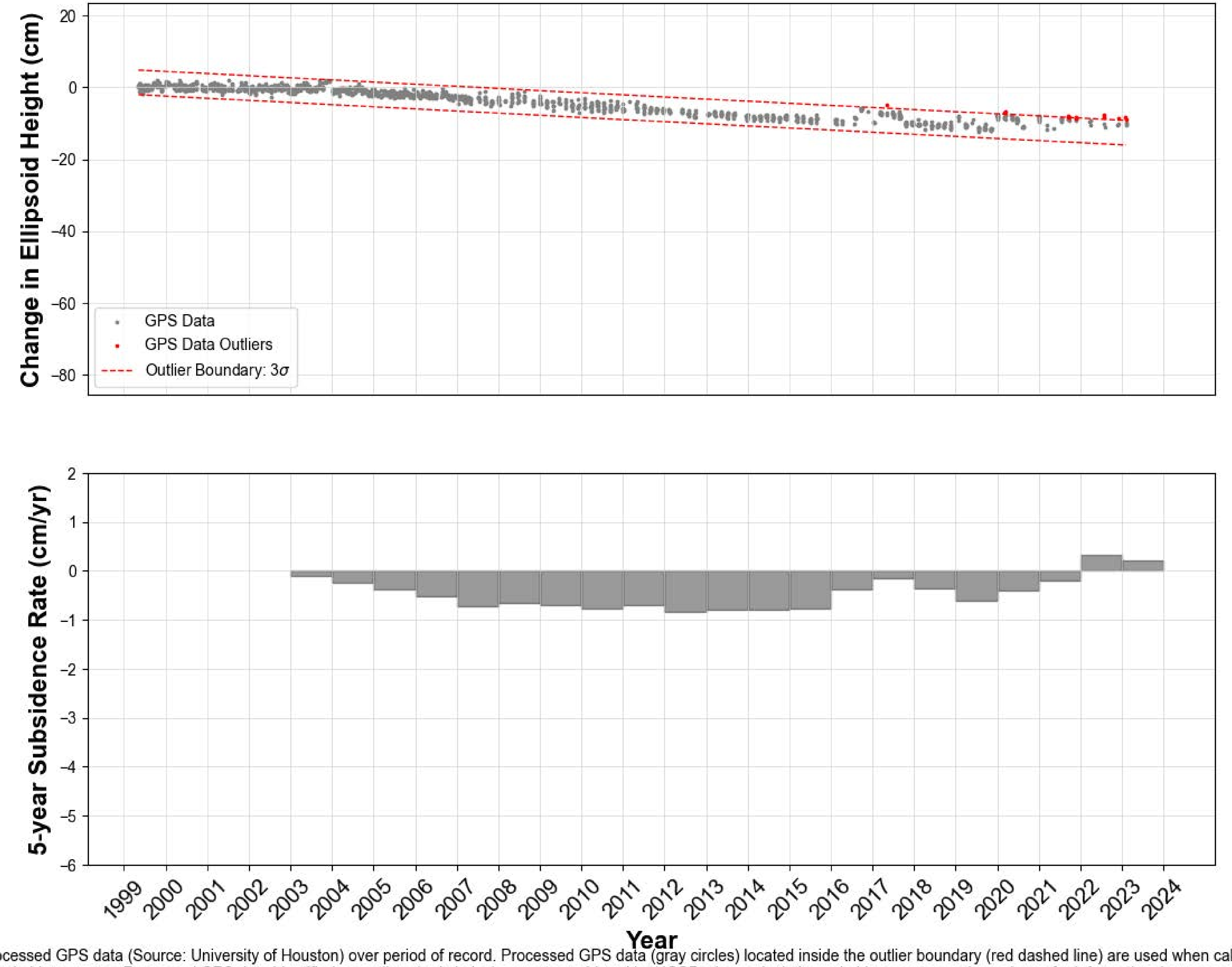




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P011

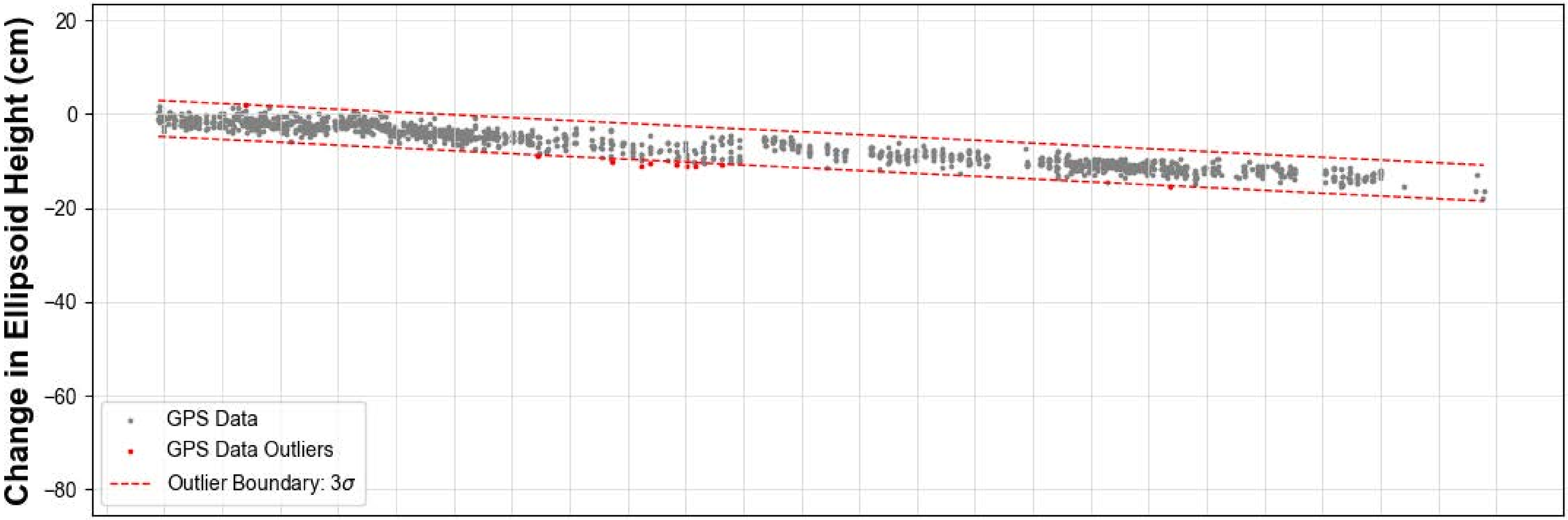
Hockley, TX

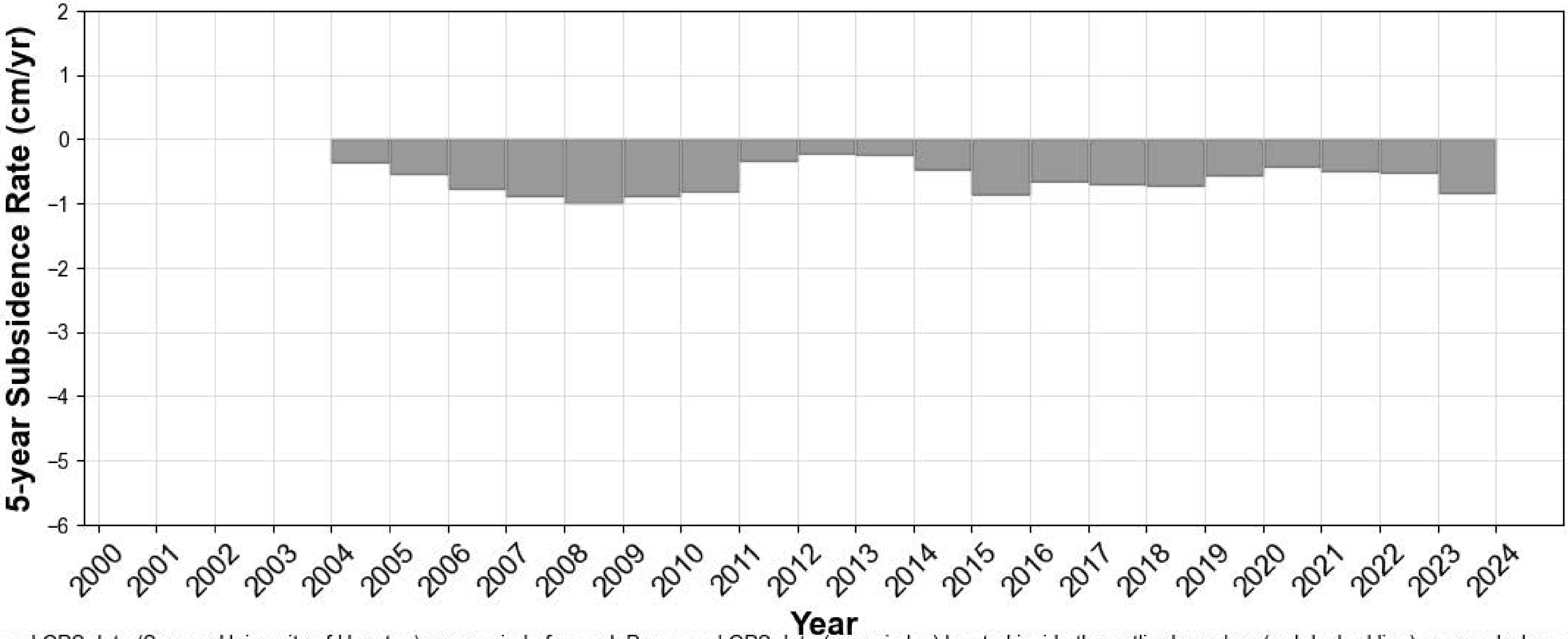


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P012

Porter, TX

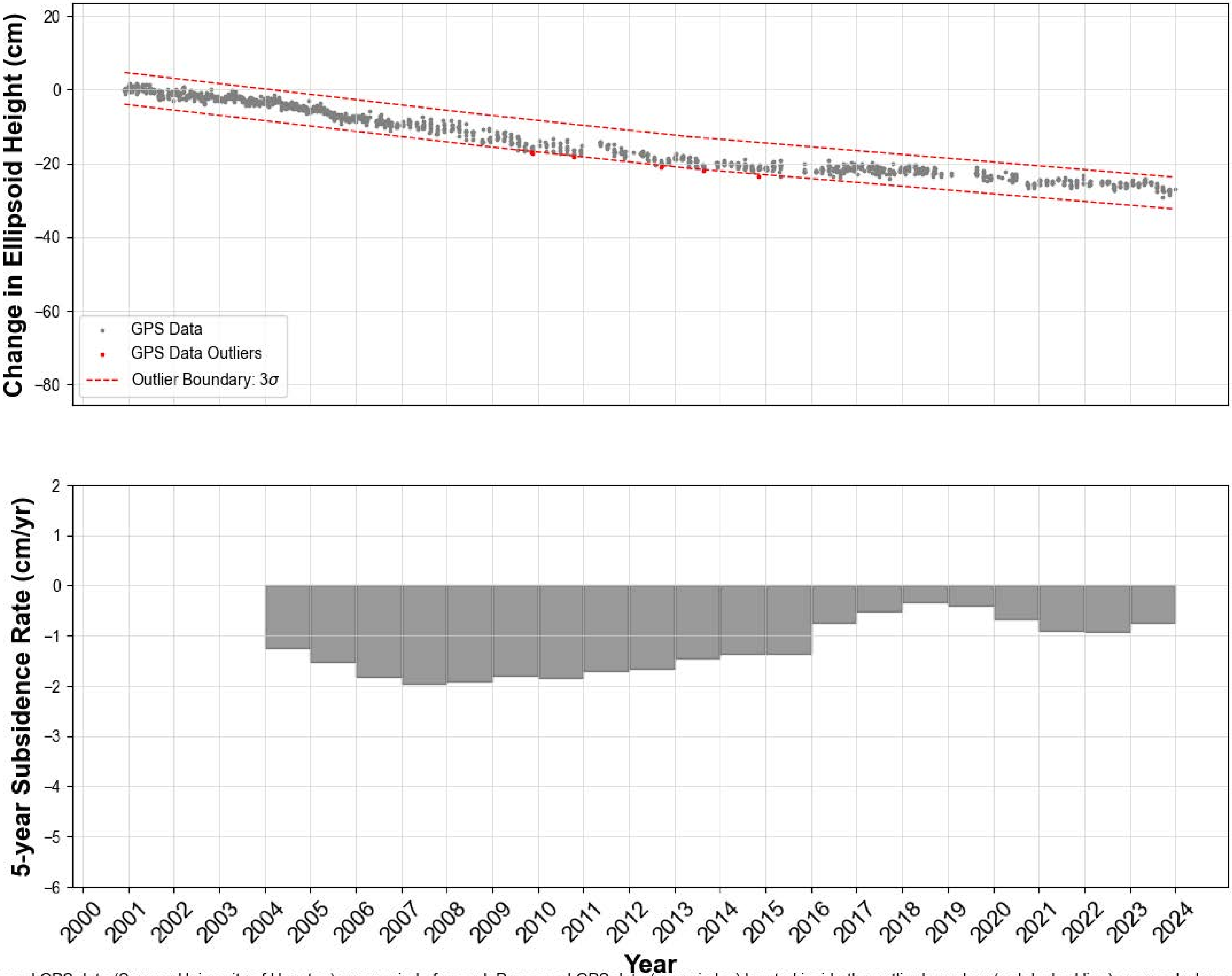




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P013

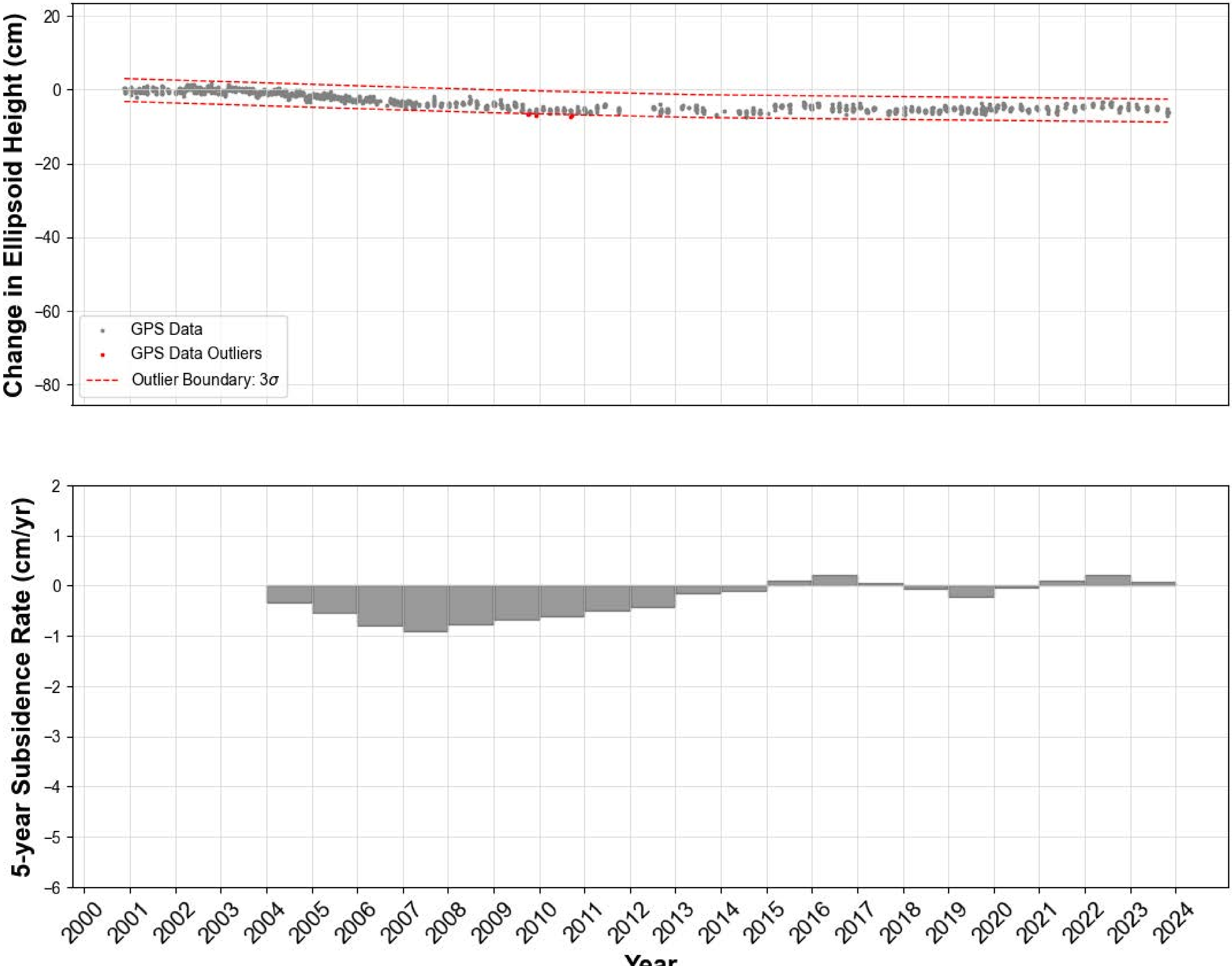
The Woodlands, TX



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

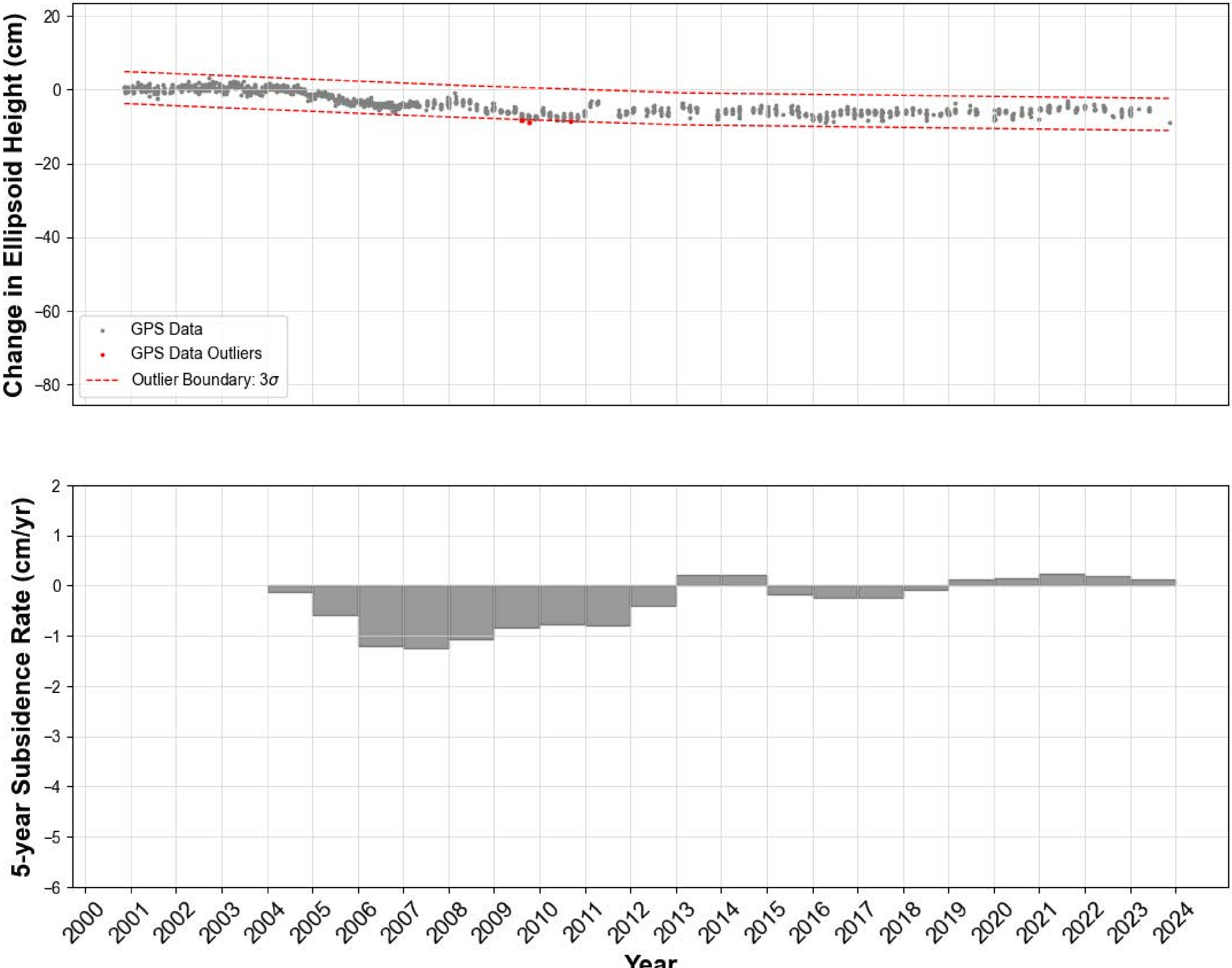
Thompsons, TX



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

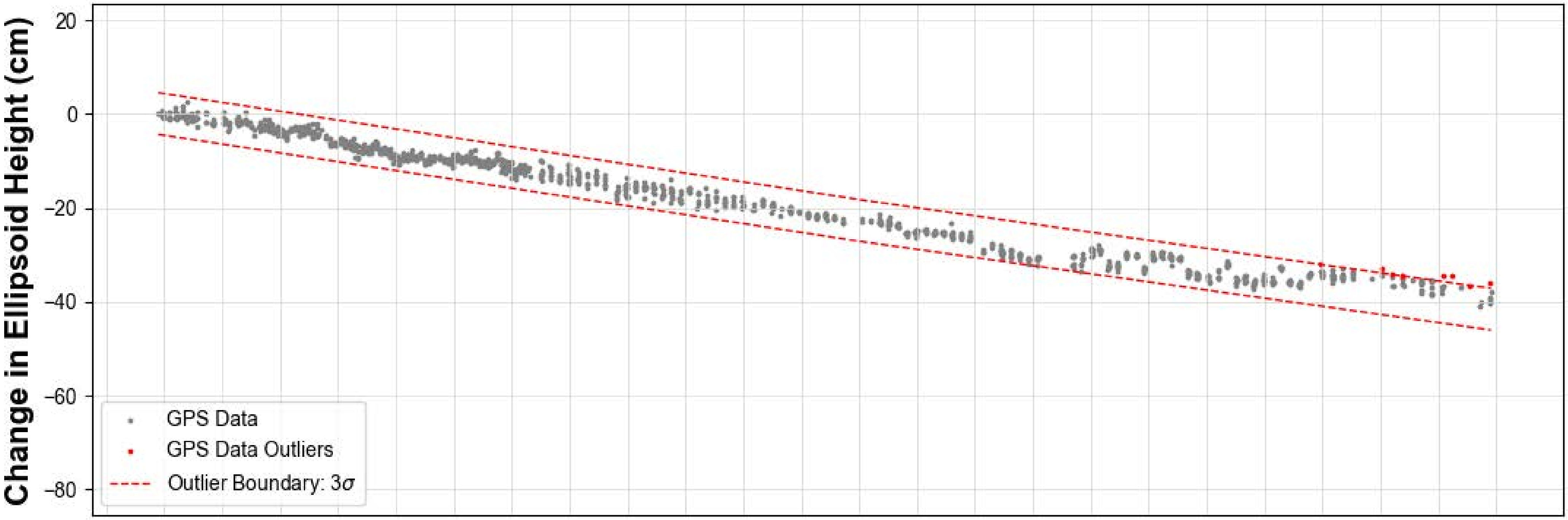
Missouri City, TX

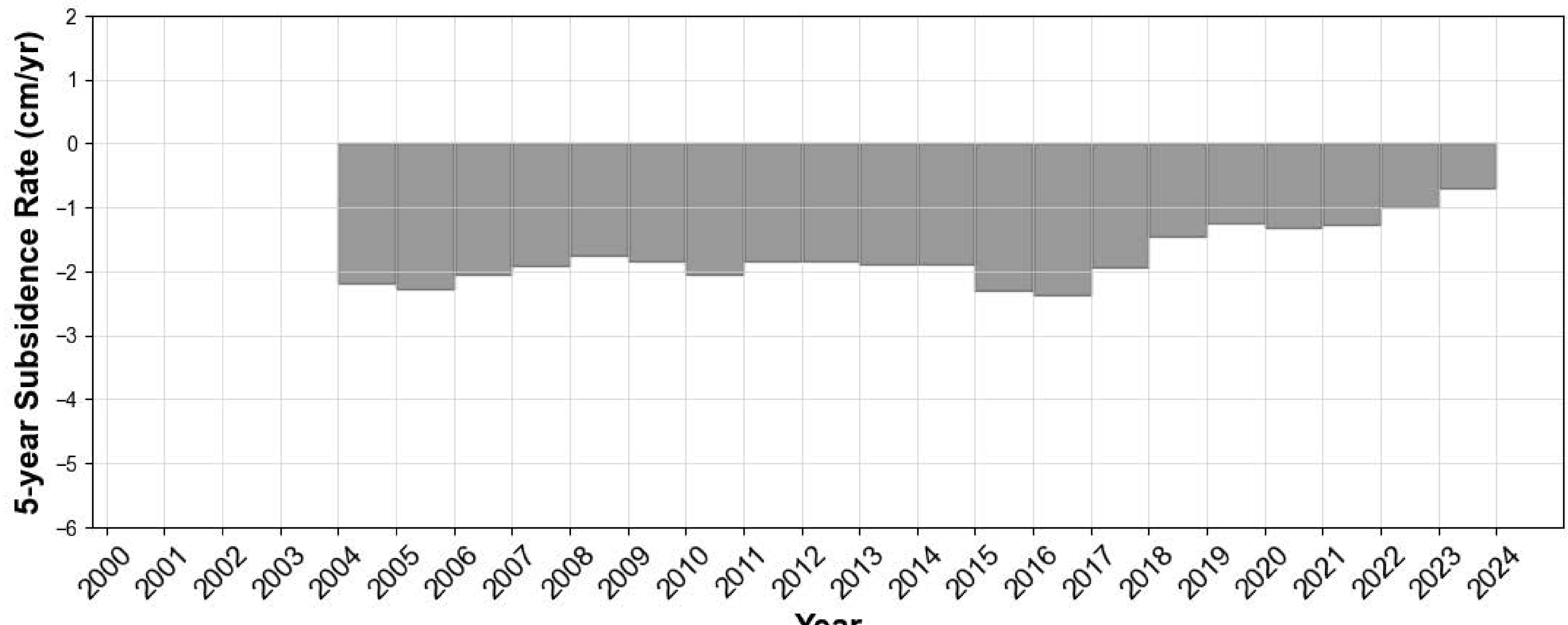


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P017

Tomball, TX

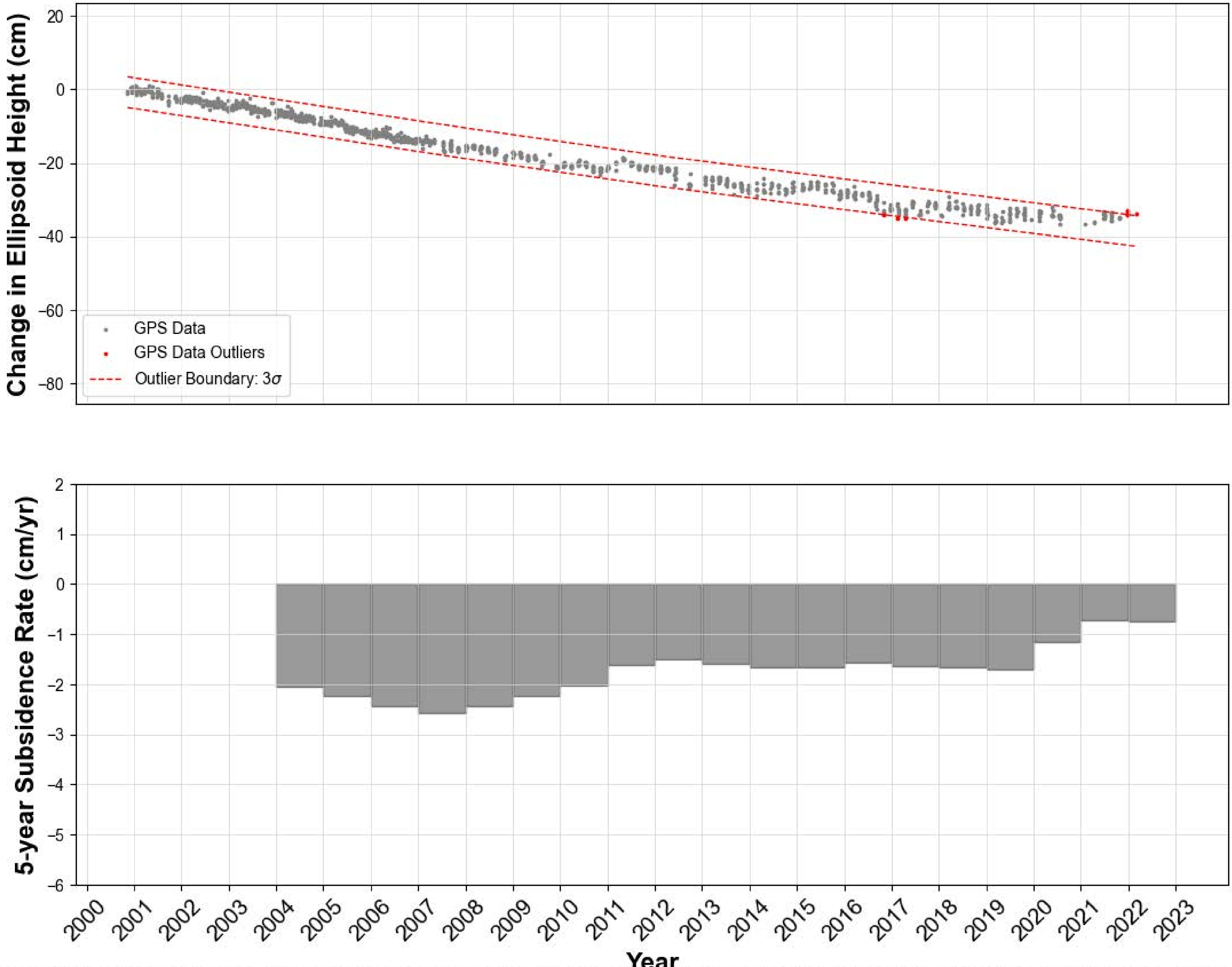




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P018

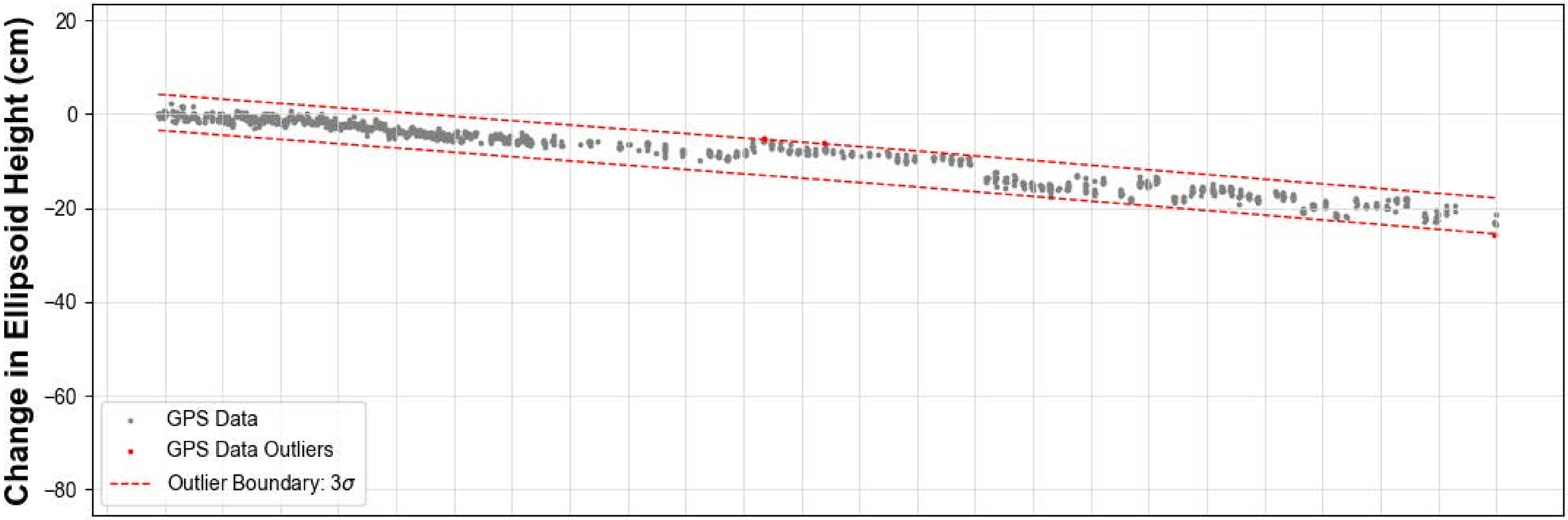
Cypress, TX

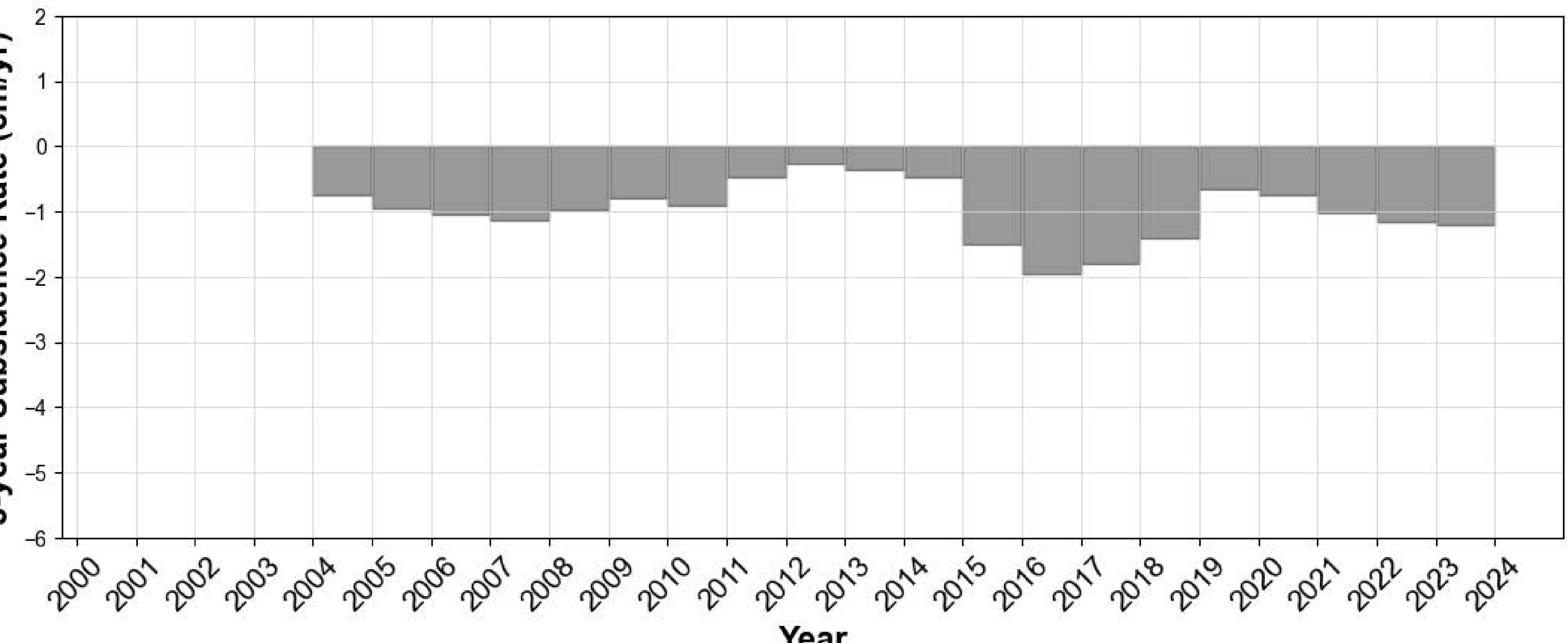


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P019

Katy, TX

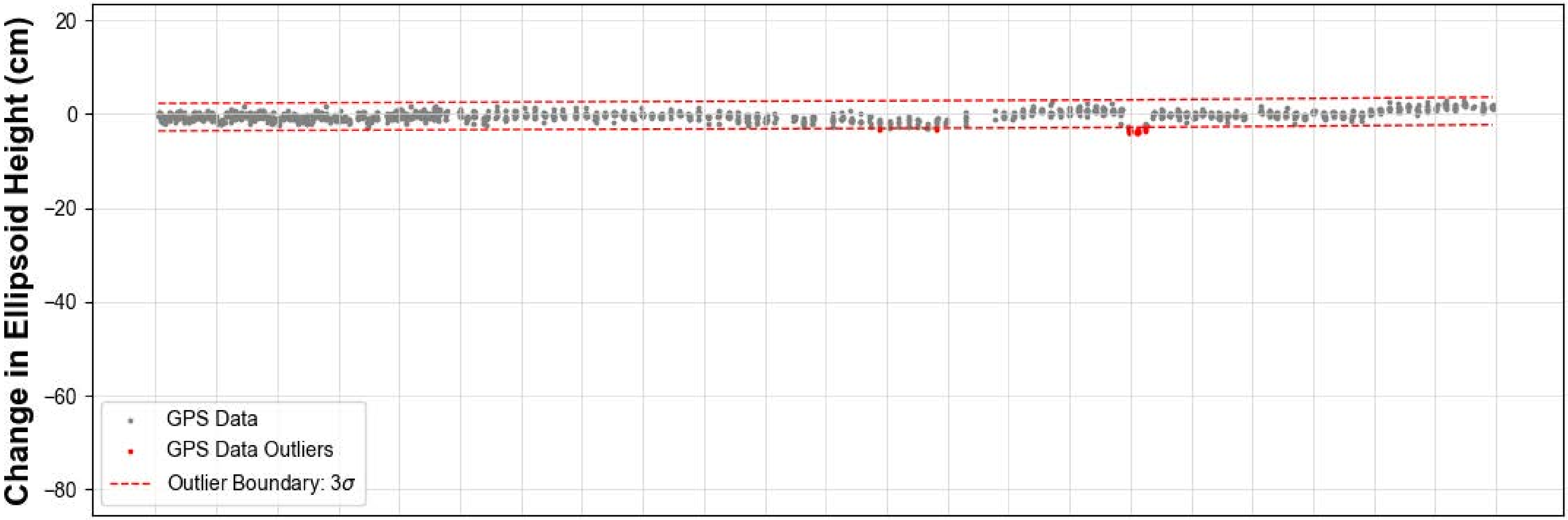


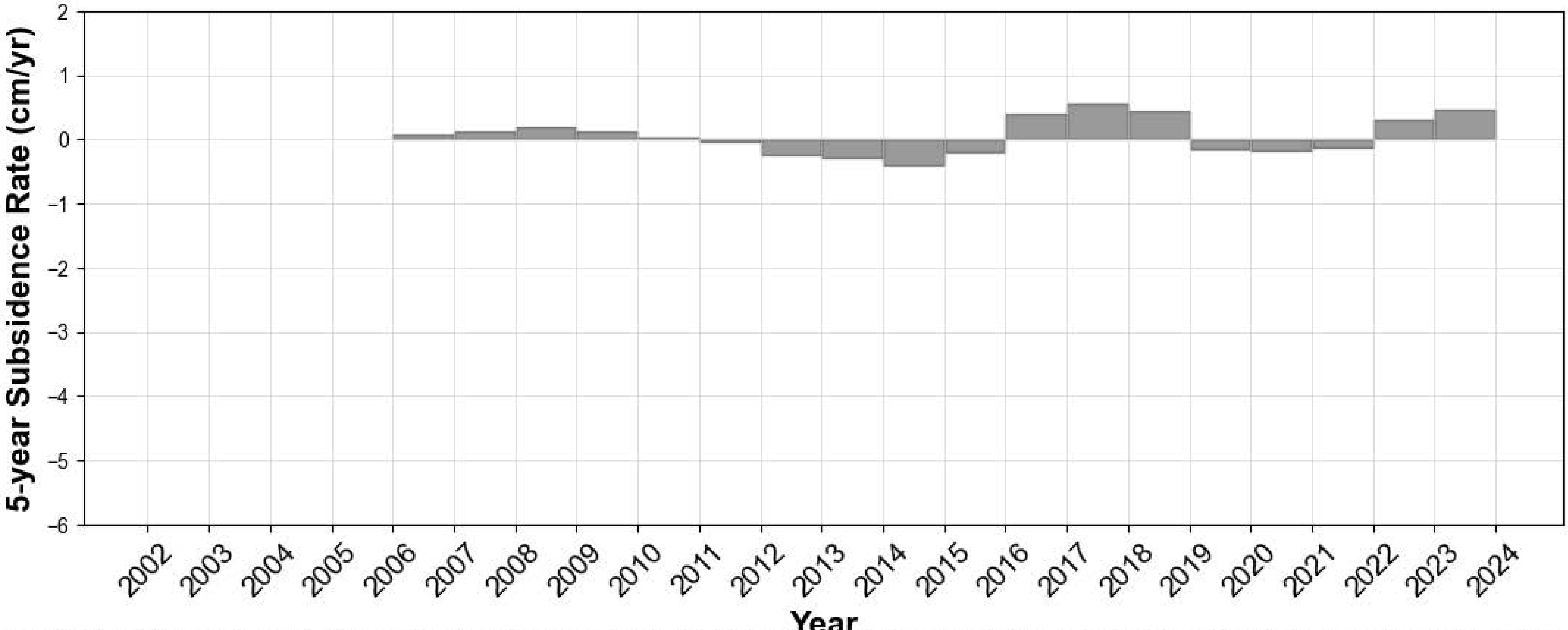


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P020

Kemah, TX

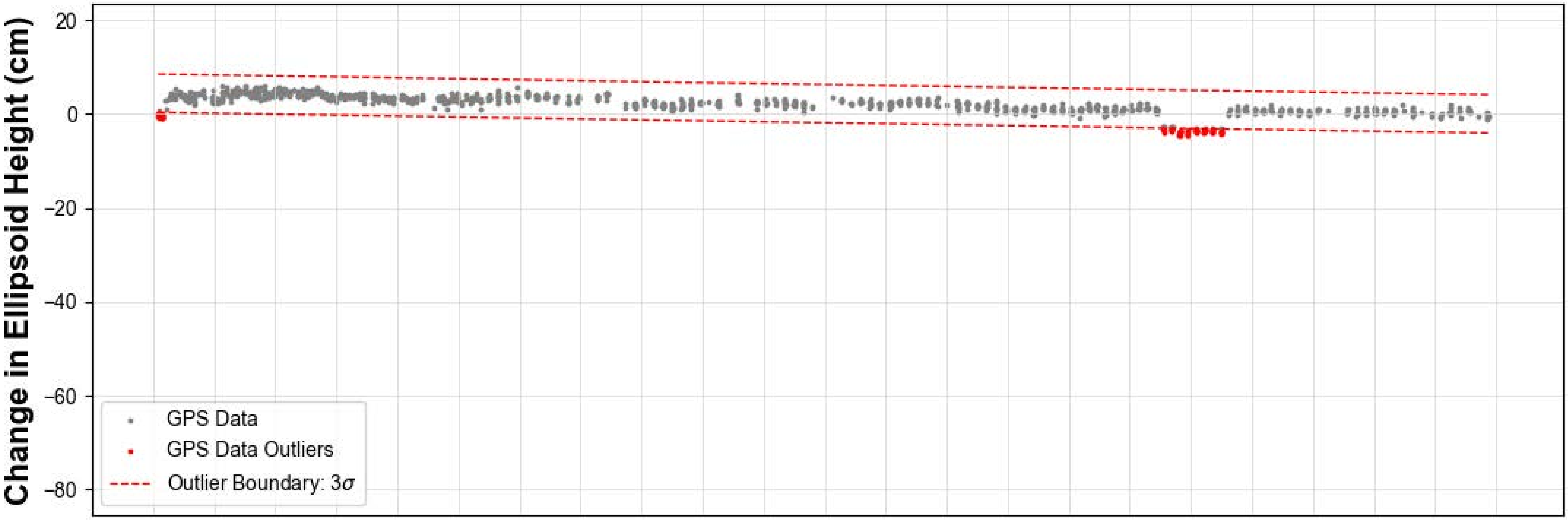


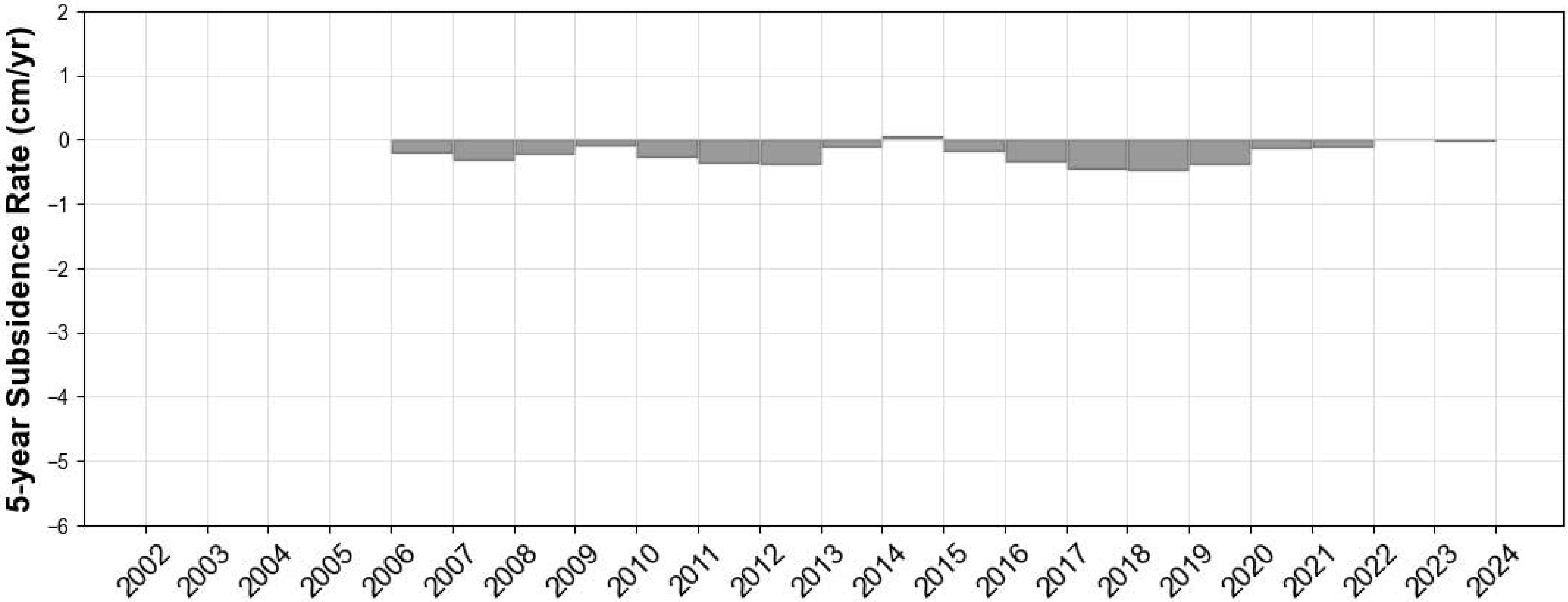


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P021

Pearland, TX

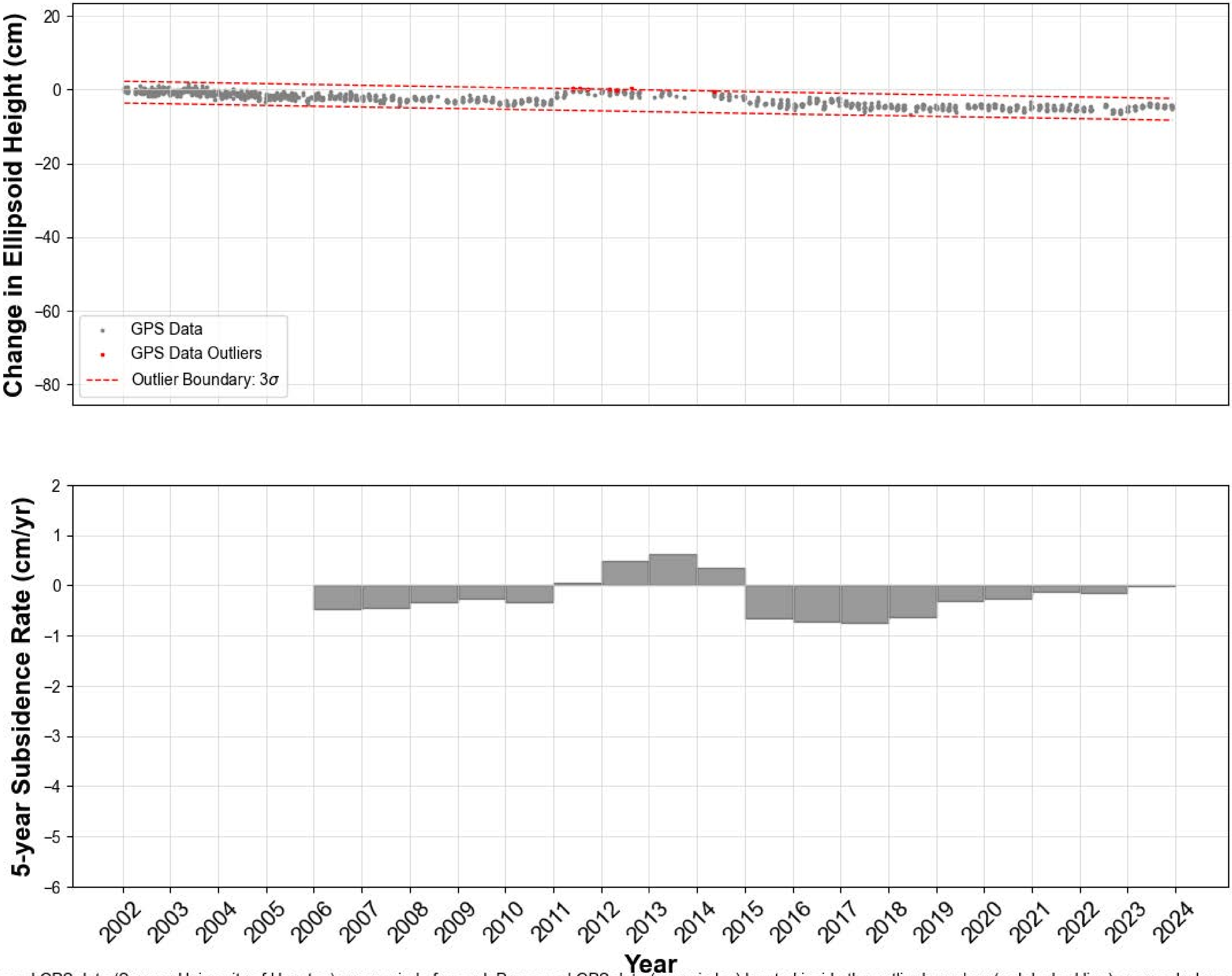




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P022

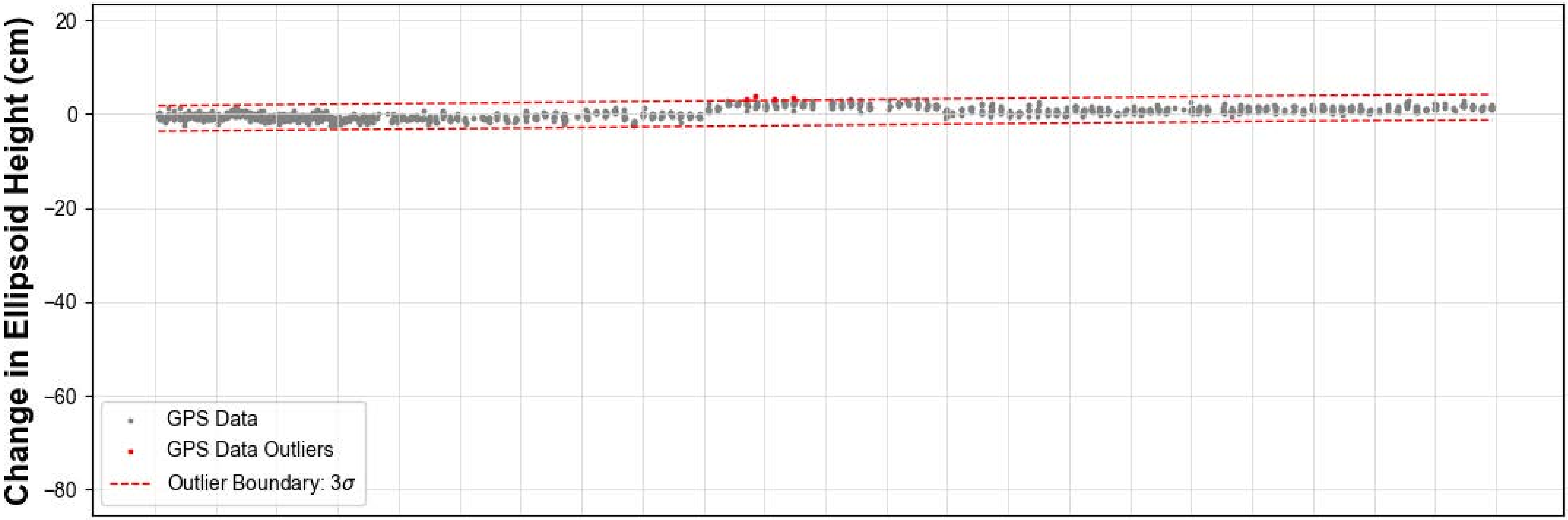
Hitchcock, TX

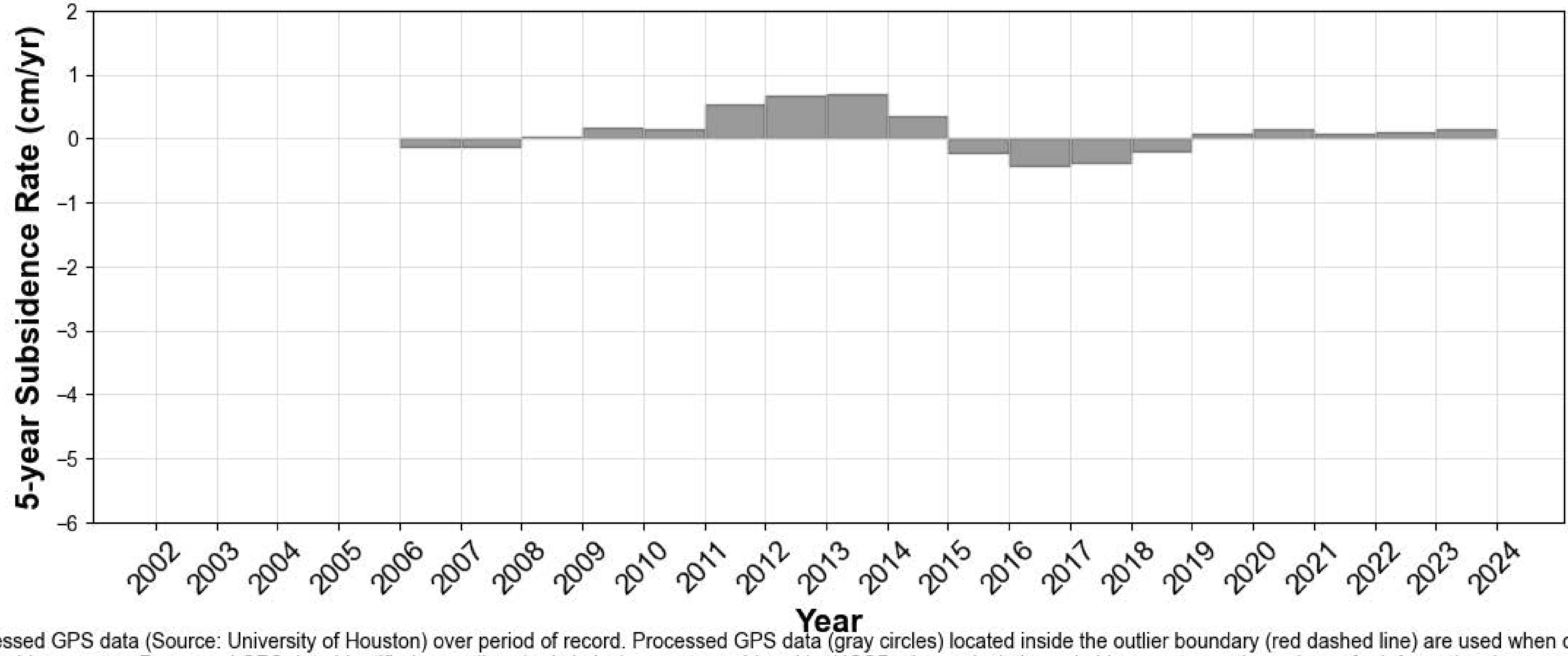


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P023

Texas City, TX

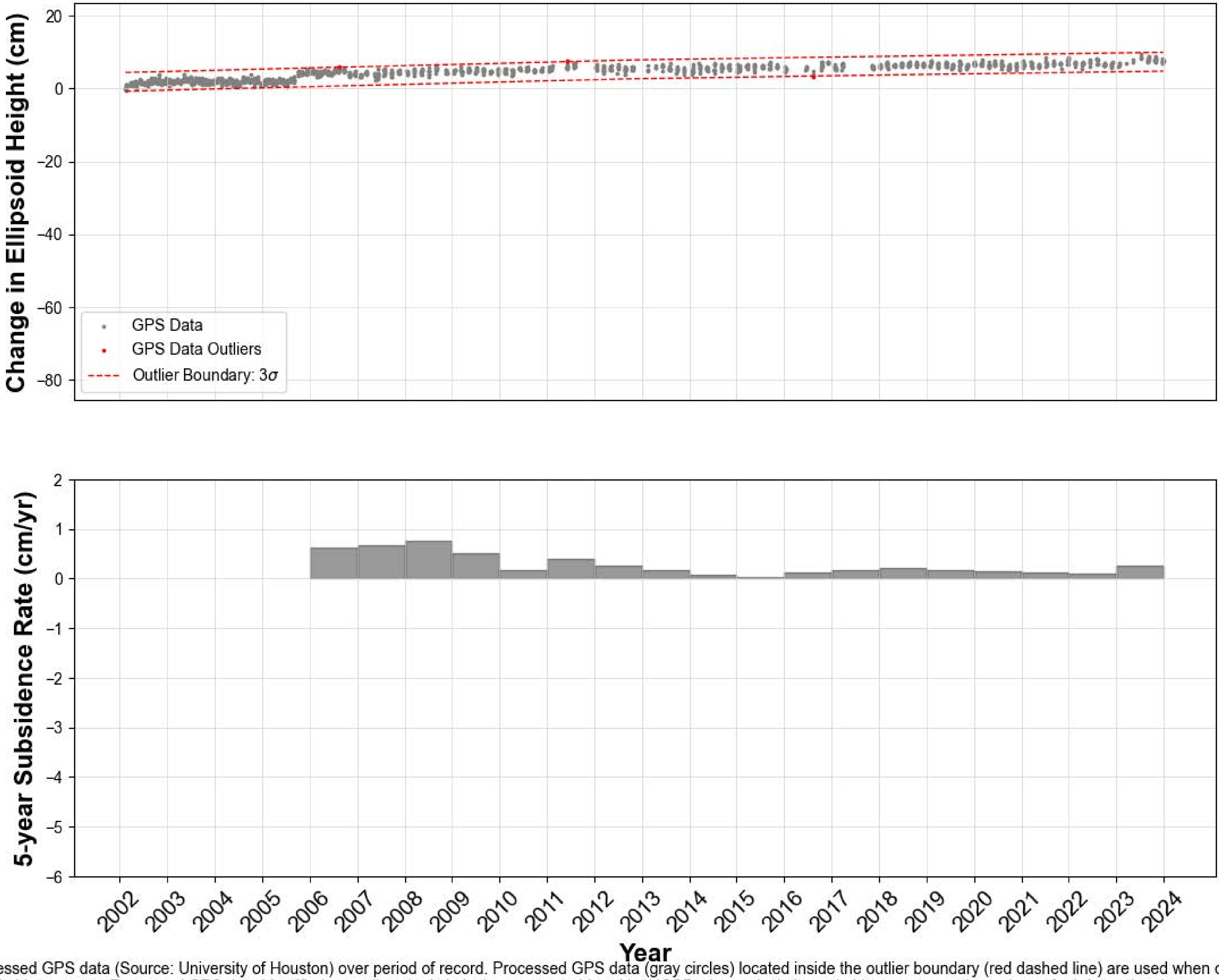




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P024

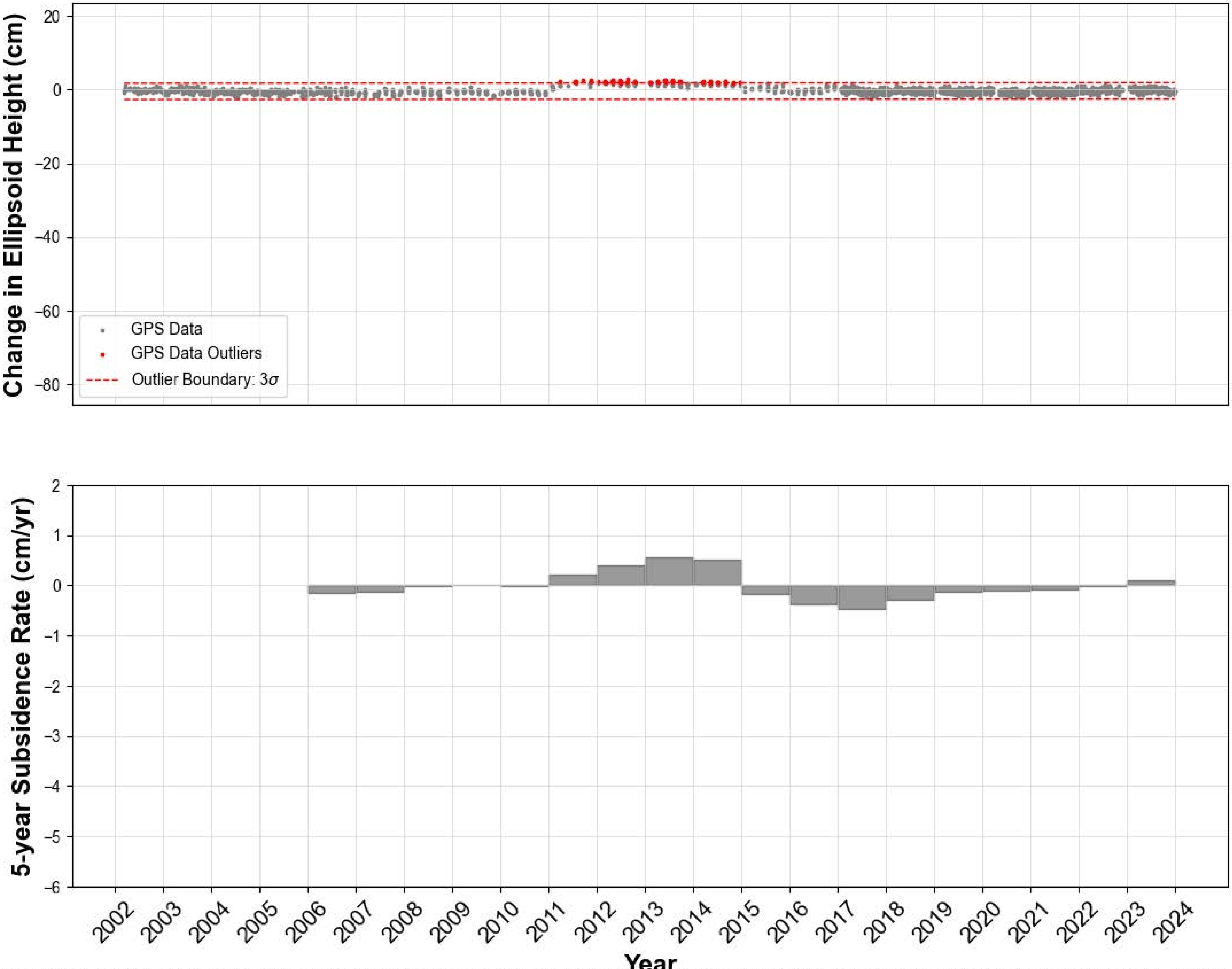
La Porte, TX



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

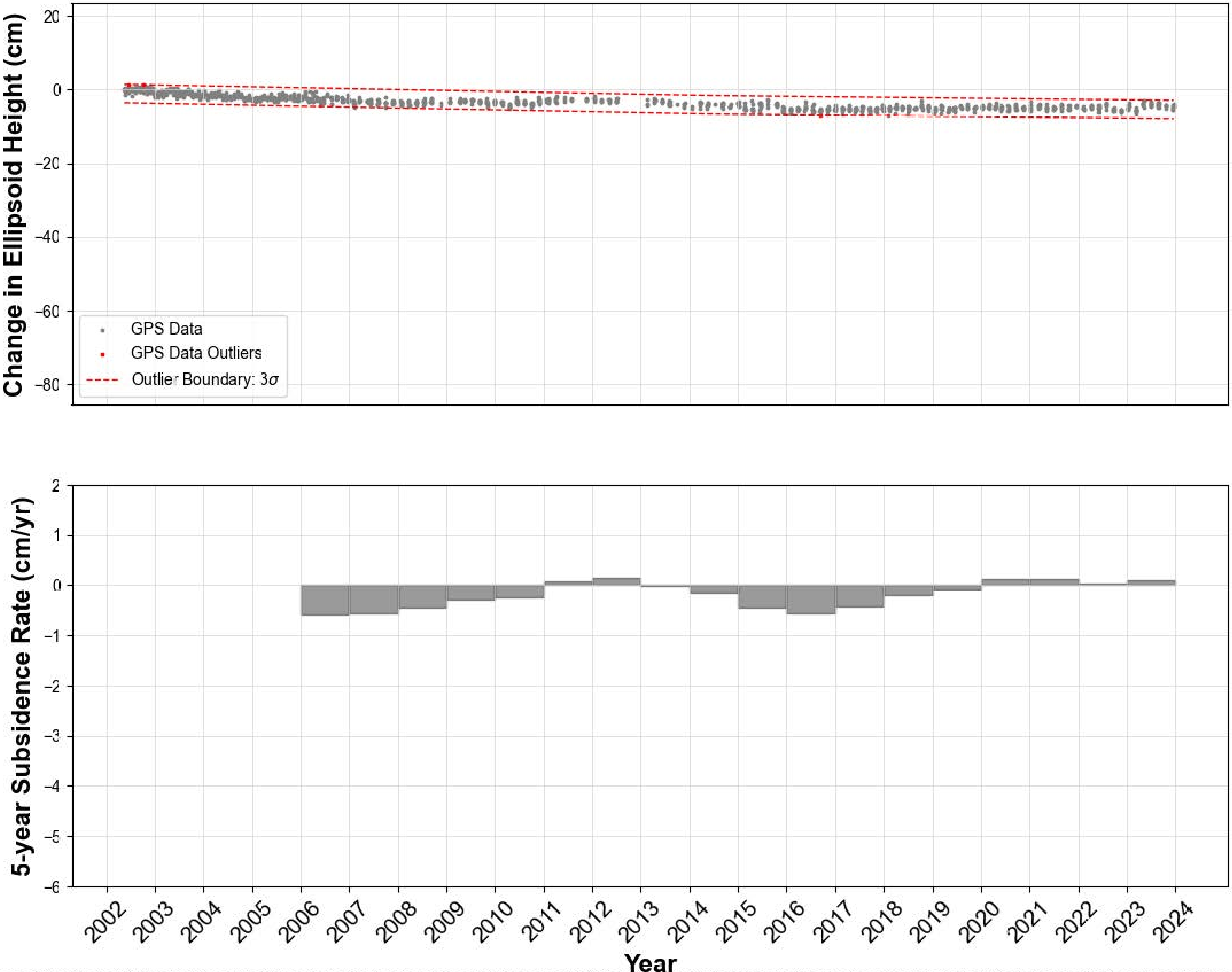
Galveston, TX



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

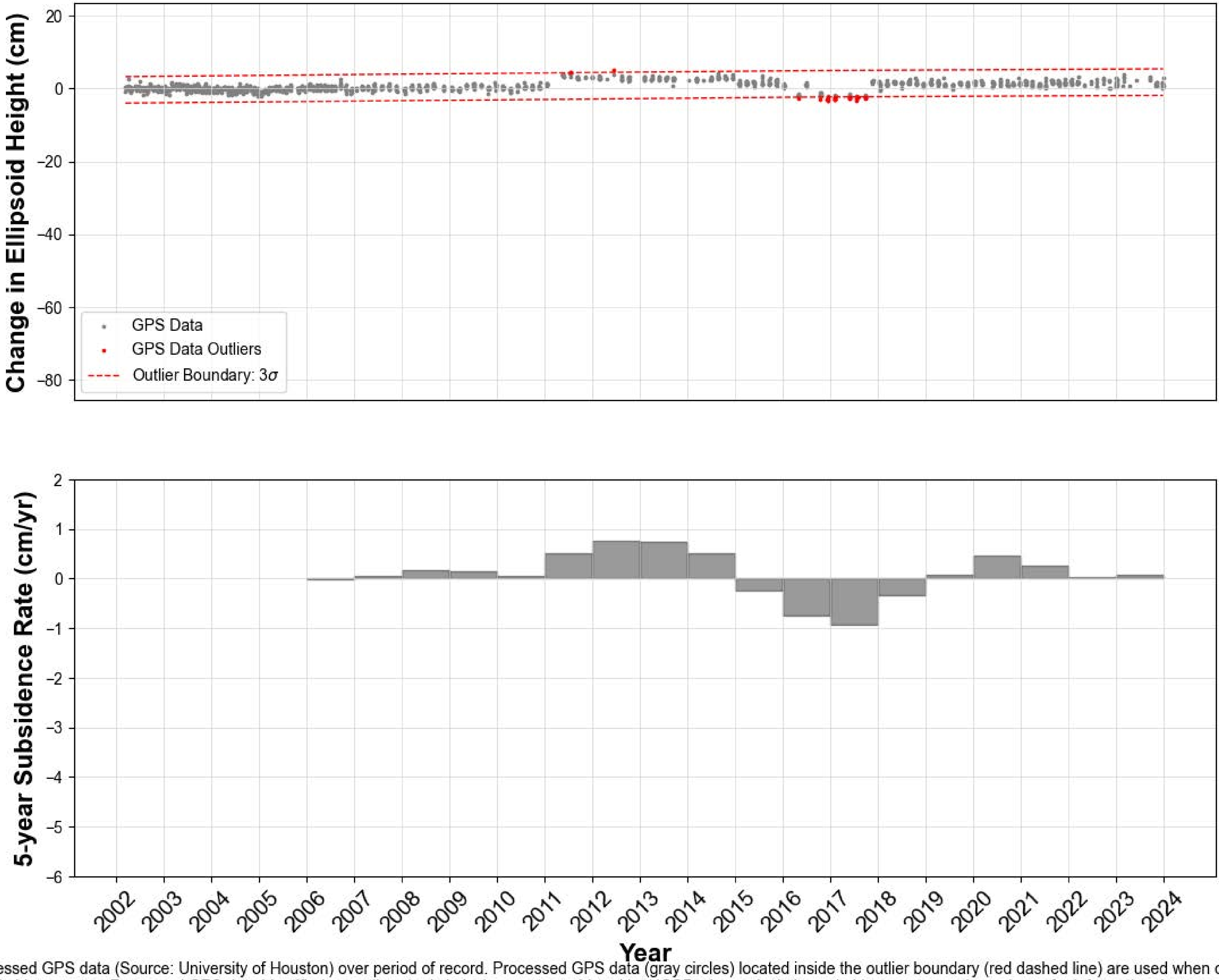
Seabrook, TX



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

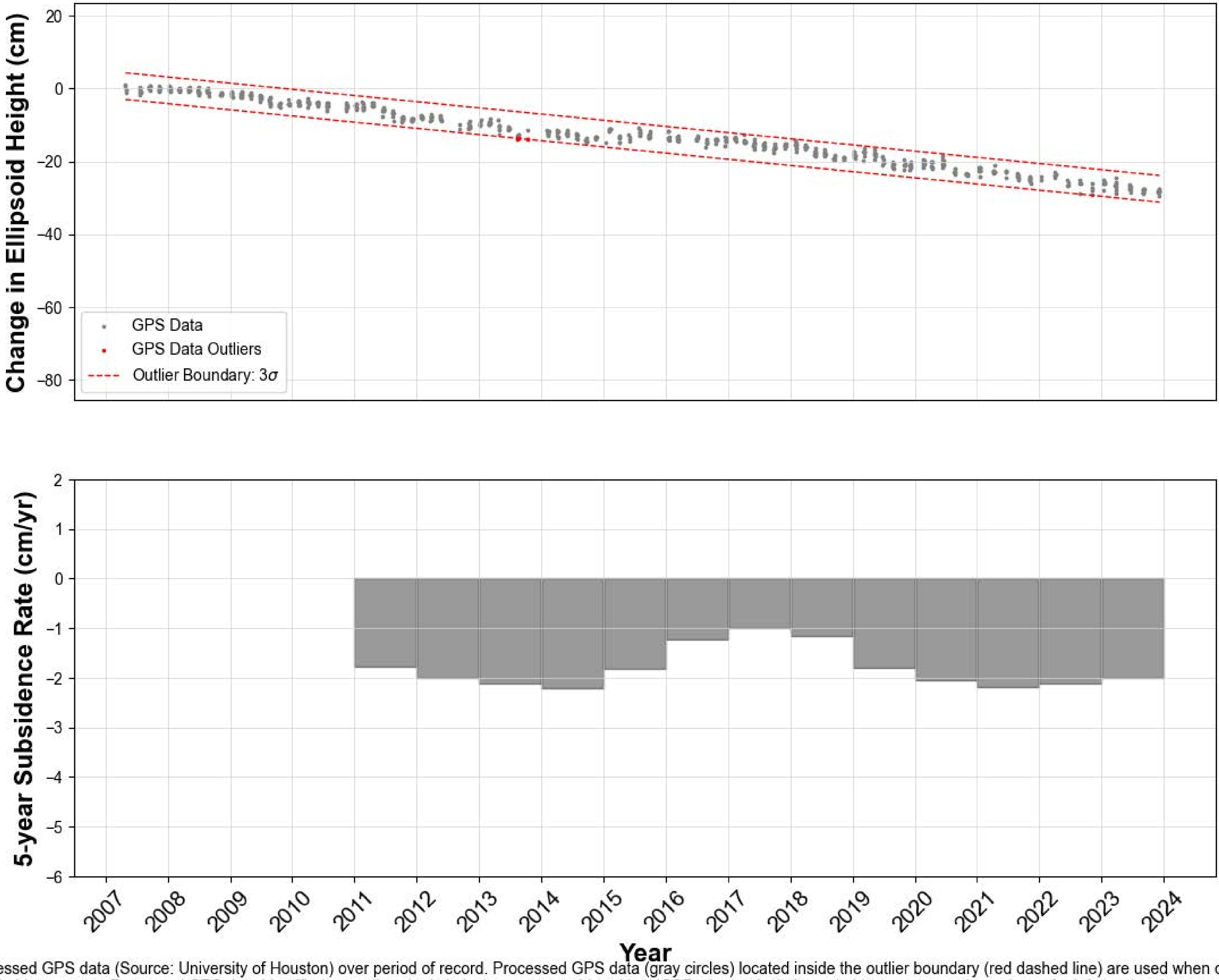
Baytown, TX



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

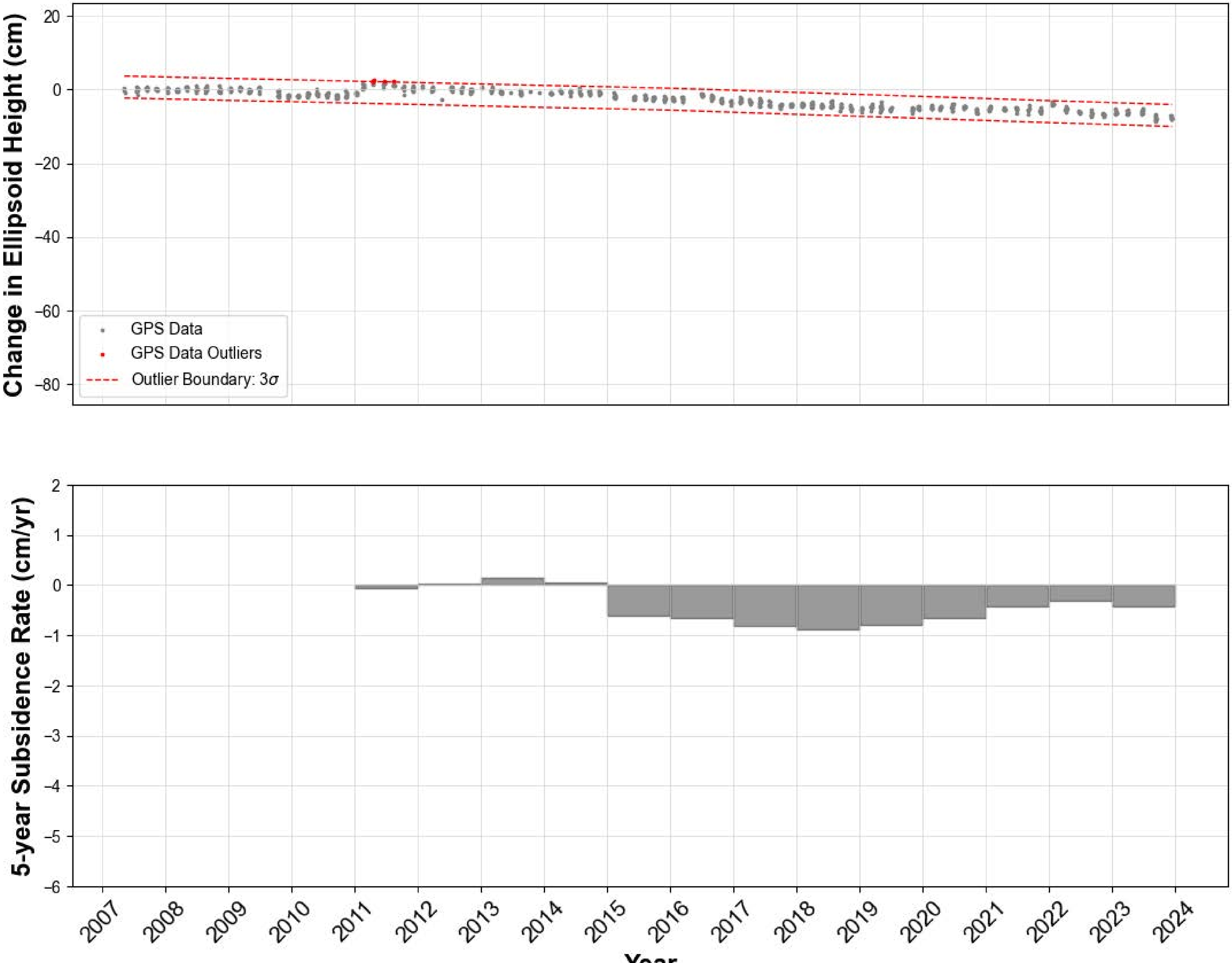
Katy, TX



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

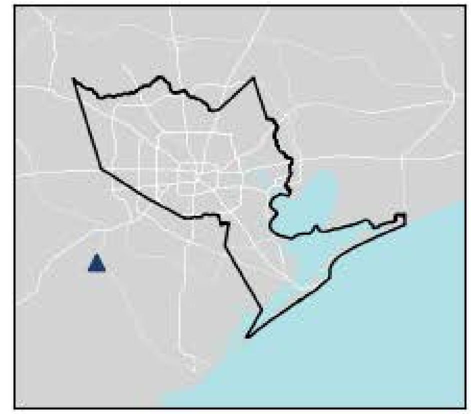
Fulshear, TX

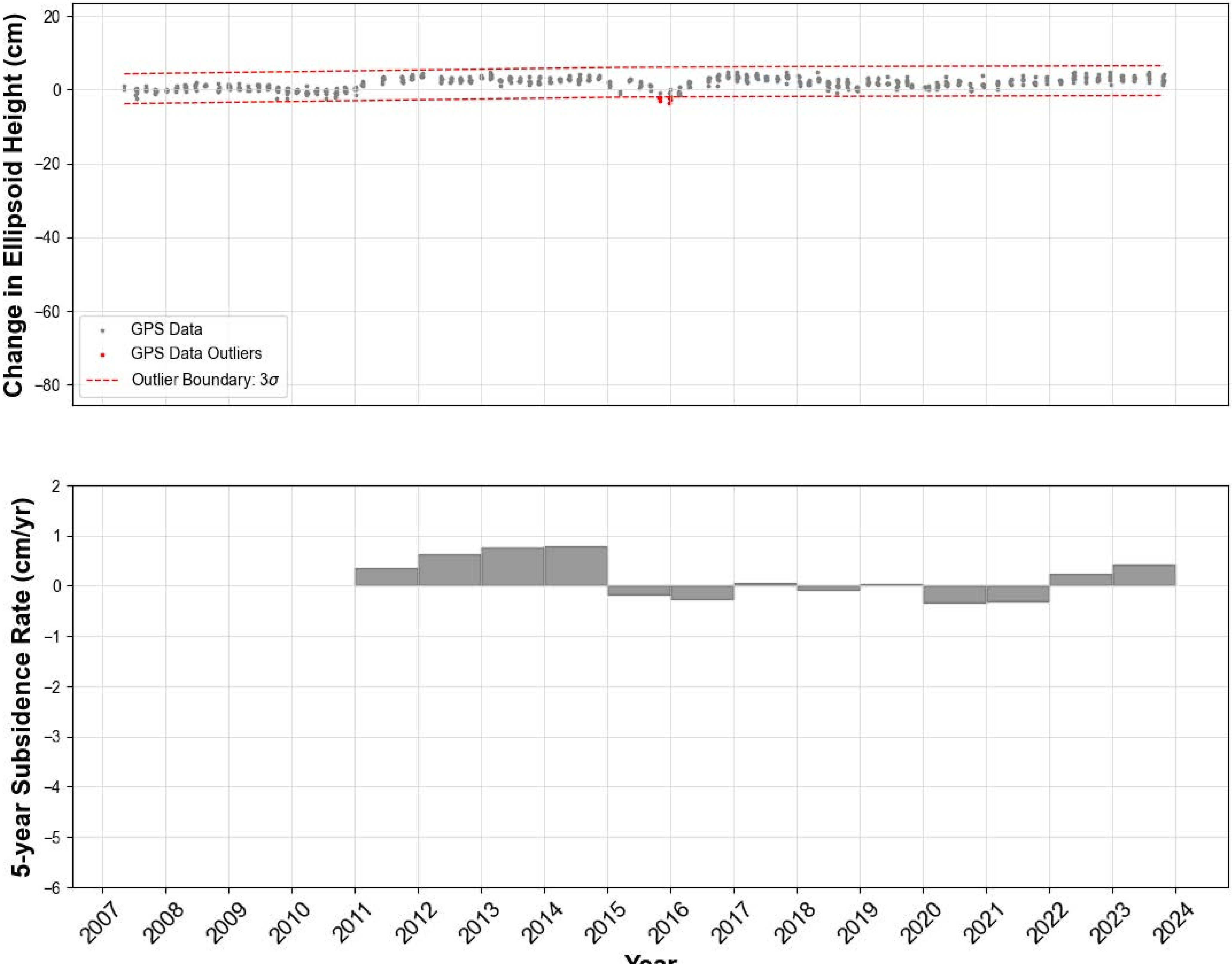


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P031

Needville, TX

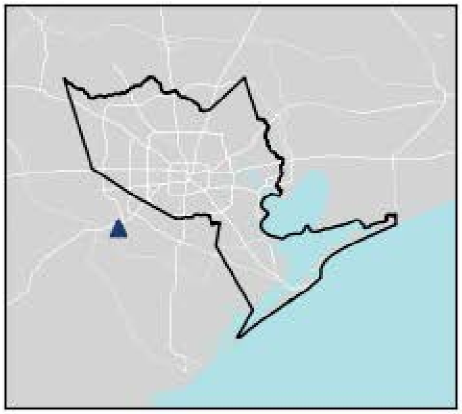


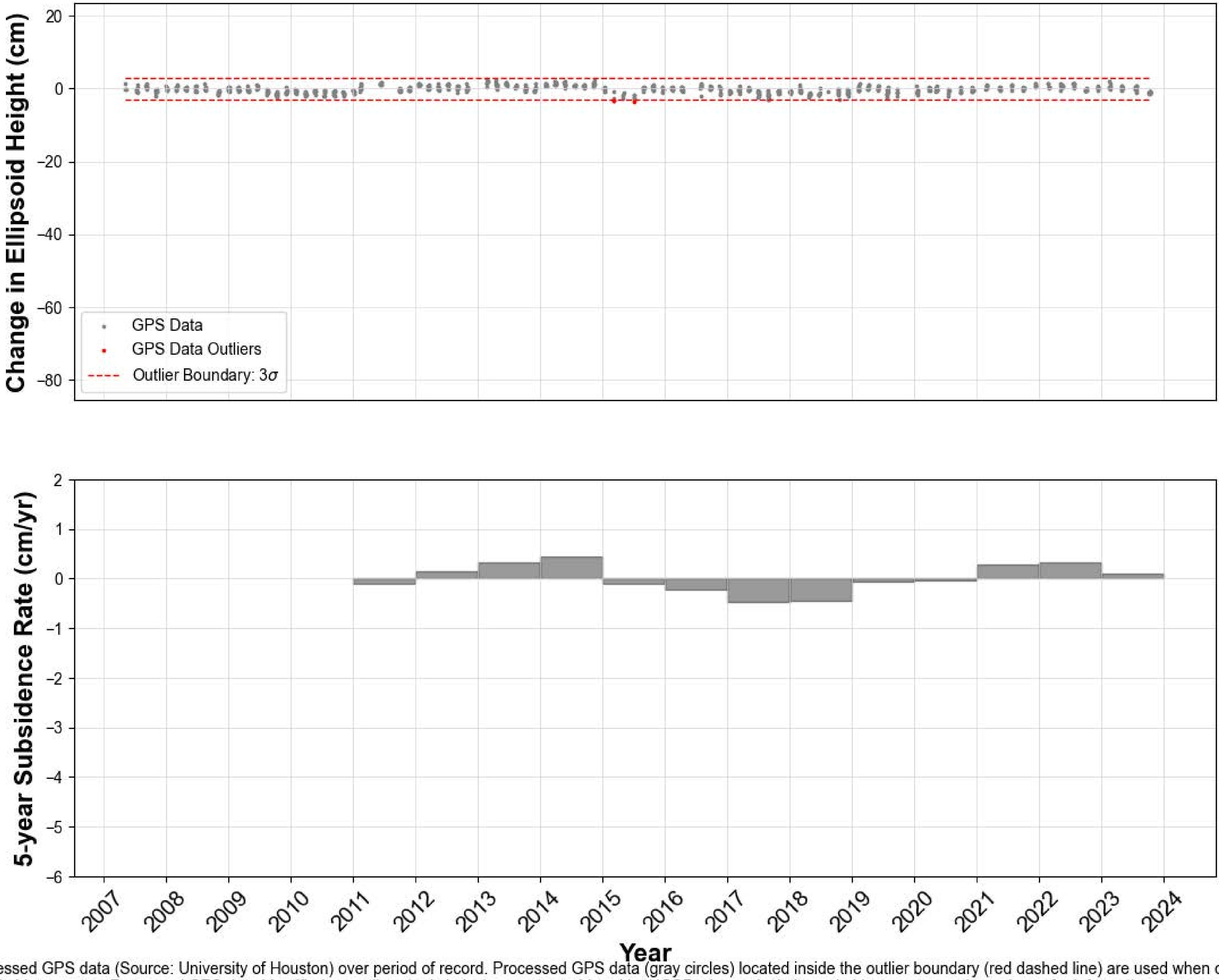


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P032

Richmond, TX

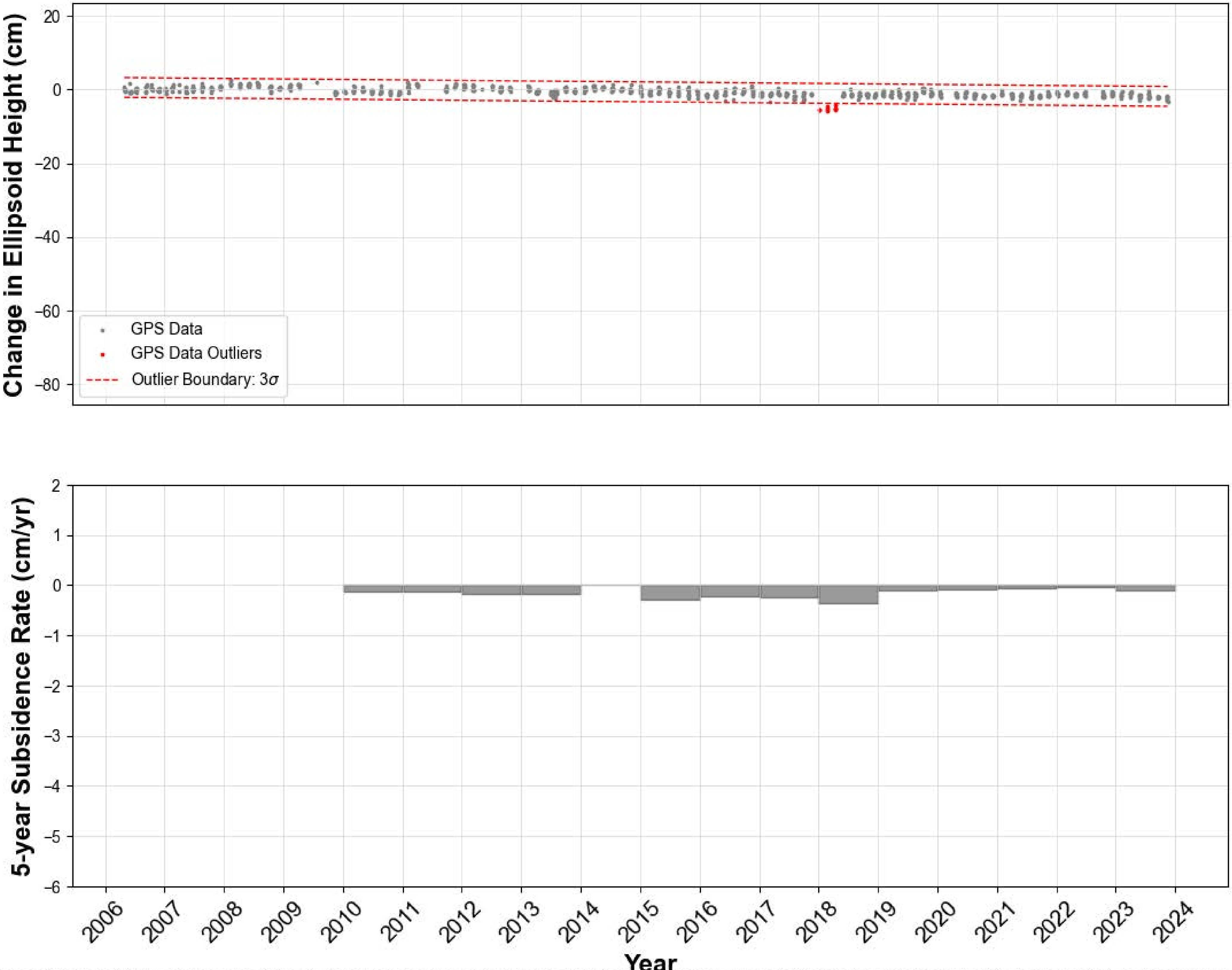




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P033

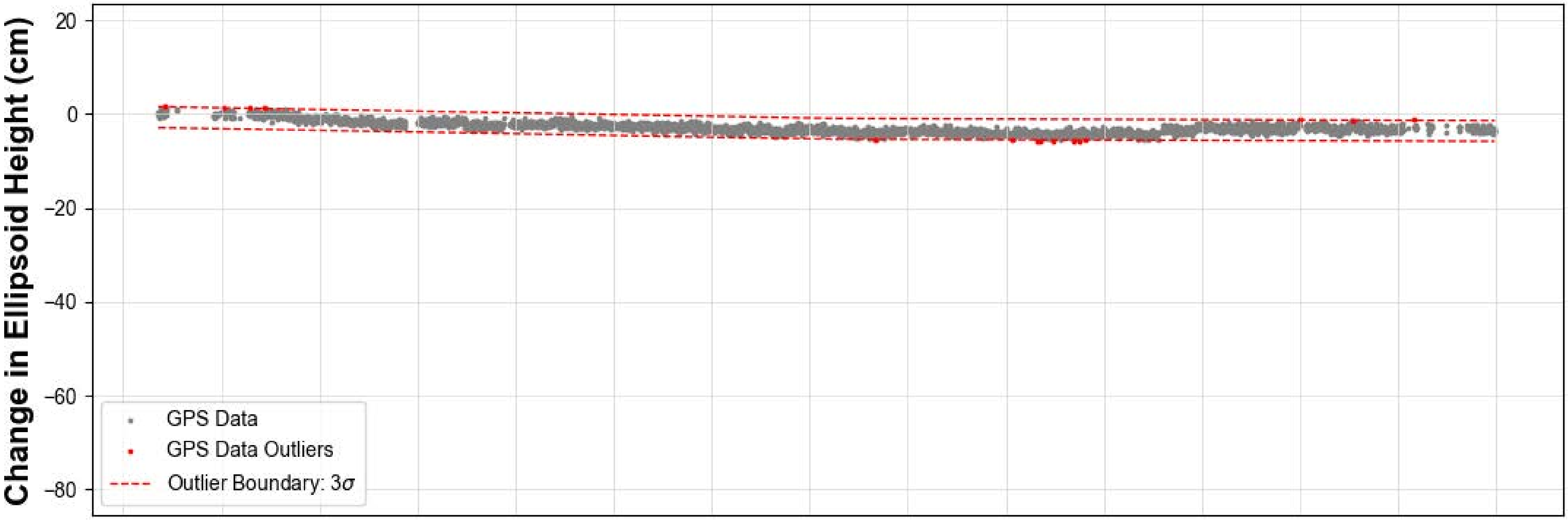
Friendswood, TX

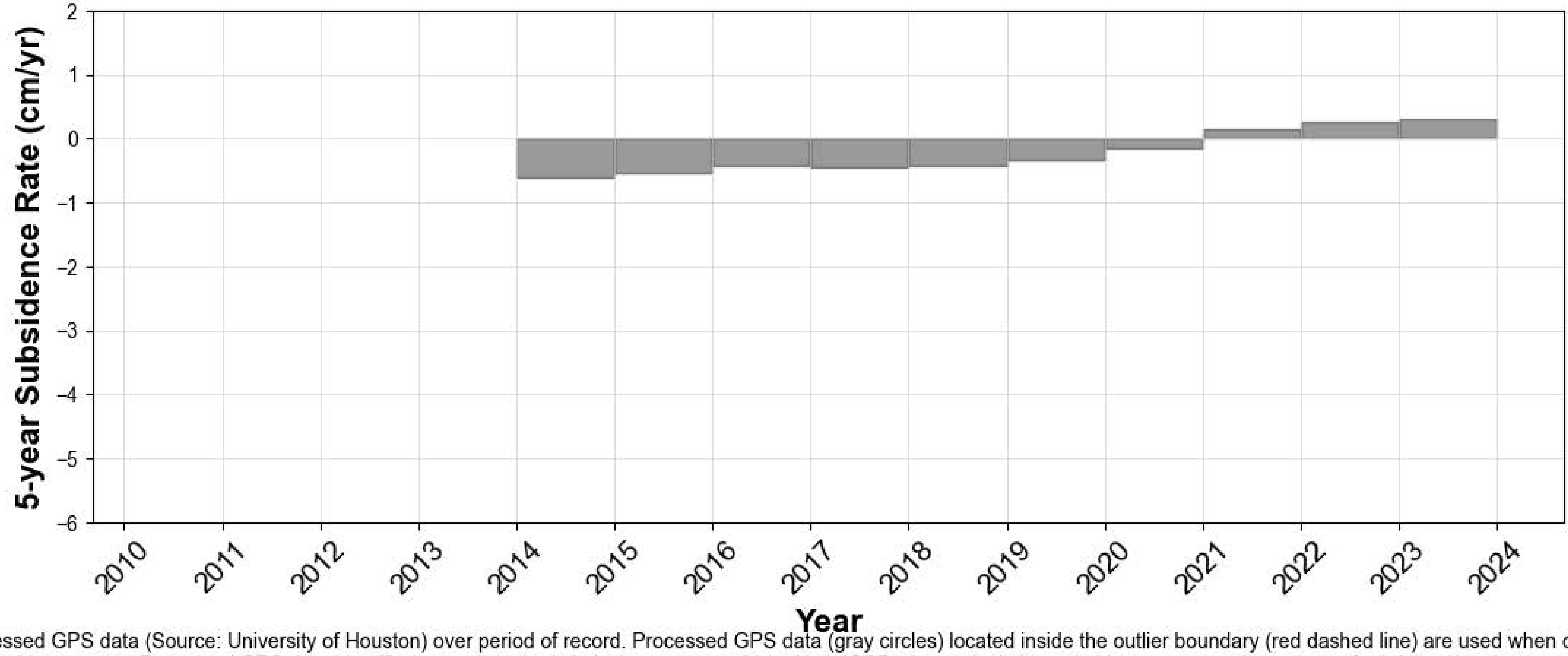


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P034

Texas City, TX

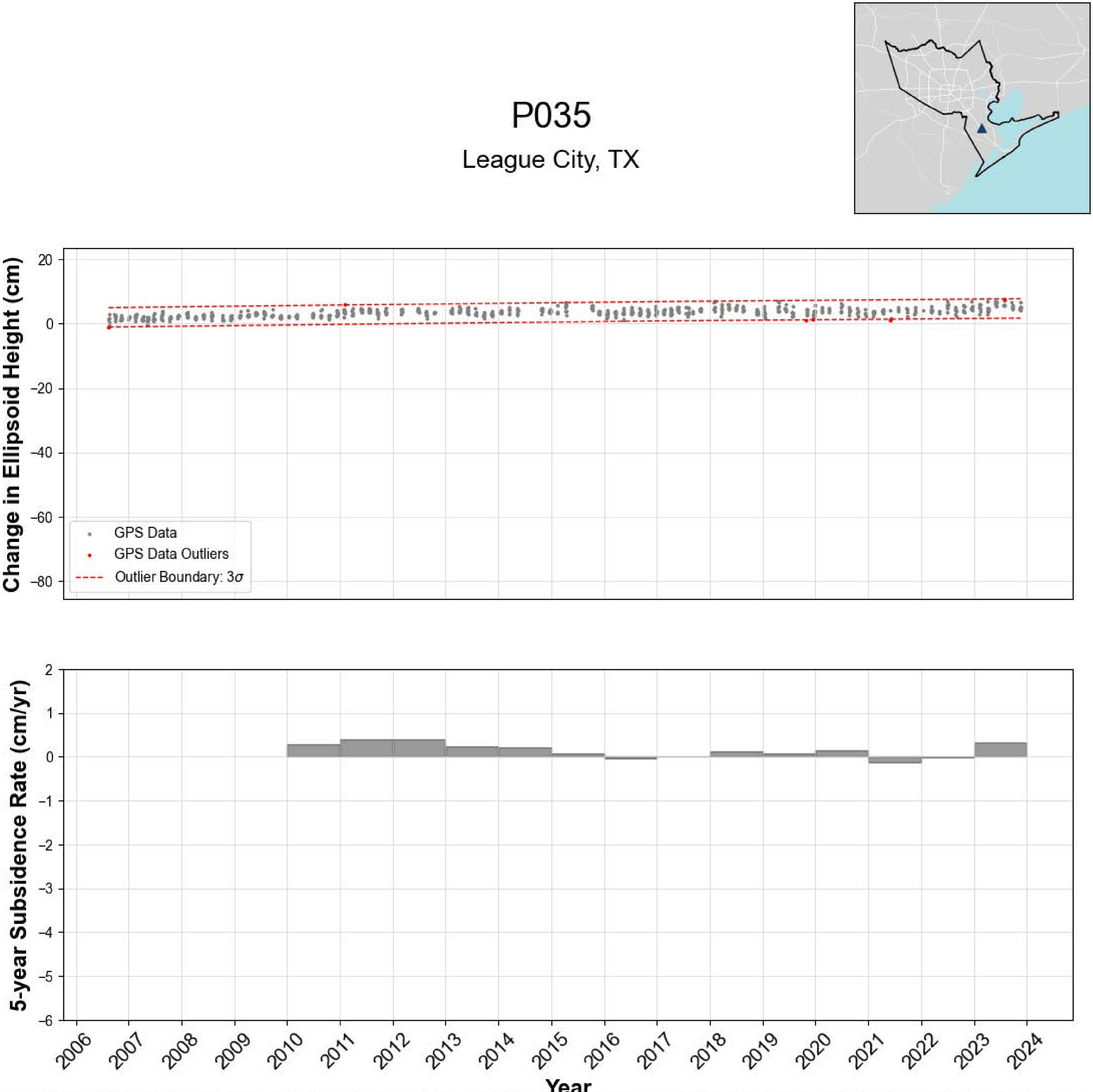




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P035

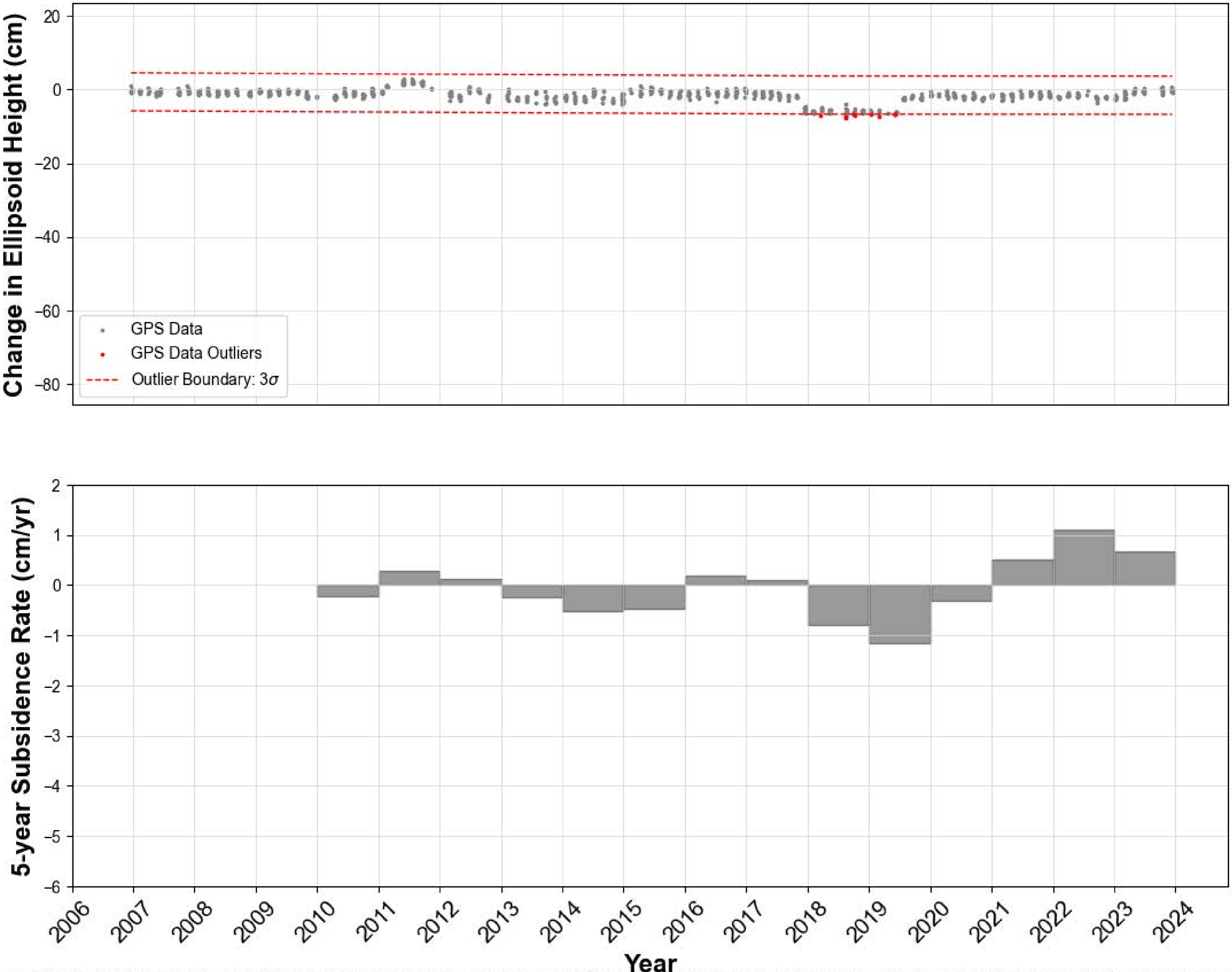
League City, TX



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

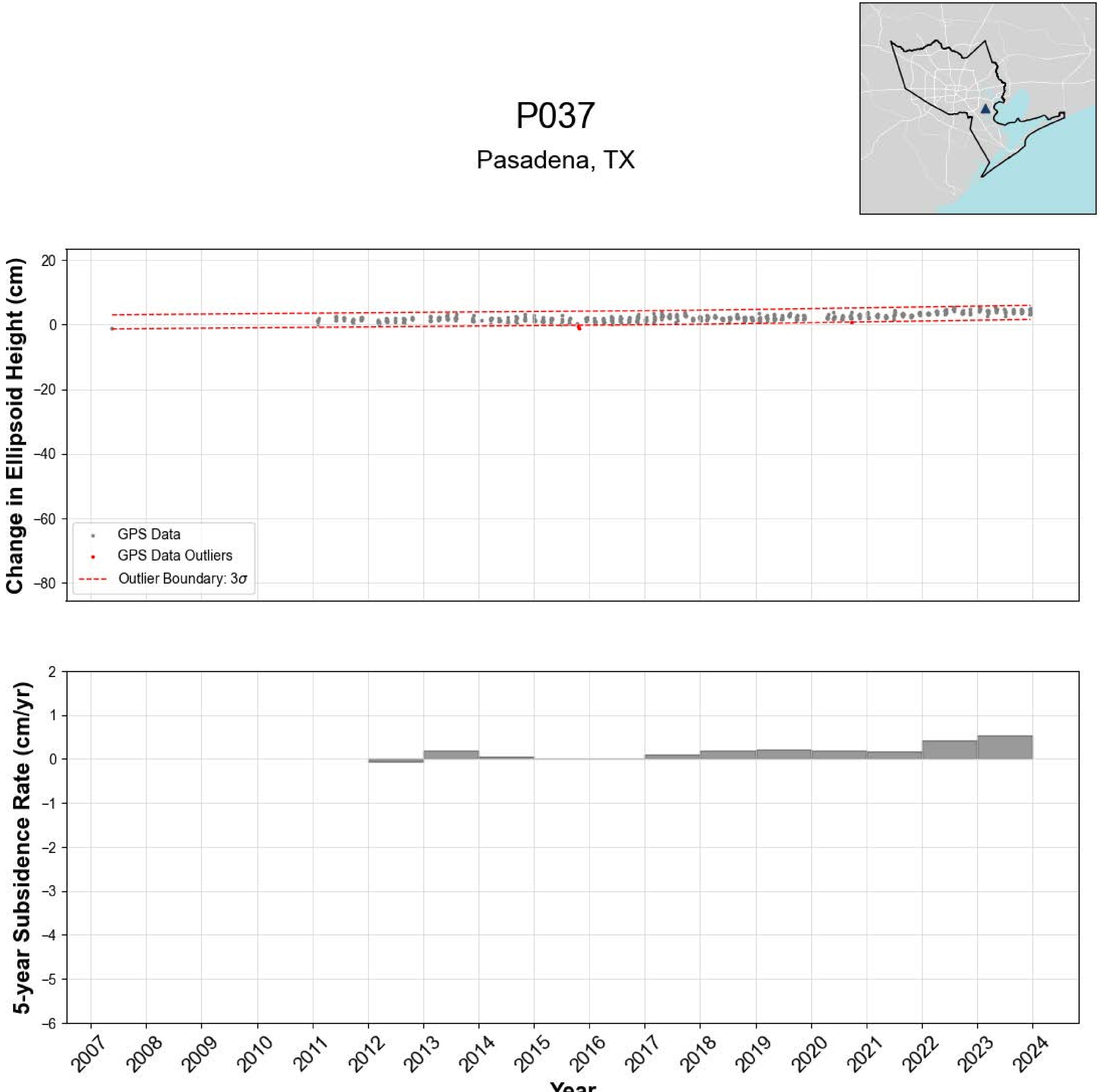
San Leon, TX



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

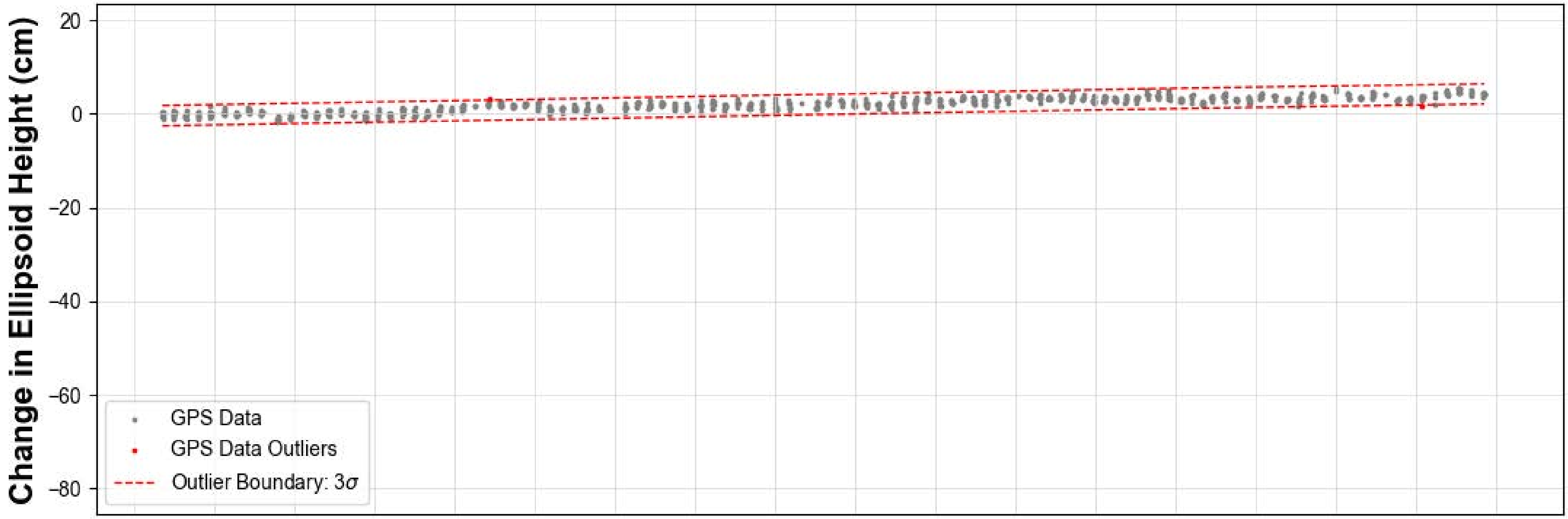
Pasadena, TX

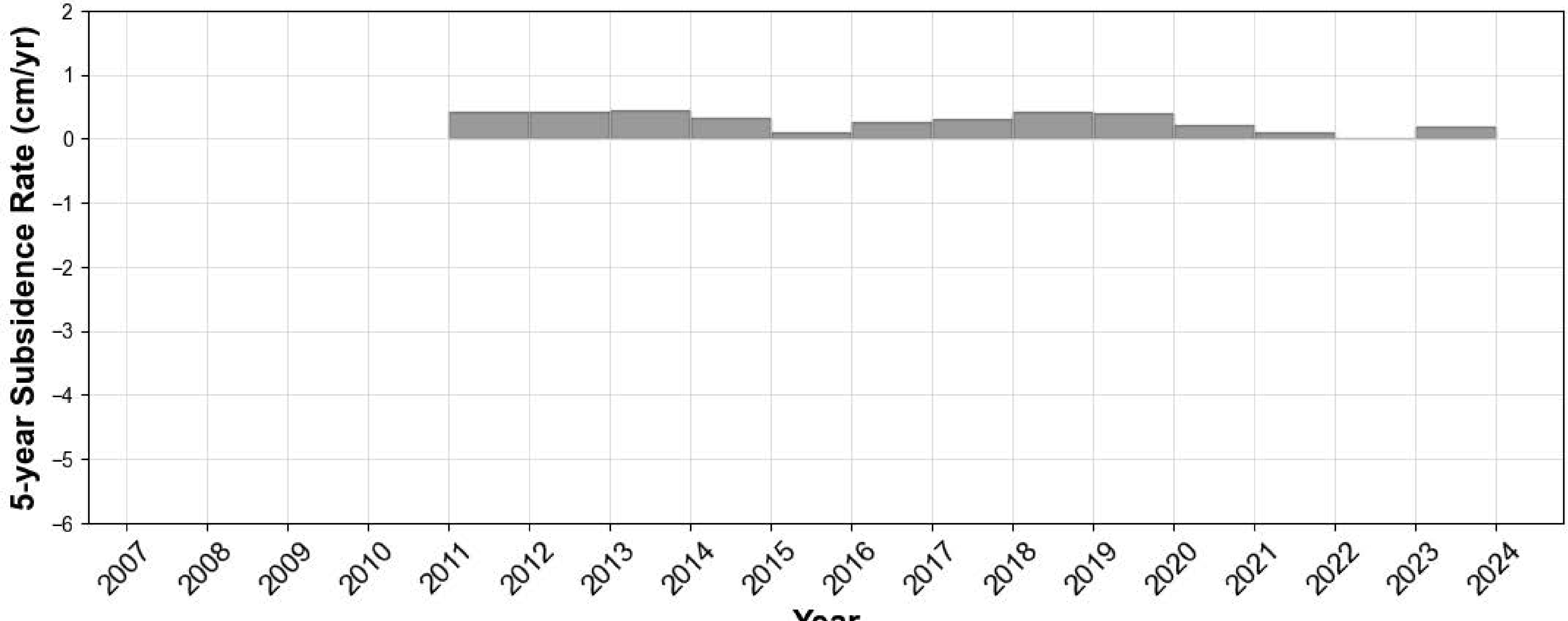


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P038

Houston, TX

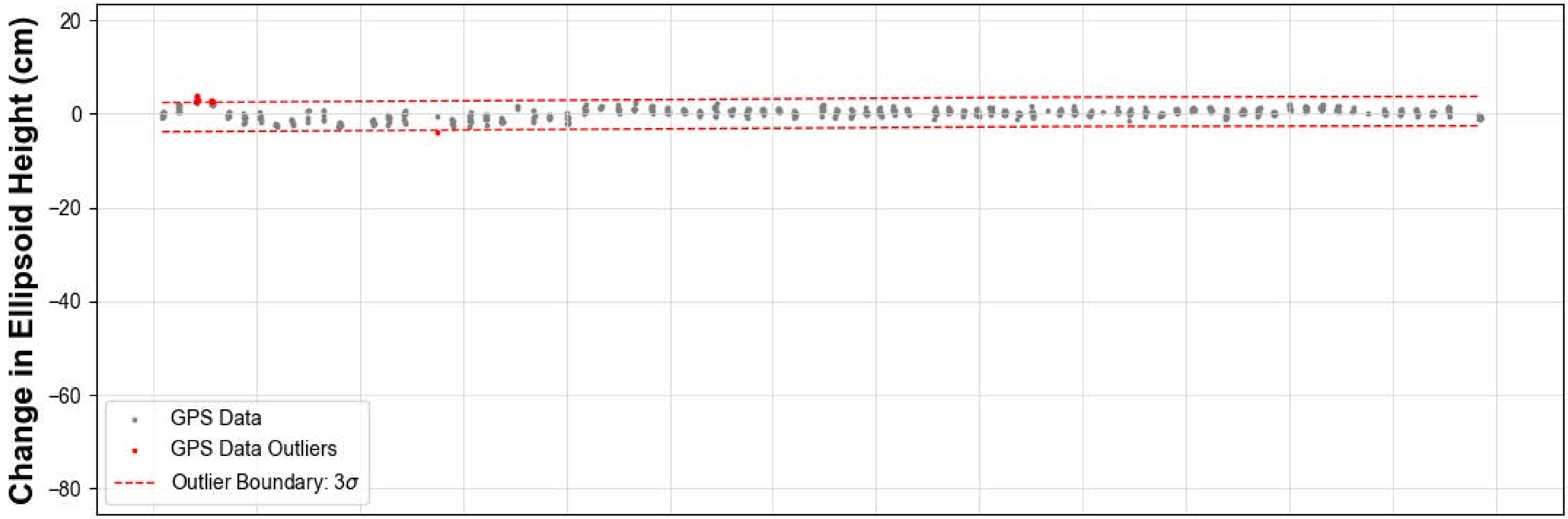


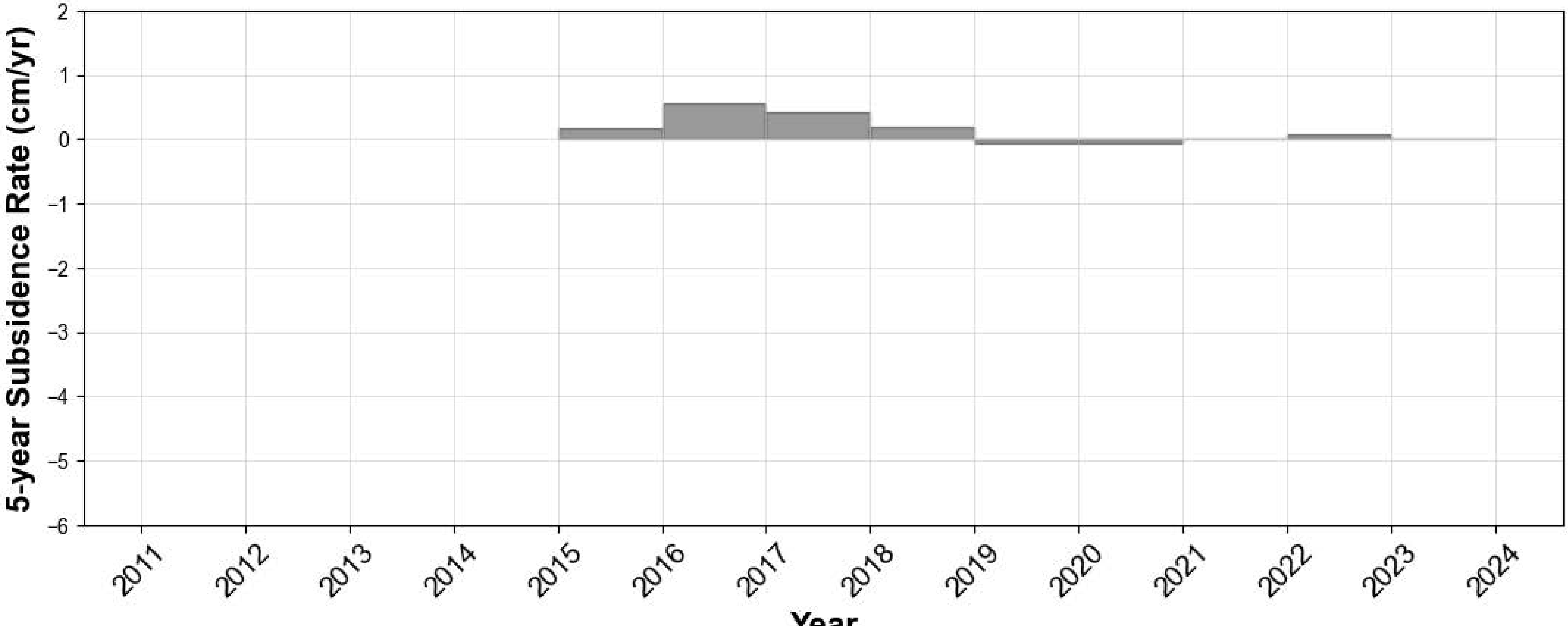


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P039

Houston, TX

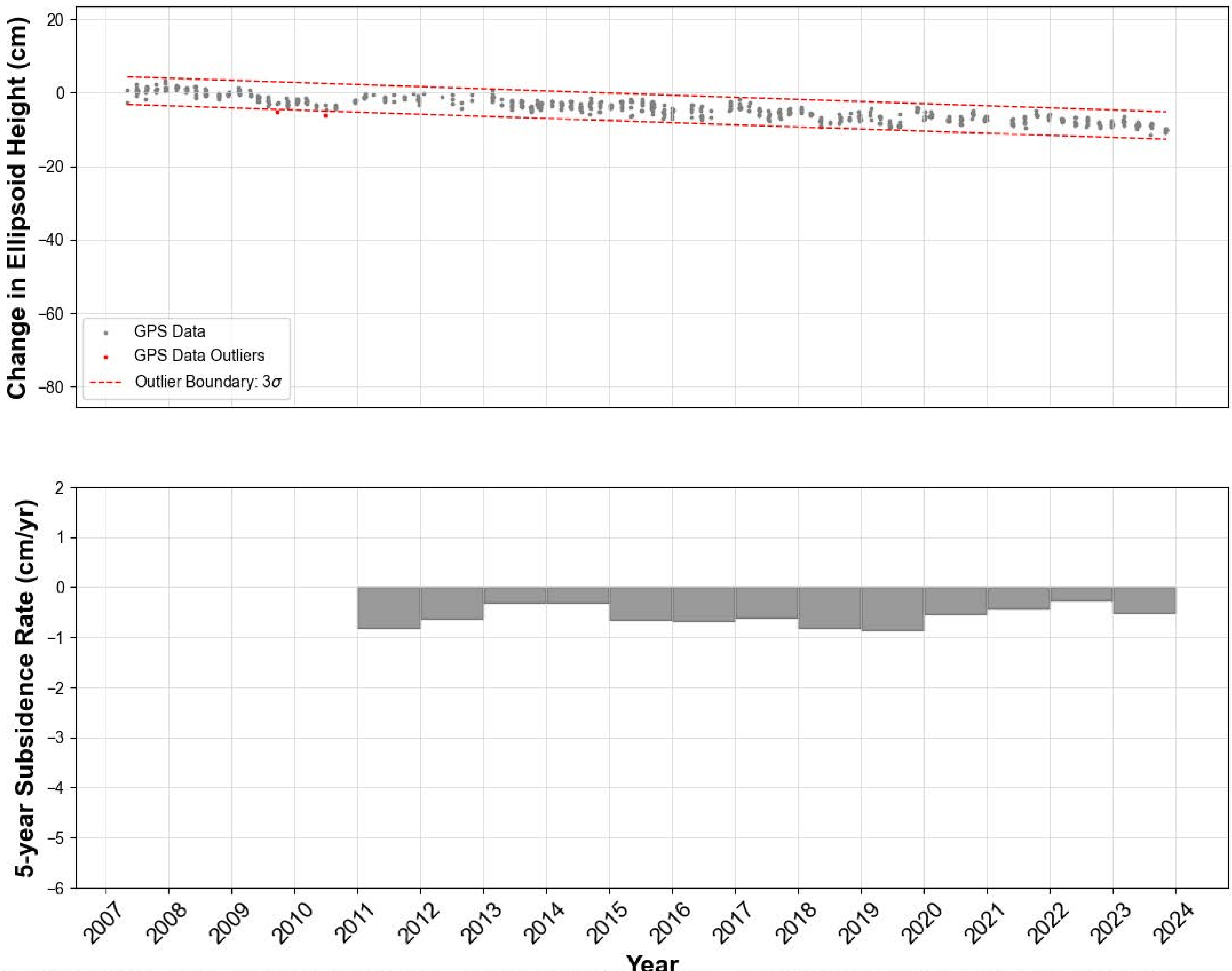




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P040

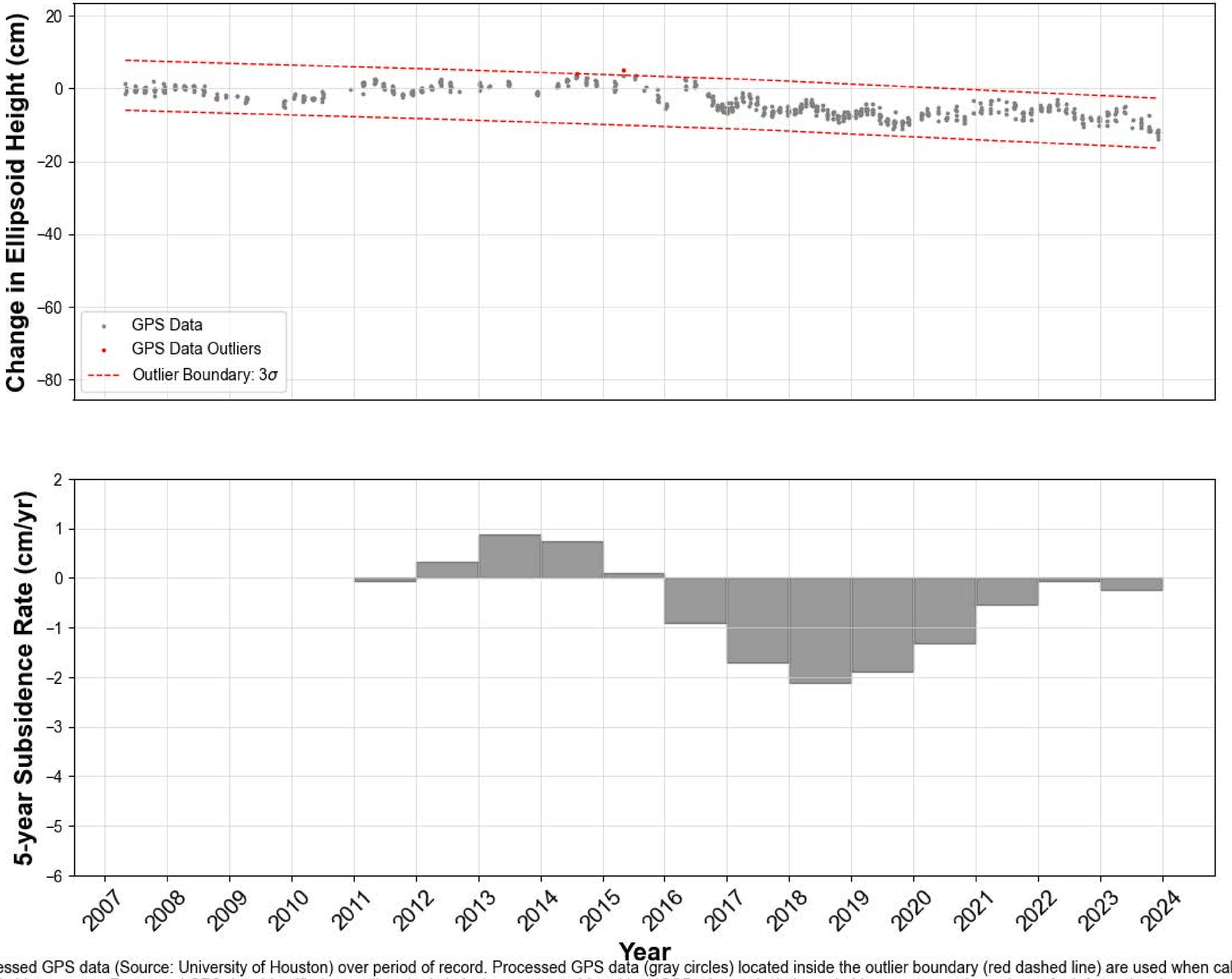
Rosharon, TX



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

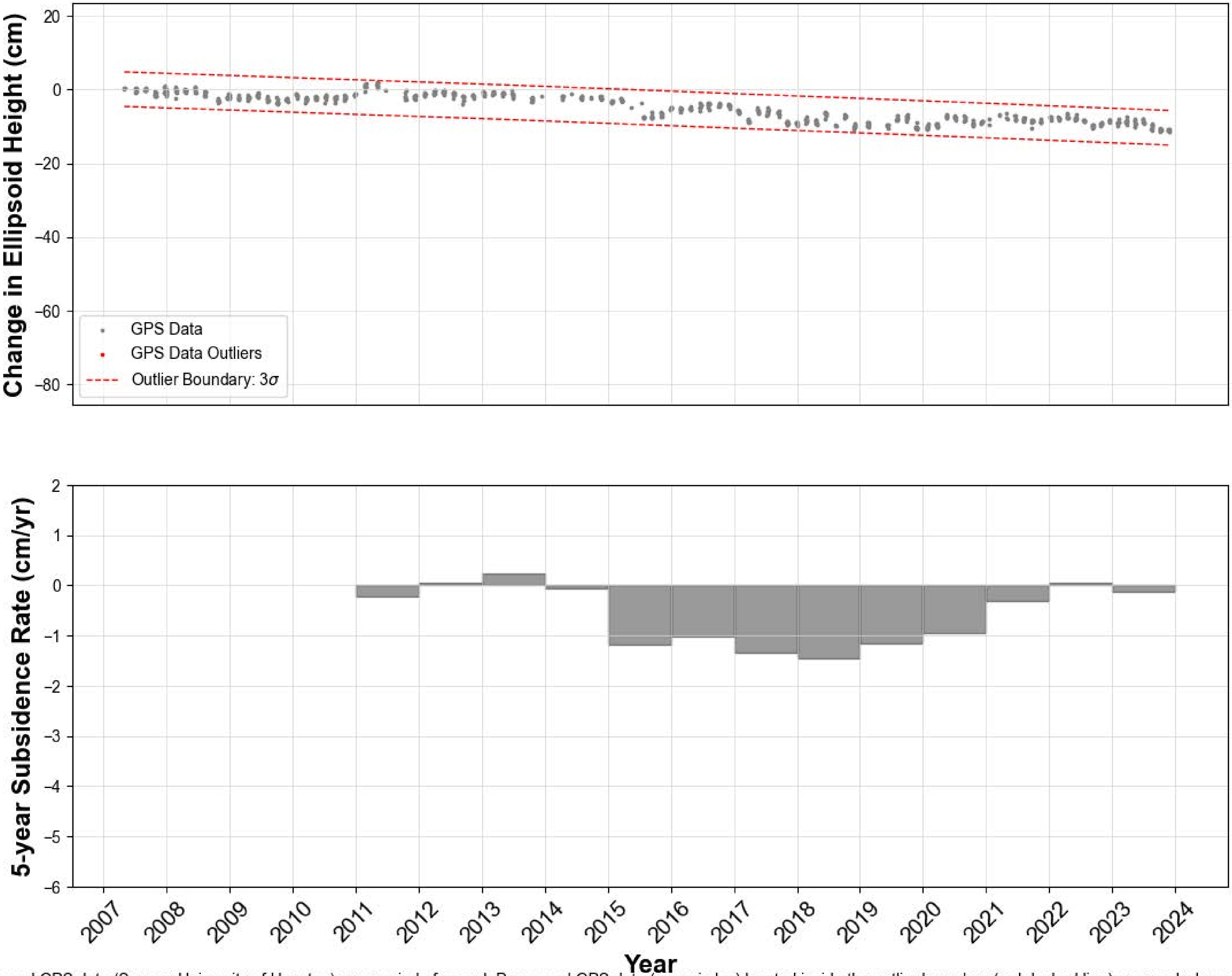
Houston, TX



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

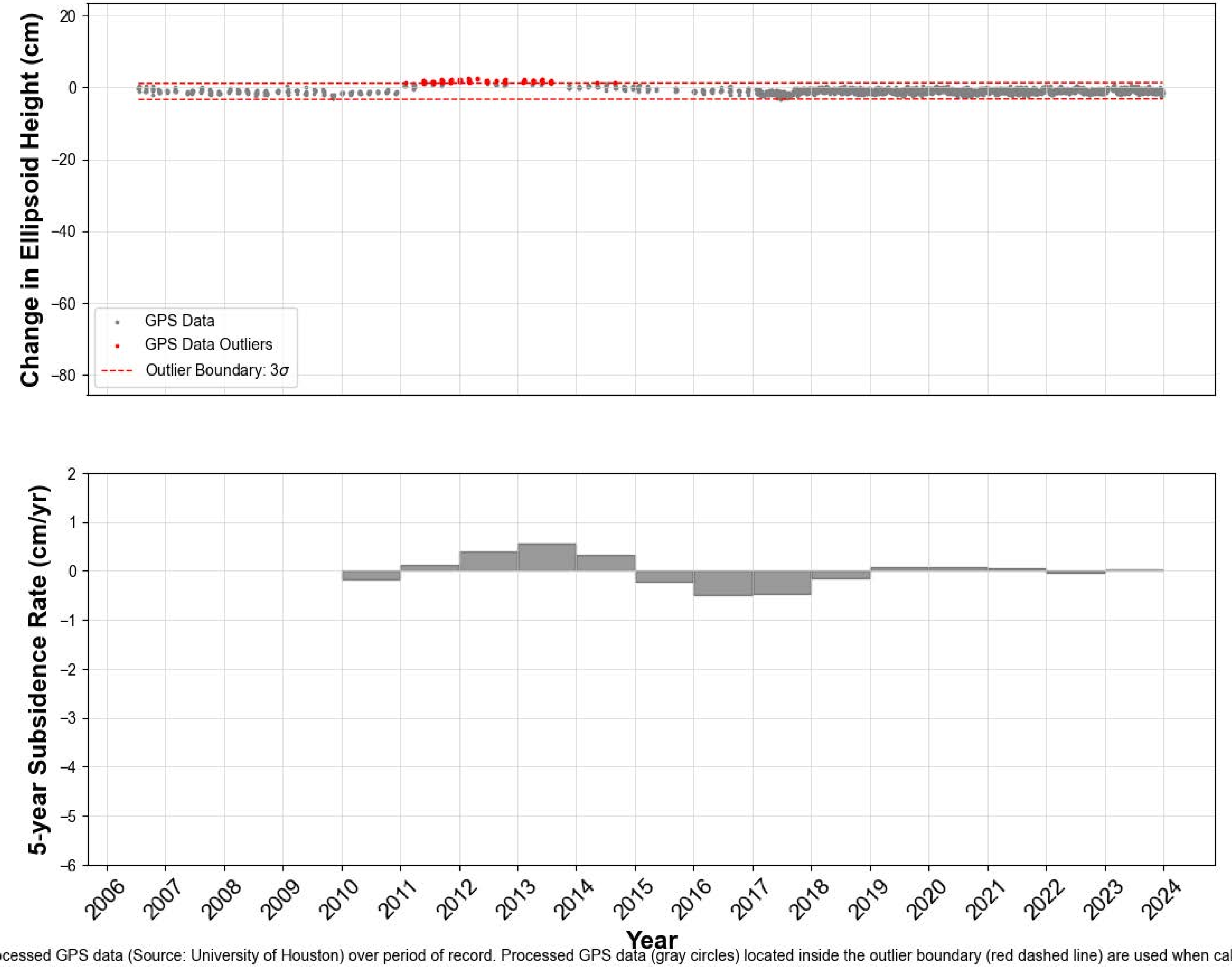
Houston, TX



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

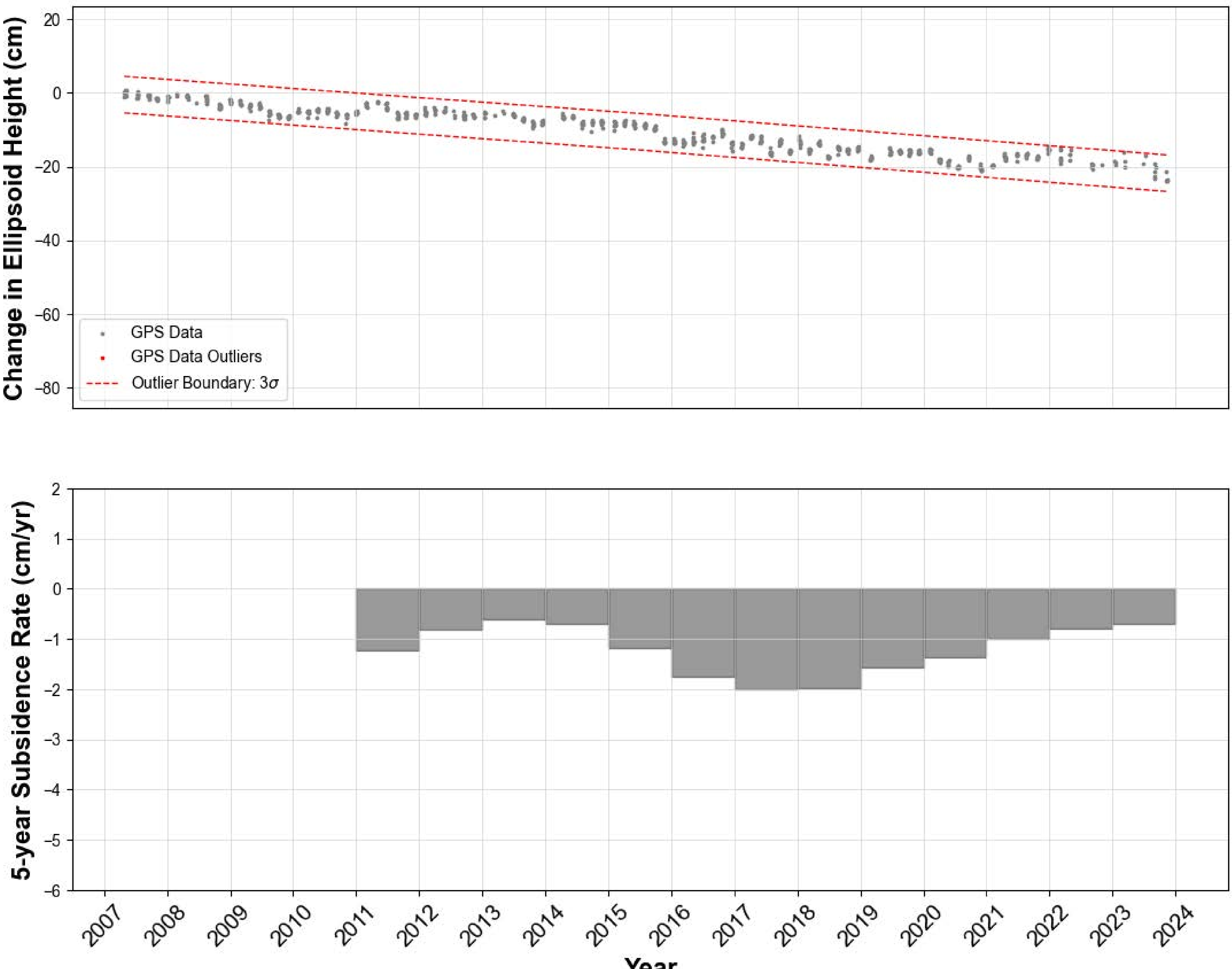
Galveston, TX



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

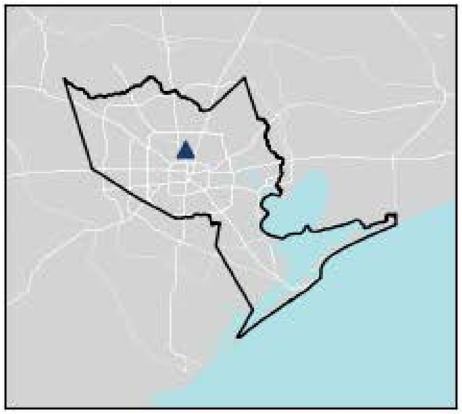
Cypress, TX

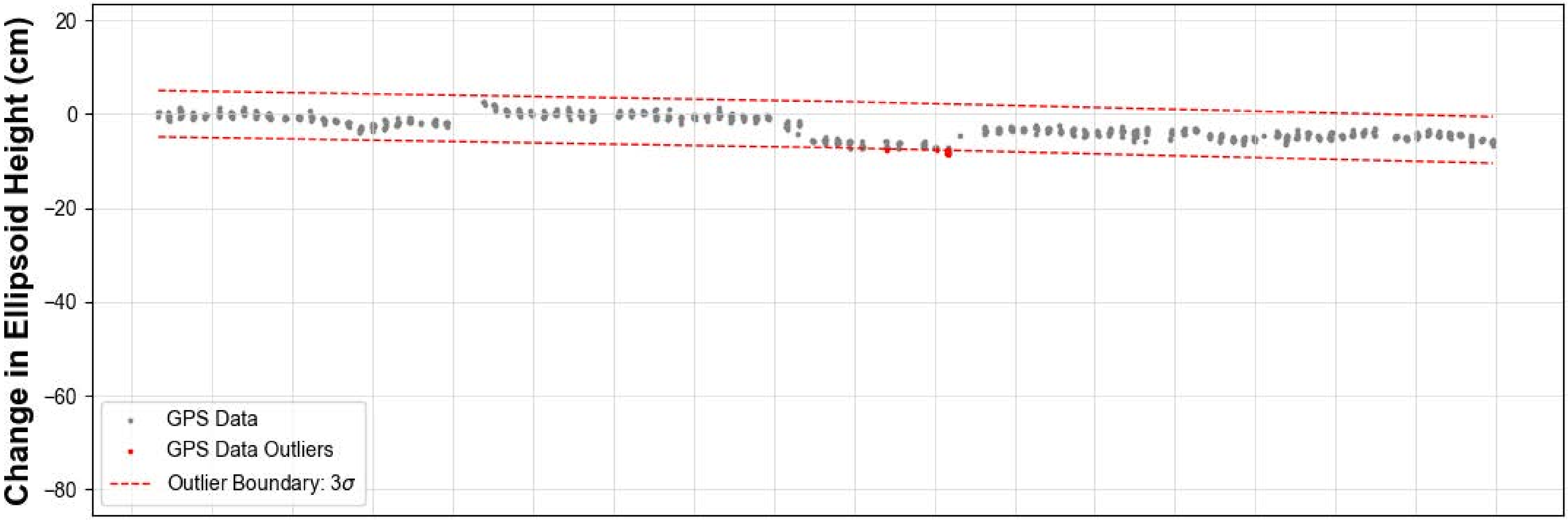


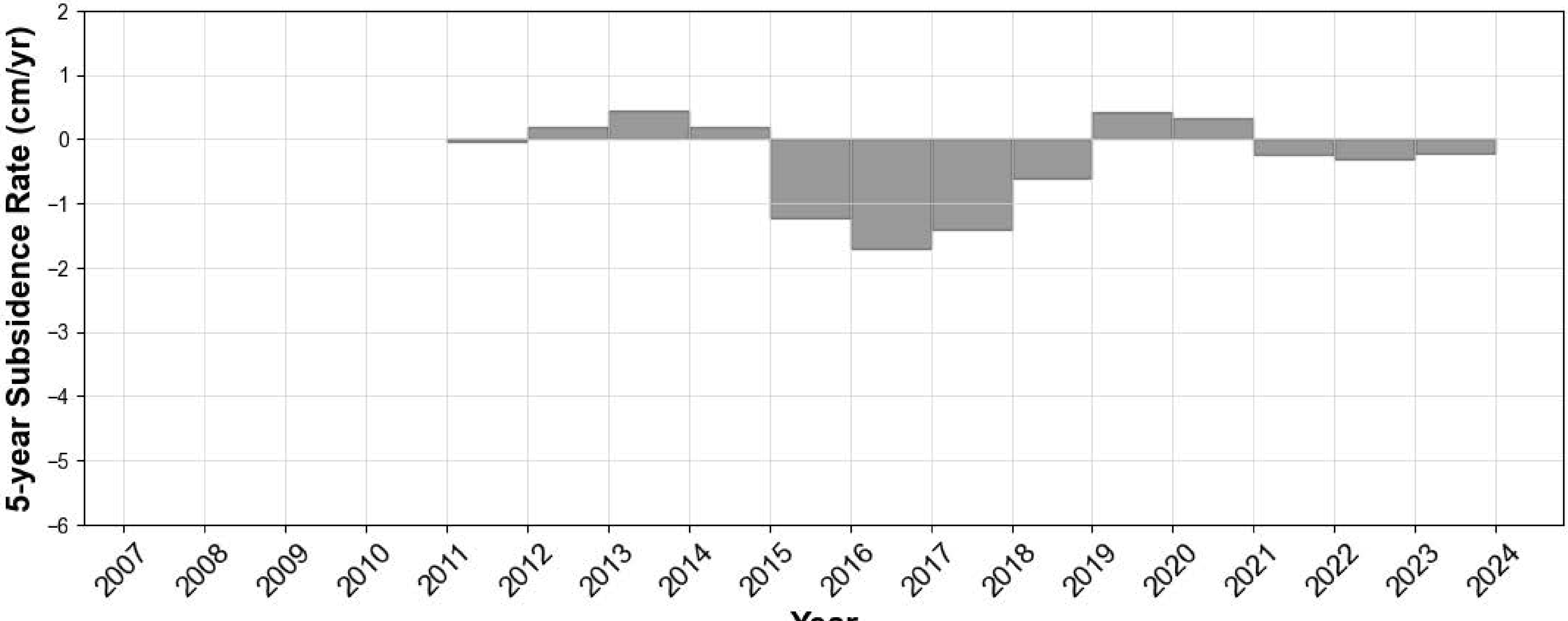
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P045

Houston, TX



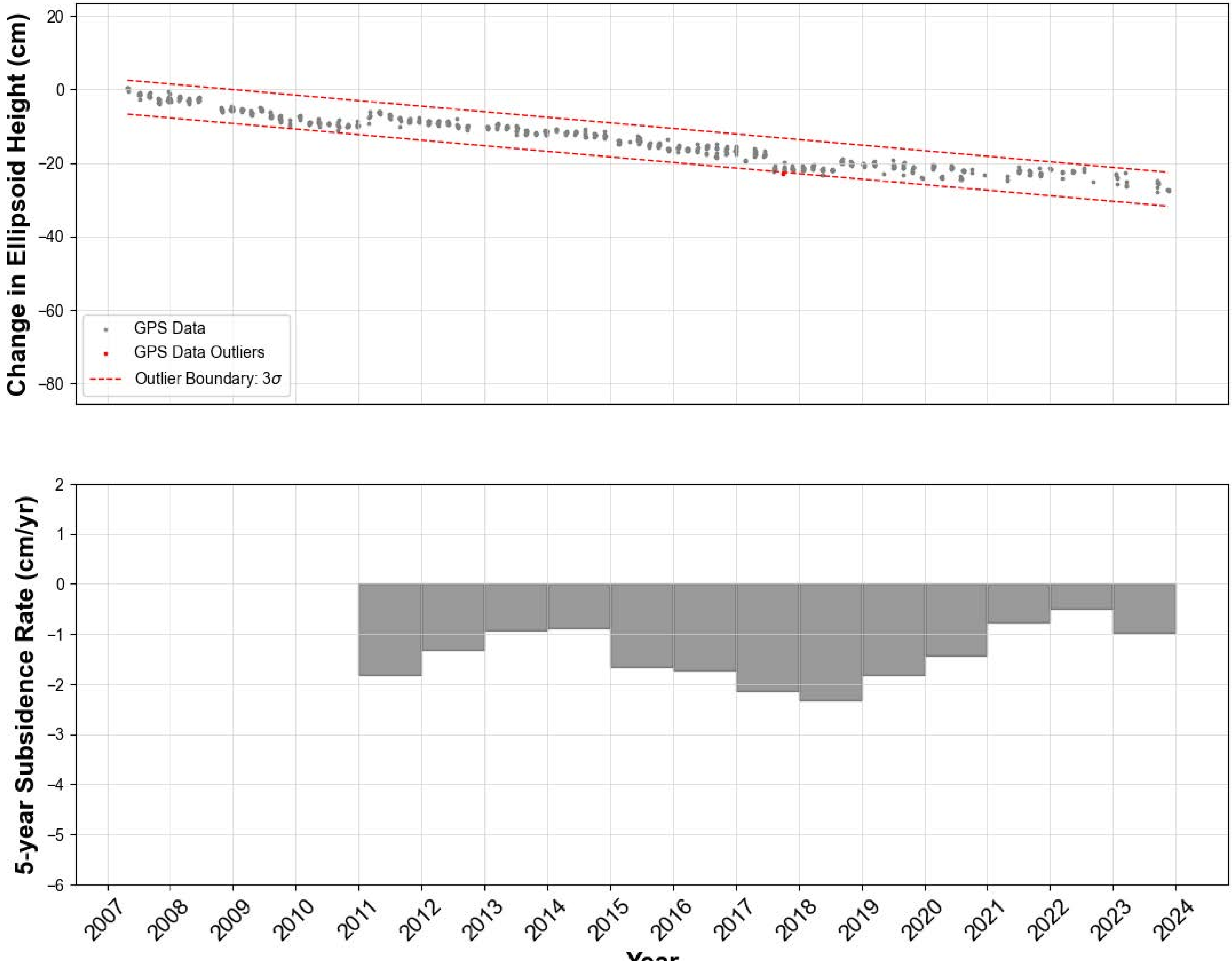




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P046

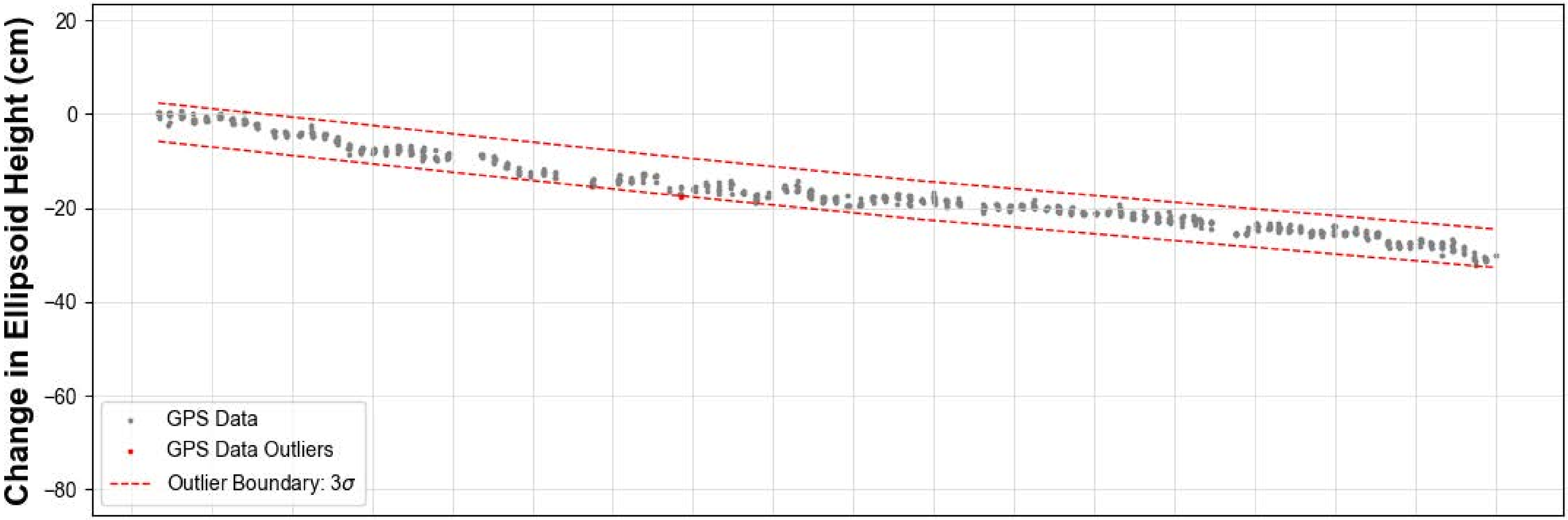
Tomball, TX

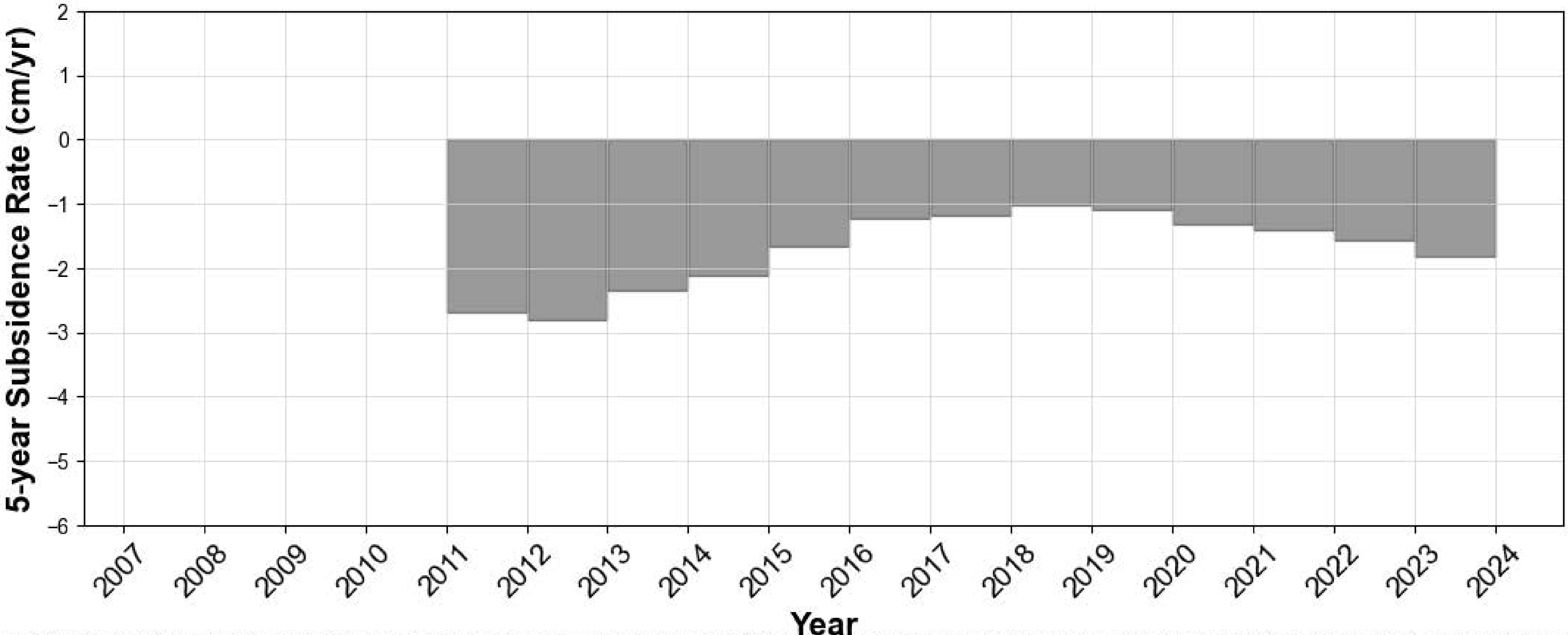


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P047

Spring, TX

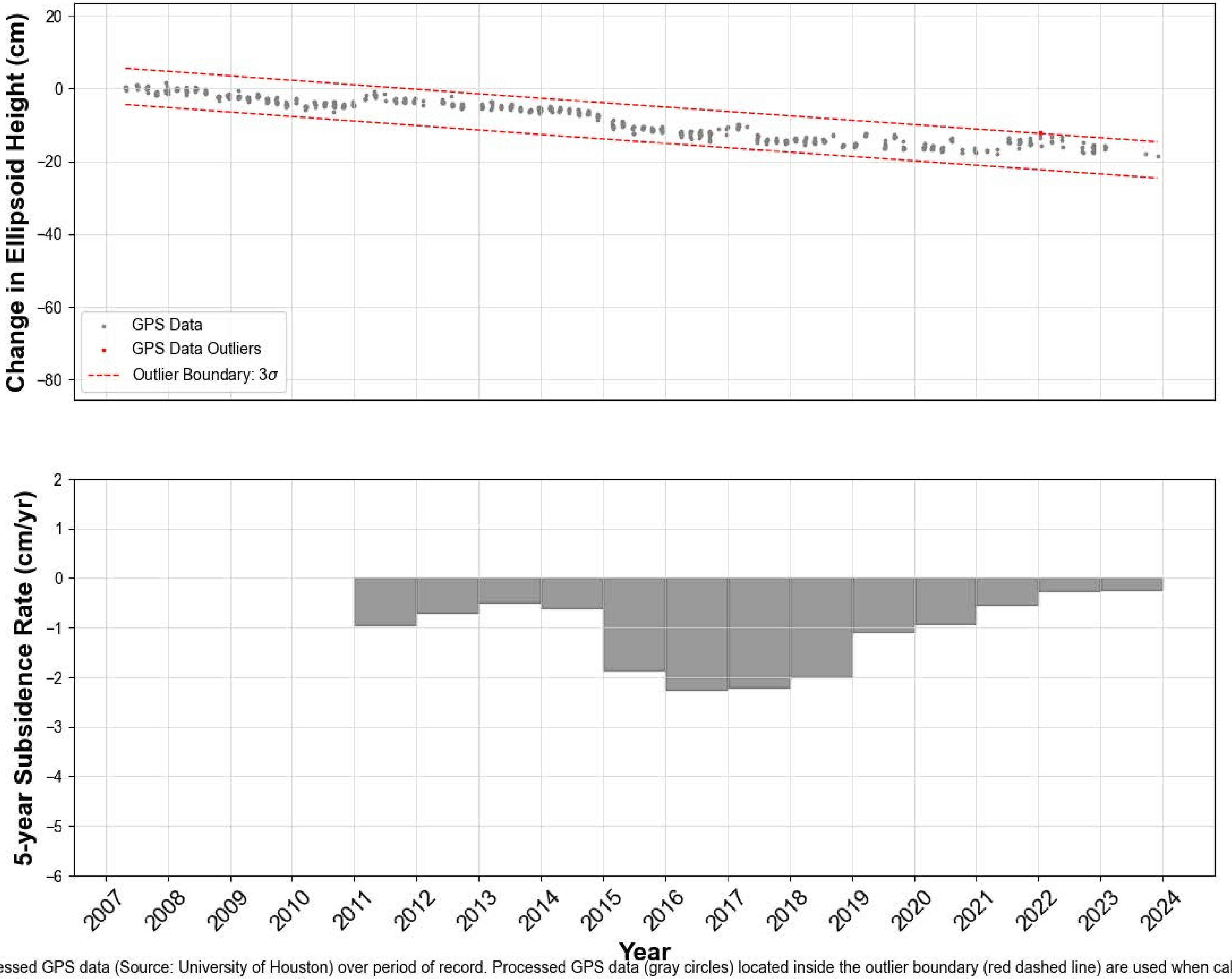




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P048

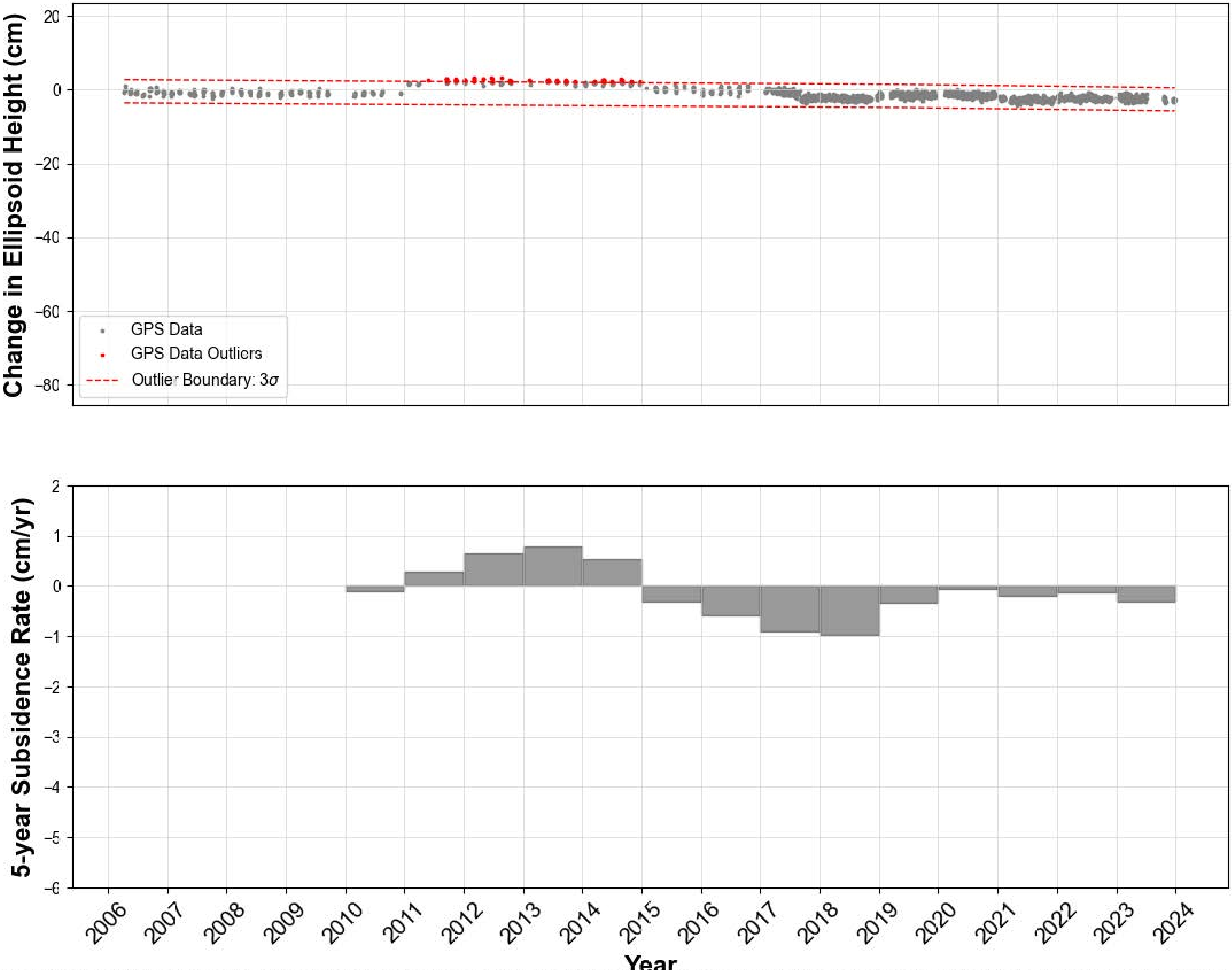
Cypress, TX



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.

P049

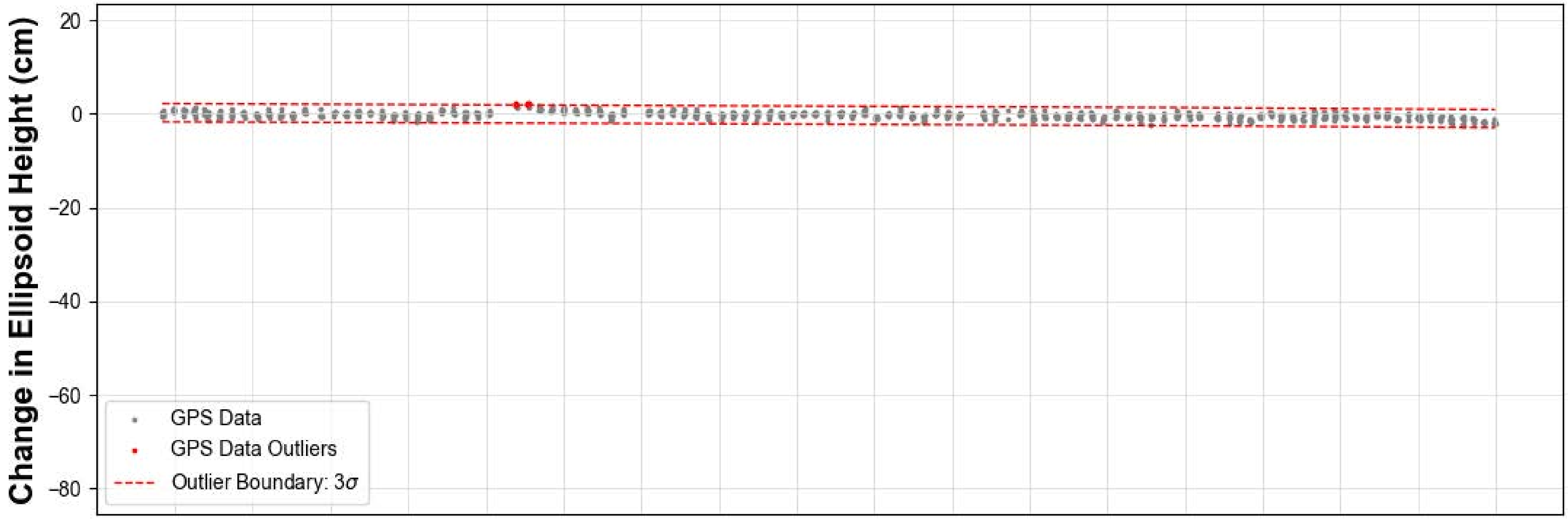
Bolivar Peninsula, TX

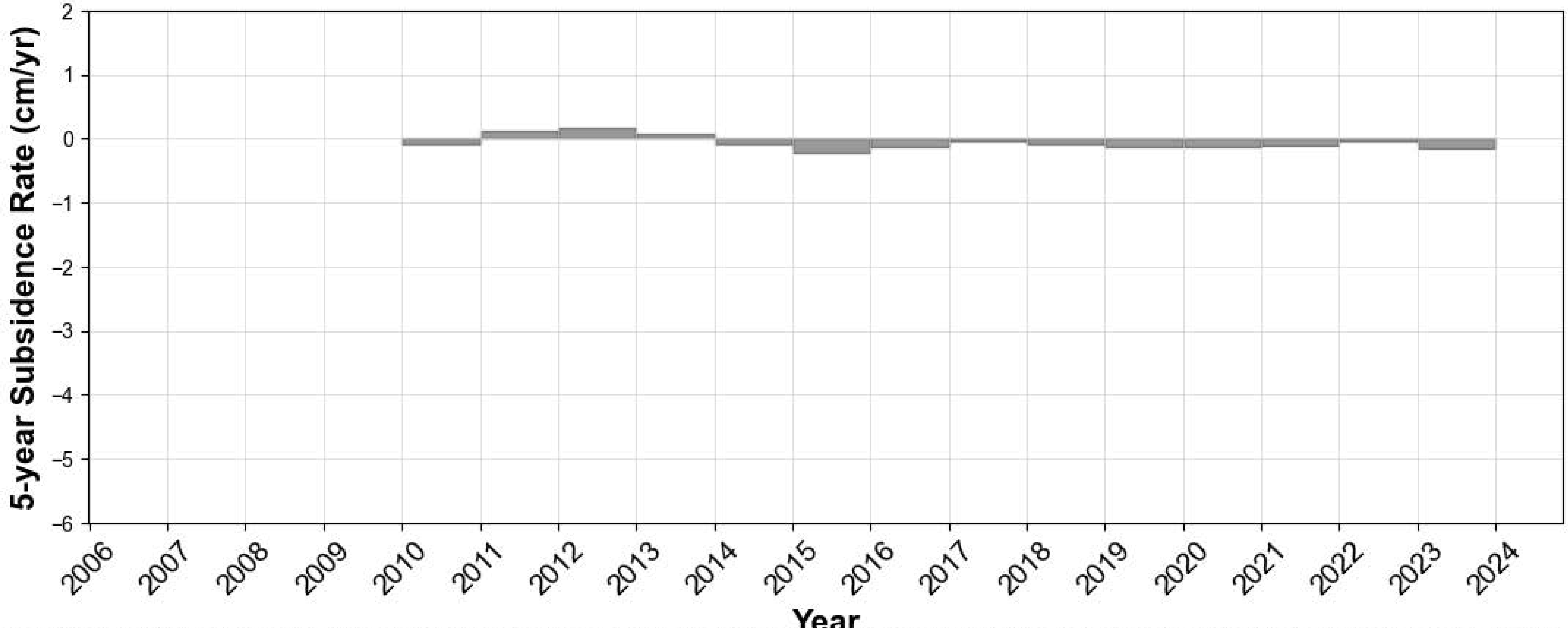


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P050

Mont Belvieu, TX

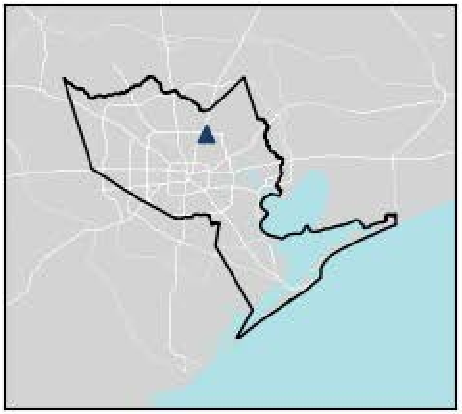


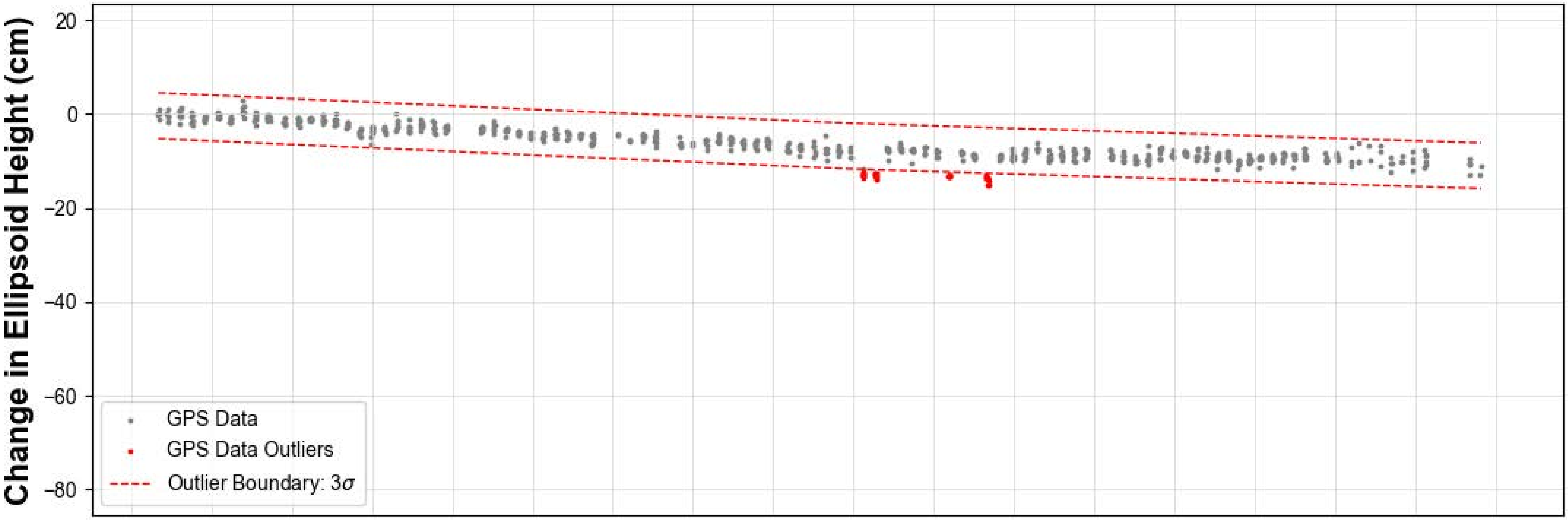


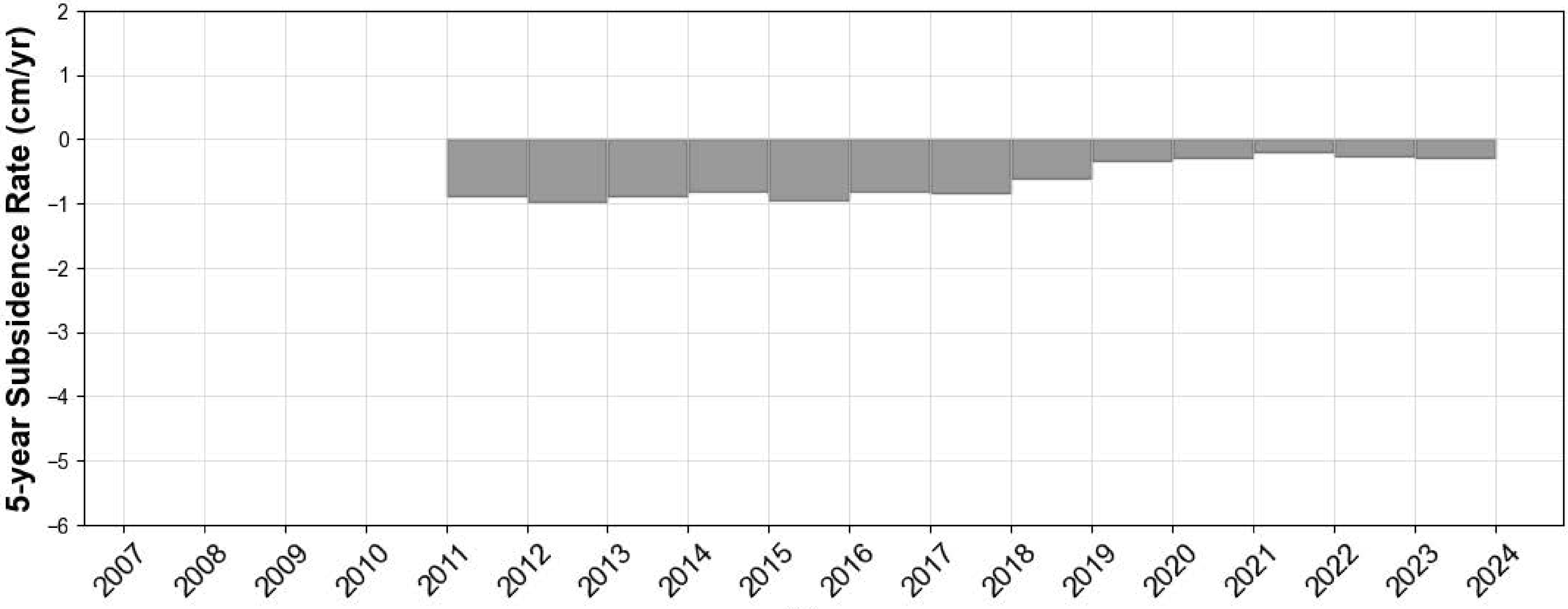
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P051

Humble, TX



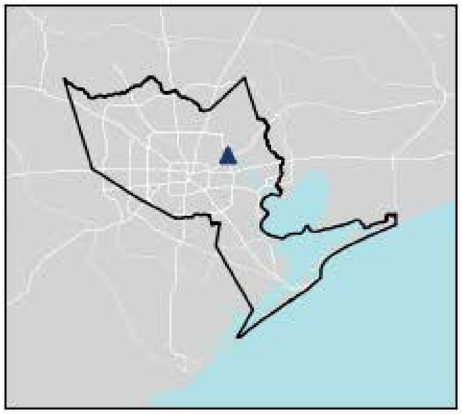


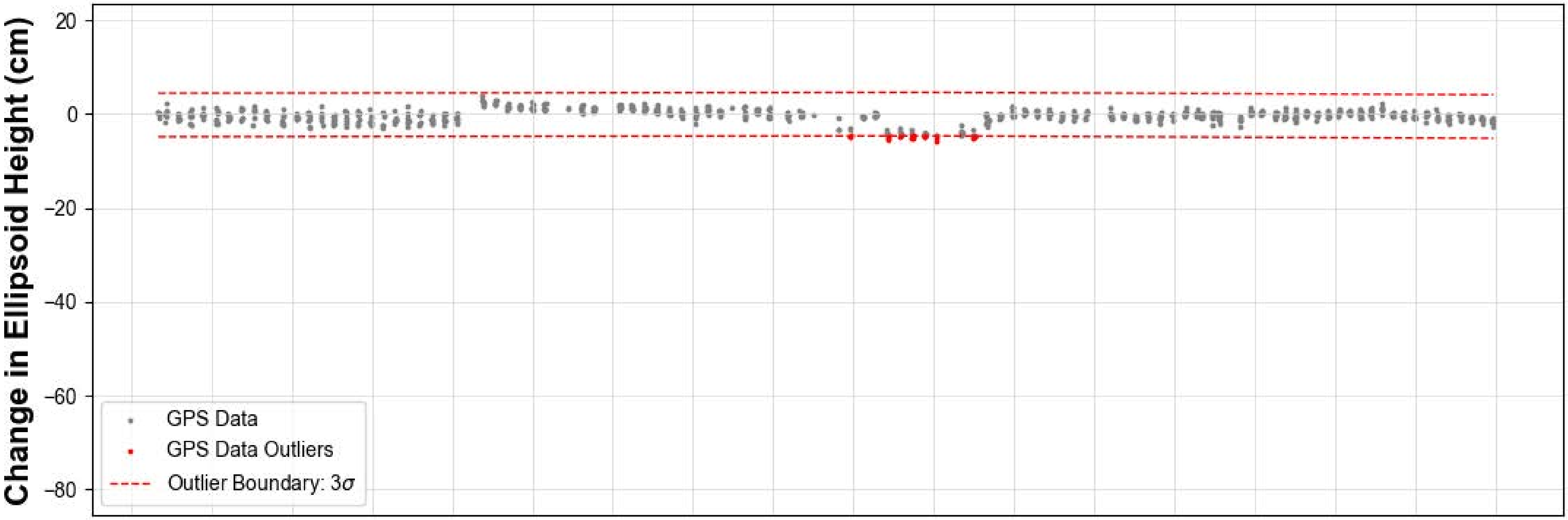


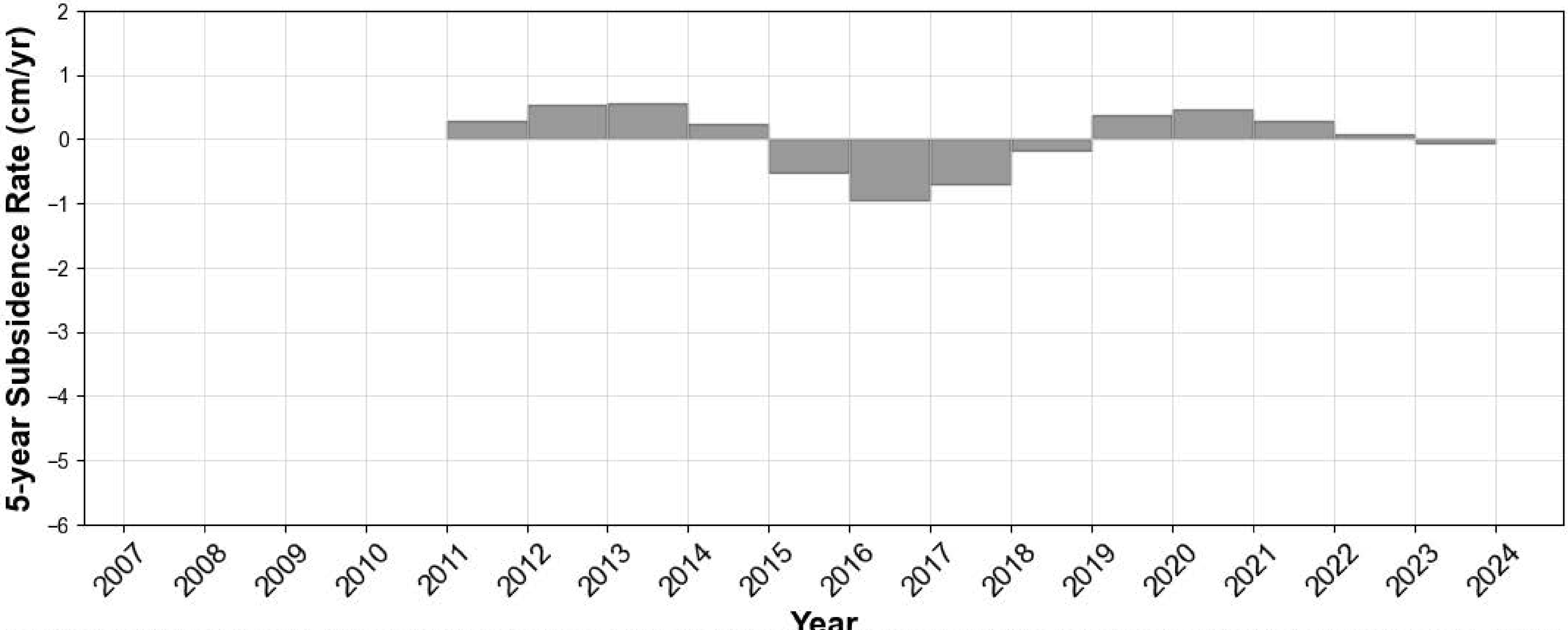
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P052

Houston, TX



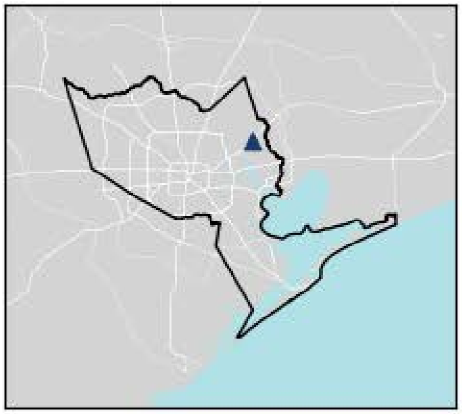


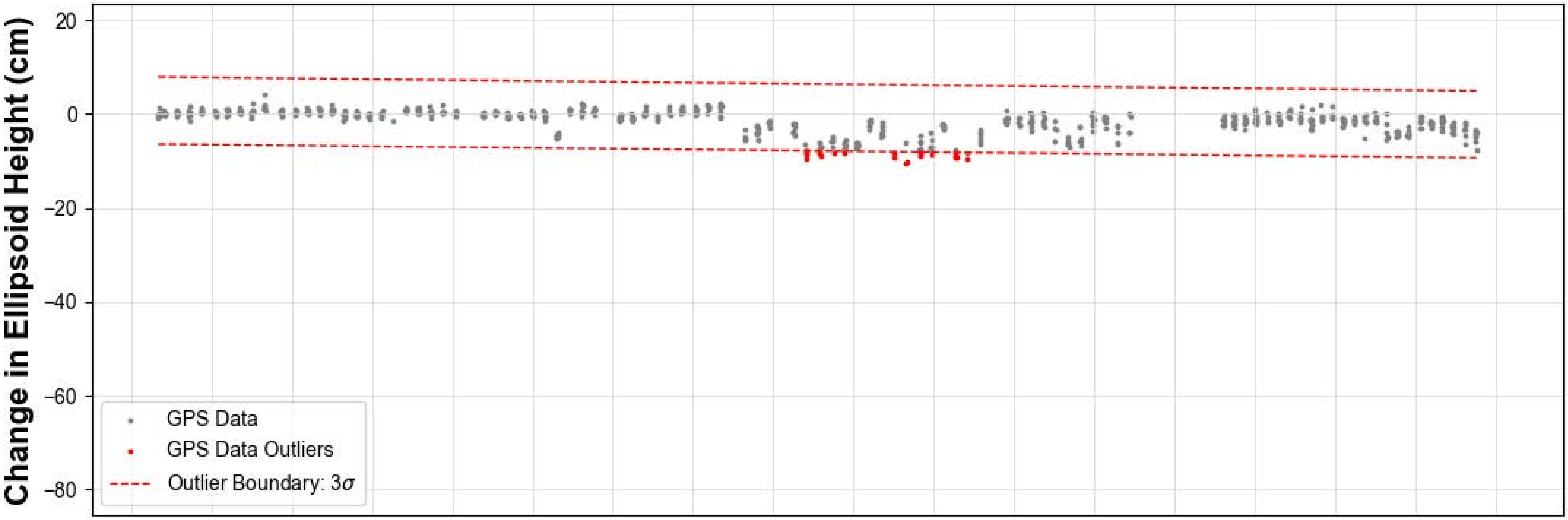


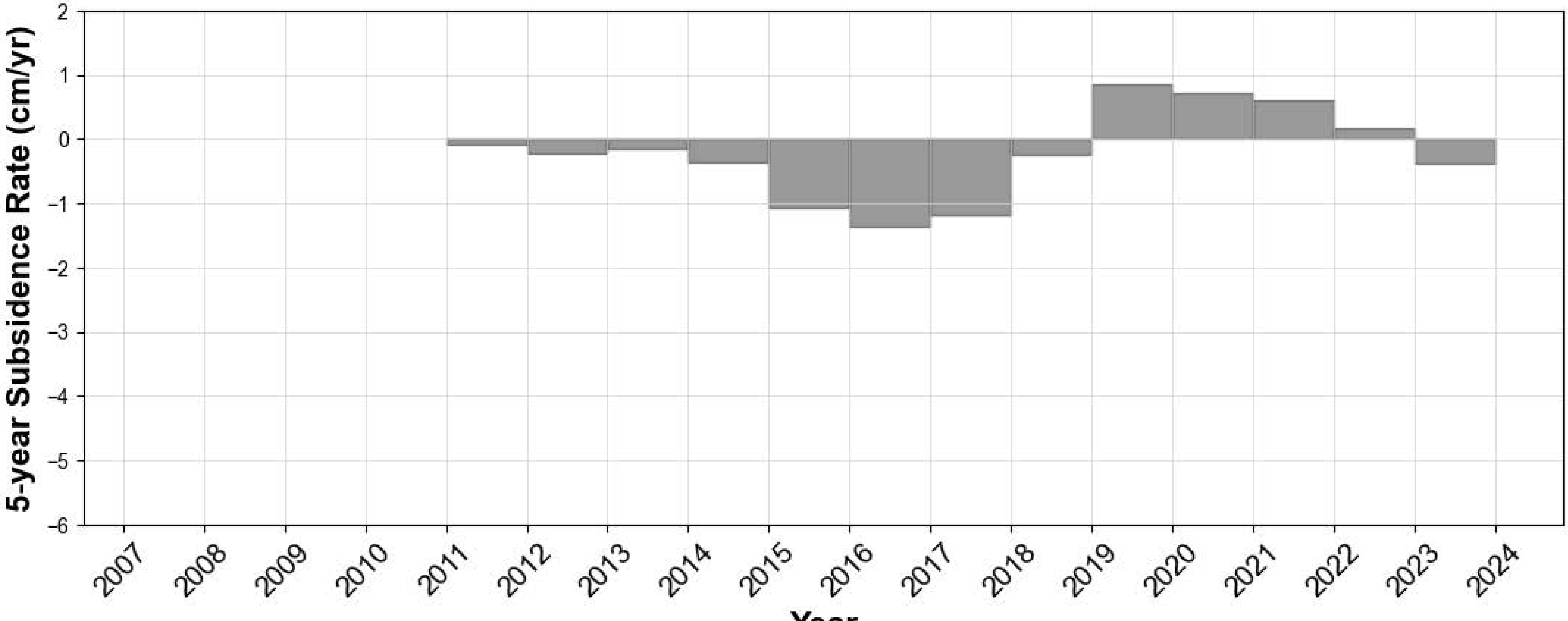
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P053

Crosby, TX



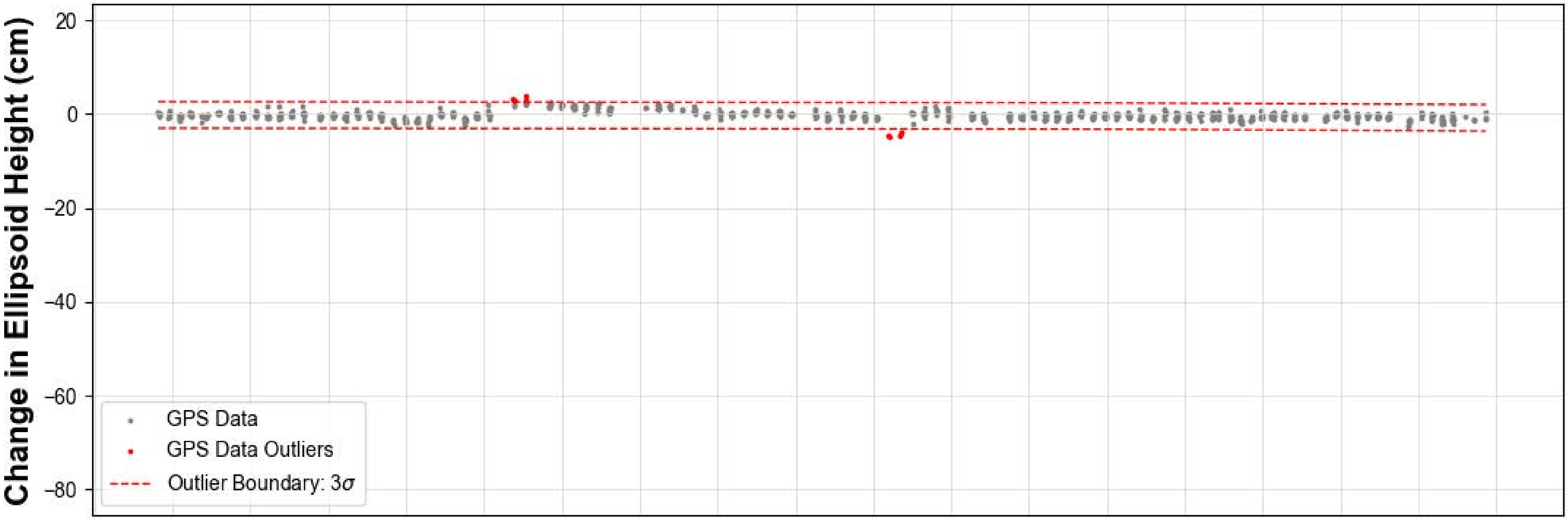


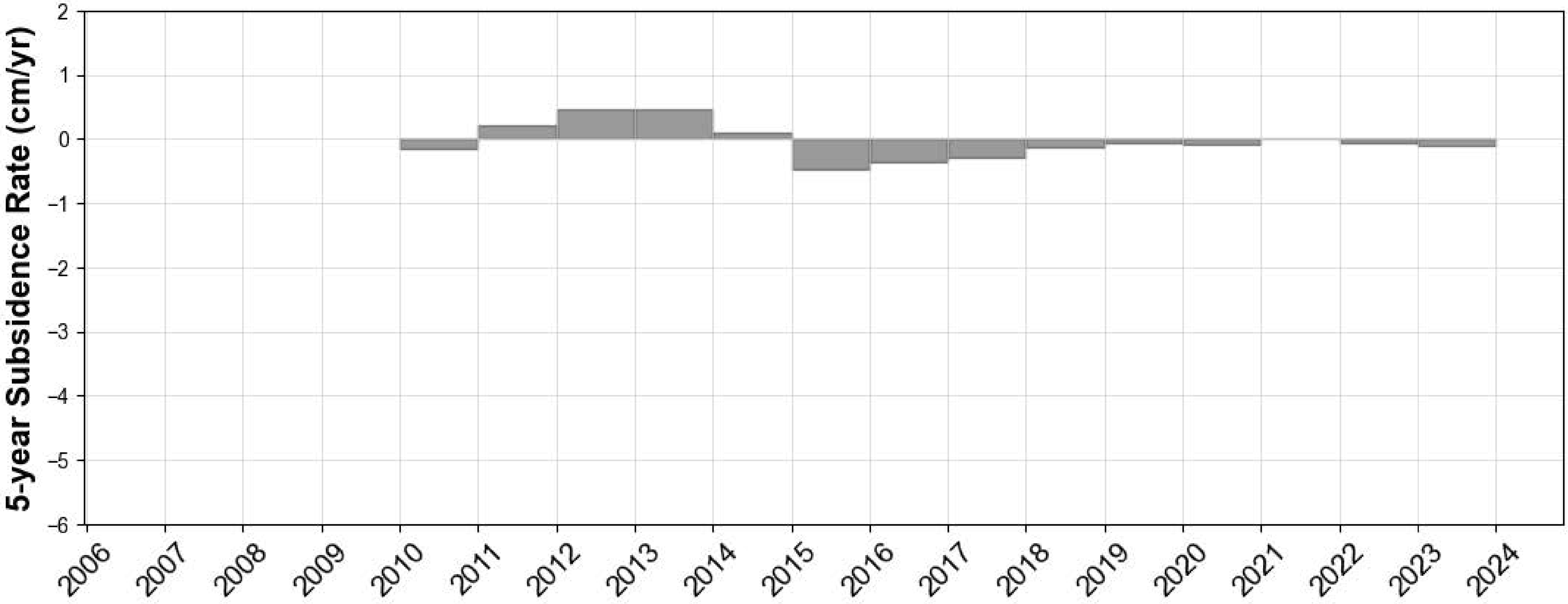


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P054

Baytown, TX

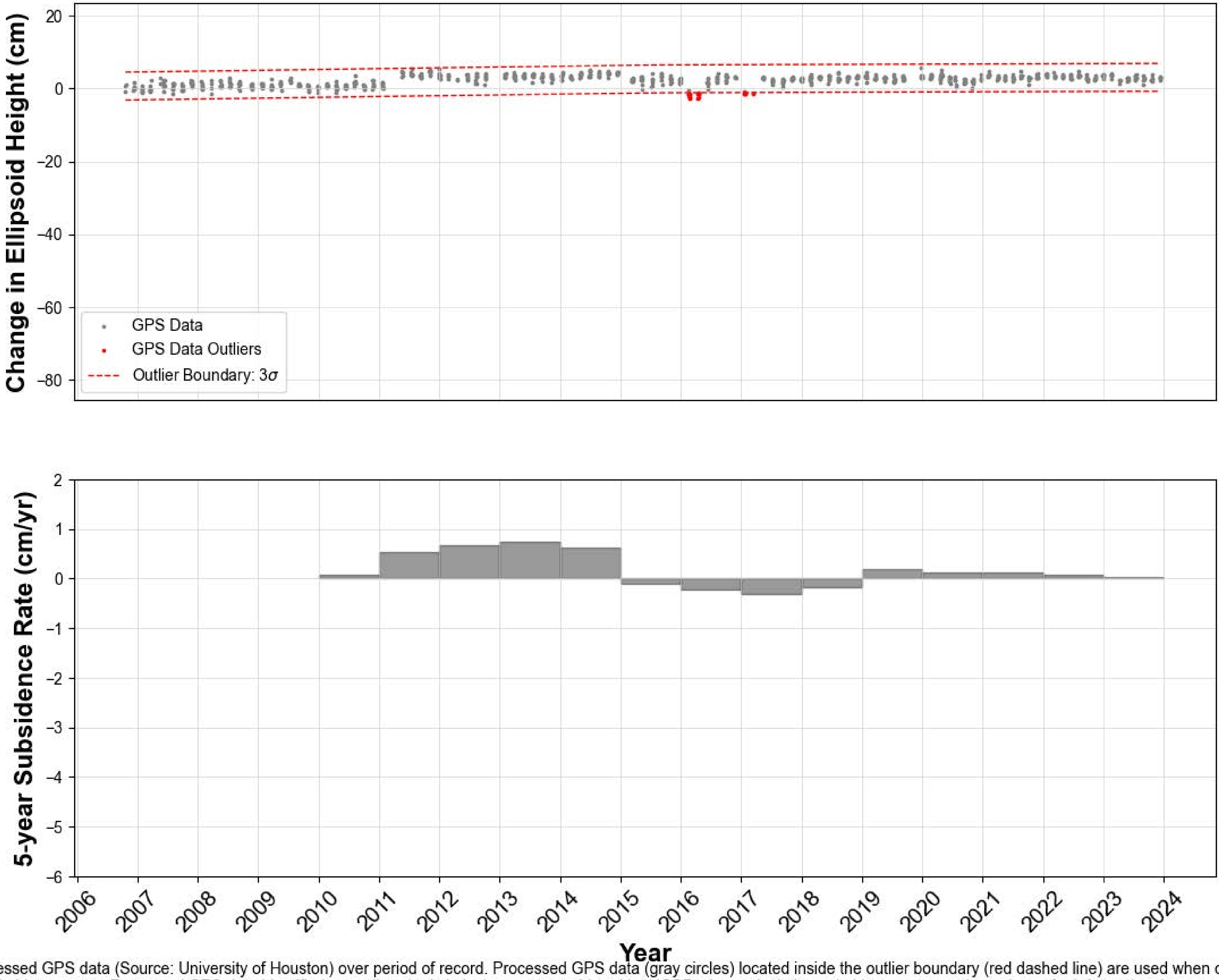




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P055

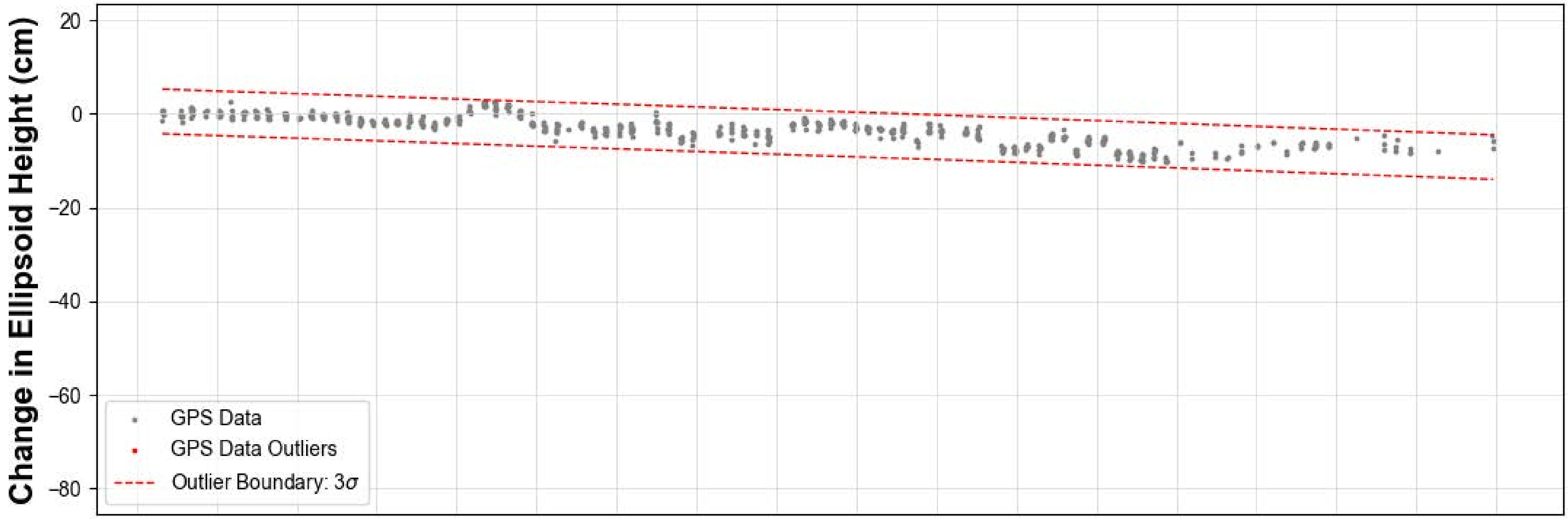
Houston, TX

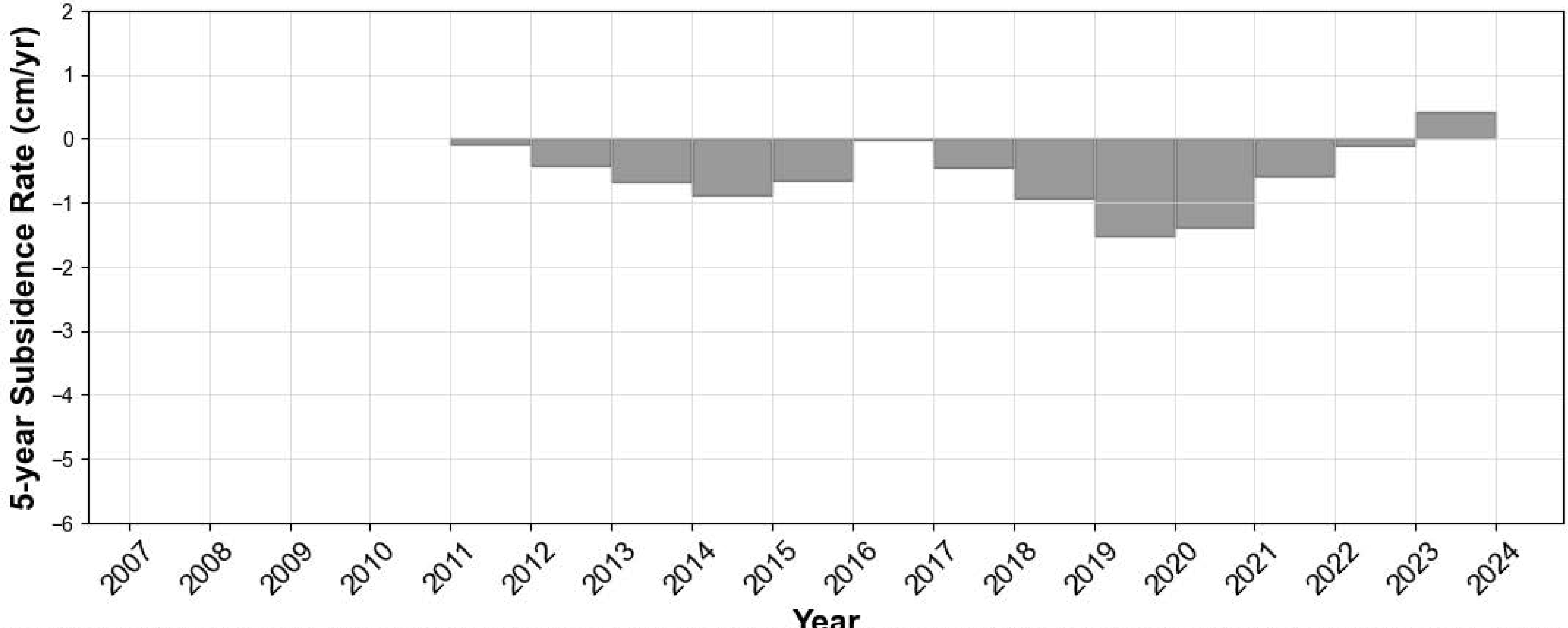


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P056

Katy, TX

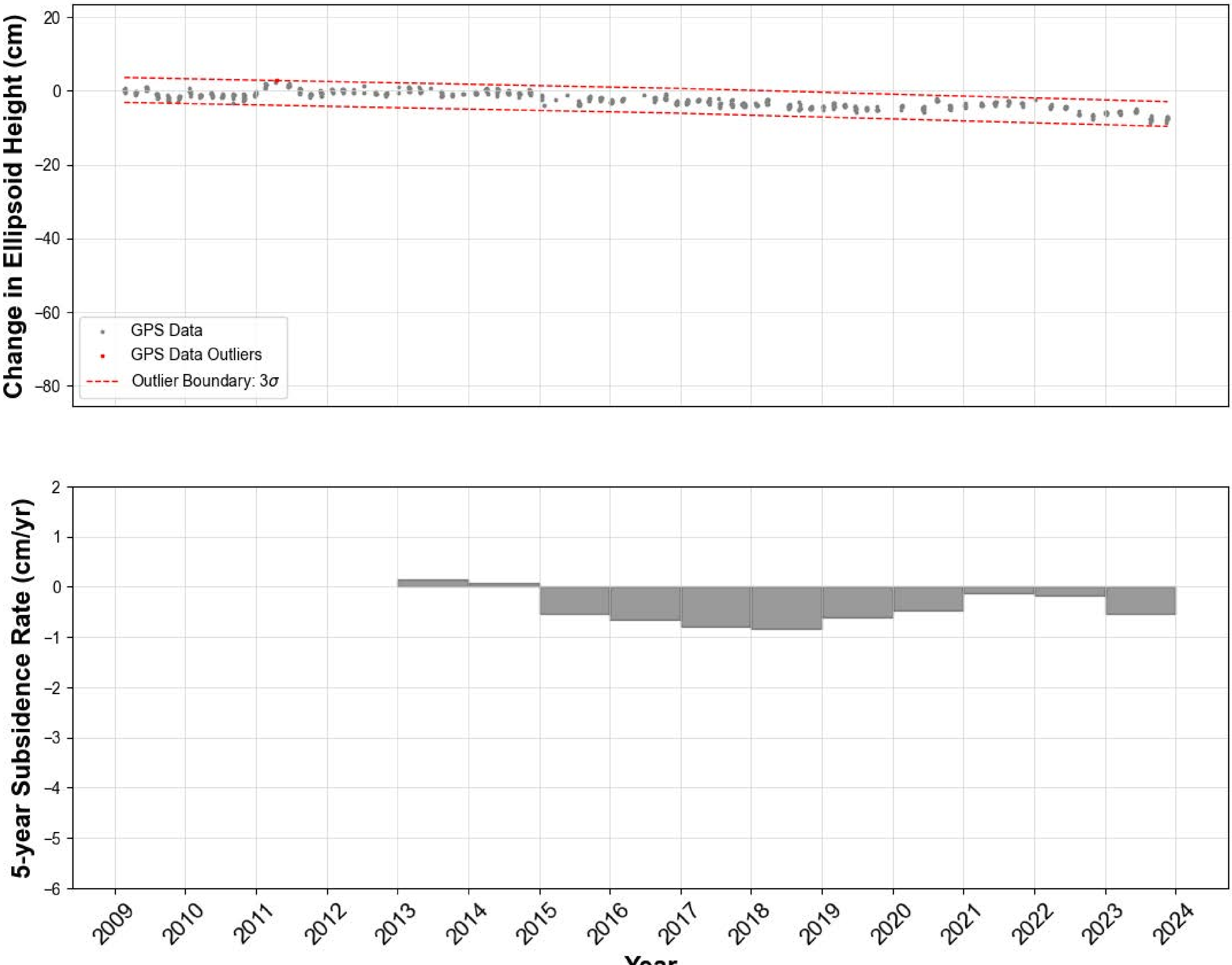




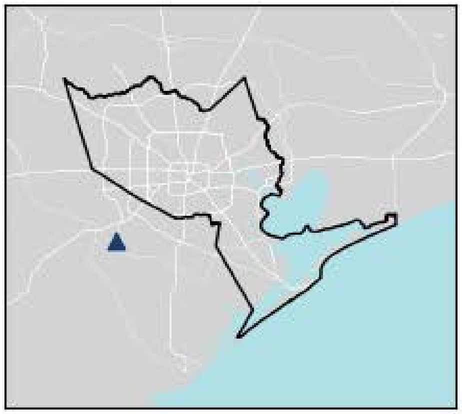
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P057

Richmond, TX

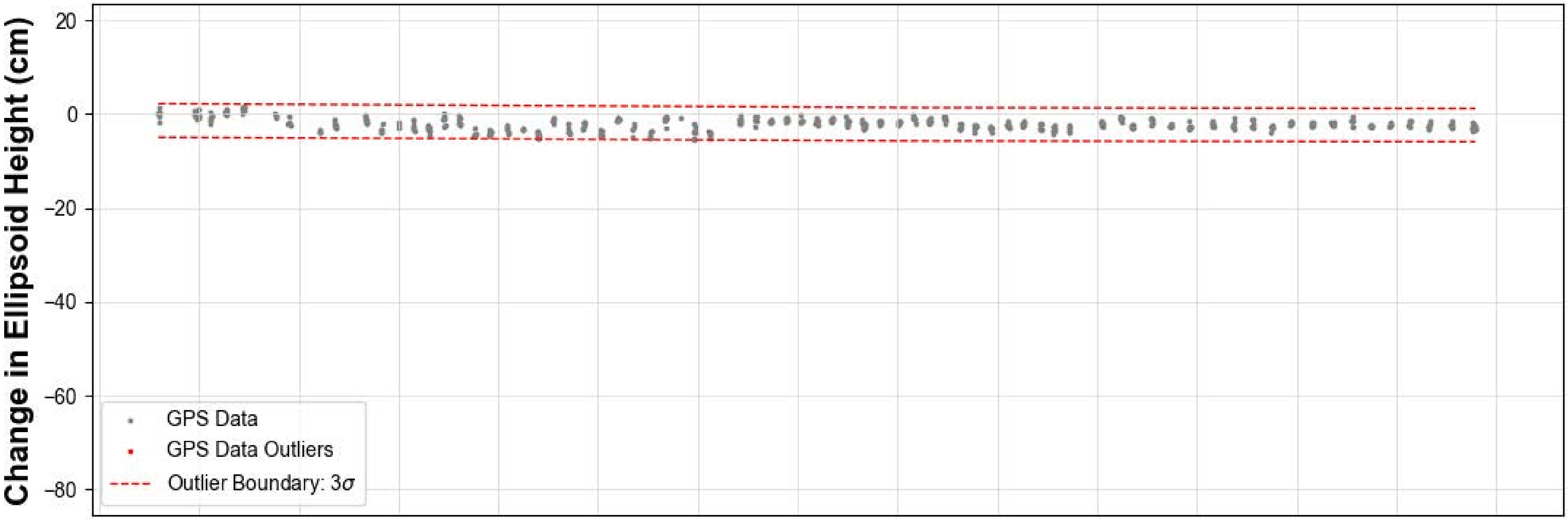


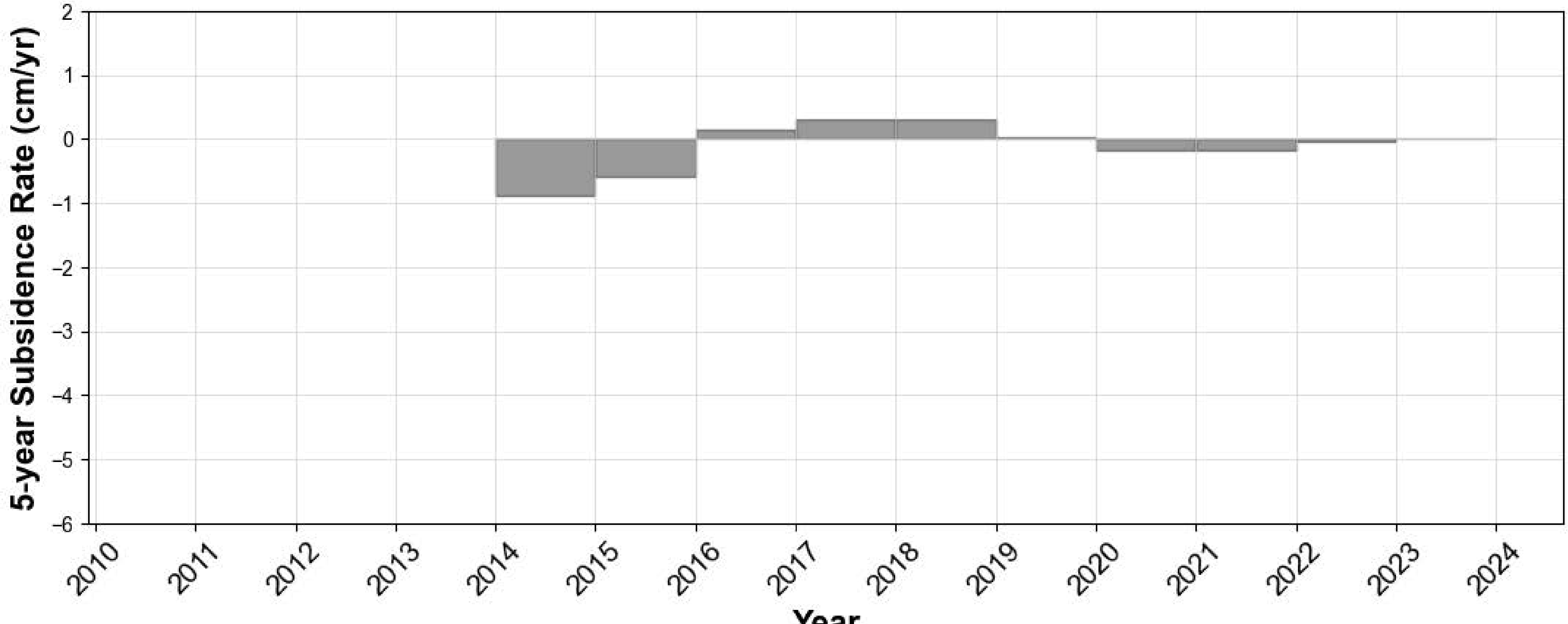
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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



P058

Richmond, TX

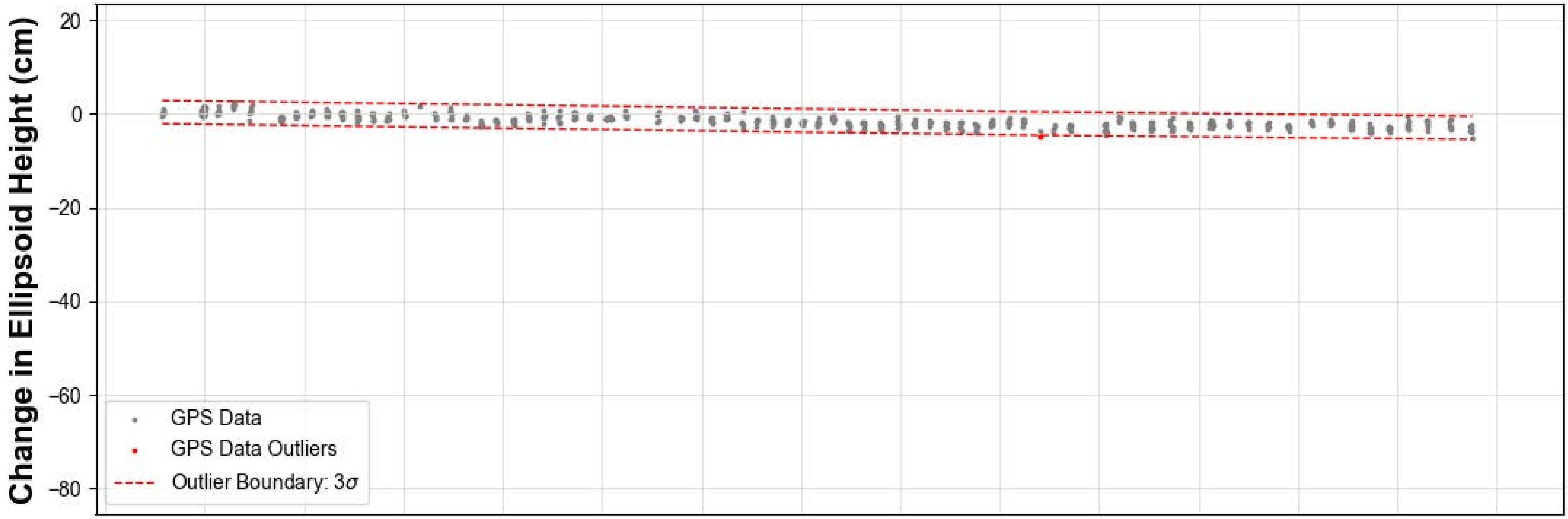


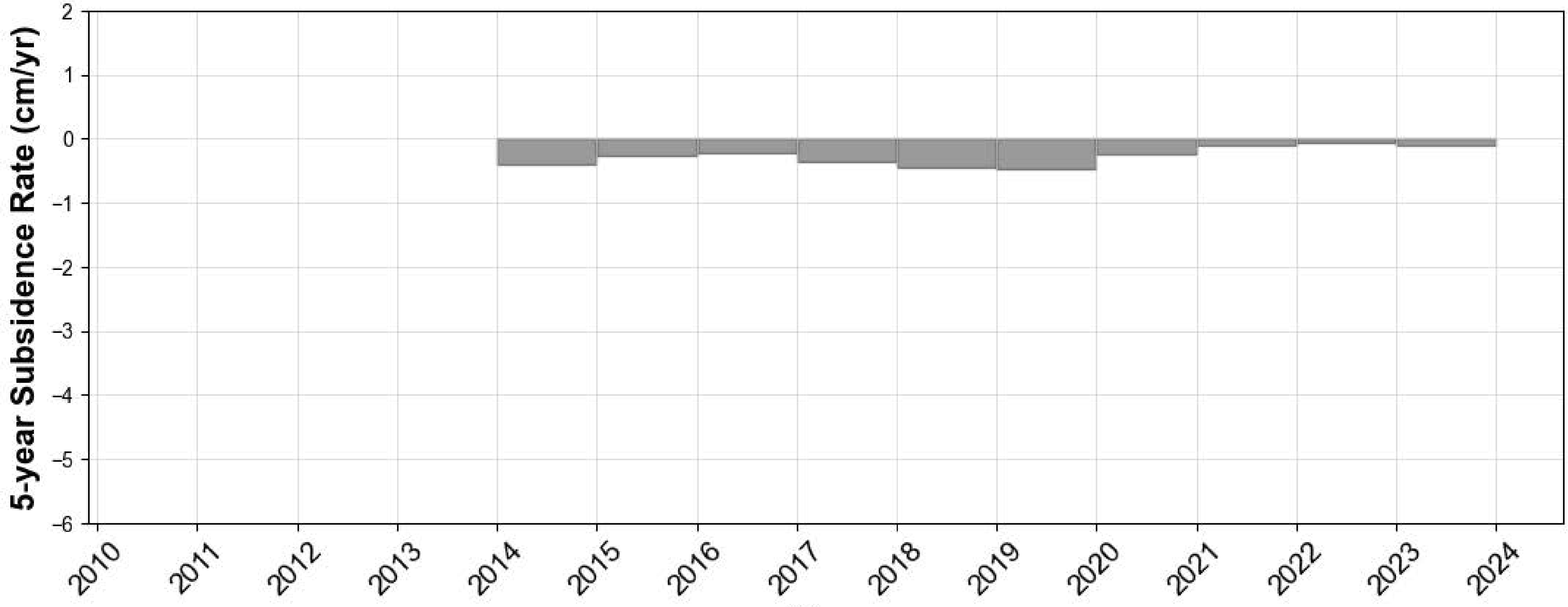


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P059

Richmond, TX

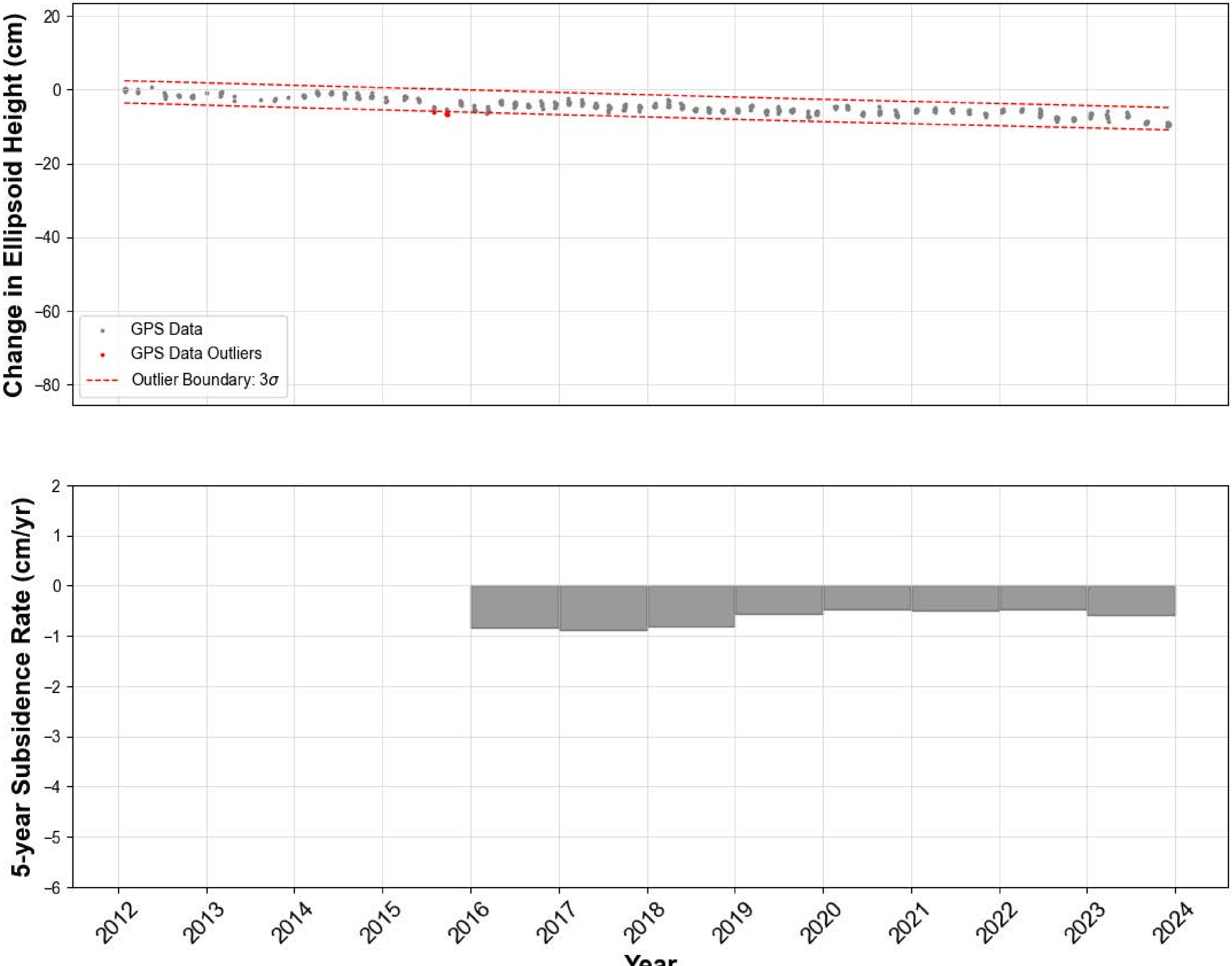




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P060

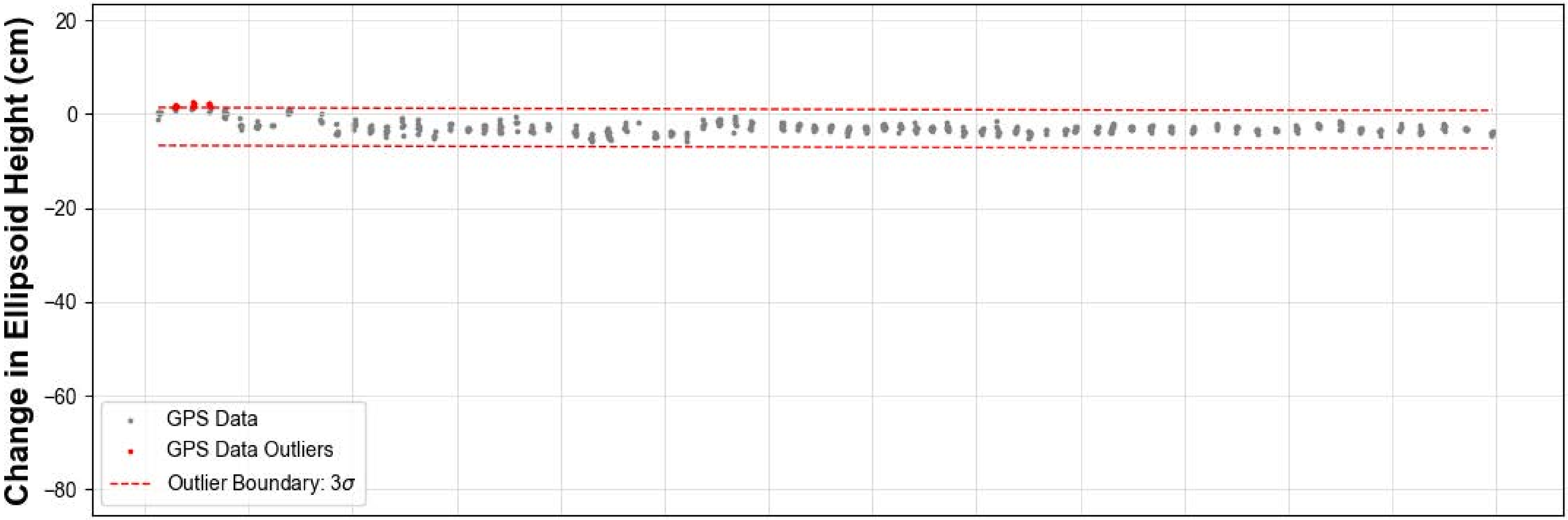
Richmond, TX

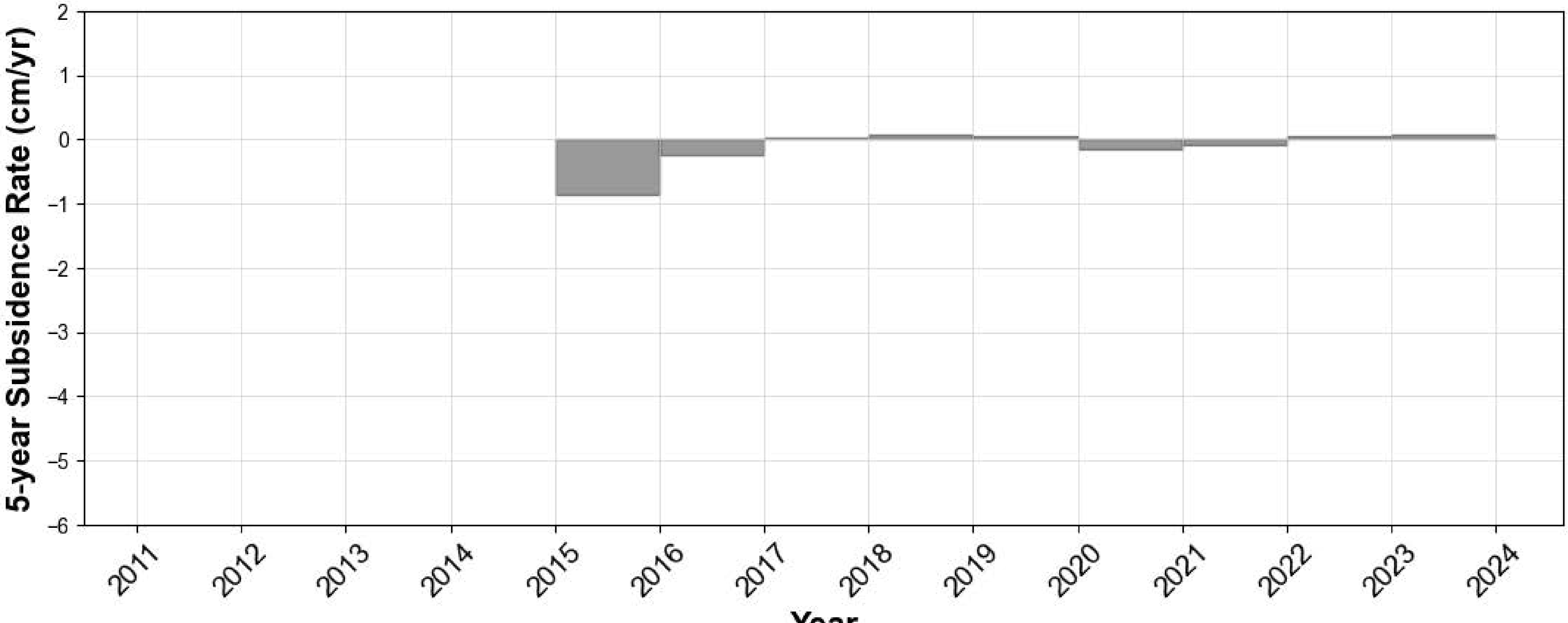


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P061

Simonton, TX

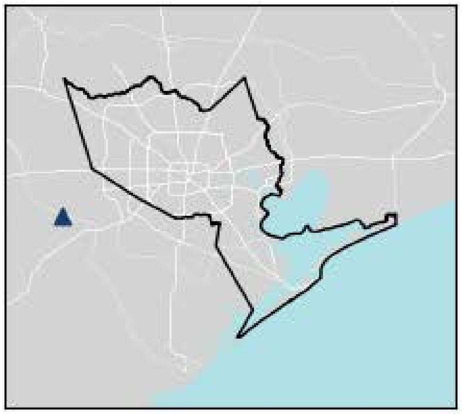


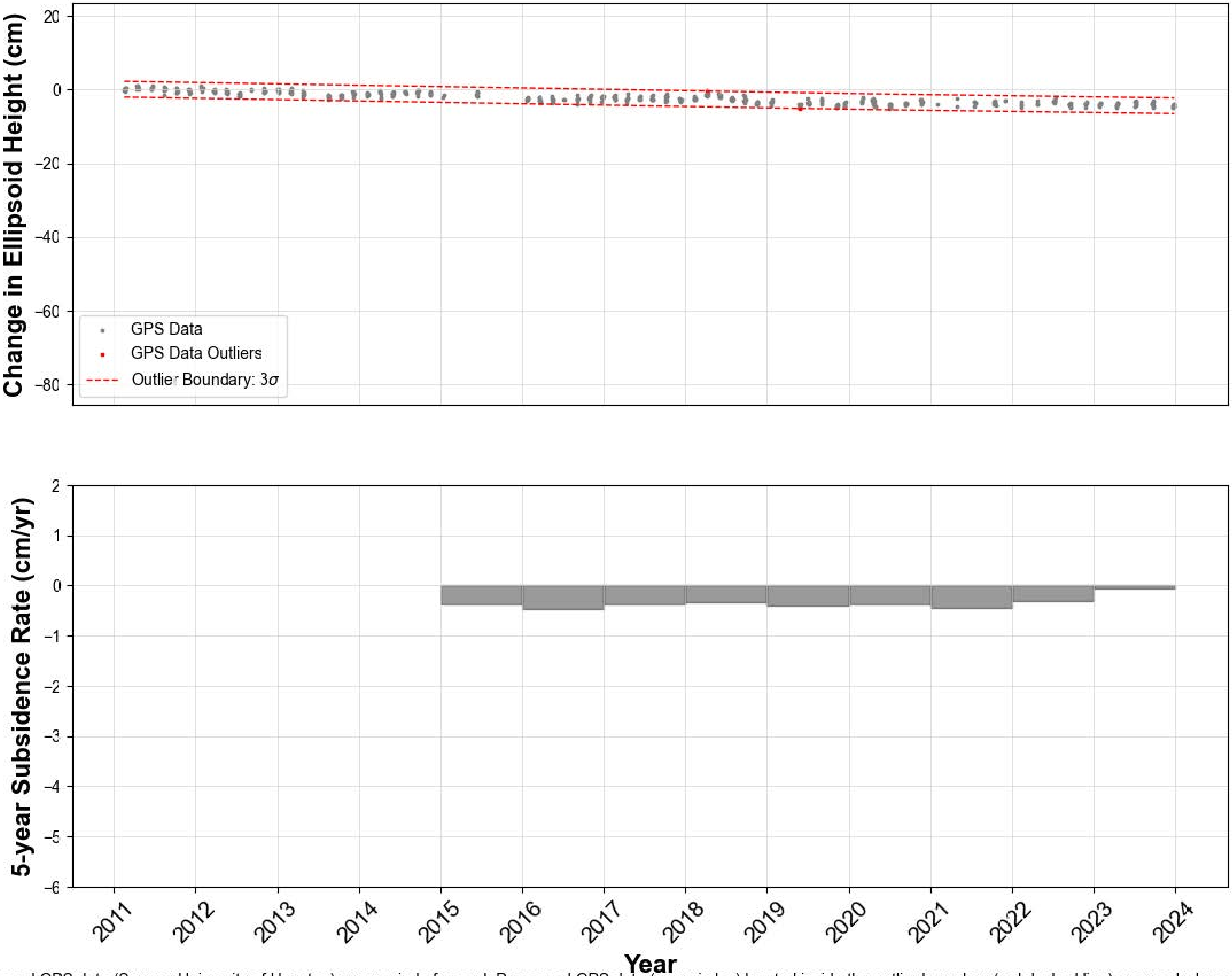


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P062

Rosenberg, TX

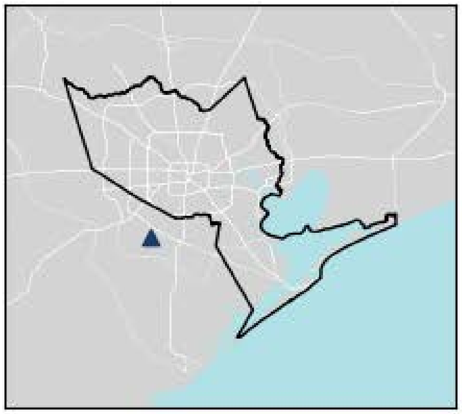


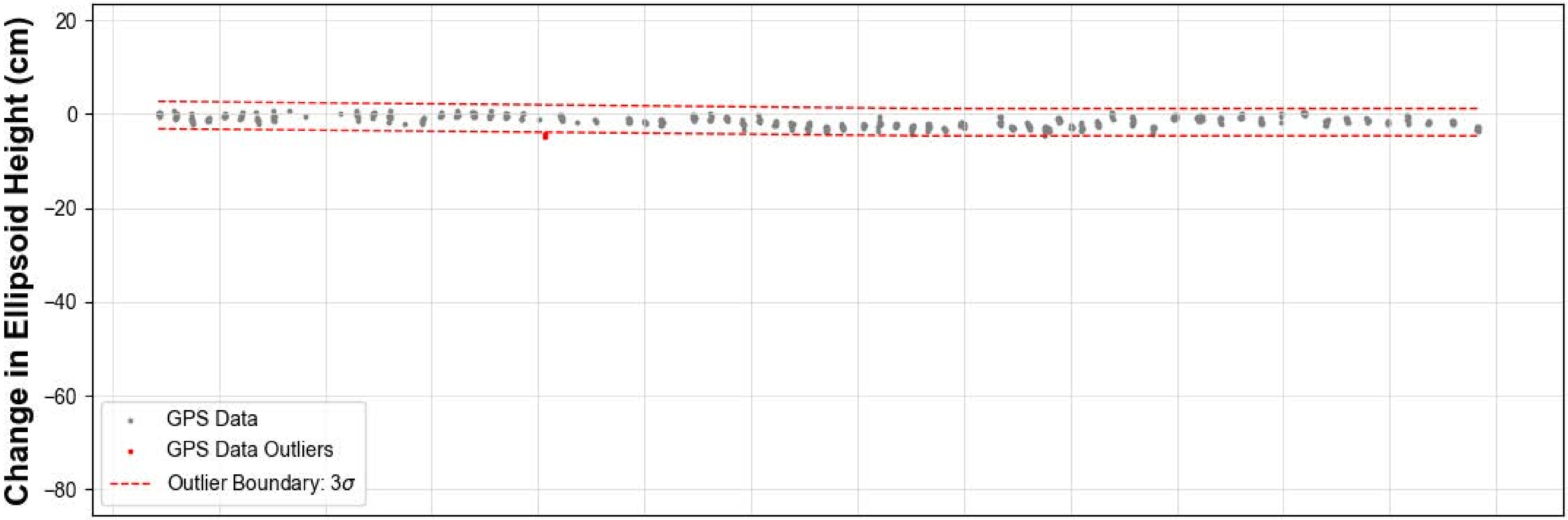


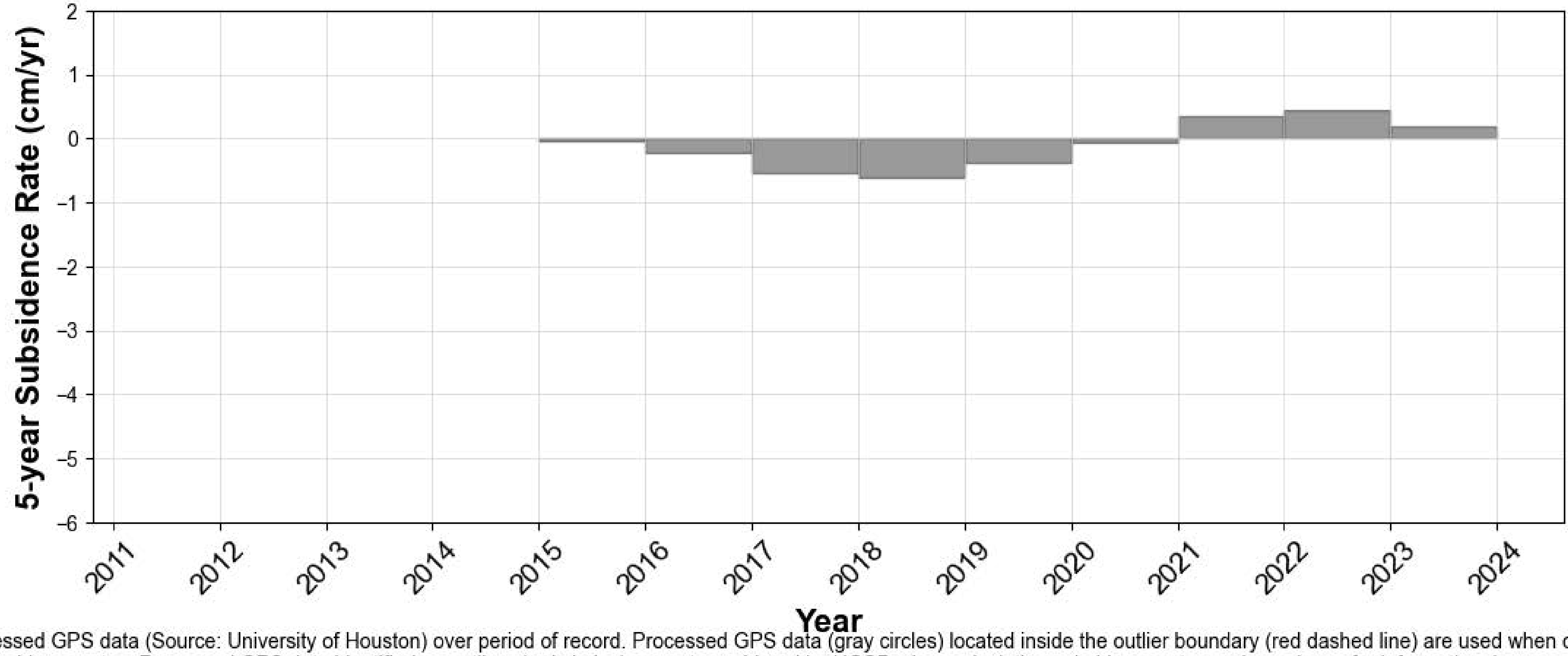
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P063

Missouri City, TX



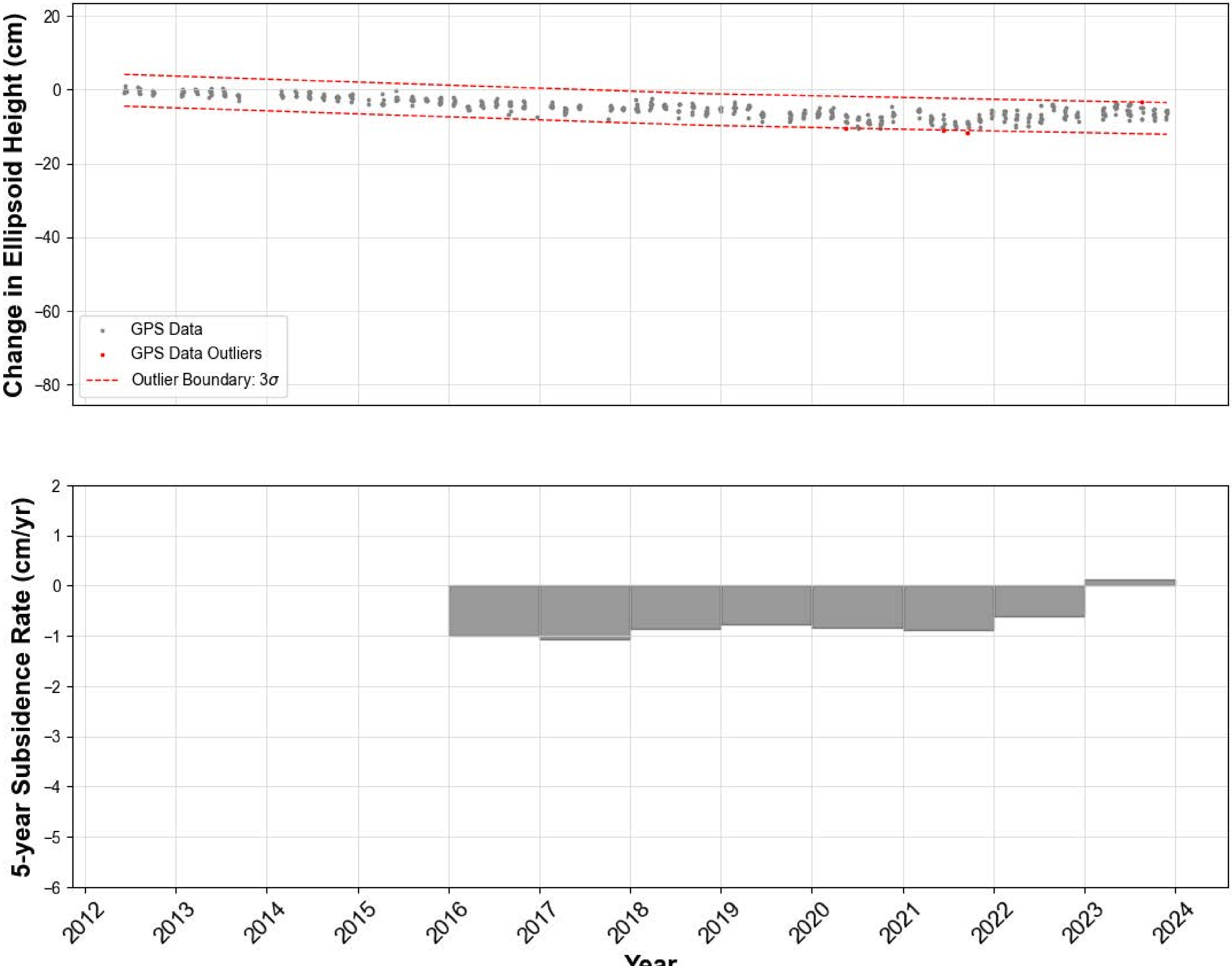




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P065

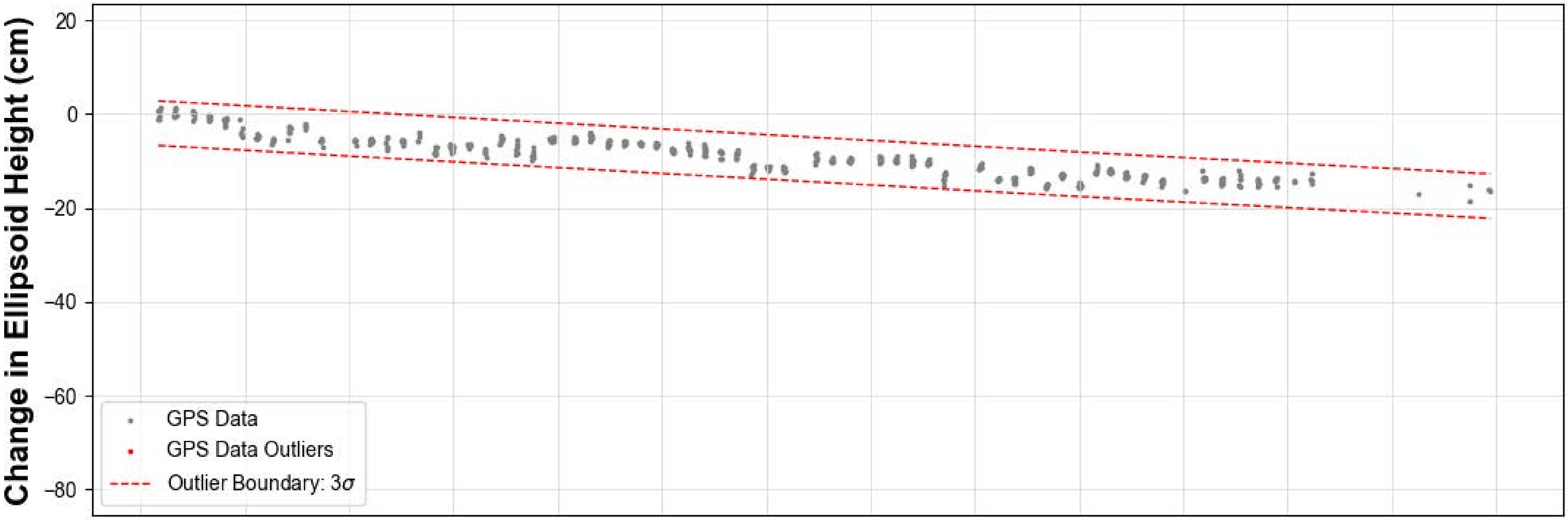
Huffman, TX

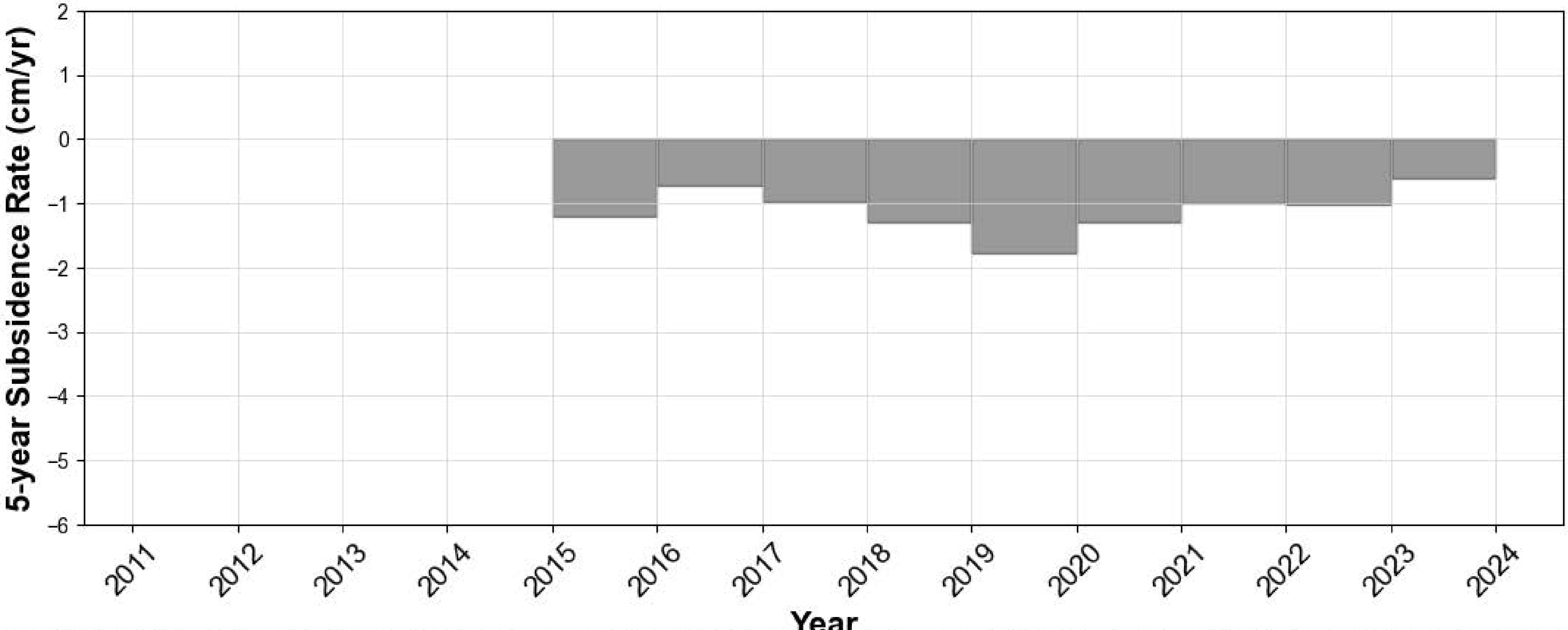


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P066

Cypress, TX

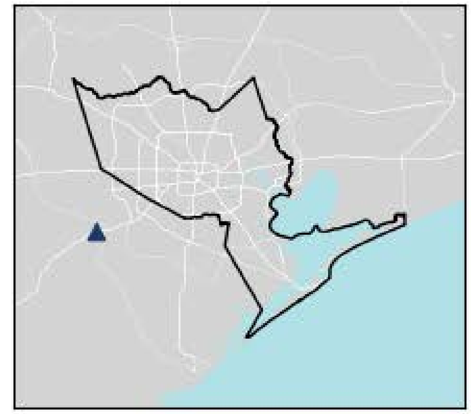


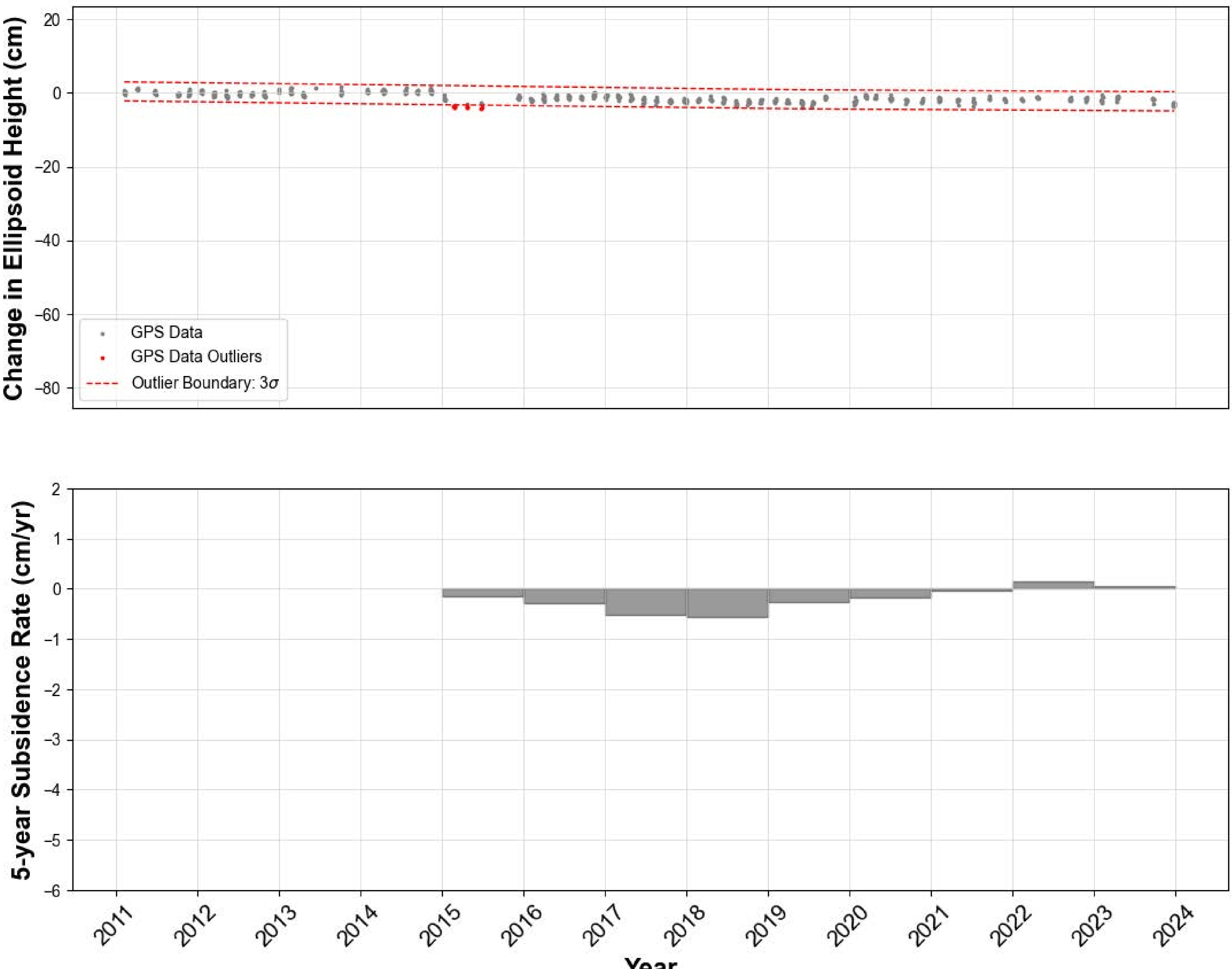


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P067

Rosenberg, TX

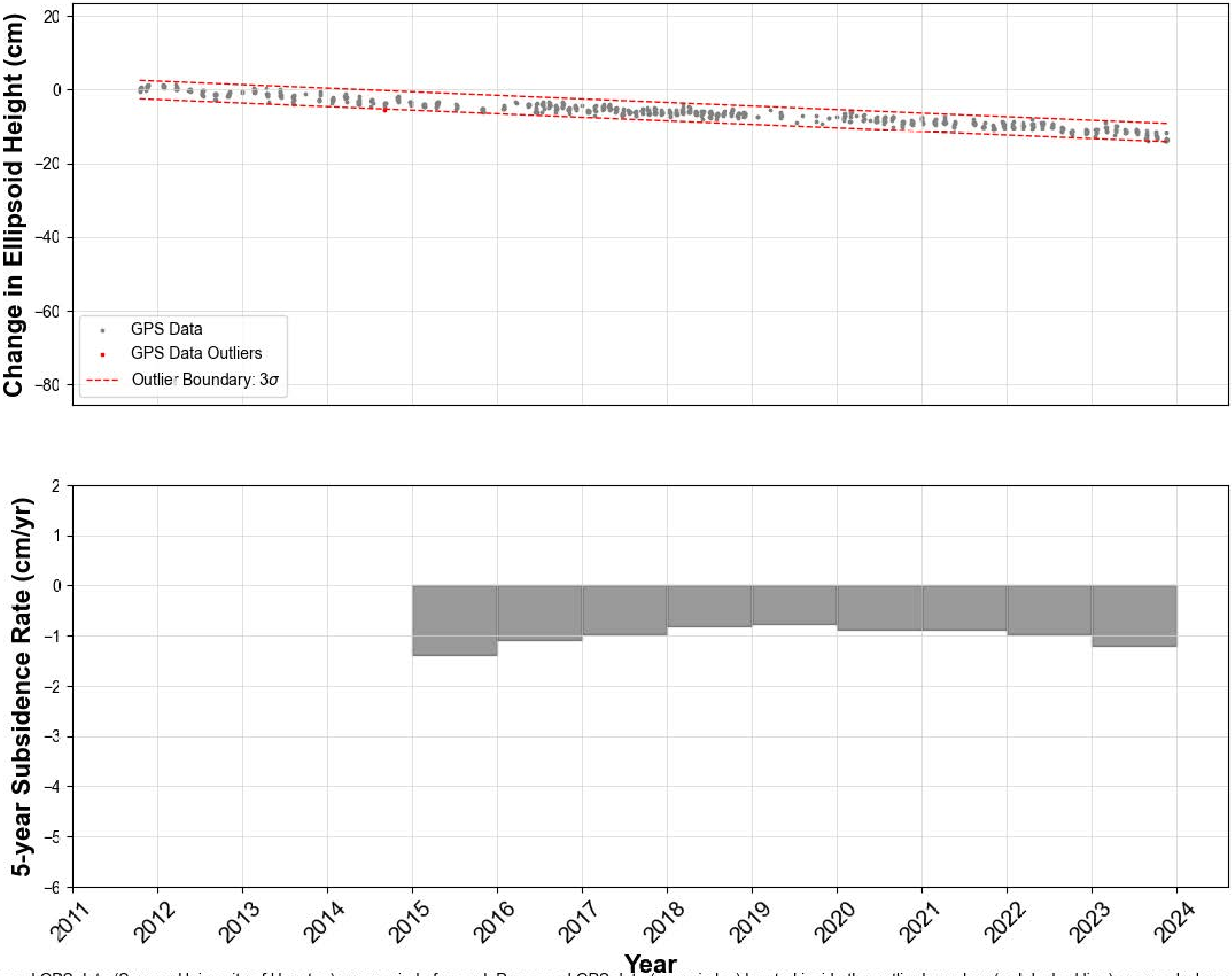




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P068

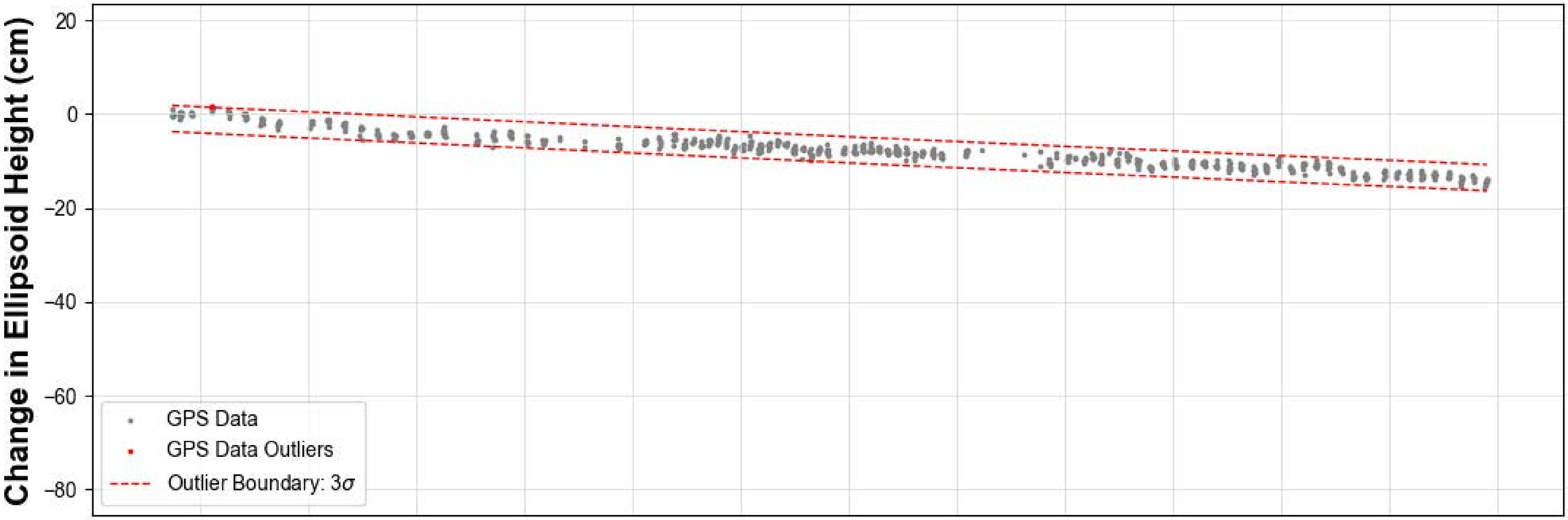
The Woodlands, TX

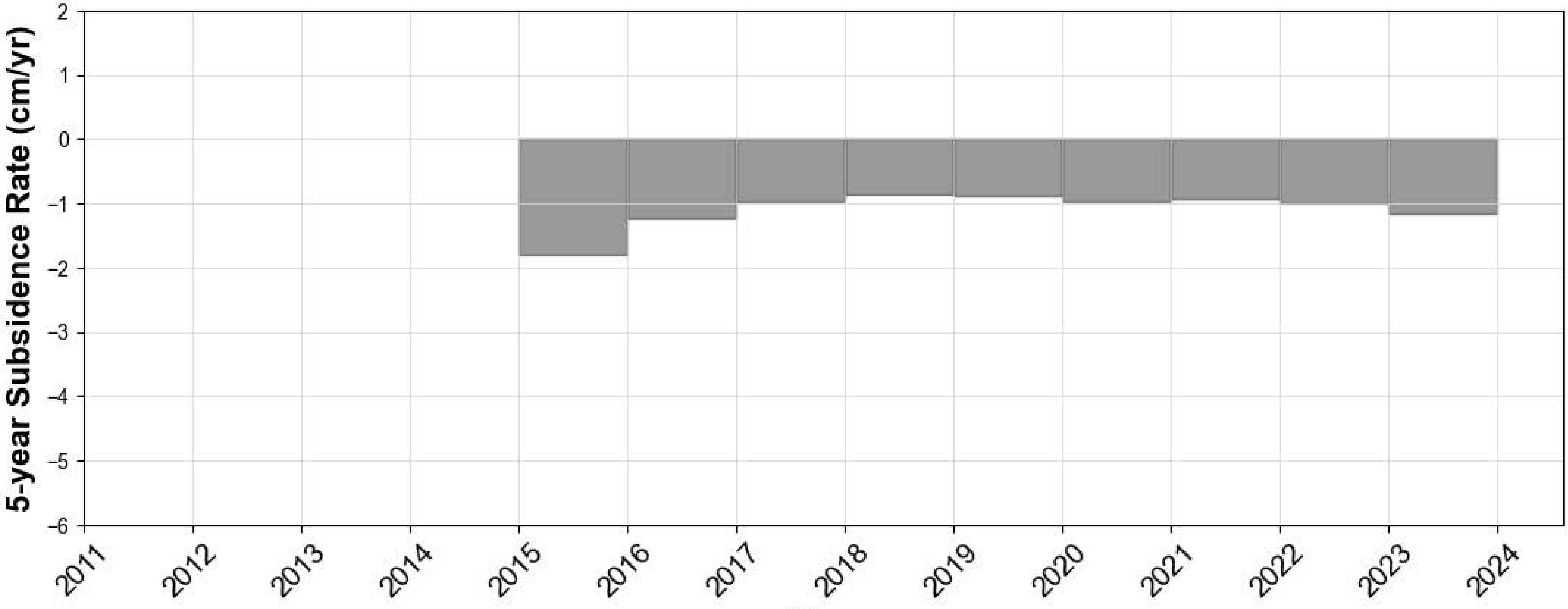


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P069

Conroe, TX

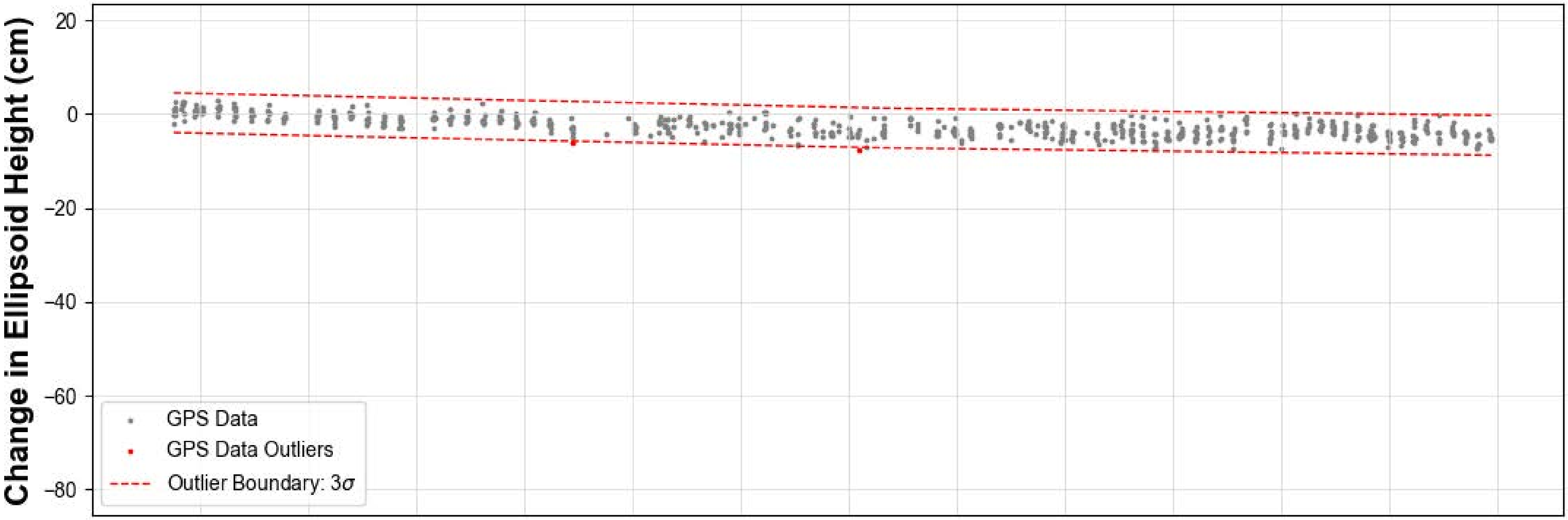


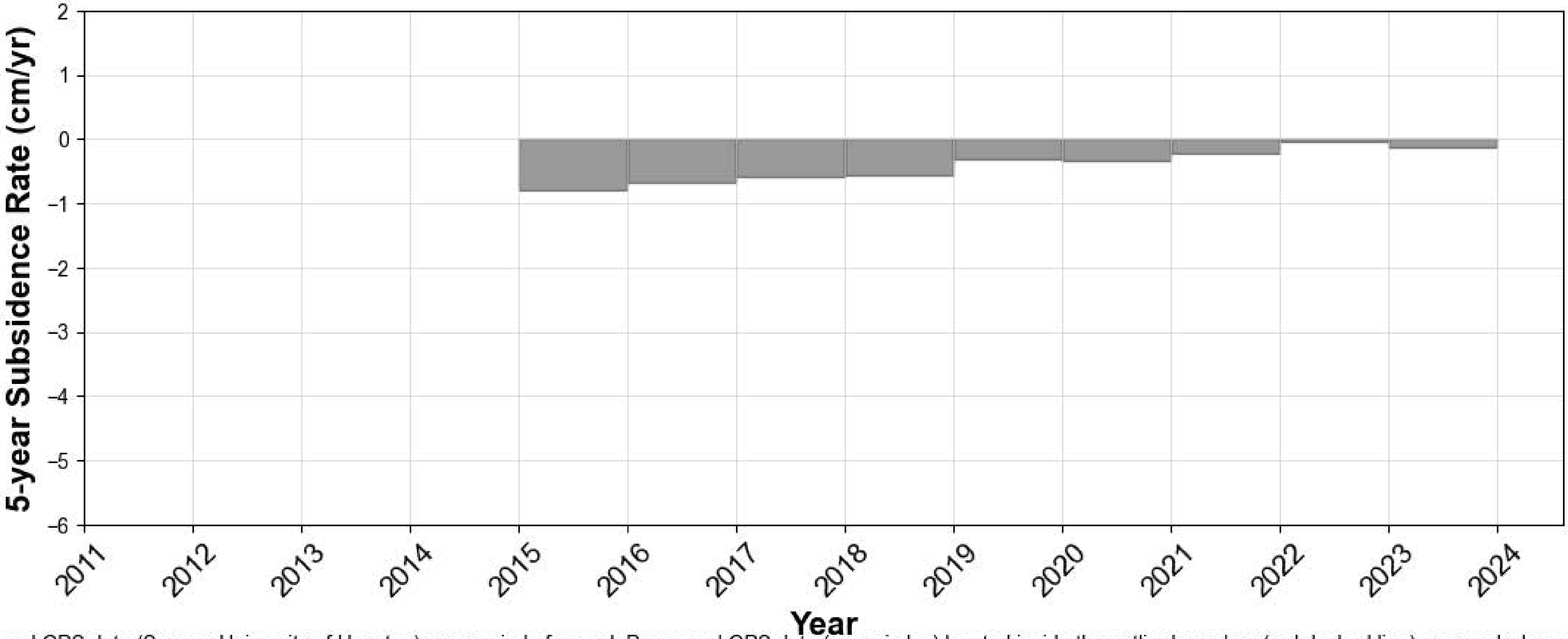


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P070

Conroe, TX

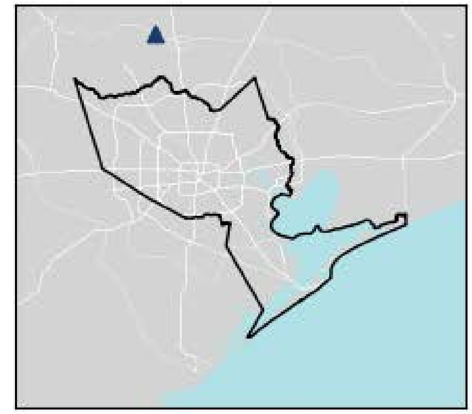


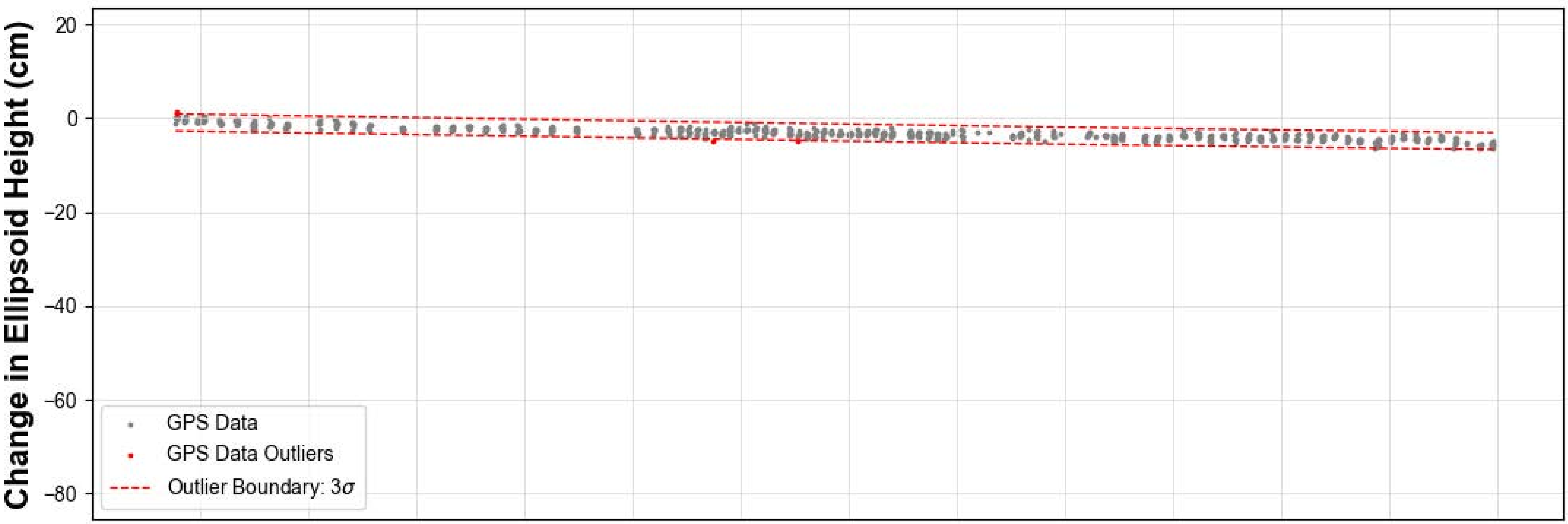


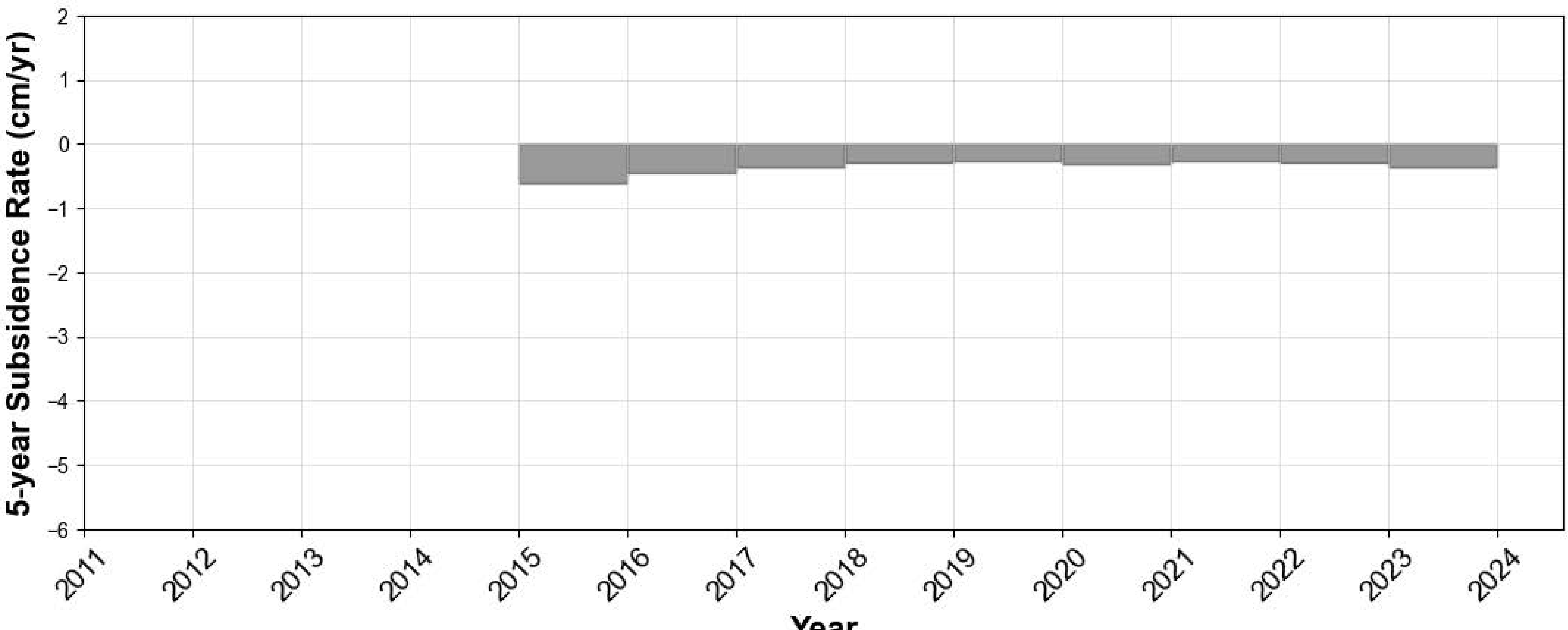
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P071

Conroe, TX



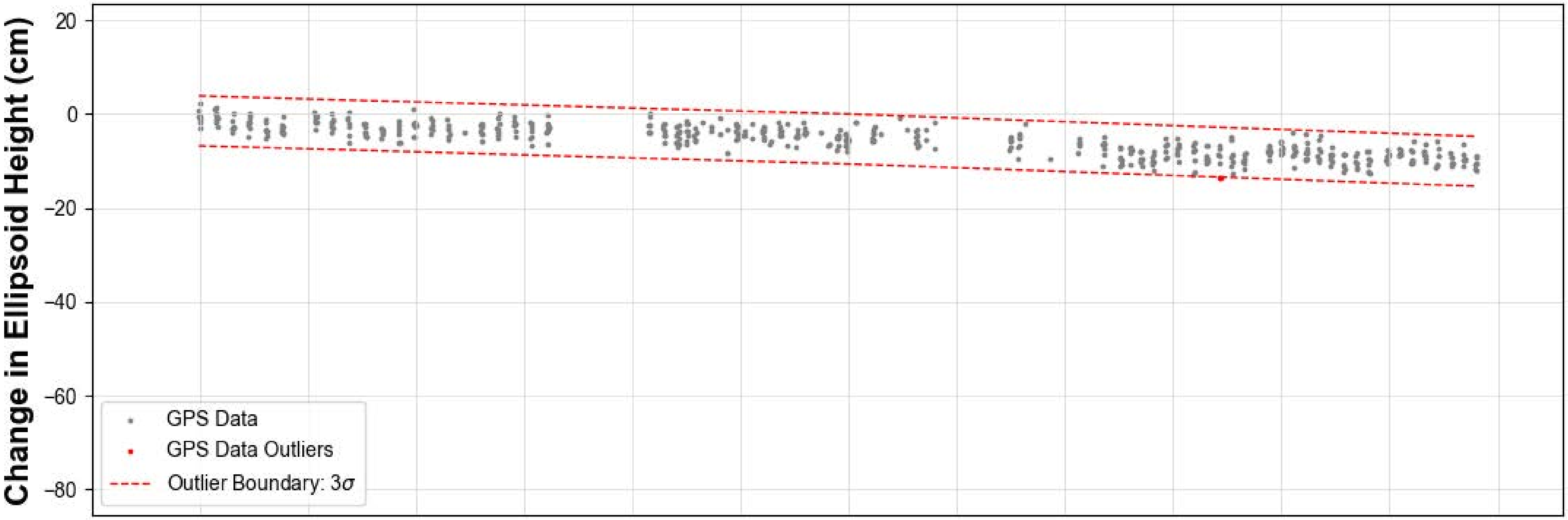


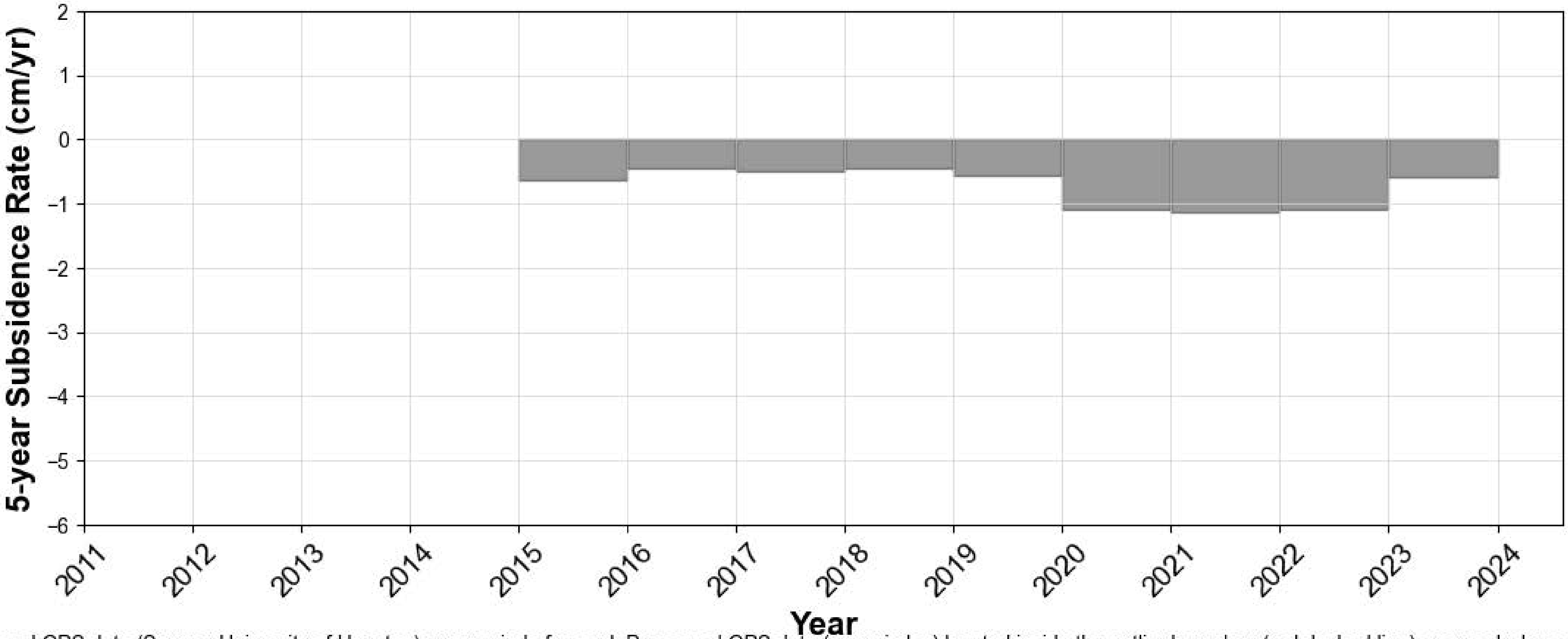


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P072

New Caney, TX

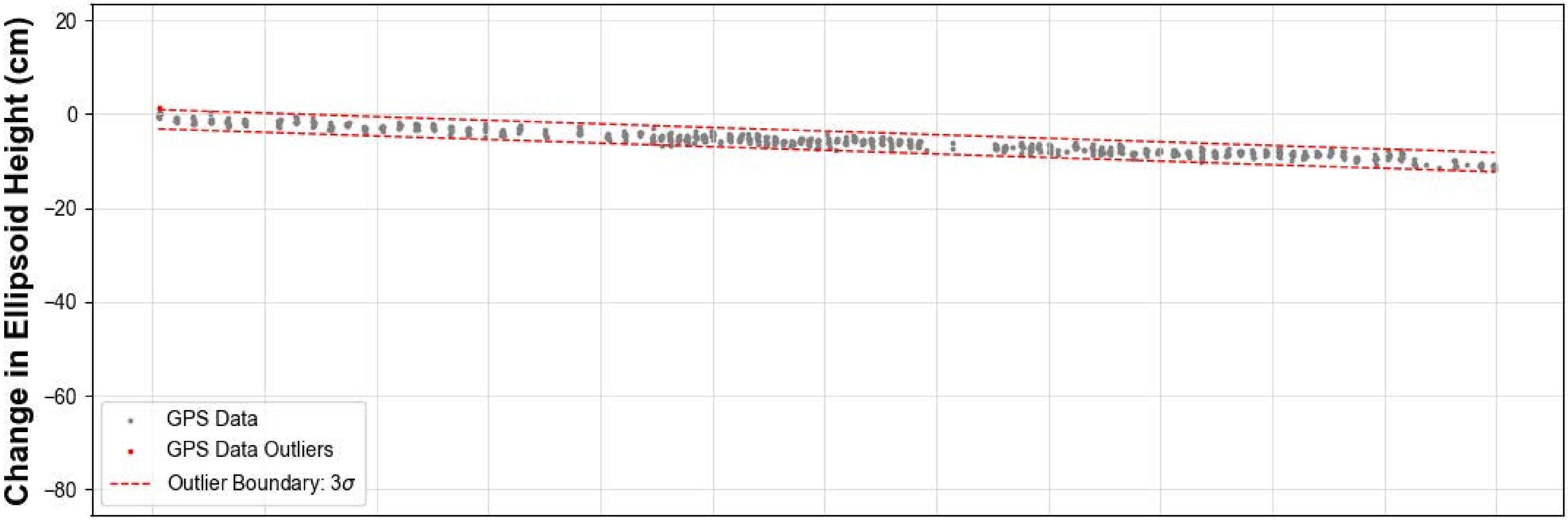


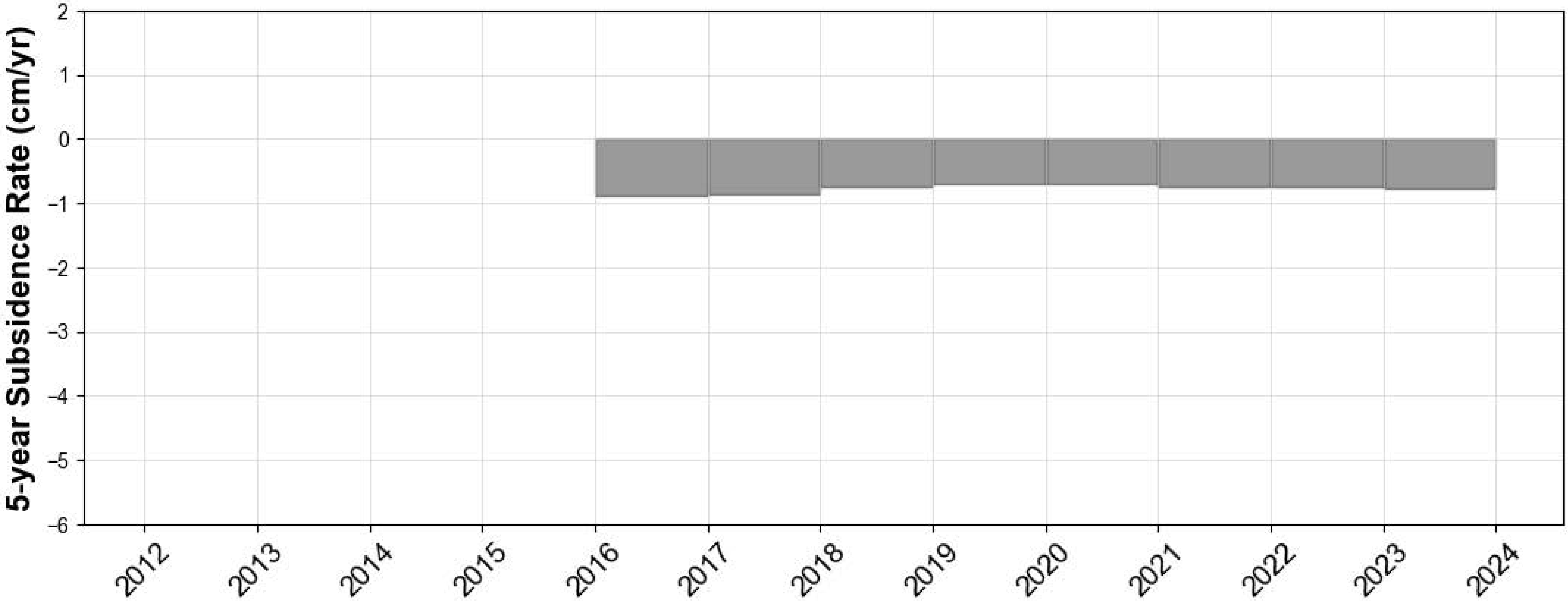


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P073

Magnolia, TX

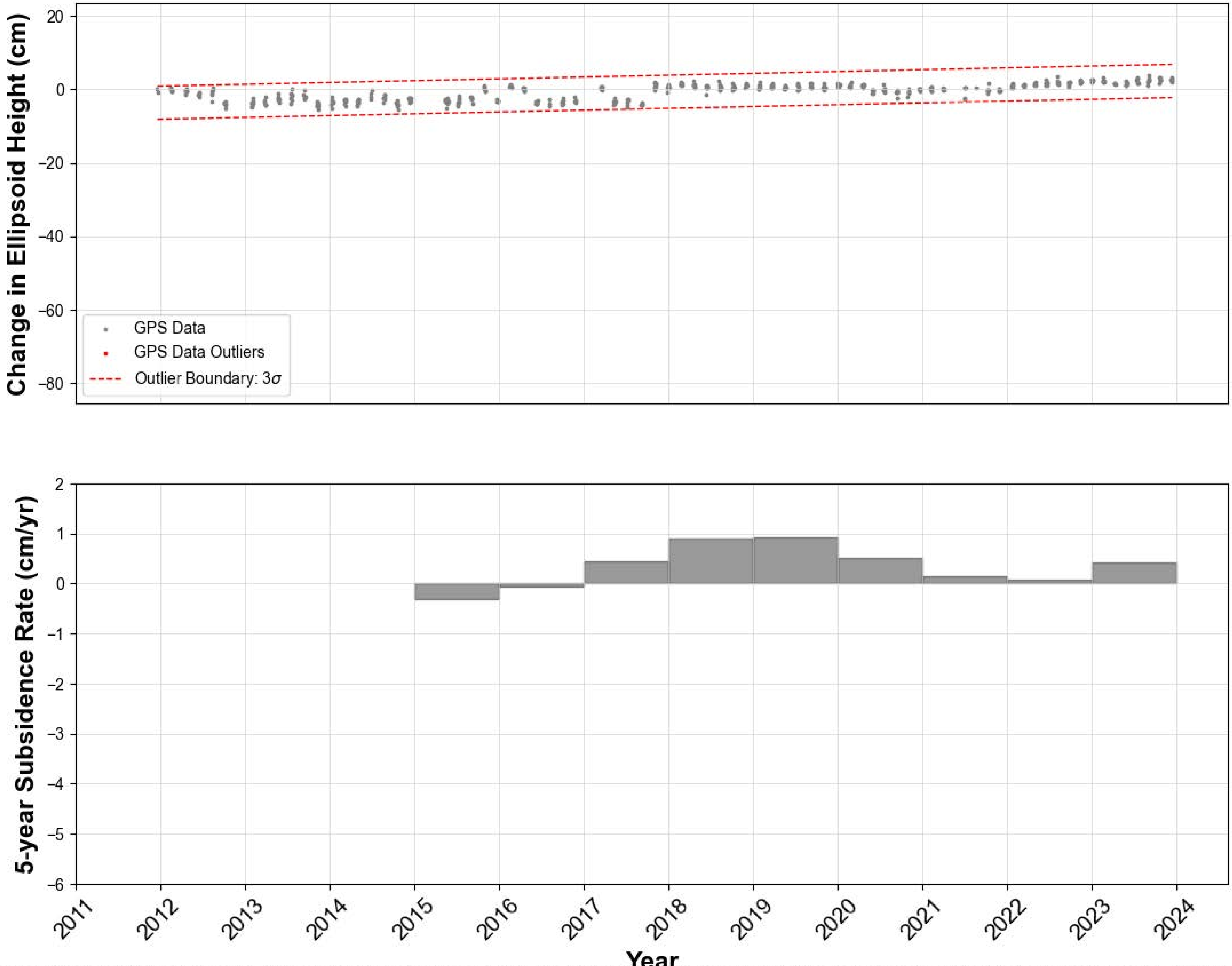




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P074

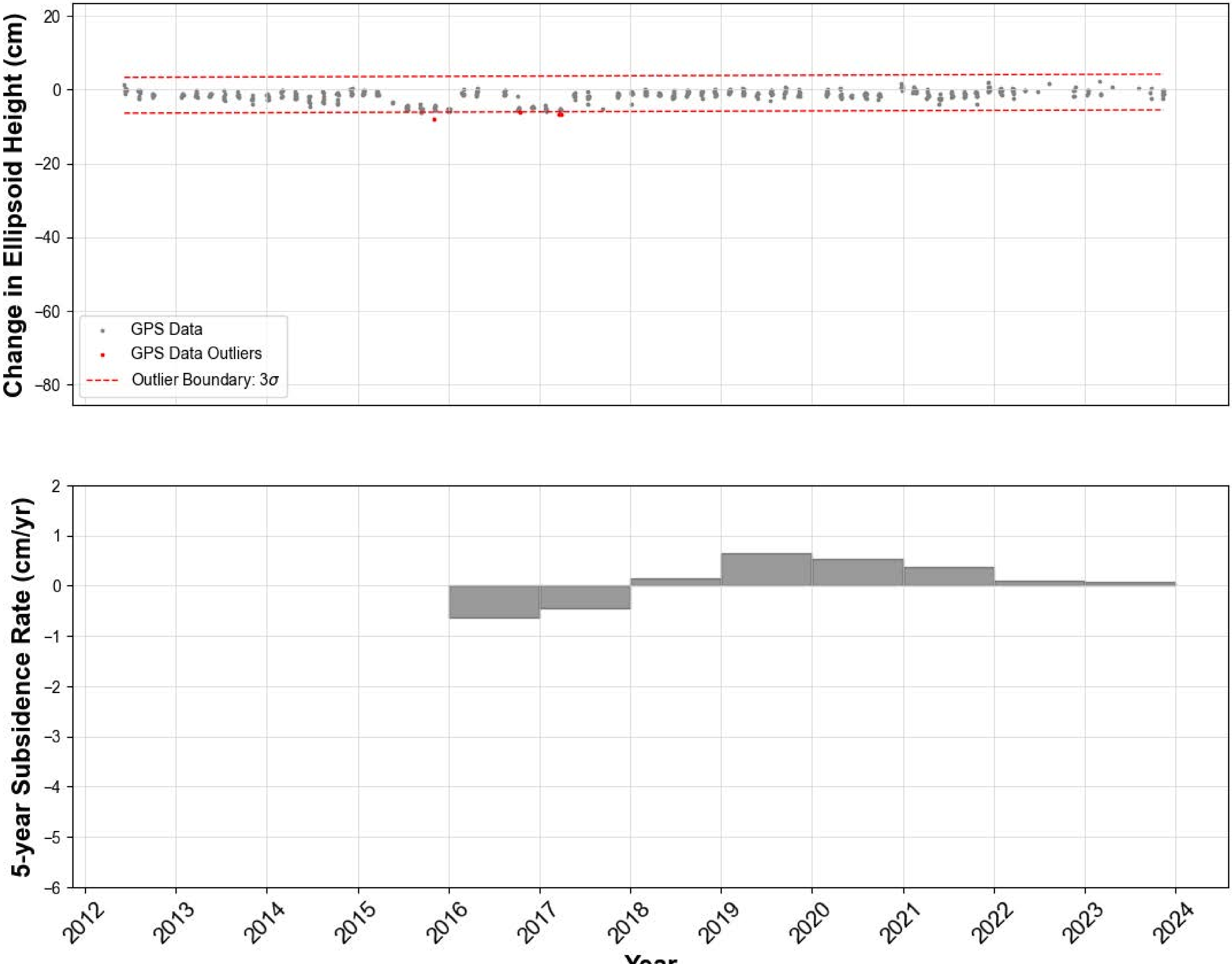
Galena Park, TX



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

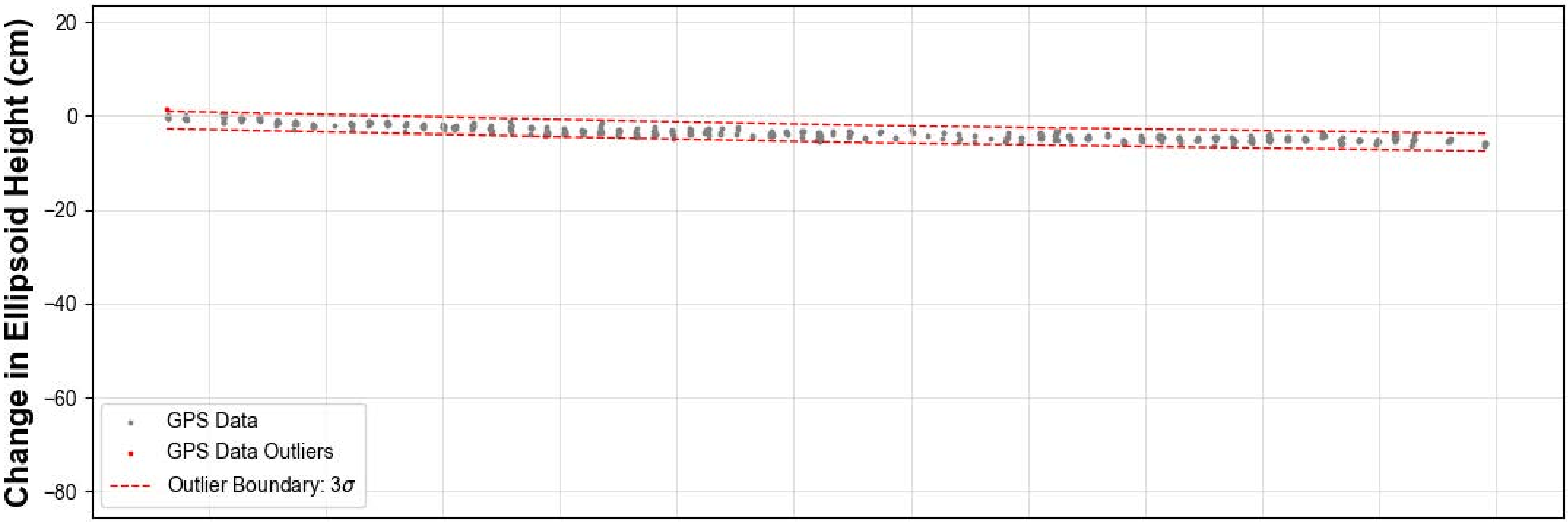
Baytown, TX

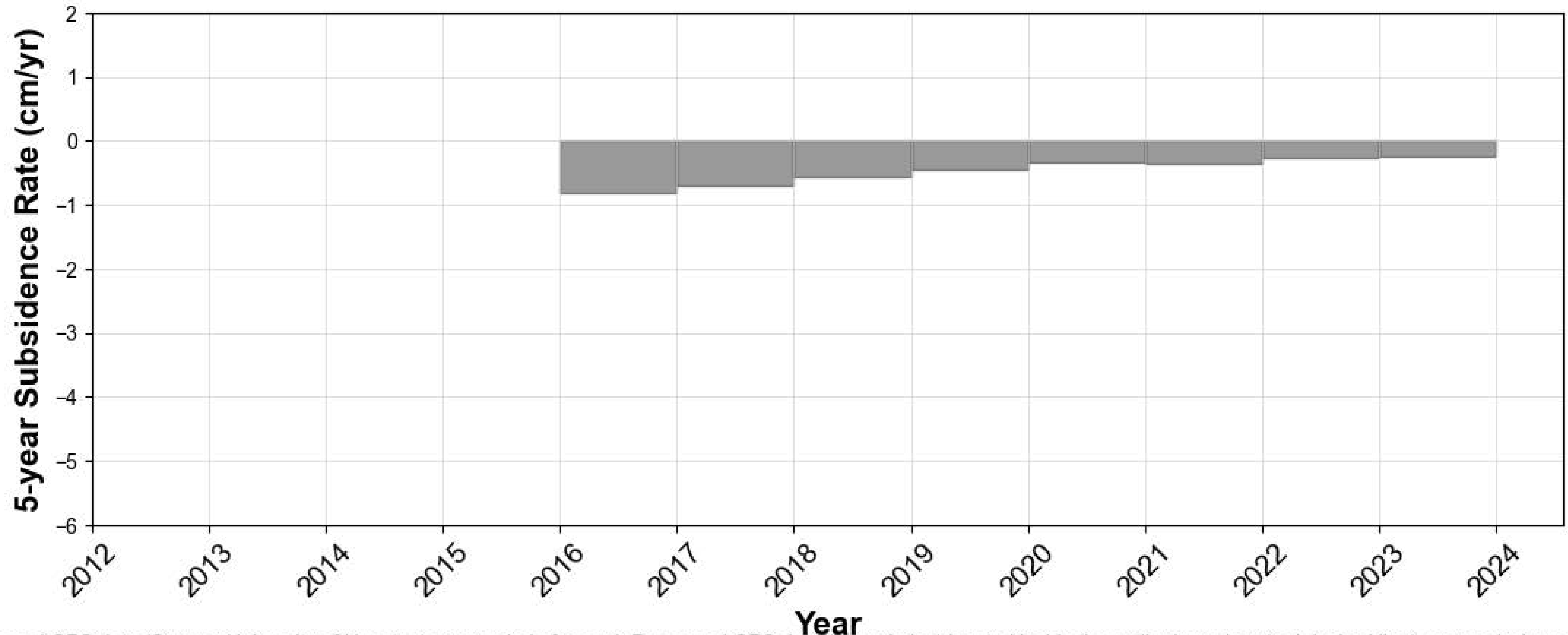


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P076

Hitchcock, TX

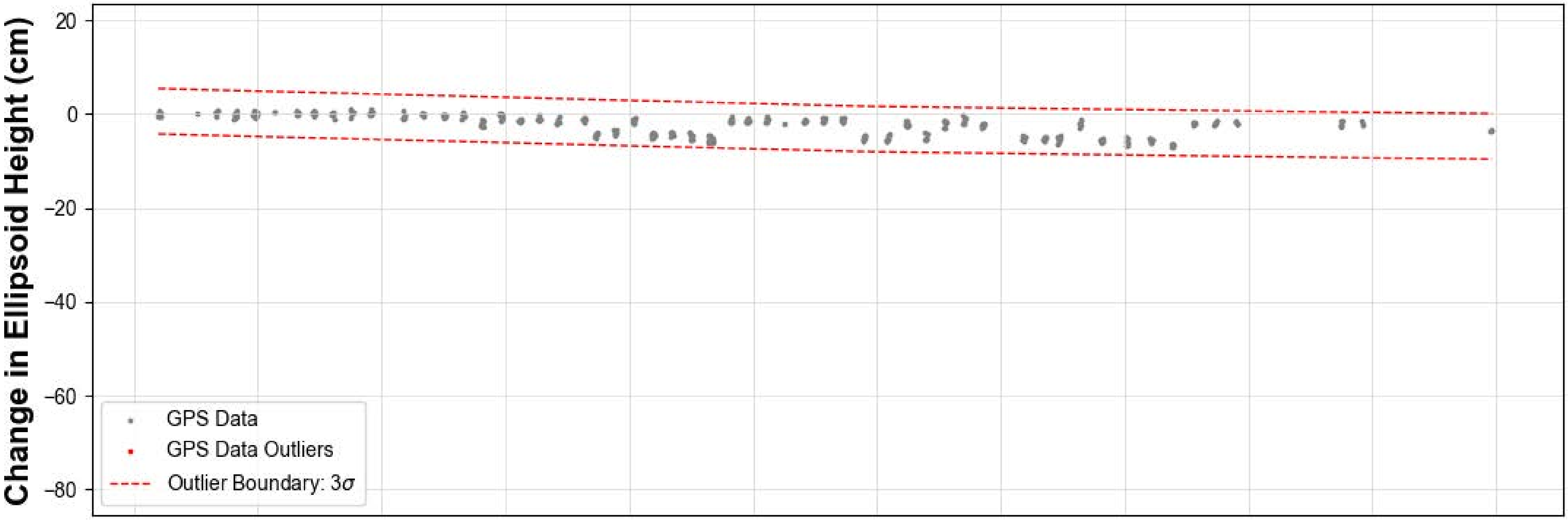


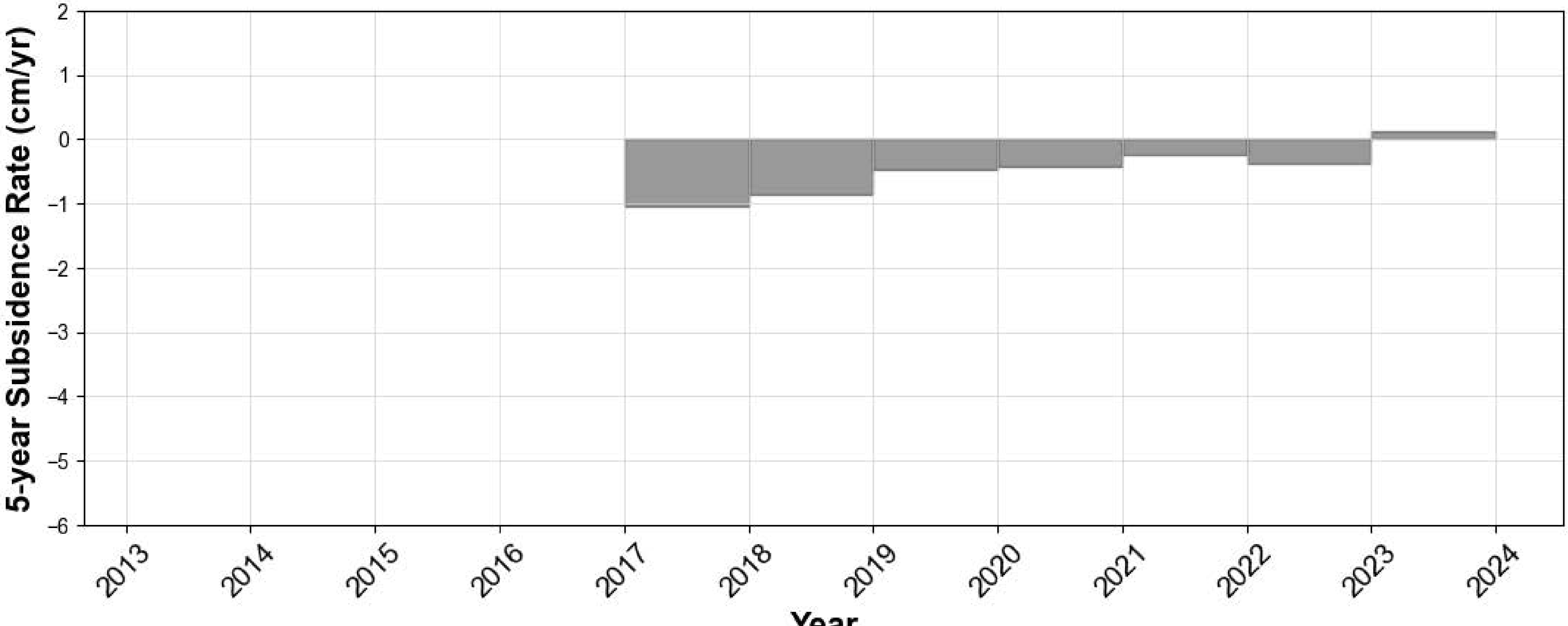


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P077

Hockley, TX

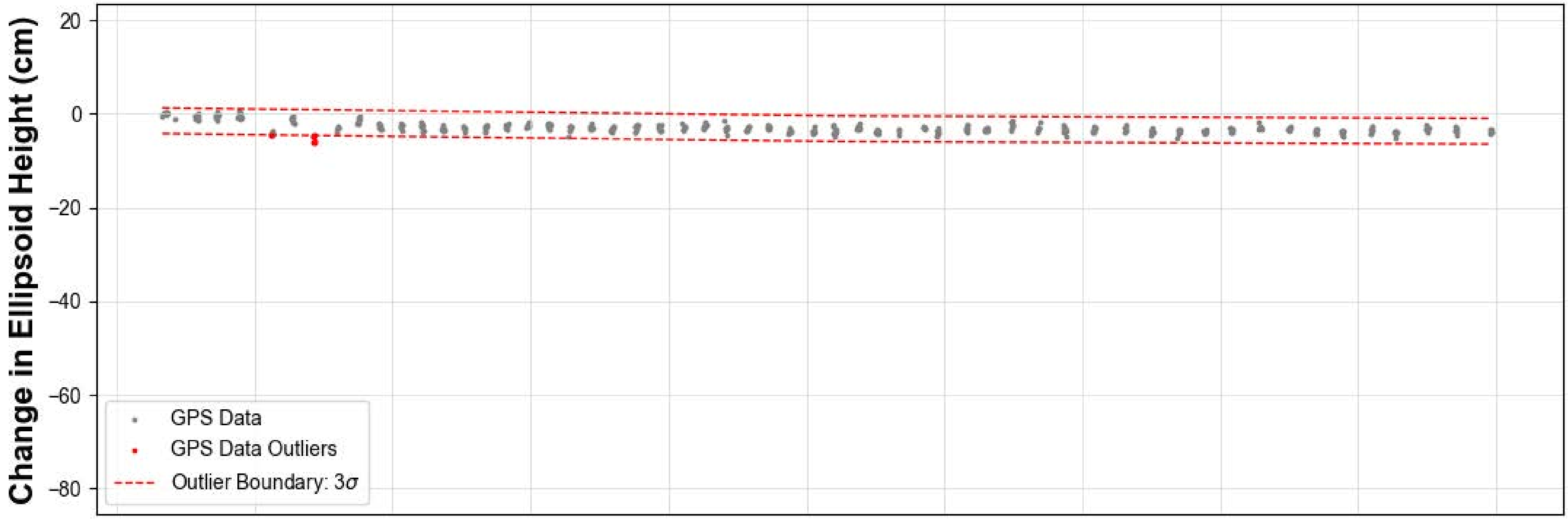


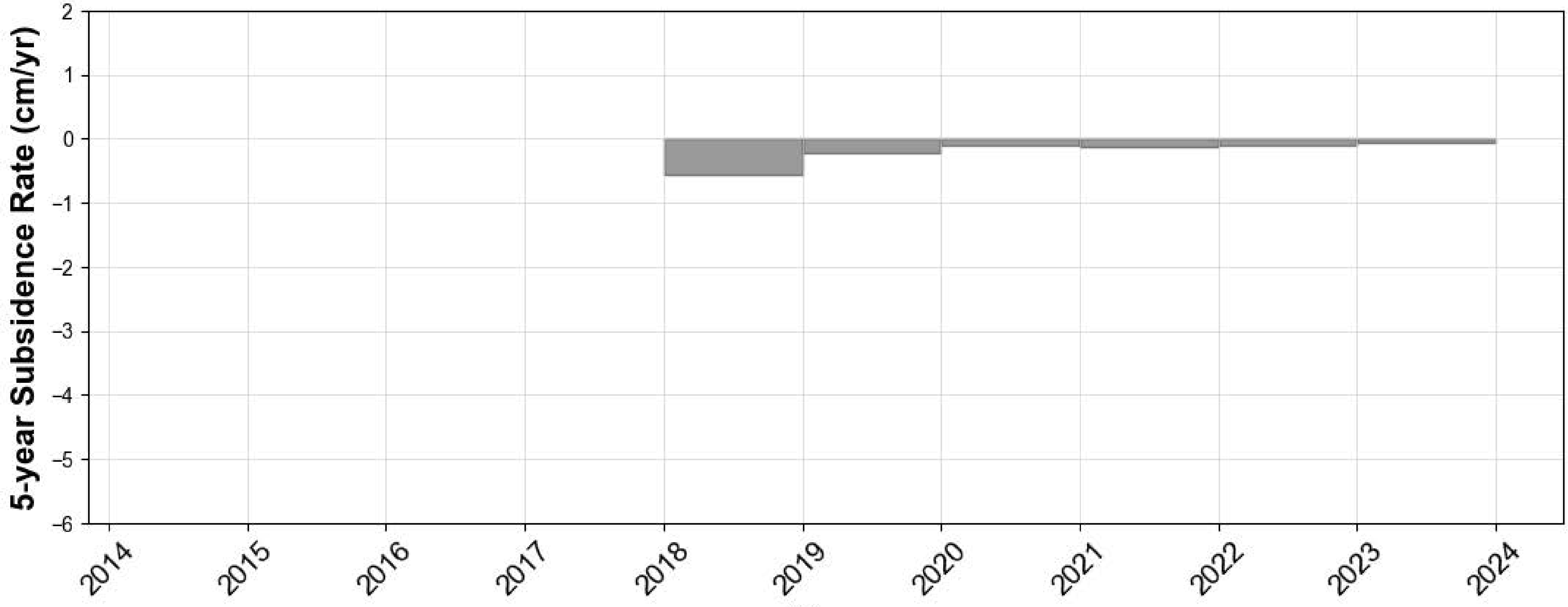


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P078

Brazos Country, TX

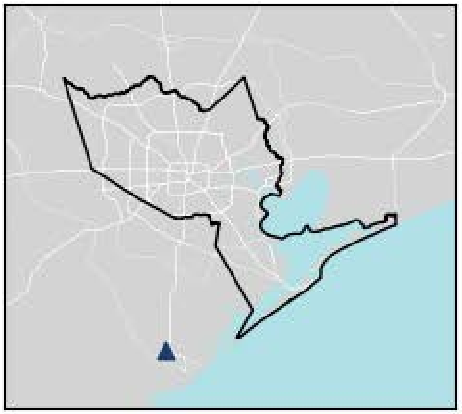


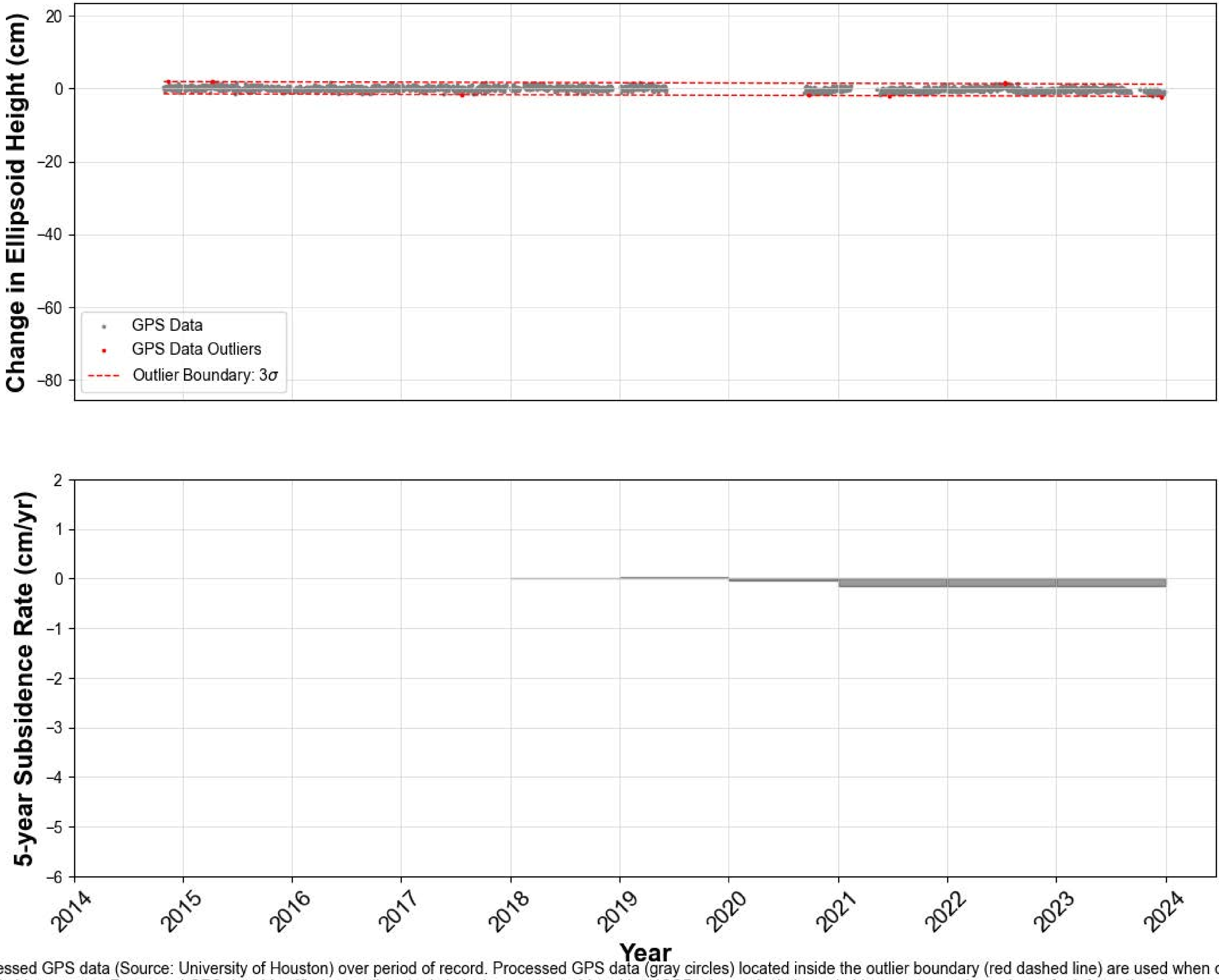


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P079

Lake Jackson, TX

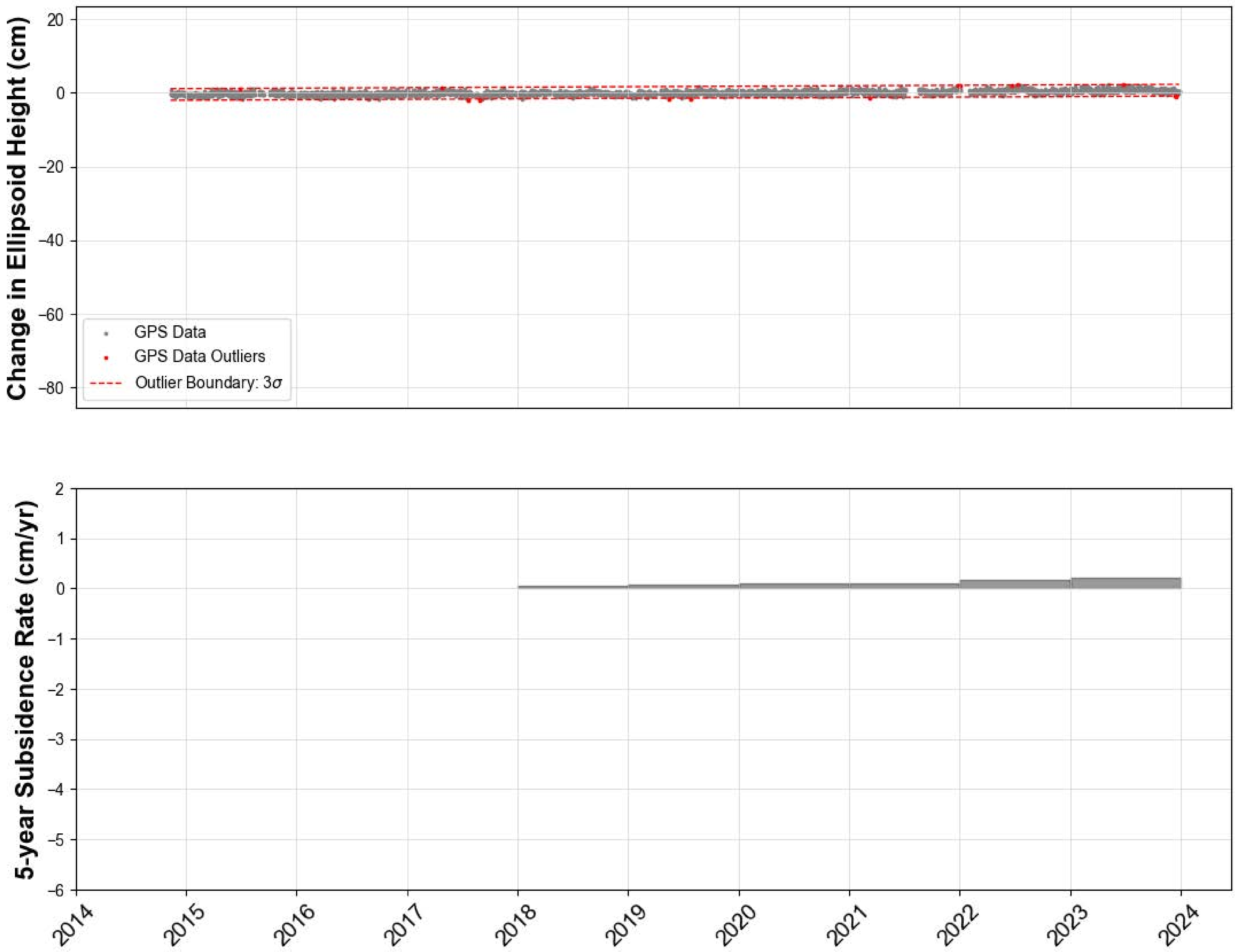




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P080

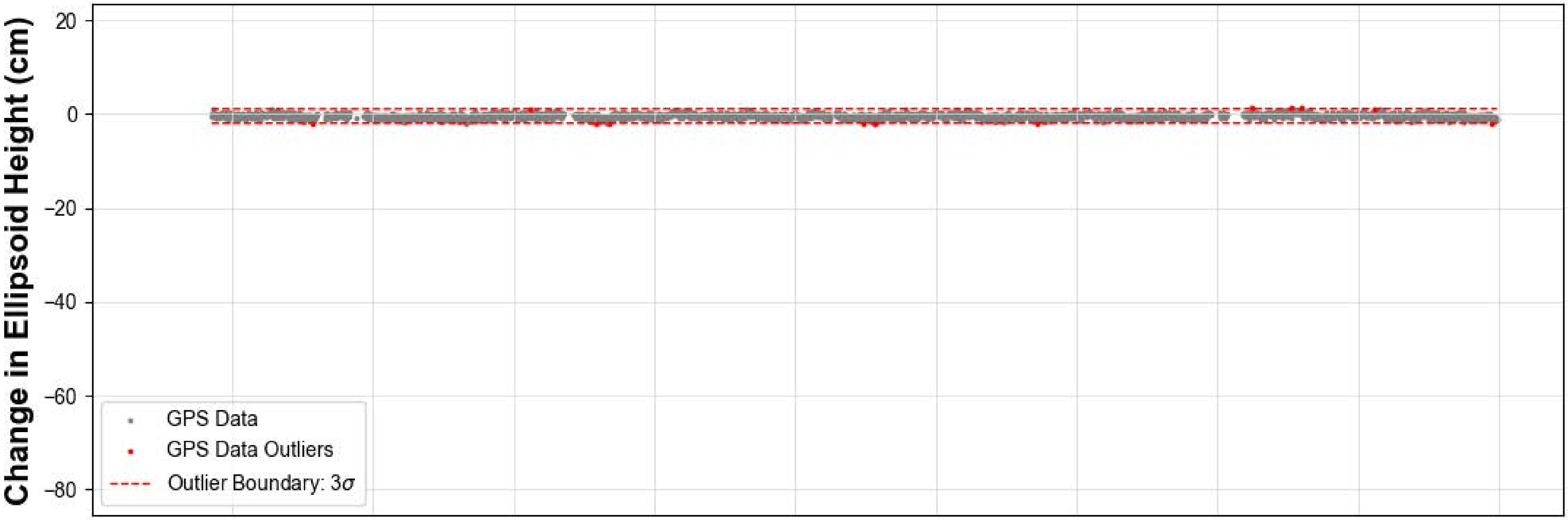
Houston, TX

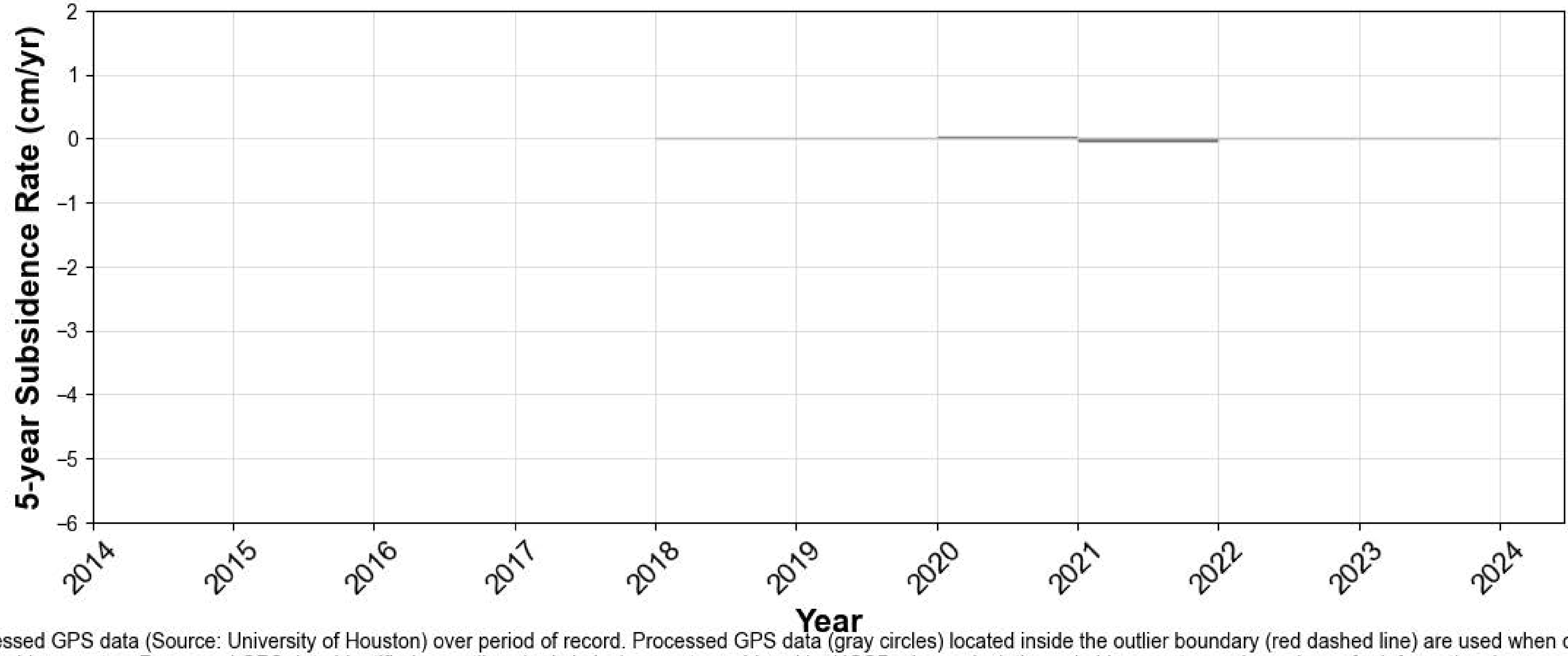


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P081

Houston, TX

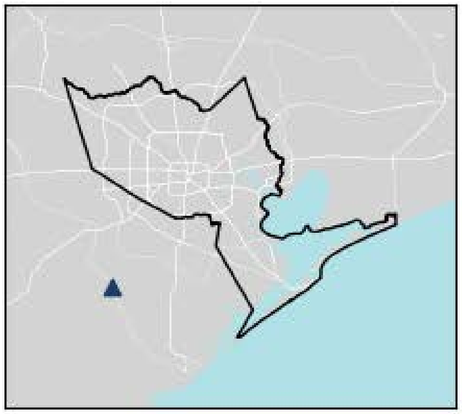


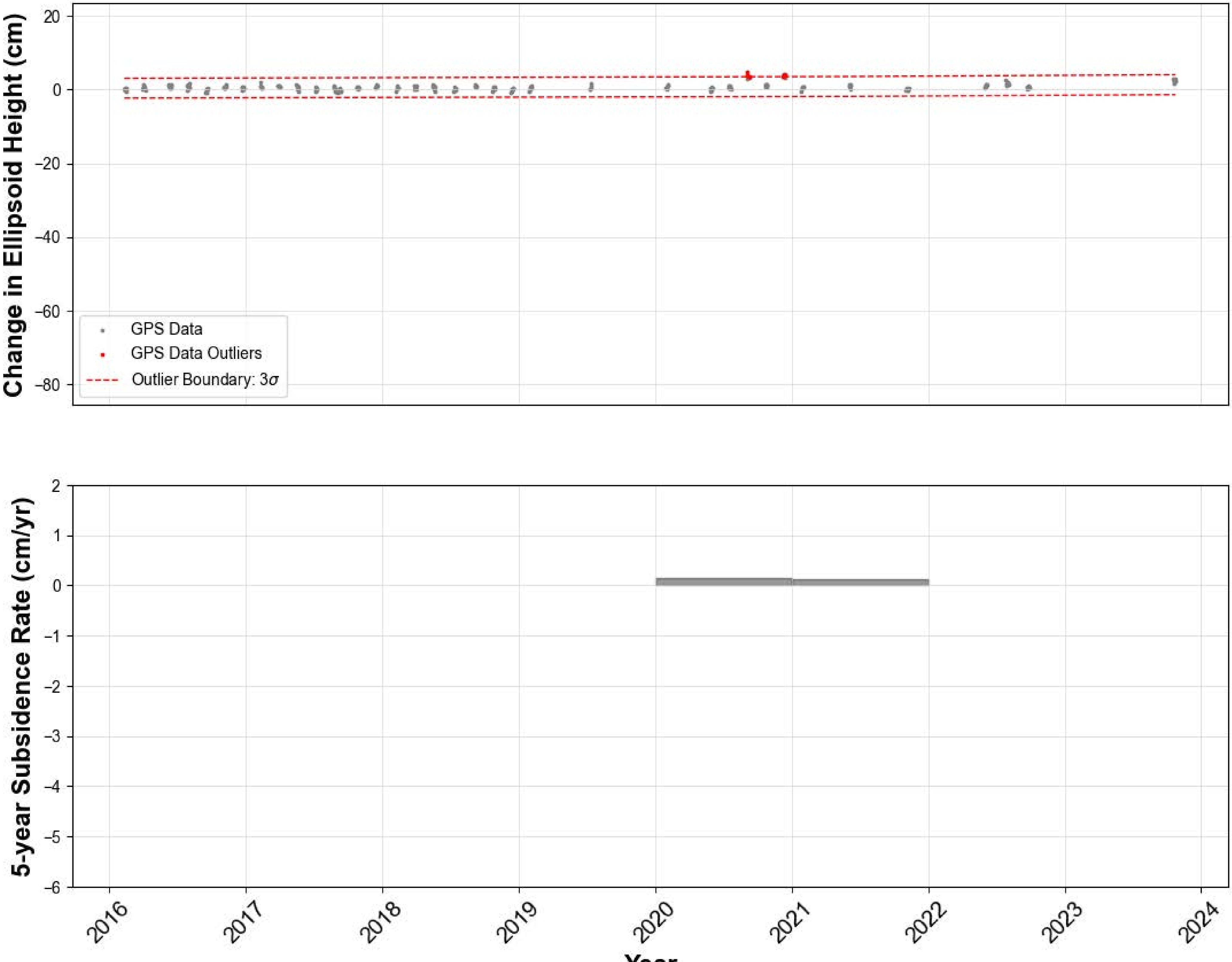


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P082

Damon, TX

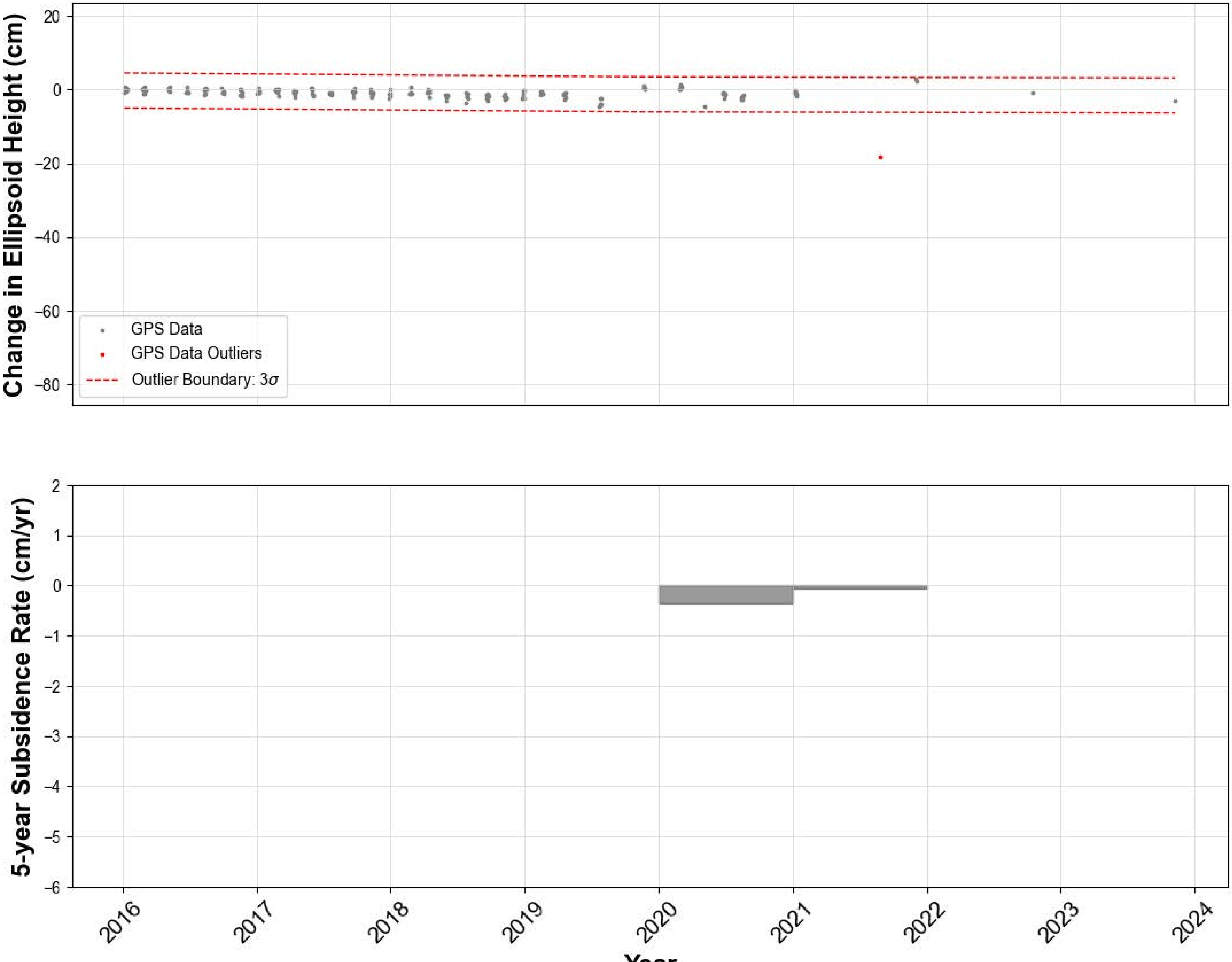




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P083

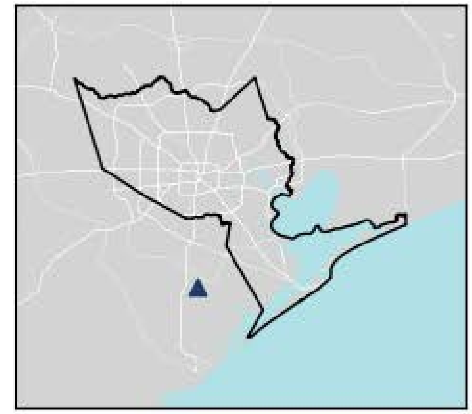
Alvin, TX

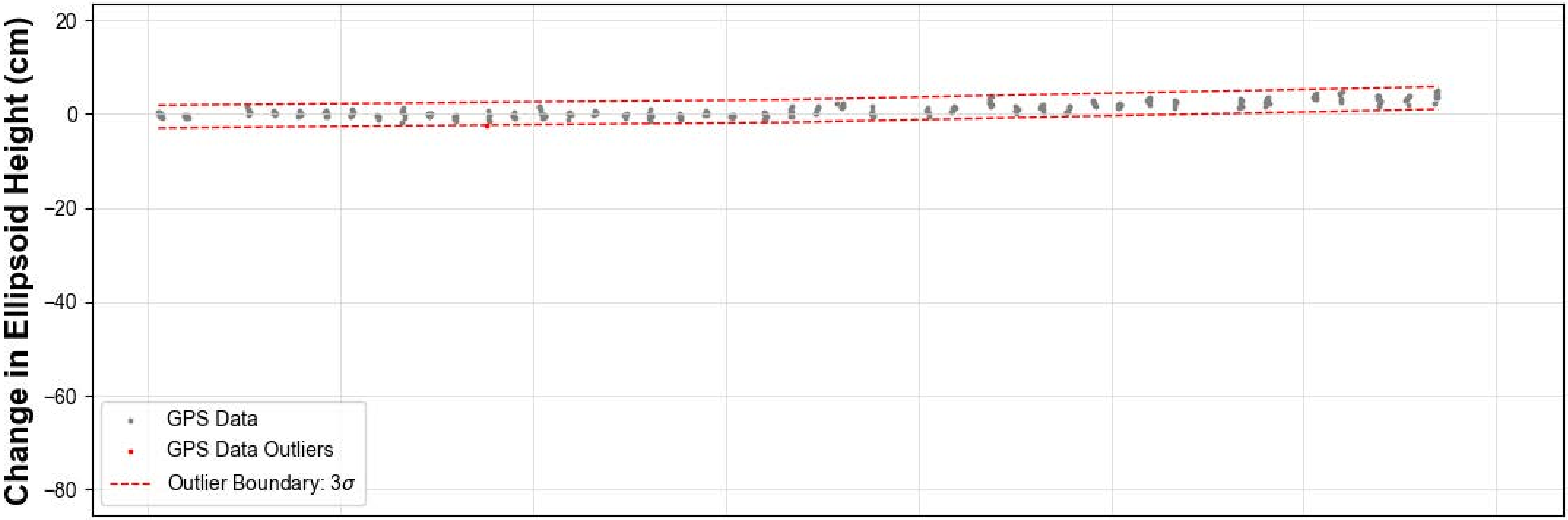


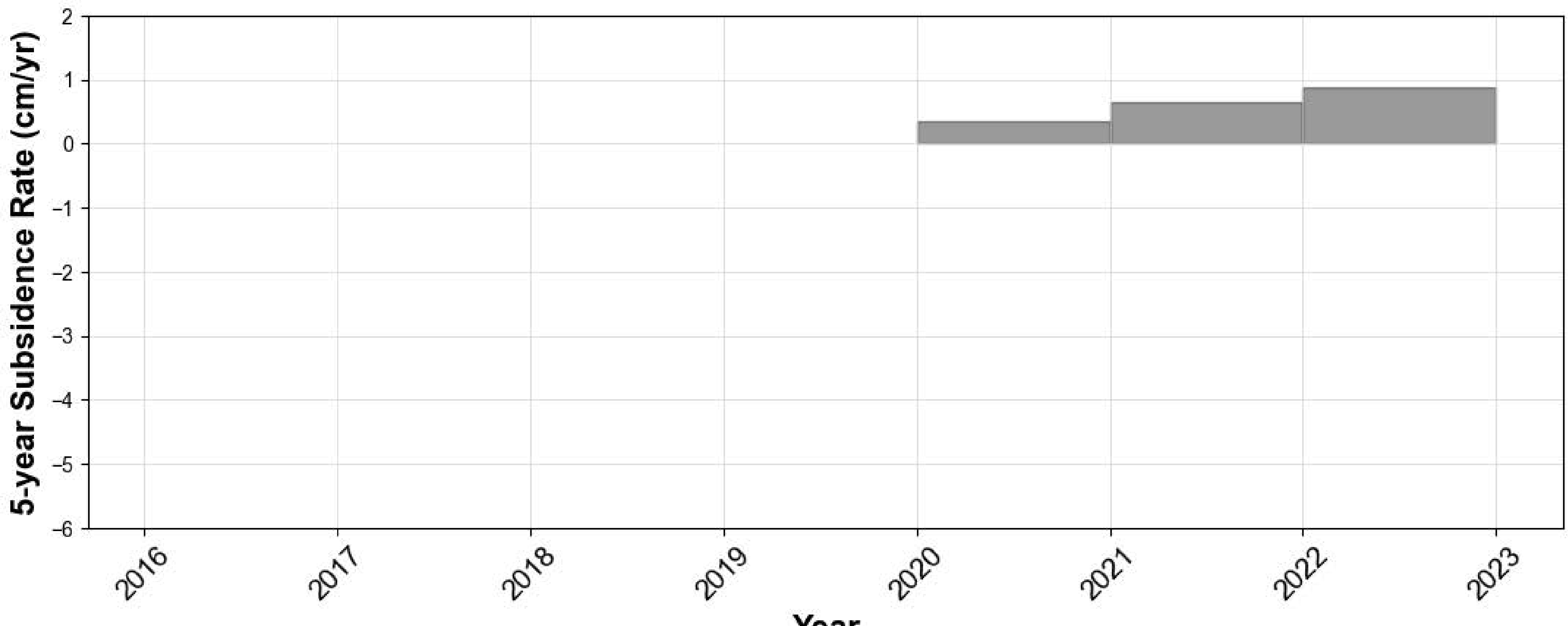
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P084

Alvin, TX



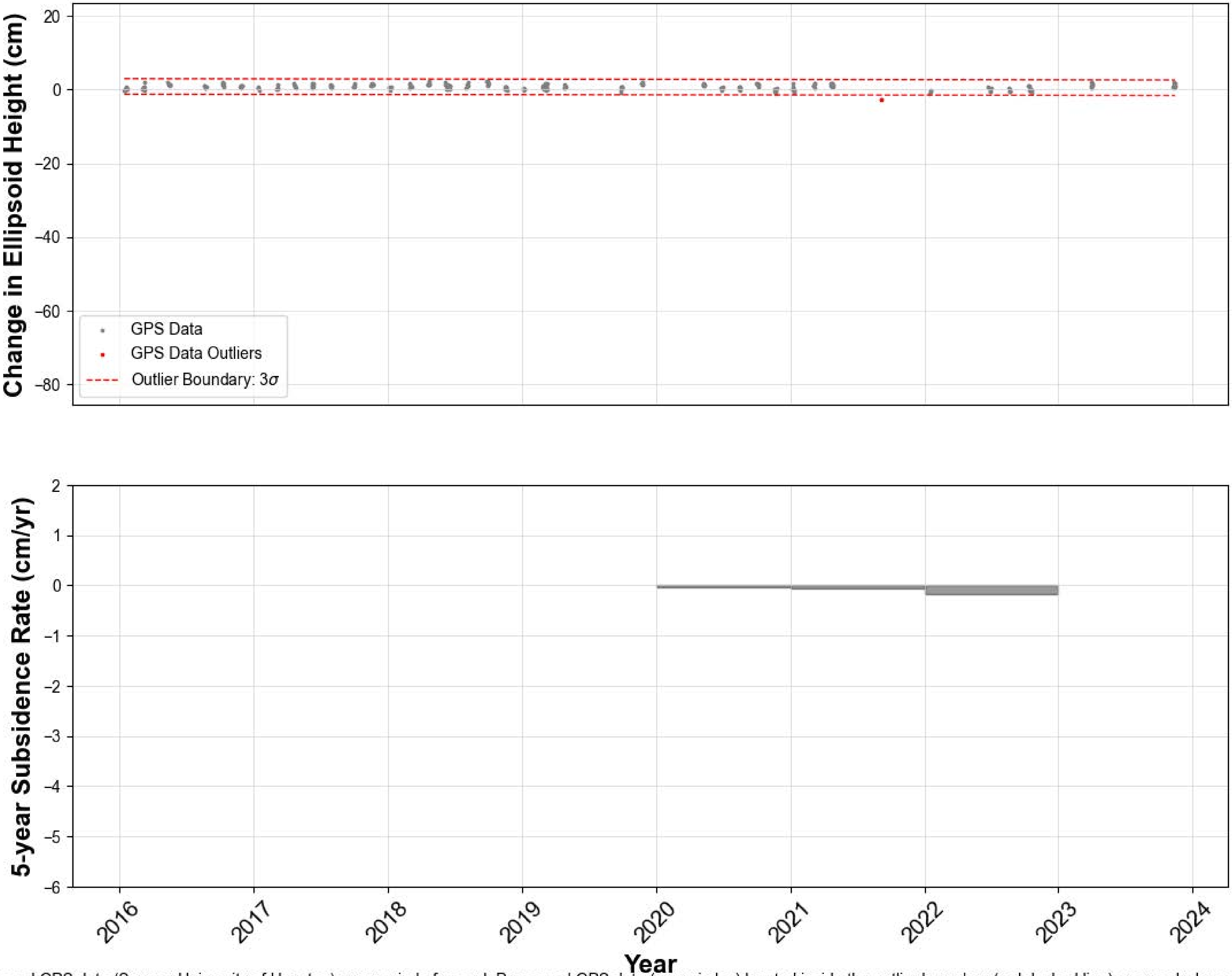




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P085

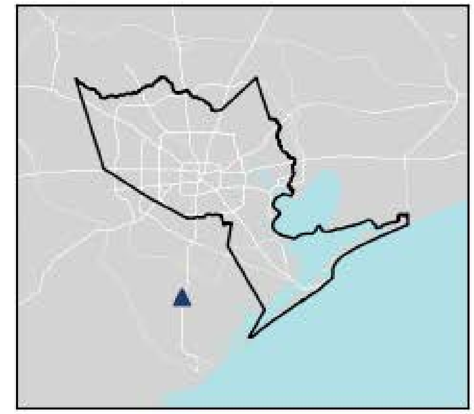
Alvin, TX

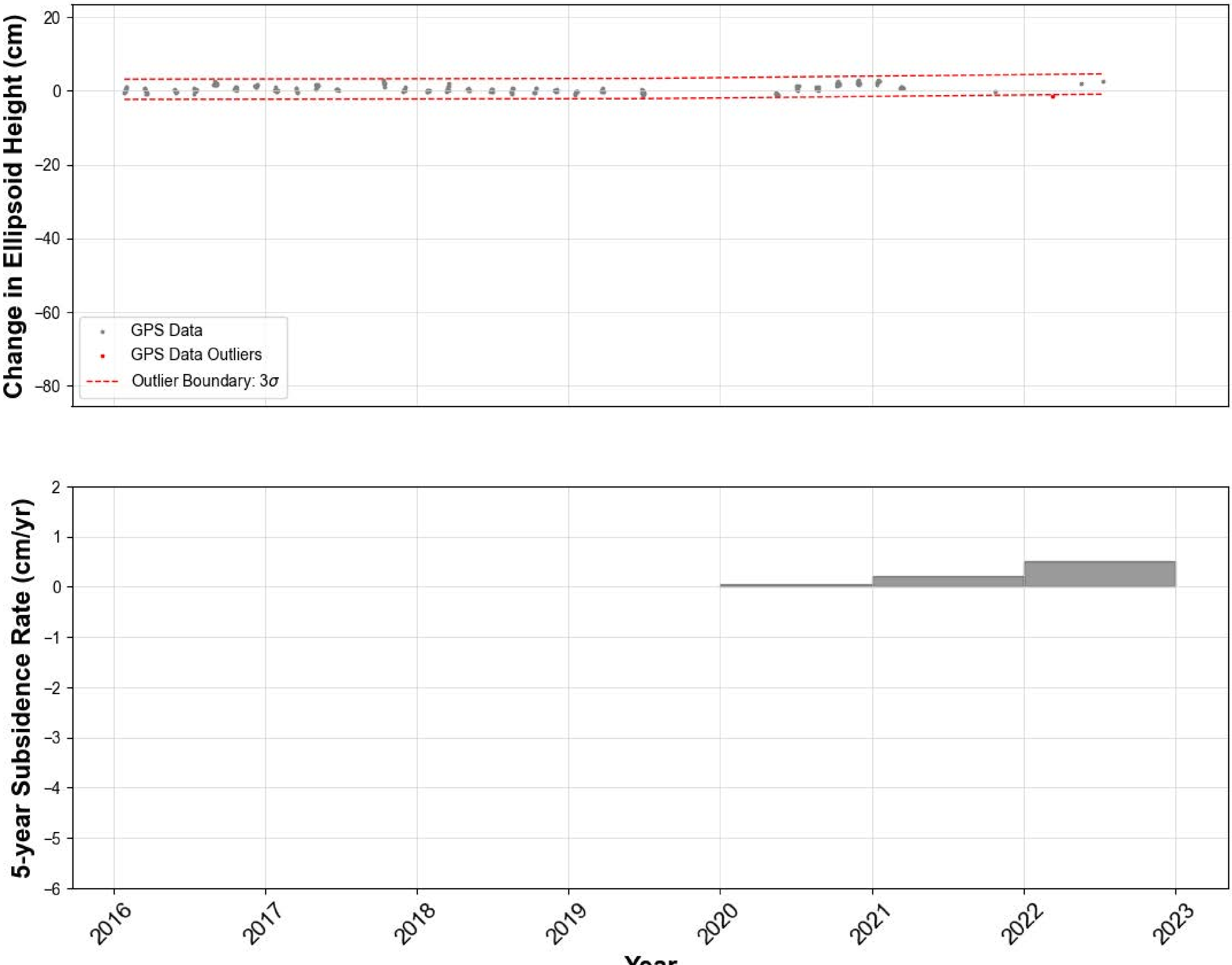


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P086

Angleton, TX

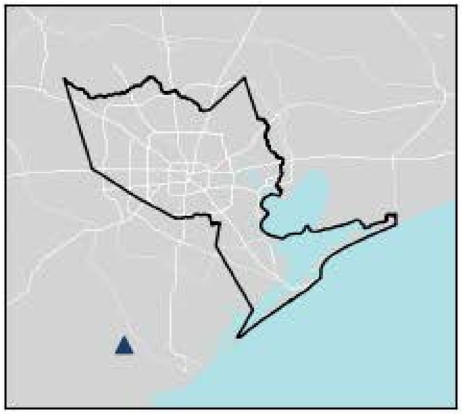


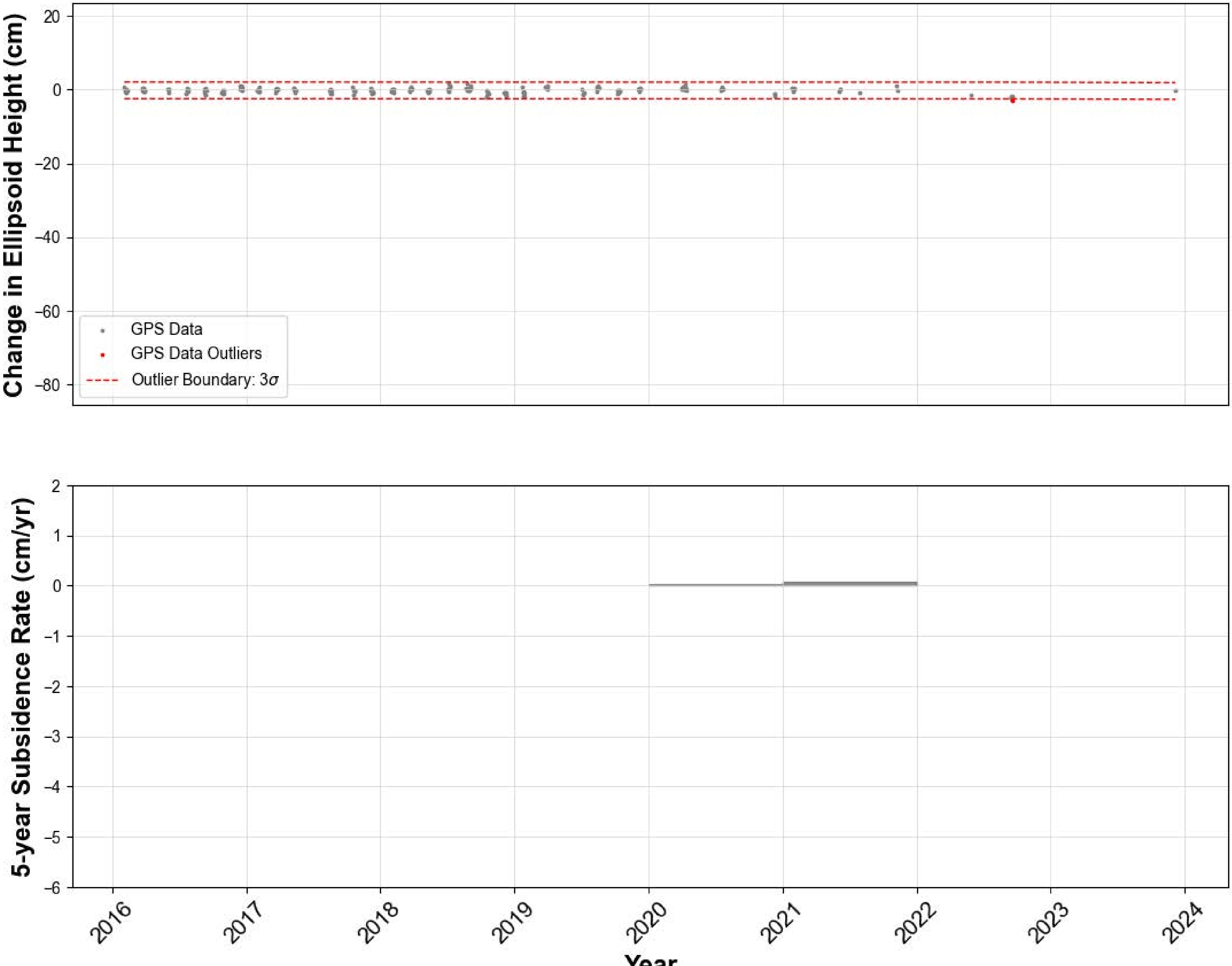


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P087

Sweeny, TX

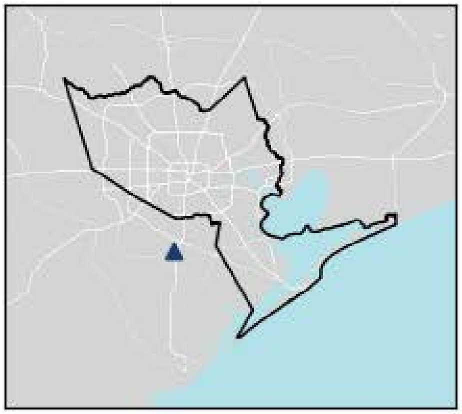


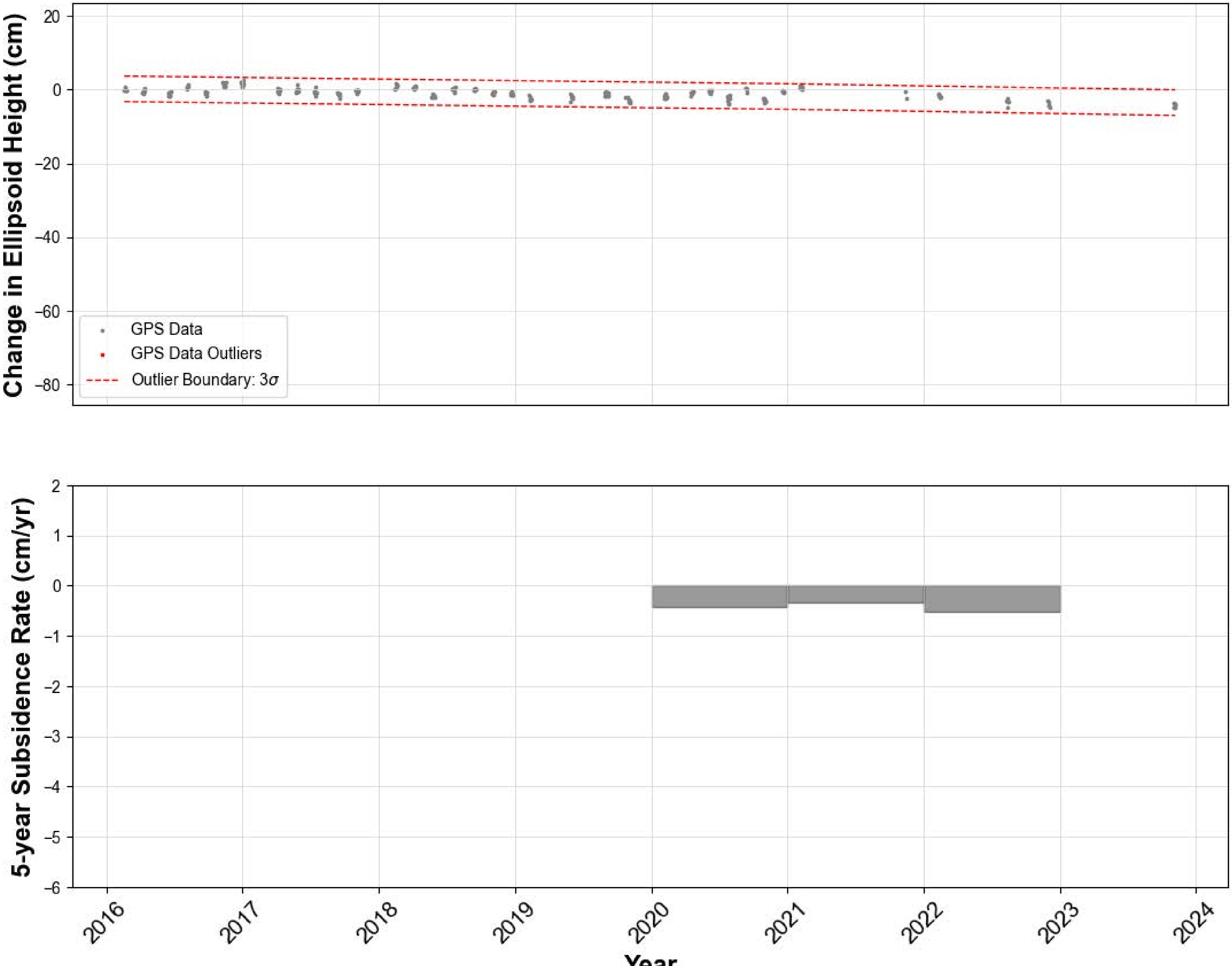


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P088

Rosharon, TX

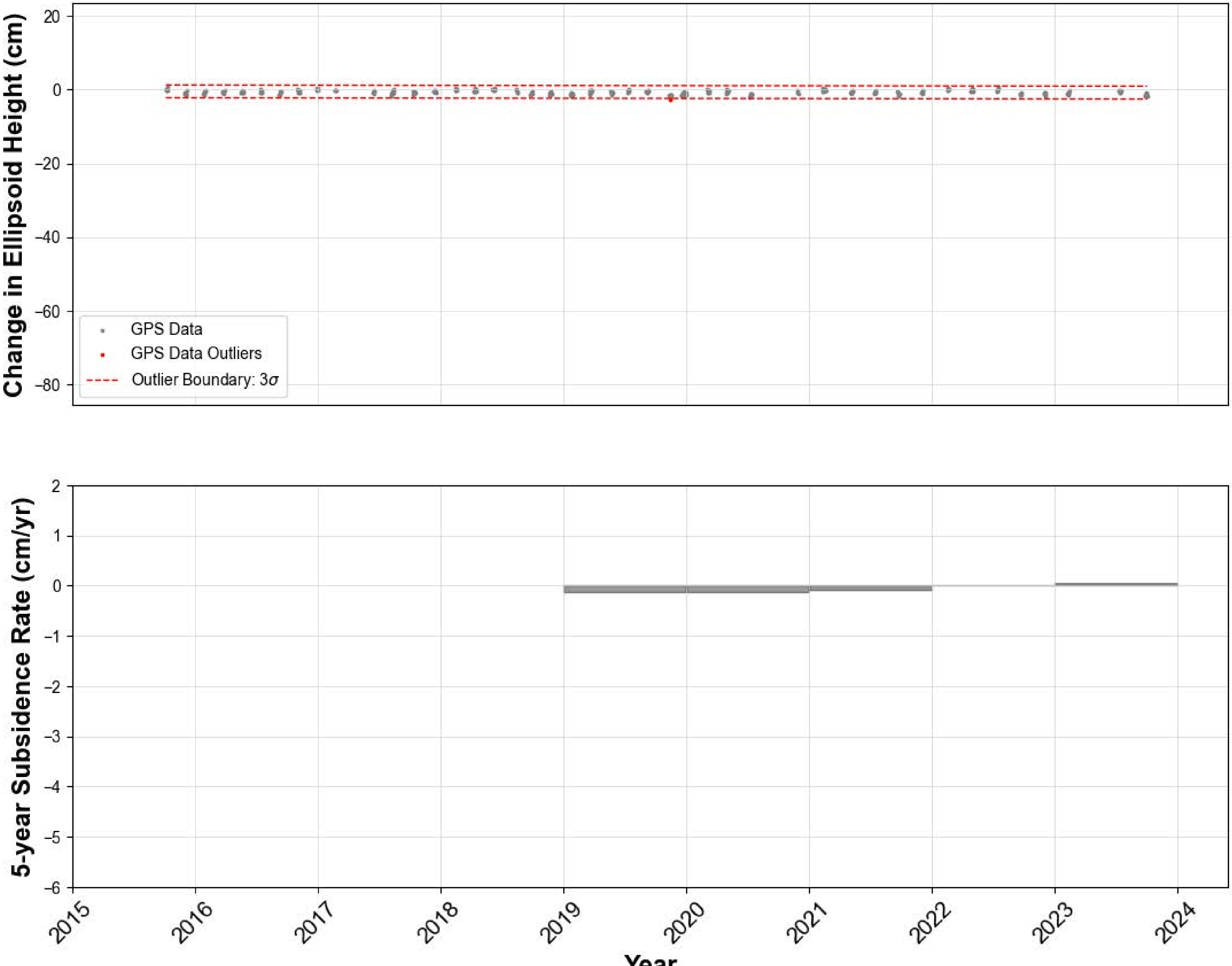




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P089

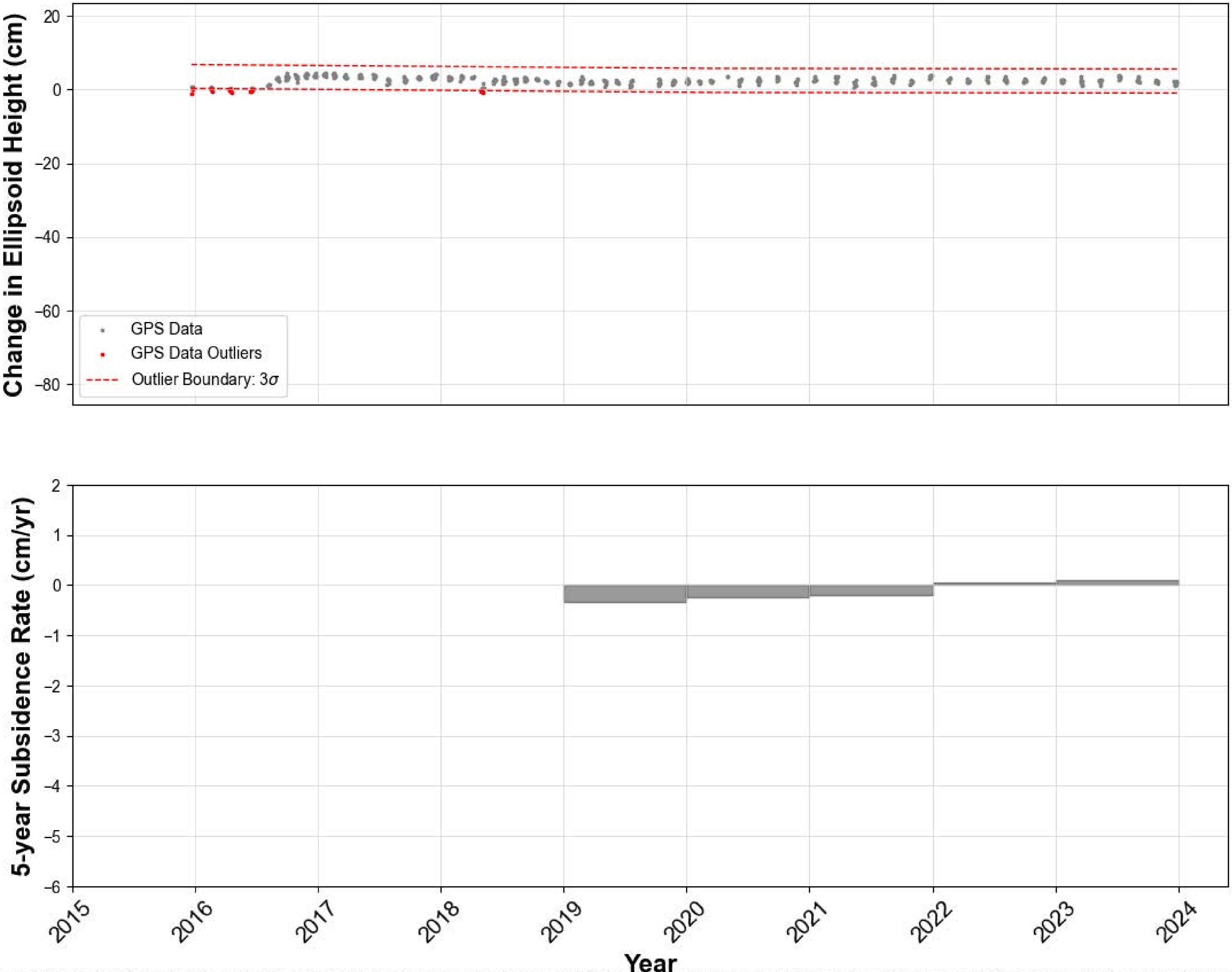
Rosenberg, TX



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

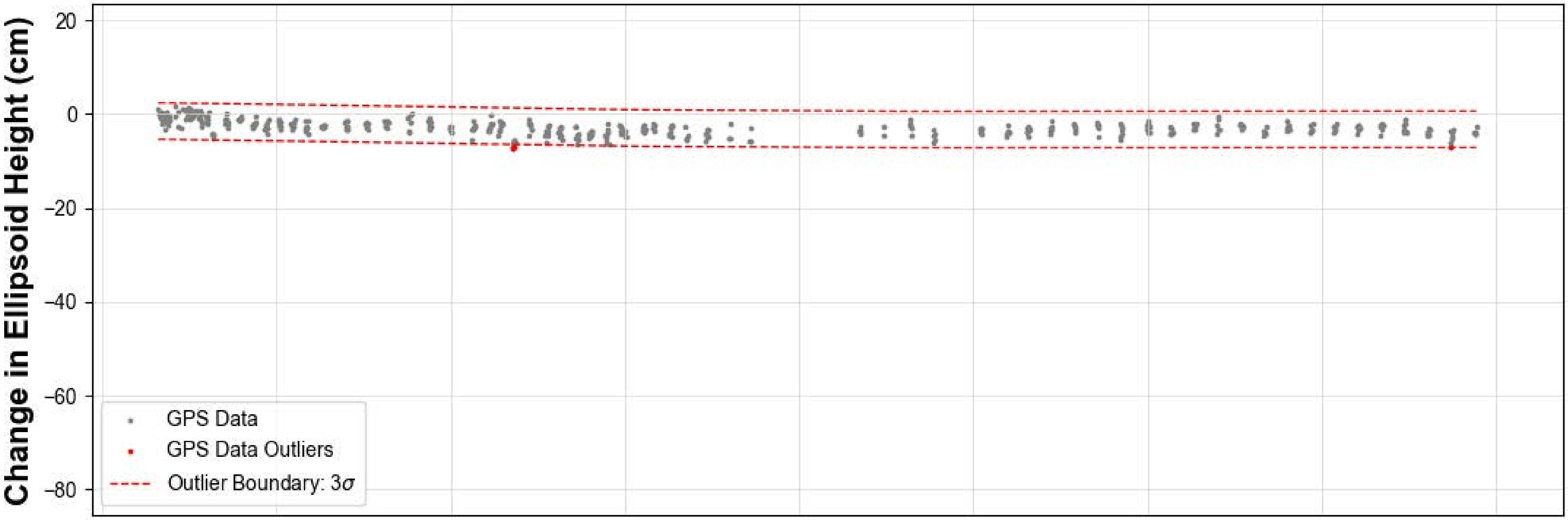
Pasadena, TX

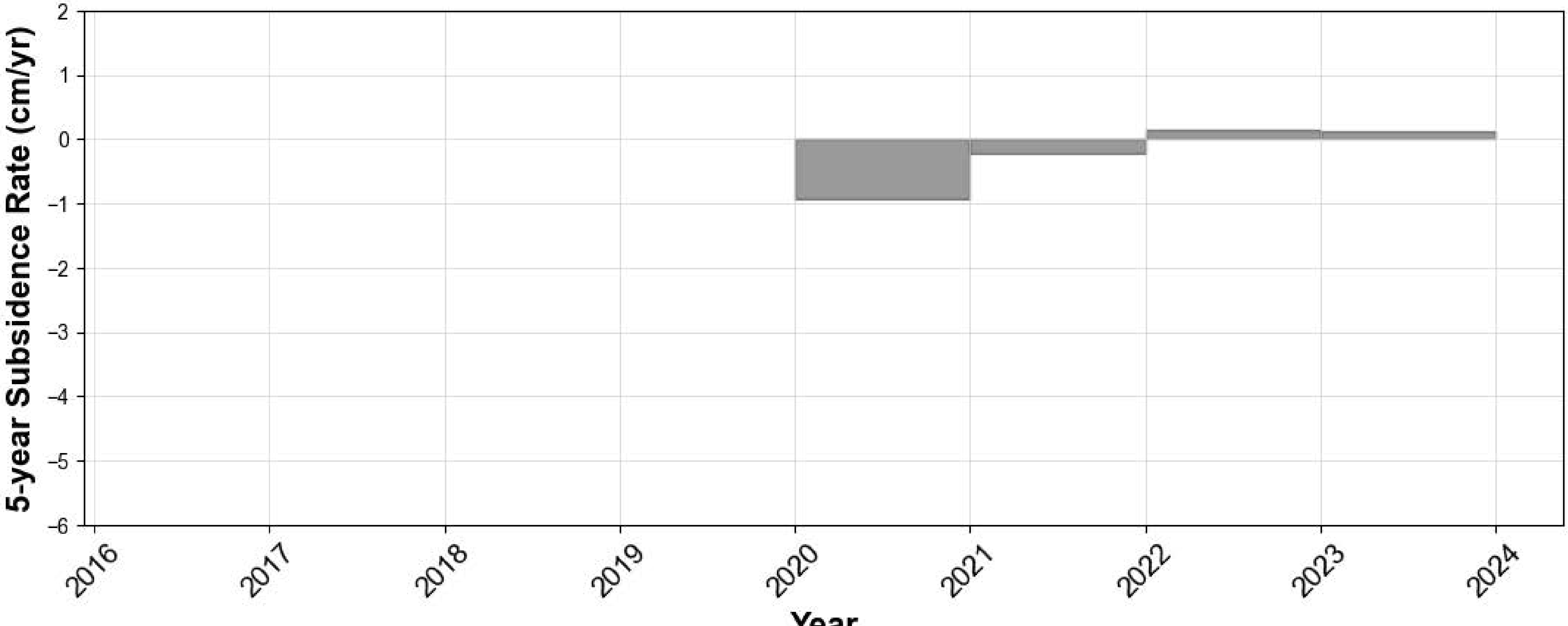


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P091

Houston, TX

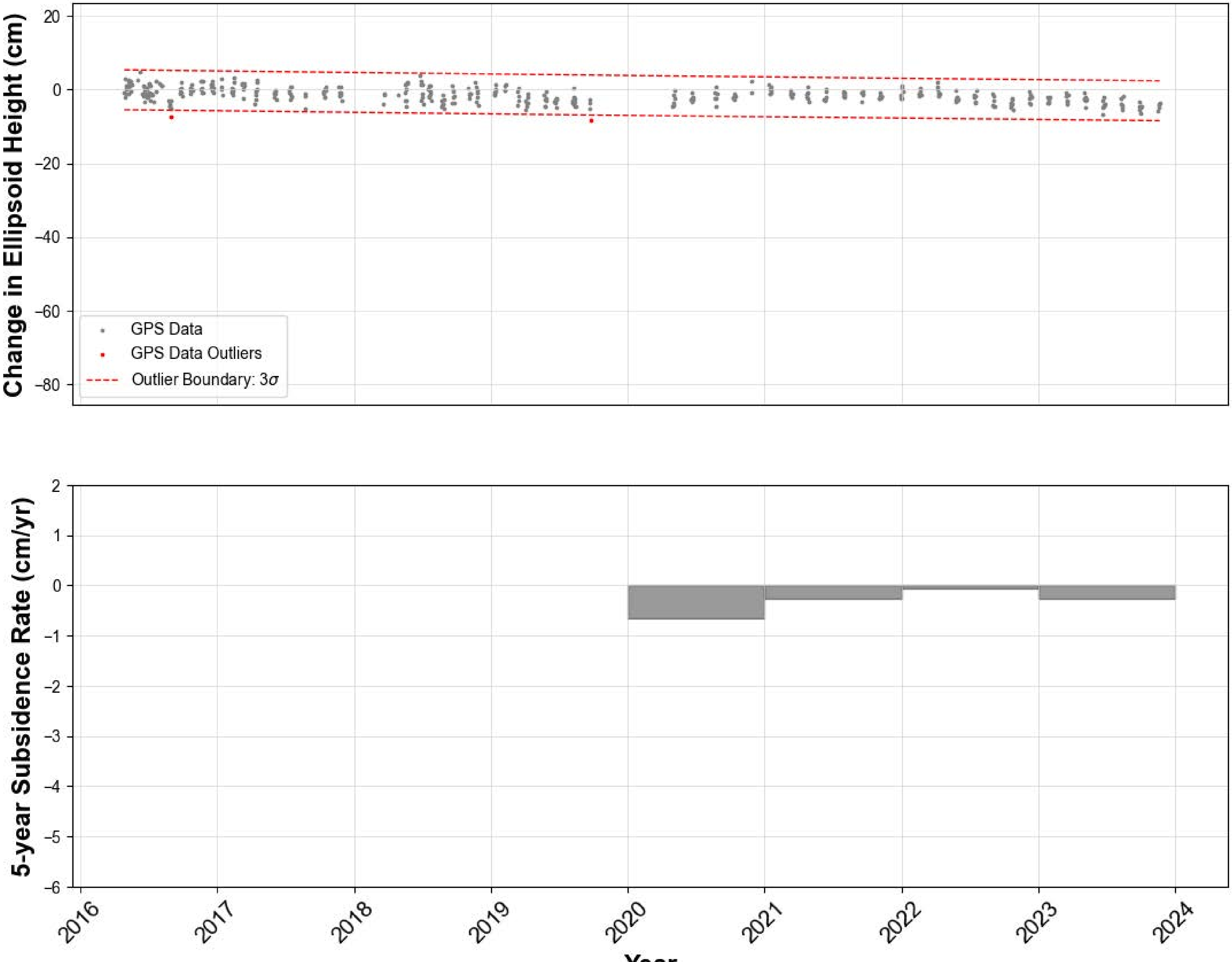




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P092

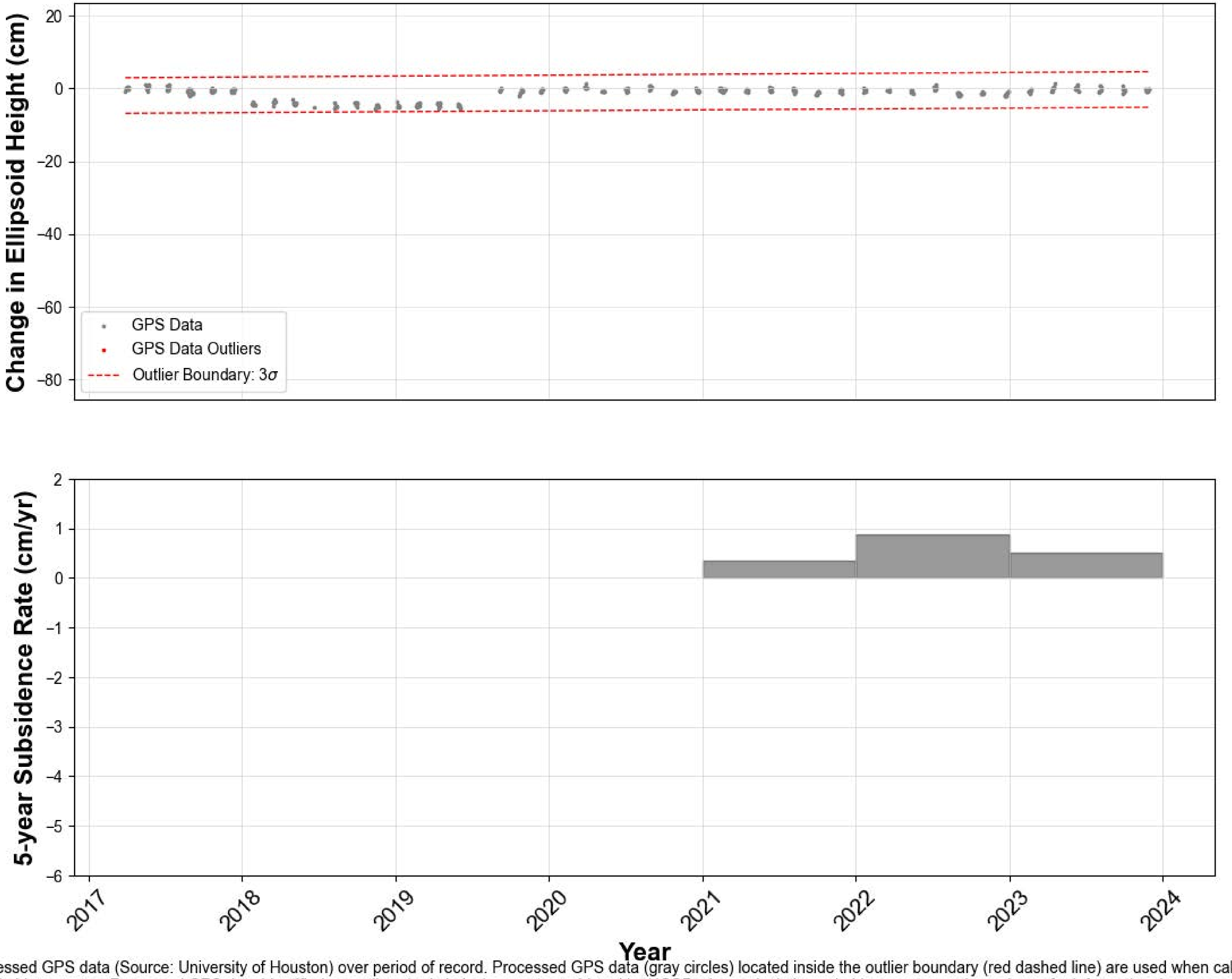
Houston, TX



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

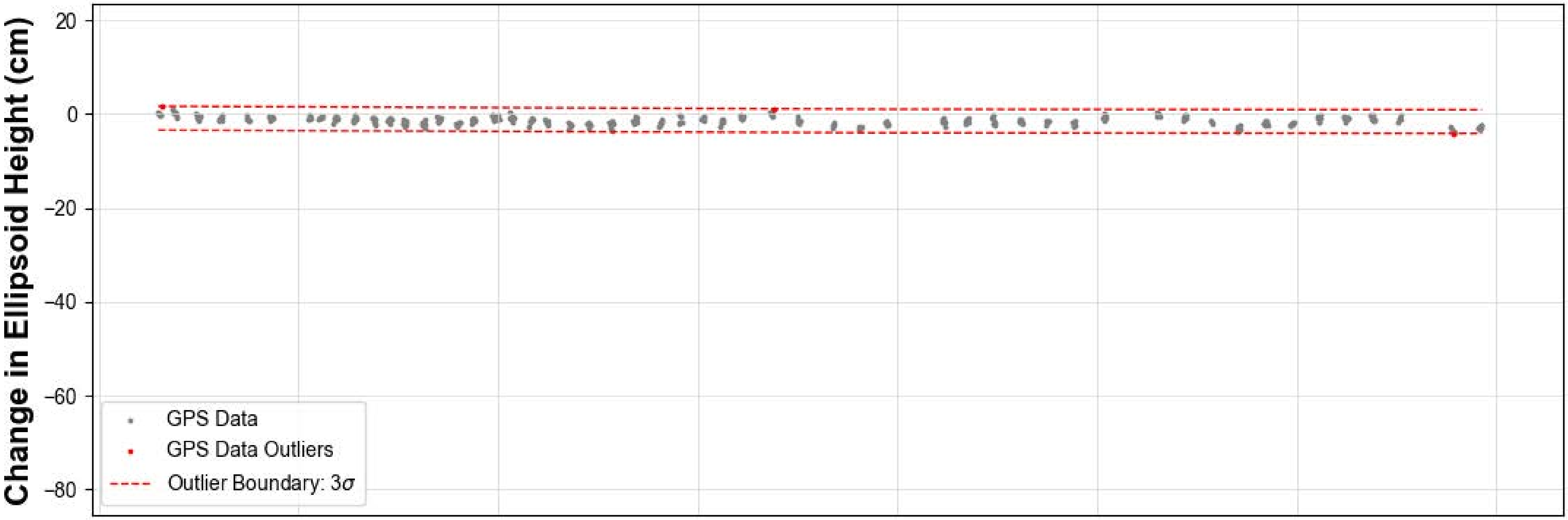
Alvin, TX

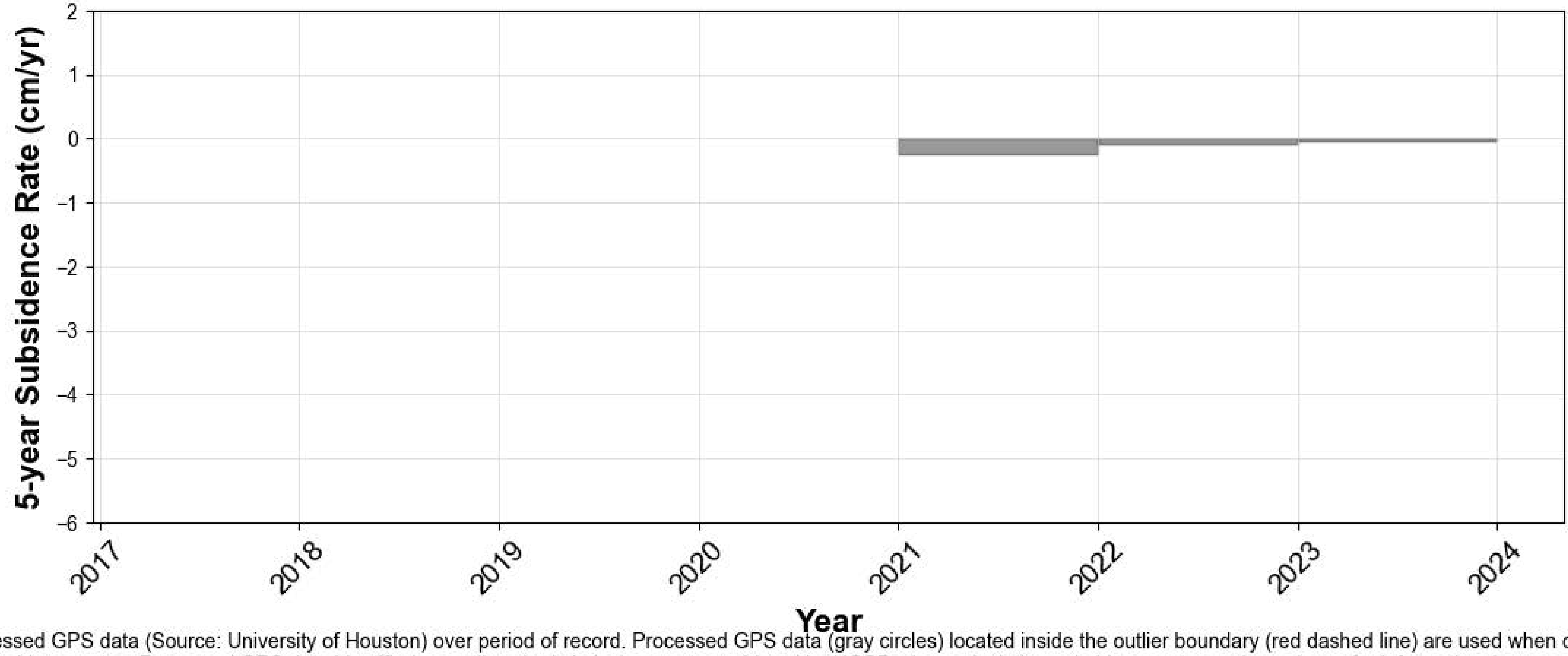


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P094

Houston, TX

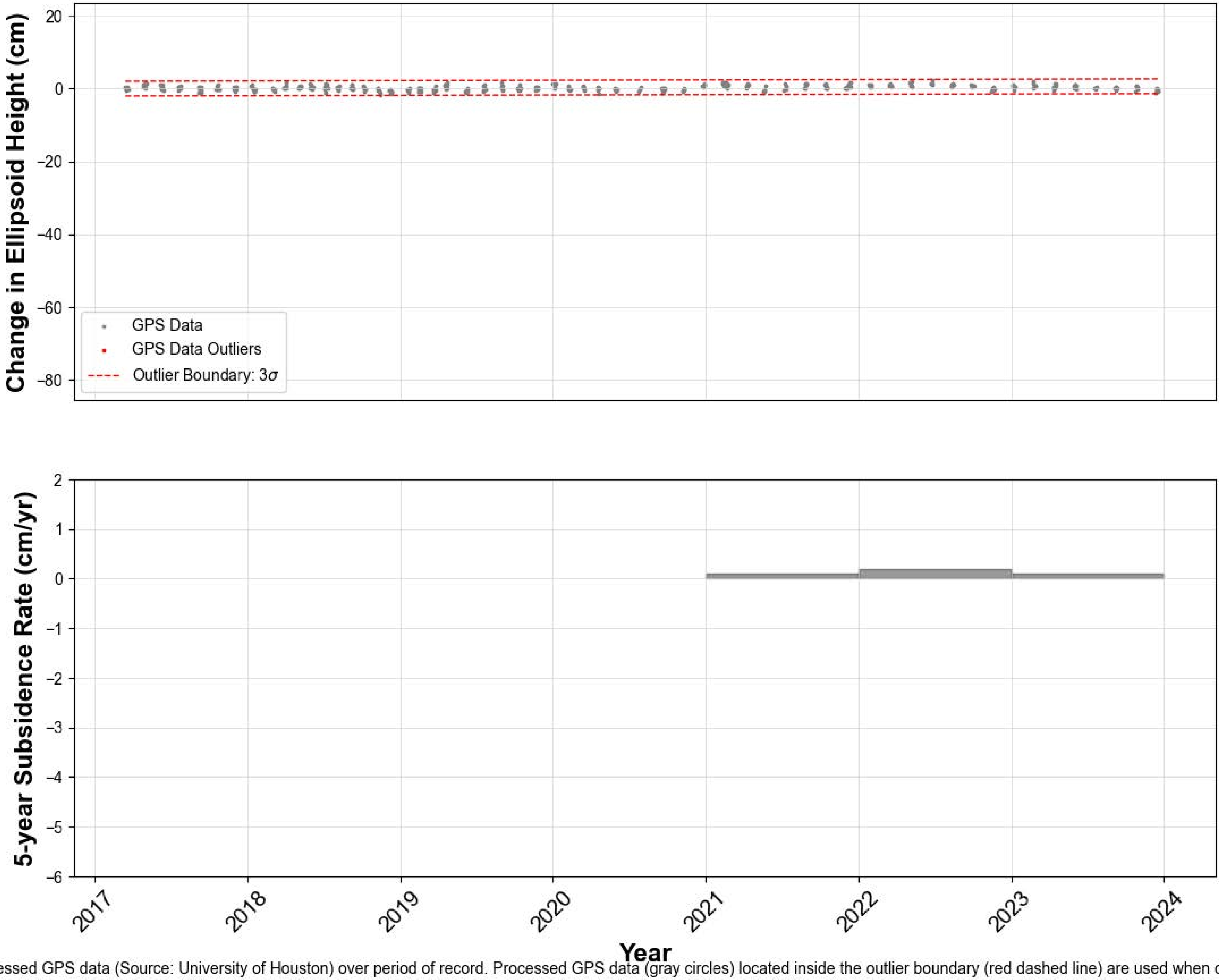




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P095

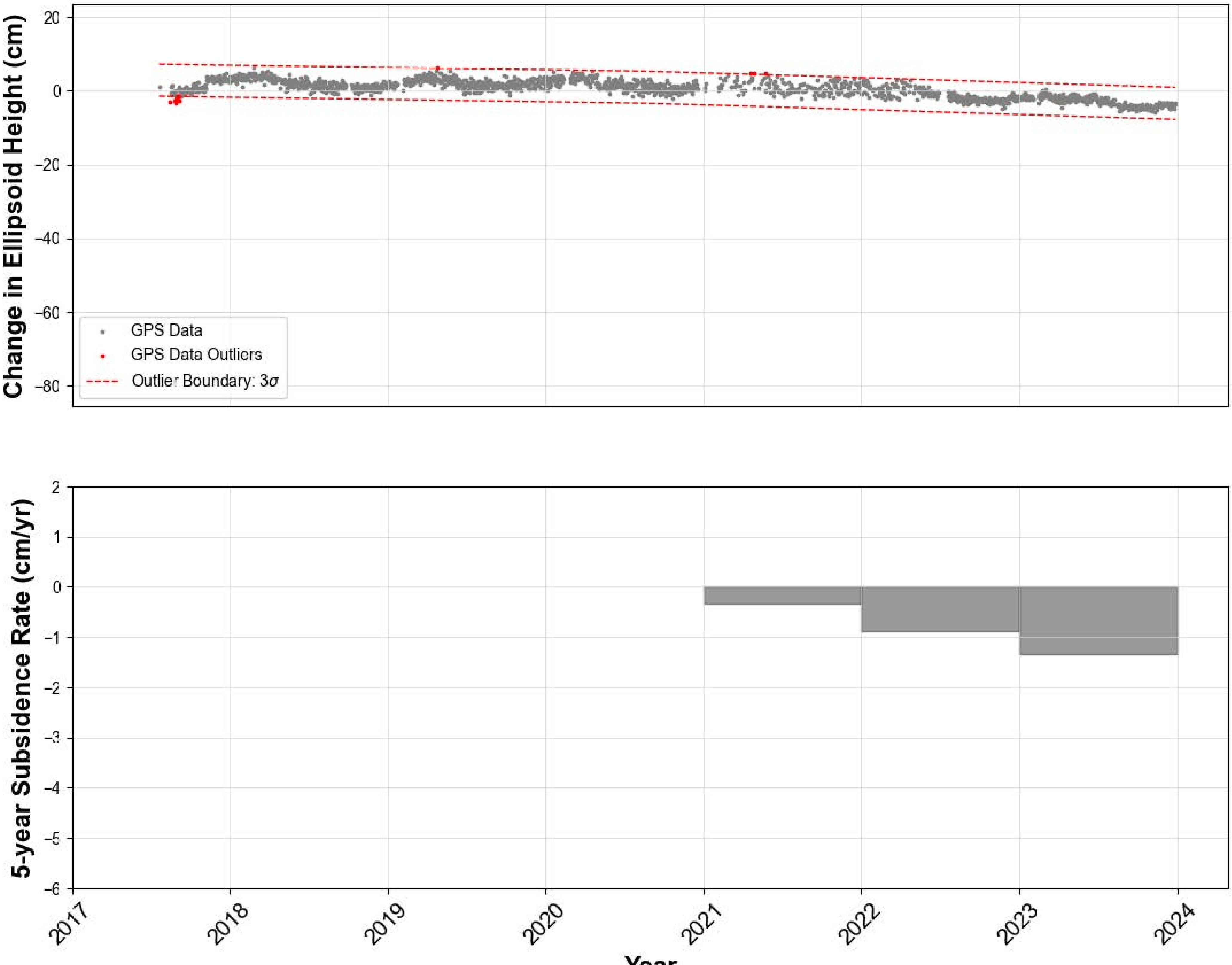
Houston, TX



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

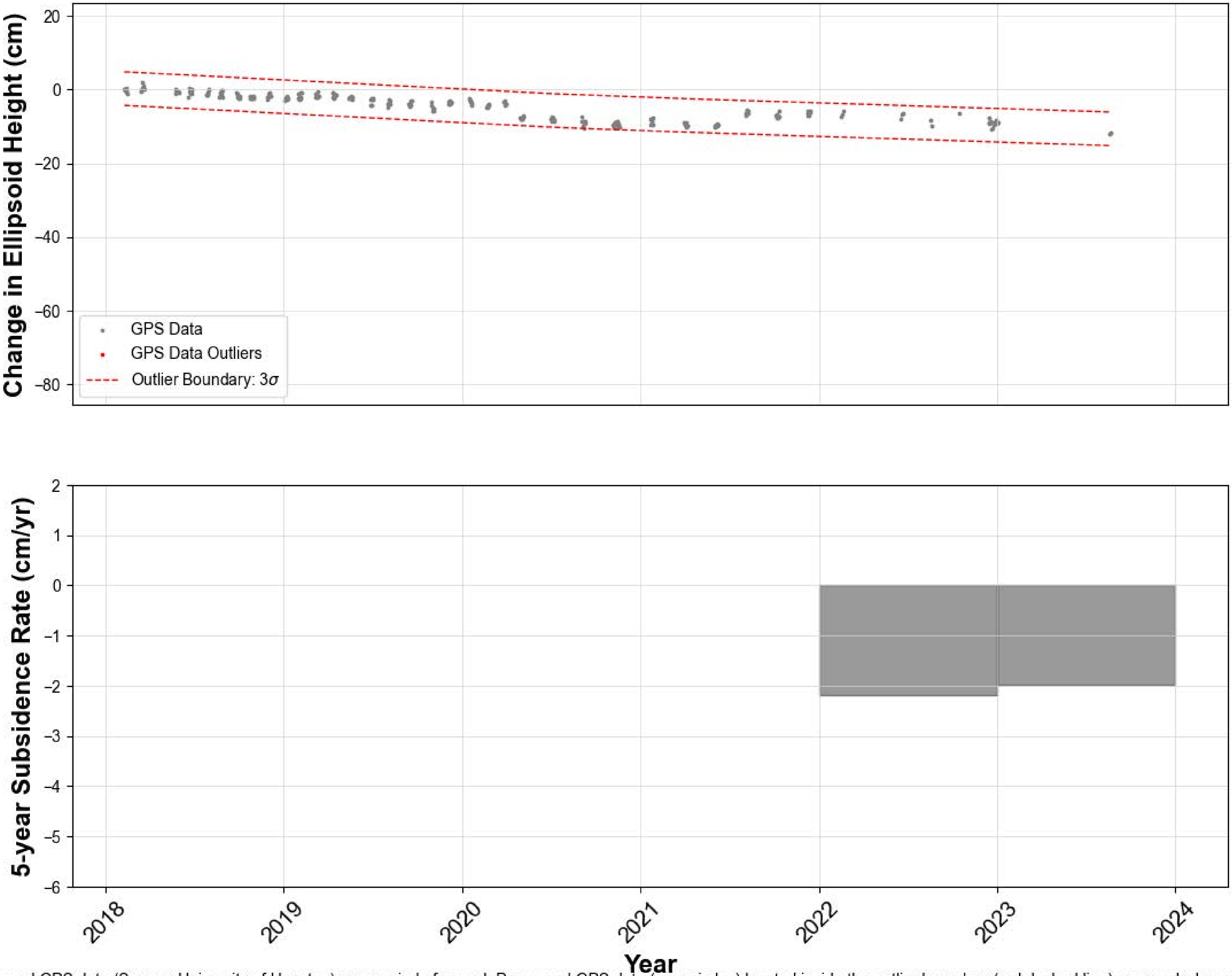
Katy, TX



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

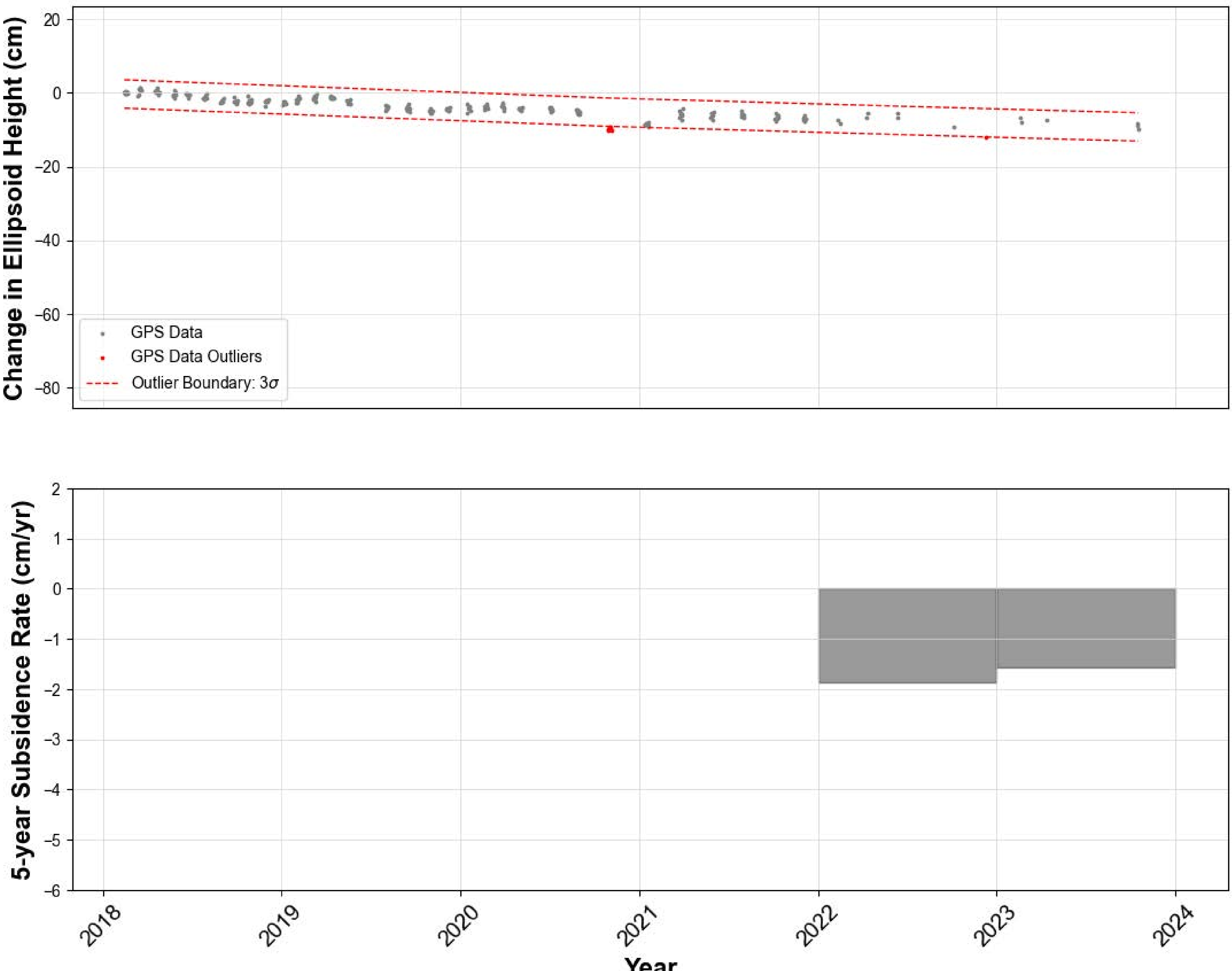
Katy, TX



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

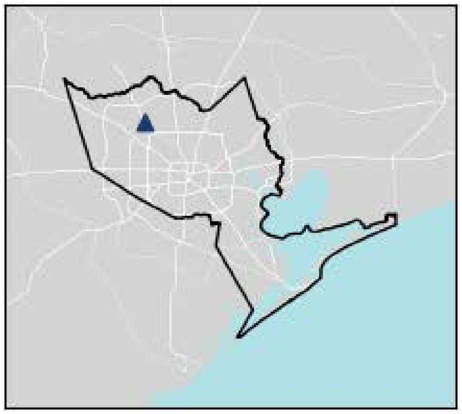
Katy, TX

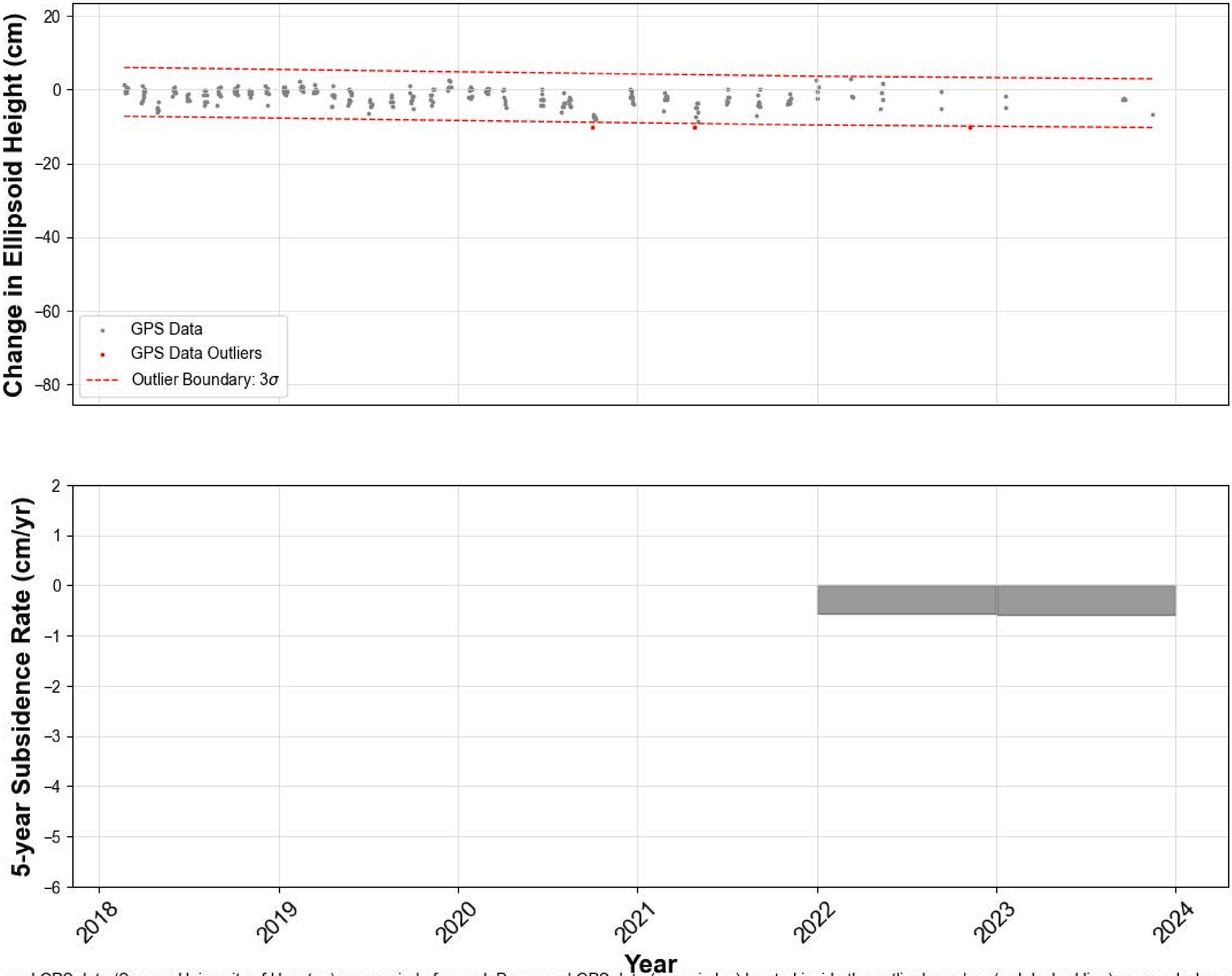


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P099

Houston, TX

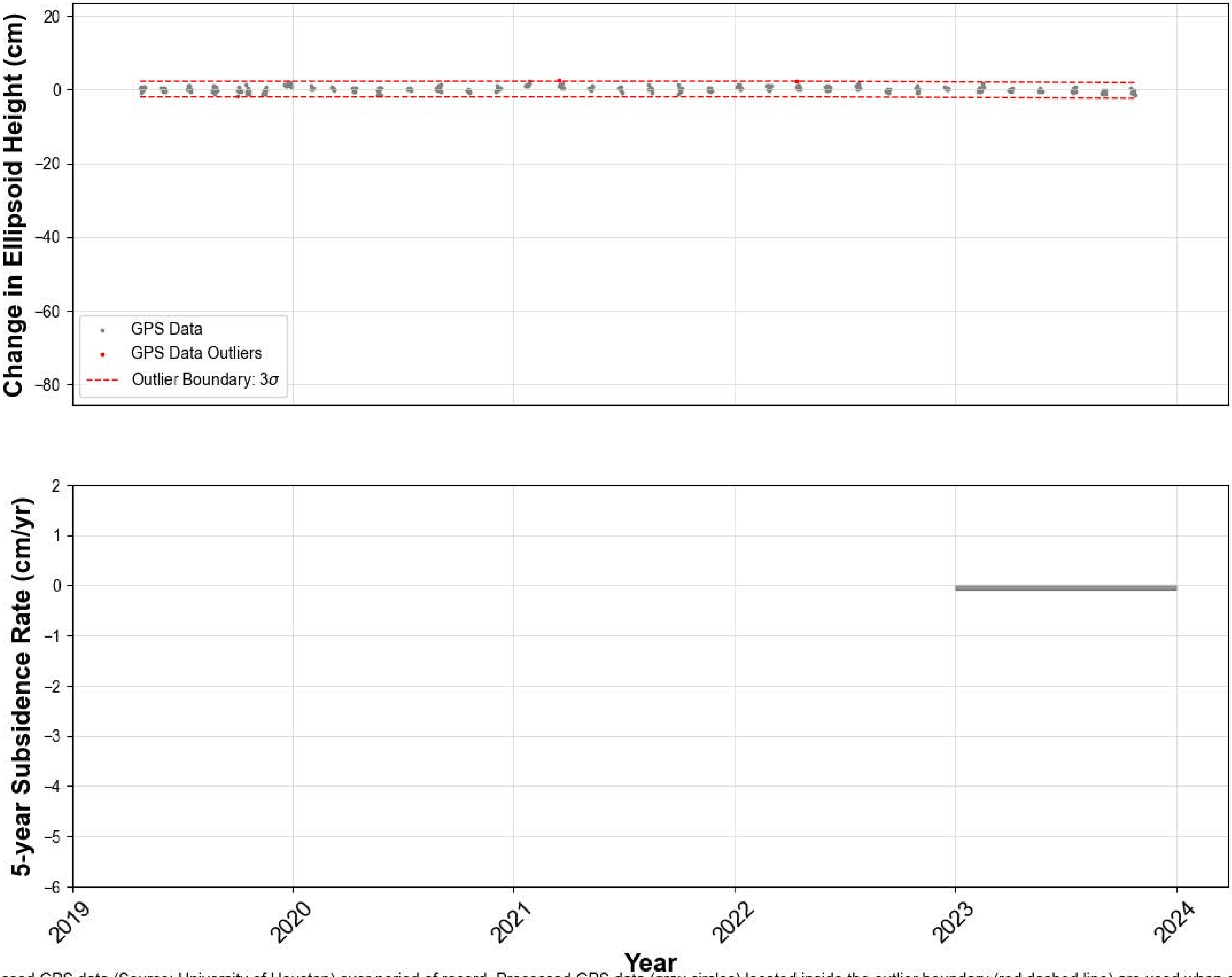




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P100

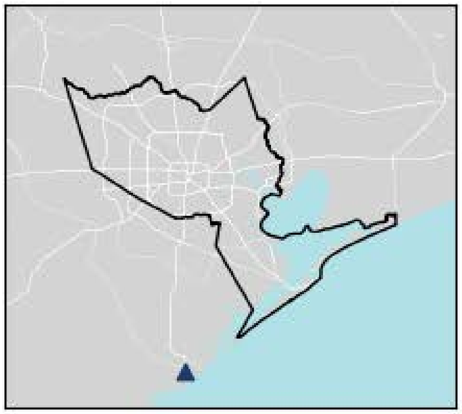
Atascocita, TX

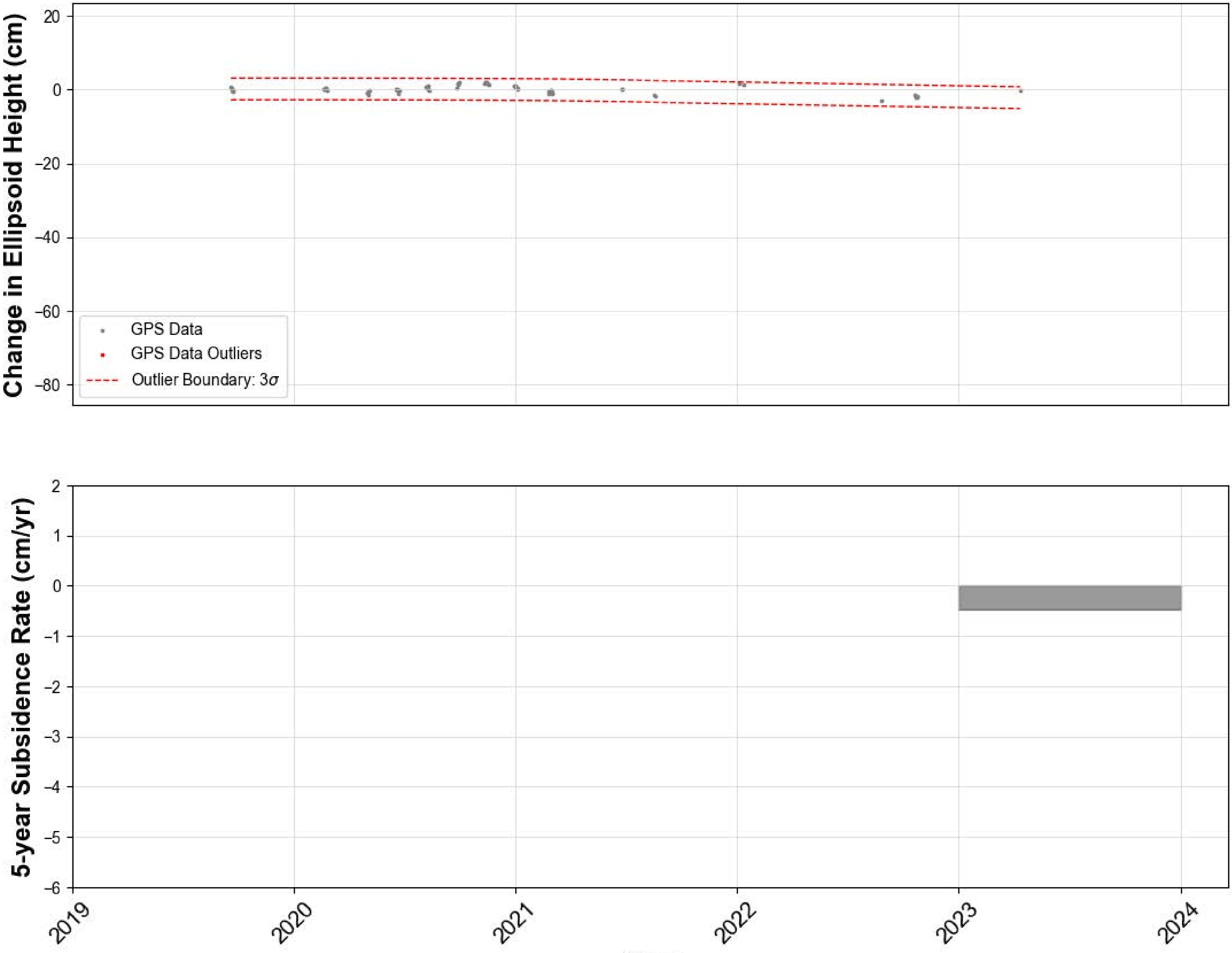


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P101

Freeport, TX

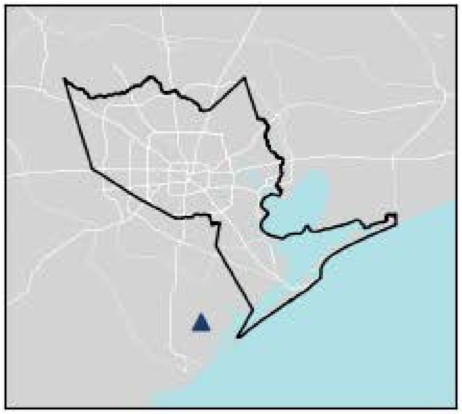


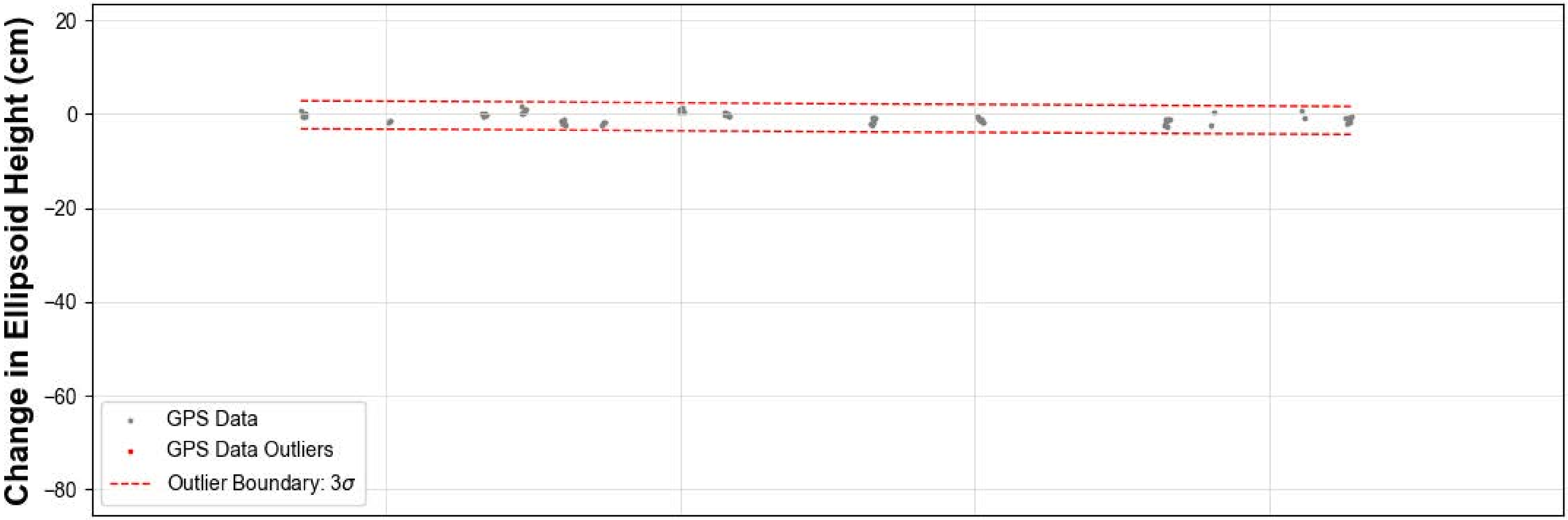


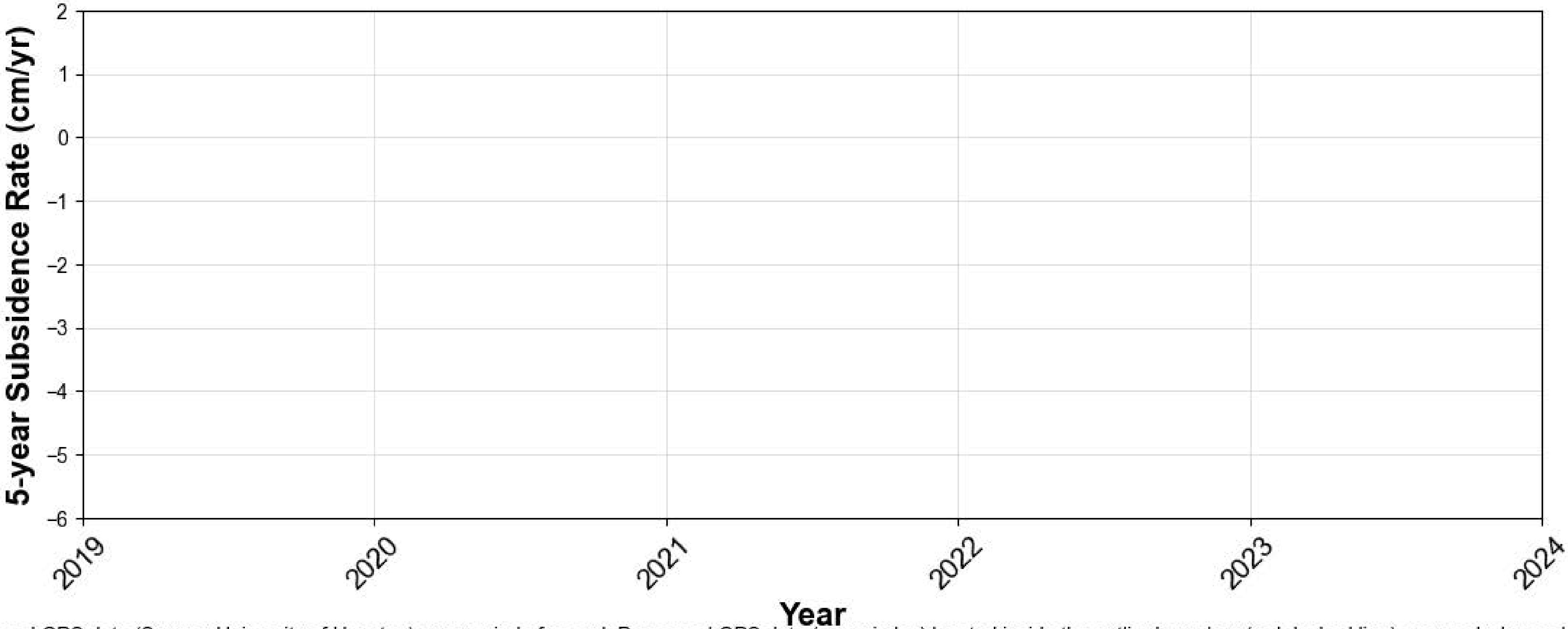
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P103

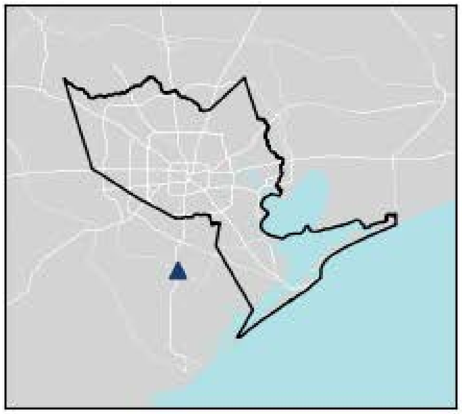
Angleton, TX





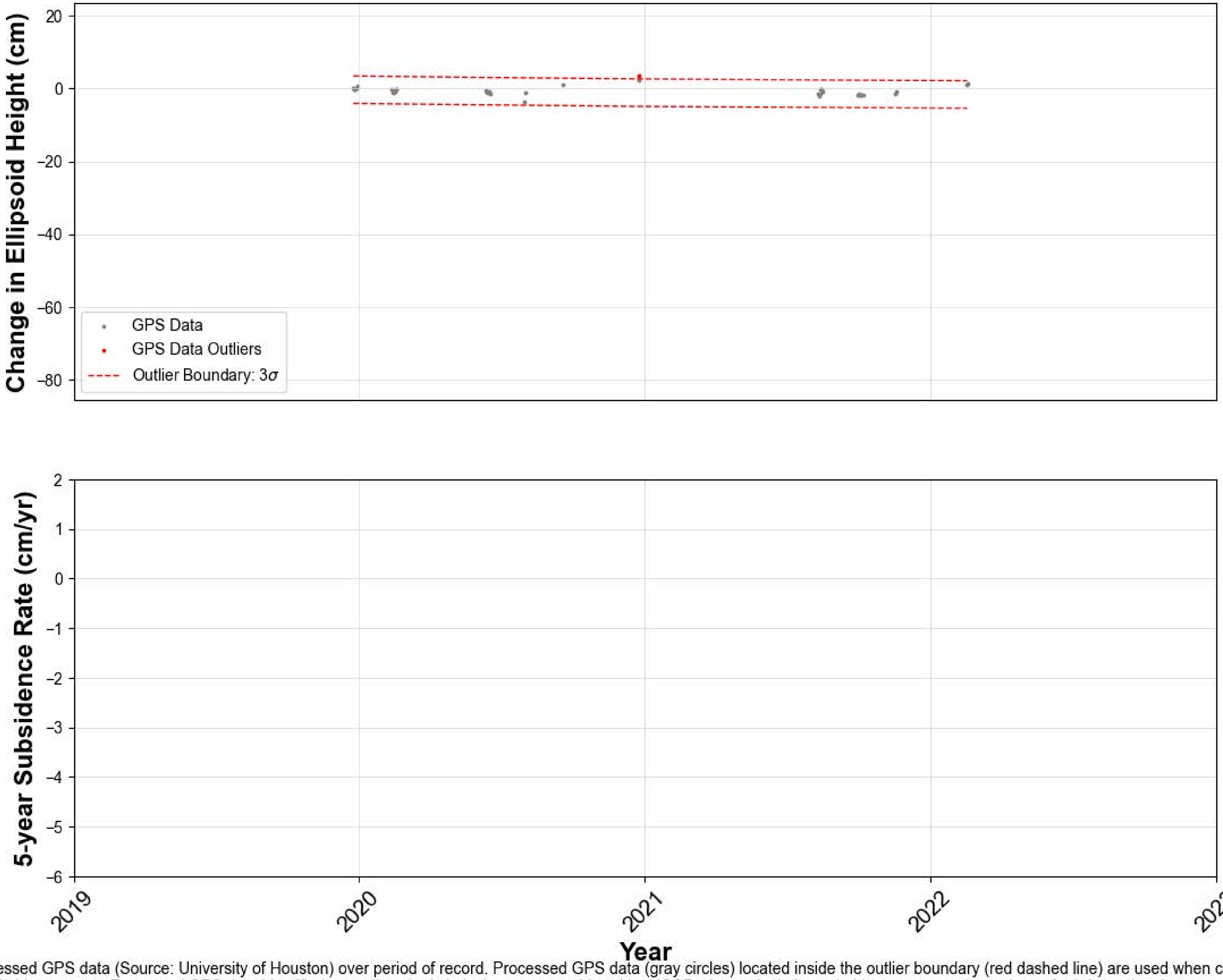


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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



P104

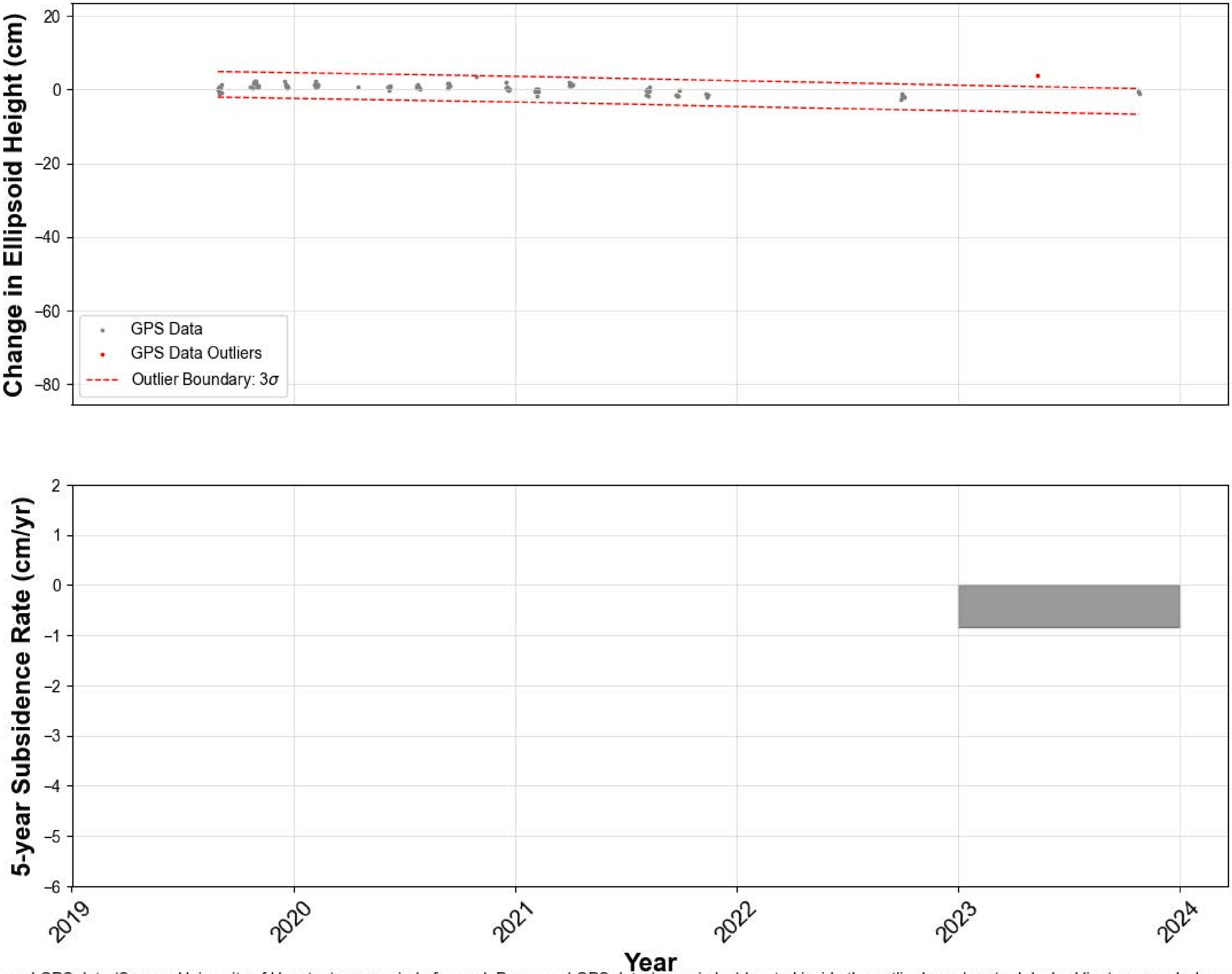
Rosharon, TX



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

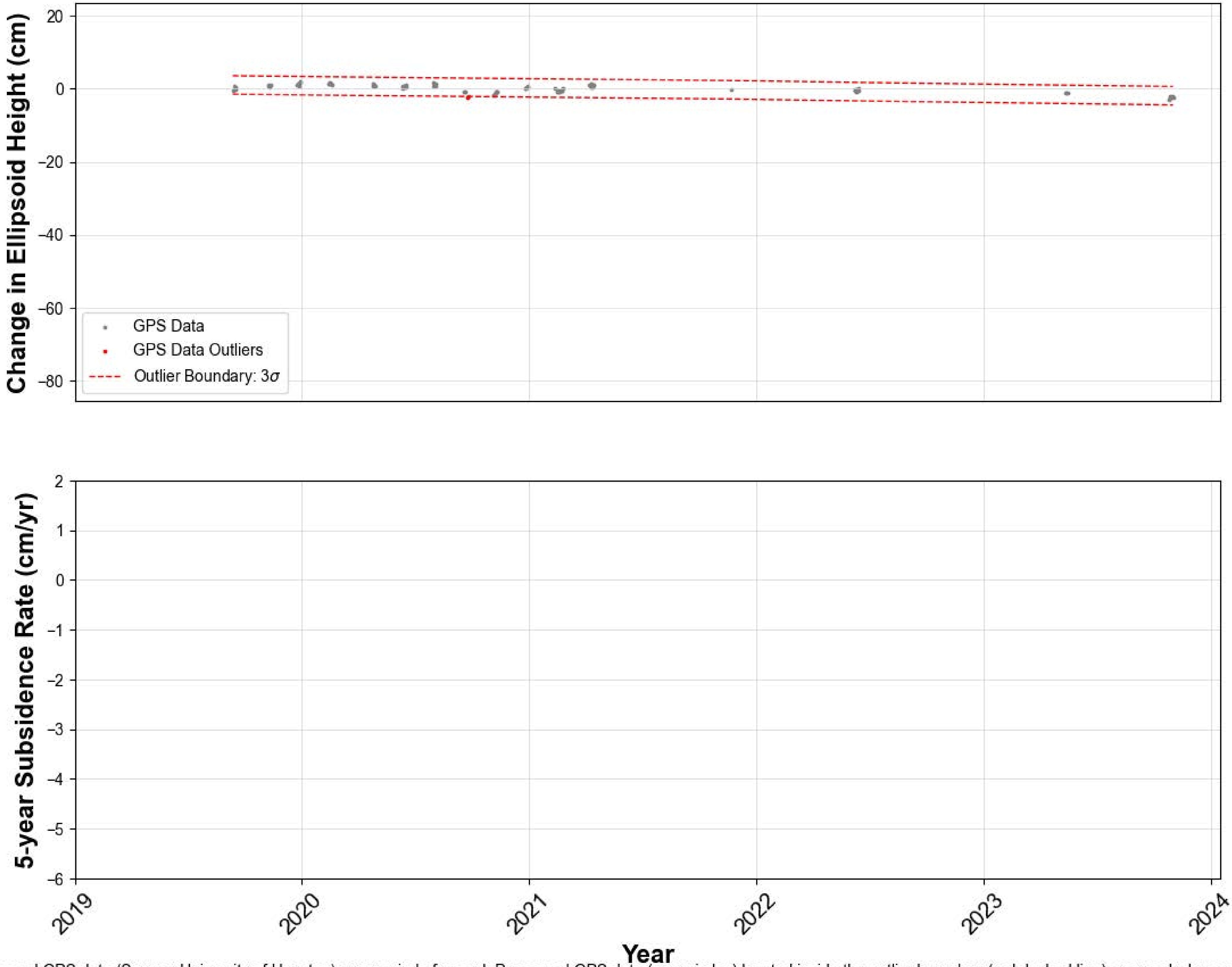
Manvel, TX



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

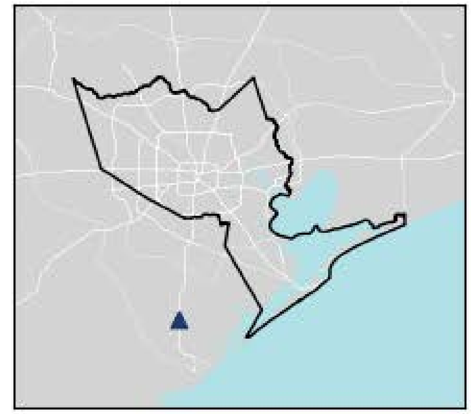
Pearland, TX

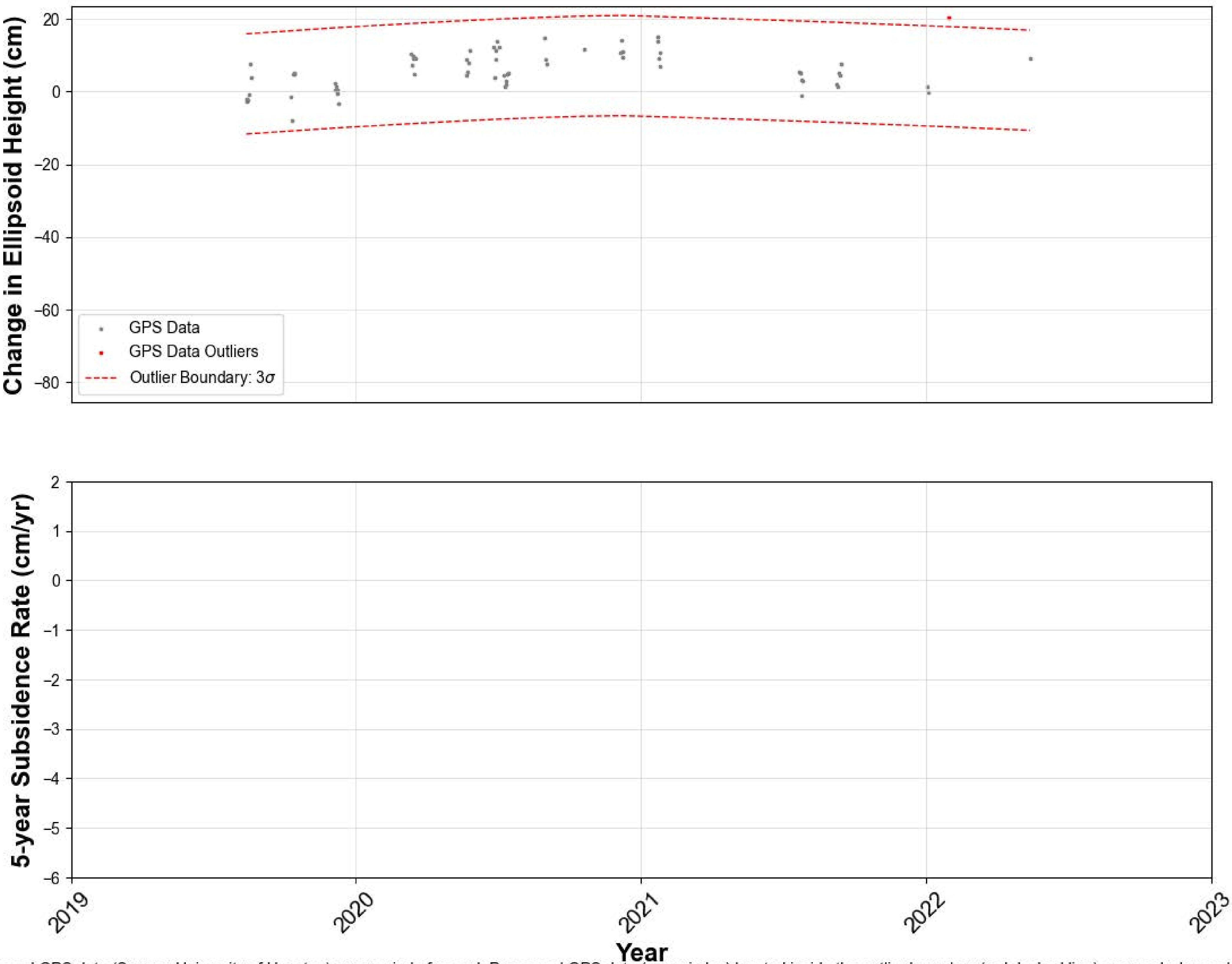


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P107

Angleton, TX

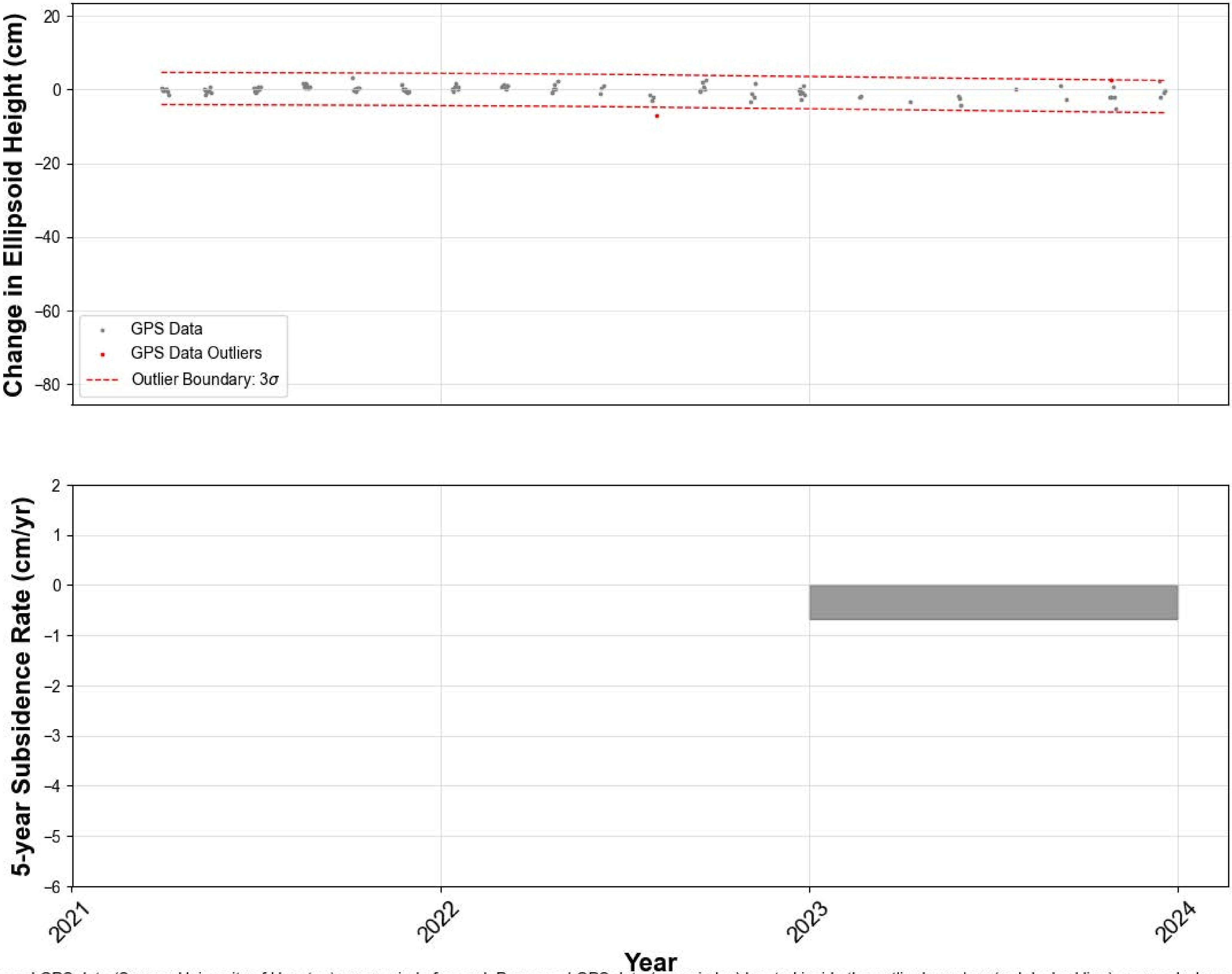




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P108

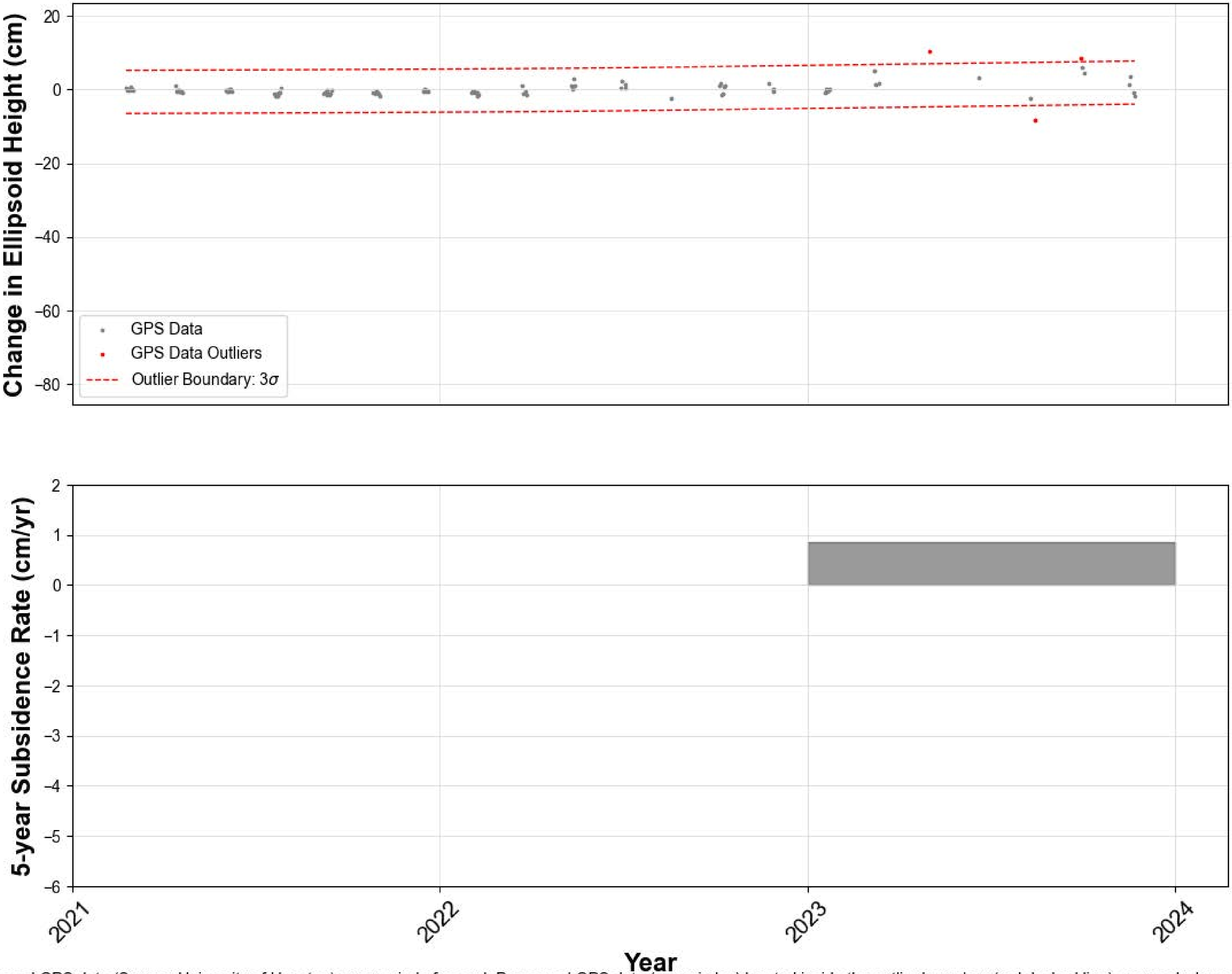
Channelview, TX



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

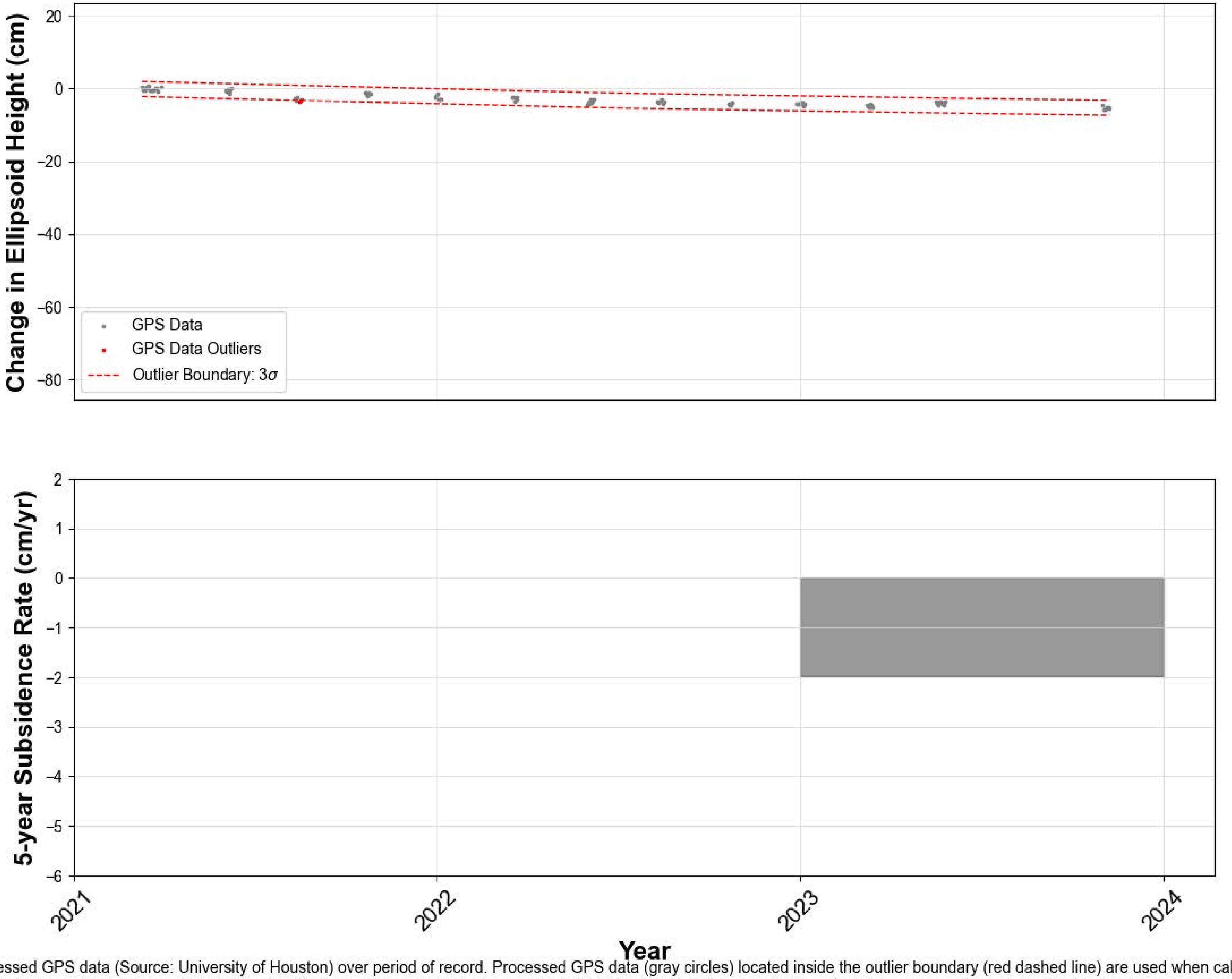
Crosby, TX



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

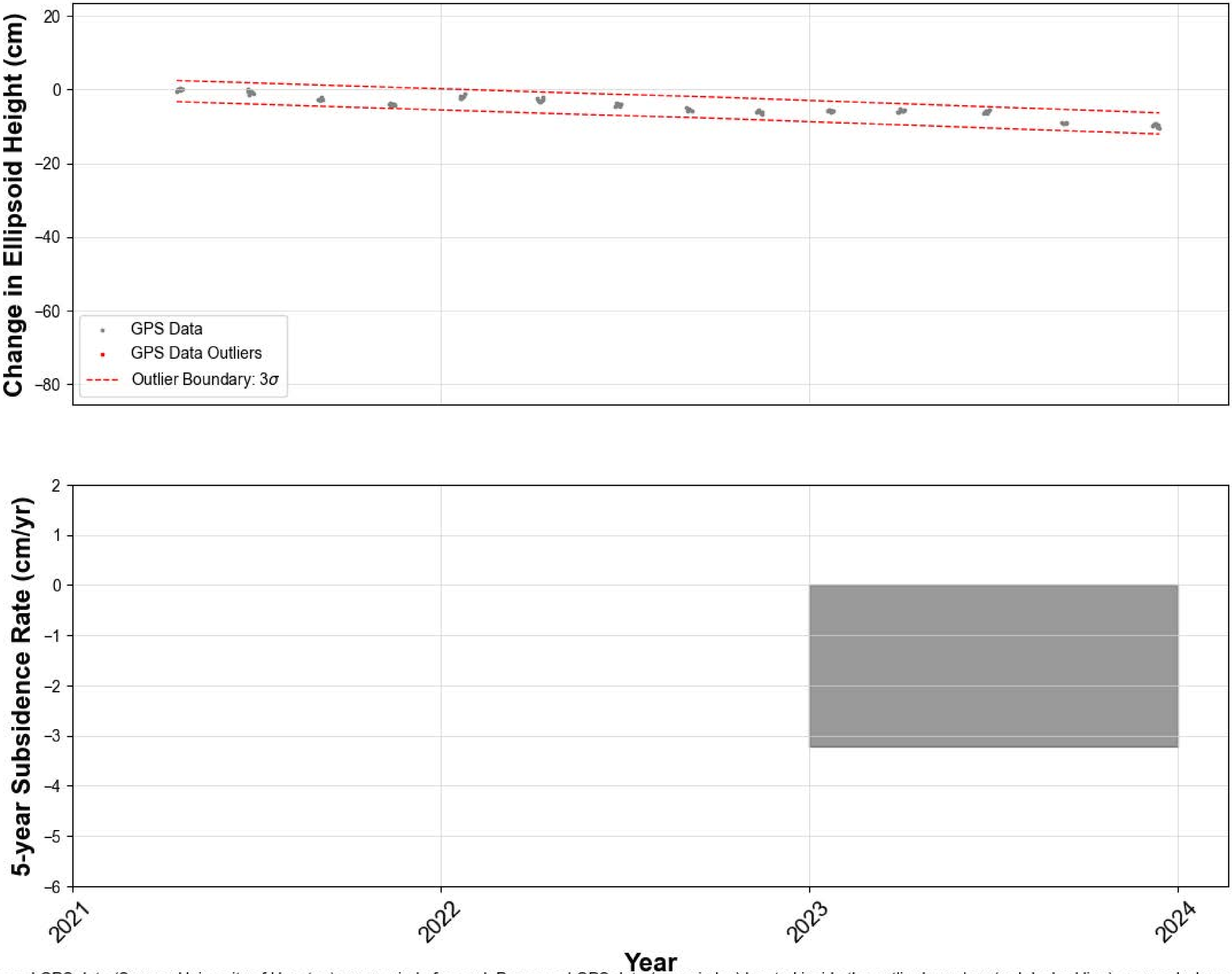
Fresno, TX



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

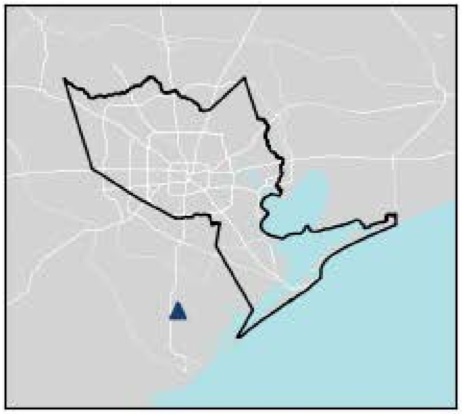
Katy, TX

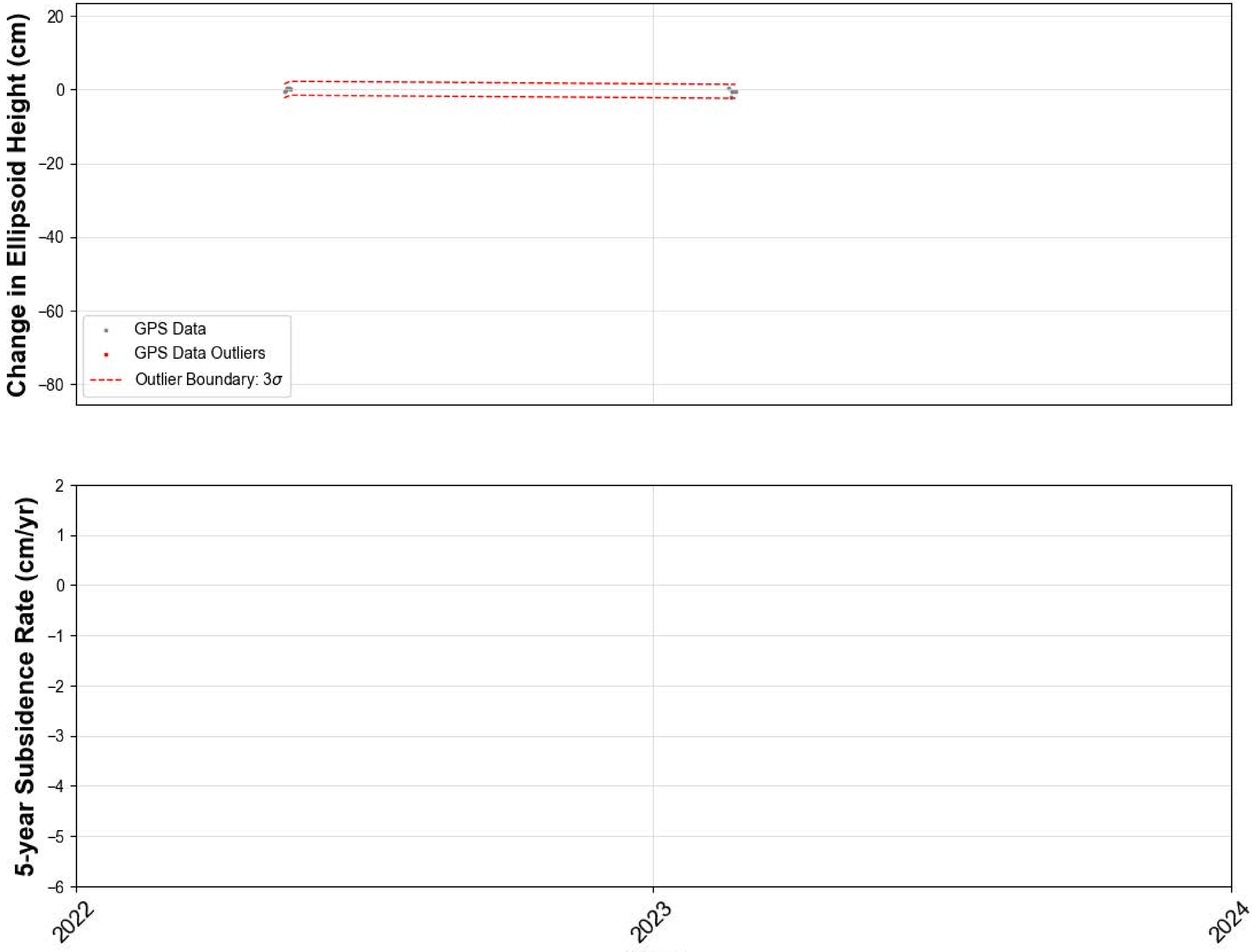


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P112

Angleton, TX

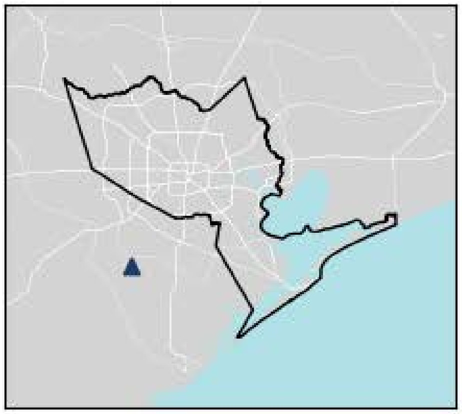


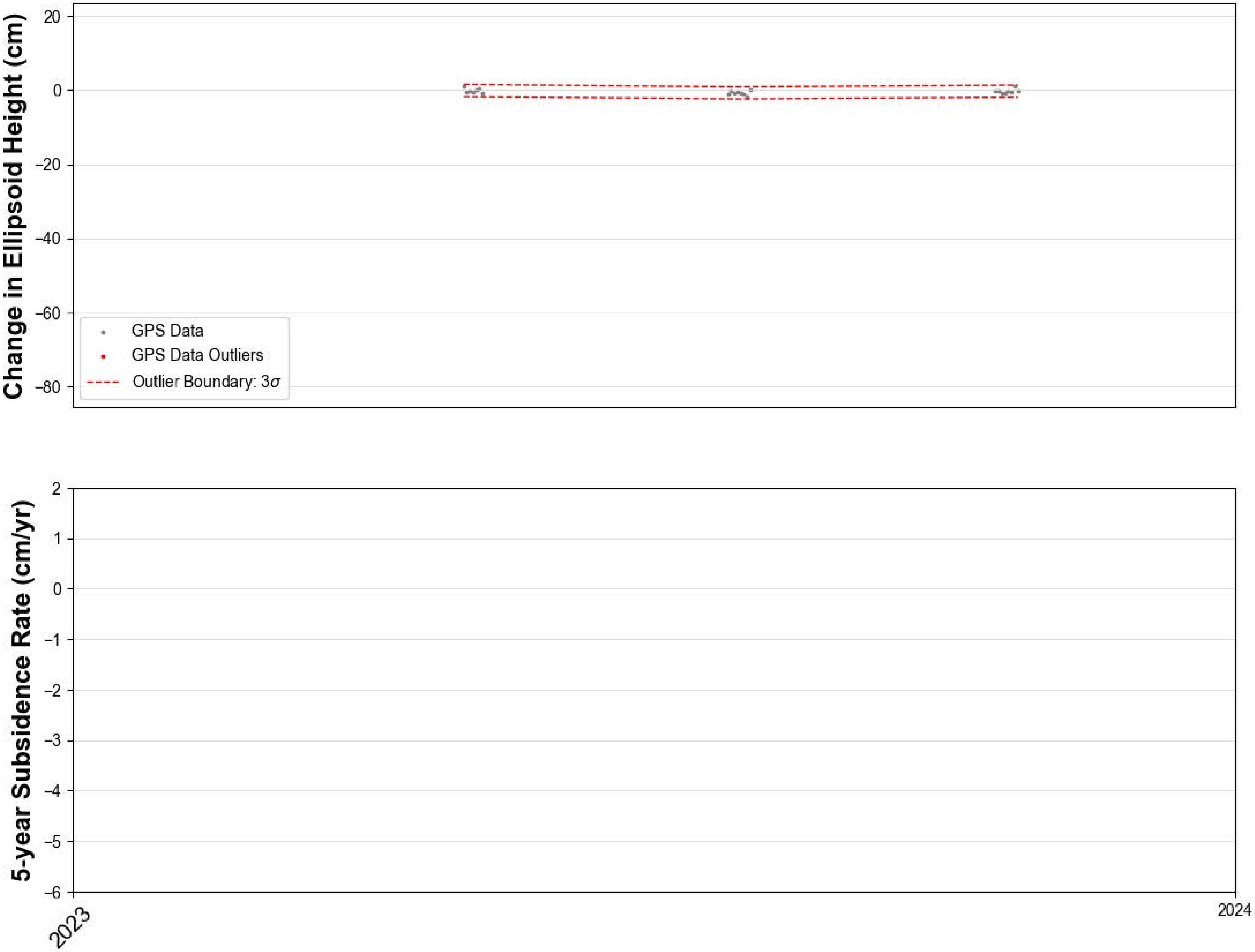


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

P113

Needville, TX





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.

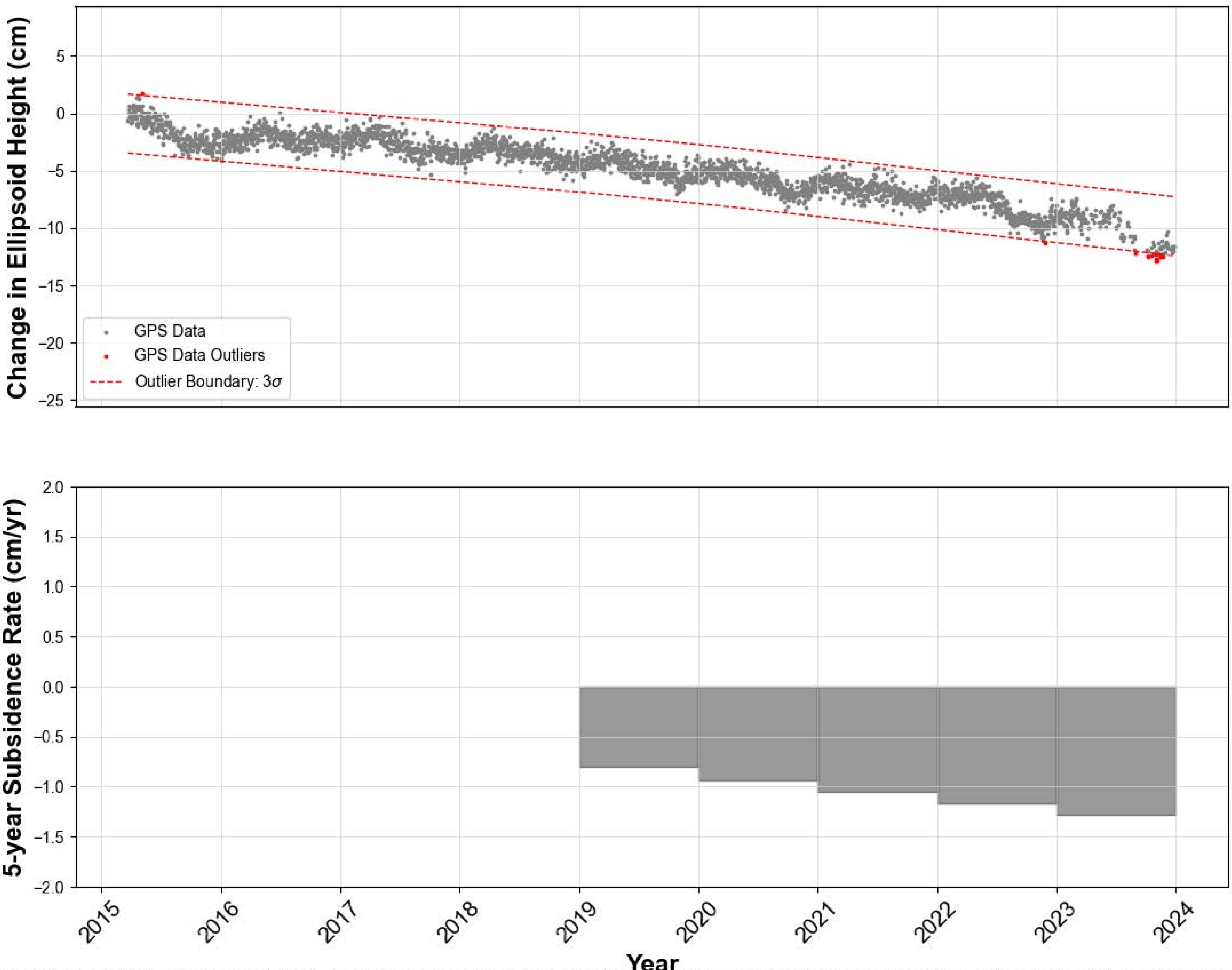
P114

Missouri City, TX

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

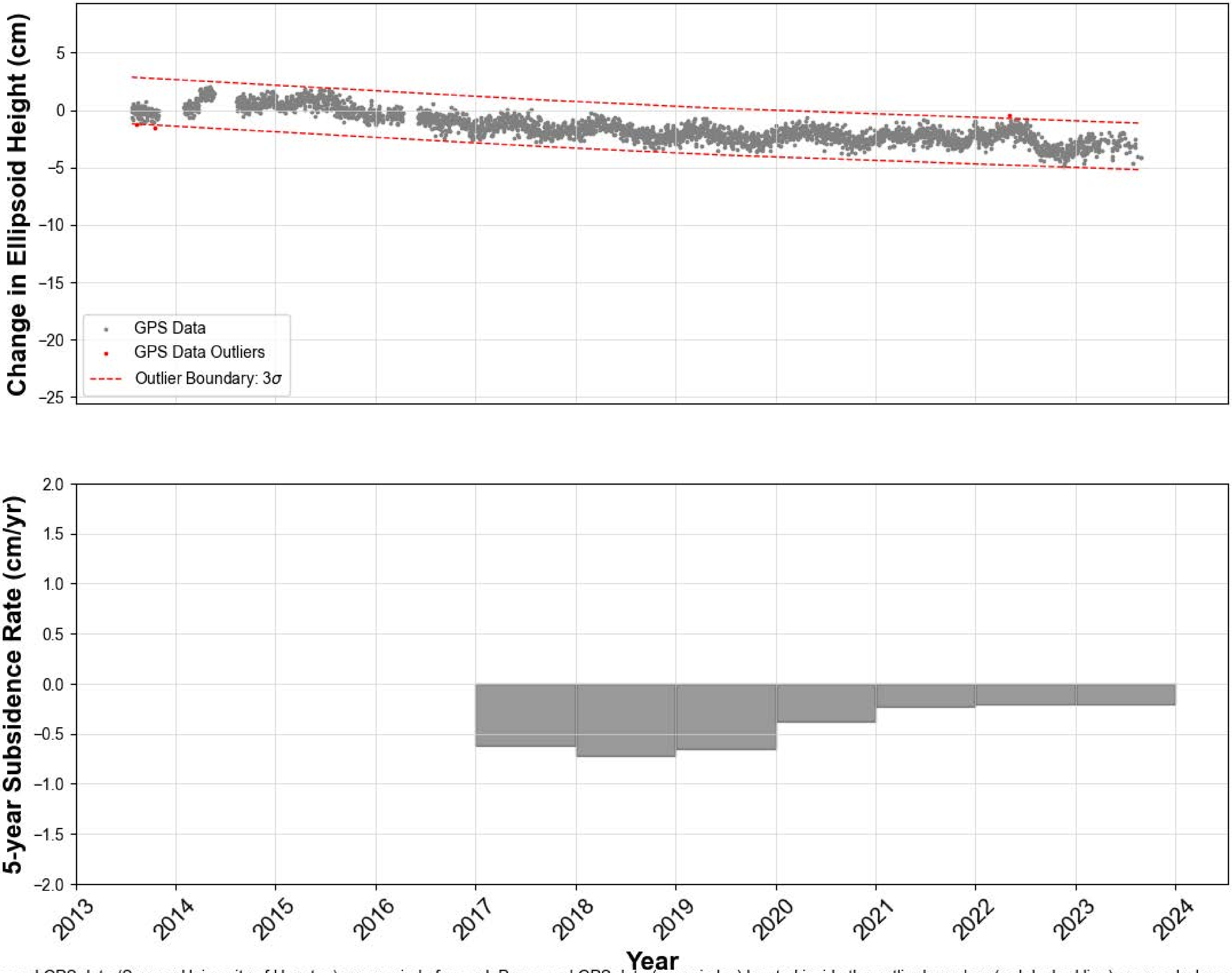
Spring, TX



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

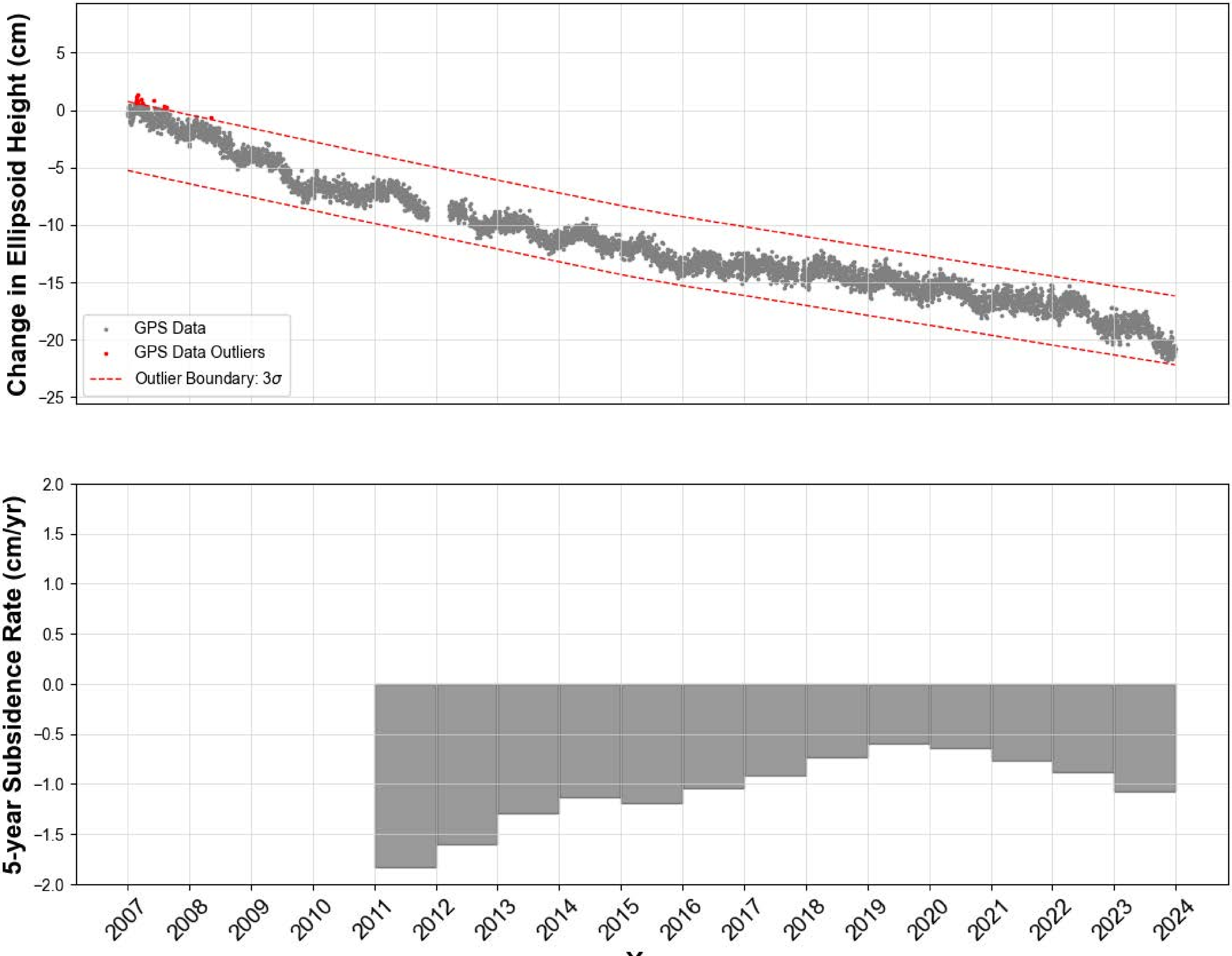
Houston, TX



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

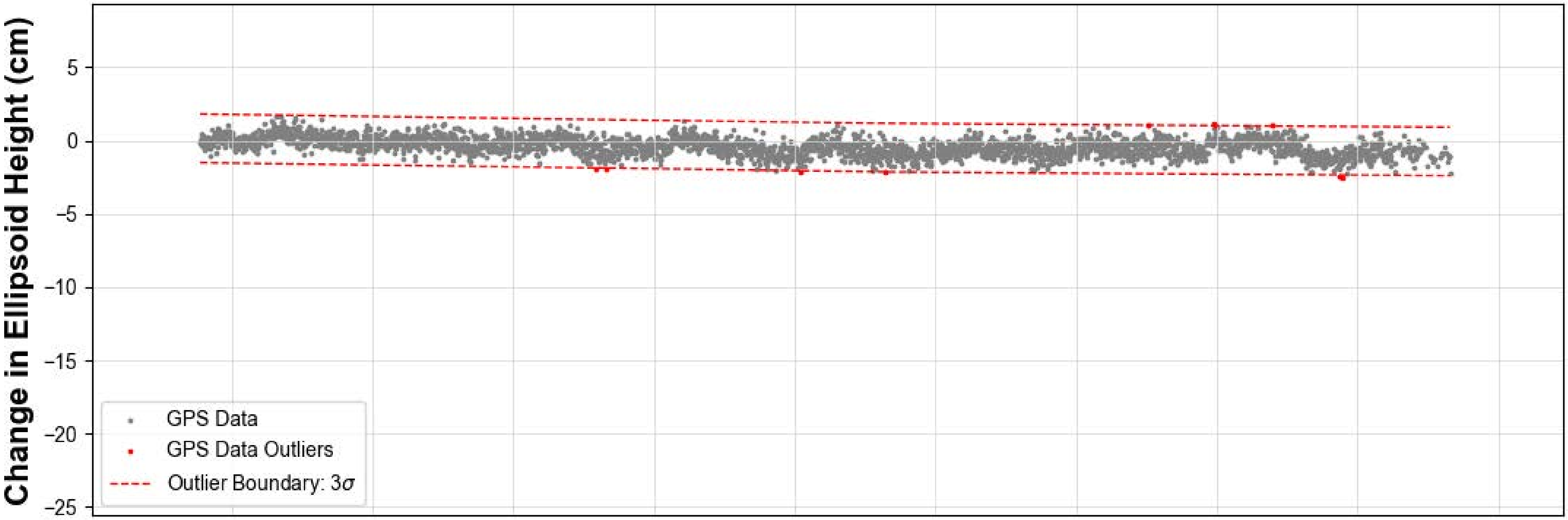
Spring, TX

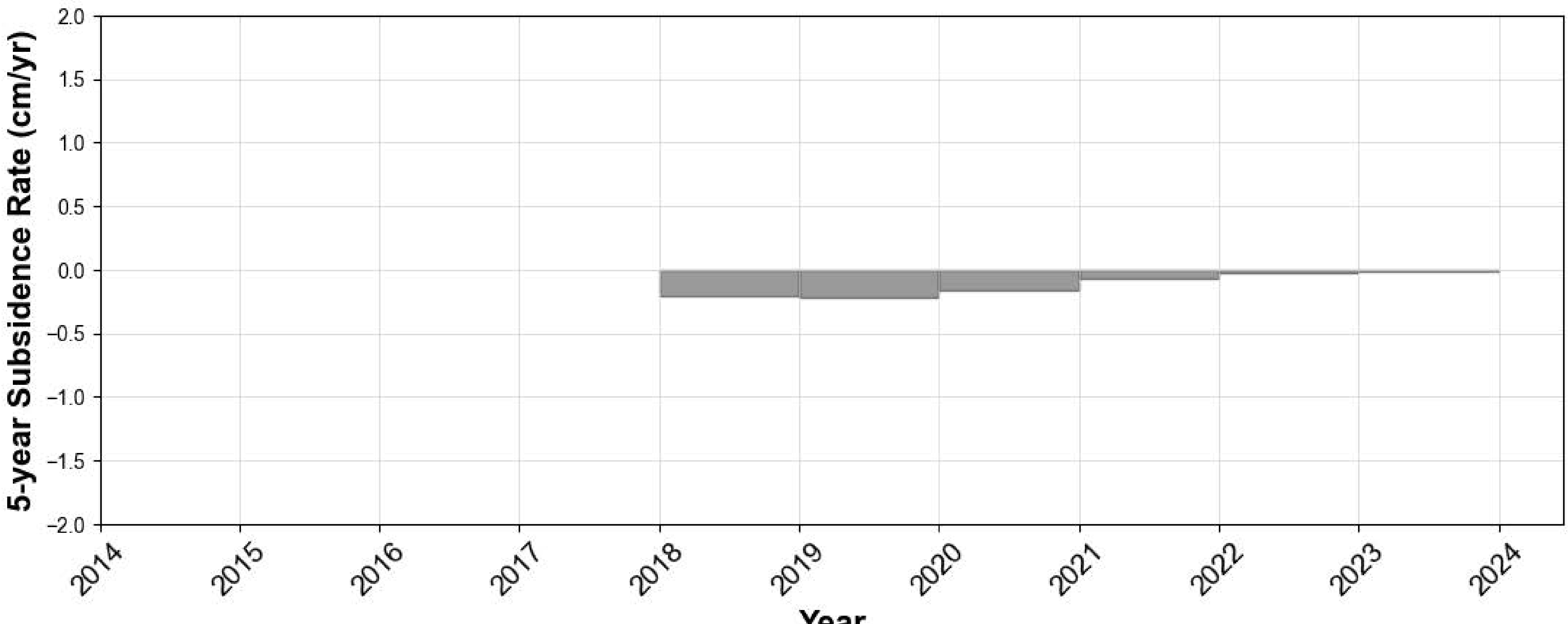


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

RPFB

Sienna, TX

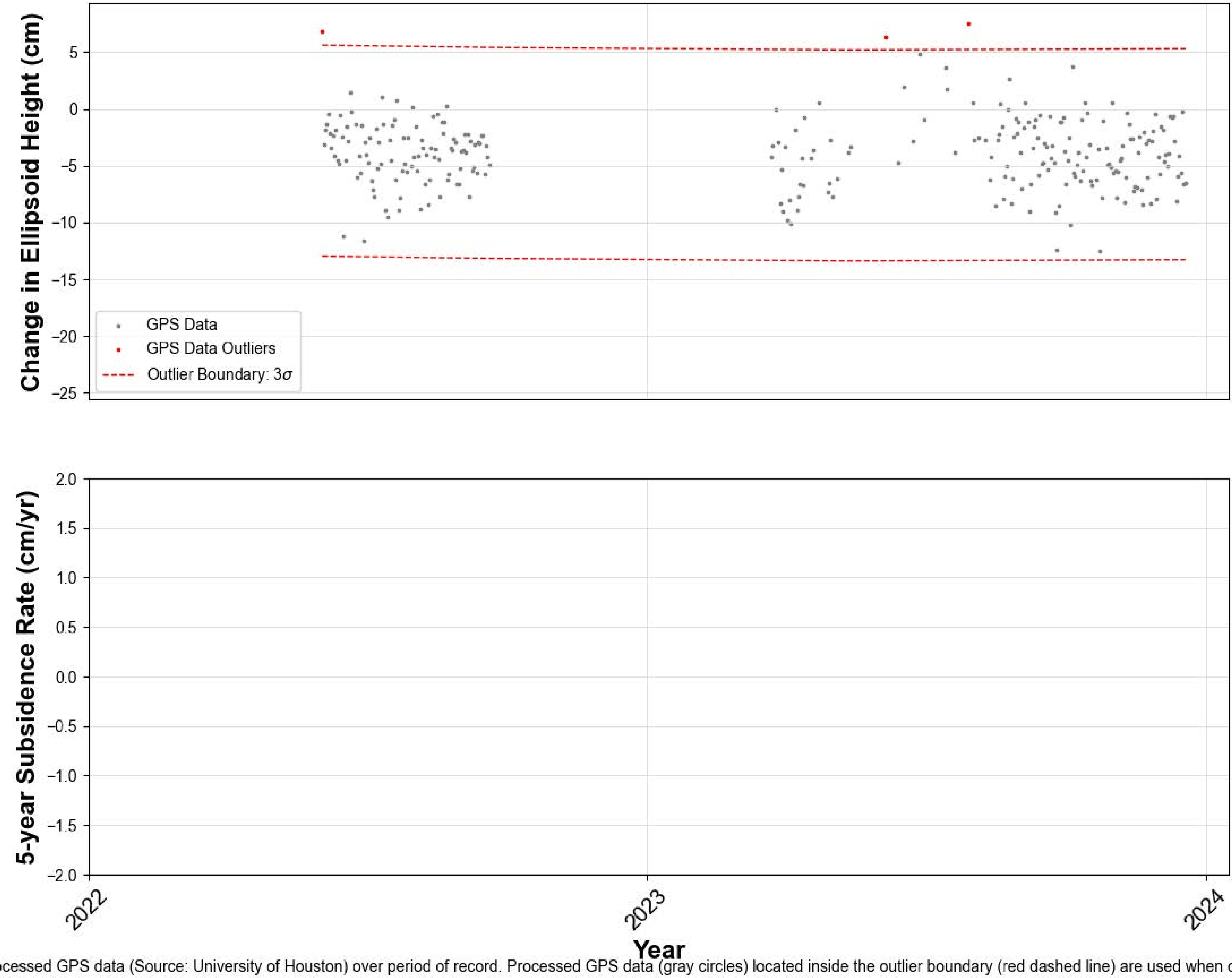




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

SANJ

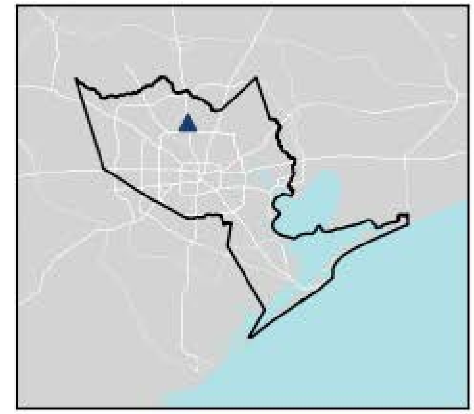
Willis, TX

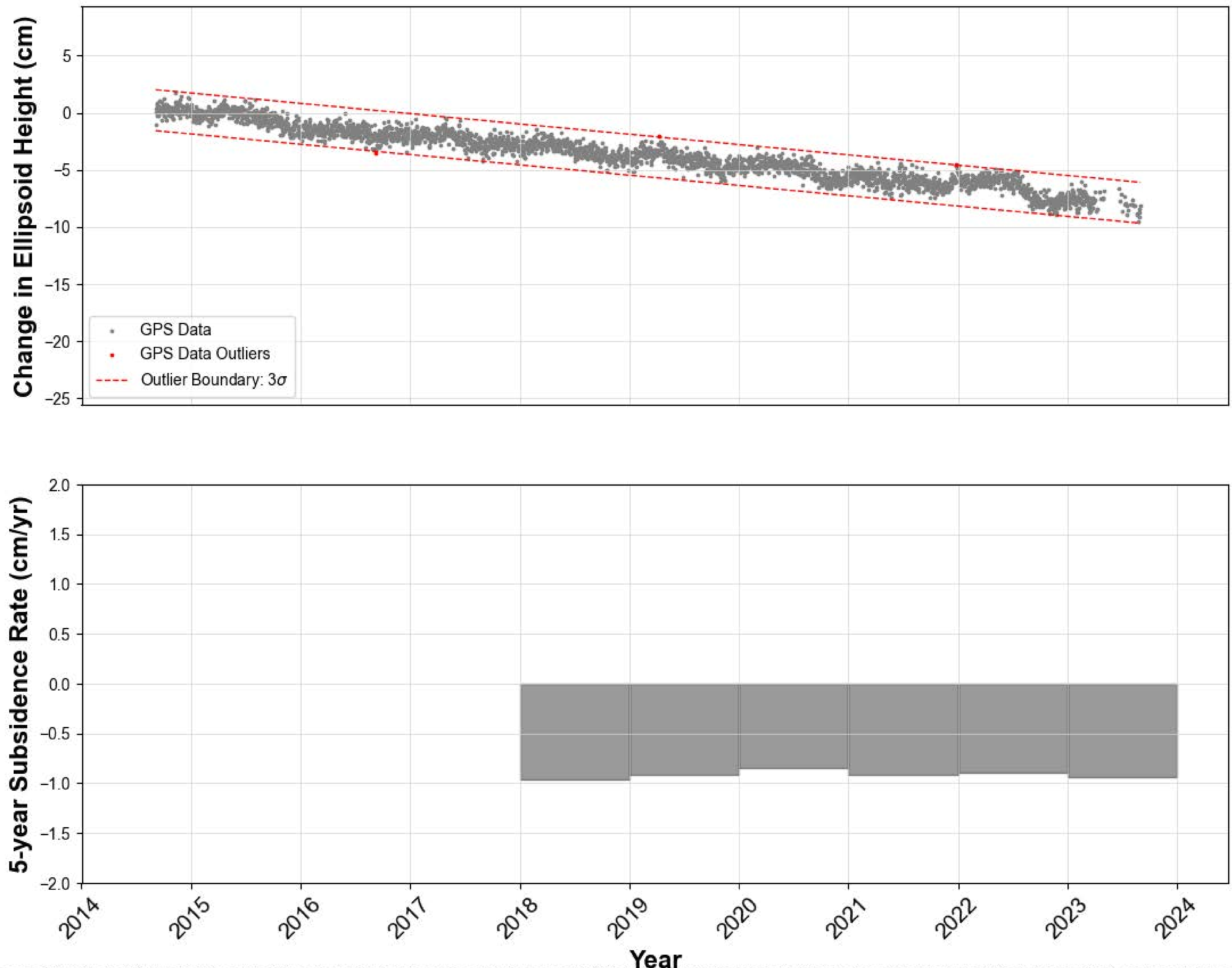


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

SESG

Houston, TX

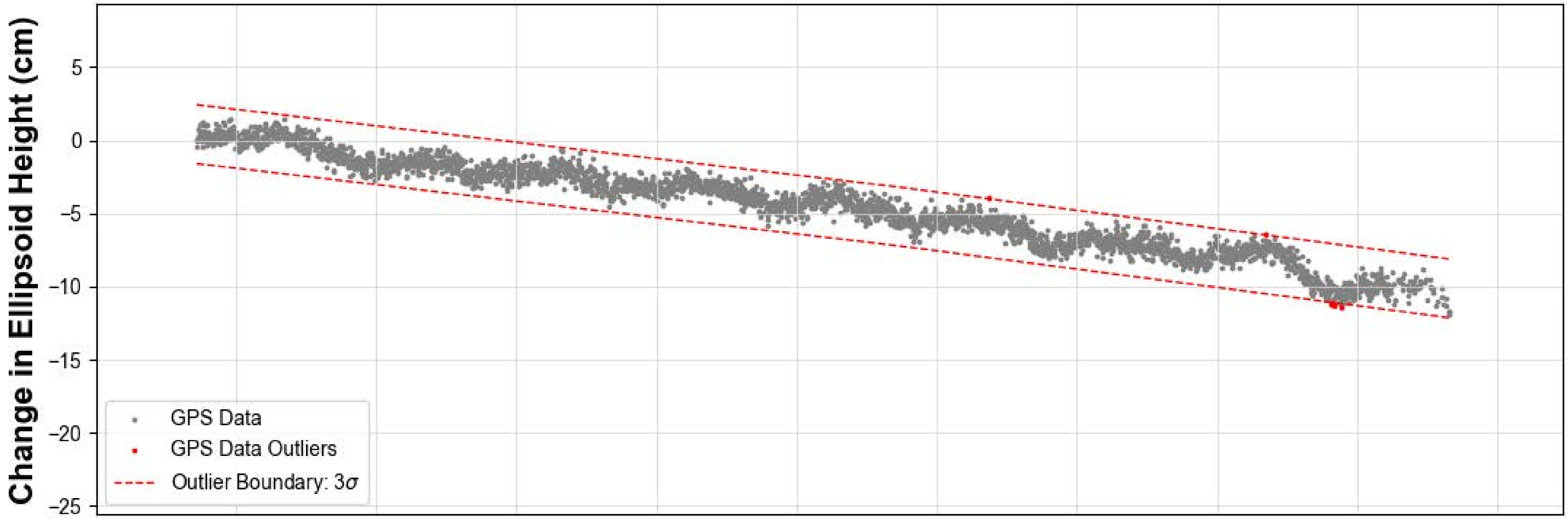


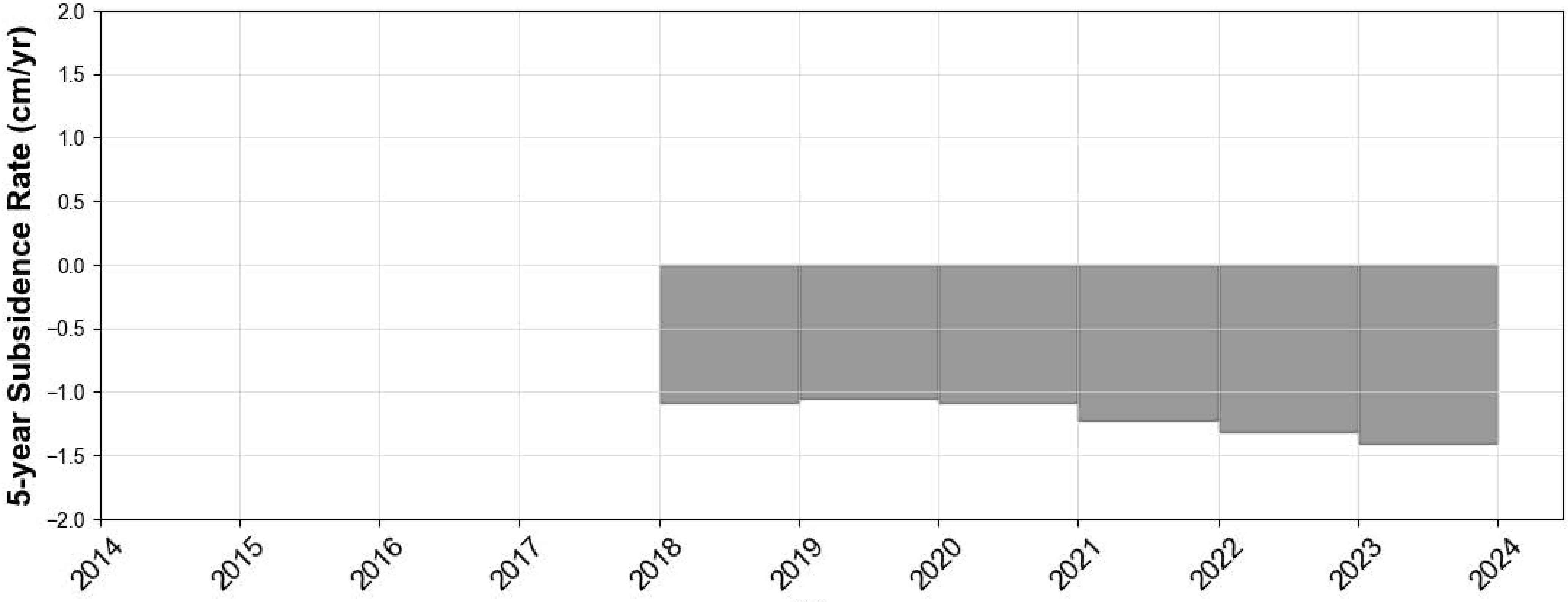


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

SHSG

Spring, TX

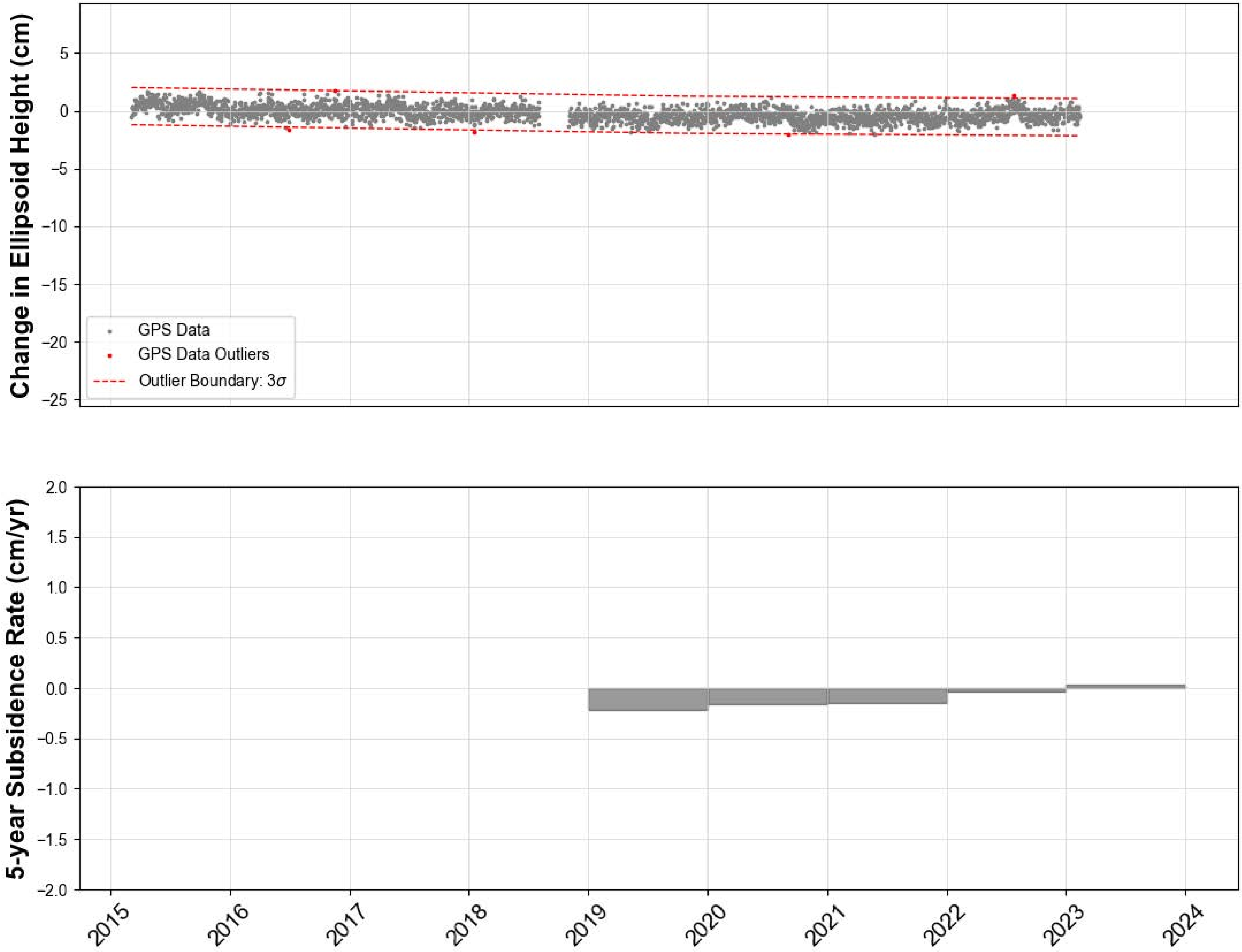




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

SISD

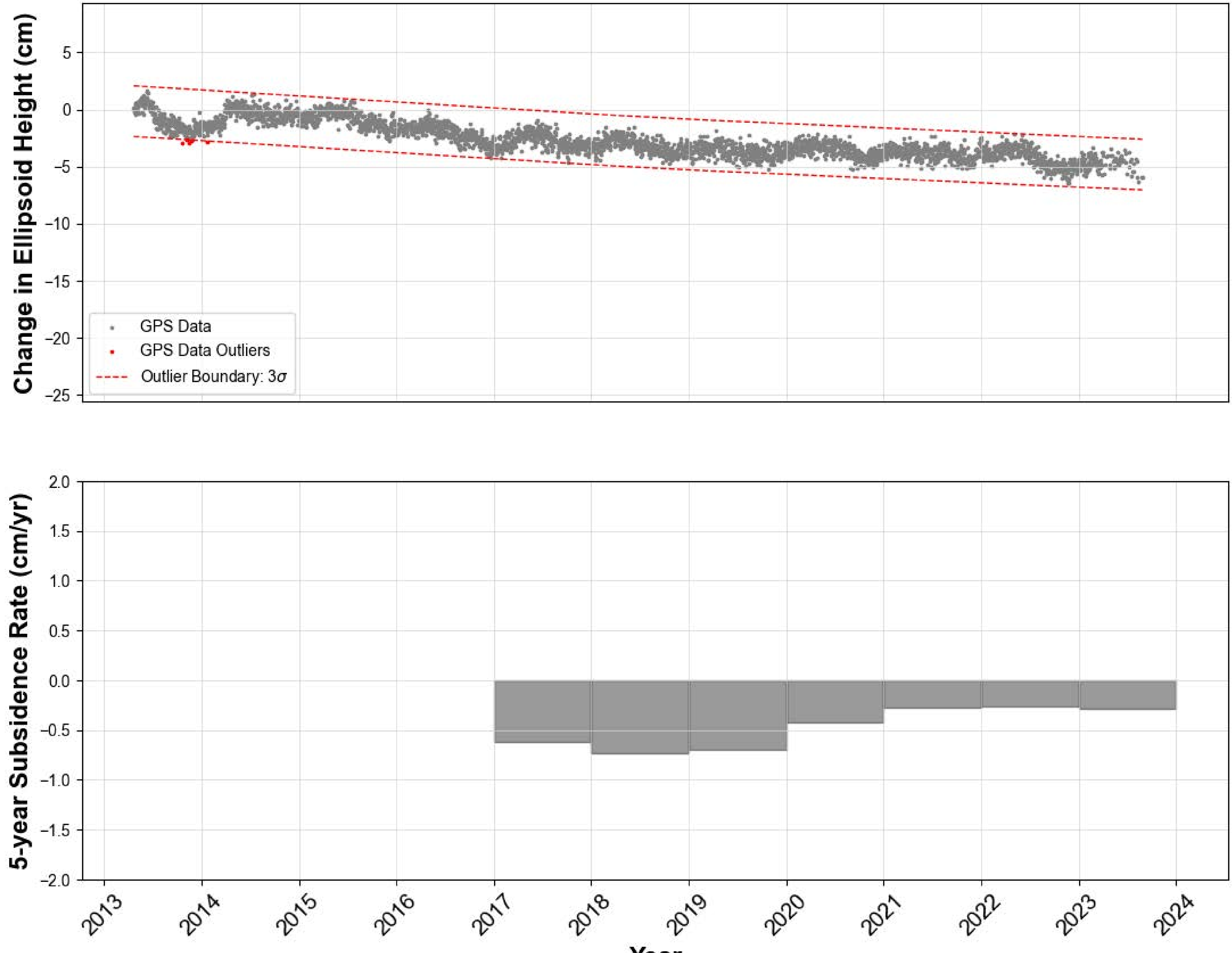
Sealy, TX



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

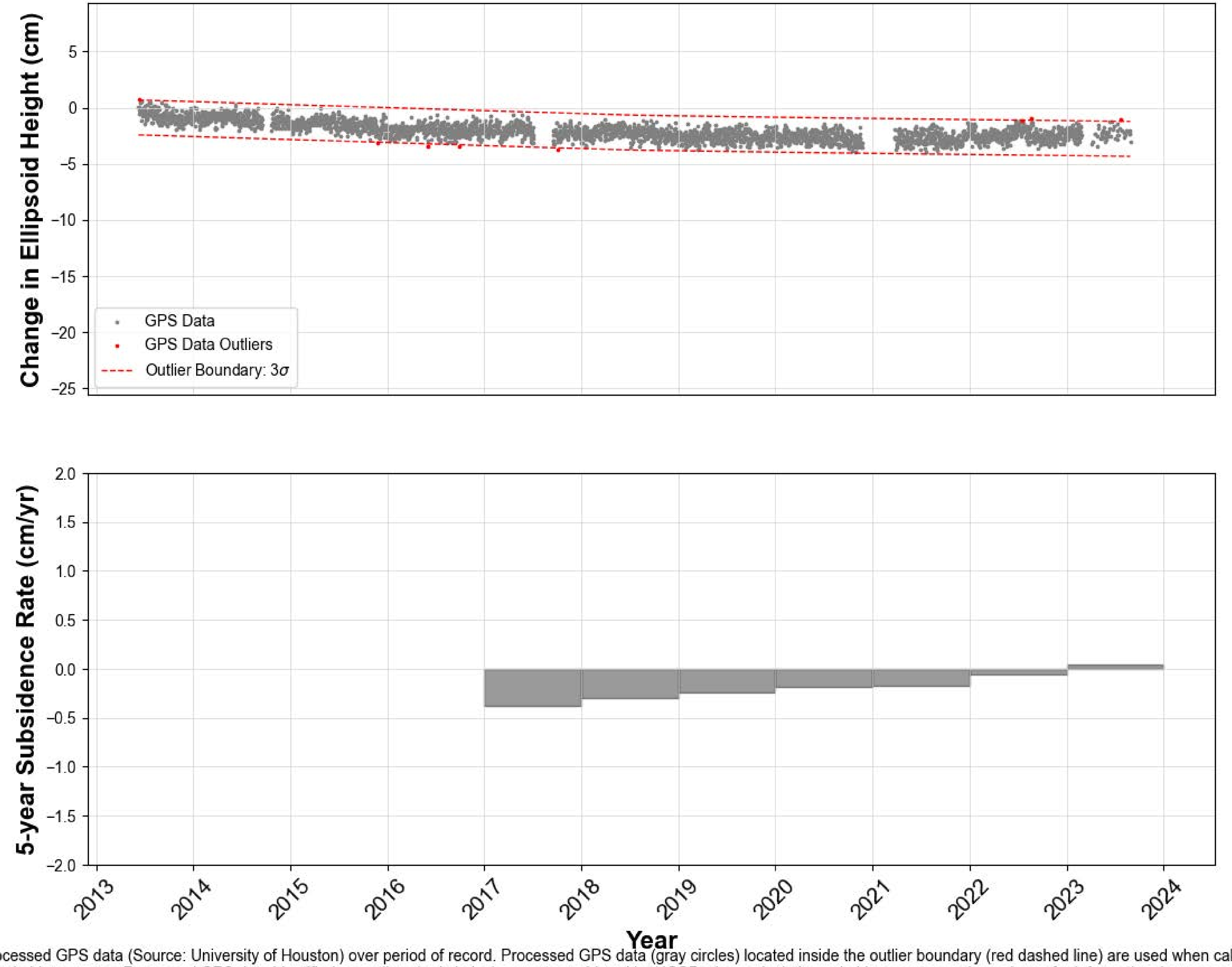
Houston, TX



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

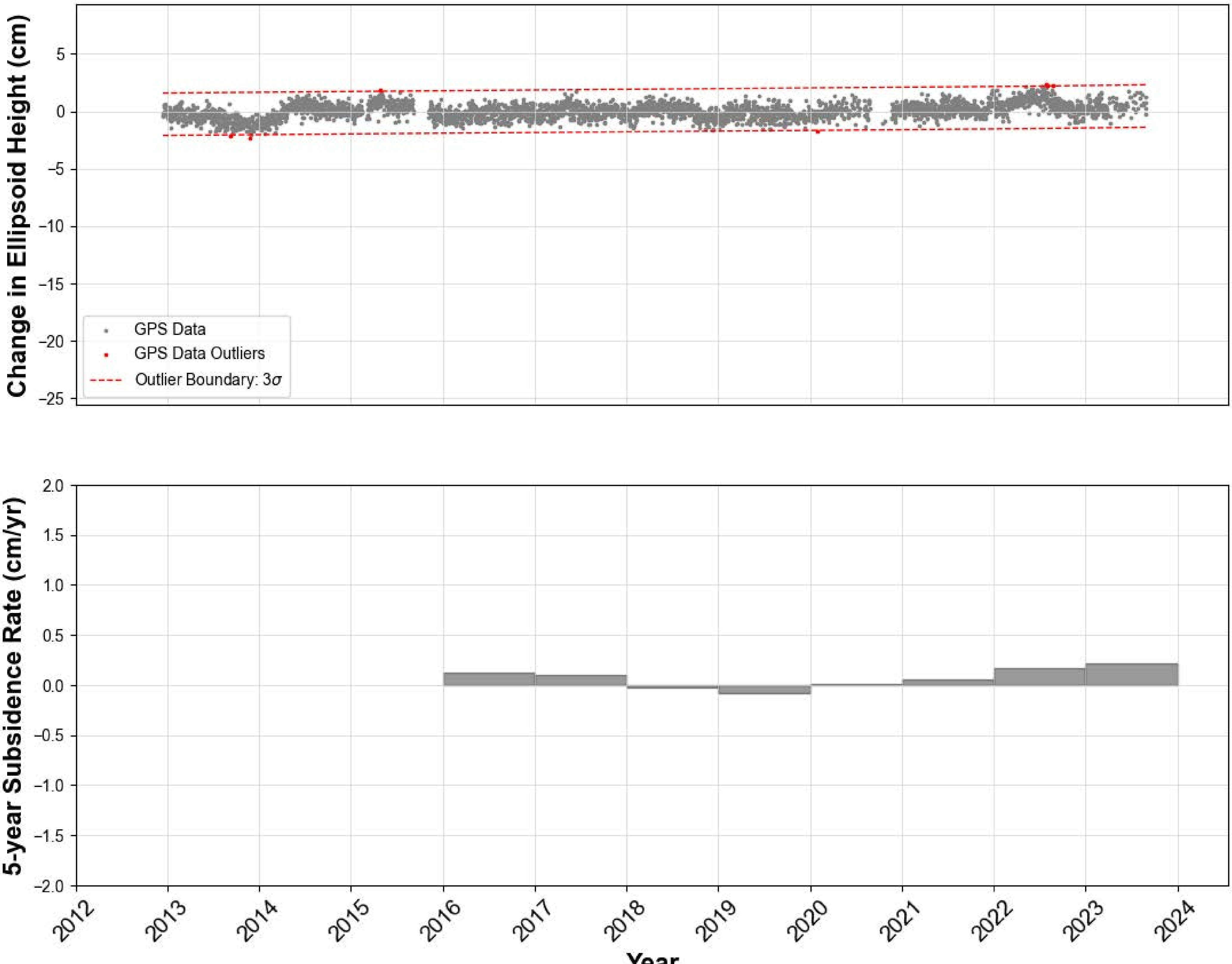
Galveston, TX



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

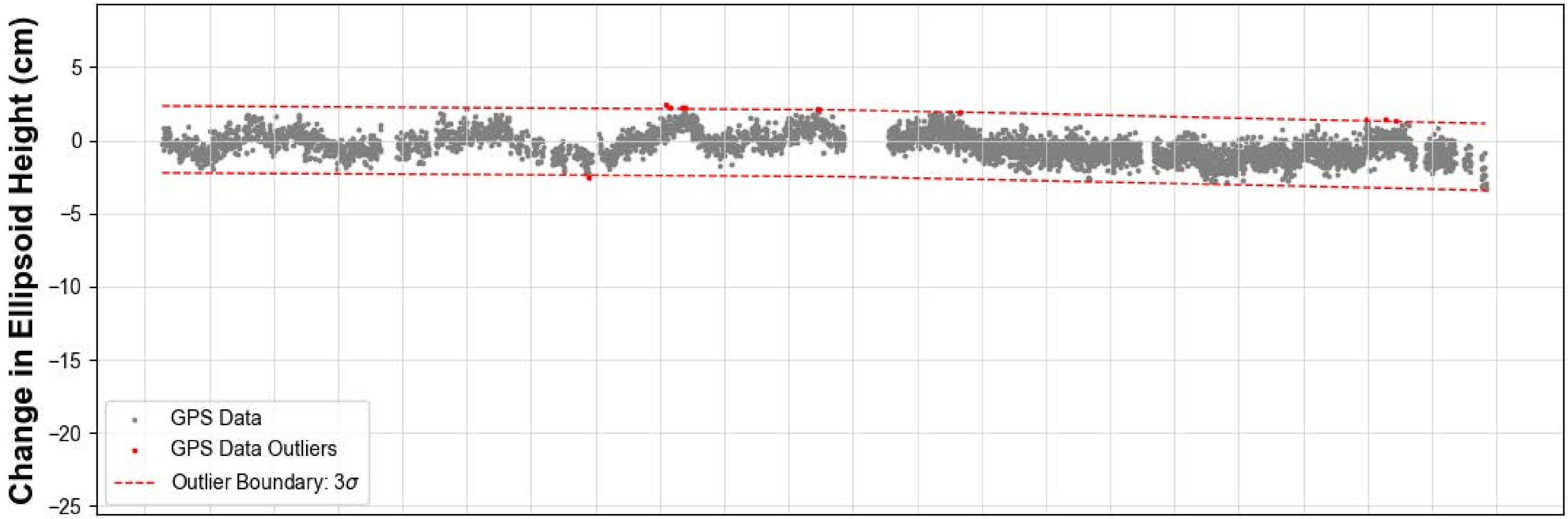
Houston, TX

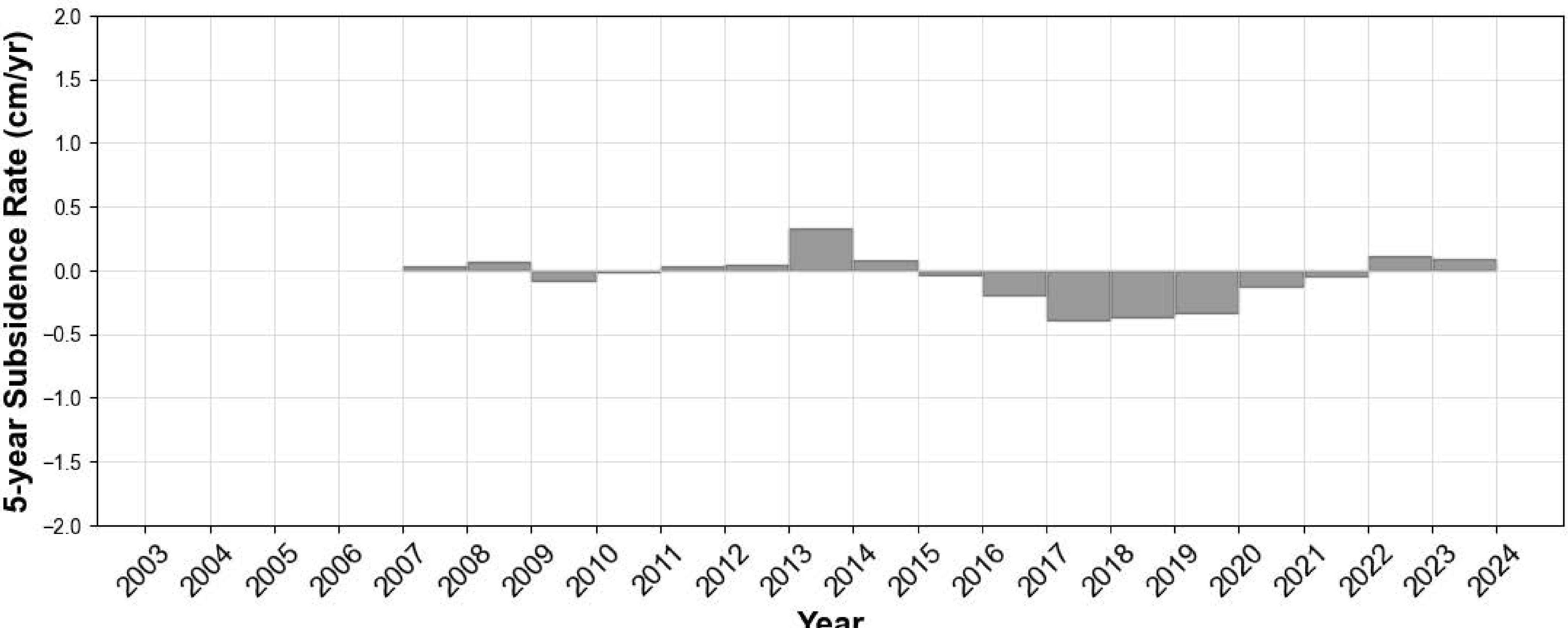


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TMCC

Houston, TX

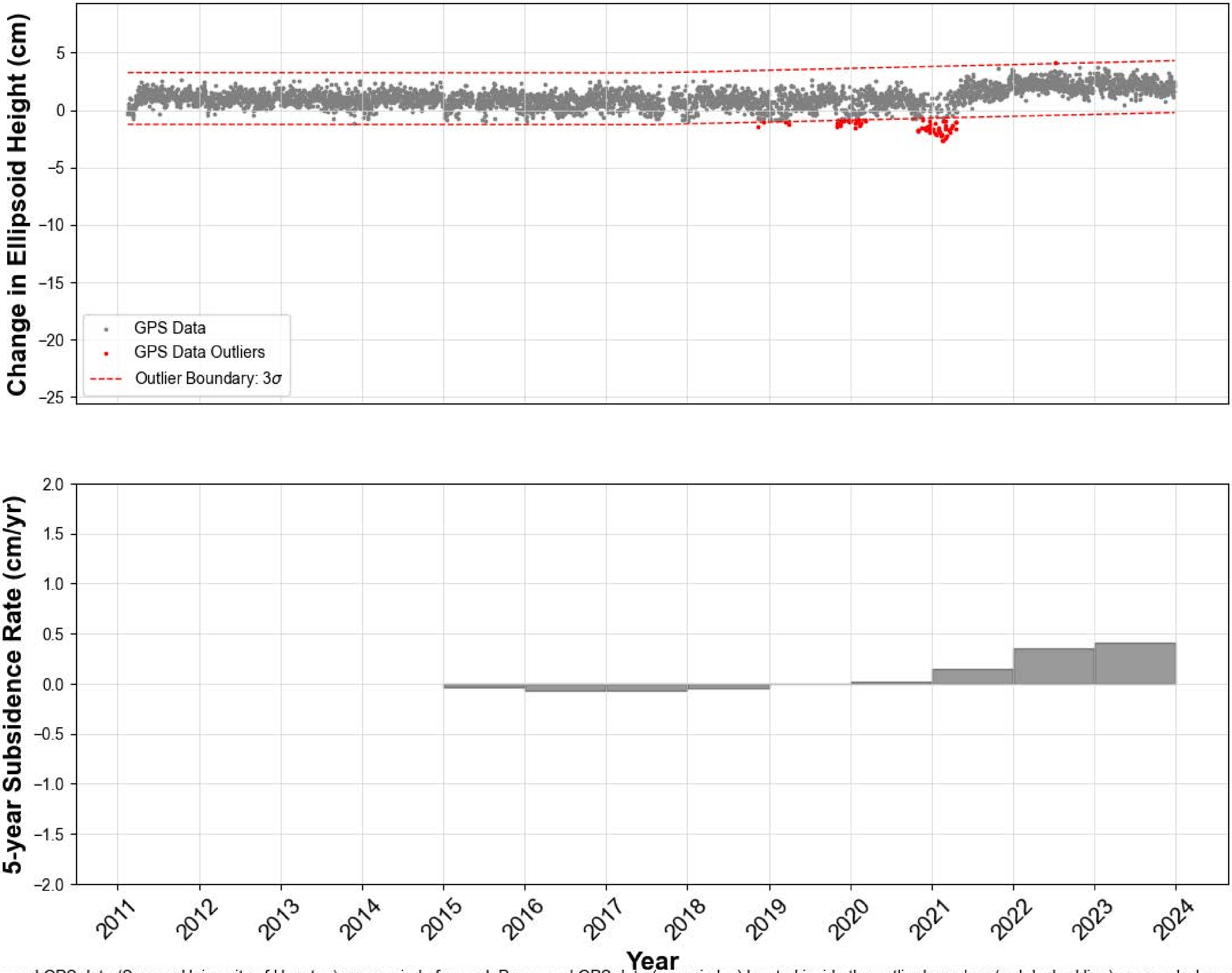




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXAC

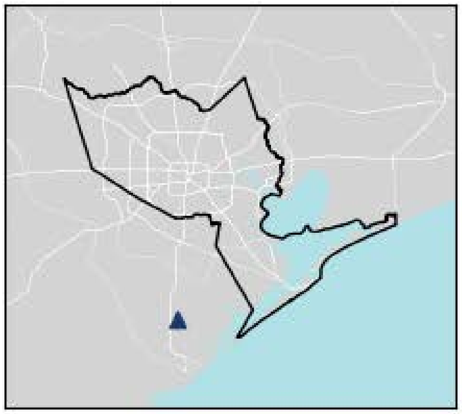
Anahuac, TX

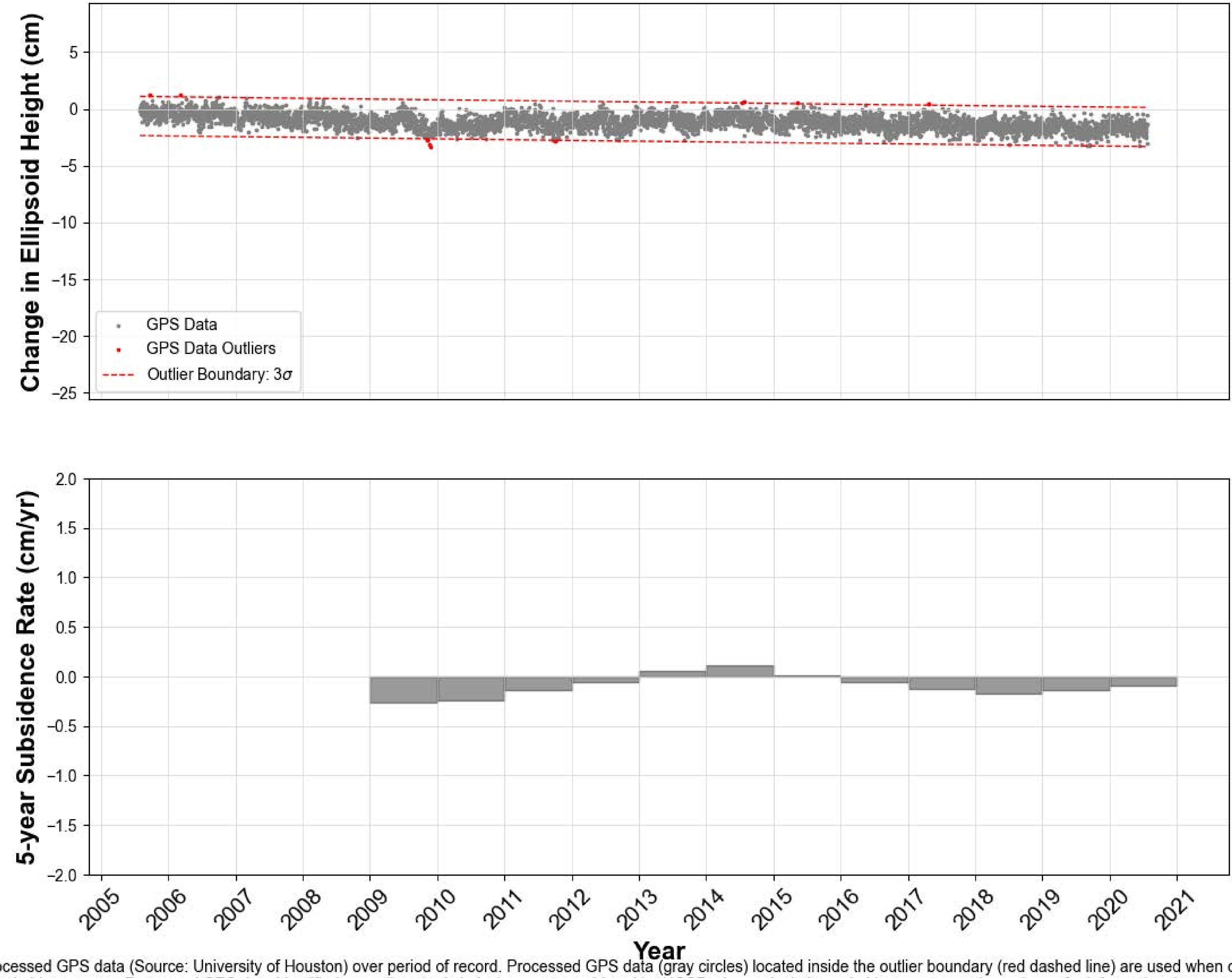


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXAG

Angleton, TX

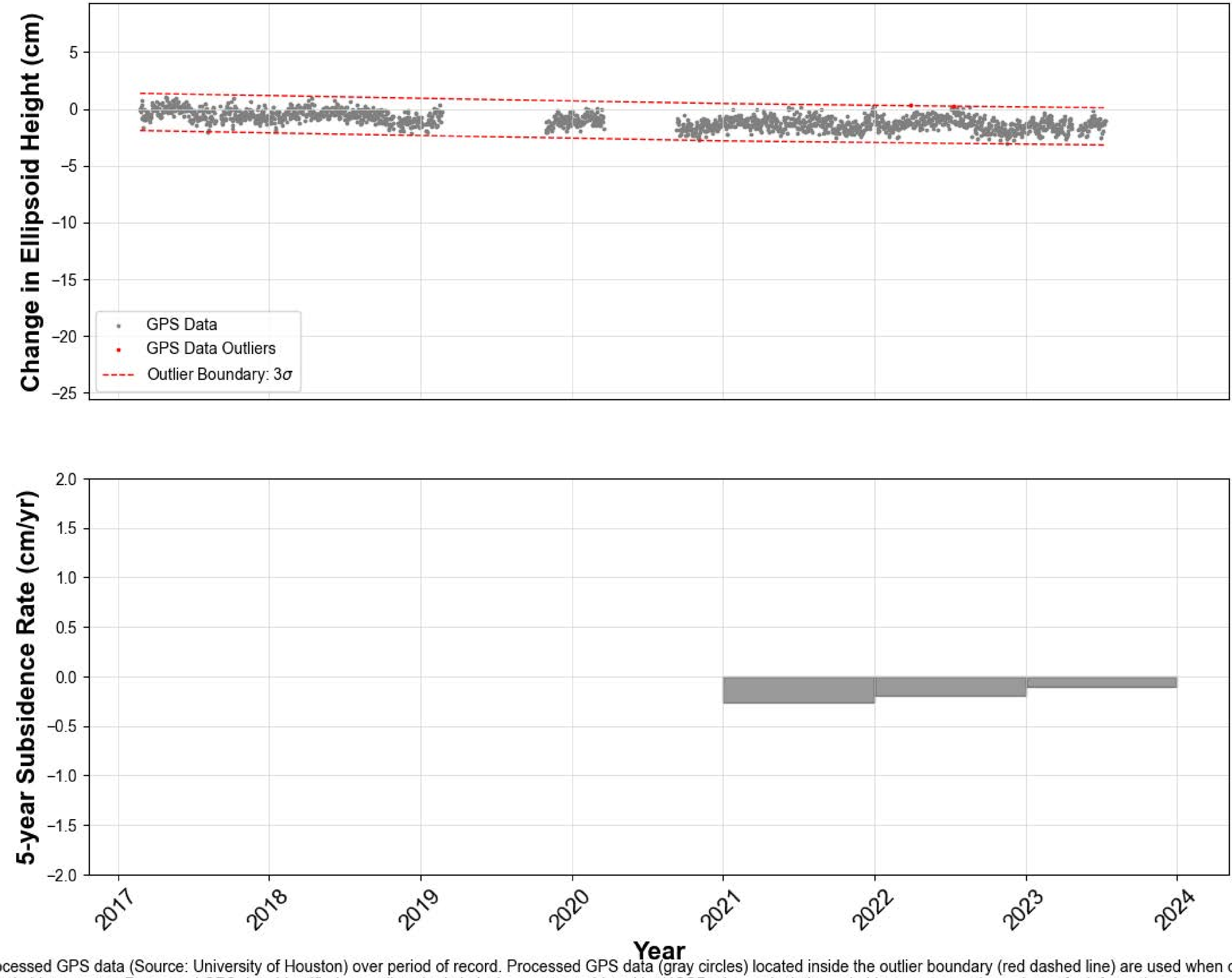




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXAV

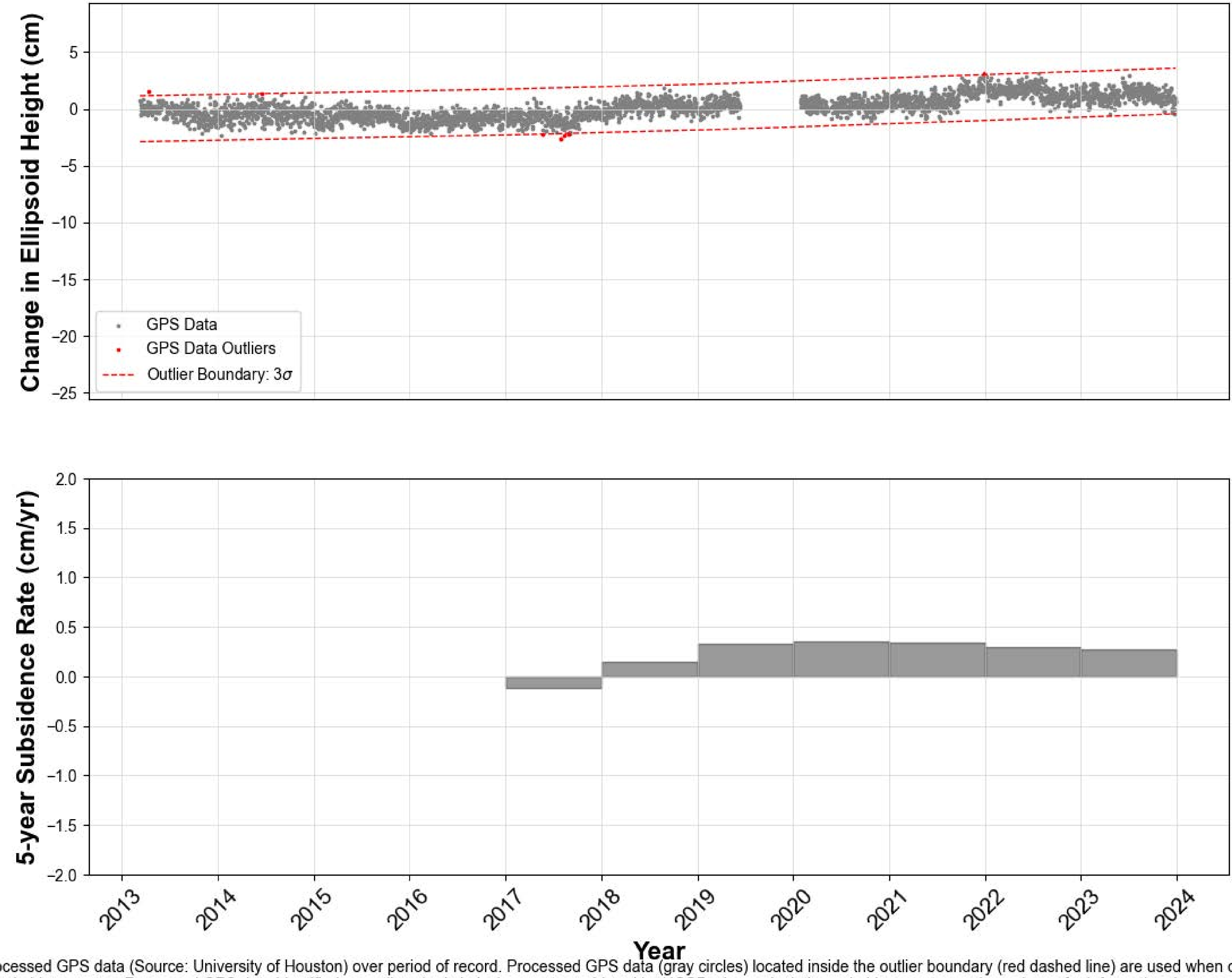
Alvin, TX



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

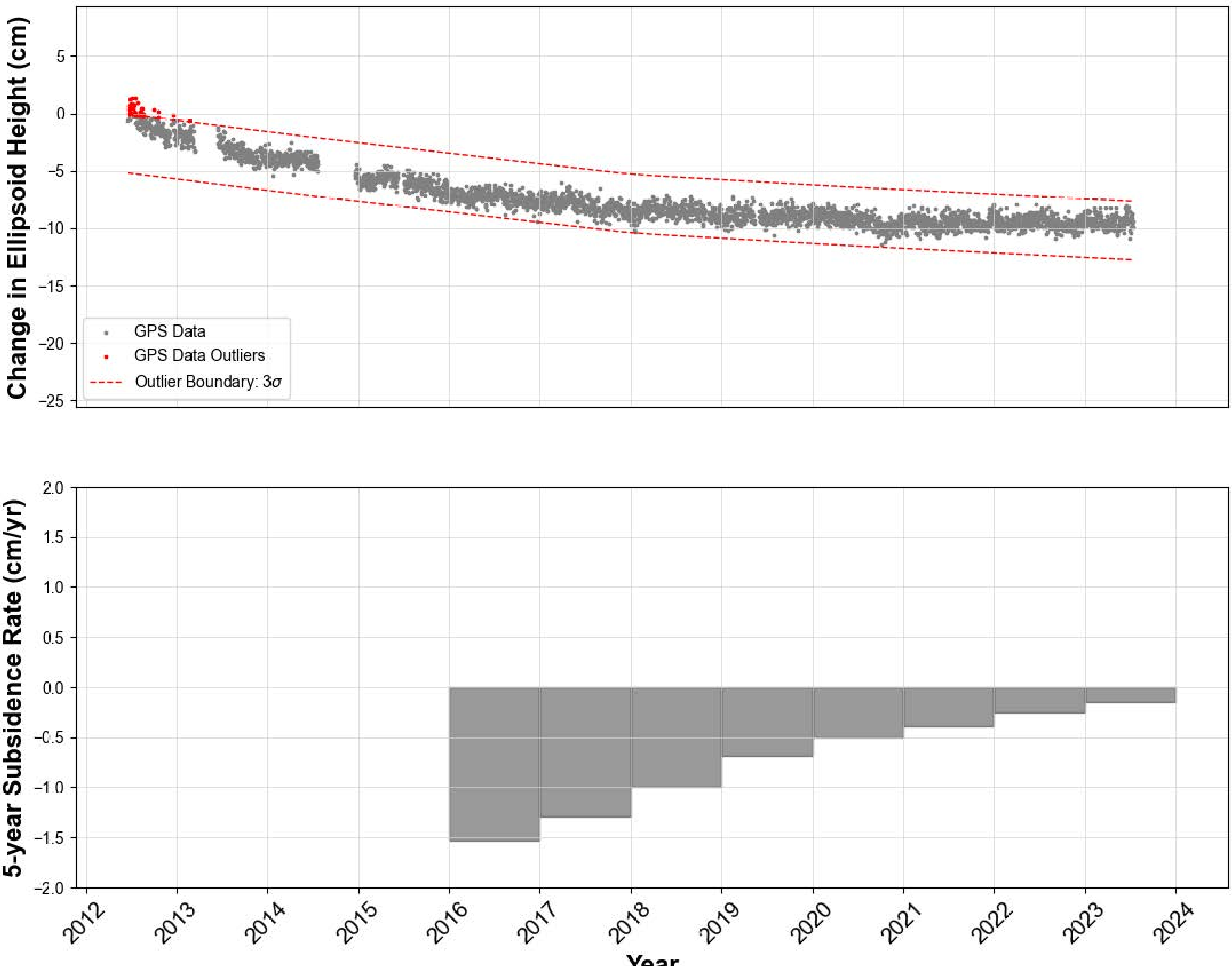
Beaumont, TX



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

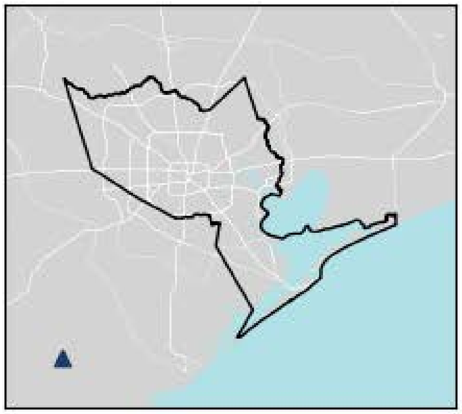
Beaumont, TX

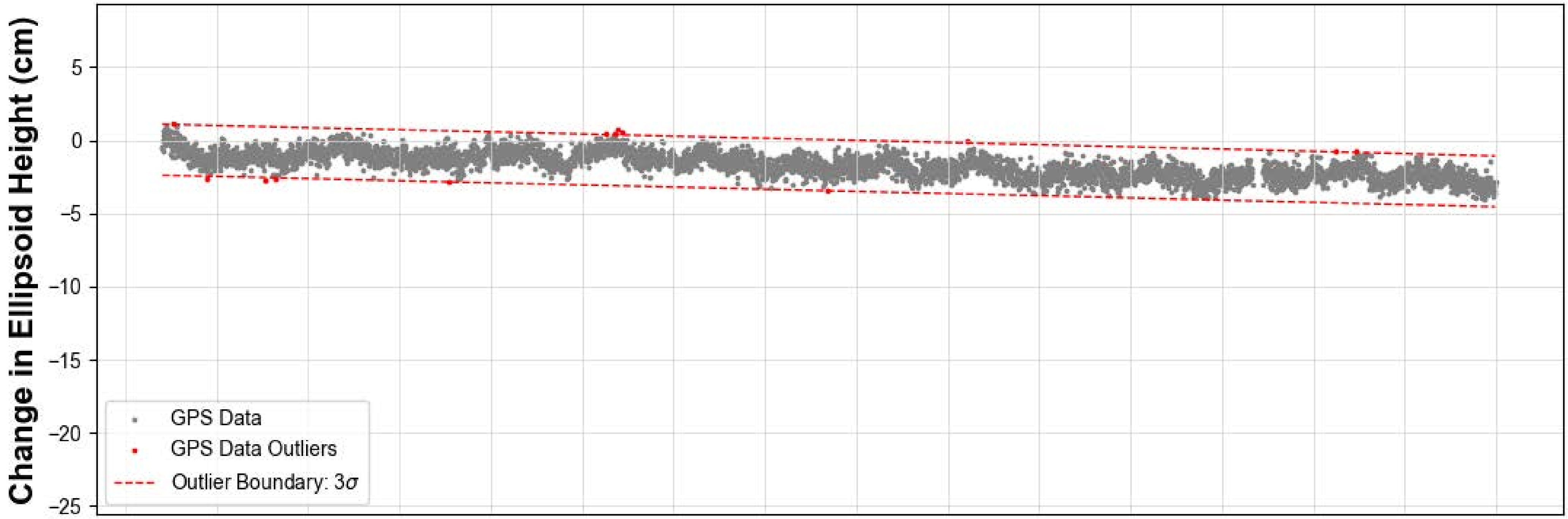


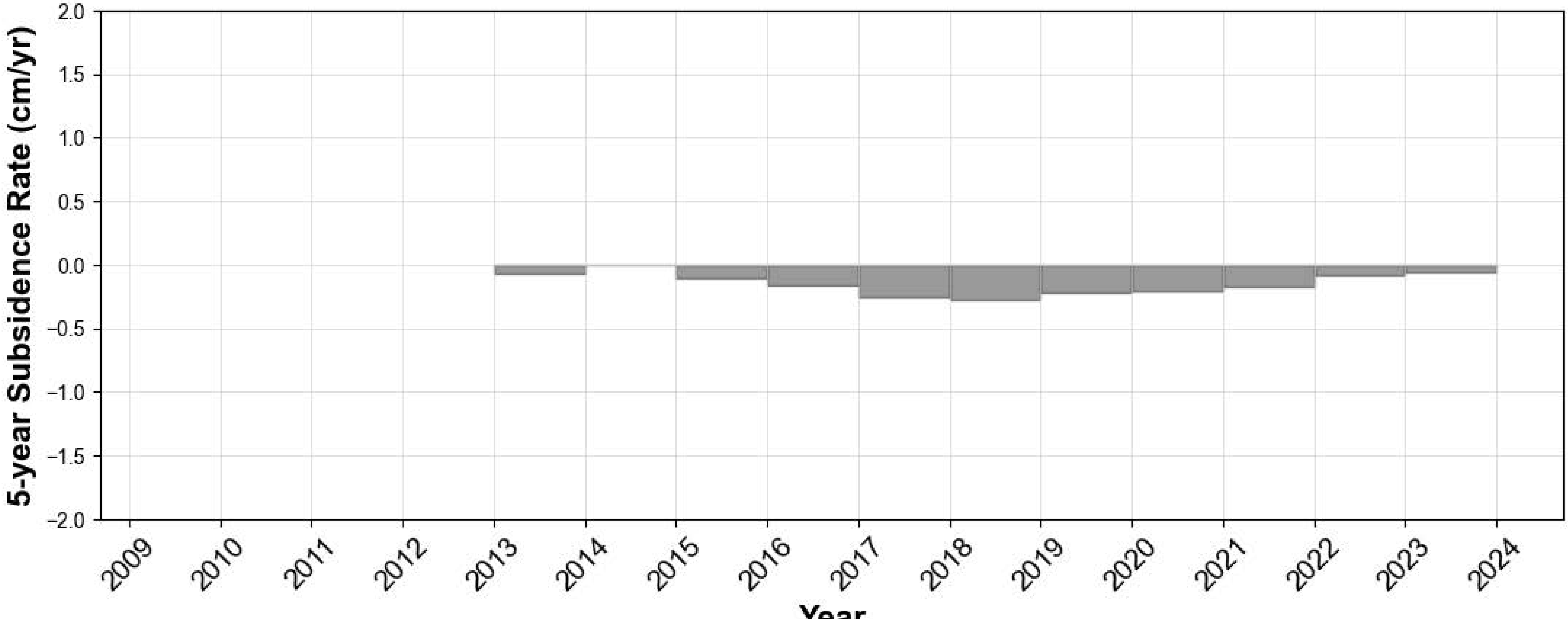
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXBC

Bay City, TX



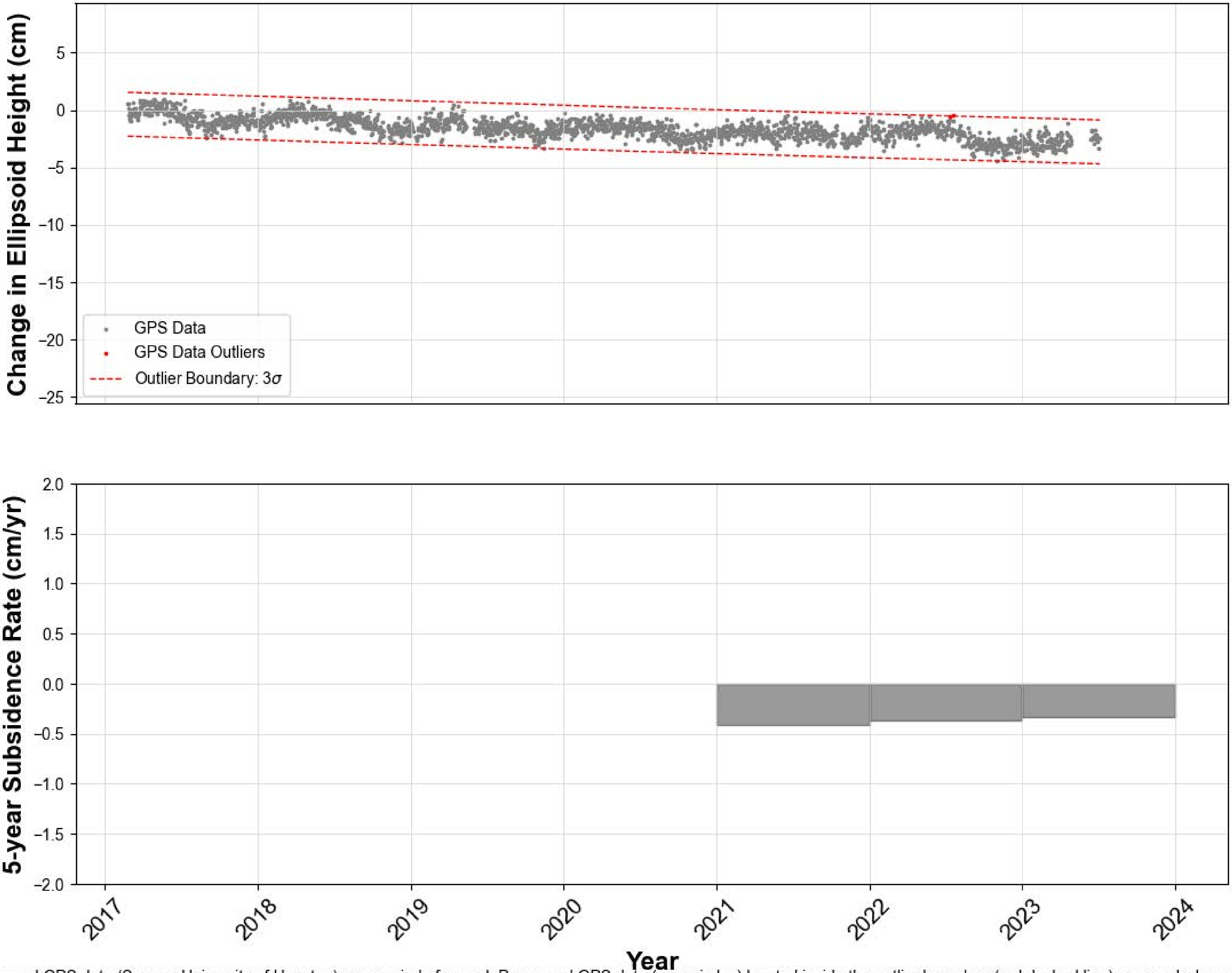




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXBH

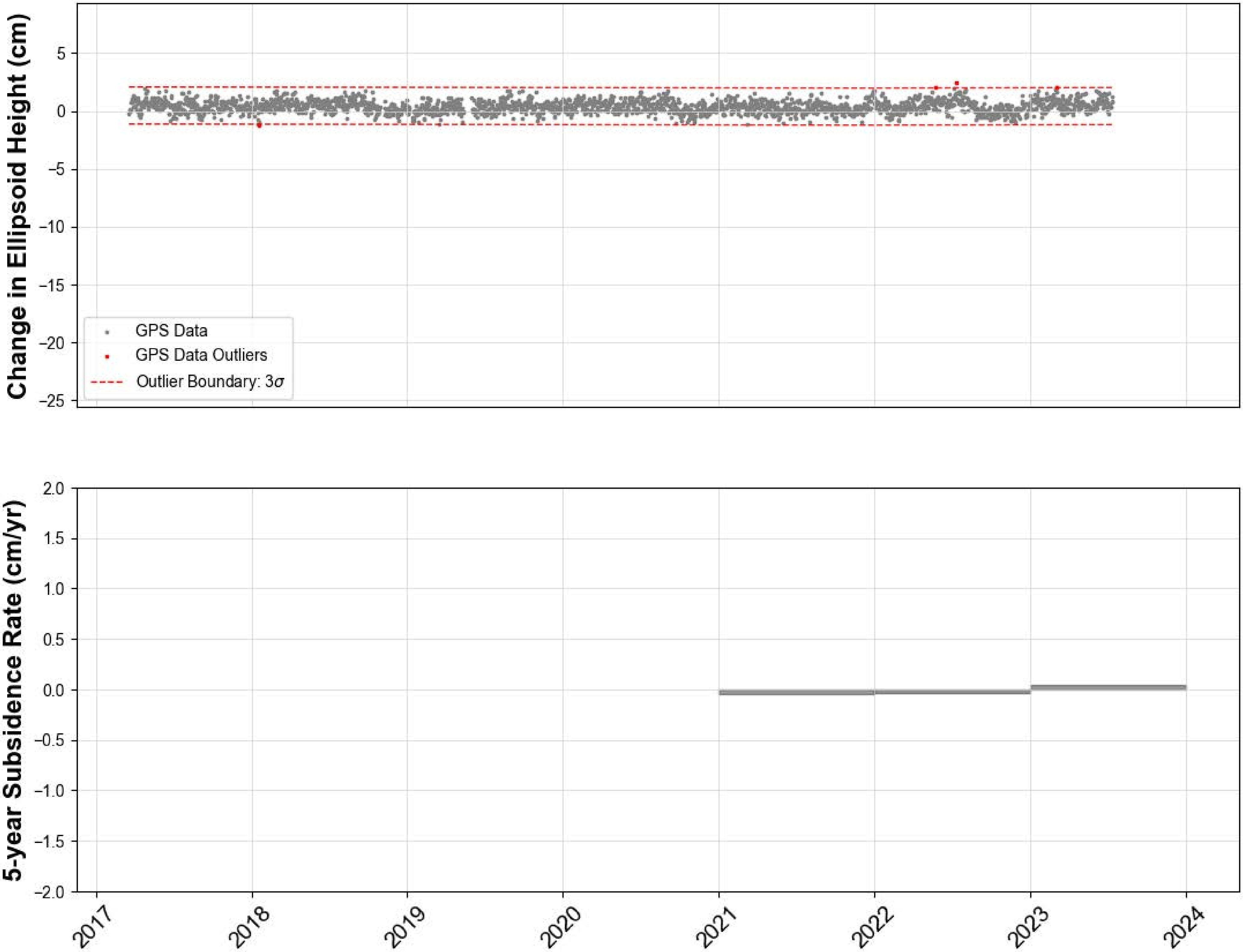
Brookshire, TX



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

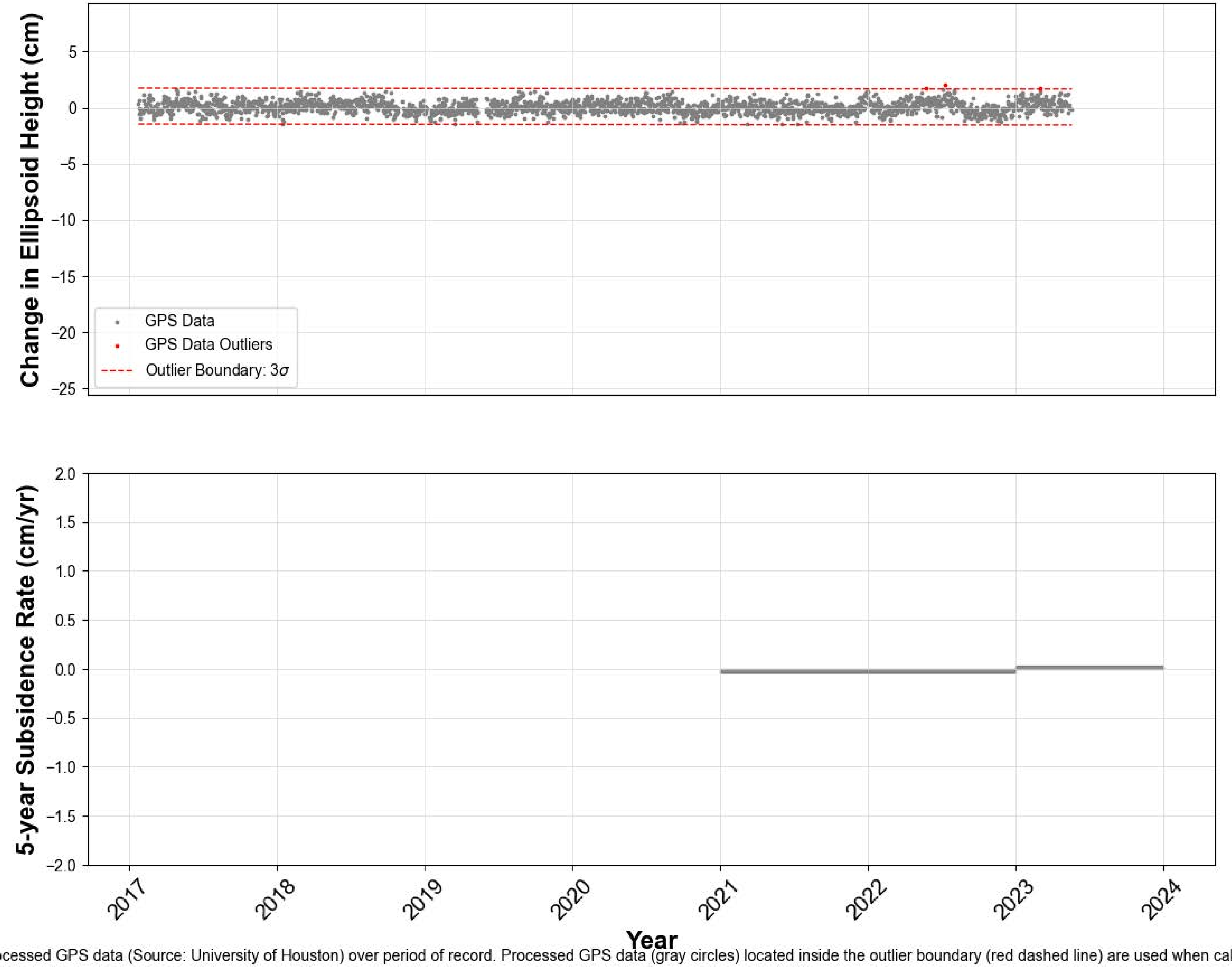
Columbus, TX



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

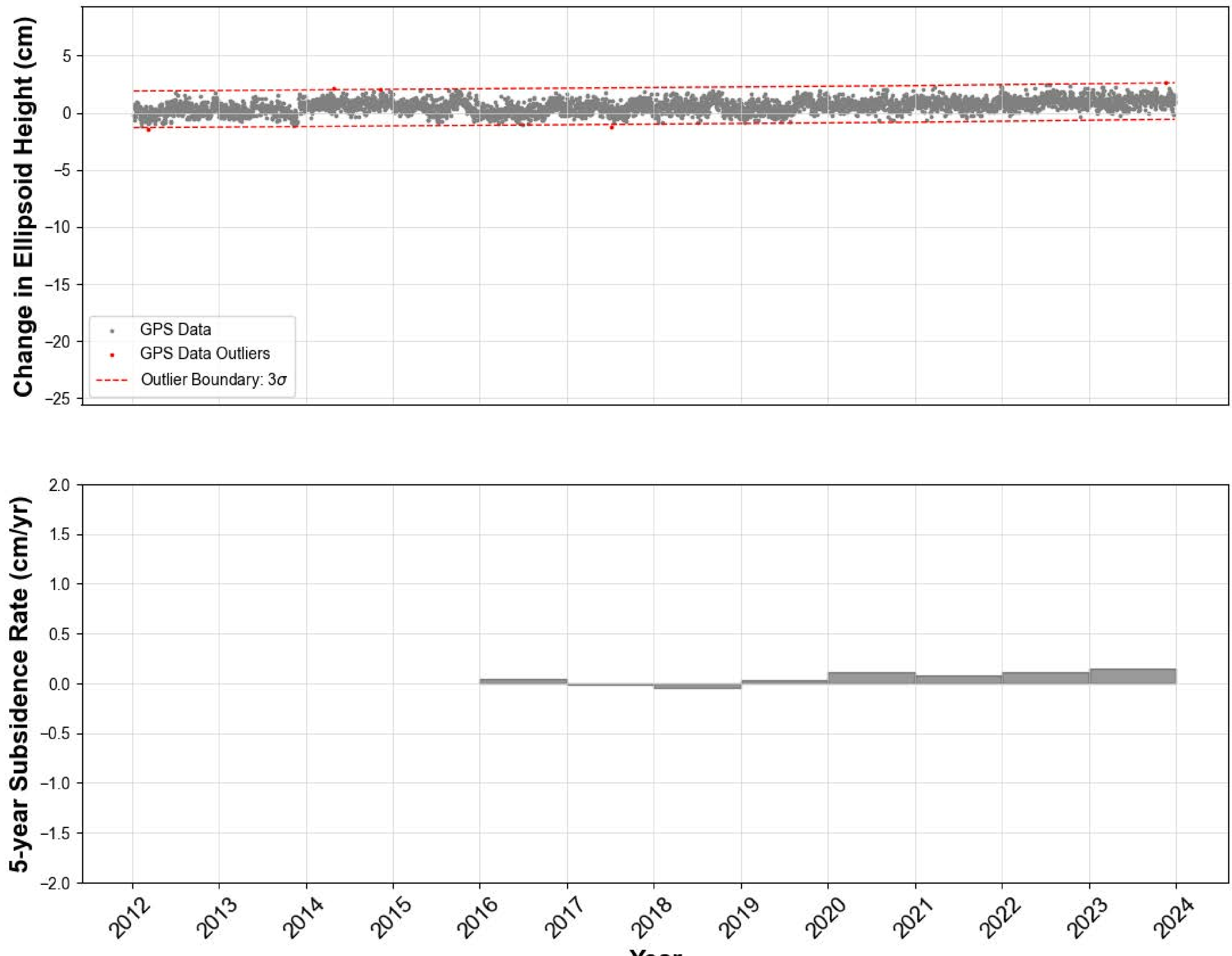
Columbus, TX



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

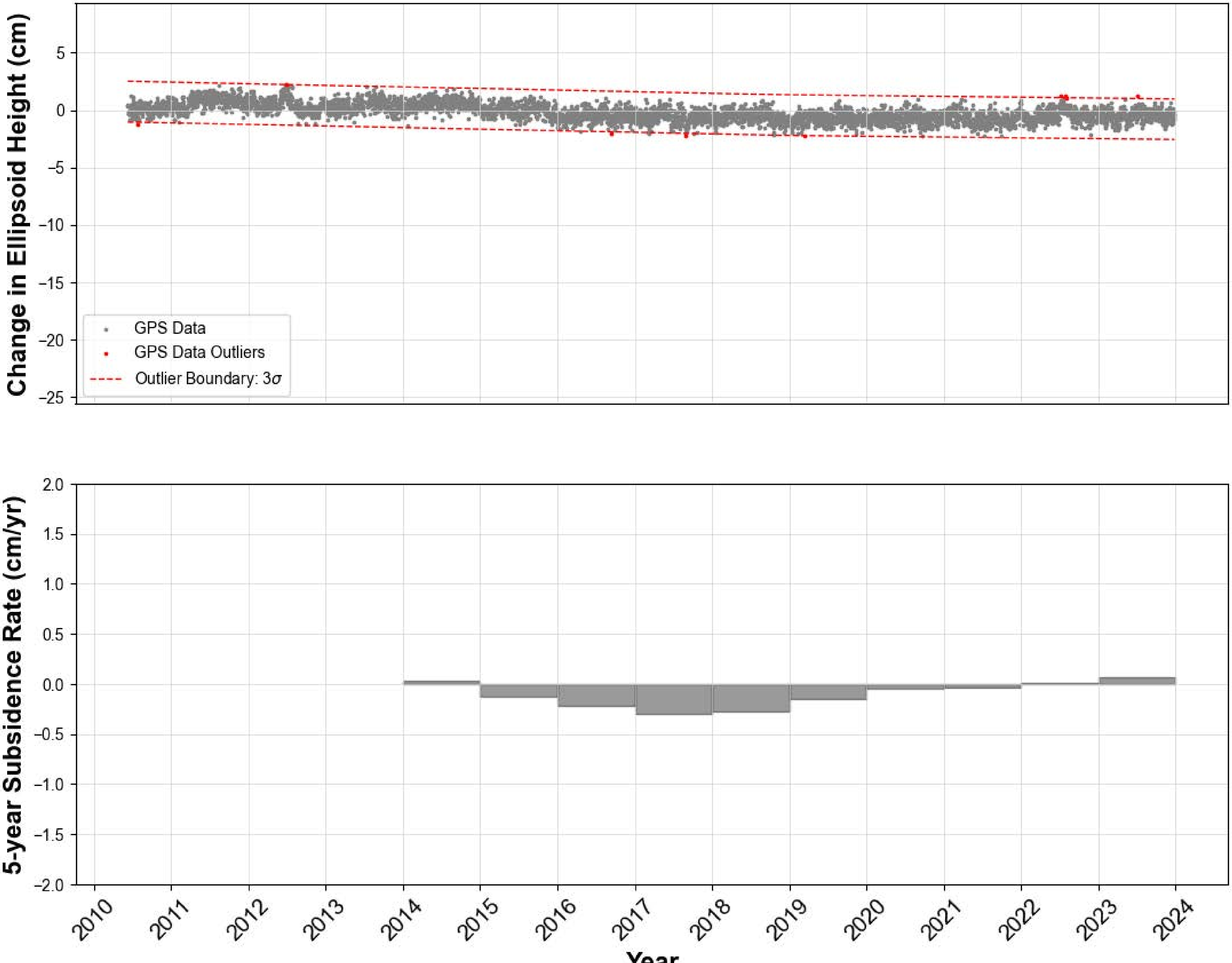
Crockett, TX



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

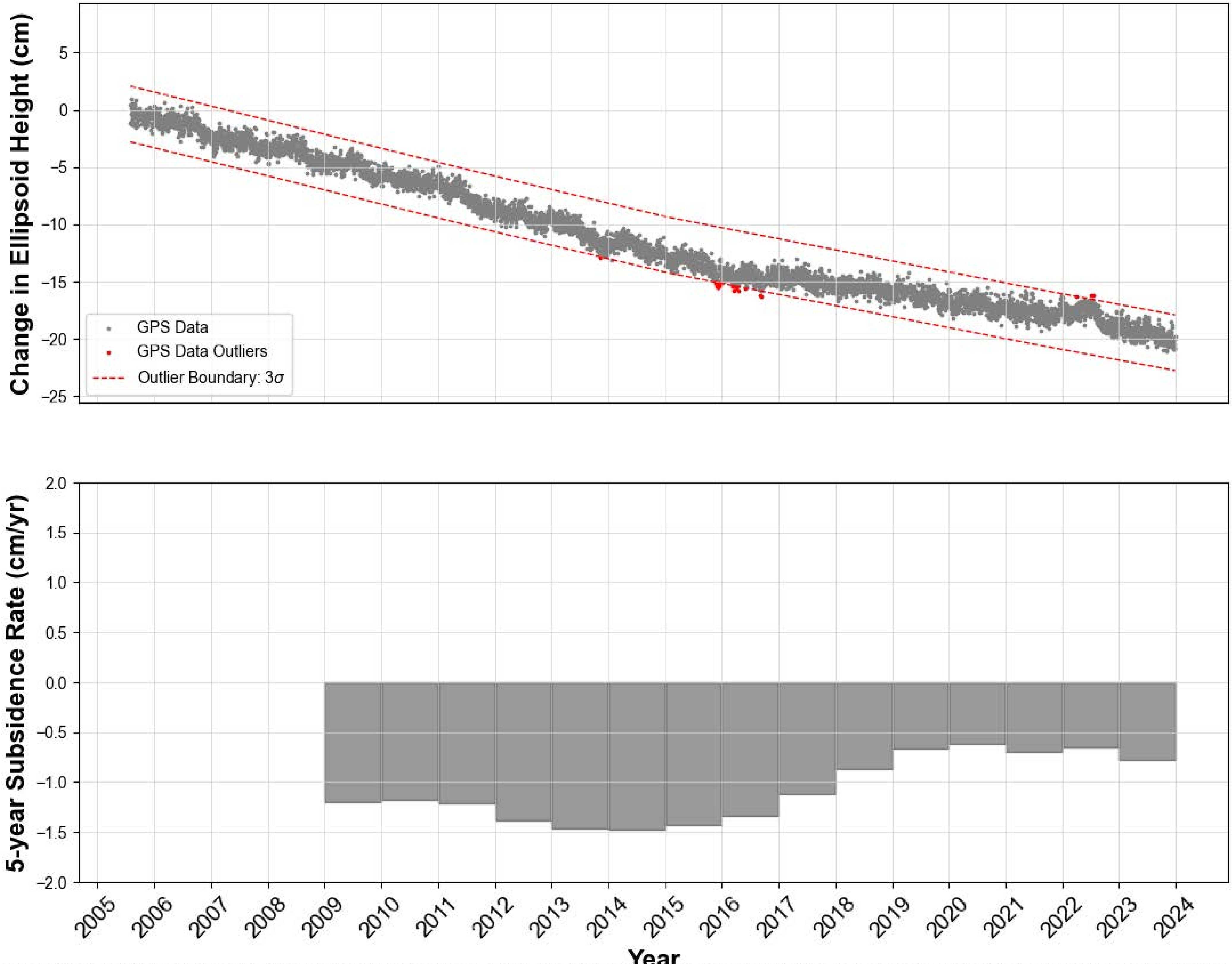
Glidden, TX



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

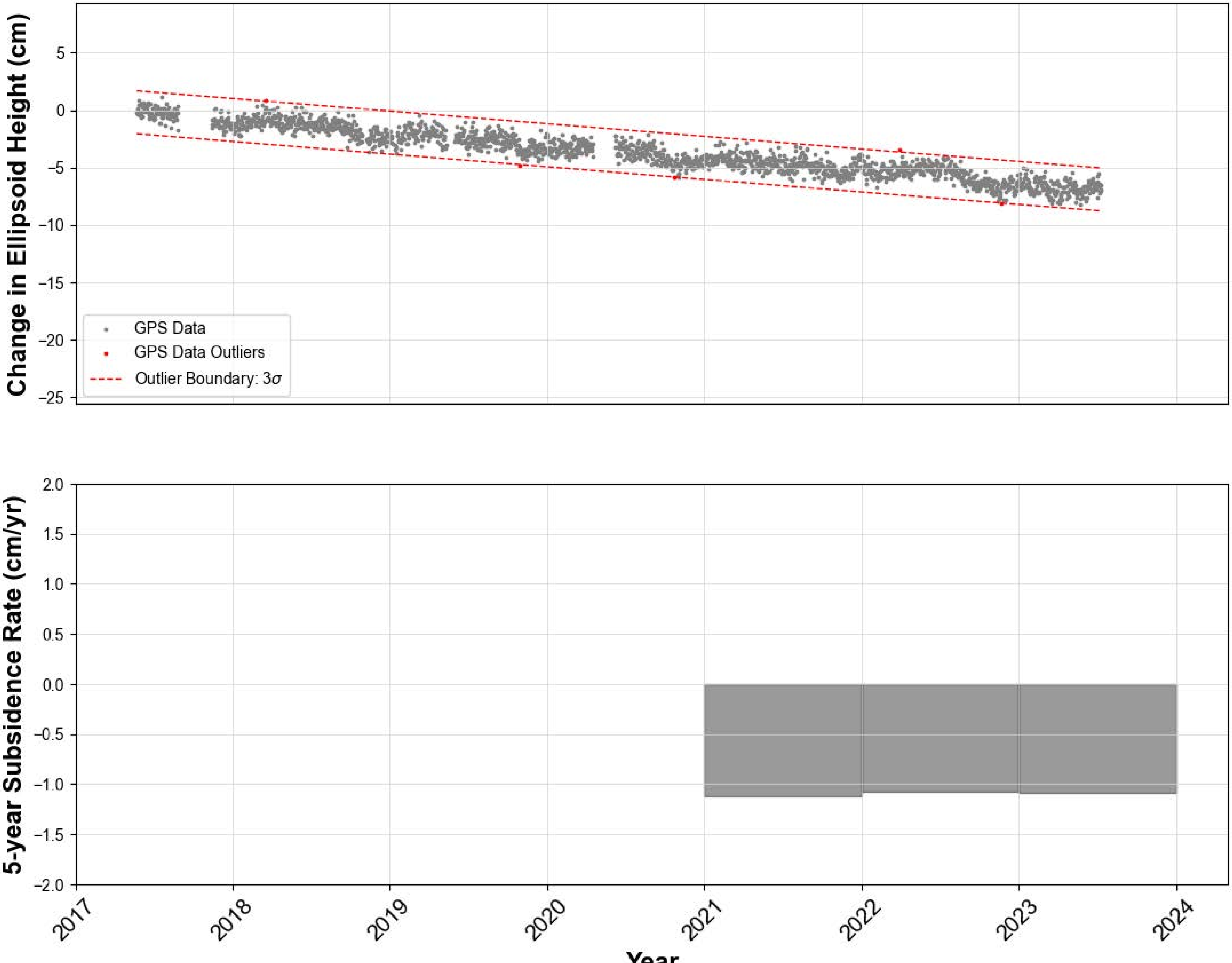
Conroe, TX



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

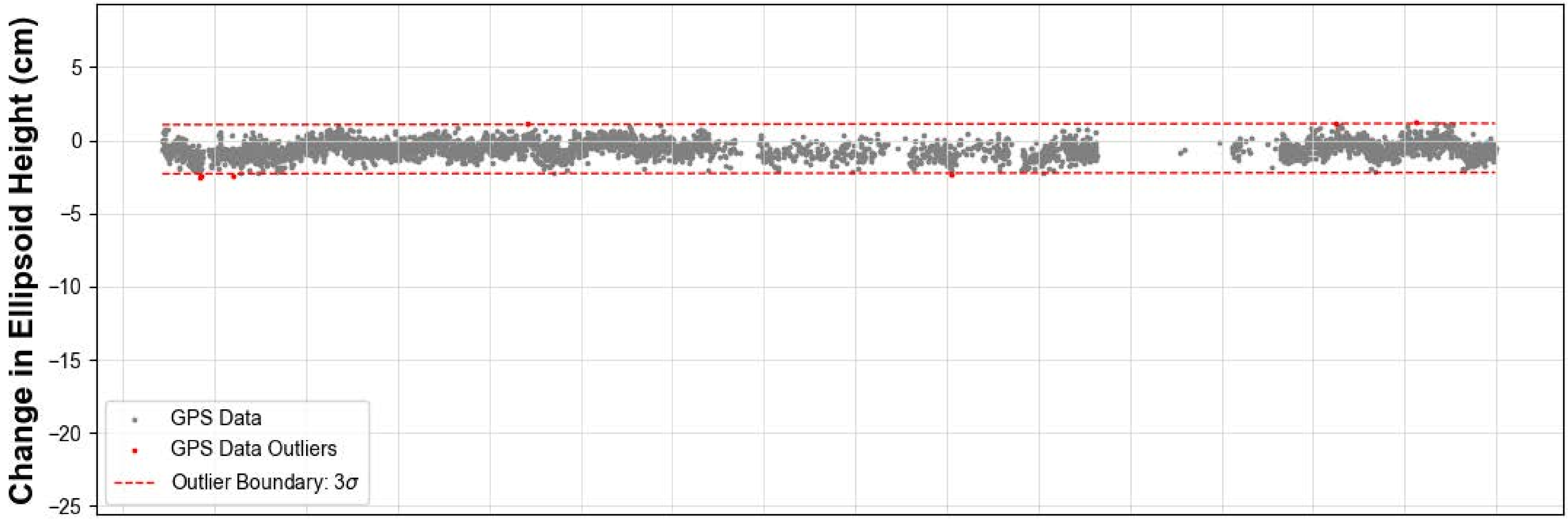
Tomball, TX

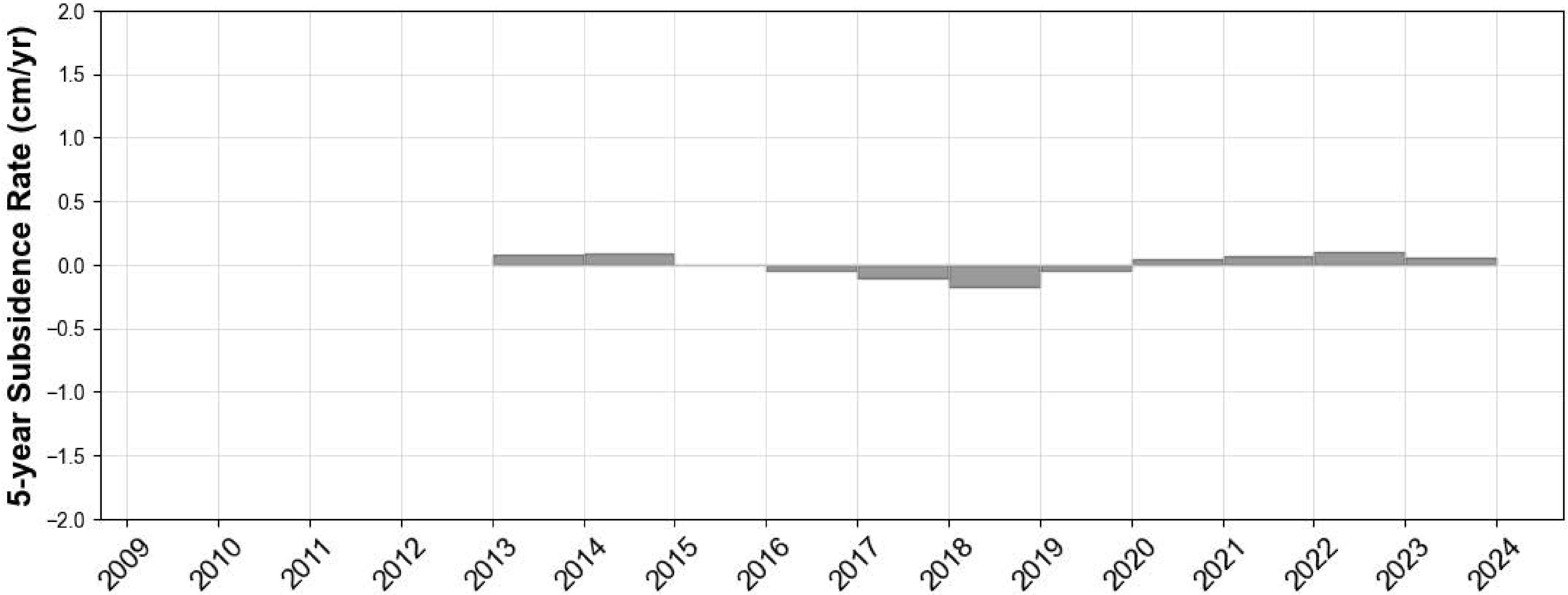


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXED

Edna, TX

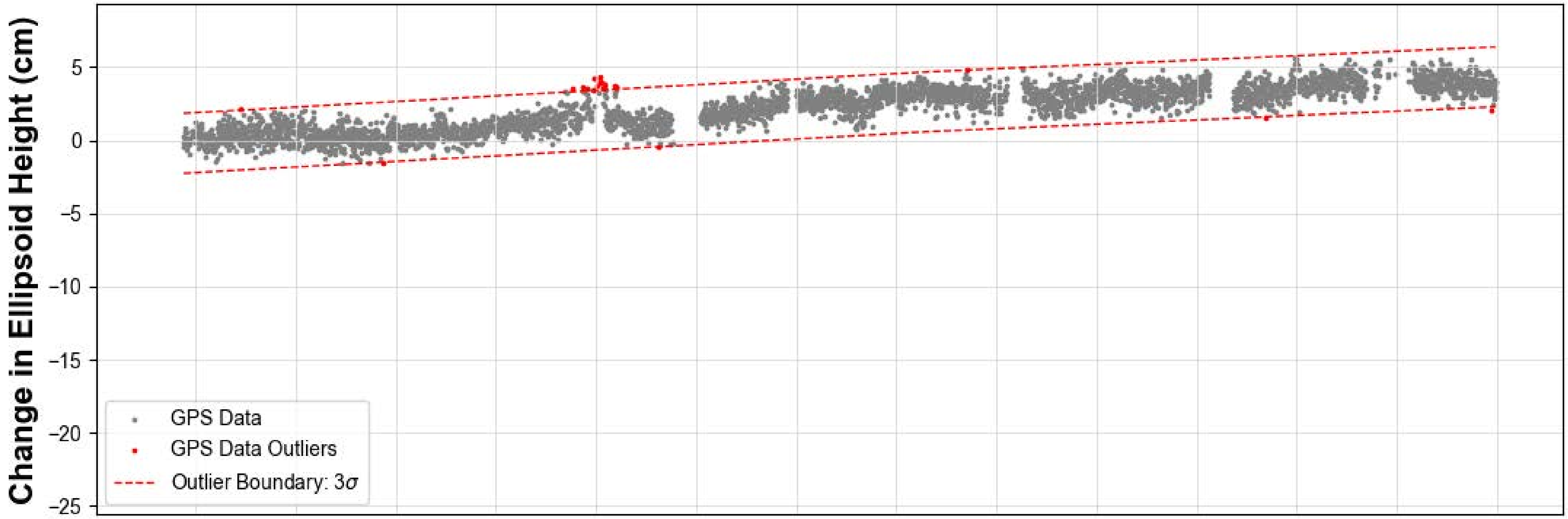


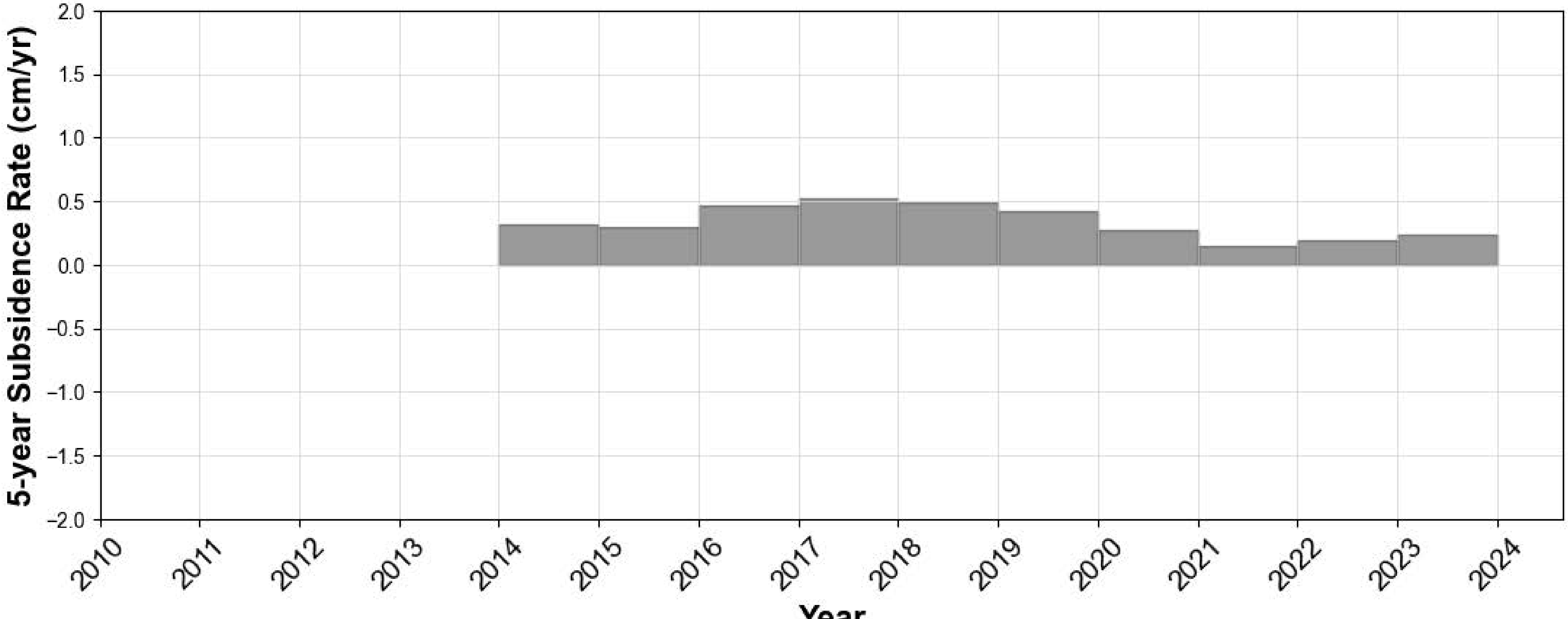


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXEX

Houston, TX

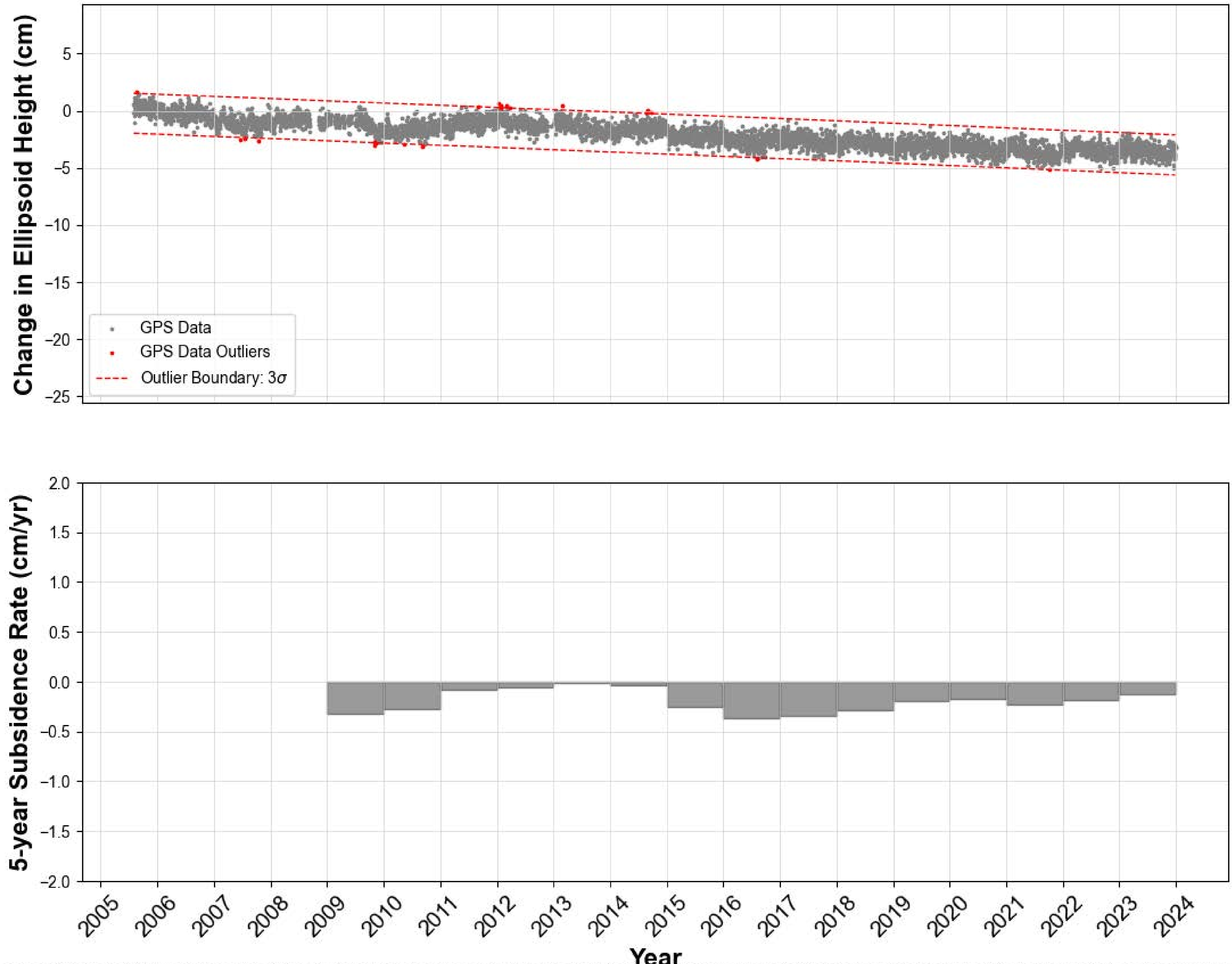




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXGA

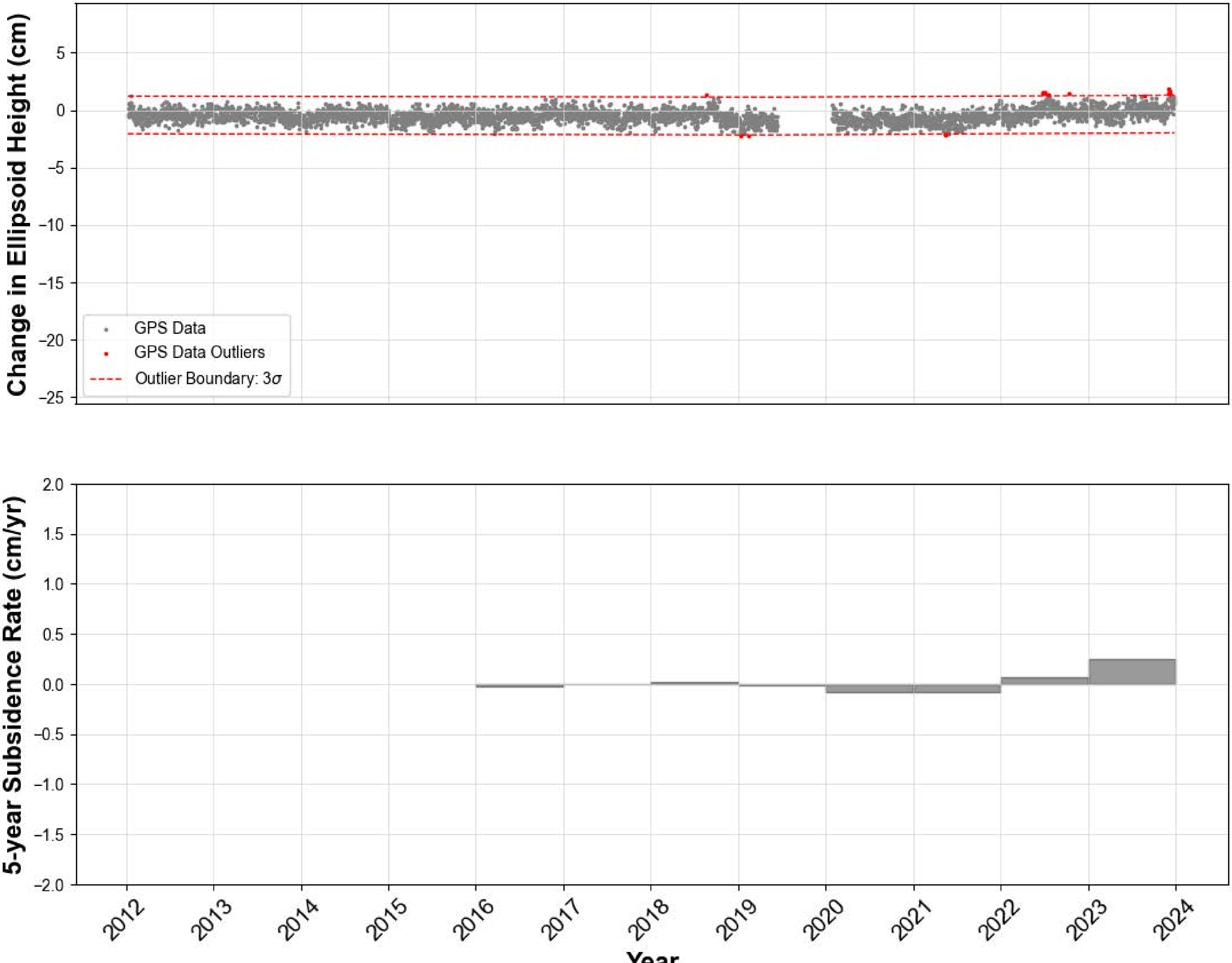
Galveston, TX



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

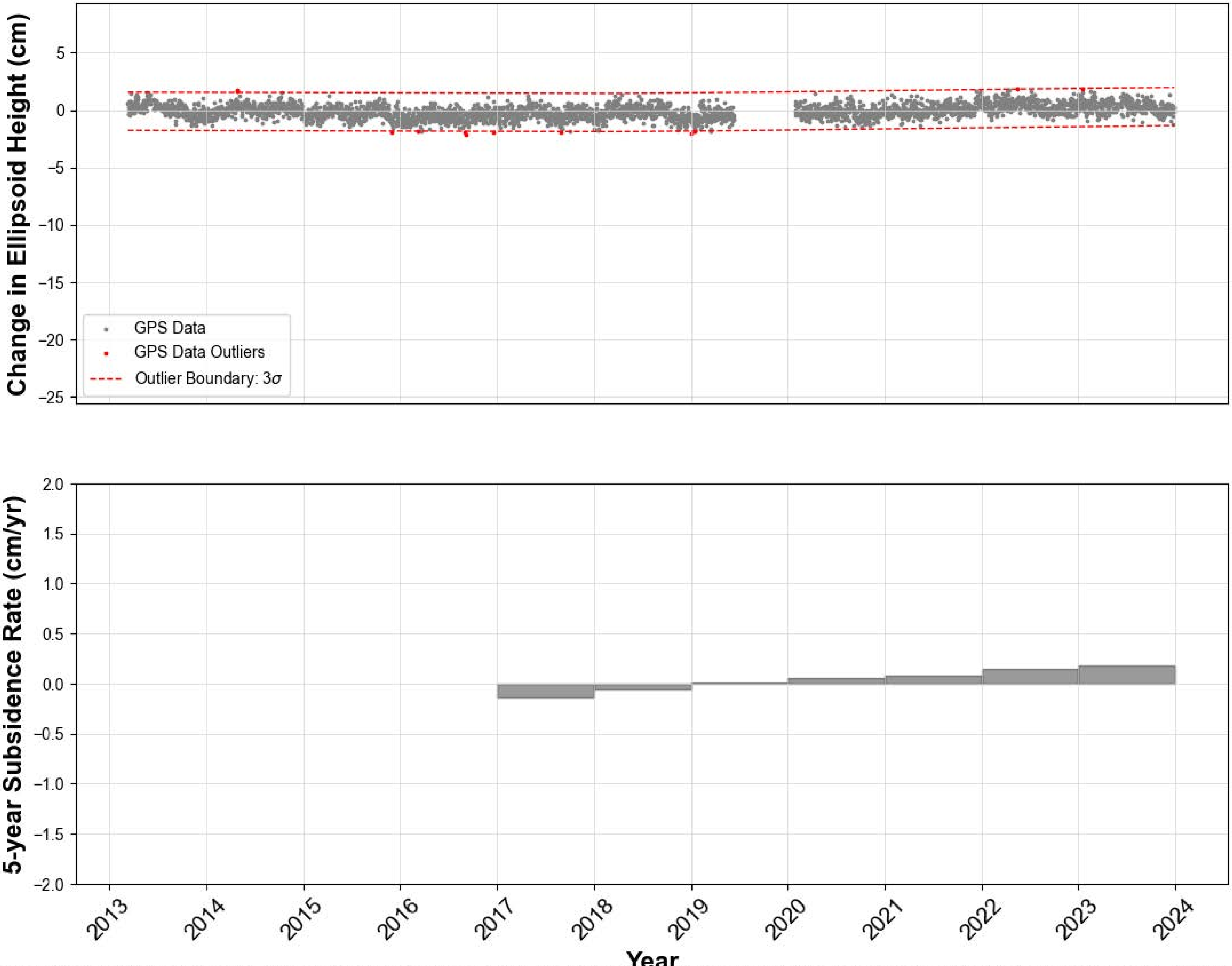
Groveton, TX



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

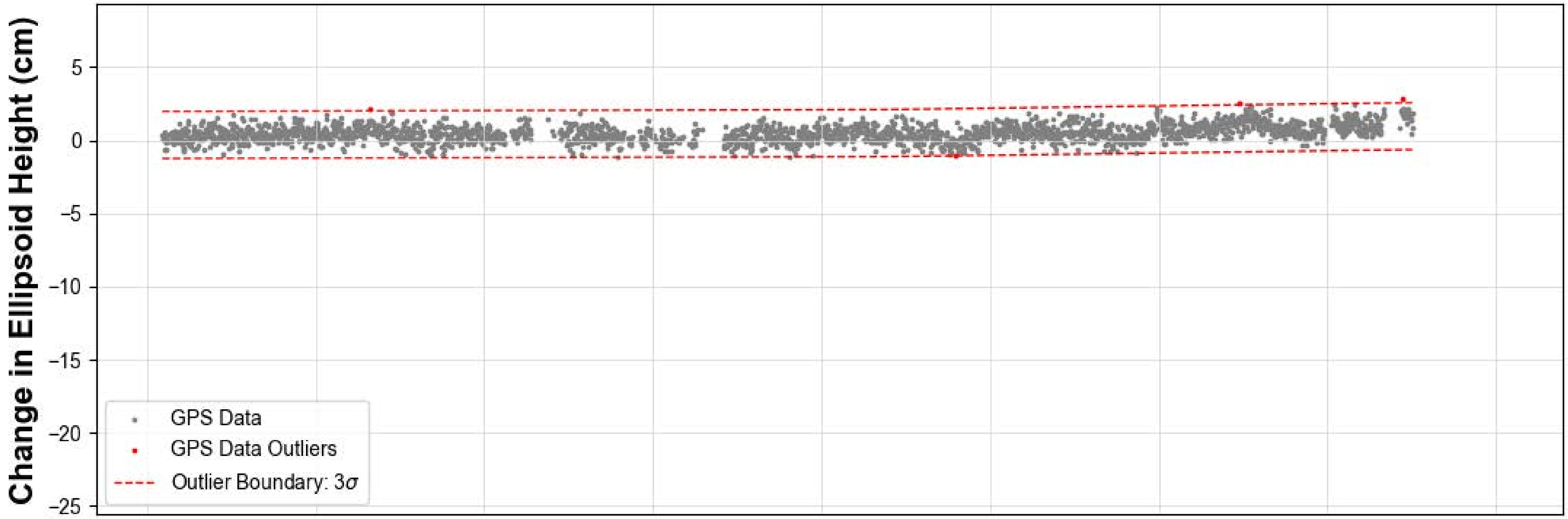
Hearne, TX

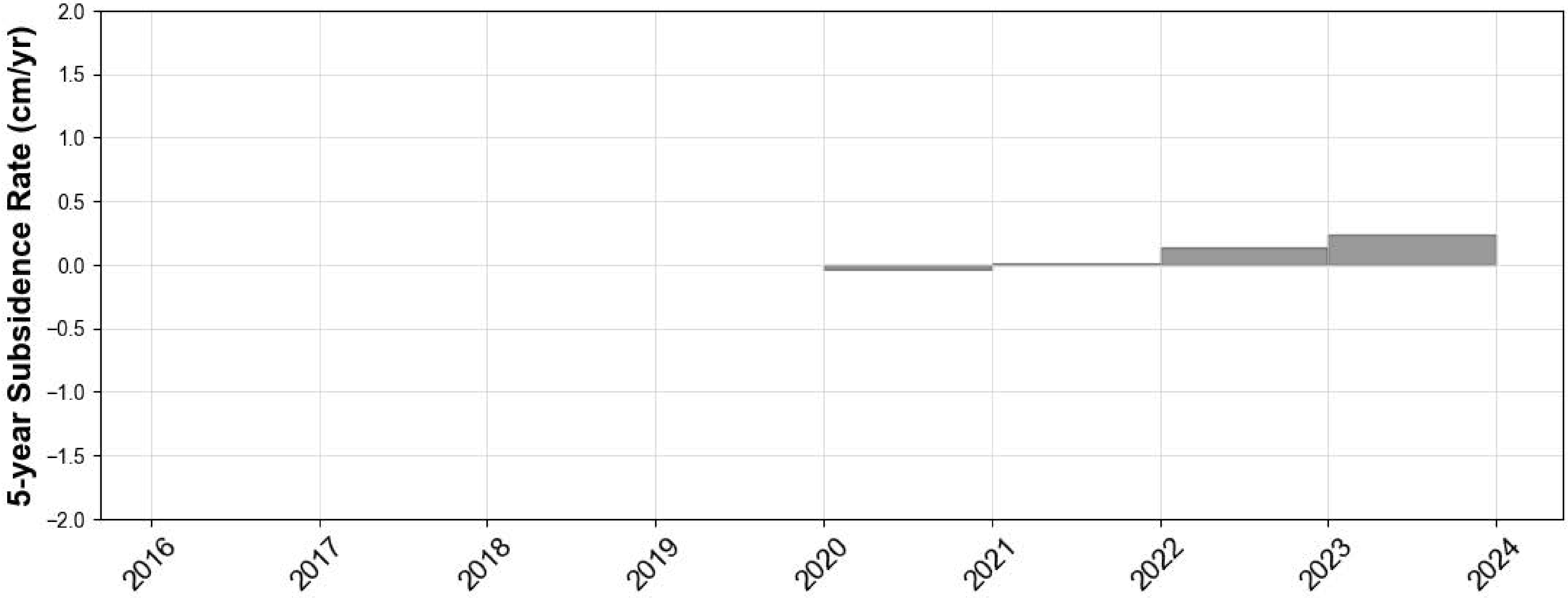


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

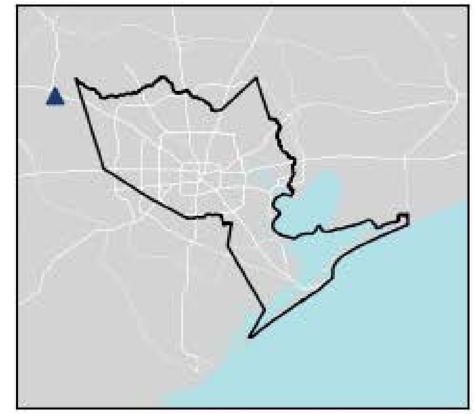
TXH2

Bolivar Peninsula, TX



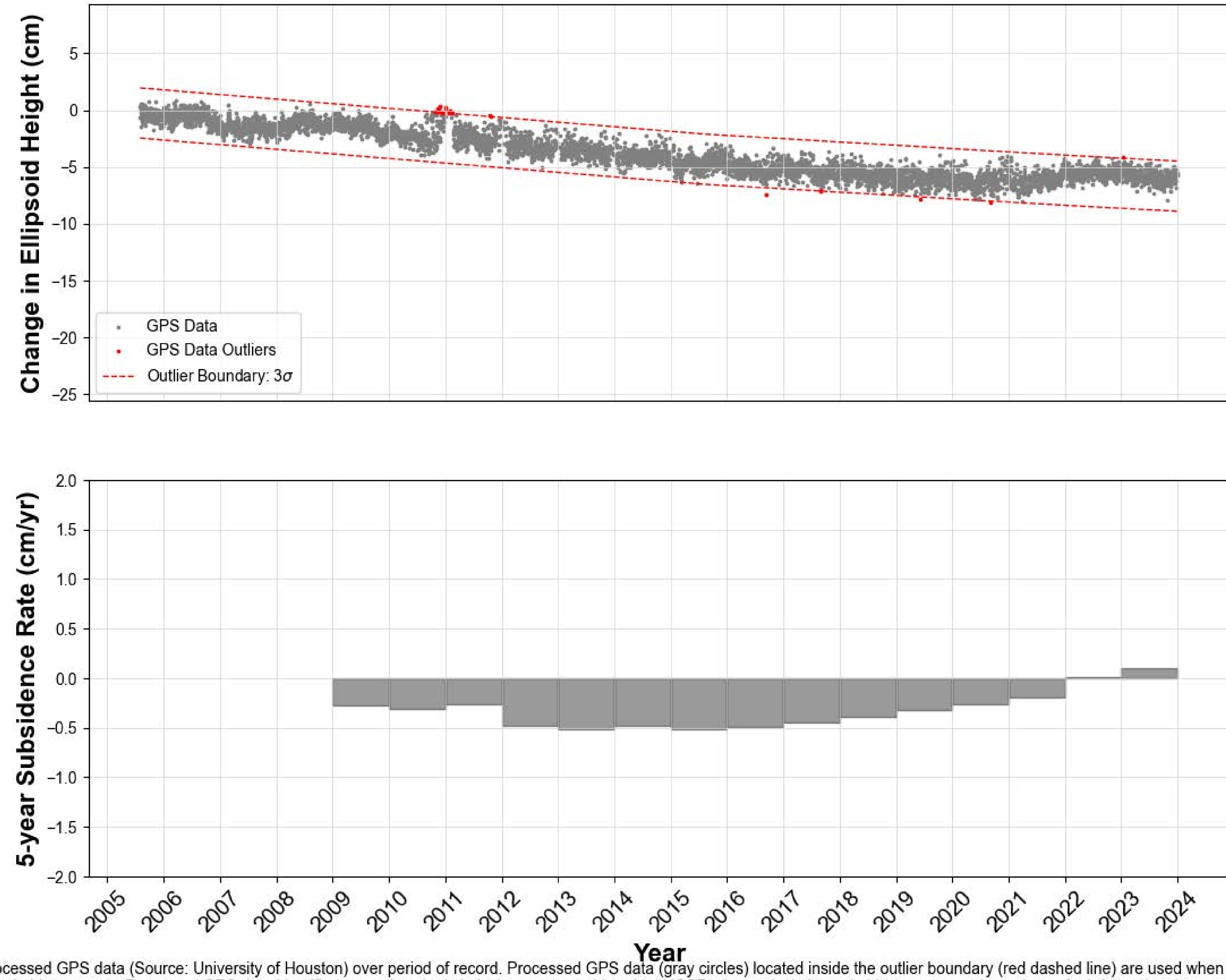


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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



TXHE

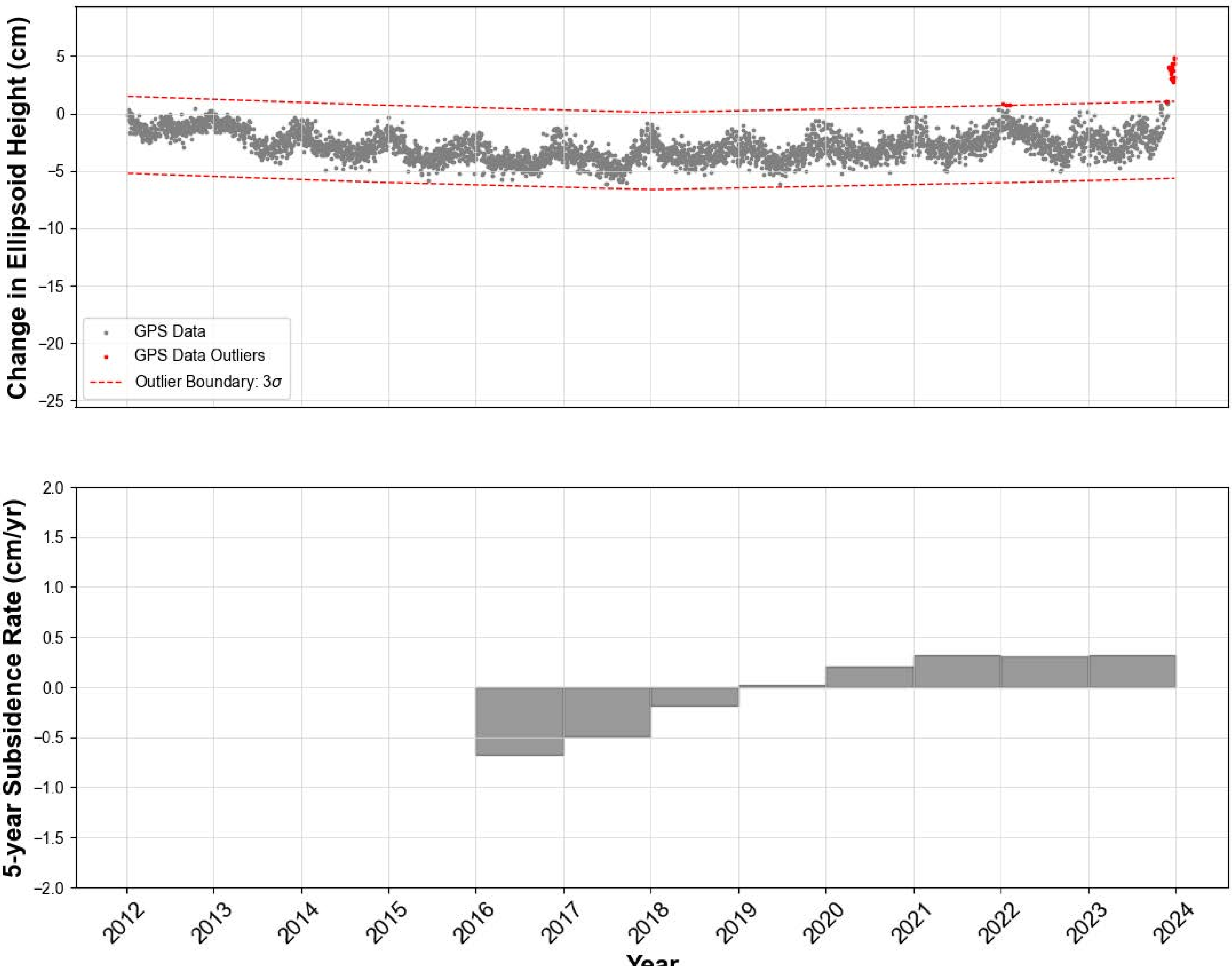
Hempstead, TX



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

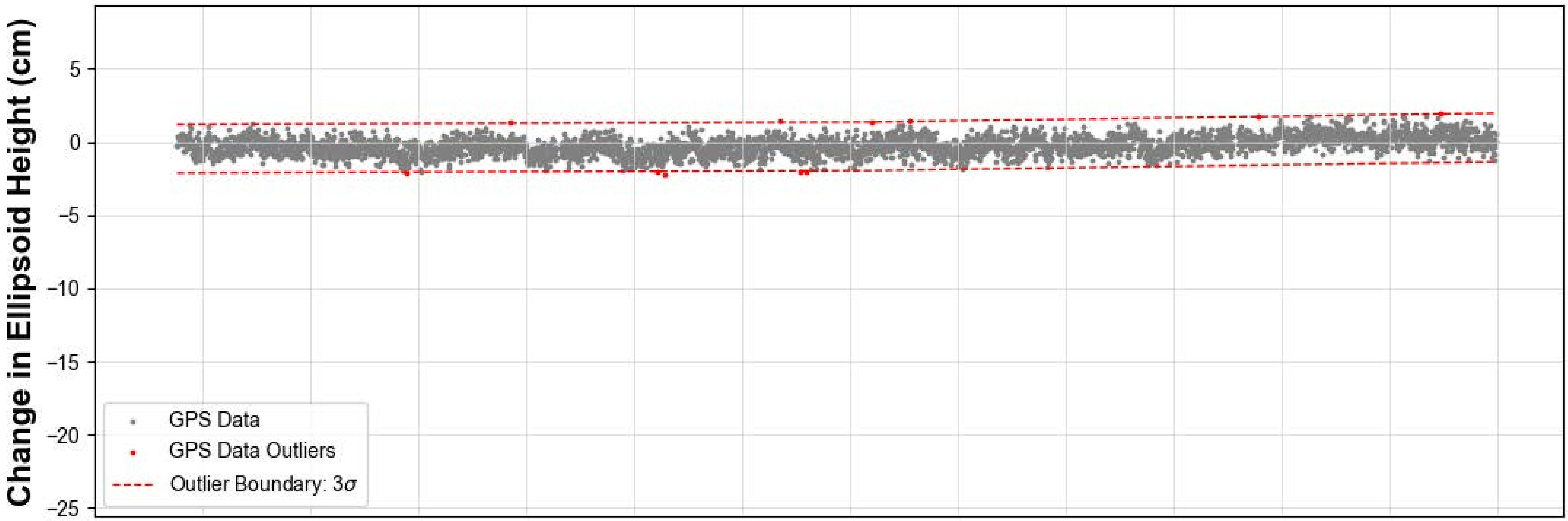
Hemphill, TX

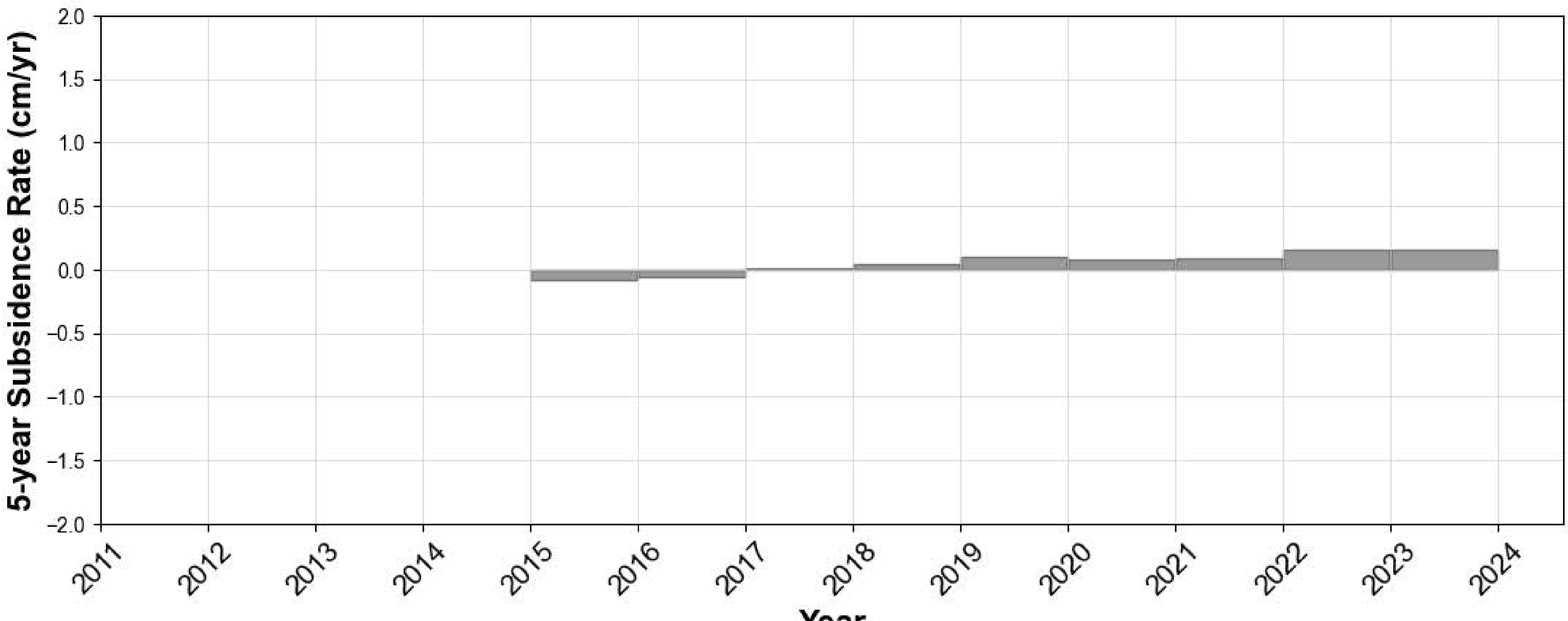


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXKO

Kountze, TX

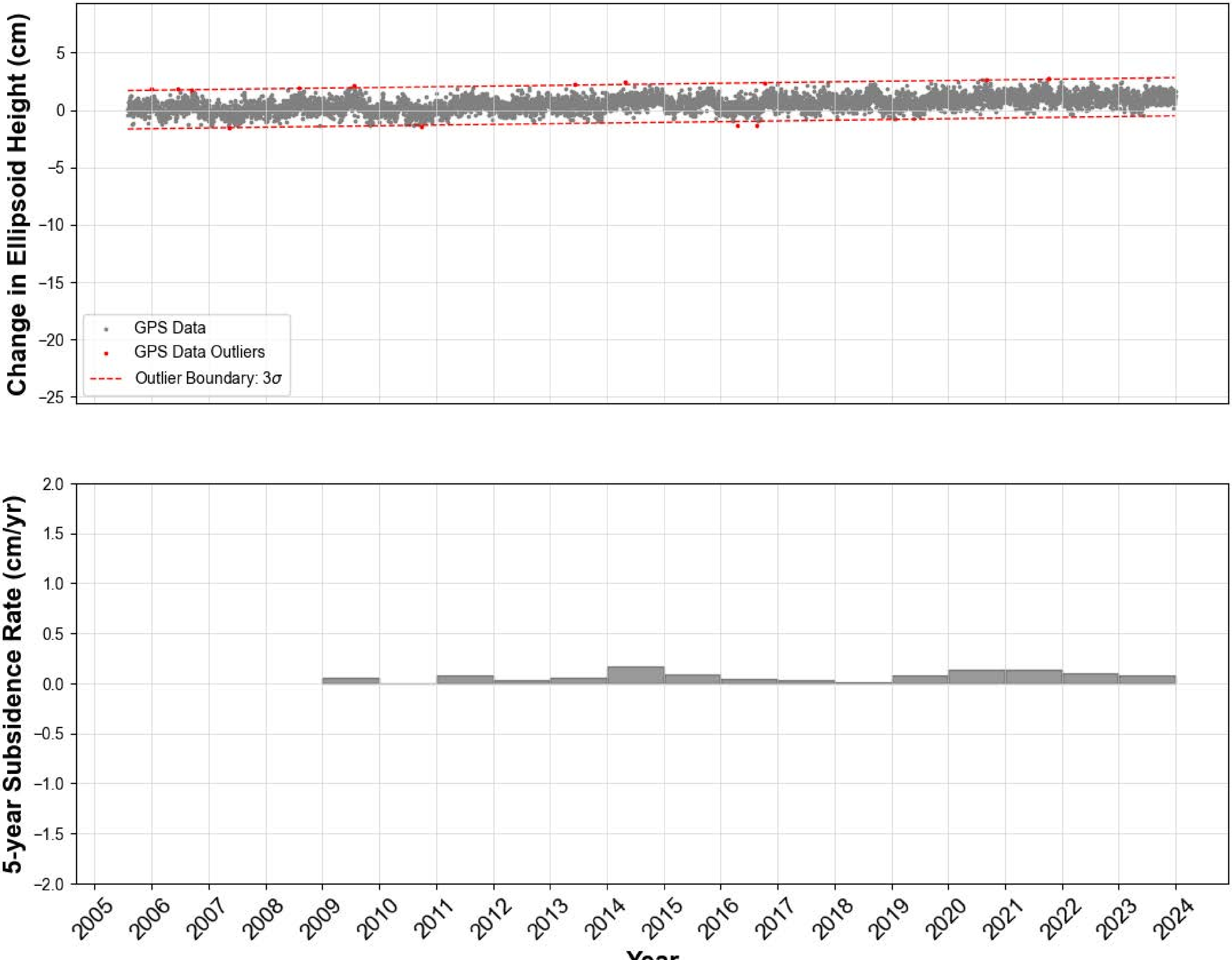




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXLF

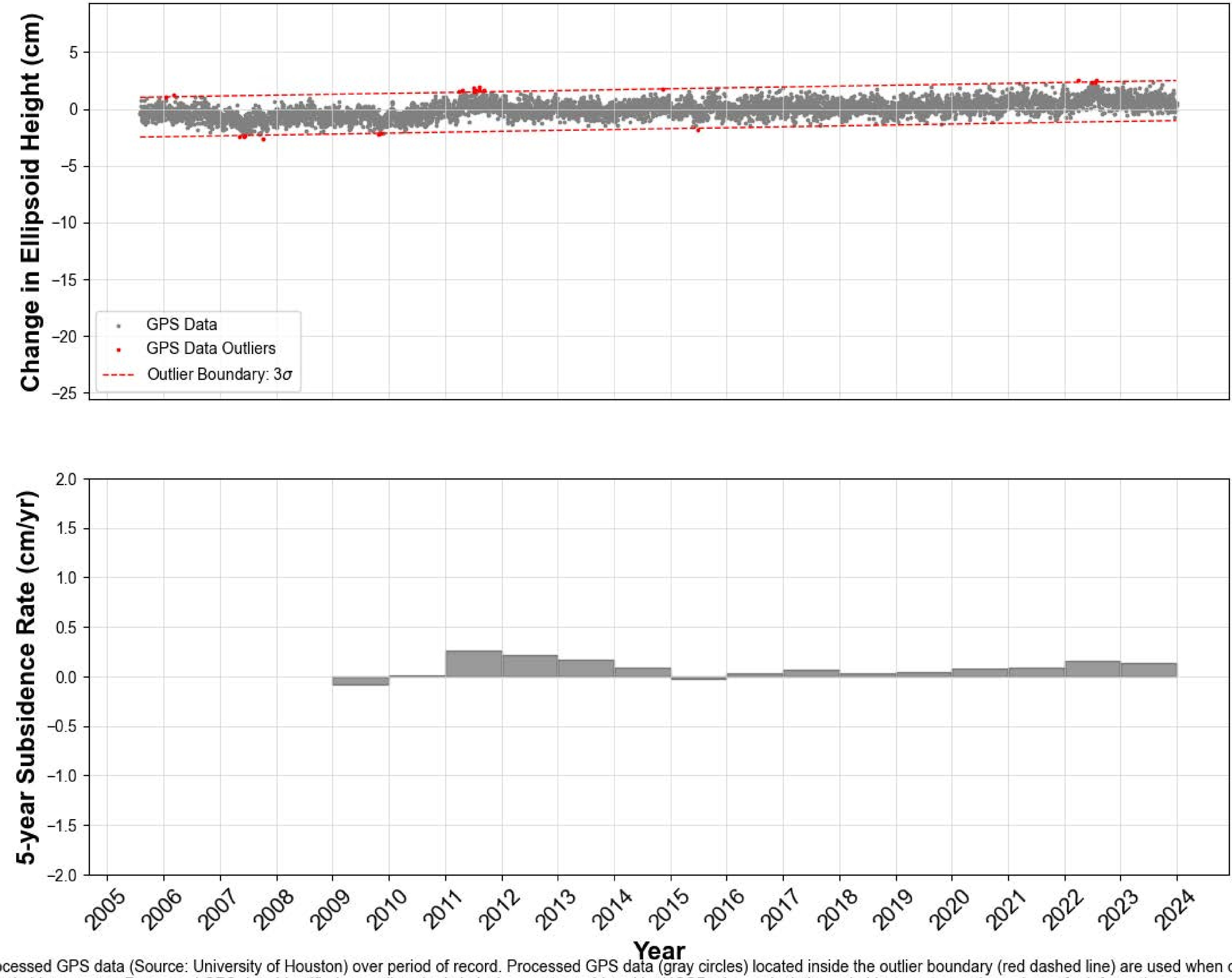
Lufkin, TX



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

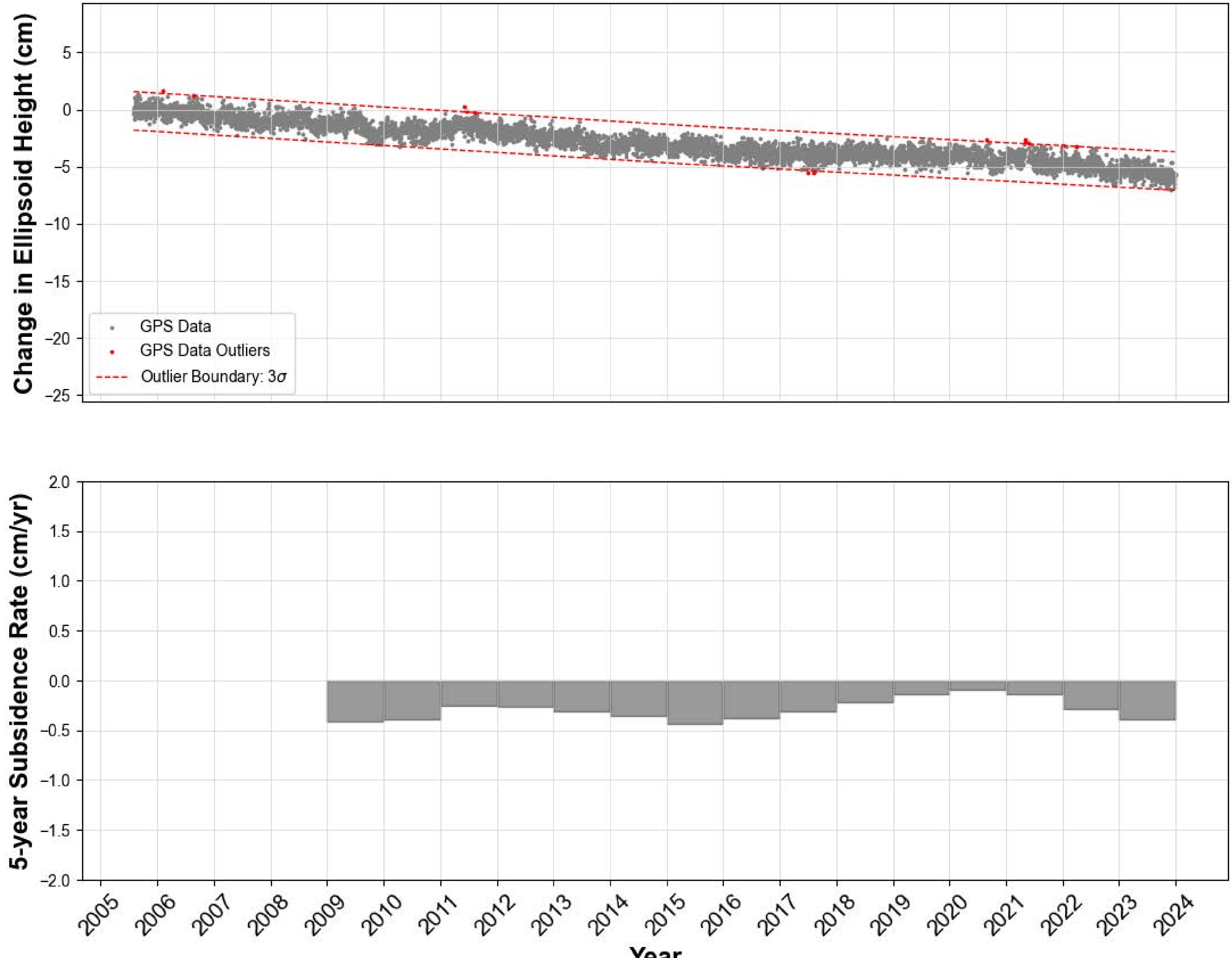
Dayton, TX



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

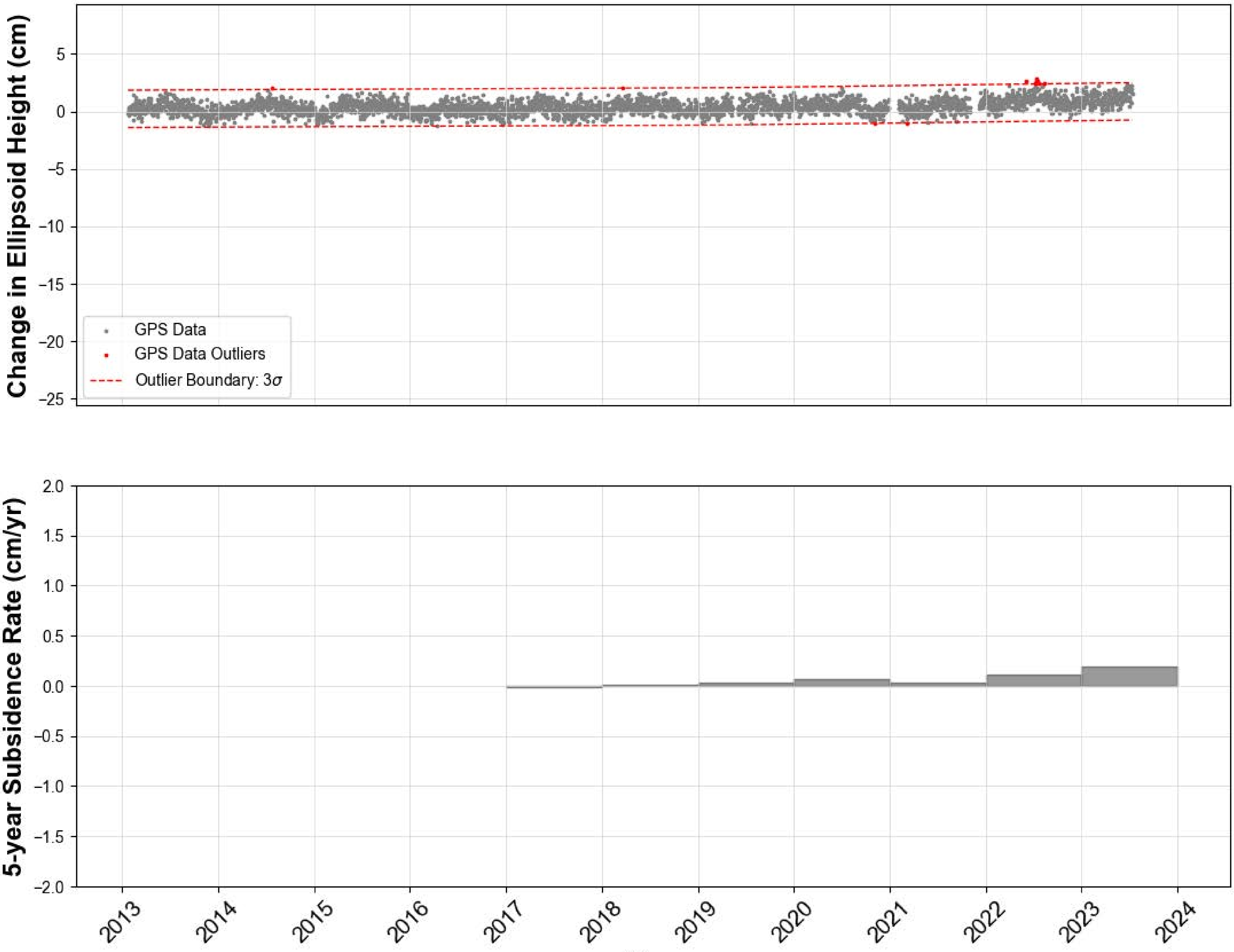
La Marque, TX



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

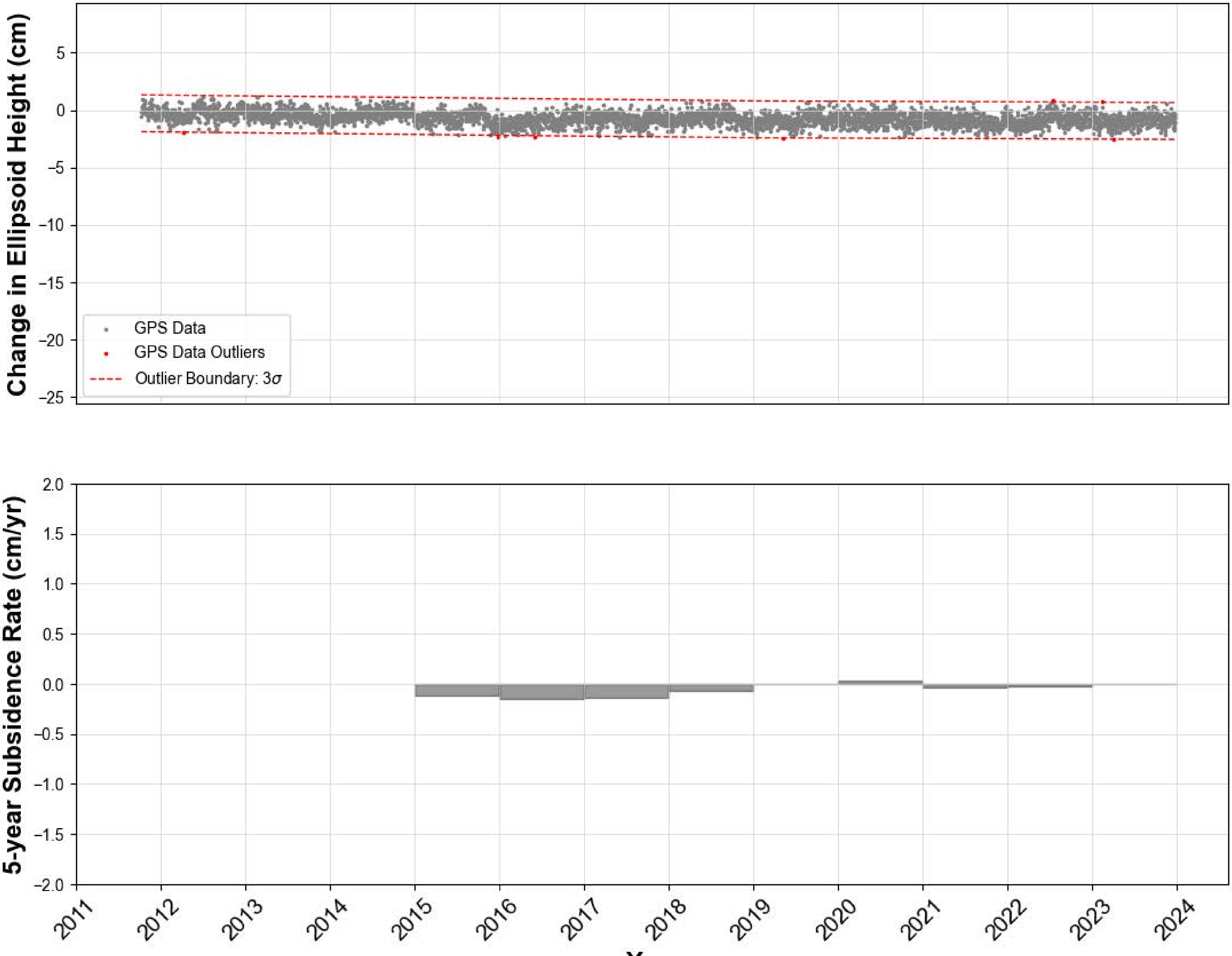
La Marque, TX



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

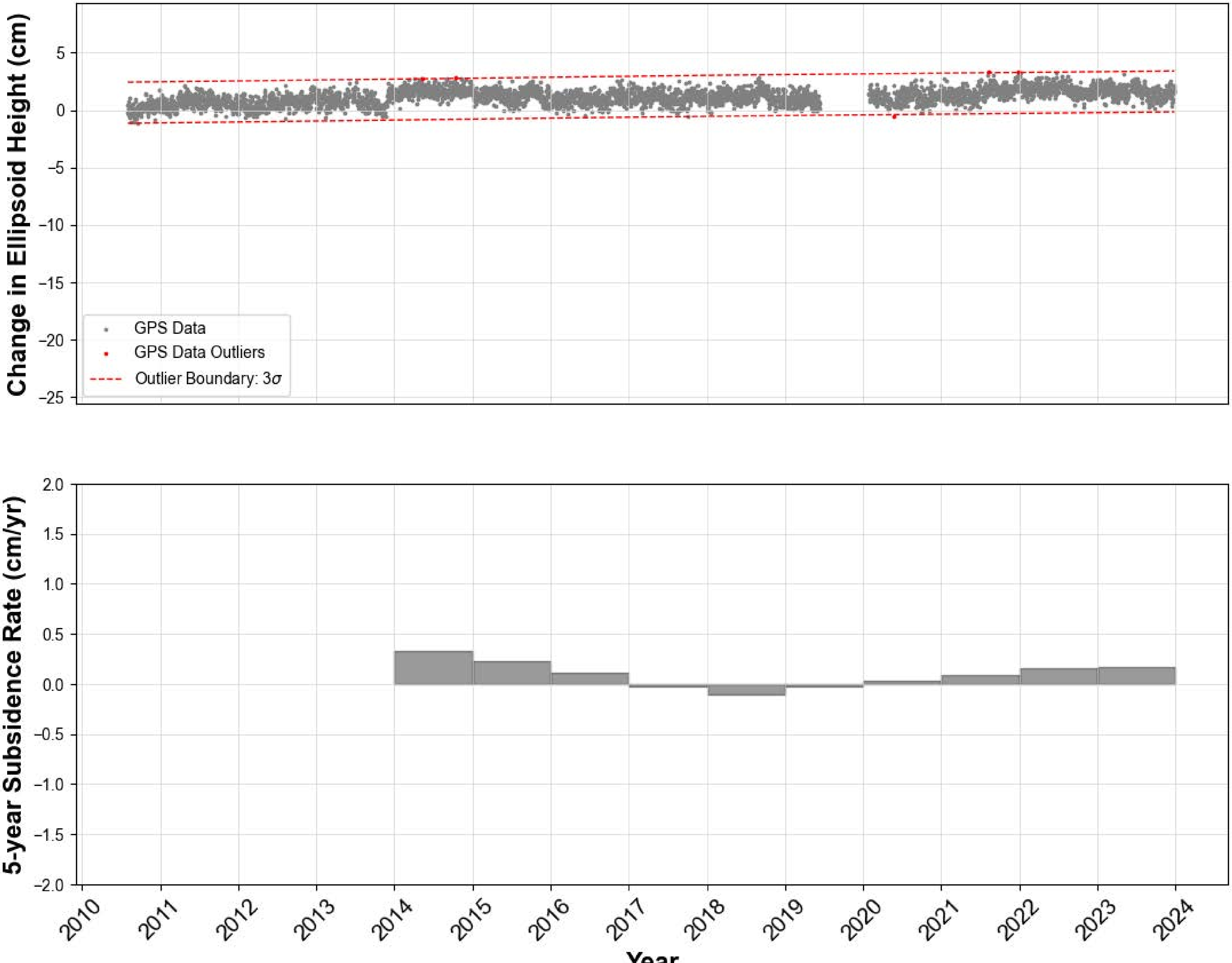
Livingston, TX



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

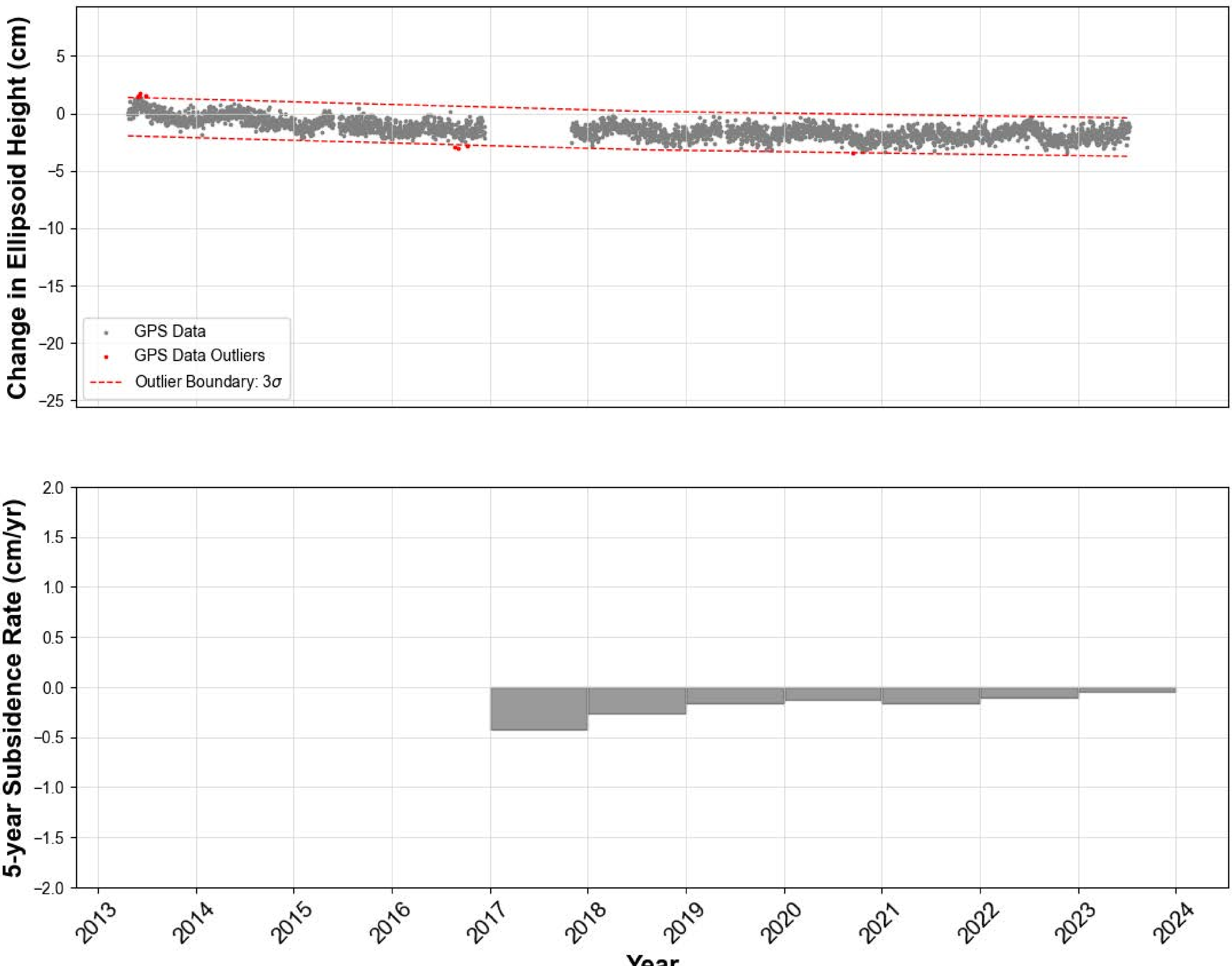
Madisonville, TX



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

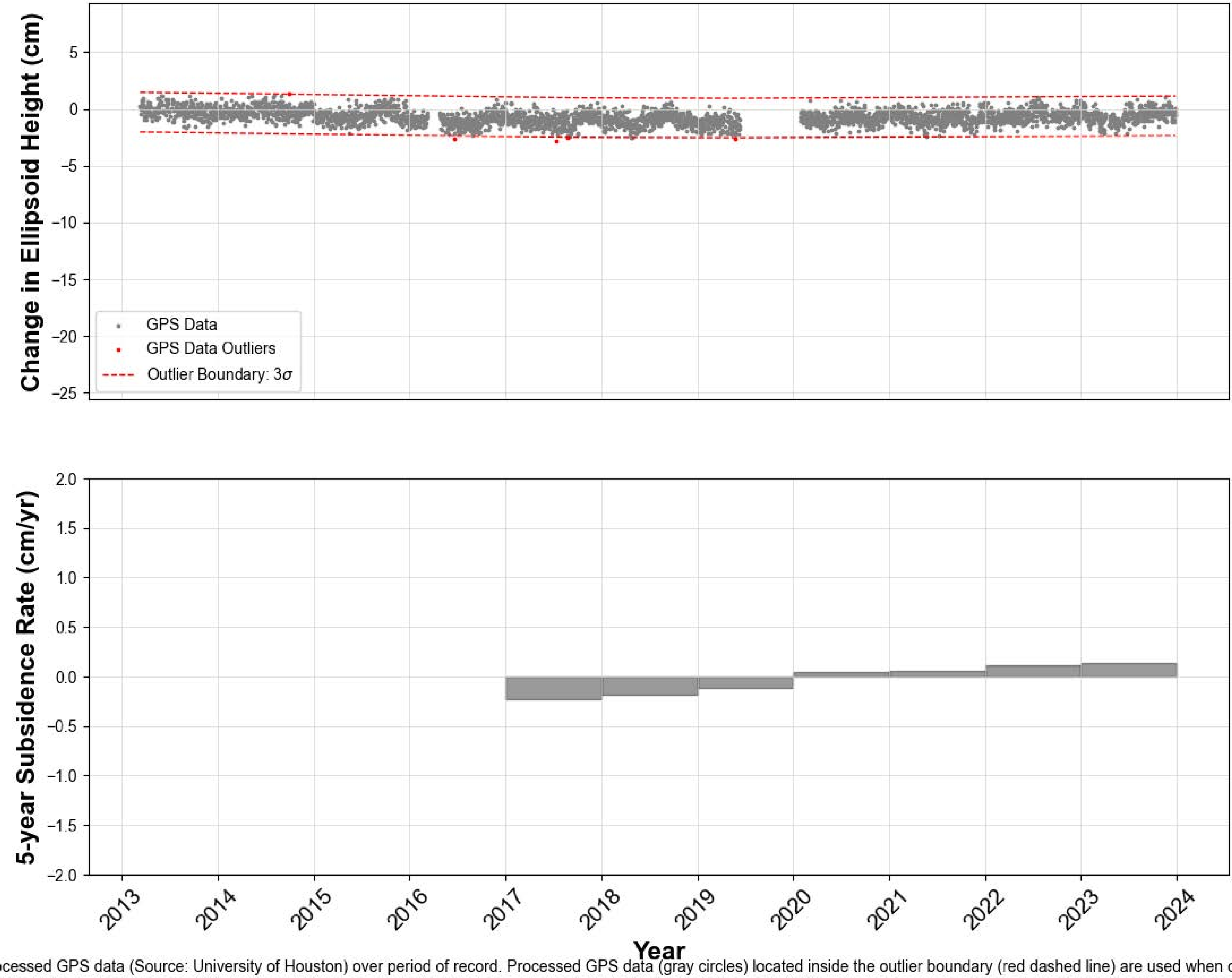
Bay City, TX



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

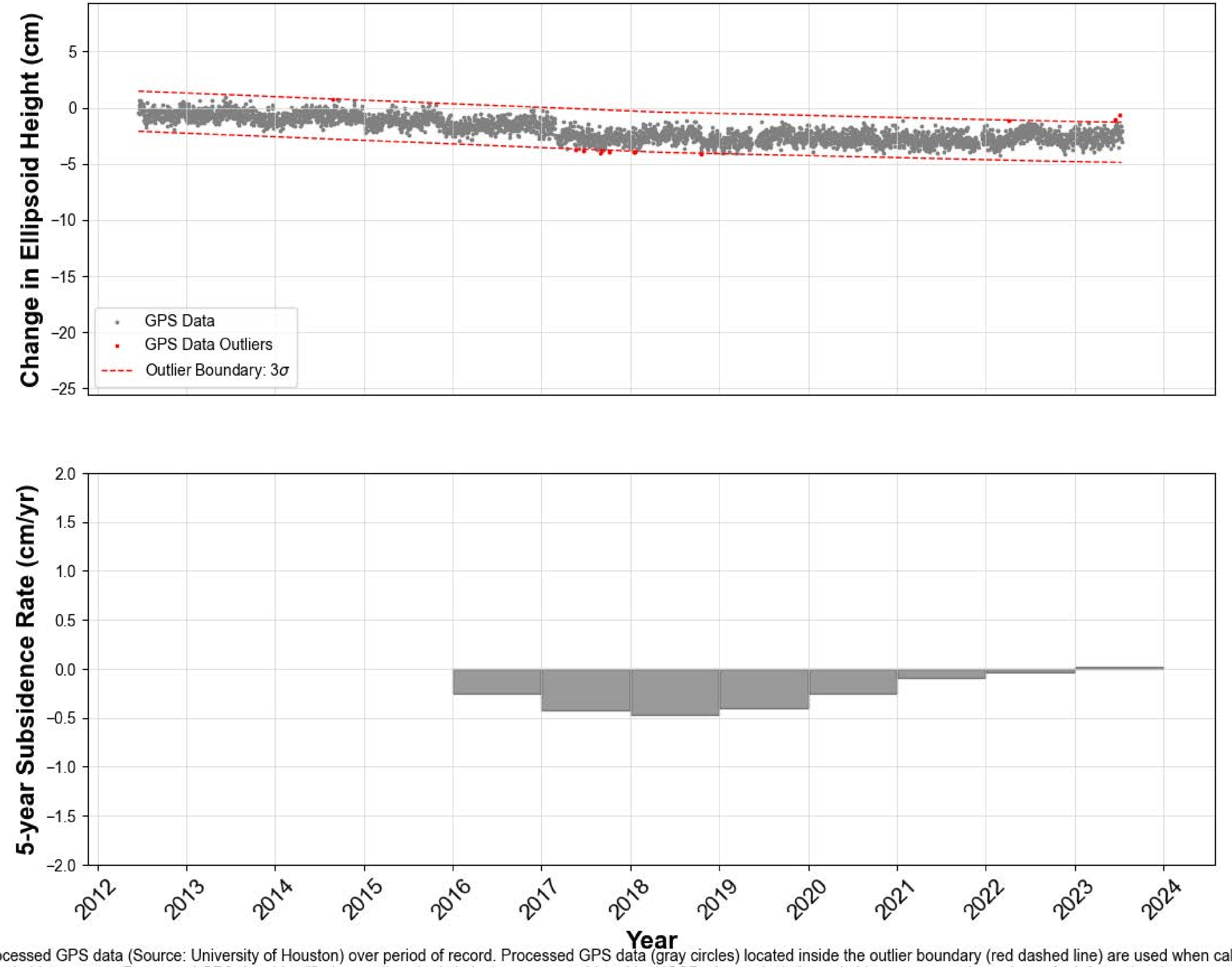
Newton, TX



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

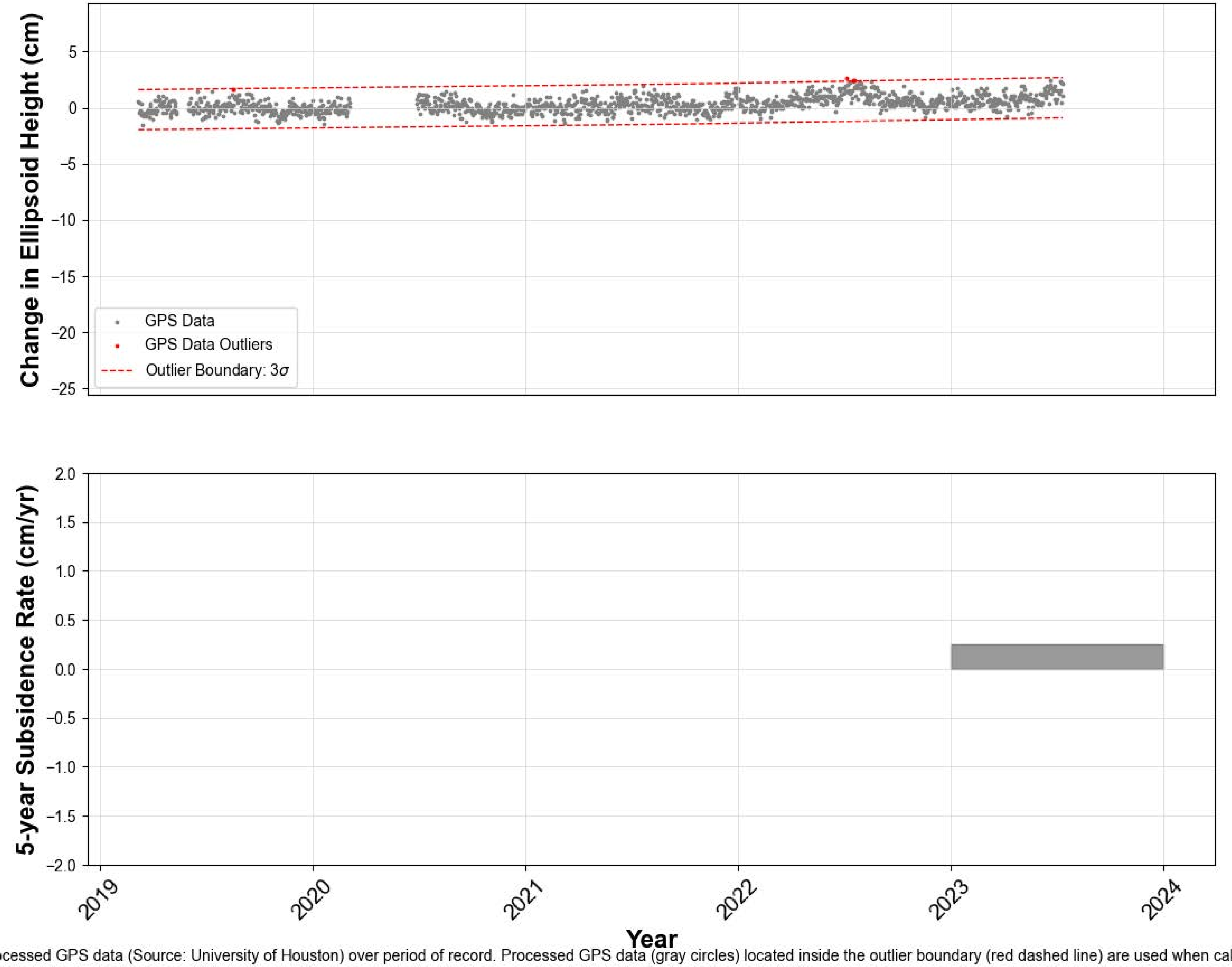
Navasota, TX



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

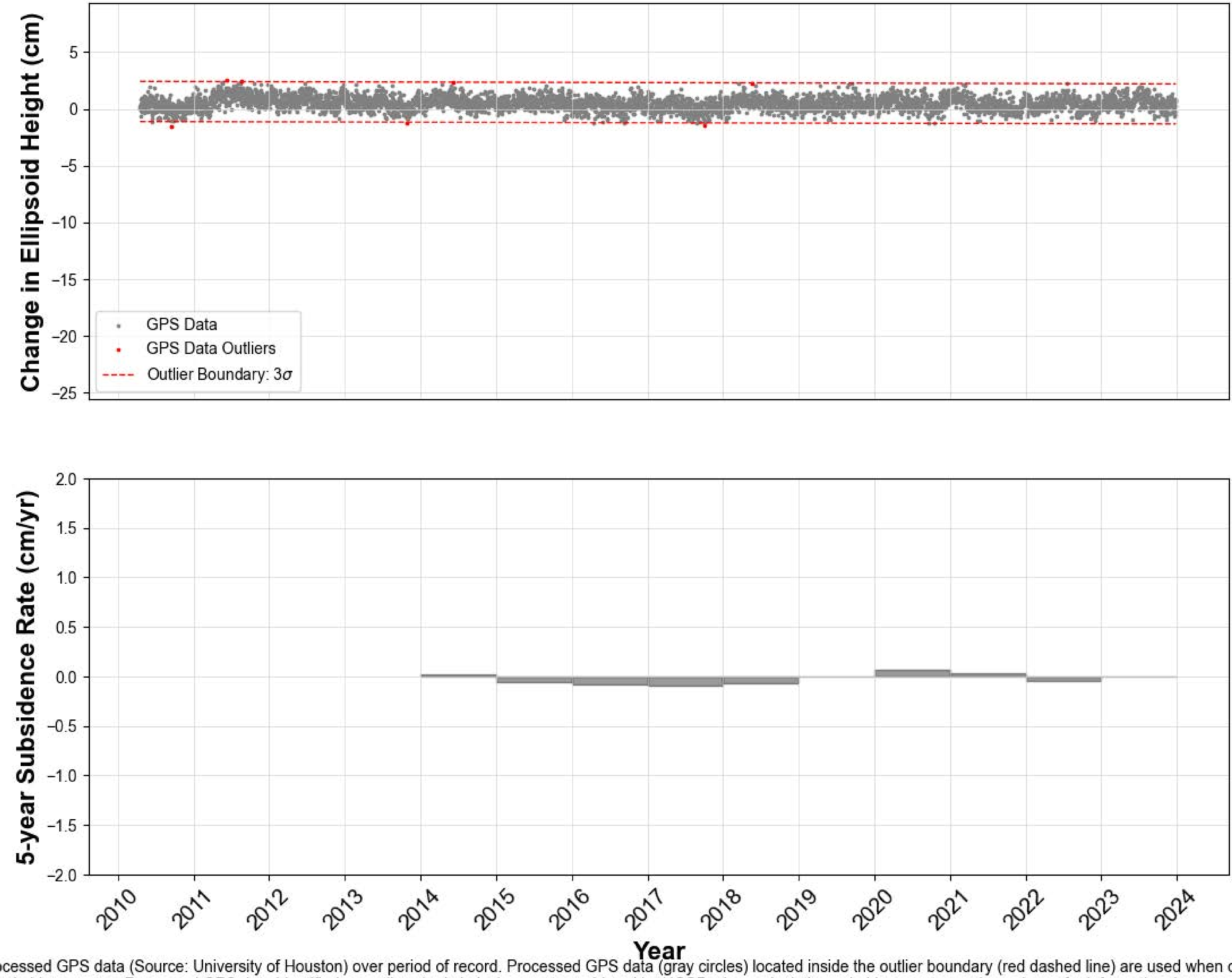
La Porte, TX



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

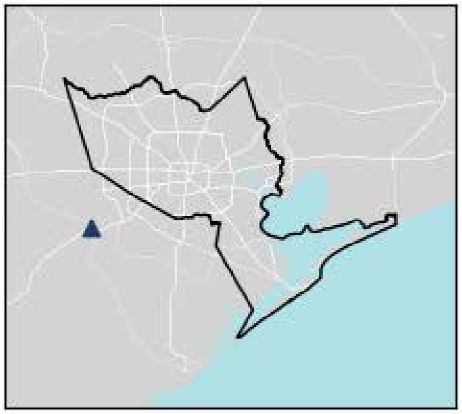
Port Lavaca, TX

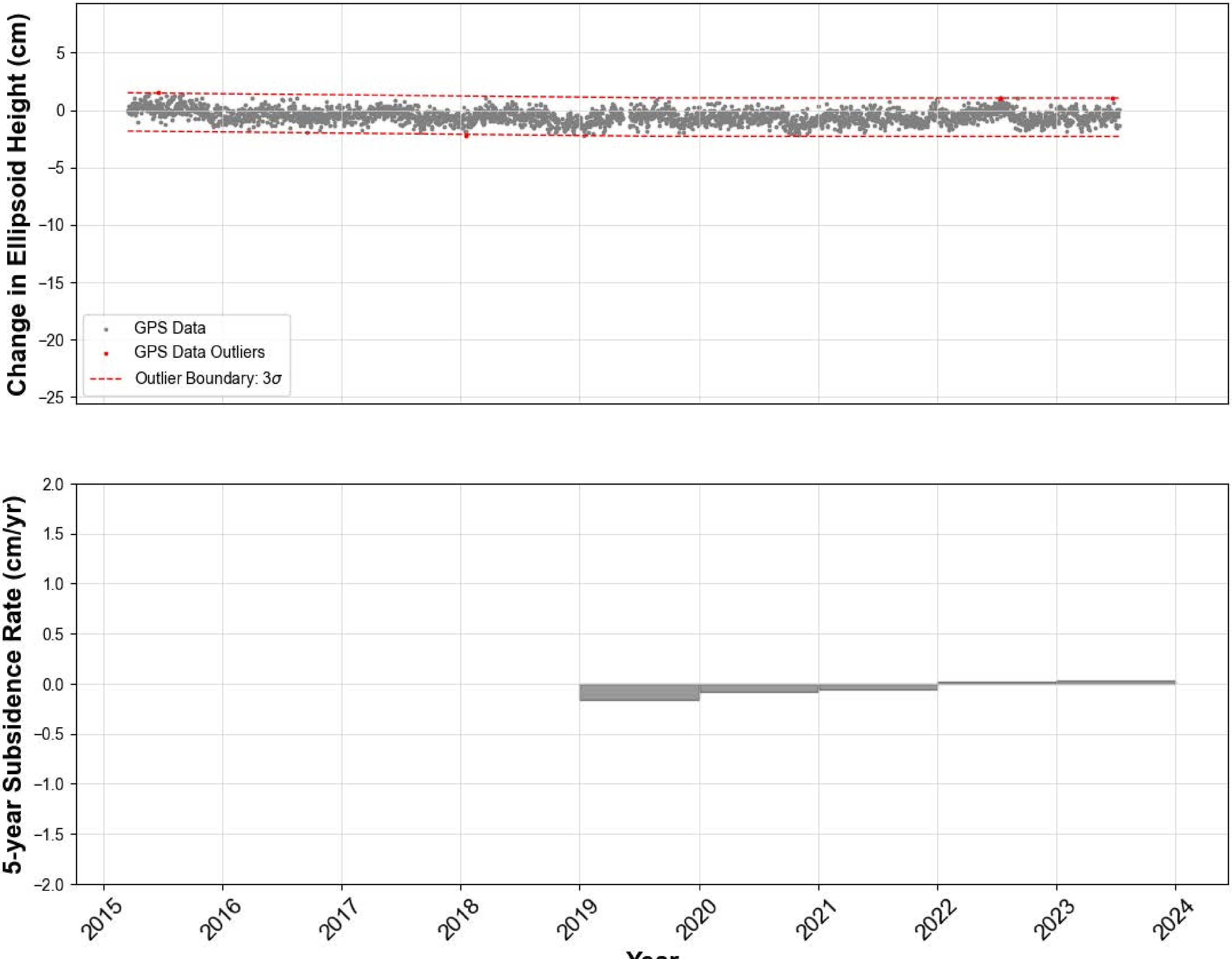


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXRN

Rosenberg, TX

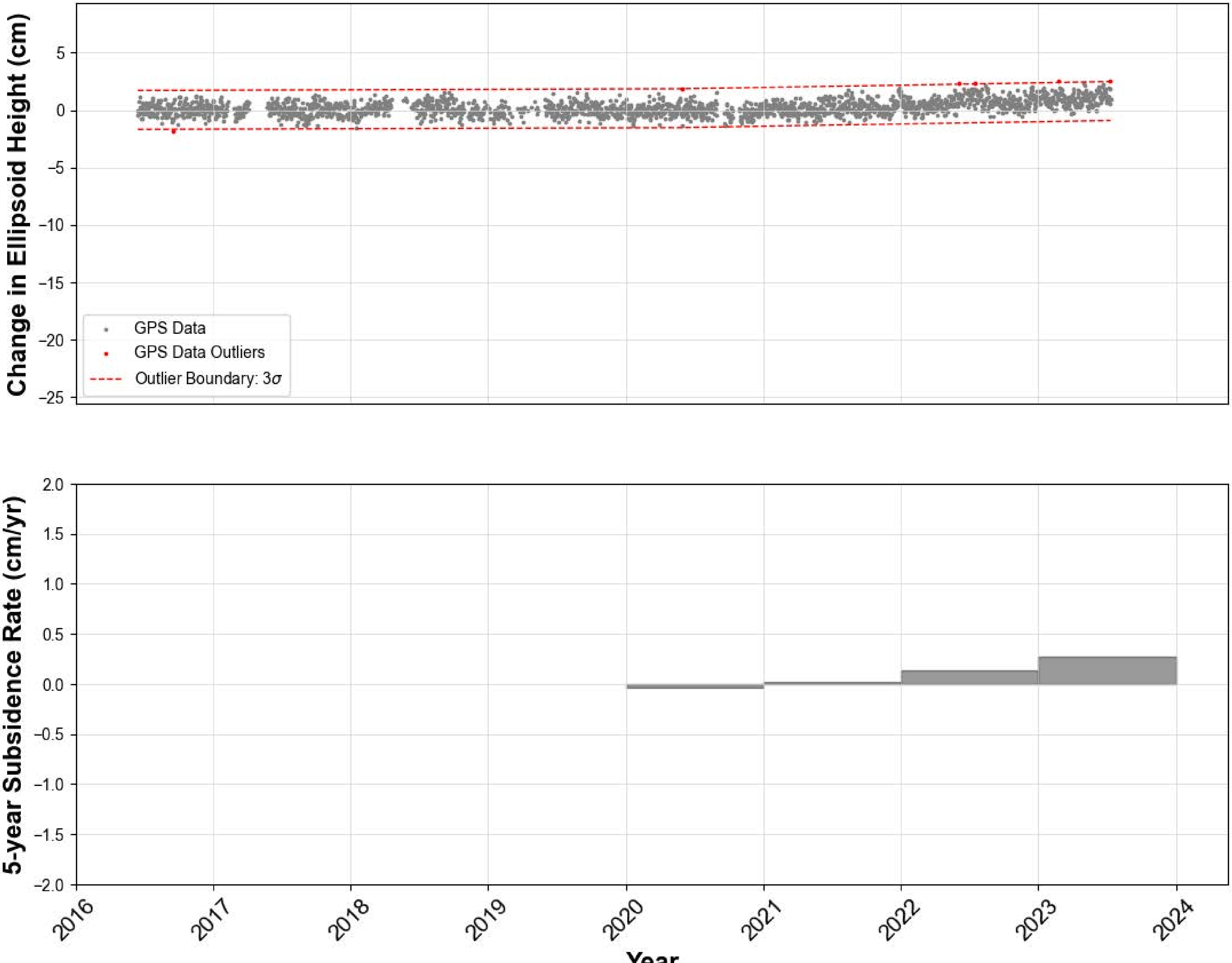




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXSP

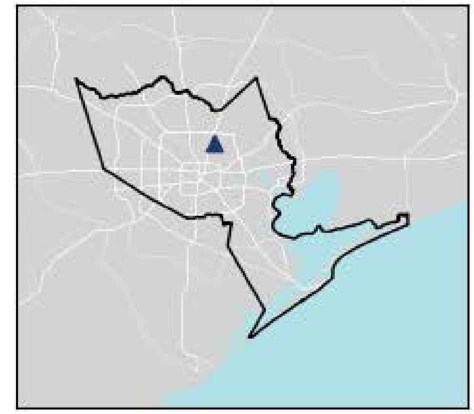
Port Arthur, TX

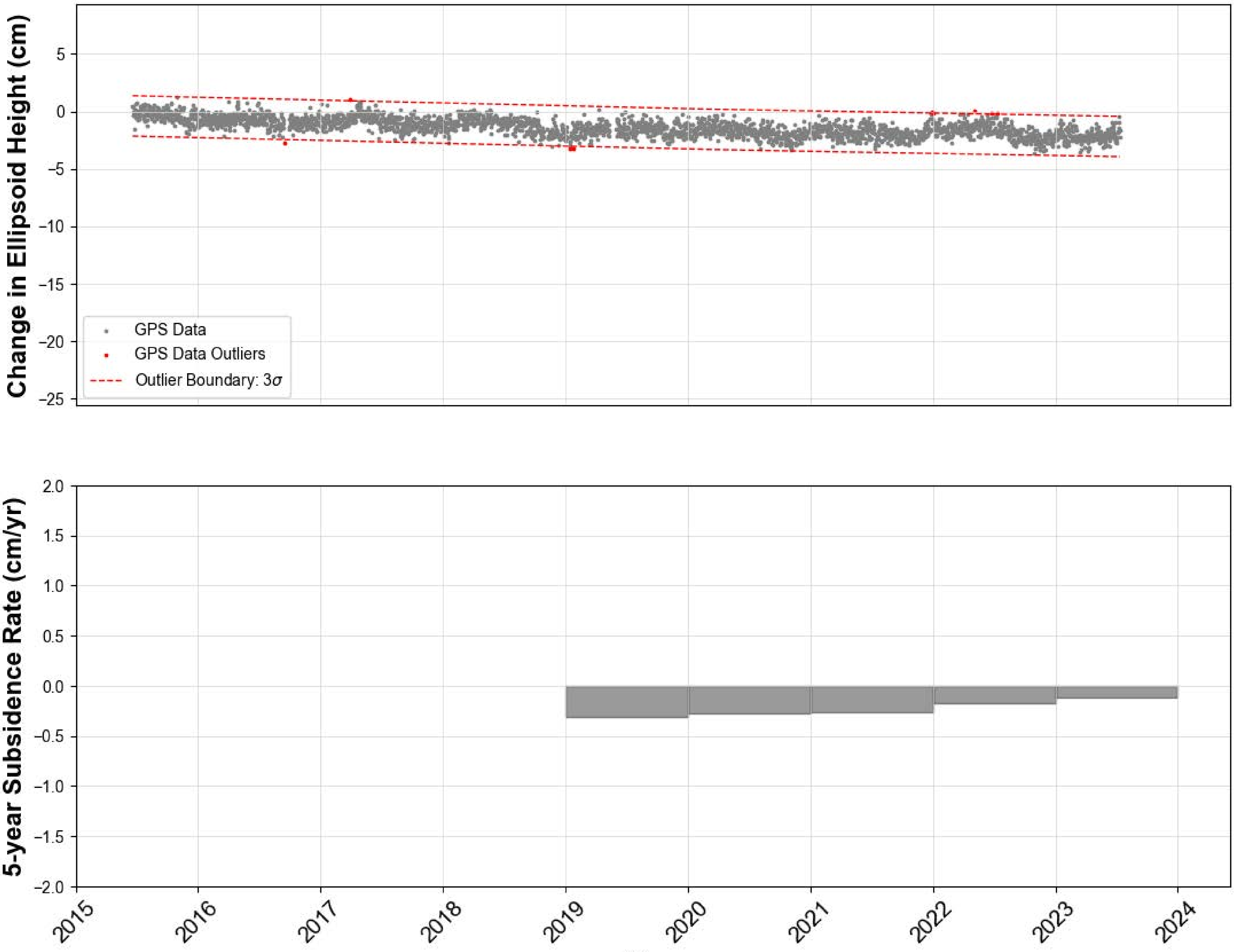


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXTG

Houston, TX

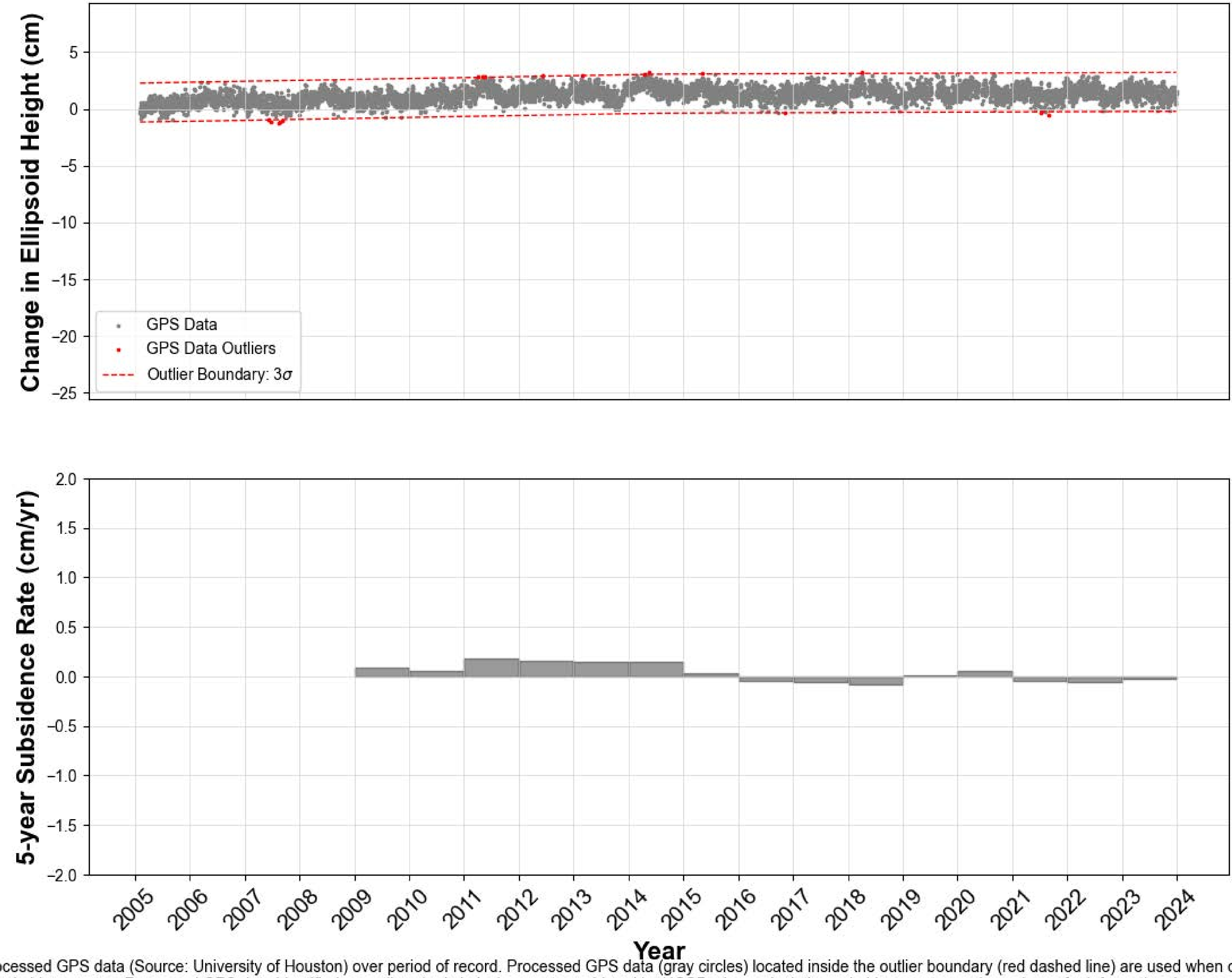




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXVA

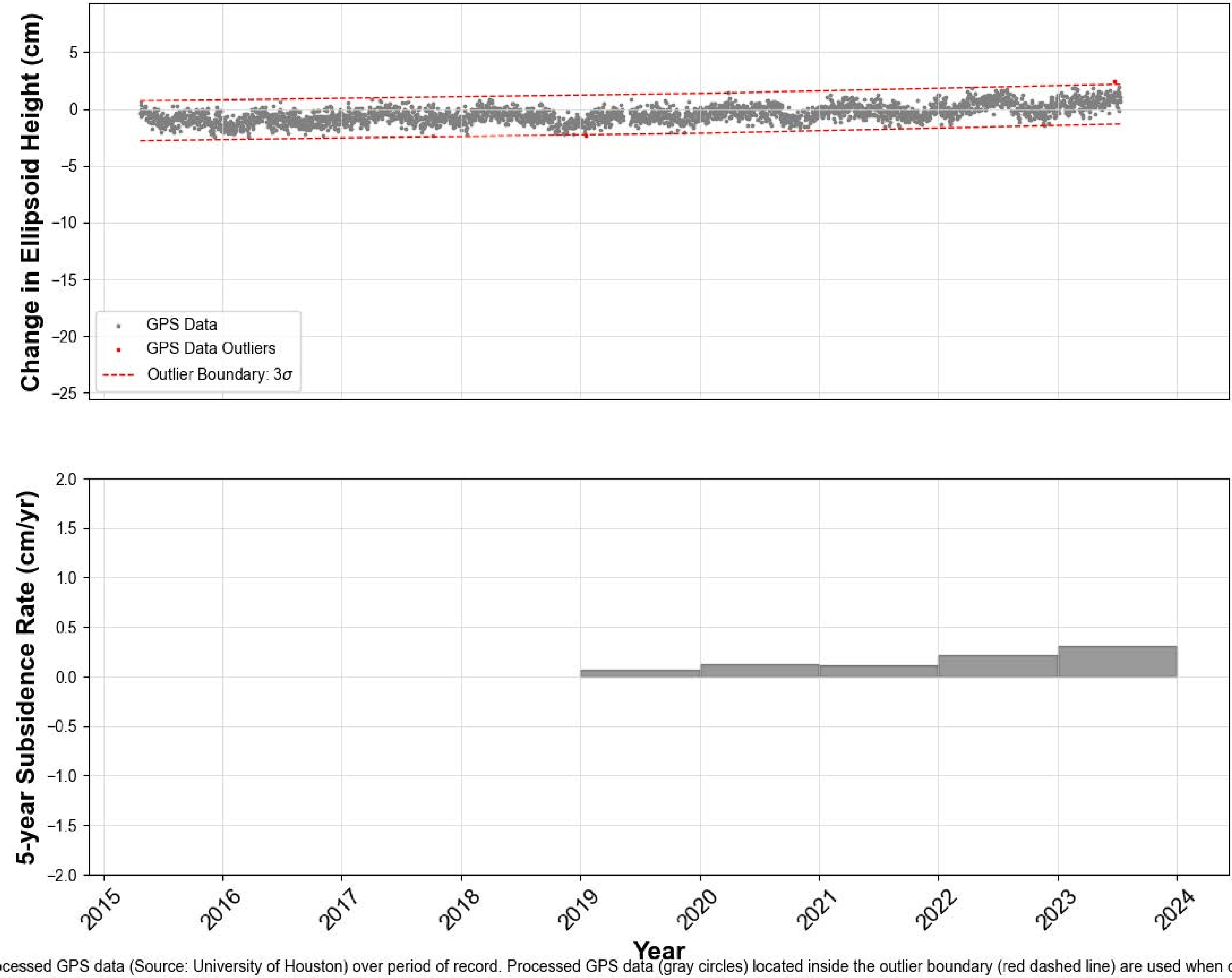
Victoria, TX



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

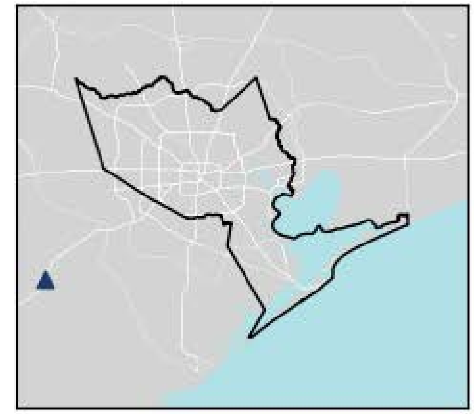
Victoria, TX

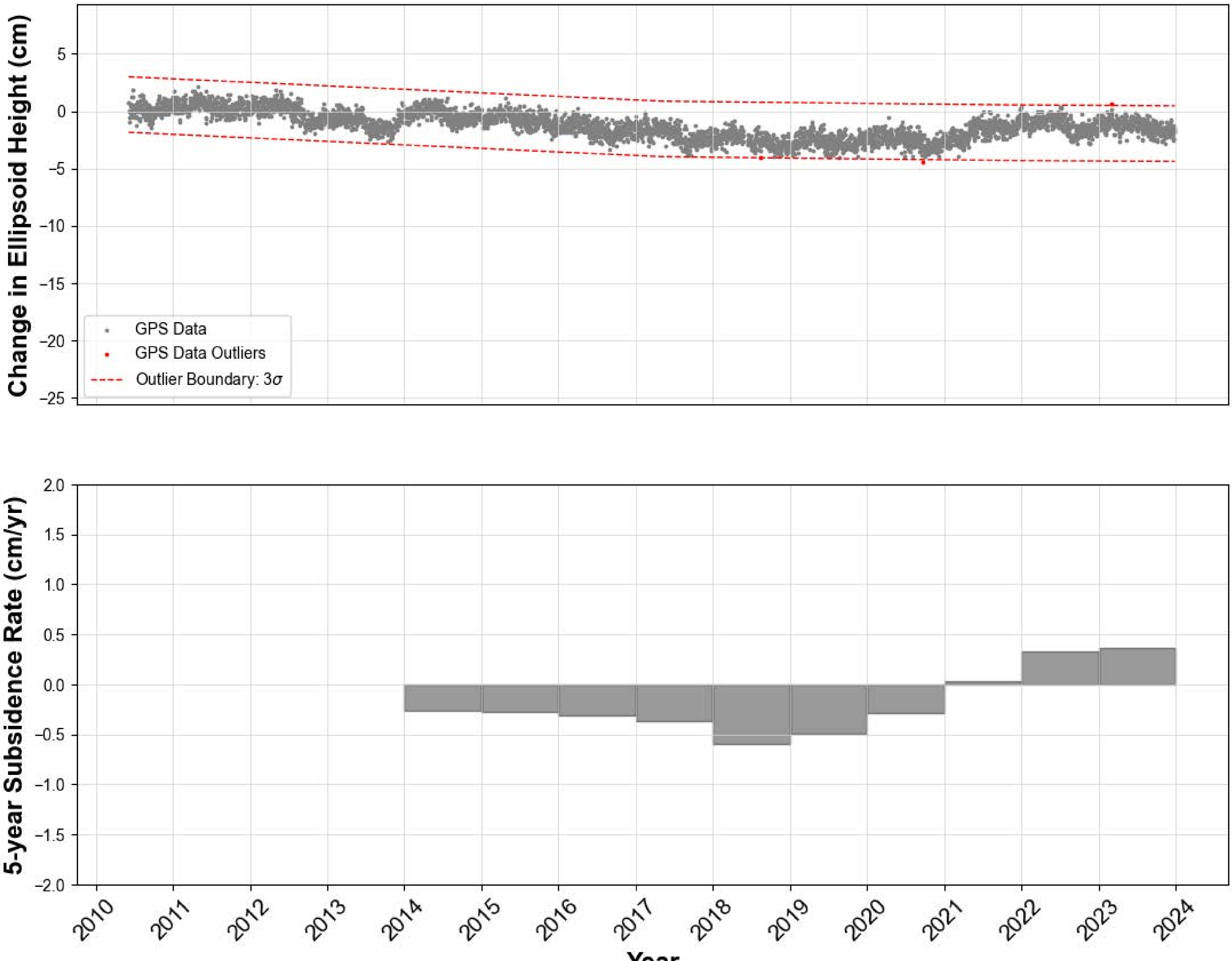


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXWH

Wharton, TX

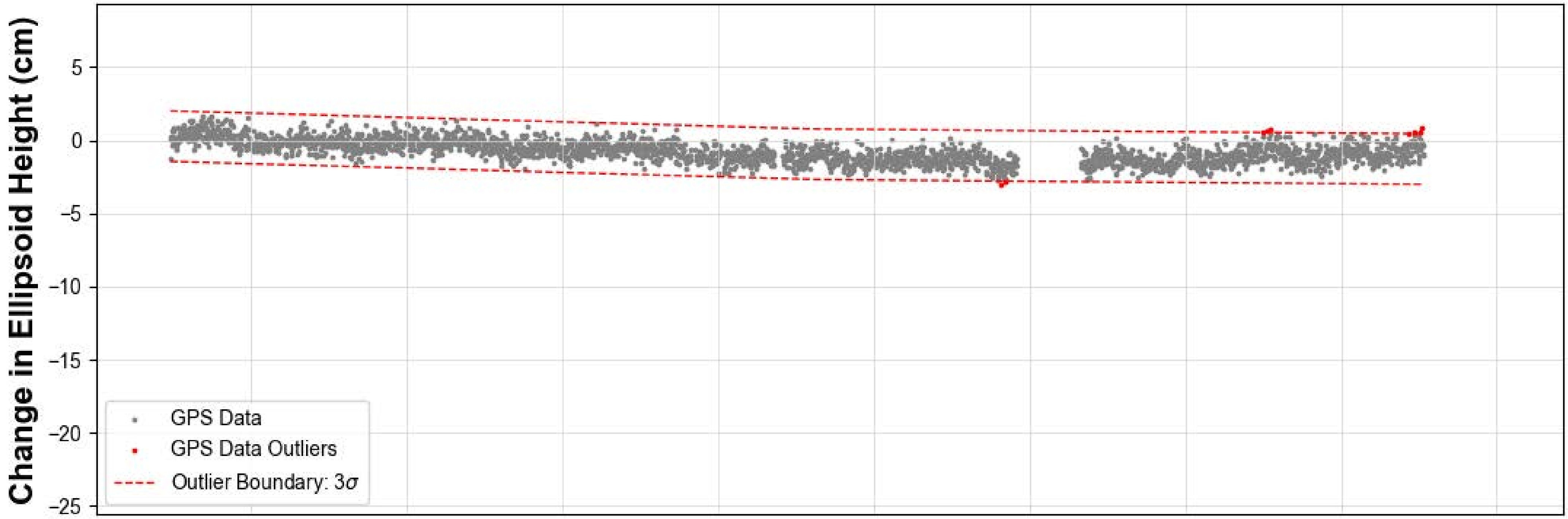


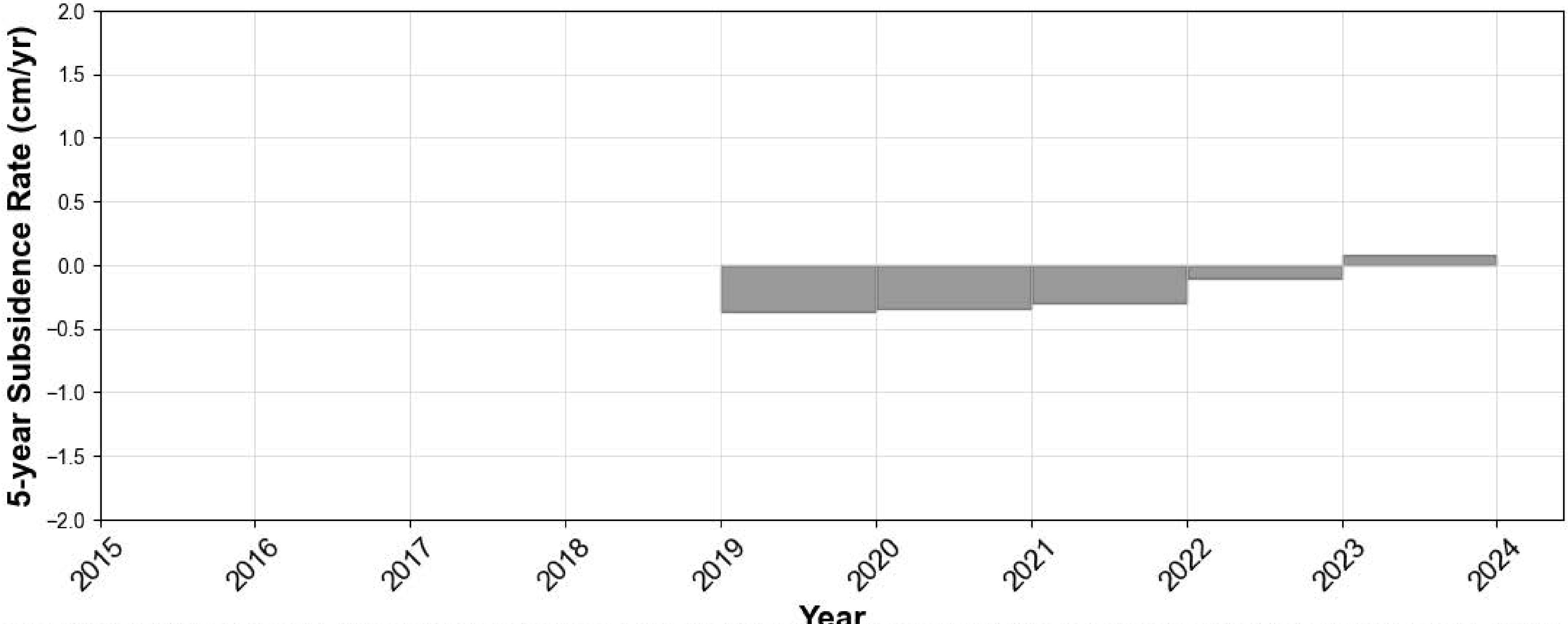


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXWI

Winnie, TX

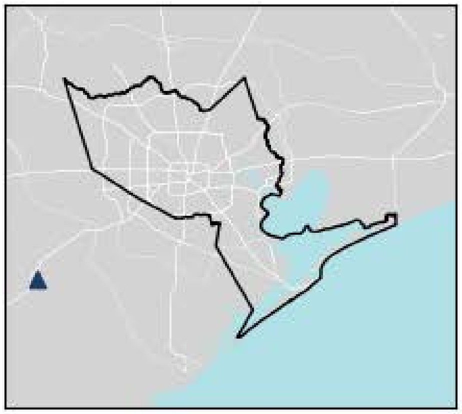


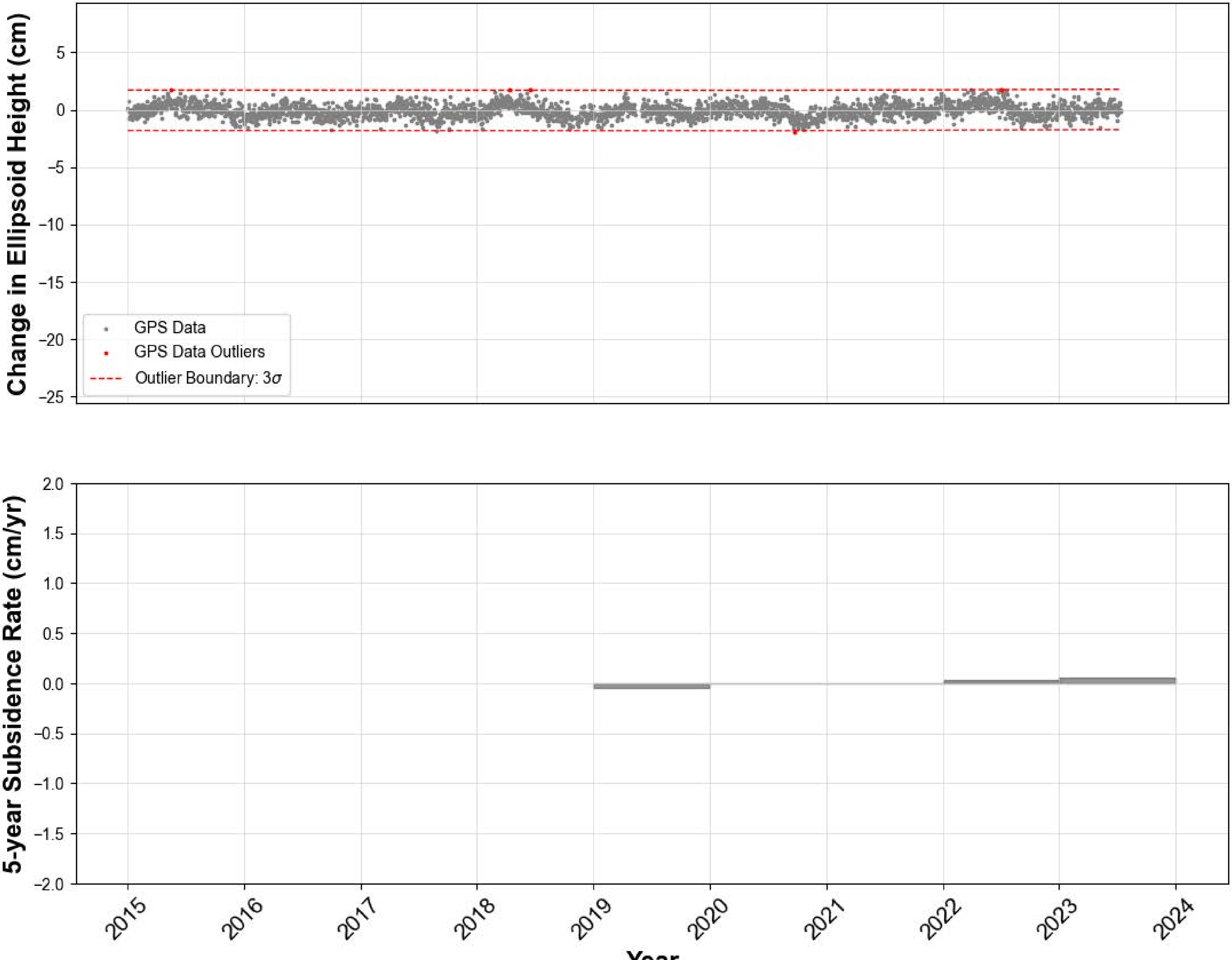


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXWN

Wharton, TX

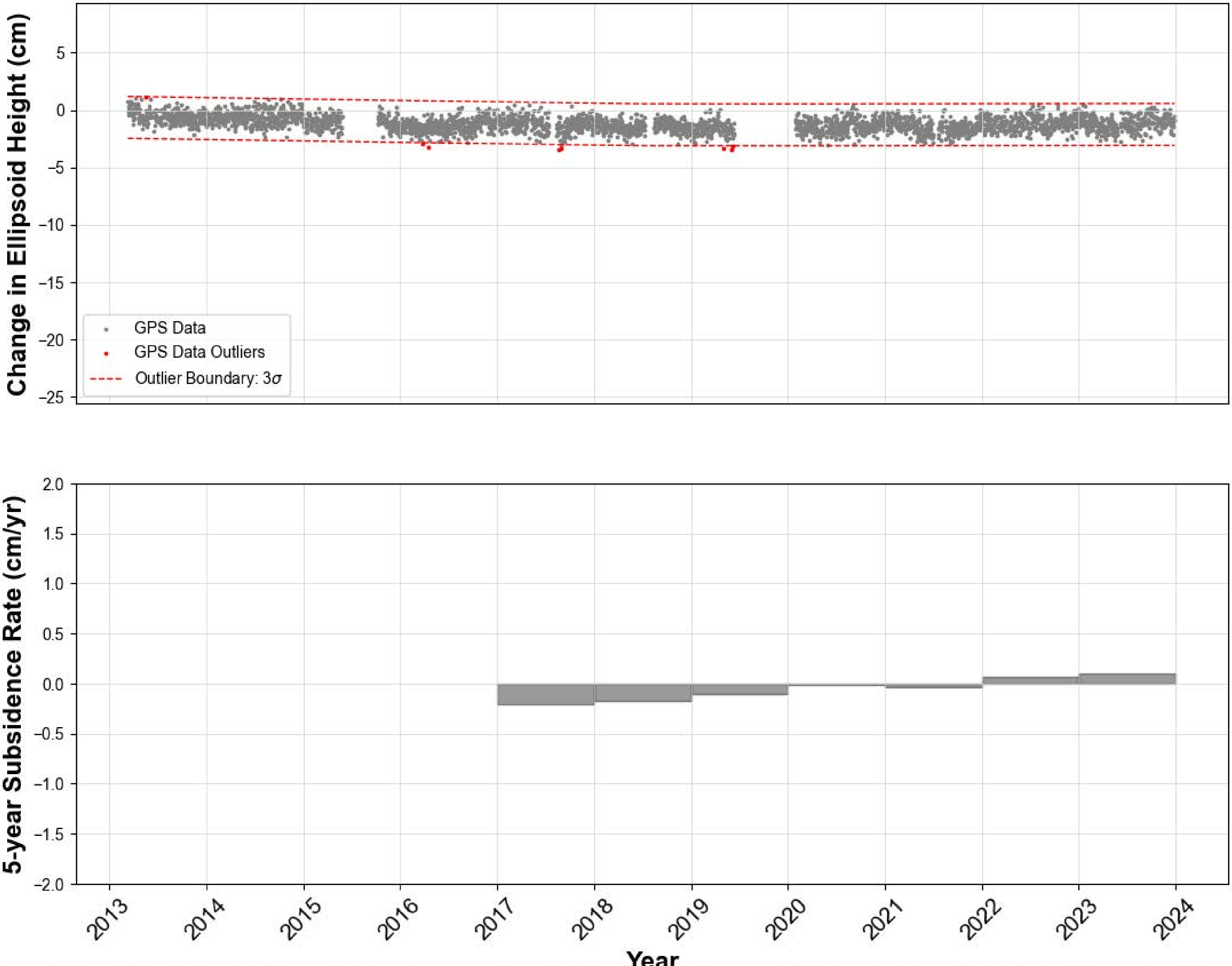




Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

TXWO

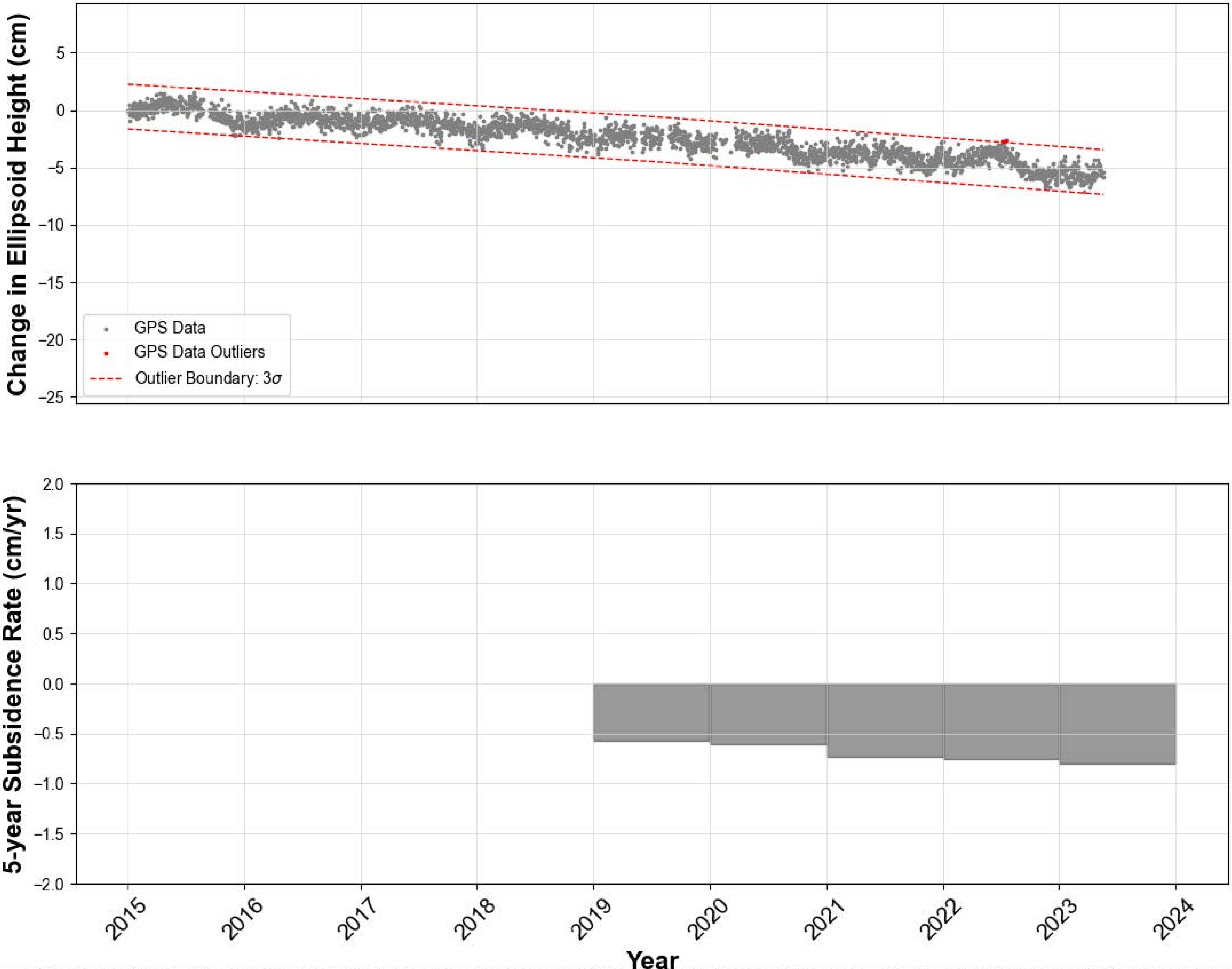
Woodville, TX



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

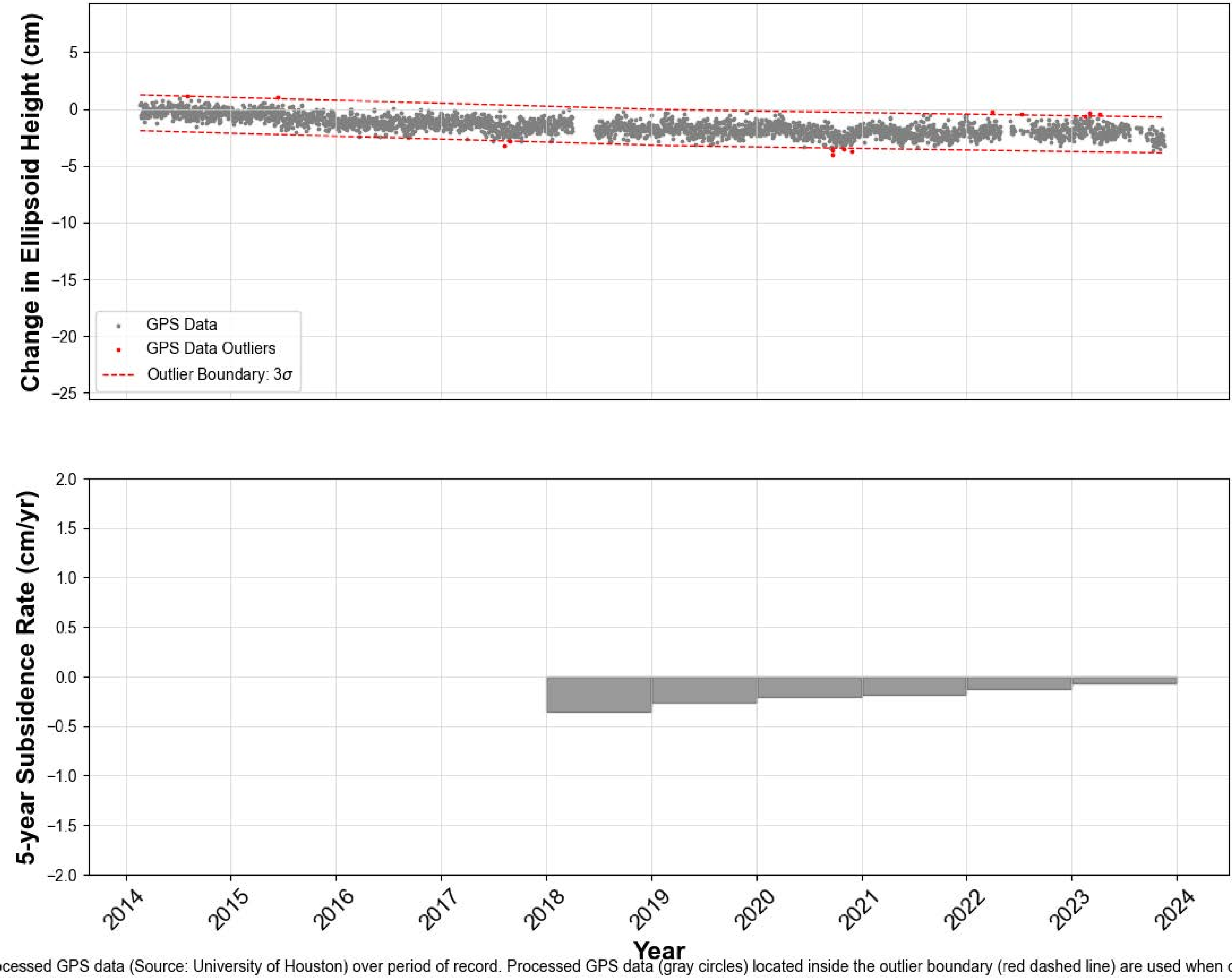
Conroe, TX



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

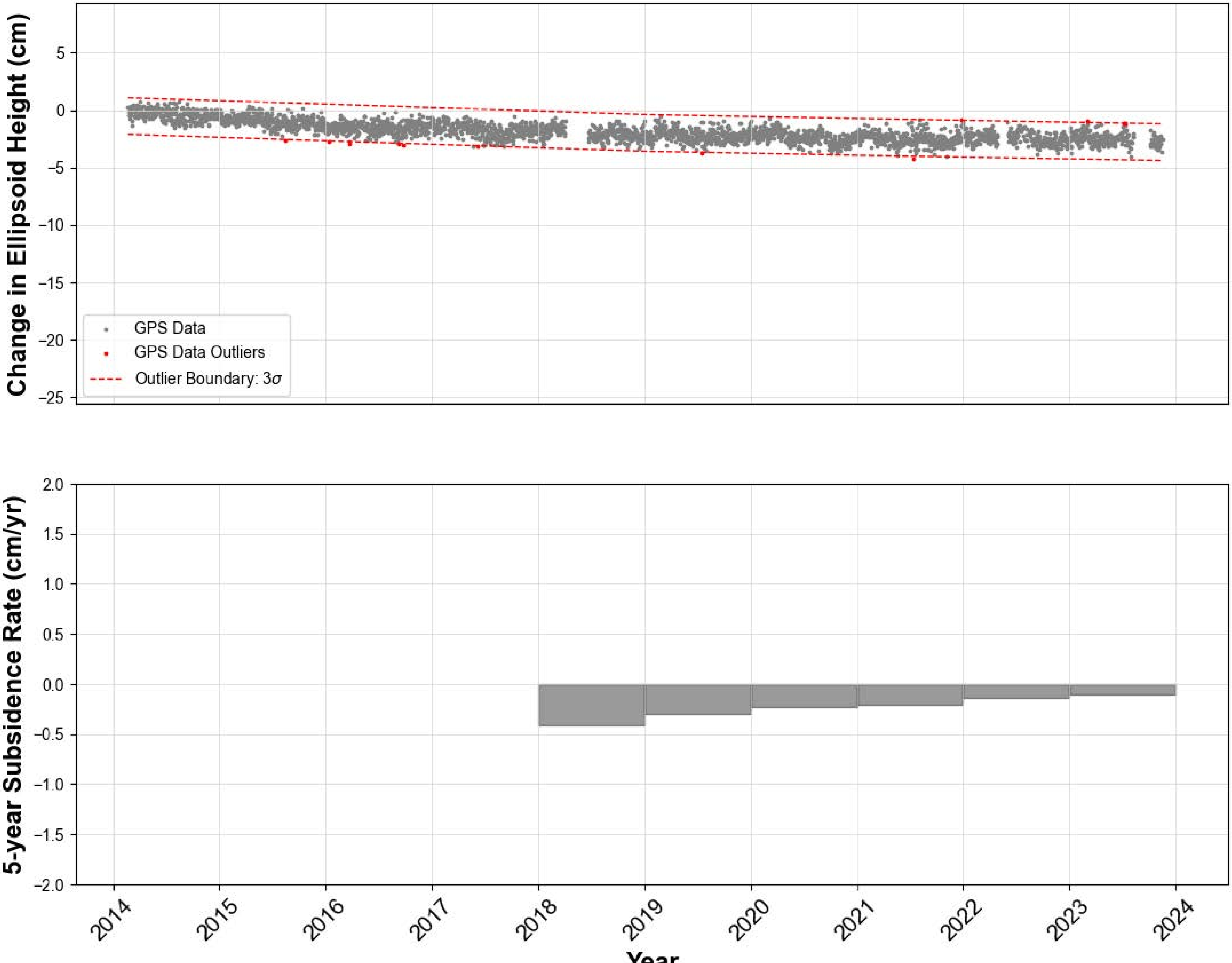
La Marque, TX



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

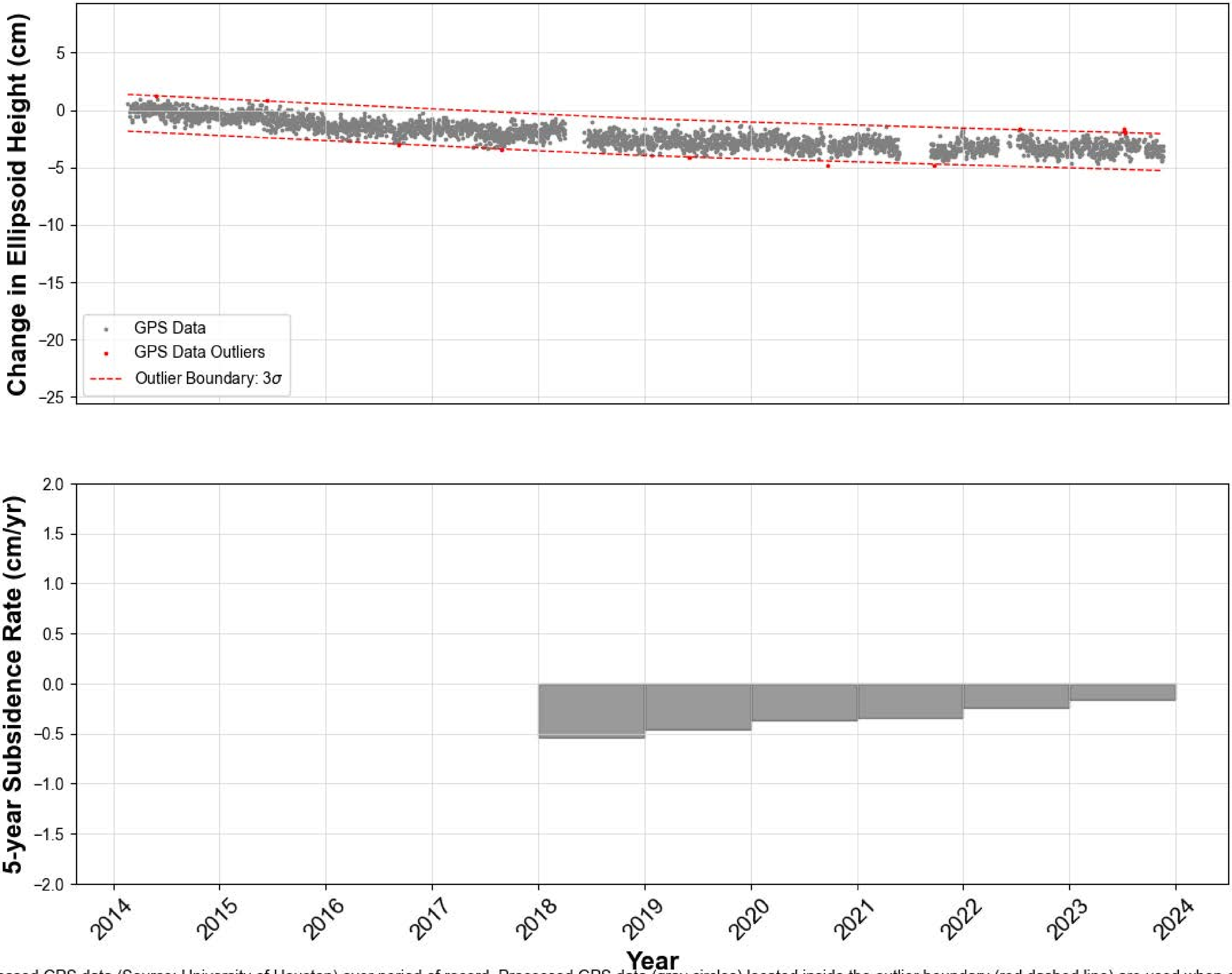
La Marque, TX



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

La Marque, TX



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.

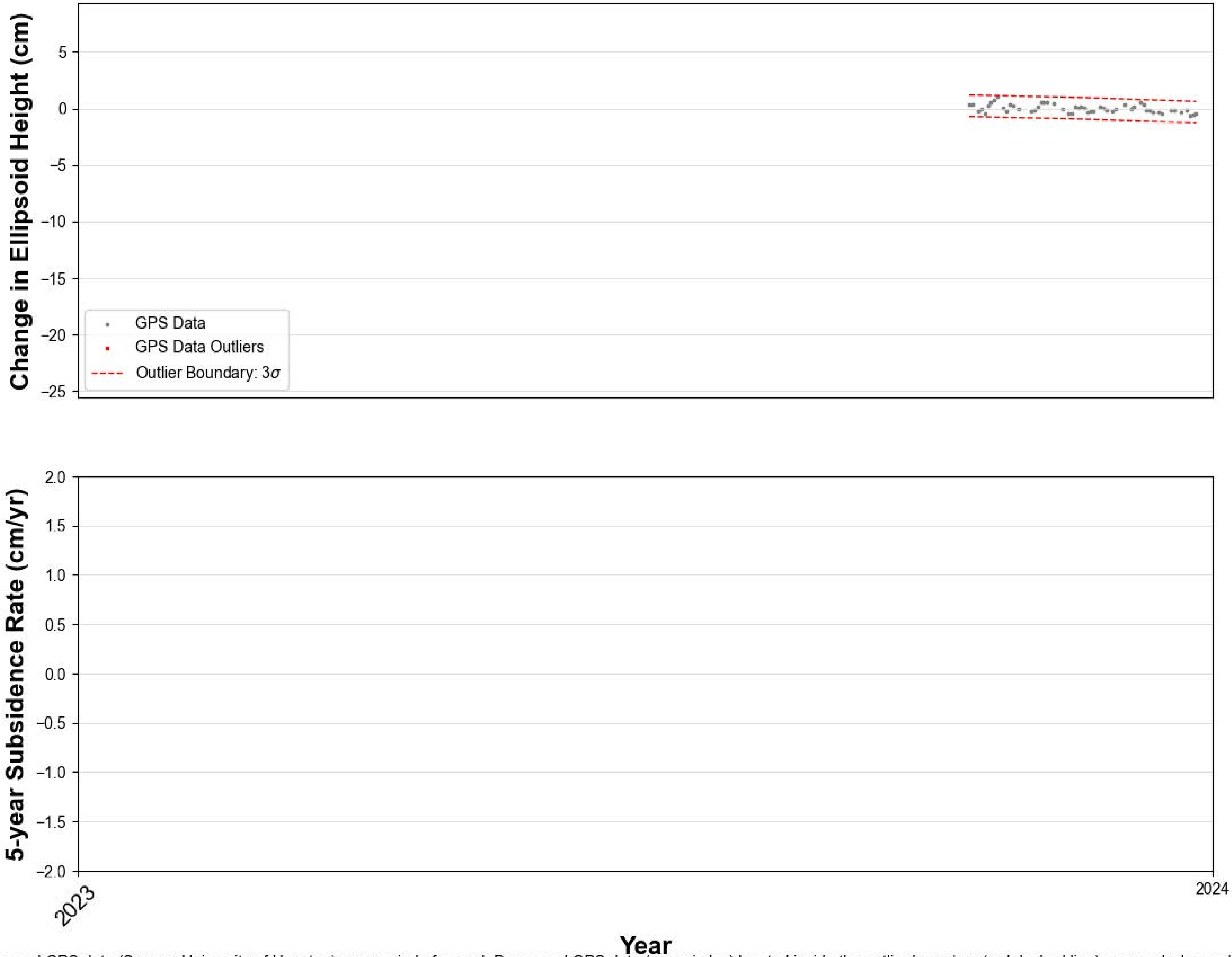
UHC4

La Marque, TX

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.

UHC5

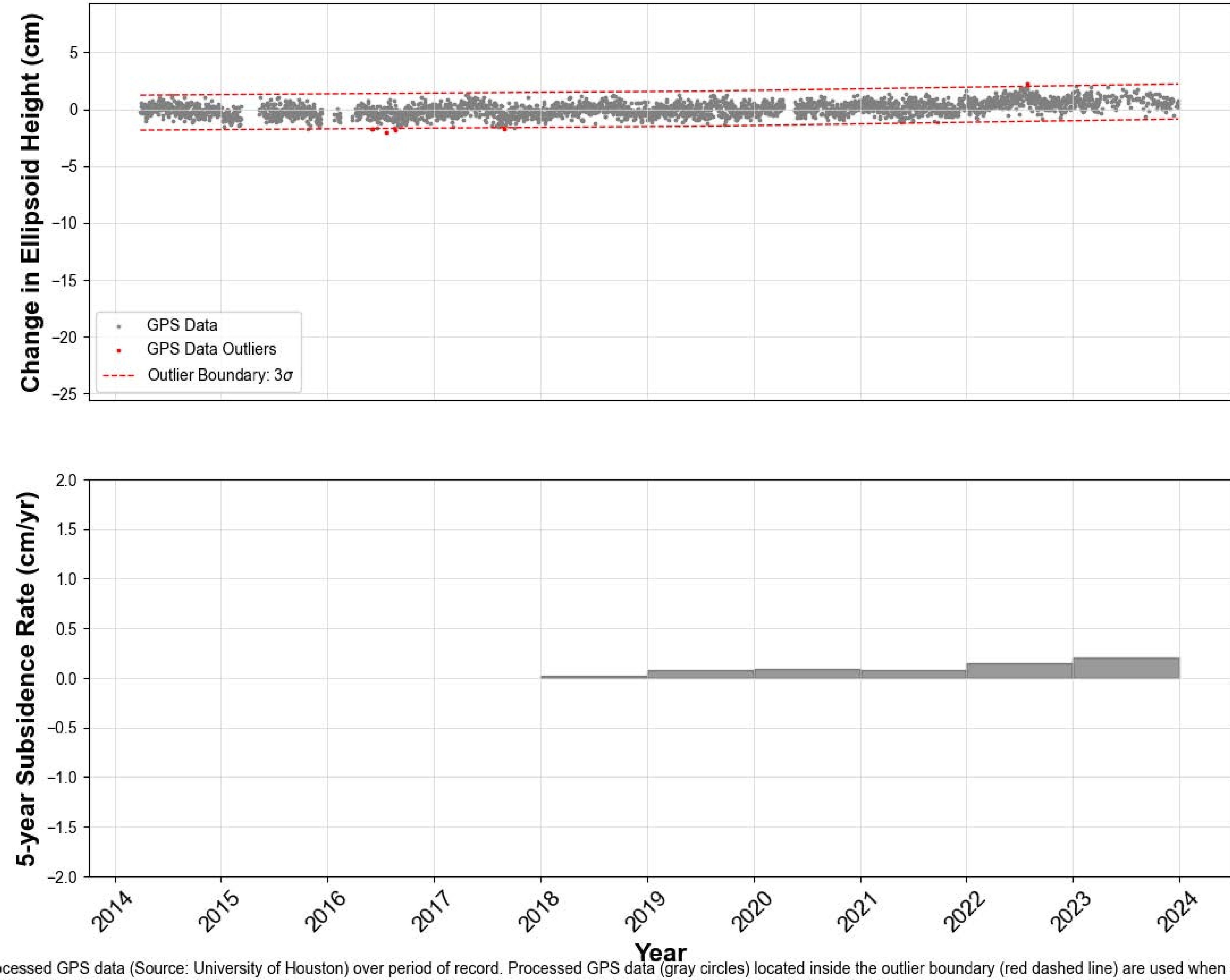
La Marque, TX



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

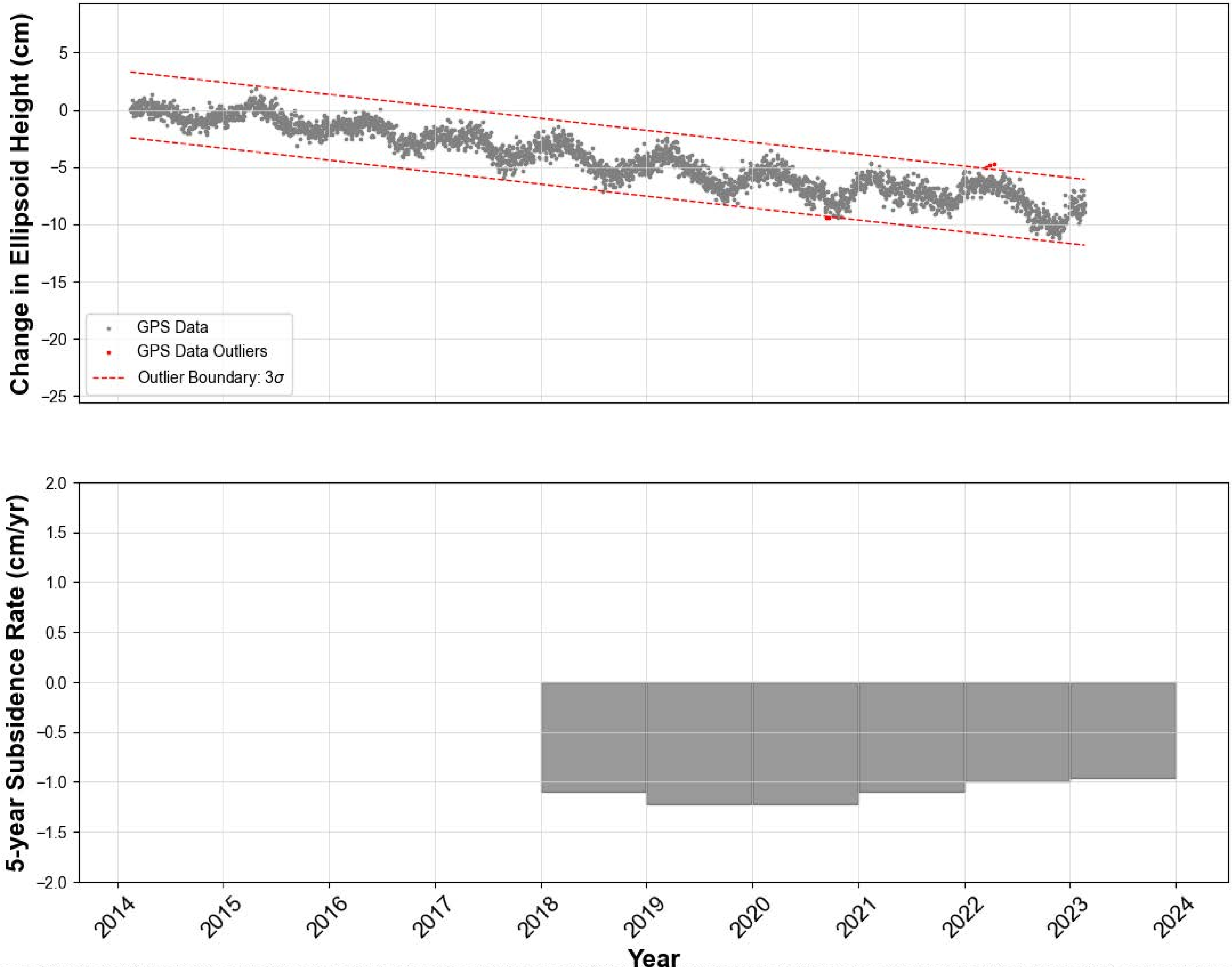
Houston, TX



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

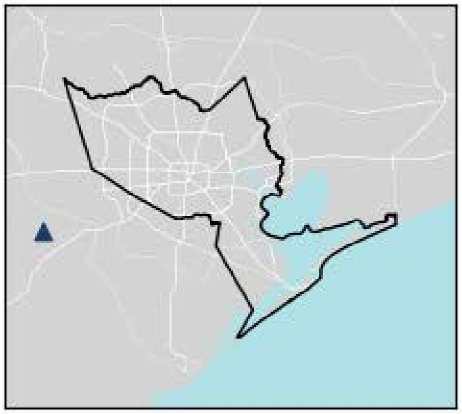
Katy, TX

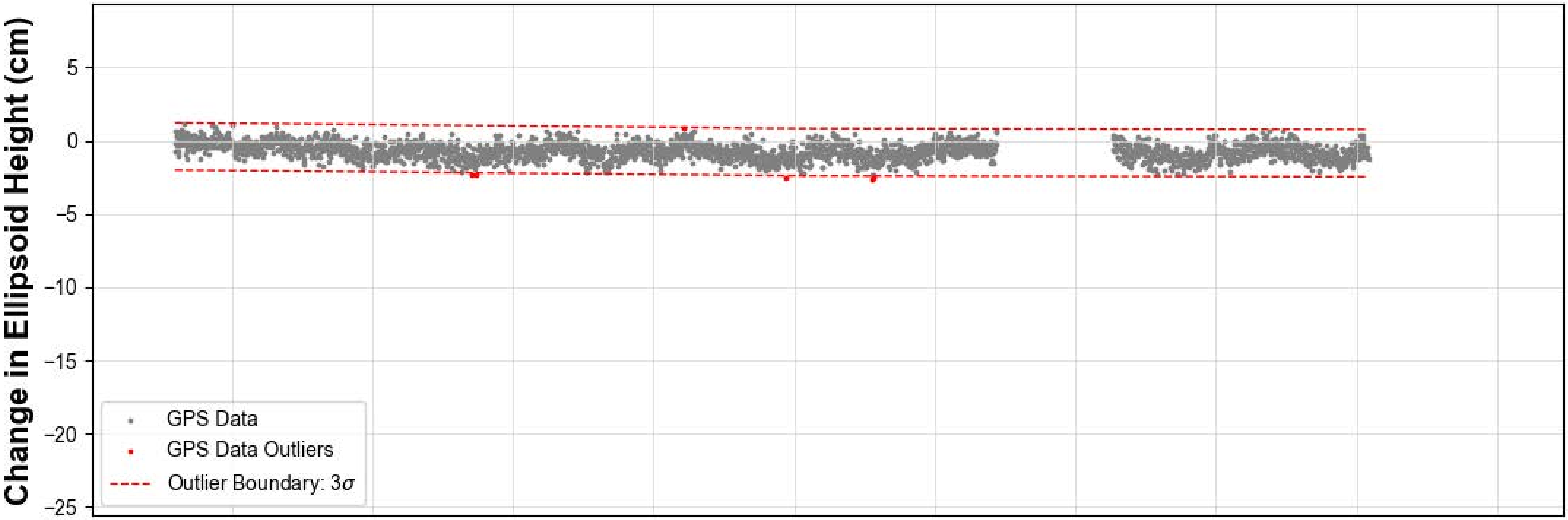


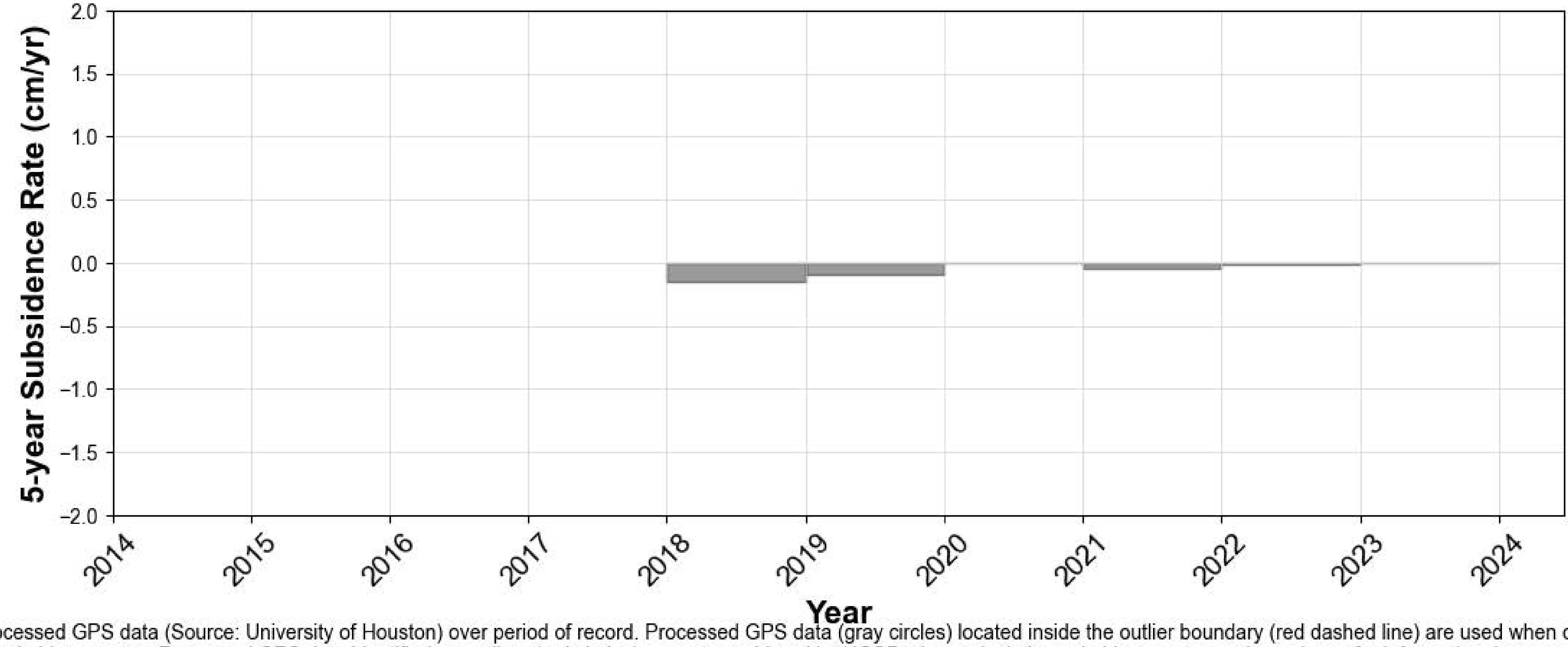
Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

UHEB

East Bernard, TX







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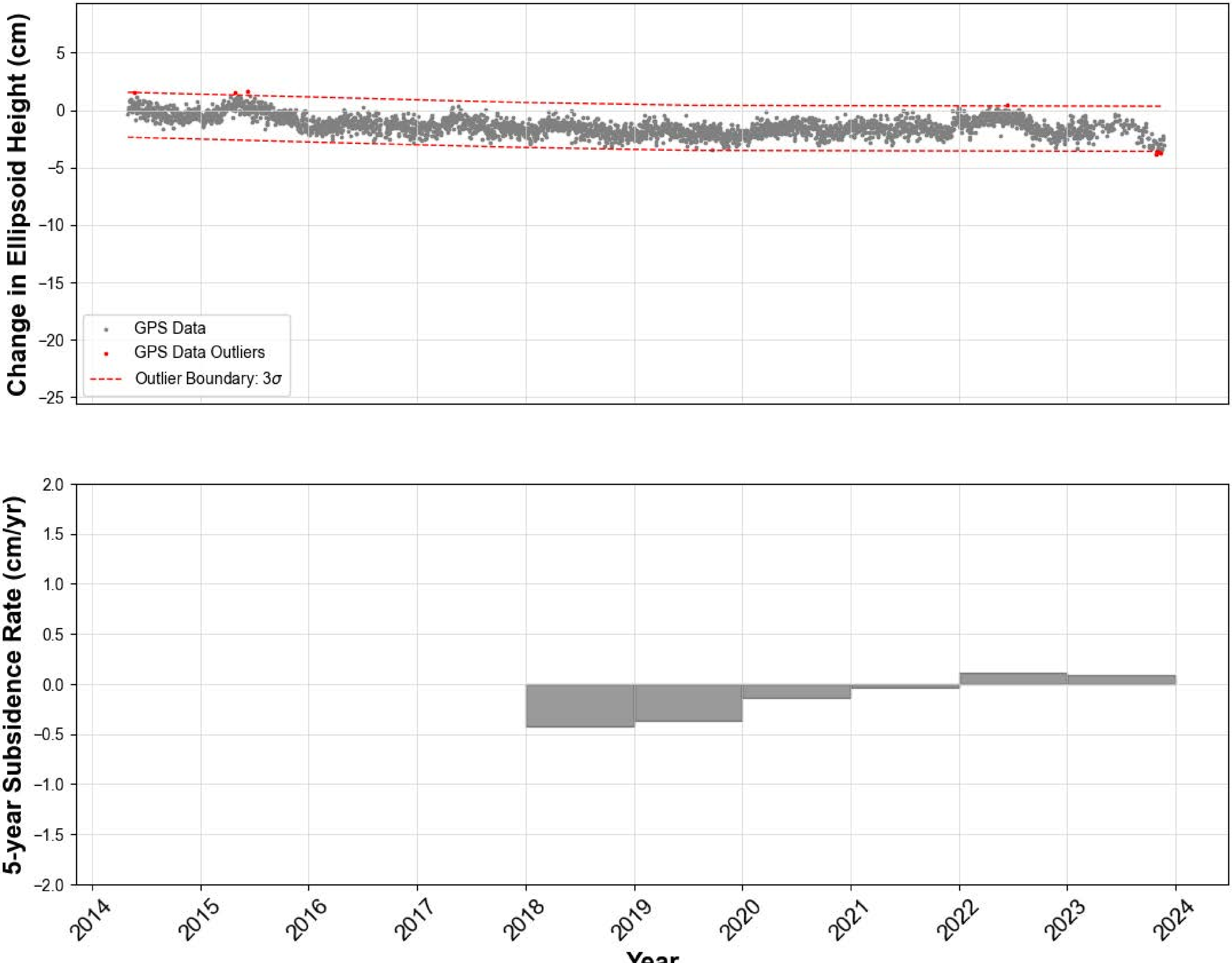
UHRI

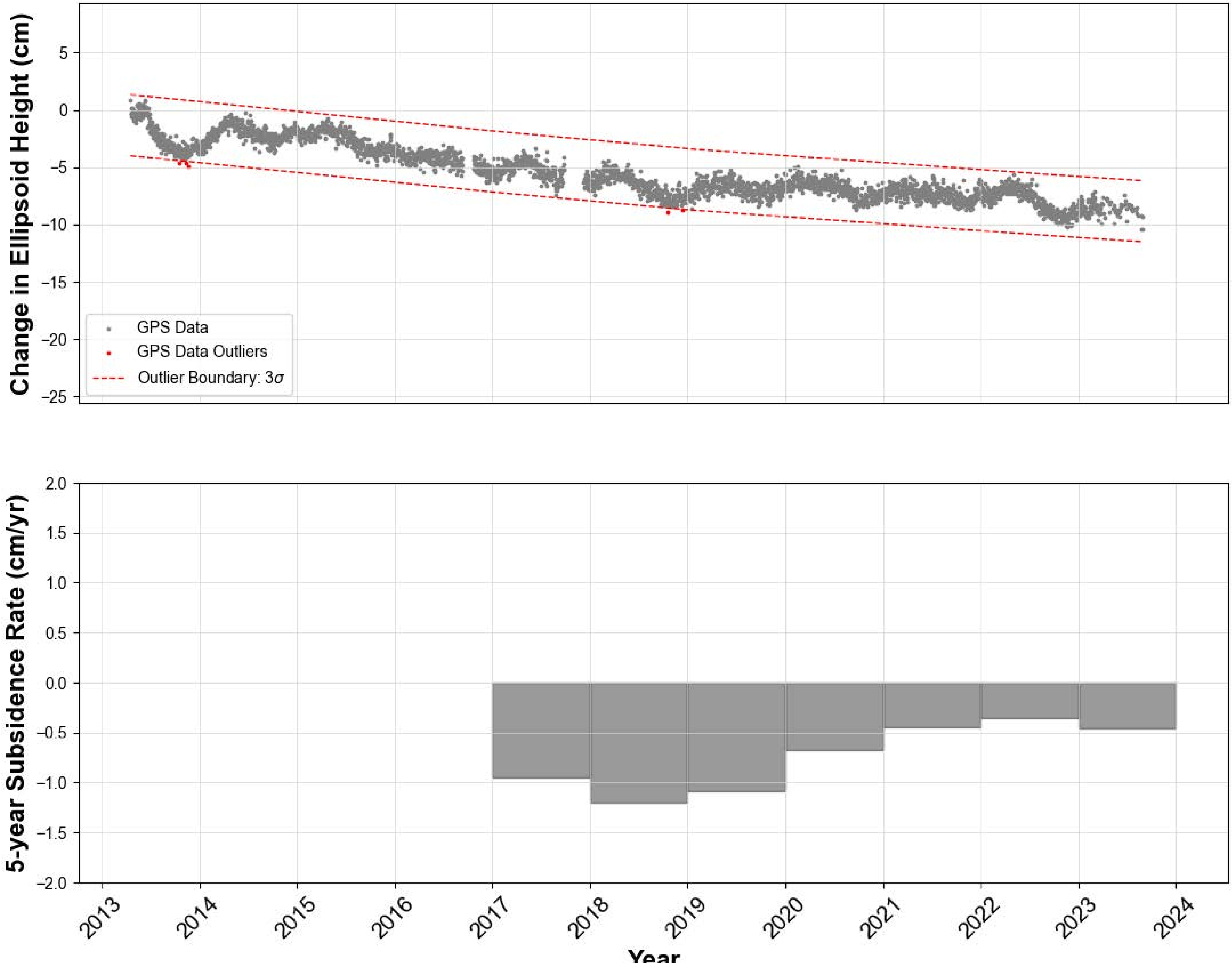
Houston, TX



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

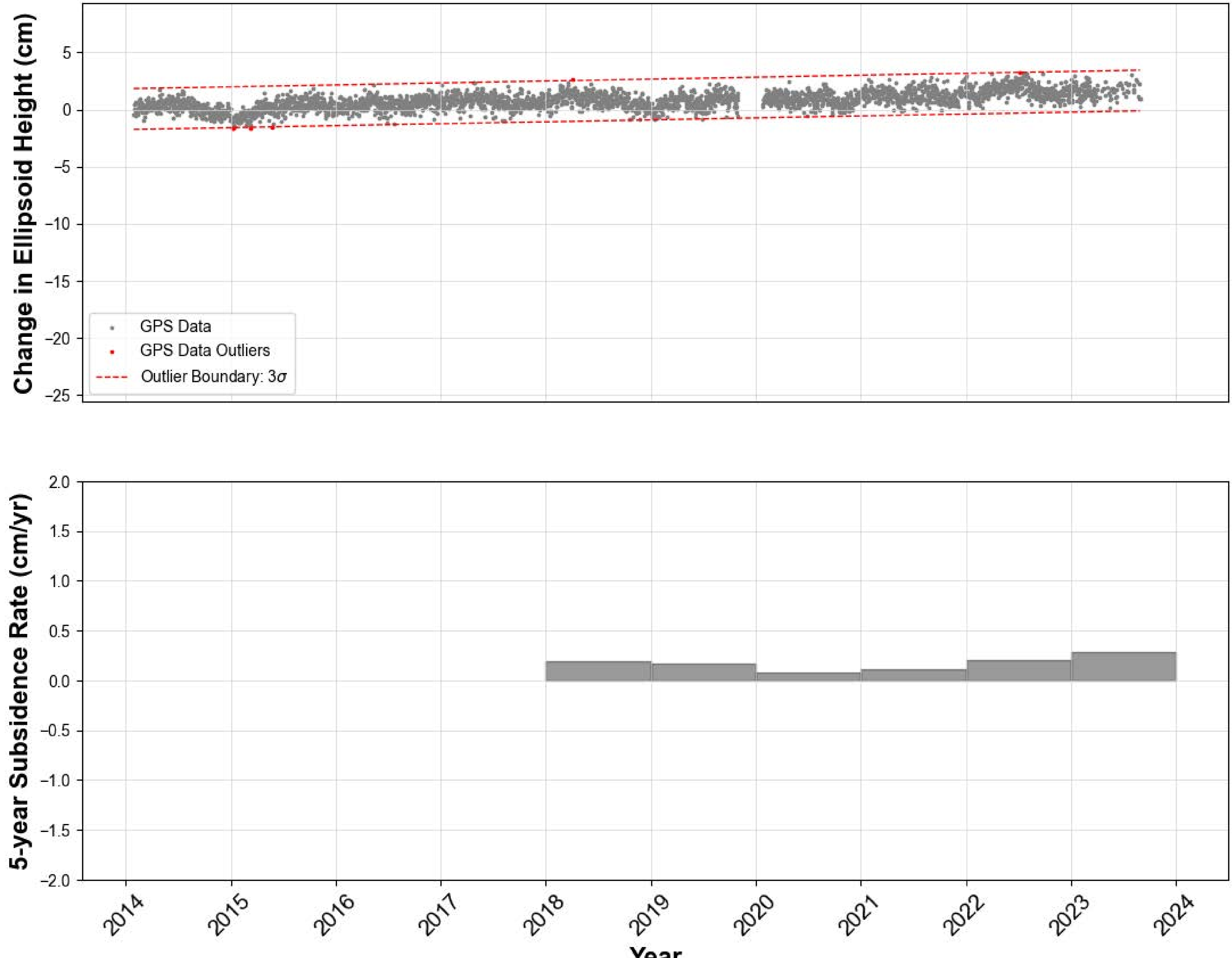
Houston, TX



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

Pasadena, TX



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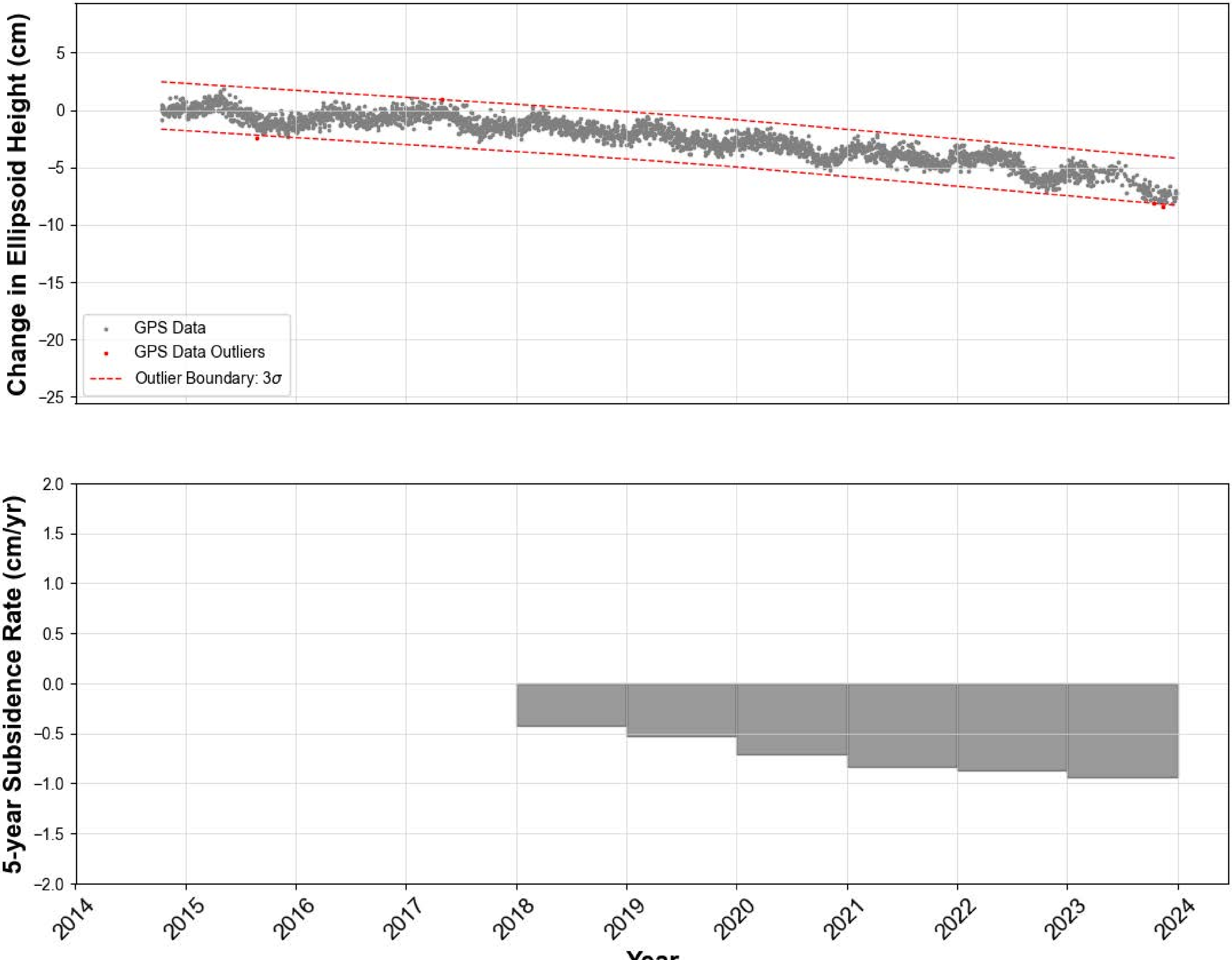
WHCR

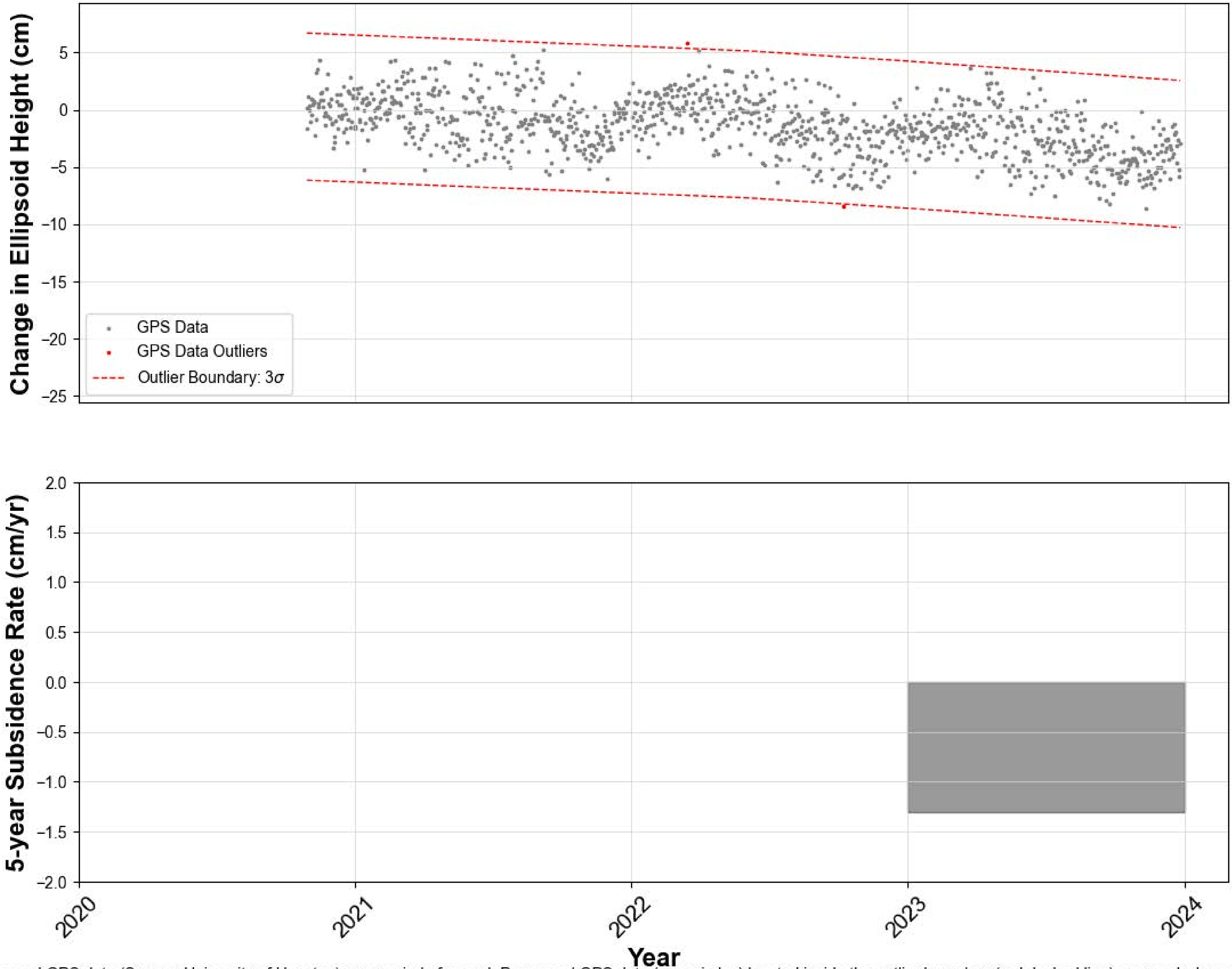
The Woodlands, TX



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

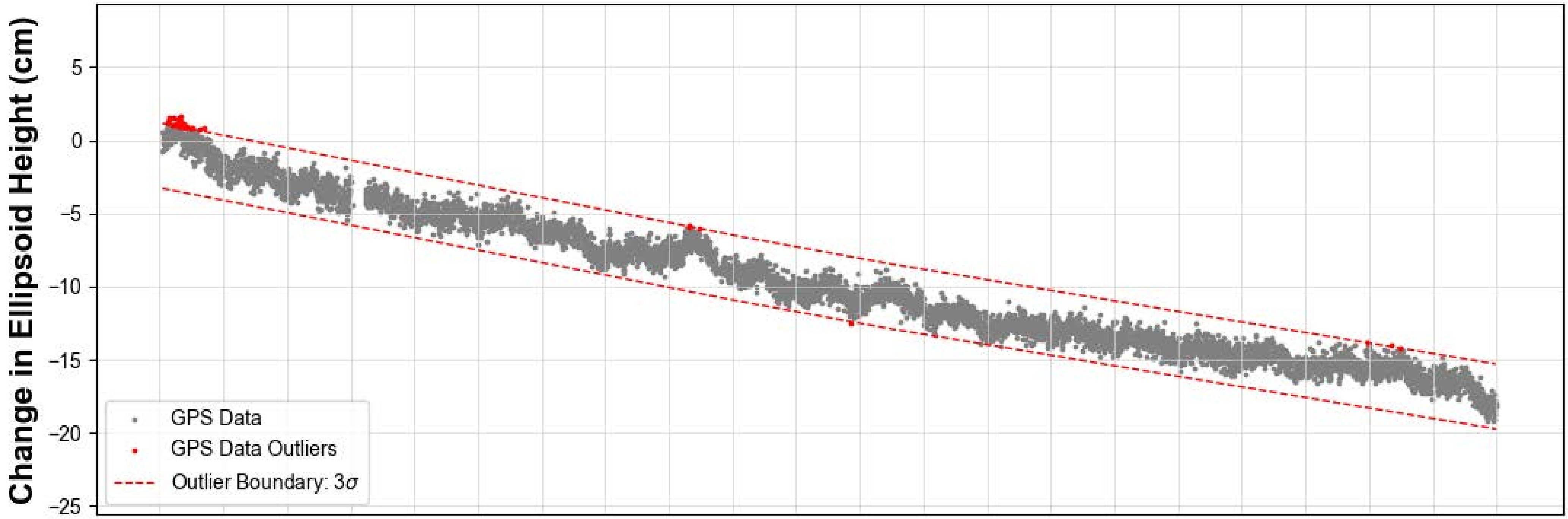
The Woodlands, TX

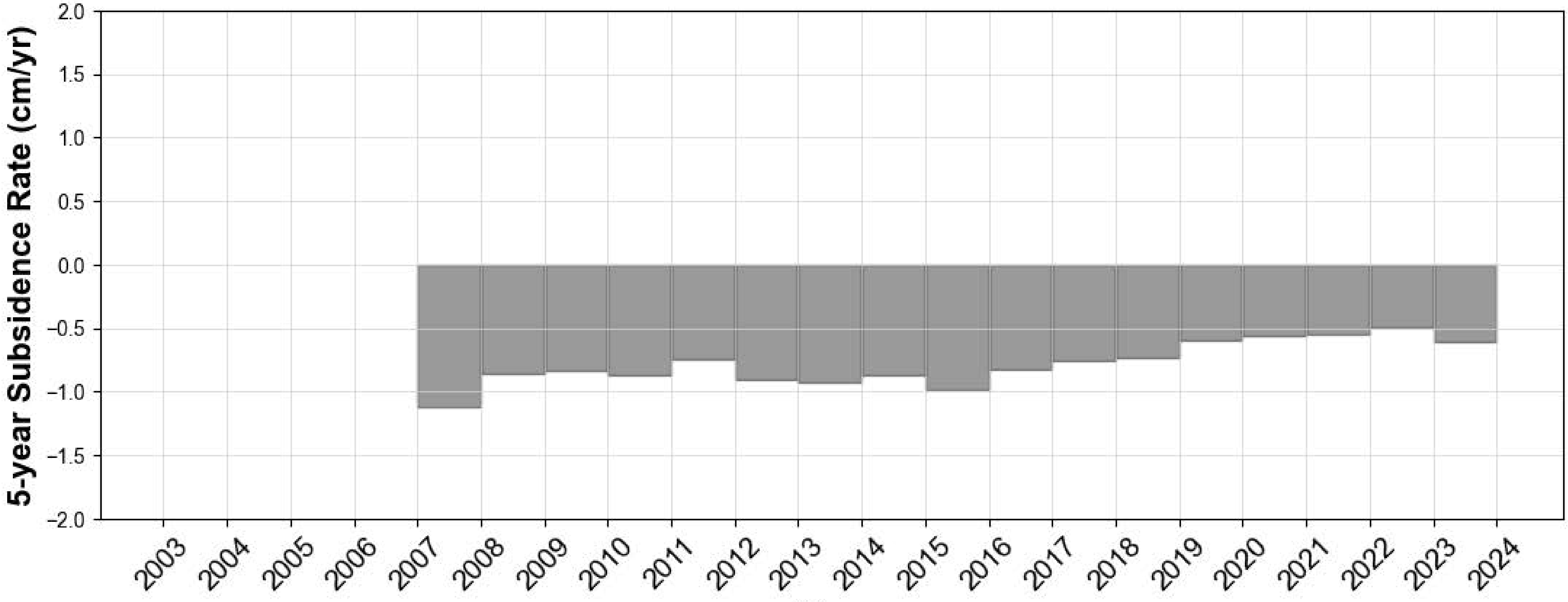


Processed GPS data (Source: University of Houston) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed line) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by HGSD when calculating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

ZHU1

Houston, TX





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Appendix C – Public Testimony and Comments

Public Testimony and Comments

The public hearing for the 2023 Annual Groundwater Report was held on April 25th, 2024 and the record remained open for public testimony and comment until May 3rd, 2024. Two questions were received and answered at the public hearing and are summarized below.

Question 1: Mr. Bill Alcorn asked, "Are we in a position to help various different agencies like Brazos River Authority to clean up this water that would be potable because they can no longer use the groundwater. Groundwater usage is 10% mostly and we're going to 20% but we can't bring water in that's contaminated. Is there anything in-line to work with the long-term contamination of the rivers?".

Answer: *Ms. Ashley Greuter (Director, HGSD) responded that the purpose of the District is to prevent subsidence through the regulation of groundwater withdrawal. The District works closely with local and regional alternative water providers to assure that the necessary quantity of water is available to facilitate compliance with our regulatory requirements. It is the responsibility of the water providers to assure they are compliant with all water-quality requirements subject to the jurisdiction of the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA).*

Question 2: Ms. Melissa Rowe stated, "Why there are no extensometers in northwest Houston or Montgomery County, why they're all central Houston area?".

Answer 2: *Mr. Jason Ramage (Hydrologist, USGS) responded that the presented extensometers were installed in the early 1970s in areas of concern during the time when water use was the greatest. Extensometers are expensive to install and the USGS is not currently part of discussions to install an extensometer in Montgomery County.*

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Harris-Galveston Subsidence District Report 2024-01

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