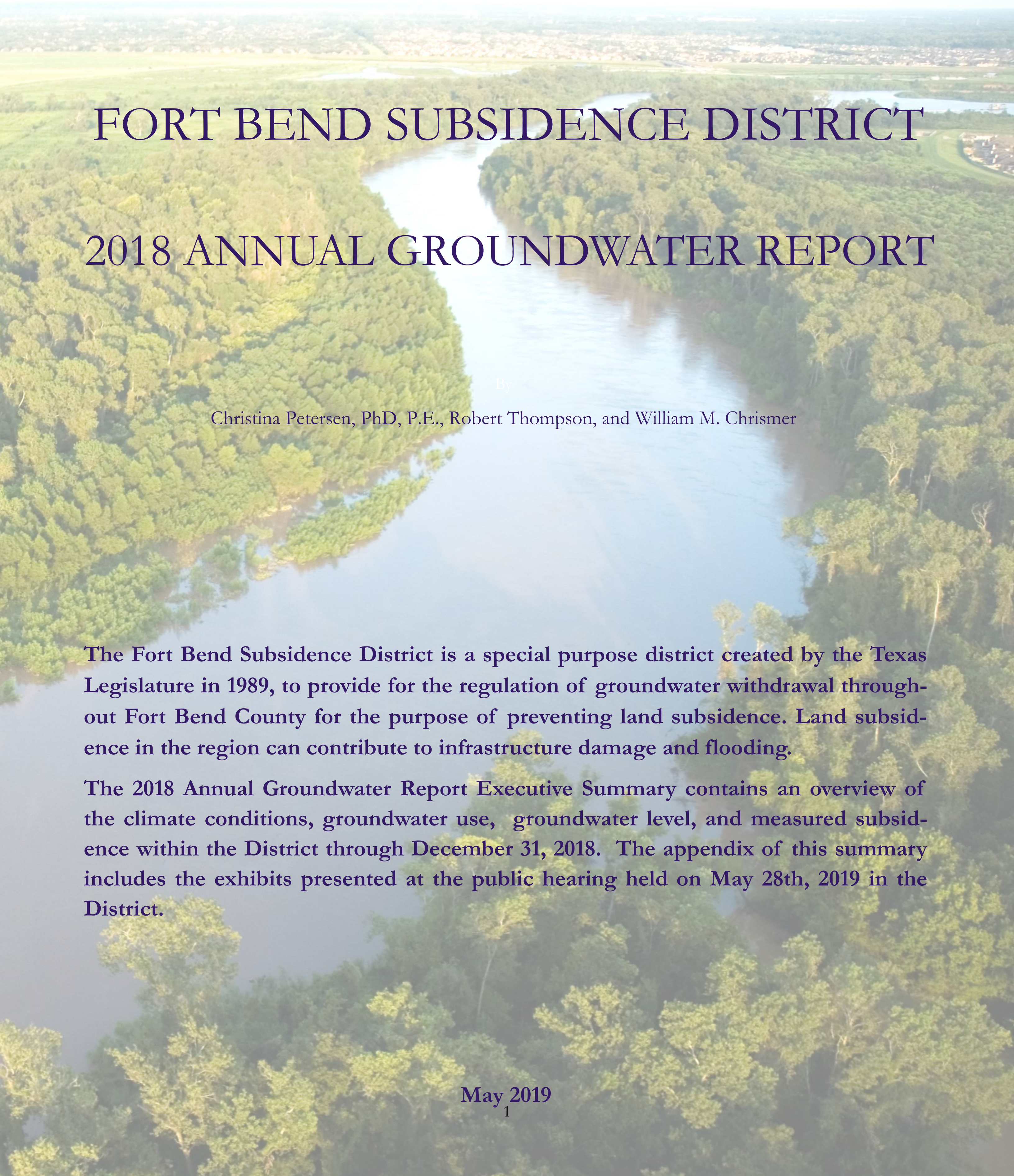

FORT BEND SUBSIDENCE DISTRICT

2018 ANNUAL GROUNDWATER REPORT

By

Christina Petersen, PhD, P.E., Robert Thompson, and William M. Chrismer

The Fort Bend Subsidence District is a special purpose district created by the Texas Legislature in 1989, to provide for the regulation of groundwater withdrawal throughout Fort Bend County for the purpose of preventing land subsidence. Land subsidence in the region can contribute to infrastructure damage and flooding.

The 2018 Annual Groundwater Report Executive Summary contains an overview of the climate conditions, groundwater use, groundwater level, and measured subsidence within the District through December 31, 2018. The appendix of this summary includes the exhibits presented at the public hearing held on May 28th, 2019 in the District.

May 2019

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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 that contributed to the 2018 annual groundwater report. The authors would like to thank the staff of the Fort Bend Subsidence District for their diligent field work in collecting and verifying GPS and water use information,, Brian Ladd and Vanson Truong (Harris-Galveston Subsidence District) for their processing and validation of water use data; Dr. Guoquan Wang (University of Houston) and his students for processing and archival of all of the raw GPS data, Joseph Turco (Northeastern University) for the development of computer scripts to aid in the interpretation and visualization of the GPS data; and the engineers, staff, and owners of the over 1,300 permitted wells in the District that submitted detailed water use information contained in this report.

Public Hearing Notice was properly posted on March 29th, 2019.
Draft Released to Public at Hearing held on May 28th, 2019 at
Hearing Examiner: Ms. Helen Truscott
Record held open for public comment until June 04, 2019.
Approved by the Board of Directors at public meeting held on June 26, 2019.

Fort Bend Subsidence District
301 Jackson Street—Suite 639
Richmond, TX, 77469

EXECUTIVE SUMMARY

INTRODUCTION

Groundwater was the primary source of water for the municipal, agricultural, and industrial users over the last century. Rapid increase in population in the 1950's due to the expansion of the industrial complex in the Houston Ship Channel area led to a dramatic increase in water demand and groundwater withdrawal. The increase in water use caused significant water-level decline in the Gulf Coast Aquifer.

Water-level decline in the Gulf Coast Aquifer causes subsidence in the Houston area. Subsidence is the loss of land-surface elevation. The Gulf Coast Aquifer is composed of many interbedded sand and clay lenses that are not horizontally or vertically continuous. This heterogeneous mix of sand and clay is unique to the Texas Gulf Coast, and results in an aquifer particularly susceptible to compaction and land-surface subsidence. Subsidence rates are the greatest in areas where the aquifer potentiometric water-level, a measure of the pressure head in the aquifer system, are decreasing over time. Historically, subsidence has occurred over a large area surrounding the Houston metropolitan area with cumulative subsidence reaching over 10 feet.

Since being enacted by the Texas Legislature in 1989, the Fort Bend Subsidence District has developed regulatory plans to address the subsidence issue in Fort Bend County. Currently, the District is parsed into two regulatory areas. Regulatory Area A (Area A) includes the areas closest to Harris County including the cities of Sugar Land, Richmond, Rosenberg, and Missouri City as well as the North Fort Bend Water Authority. Regulatory Area B (Area B) includes the western and southern portions of Fort Bend County including Simonton and Weston Lakes as well as the West Fort Bend Water Authority.

The District Regulatory Plan, last updated in 2013, requires all permitted groundwater users to source 60% of their total water demand from an alternative source of water (not groundwater). Alternative water sources are defined as sources that when developed do not contribute to subsidence within the District. Permittees in Area A are currently going through the conversion process and may submit a groundwater reduction plan for approval. An approved groundwater reduction plan requires the permittee to follow a conversion process that allows for a gradual conversion over time, 30% conversion by 2014, and 60% by 2025. More information about the District Regulatory Plan and the requirements can be found at www.fbsubsidence.org.

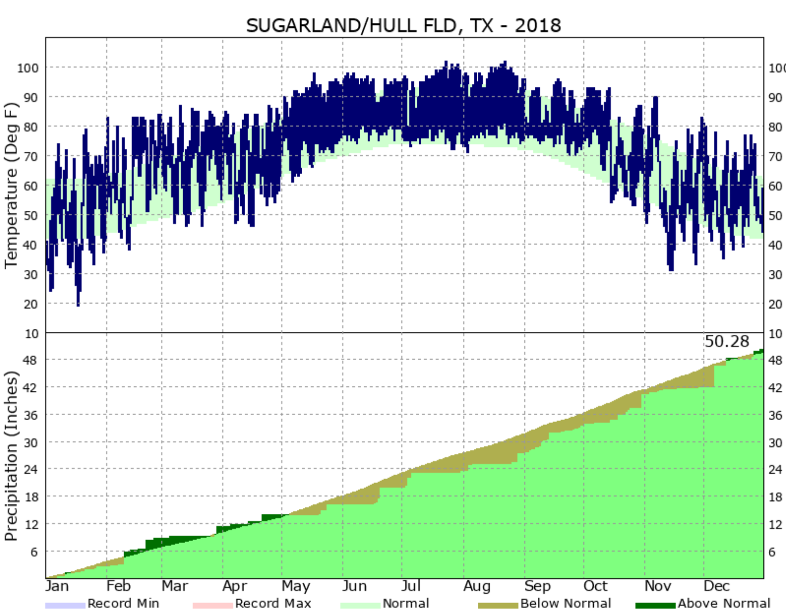


Figure 1. Measured precipitation and temperature at the City of Sugarland and 30-year normal averages, 2018 (Source: National Climatic Data Center)

CLIMATE

Annual variations in precipitation can have a significant impact on the total water demand of the District. Water use patterns change during periods of climatic variation, which results in changes in water levels and potentially in subsidence rates. During periods of excessive rainfall, total water demand can decline, conversely, during prolonged dry periods, water use can increase resulting in declining water levels in the aquifer and subsidence.

Overall, the 2018 calendar year finished the year about

A In the 2013 regulatory plan regulatory Area A included the Richmond/Rosenberg subarea that required the 30% conversion to be completed by the end of 2015.

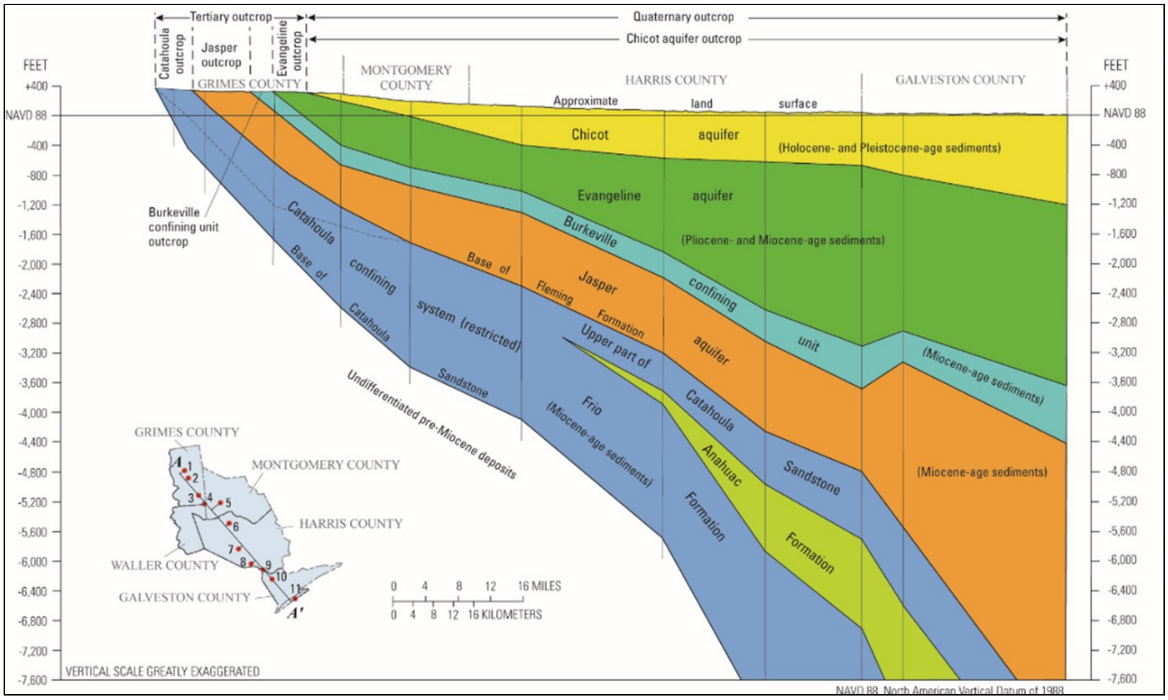


Figure 2. Hydrogeologic cross-section of the Gulf Coast Aquifer System in the Houston region, Texas. (source: U.S. Geological Survey)

normal in total precipitation (Figure 1) based on data collected near Sugar Land, TX. Although there were several moderate rainfall events, generally, rainfall accumulation was steadily near normal for most of the year.

HYDROGEOLOGY

The Gulf Coast aquifer exists as an accretionary wedge of unconsolidated sediments composed primarily of sand, silt, and clay. Indicative of a transgressive-regressive shoreline depositional environment, the interbedded sands and clays are not horizontally or vertically continuous at larger than a local scale.

The three primary water bearing units include the Chicot, Evangeline, and Jasper aquifers. The Chicot and the Evangeline aquifers comprise the shallow system of aquifers. They are hydrologically connected, allowing for the free flow of water between the two units. Historically, nearly all the groundwater production in the Gulf Coast Aquifer System in the District has occurred in the shallow system. The Jasper aquifer is the deepest of the three primary water bearing units and is isolated by the regionally persistent Burkeville confining unit.

In the region, the Catahoula Sandstone, deepest water bearing unit in the Gulf Coast Aquifer system, and the Burkeville confining unit are utilized as a groundwater supply in areas to the north and west of the District where these units may produce appreciable amounts of water.

Historically, most of the subsidence that has occurred in the region can be sourced to clay compaction in the shallow water bearing units associated with long-term water use and the decline in the aquifers' potentiometric surface. Because of the significant amount of clay material in the primary water bearing units of the aquifer, the risk of compaction is high in areas where the developed portions of the aquifers are relatively shallow and under high stress from groundwater development.

WATER USE

How much water is withdrawn from the aquifer on an annual basis is one of the most important data sets compiled each year by the District. All permittees in the District are required to report their annual groundwater use each year.

Since 1989, water users in the District have been working with regional and statewide providers of raw and treated surface waters to prepare for the pending conversion requirements in the District in 2025. The most recent conversion requirement in 2014 has been offset by the rapid growth of Fort Bend County and consistent development of rural agricultural land to suburban and urban areas. The percent of total water demand sourced from groundwater has dropped from about 60% in 1990 to about 50% in 2018 (Figure 3). Total water demand has

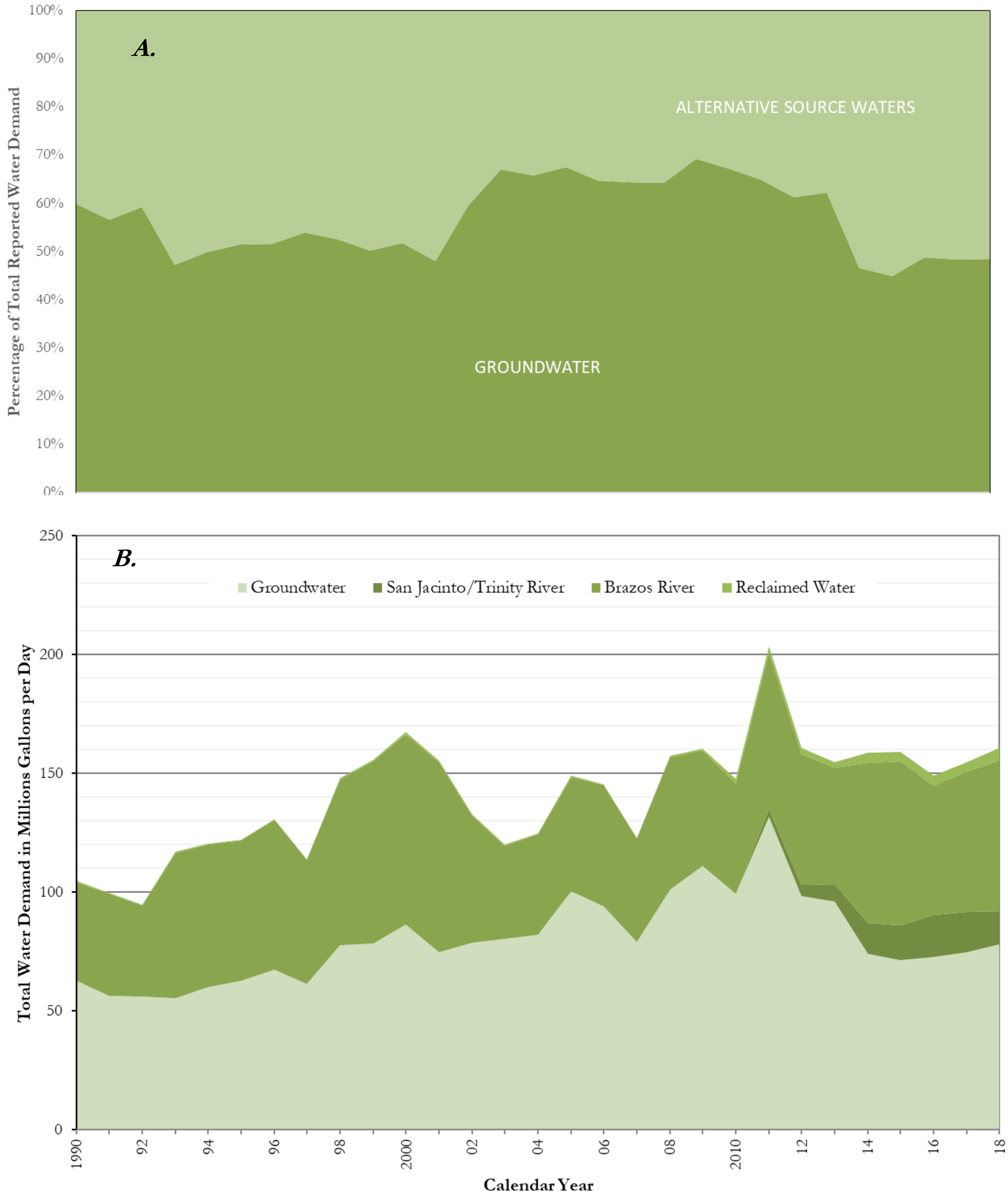


Figure 3. (A) Distribution of groundwater and all alternative source waters as a percentage of the total reported water demand, and (B) the total reported water demand in million gallons per day for all source waters, Fort Bend County, Texas, 2018.

increased since 1990 from about 100 million gallons per day (MGD) to about 160 MGD, with increases coming primarily from all water sources including reclaimed water.

The two primary water uses in the District are for public supply and agricultural irrigation. Public supply groundwater use remains the largest single use category at about 59 MGD, a 5% increase from 2017, and accounts for 76% of groundwater used in the district. Since the last regulatory conversion milestone in 2014, public supply uses have steadily increased about 8% since the low of about 55 MGD following conversion in 2014. Agricultural irrigation has remained relatively steady at about 15 MGD since 2014 with the largest annual amount of water use (about 31 MGD) occurring during the drought of 2011.

The district is divided into two regulatory areas that define how much groundwater may be utilized as a percentage of the total water demand. In 2018, total groundwater withdrawal in Area A was 66.9 MGD, a 3% increase over the previous year (Figure 4). In 2018, total groundwater withdrawal in Area B was 11 MGD, a 14% increase over the previous year. In 2025, permittees with an approved groundwater reduction plan in Area A will transition from 70% groundwater to 40% groundwater as a percentage of total water demand. Entities in Area A are working cooperatively to develop the supply and infrastructure (supply, treatment, and conveyance) needed to facilitate the next regulatory conversion milestone in 2025.

Total alternate water use increased about 3% from 2017. Surface water came from all three rivers basin within the region with the greatest amount coming from the Brazos (77%), the Trinity/San Jacinto System (17%), and reclaimed water projects (6%).

Total water demand (surface water, reclaimed water, and groundwater) within the District increased to 160.6 MGD during 2018 (up 3.1% from 2017). Groundwater is still the single largest source of water in the District supporting nearly 49% of the total water demand. The Brazos River is the second largest utilized source of water for the District supporting about 39% of the total water demand.

AQUIFER WATER LEVEL

All groundwater used in the District is sourced from the Gulf Coast Aquifer System, which is comprised of three primary water bearing units. The two units most widely used in the District are the Chicot and Evangeline aquifers. The Chicot is the shallowest aquifer in the District which is directly connected to the Evangeline aquifer immediately below. The Burkeville confining unit lies

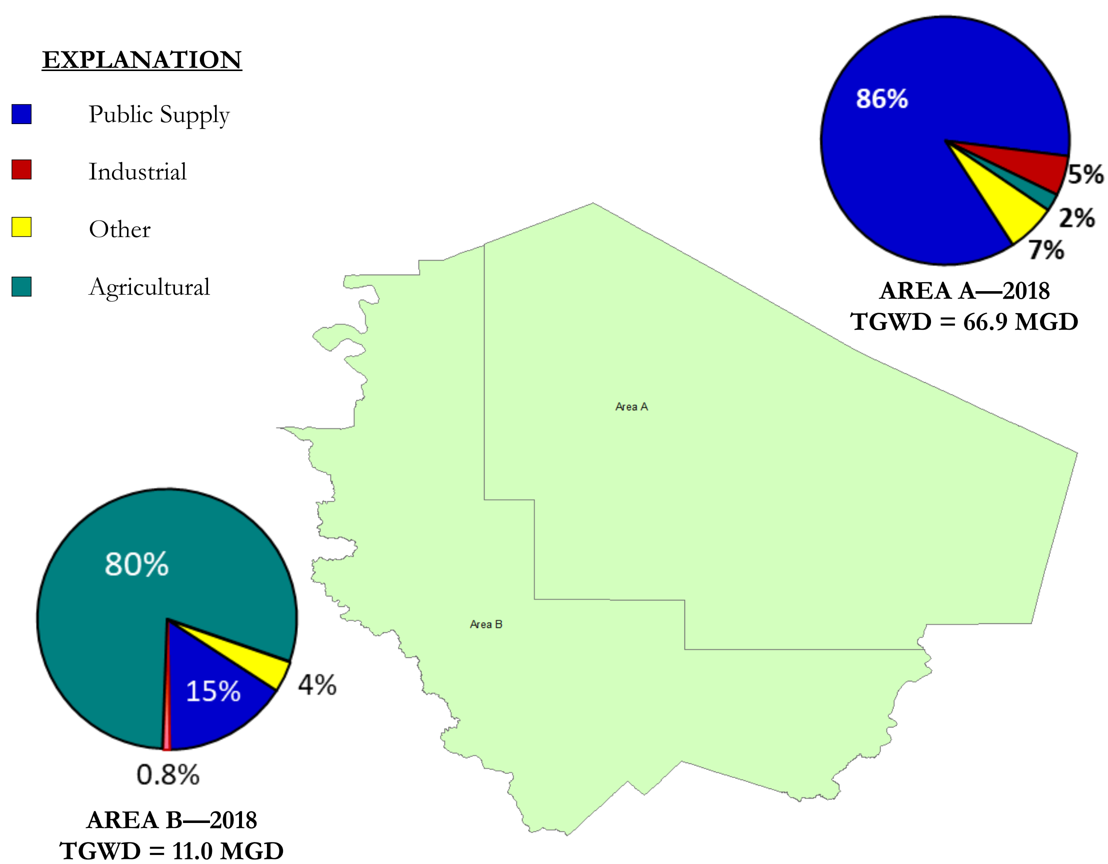


Figure 4. Total groundwater produced by regulatory area with primary use classification as: public/municipal, industrial, Agricultural, and other irrigation uses, Fort Bend County, Texas, 2018.

beneath the surficial aquifers and isolates the third primary aquifer, the Jasper aquifer. The Jasper aquifer is not widely used in the District but is a primary source of water for Montgomery County to the North. In 2018, the first production well screened in the Jasper aquifer in Fort Bend County was in development. The aquifers dip and thicken as they approach the coast from their western-most extent in Grimes and Waller County (Figure 2).

Annually, since 1975, the U.S. Geological Survey (USGS) has measured the water level in hundreds of wells throughout the Houston Region in all primary aquifers to document the impact of changes in water use on the aquifer. Since aquifer water level is the best measure of the pressure in the aquifer, this information is also of vital importance to understanding the impact of changes in water use on subsidence. For example, potentiometric surface data from the Evangeline aquifer collected in 2019 shows the areas of primary stress on the aquifer occurs in northern and western Harris County, and southern Montgomery County (Figure 5).

SUBSIDENCE

Subsidence is the lowering of land surface elevation. Subsidence in the Gulf Coast is caused primarily by the reduction of pressure in the aquifer due to groundwater extraction for municipal, industrial, and irrigation supply. As the water level in the aquifers decline, the clay lenses in the aquifer depressurize and compact, resulting in the subsidence observed at the surface.

Since the late 1990's, the District has been utilizing Global Positioning Stations (GPS) to monitor the land surface deformation in the area. Working collaboratively with the University of Houston researchers, the monitoring network has grown to over 200 monitoring sites throughout the region that area operated by the Harris-Galveston Subsidence District, the Fort Bend Subsidence District, the University of Houston, the Lone Star Groundwater Conservation District, and the Brazoria County Groundwater Conservation District.

The average annual rate of movement is a useful measure to show the current activity at a monitoring site. Figure 7 shows the average annual rate of subsidence from 2014-2018 at over 197 sites in the currently active network that have been active for three years or longer. When compared to the aquifer water level change data shown in Figure 6, in areas where water level has risen, current subsidence rates are small or some uplift (rebound) has occurred. However, in areas where the potentiometric water-level in the aquifer system is below pre-development levels, subsidence rates increase.

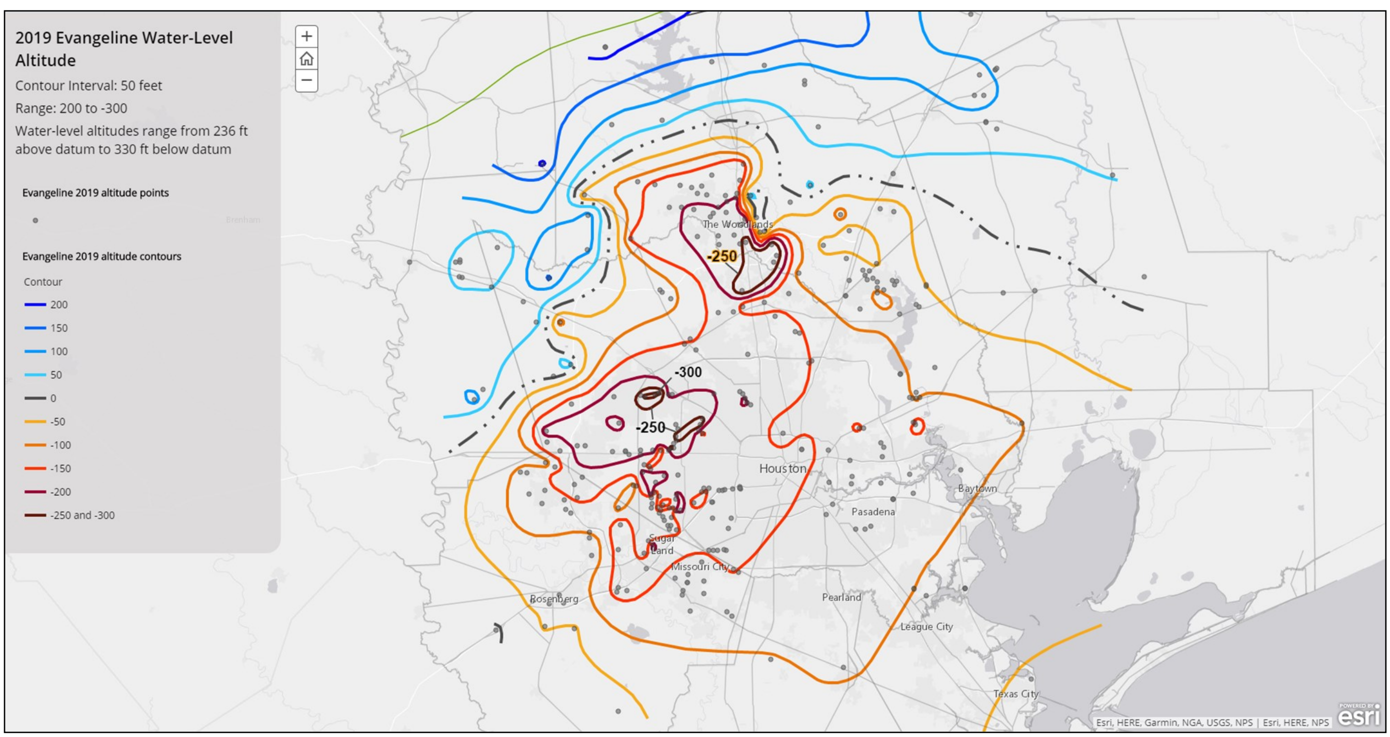


Figure 5. Altitude of the potentiometric surface determined from water-levels measured in tightly cased wells screened in the Evangeline aquifer, Houston Region, Texas, 2019 (source: U.S. Geological Survey)

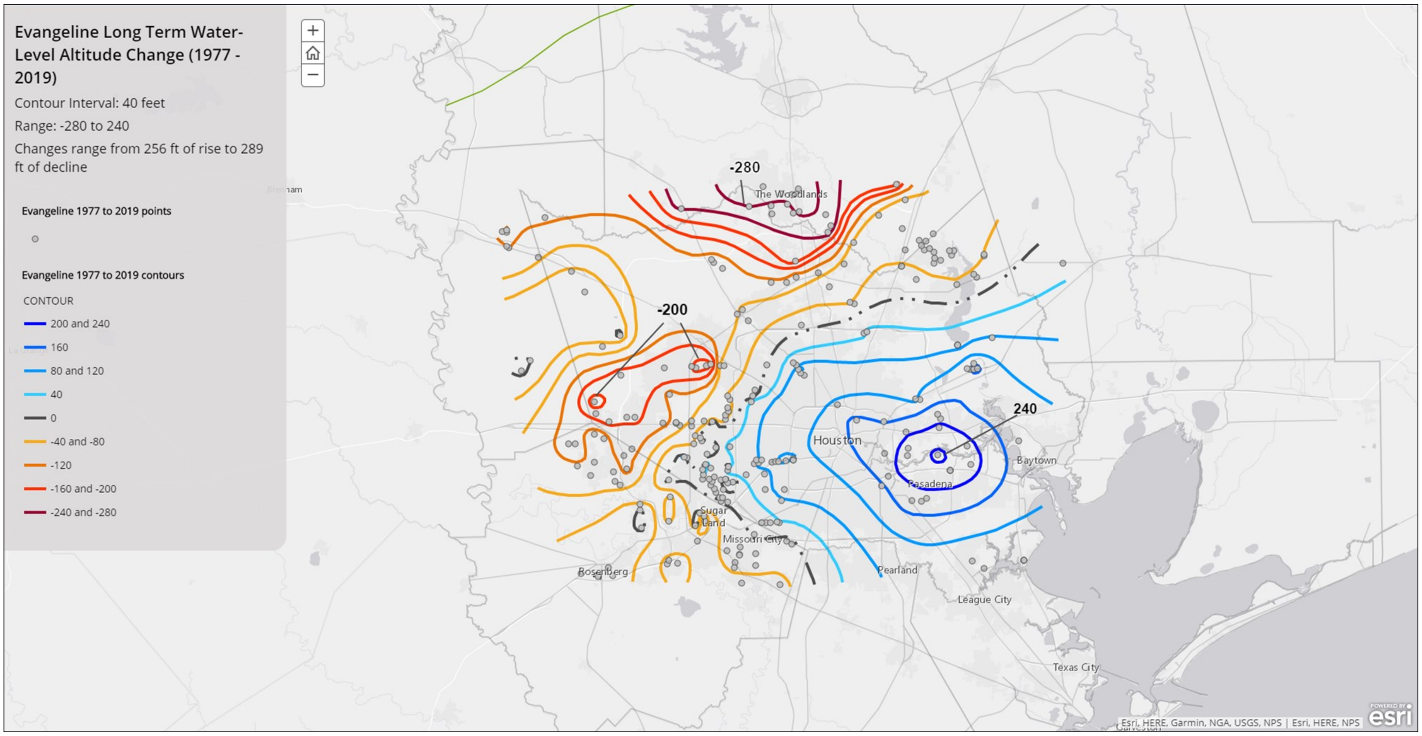


Figure 6. Potentiometric water-level change at wells screened in the Evangeline aquifer, Houston Region, Texas, 1977 to 2019 (source: U.S. Geological Survey)

Quarterly, the raw GPS data collected from all stations within the subsidence monitoring network are processed by Dr. Guoquan Wang at the University of Houston by comparing the station data to a stable horizontal reference frame designated Houston16. The reference frame uses publicly available GPS observation (>5 years) from 15 continuously operating reference stations located outside of the greater Houston area. More information on the reference frame and how it is used can be found at Kearns and Wang, 2018. Subsidence rates are determined by using the linear regression best fit through up to the last five years of data for sites with more than three years of record. The annual rates of subsidence observed in Fort Bend County are generally less than 1.0 cm/year. The largest rate of subsidence observed in Area A occurs in northern Fort Bend County near the city of Katy where the annual rate of subsidence is 1.68 cm/yr (about 0.5 feet per decade).

In 2015, the Lone Star Groundwater Conservation District took regulatory action to stabilize the potentiometric water level in Montgomery County to improve the sustainability of the aquifer and prevent future subsidence. Lone Star's regulations required the conversion of 30% of historical demand to an alternative source water with the remaining 70% to be sourced by groundwater. Because of that action and the compliance by groundwater users in Southern Montgomery County, water-levels rose in the aquifers and consequently the subsidence rates in those areas were reduced. The data collected at HGSD site PA13 is an example of the impact groundwater regulation can have on the resource and subsidence in the region (Figure 8b).

Subsidence has occurred throughout the region has a result of groundwater development. Recent data collected from the GPS monitoring network operated in cooperation with the University of Houston shows the expansion of the subsidence area due to groundwater development in neighboring counties. The estimated magnitude of subsidence determined through benchmark surveying and GPS monitoring is shown in Figure 9. District surveys and active monitoring shows estimated subsidence magnitudes greater than 1 foot since 1906 exists throughout Area A with nearly 5 feet of subsidence having occurred in Eastern Fort Bend County.

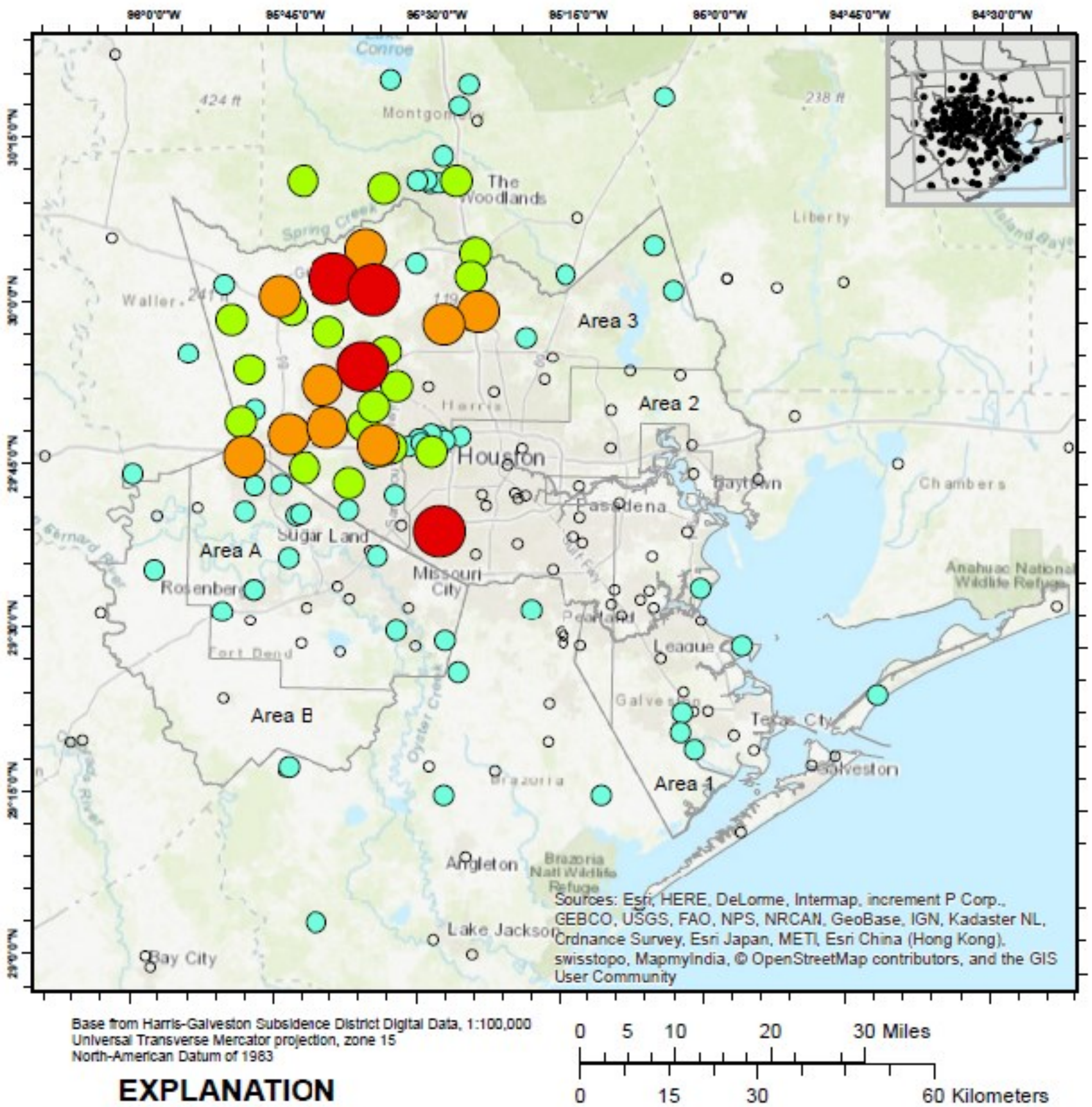
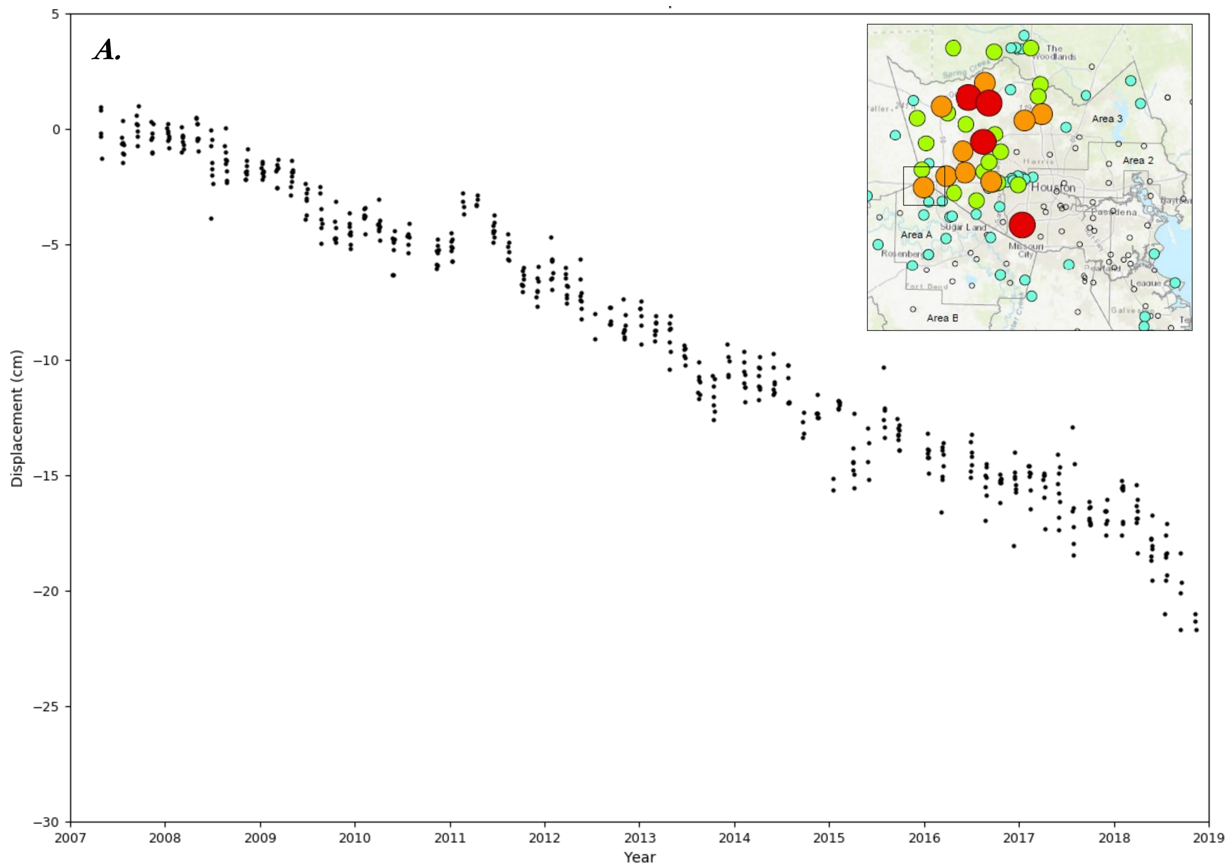


Figure 7. Rate of land surface subsidence, referenced to the Horizontal Reference Frame 16, at GPS monitoring stations with more than three years of data, operated by the Harris-Galveston Subsidence District and the University of Houston, Houston Region, Texas, 2014-2018.



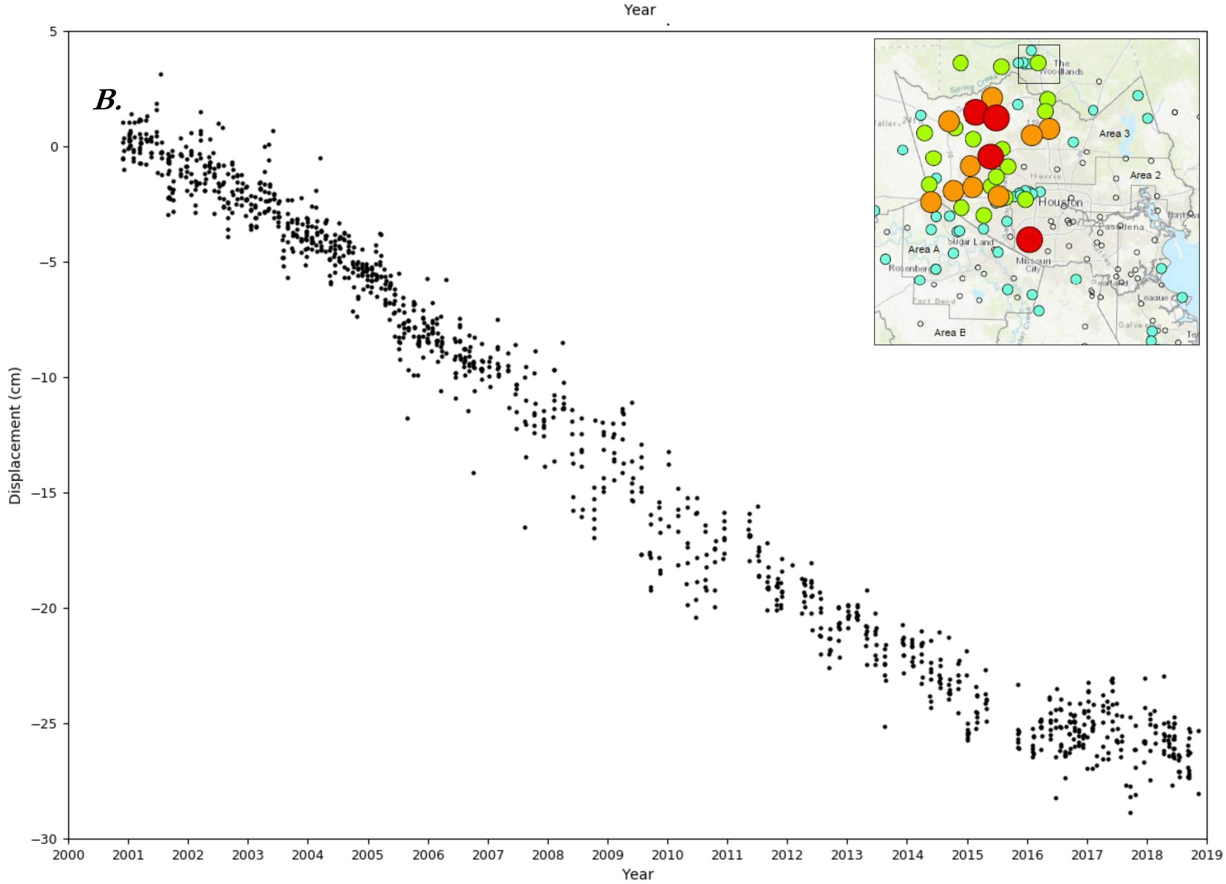


Figure 8. A) Period of record subsidence monitoring data from HGSD station PA29 located near Katy, Texas, 2007-2018; and B) period of record subsidence monitoring data from HGSD station PA13 located near The Woodlands, Texas, 2000-2018.

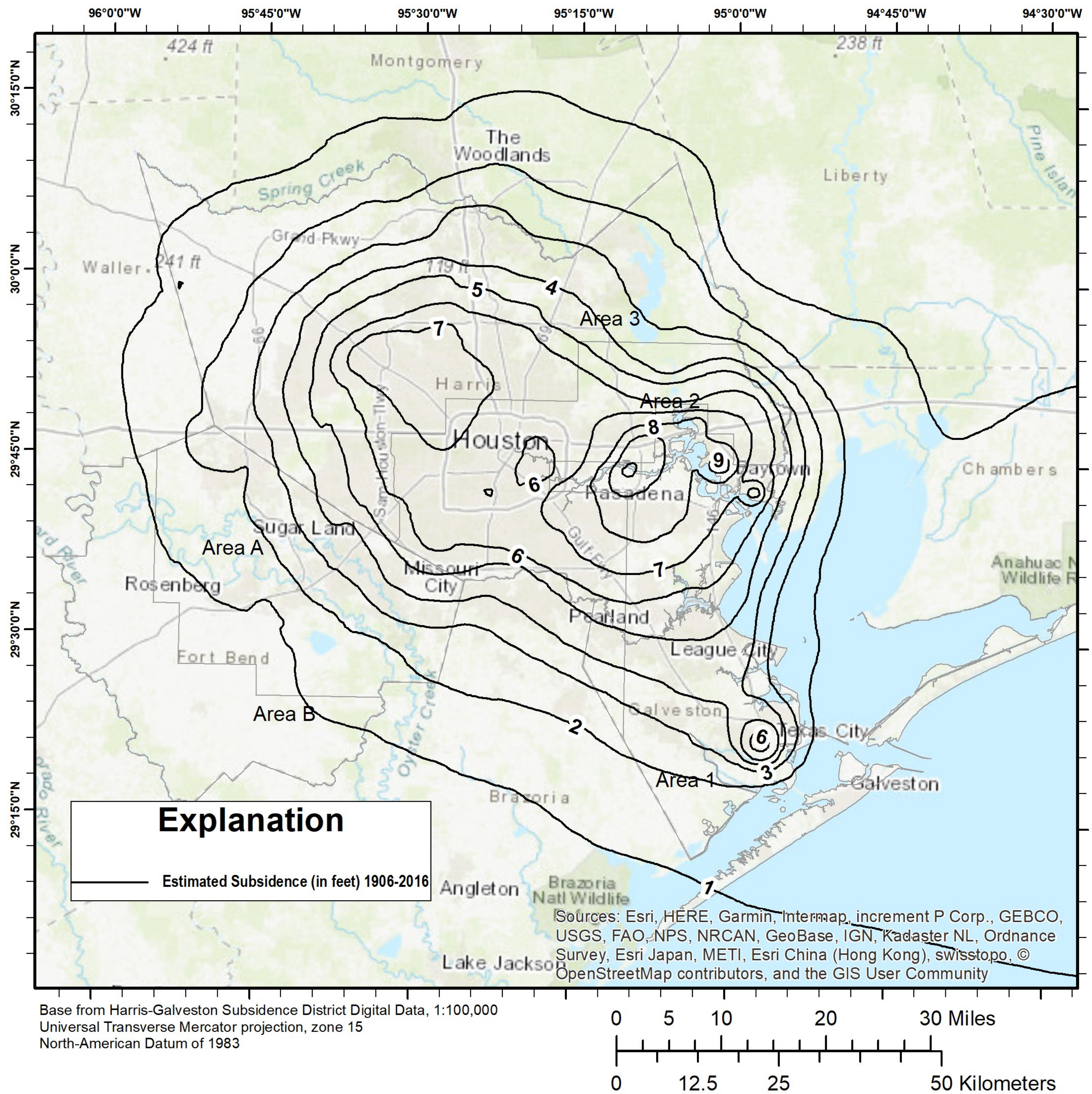


Figure 9. Estimated subsidence from 1906-2016 using measured land surface elevation change at benchmarks surveyed in 2000 and estimated annual subsidence rates from 2011-2016 at HGSD GPS subsidence network assuming a constant rate of subsidence from 2010-2016.

RECENT PUBLICATIONS

Kearns T. J., Wang G., Turco M., Welch J., and Tsibanos V. (2018). Houston16: A stable geodetic reference frame for subsidence and faulting study in the Houston metropolitan area, Texas, U.S. *Geodesy & Geodynamics*. https://doi.org/10.1016/j.geog.2018.05.005

Kelley, V. ,V., and Deeds, N. (2019). Assessment of Subsidence and Regulatory Considerations for Aquifer Storage and Recovery in the Evangeline and Chicot Aquifers. HGSD Scientific Report 2019-001, 190 p.

Kelley, V. , Deeds, N., Young, S.C., Pinkhard, J. (2018) Subsidence Risk Assessment and Regulatory Considerations for the brackish Jasper Aquifer. HGSD Scientific Report 2019-002, 83 p.

Wang G., Turco M., Soler T., Kearns T., and Welch, J. (2017). Comparisons of OPUS and PPP solutions for subsidence monitoring in the greater Houston area. *J. Surv. Eng.* 143(4), 05017005, https://ascelibrary.org/doi/10.1061/%28ASCE%29SU.1943-5428.0000241

Wang G., T. Soler (2013). Using OPUS for Measuring Vertical Displacements in Houston, TX, *Journal of Surveying Eng*ineering, 139(3), 126-134, doi:10.1061/(ASCE)SU.1943-5428.0000103

Young, S.C, Kelley, V., Deeds, N., Hudson, C., and Piemonti, D. (2017). Report on the Delineation of Fresh, Brackish, and Saline Groundwater Resources based on Interpretation of Geophysical Logs, HGSD Scientific Report 2018-001, 216 p.

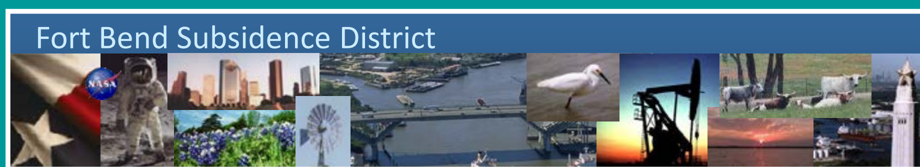
Yu J., Wang G., Kearns T. J., and Yang L. (2014). Is there deep-seated subsidence in the Houston-Galveston area? *International Journal of Geophysics*, 942834, 1-11,doi:10.1155/2014/942834

Fort Bend Subsidence District

2018 ANNUAL GROUNDWATER REPORT

(29th Annual Report)

YEAR ENDING, DECEMBER 31, 2018



2018 Annual Groundwater Report

www.fbsubsidence.org

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301 Jackson Street, Suite 639, Richmond, TX 77469-0427
(281) 342-3273

2018 GROUNDWATER HEARING

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INTRODUCTION

Pursuant to Fort Bend Subsidence District (the District or FBSD) Resolution No. 19-410 passed on March 27, 2019, the Board of Directors held the Annual Groundwater Hearing beginning at 2:30 p.m. on May 28, 2019 at the William B. Travis building, 301 Jackson Street, sixth floor meeting room, in Richmond, Texas. The public hearing fulfills the requirements of the District's enabling legislation, which states that the Board of Directors shall hold a public hearing to take testimony concerning the effects of groundwater withdrawals on the subsidence of land within the District during the preceding year.

This report was prepared in accordance with an Inter-local Agreement between the District and the Harris-Galveston Subsidence District (HGSD). This report was prepared by Mr. Robert Thompson of the District's staff, with special assistance from Mr. Vanson Truong, Mr. Mike Chrismer, Dr. Tina Petersen along with others from the District staff; from Mr. Jason Ramage from the US Geological Survey; and Dr. Guoquan "Bob" Wang of the Department of Earth and Atmospheric Sciences-University of Houston. The following findings were presented for this Groundwater Report for the year ending December 31, 2018.

Helen Stewart Truscott
Hearing Examiner

TESTIMONY AND FINDINGS

Ms. Helen Truscott, the Hearing Examiner, opened the Hearing at approximately 2:30 p.m. She stated that representatives from the Fort Bend Subsidence District and the United States Geological Survey would give testimony. She also asked that if anyone else planned to give testimony or ask questions, that they state their name and whom they were representing. The record remained open until June 4, 2019 at 5:00 pm.

In attendance at the hearing were members of the public and members of the District and USGS staff. Those giving testimony were Mr. Robert Thompson of the District and Mr. Jason Ramage, Hydrologist, Houston Sub-district, Water Resources Division, United States Geological Survey, Department of the Interior. Mr. Thompson began by presenting ten exhibits including topics of precipitation, groundwater pumpage, and surface-water use. Mr. Ramage then presented 23 exhibits showing aquifer water-level altitudes and changes, exhibits showing extensometer compaction measurements taken in Fort Bend and neighboring counties, and exhibits summarizing the data. Mr. Thompson continued by presenting three exhibits including maps, subsidence charts/monitor site locations within Fort Bend County and one exhibits that showed the change in elevation measurements during 2018 for each of the Periodically Active Monitor Sites (PAMs), Continuously Operating Reference Stations (CORS) and Extensometers in and around Fort Bend County.

SUBSIDENCE DISTRICT TESTIMONY

Mr. Thompson presented testimony concerning monthly precipitation and groundwater withdrawals during the year 2018. The groundwater withdrawals for 2018 were compared with annual groundwater pumpage data since 1990. This data was compiled from annual groundwater pumpage reports submitted by well owners whose wells were permitted by the District at any time during the calendar year of 2018. The District's enabling legislation requires each well owner to submit water well pumpage data annually to the District. There were 1227 permitted wells in 2018. The reports, submitted as of the date of the Groundwater Hearing, represented nearly 100 percent of the pumpage within the District for the year 2018. Only 28 well reports for 2017 (estimated at 0.0 MGD) had not been received at the time of this report. The following exhibits and summaries depict Mr. Thompson's presentation.

Mr. Thompson noted that because the amount and timing of rainfall often determines the amount of irrigation (and consequently the amount of groundwater pumped) that takes place annually, he would begin his presentation with a look at the precipitation patterns in the District.

FBSD EXHIBIT NO. 1: WEATHER MONITORING SITES

Mr. Thompson presented two exhibits describing precipitation measurements for calendar year 2018 in the District. The data is reported for Sugar Land Regional Airport, a site within the City of Sugar Land. Precipitation data was collected from the NOAA National Data Center web site.

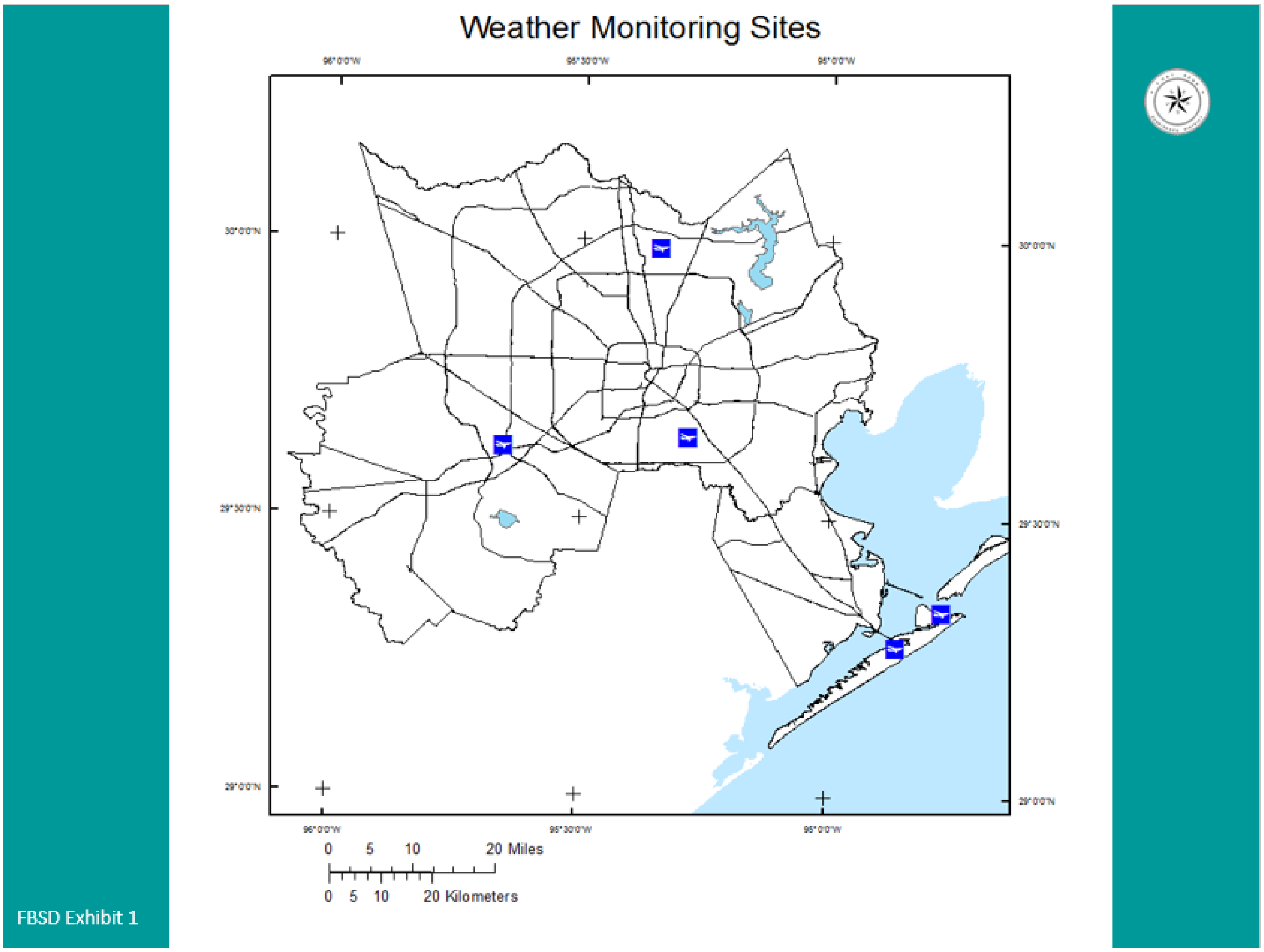
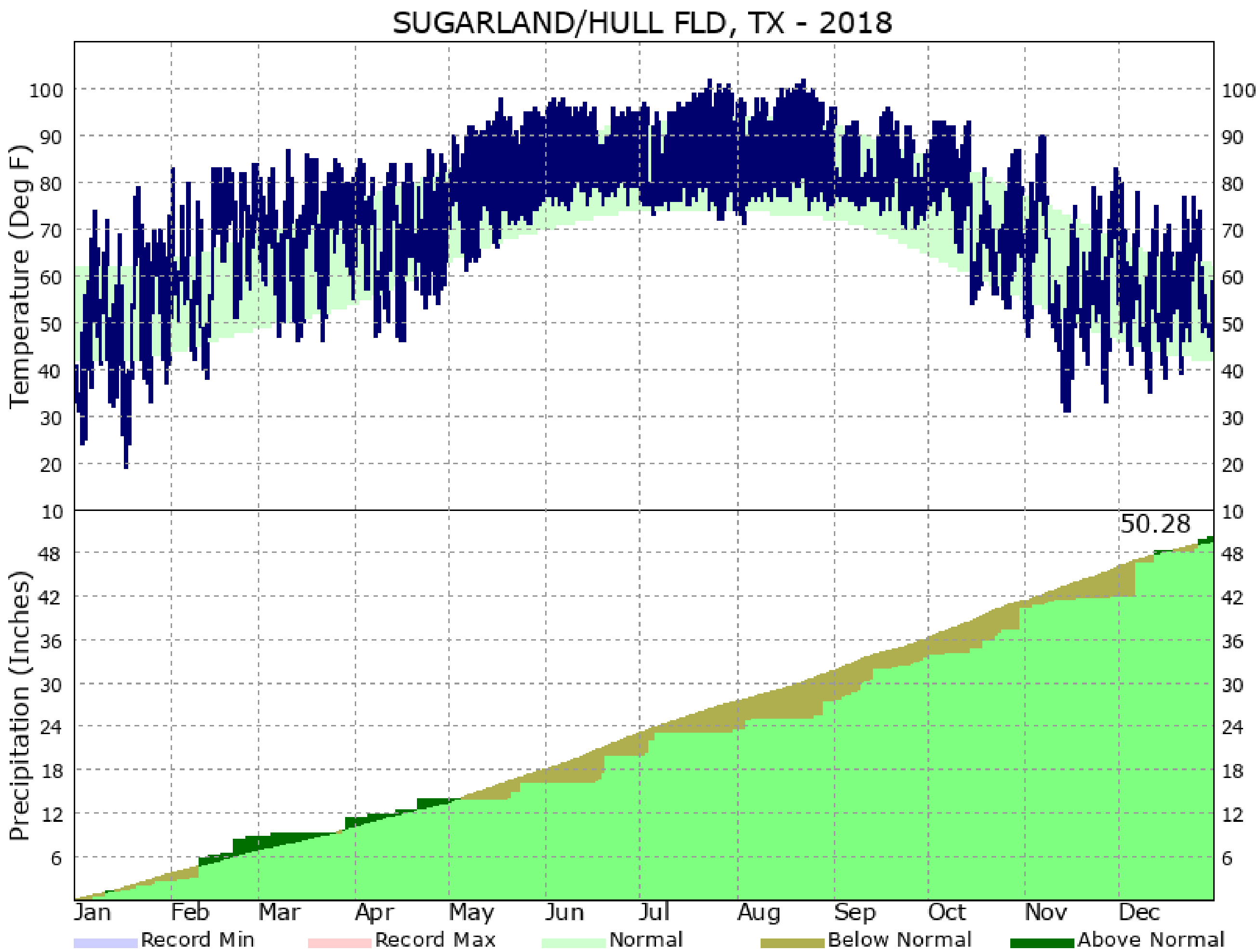


Exhibit 1: Location of weather stations across the area.

FBSD EXHIBIT NO. 2: 2018 PRECIPITATION AT SUGAR LAND AIRPORT

Monthly precipitation data for Sugar Land is shown for the year ending December 31, 2018. Normal precipitation is based on three full decades (1981-2010). The light brown color in the bottom section of the chart represents below normal and dark green is for above normal rainfall. The chart at the top displays the normal and actual temperatures for 2018.



FBSD Exhibit 2 National Oceanic and Atmospheric Administration

Total precipitation was 50.28 in 2018. The one-year cumulative departure from normal for Sugar Land Airport was +0.78 inches. The spring was above normal, while the summer months were below normal. Mr. Thompson noted that regulations and precipitation patterns could affect the amount of groundwater that is pumped. Mr. Thompson moved on to show changes in pumpage patterns.

GROUNDWATER WITHDRAWALS AND TOTAL WATER DEMAND FOR 2018

Mr. Thompson next presented eight exhibits on water use: four exhibits depicting groundwater withdrawal within Fort Bend County broken out by regulatory area and use, one exhibit showing surface and re-use water, one exhibit showing total water demand, and two exhibits showing groundwater withdrawal for the Tri-County region of Fort Bend, Harris, and Galveston Counties. All groundwater and surface-water use is reported in million gallons per day (MGD).

As is usual, the groundwater withdrawal total was updated for the previously reported year of 2017. Subsequent data was added, and corrections made after the 2017 Groundwater Report was presented in April 2018These 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. There were no changes presented related to the 2017 annual report.

For comparison and as part of the continued cooperation between the Fort Bend Subsidence District and HGSD, recorded groundwater pumpage totals were included for Harris and Galveston Counties.

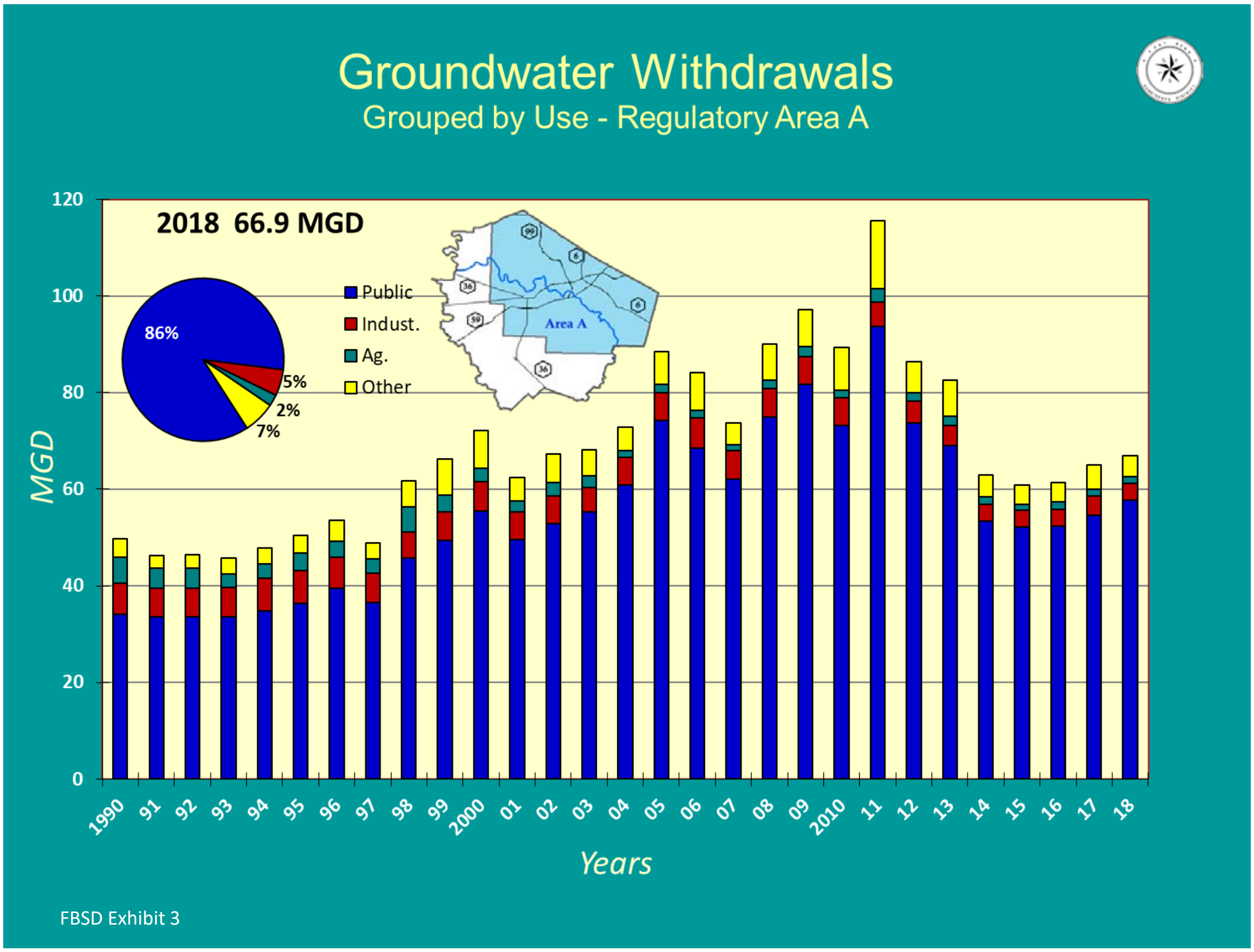
In 2013, the FBSD approved the 2013 Regulatory Plan, which divided the District into two large regulatory areas (Area A and Area B). Regulatory Area A encompasses the greatest density of population of Fort Bend County, generally the northern and eastern portions of Fort Bend County, and in the following charts is shown in blue on the maps.

Regulatory Area B encompasses the remainder of Fort Bend County, generally the far western and southern portions of the county and is shown in yellow on the maps.

FBSD EXHIBIT NO. 3: GROUNDWATER PUMPAGE – BY USE - REGULATORY AREA A

Total groundwater pumpage from Regulatory Area A was 66.9 MGD for 2018; a 3% increase from 2017. Irrigation pumpage is given as a total and as a breakout of agricultural (includes traditional farm crops plus nurseries, sod farms, tree farms, etc.) and other (includes uses for irrigation of parks, cemeteries, golf courses, common areas, and amenity lakes) irrigation.

Year	Total	% Chg	Public Supply	% Chg	Indust.	% Chg	All Irrig.	% Chg	Ag. Irrig.	% Chg	Other Irrig.	% Chg
2017	65.1	6%	54.7	4%	4.0	14%	6.5	16%	1.3	-13%	5.2	27%
2018	66.9	3%	57.7	5%	3.5	-13%	5.8	-10%	1.5	21%	4.3	-18%

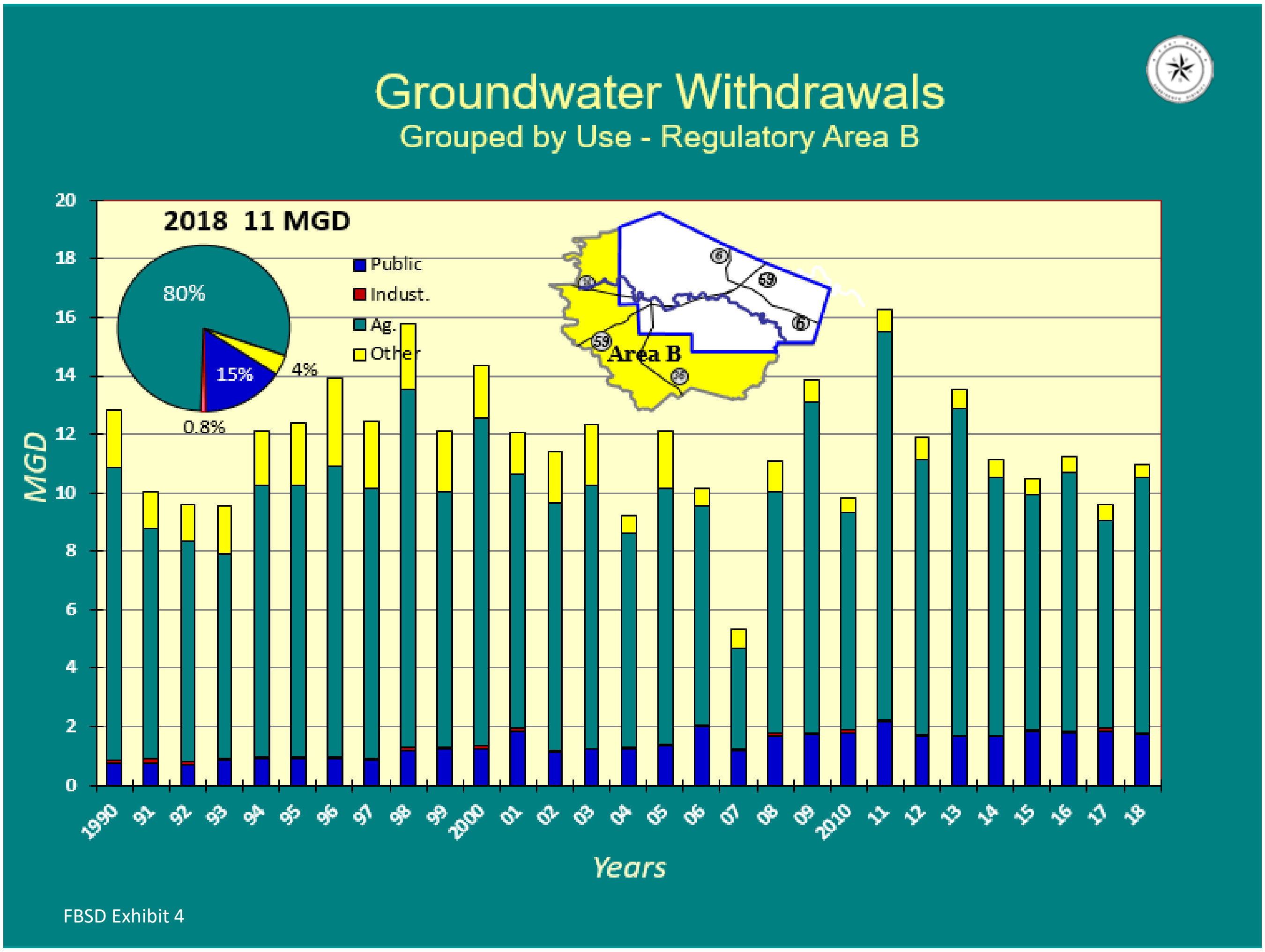


Eighty-six percent (57.7 MGD) of the total groundwater pumped (66.9 MGD) was for public supply. The next largest portion (7%, 4.3 MGD) went to other irrigation use followed by industrial (5%, 3.5 MGD). Agricultural irrigation was the smallest category, accounting for 2% (1.5 MGD) of the groundwater pumped within Regulatory Area A.

FBSD EXHIBIT NO. 4: GROUNDWATER PUMPAGE – BY USE - REGULATORY AREA B

Total groundwater pumpage in Regulatory Area B was 11.0 MGD for 2018; a 14% increase from 2017.

Year	Total	% Chg	Public Supply	% Chg	Indust.	% Chg	All Irrig.	% Chg	Ag. Irrig.	% Chg	Other Irrig.	% Chg
2017	9.6	-15%	1.9	4%	0.1	83%	7.7	-19%	7.1	-20%	0.6	2%
2018	11.0	14%	1.7	-8%	0.1	33%	9.2	20%	8.8	23%	0.4	-24%

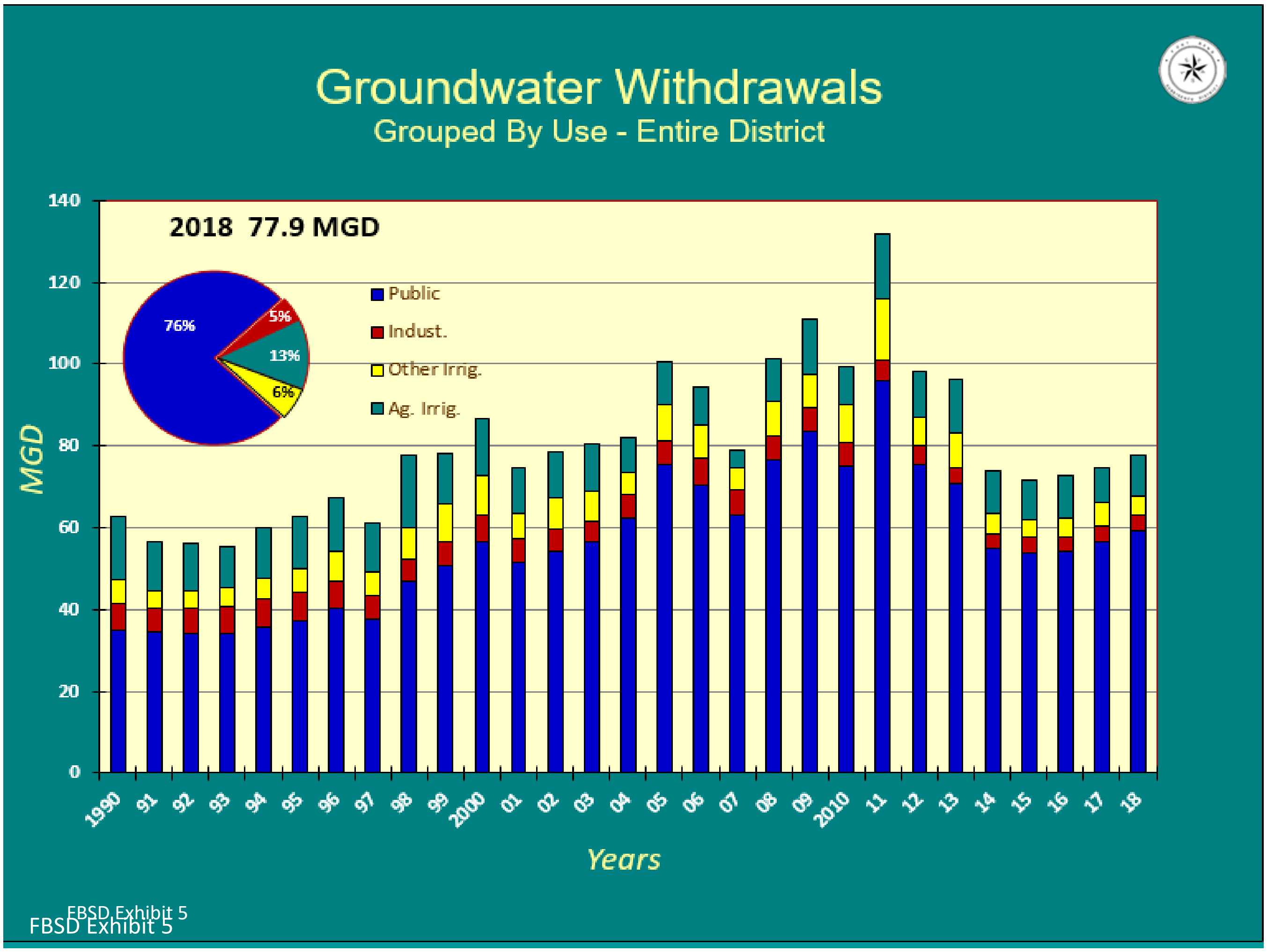


Eighty percent (8.8 MGD) of the groundwater pumped was for agricultural irrigation, while 15% (1.7 MGD) went to public supply. The remaining groundwater was for other irrigation (4%, 0.4 MGD) and industrial use accounted for very little.

FBSD EXHIBIT NO. 5: GROUNDWATER PUMPAGE – BY USE – FORT BEND COUNTY

Looking at the data from a District-wide perspective, total groundwater pumpage increased by 4% in 2018, from 74.7 MGD in 2017 to 77.9 MGD in 2018.

Year	Total	% Chg	Public Supply	% Chg	Indust.	% Chg	All Irrig.	% Chg	Ag. Irrig.	% Chg	Other Irrig.	% Chg
2017	74.7	3%	56.5	4%	4.0	14%	14.1	-6%	8.4	-19%	5.8	24%
2018	77.9	4%	59.4	5%	3.6	-12%	15.0	6%	10.3	23%	4.7	-19%

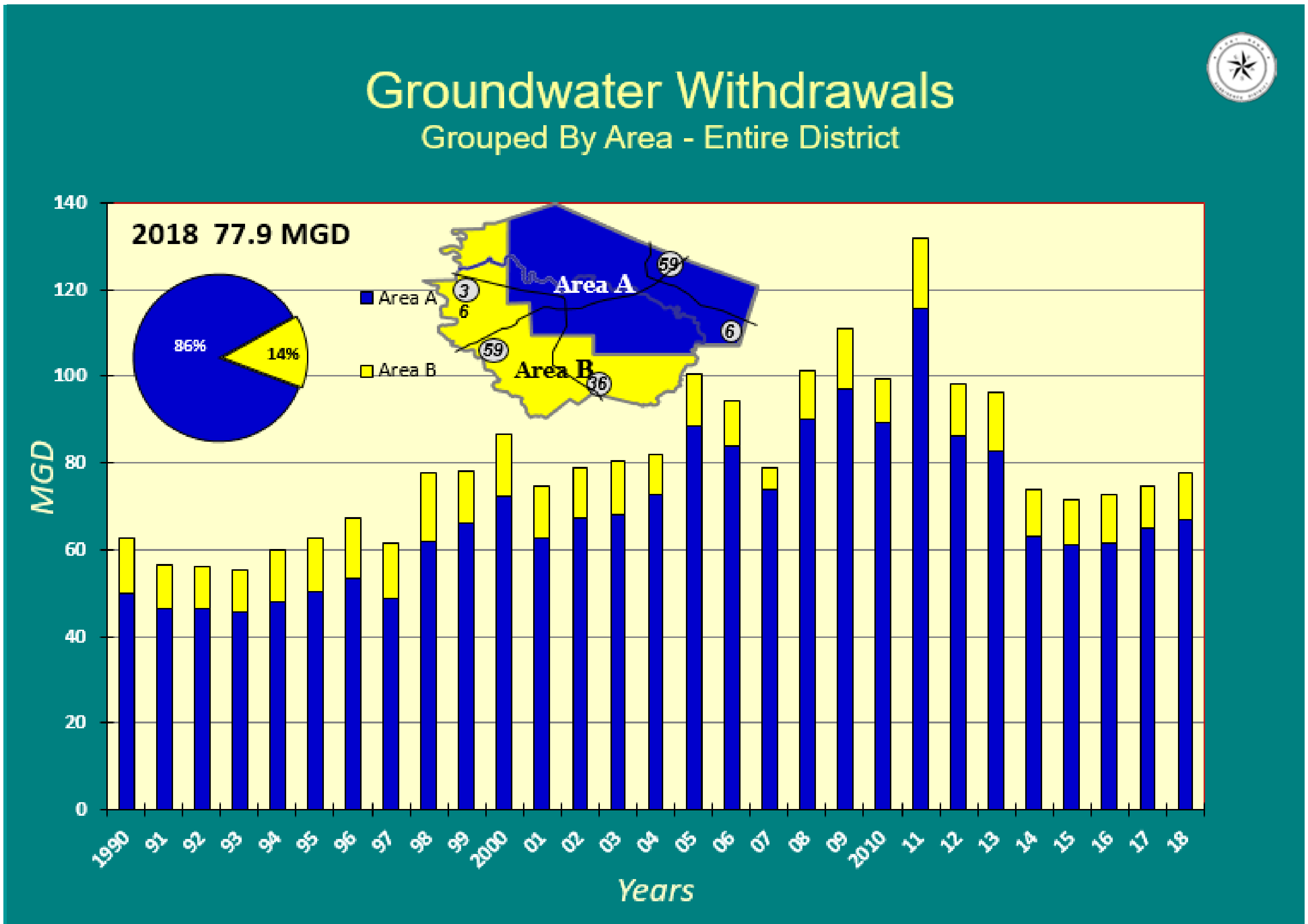


Seventy-six percent (59.4 MGD) of the groundwater pumped was used for public supply; the second largest percentage was agricultural irrigation, which accounted for 13% (10.3 MGD) of the total of 77.9 MGD. Other irrigation usage followed at 6% (4.7 MGD) with industrial usage as the smallest category of use at 5% (3.6 MGD).

FBSD EXHIBIT NO. 6: GROUNDWATER PUMPAGE – BY REGULATORY AREA – FORT BEND COUNTY

Of the 77.9 MGD total groundwater pumpage for Fort Bend County, Regulatory Area A accounted for 86% (66.9 MGD) for 2018. Regulatory Area B pumped 14% (11.0 MGD) of the total.

Year	Total	% Chg	Area A	% Chg	Area B	% Chg
2017	74.7	3%	65.1	6%	9.6	-15%
2018	77.9	4%	66.9	3%	11.0	14%

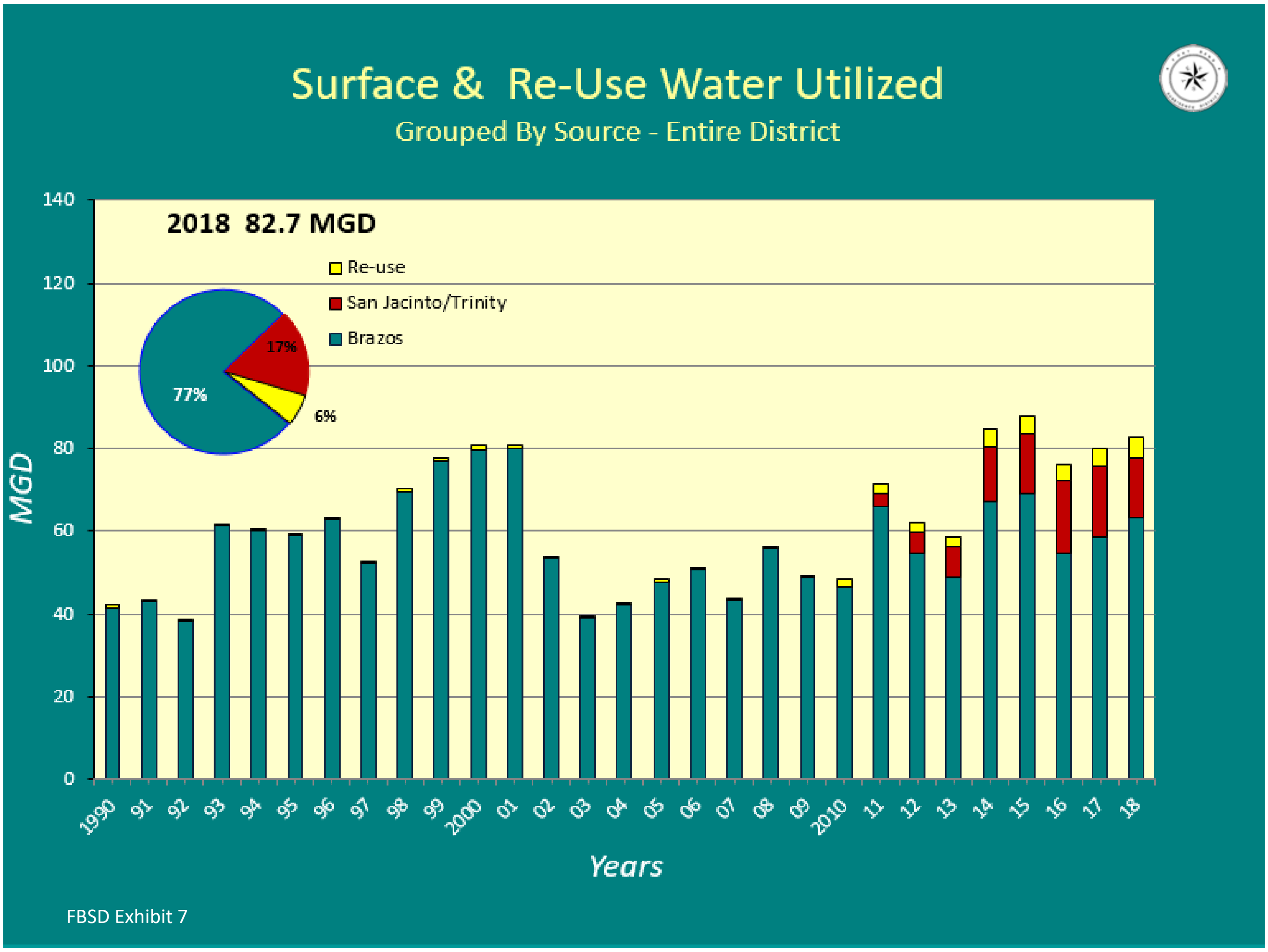


FBSD Exhibit 6

FBSD EXHIBIT NO. 7: ALTERNATE WATER (SURFACE AND RE-USE WATER) HISTORY

Two primary water sources are utilized within the District's boundaries; groundwater and alternate water, which is comprised of surface water and re-use water. Surface water use in 2018 increased by 3% (2.5 MGD). Re-use water remains only a small portion of the alternate water supply strategy amounting to 6% (5.1 MGD) of the alternate water total of 82.7 MGD in 2018. Surface water in Fort Bend County comes from the Brazos River 77% (63.5 MGD) and San Jacinto/Trinity Rivers 17% (14.2 MGD).

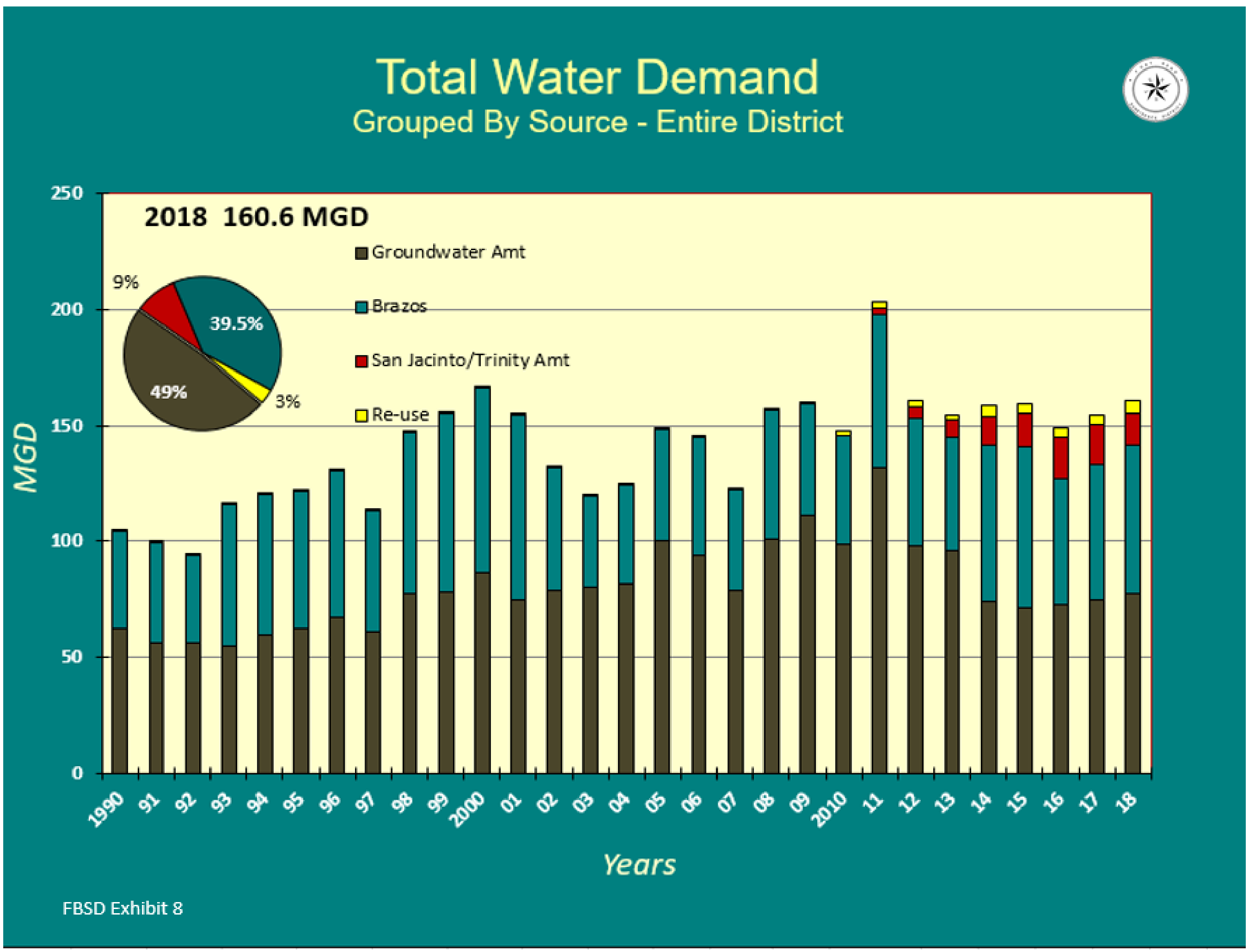
Year	Surface/ Alternate Water	% Chg	Brazos River	% Chg	San Jacinto/ Trinity	% Chg	Reuse	% Chg
2017	80.2	5%	58.7	8%	17.2	-2%	4.3	3%
2018	82.7	3%	63.5	8%	14.2	-17%	5.1	19%



FBSD EXHIBIT NO. 8: TOTAL WATER DEMAND – BY SOURCE IN FORT BEND COUNTY

In 2018, total water demand for Fort Bend County was 160.6 MGD. Groundwater pumpage constituted 49% of that amount, surface water from the Brazos River was 39.5%, the San Jacinto/Trinity Rivers was 9% and re-use was 3%.

Year	Total Water Demand		Ground-water		San Jacinto/ Trinity		Brazos		Re-use	
	Amt	% Chg	Amt	% Chg	Amt	% Chg	Amt	% Chg	Amt	% Chg
2017	155.9	5%	74.7	3%	17.2	-2%	58.7	8%	4.3	4%
2018	160.6	3%	77.9	4%	14.2	-17%	63.5	8%	5.1	19%

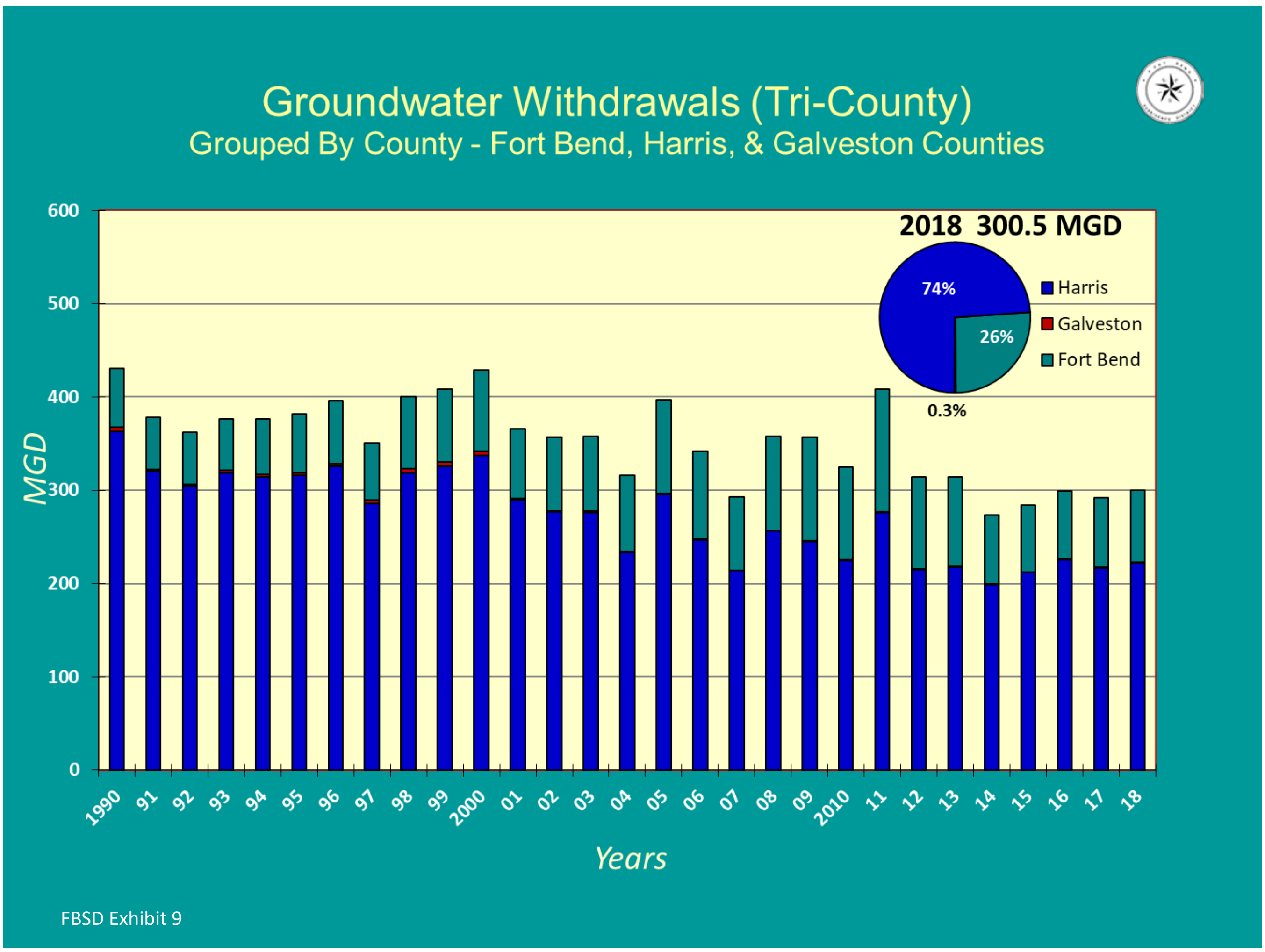


FBSD EXHIBIT NO. 9: TRI-COUNTY GROUNDWATER PUMPAGE – BY COUNTY PERCENTAGES – FORT BEND, GALVESTON AND HARRIS COUNTIES

Looking at groundwater pumping in the Tri-County region of Fort Bend, Harris and Galveston Counties, Harris County remains the largest user of groundwater at 74% in 2018. Fort Bend pumped 26% of the total groundwater. Galveston County's portion remained below 1%.

Total groundwater pumped in the Tri-County region for 2018 was 300.5 MGD.

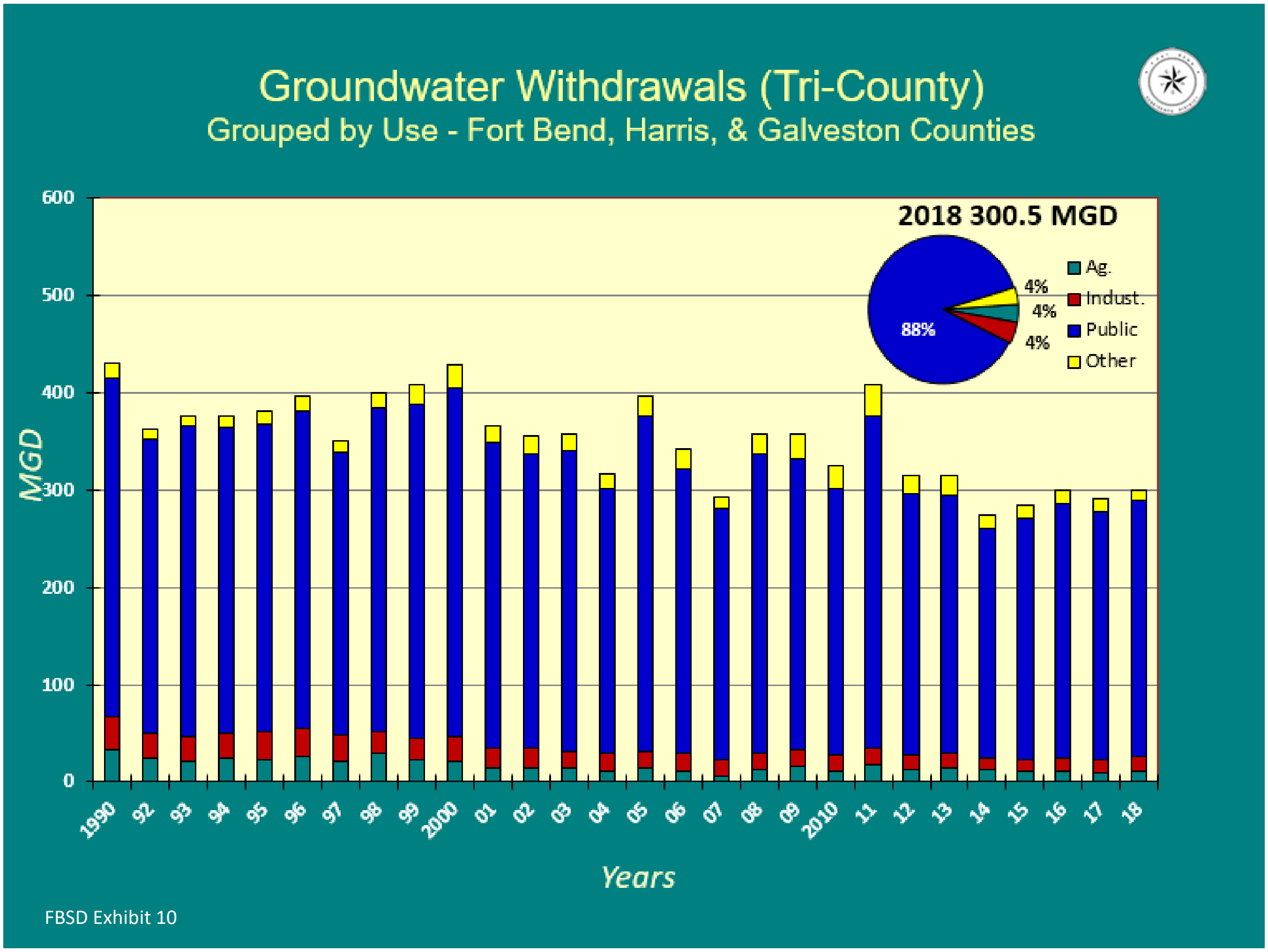
Year	Total	% Chg	Fort Bend	% Chg	Galveston	% Chg	Harris	% Change
2017	291.8	-2%	74.7	3%	0.8	21%	216.4	-4%
2018	300.5	3%	77.9	4%	0.8	8%	221.7	2%



FBSD EXHIBIT NO. 10: TRI-COUNTY GROUNDWATER PUMPAGE – BY USE – FORT BEND, GALVESTON AND HARRIS COUNTIES

In the Tri-County region, 88% of the groundwater withdrawn was used for public supply, industrial use accounted for 4%, agriculture for 4%, and 4% was for other uses.

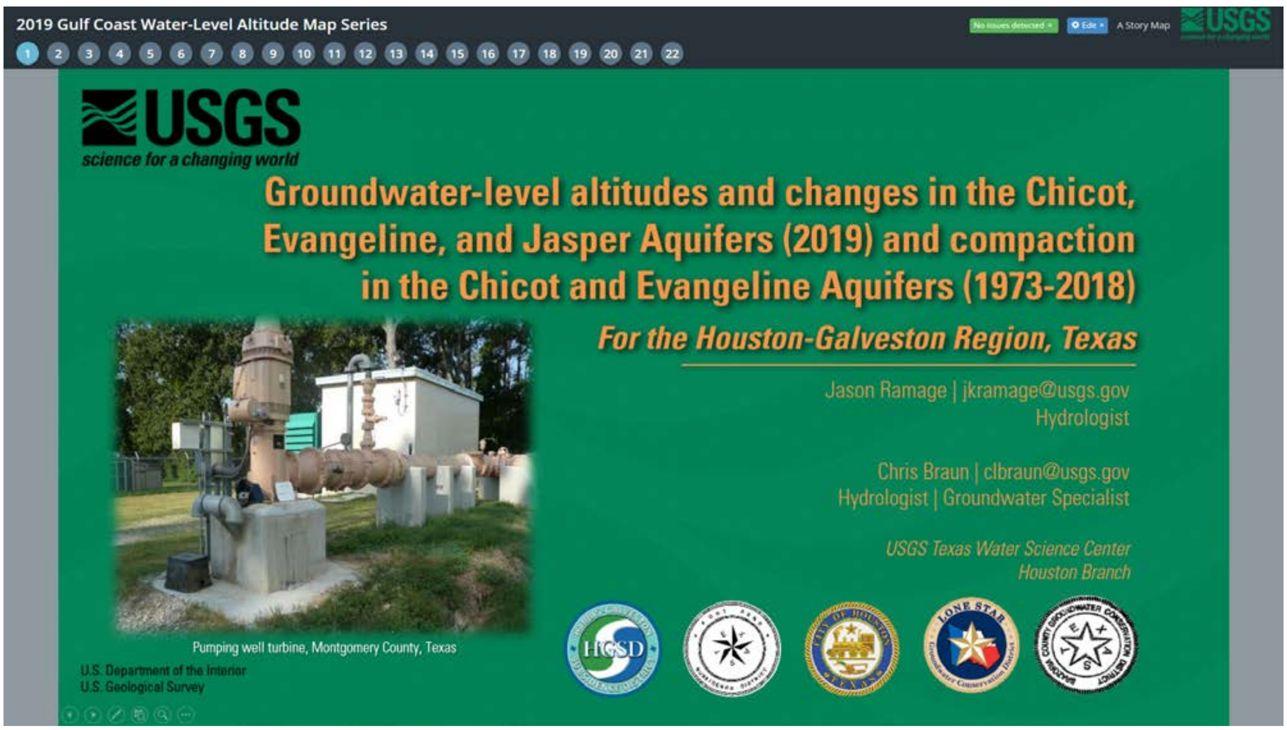
Year	Total	% Chg	Ag	% Chg	Indust.	% Chg	Public	% Chg	Other	% Chg
2017	291.8	-2%	9.7	-17%	13.2	4%	255.6	-3%	13.3	9%
2018	300.5	3%	11.6	19%	14.1	6%	263.7	3%	11.1	-17%



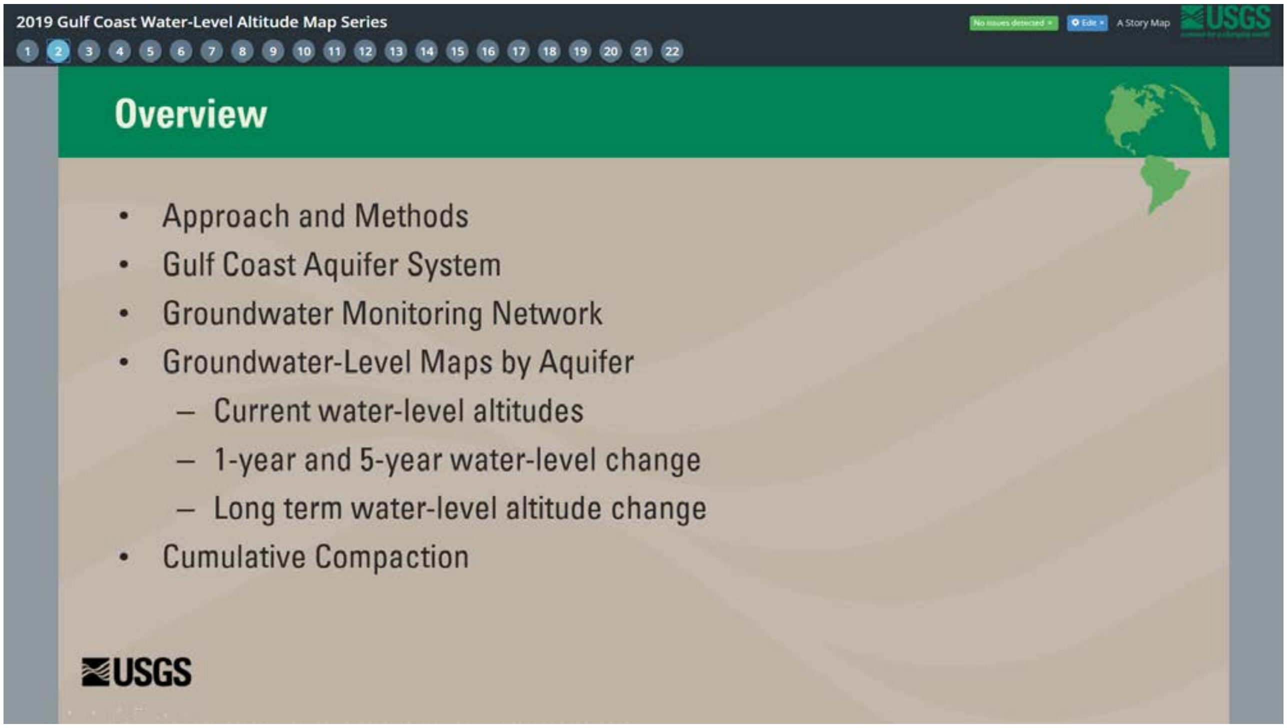
Mr. Thompson noted that groundwater withdrawal inversely affects the water levels within the aquifers. Over time, as pumpage increases, water levels decrease. The following exhibits from the United States Geological Survey look at subsidence mechanisms, changes to aquifer water levels, and the compaction that has resulted.

Mr. Thompson yielded to Mr. Ramage from the USGS.

Mr. Jason Ramage, a Groundwater Hydrologist with the USGS, presented testimony concerning annual water-level measurements, taken in December 2018 through March 2019 and compaction measurements taken monthly from fourteen extensometer sites. The USGS collects water level and subsidence measurements as part of a joint funding agreement with the District, the Harris-Galveston Subsidence District, the City of Houston, the Brazoria County Groundwater Conservation District, and the Lone Star Groundwater Conservation District. Mr. Ramage submitted for the USGS, a total of 23 exhibit *drafts*, as part of a U.S. Department of the Interior, USGS Open File Report to be released mid-summer 2019, upon final national review.



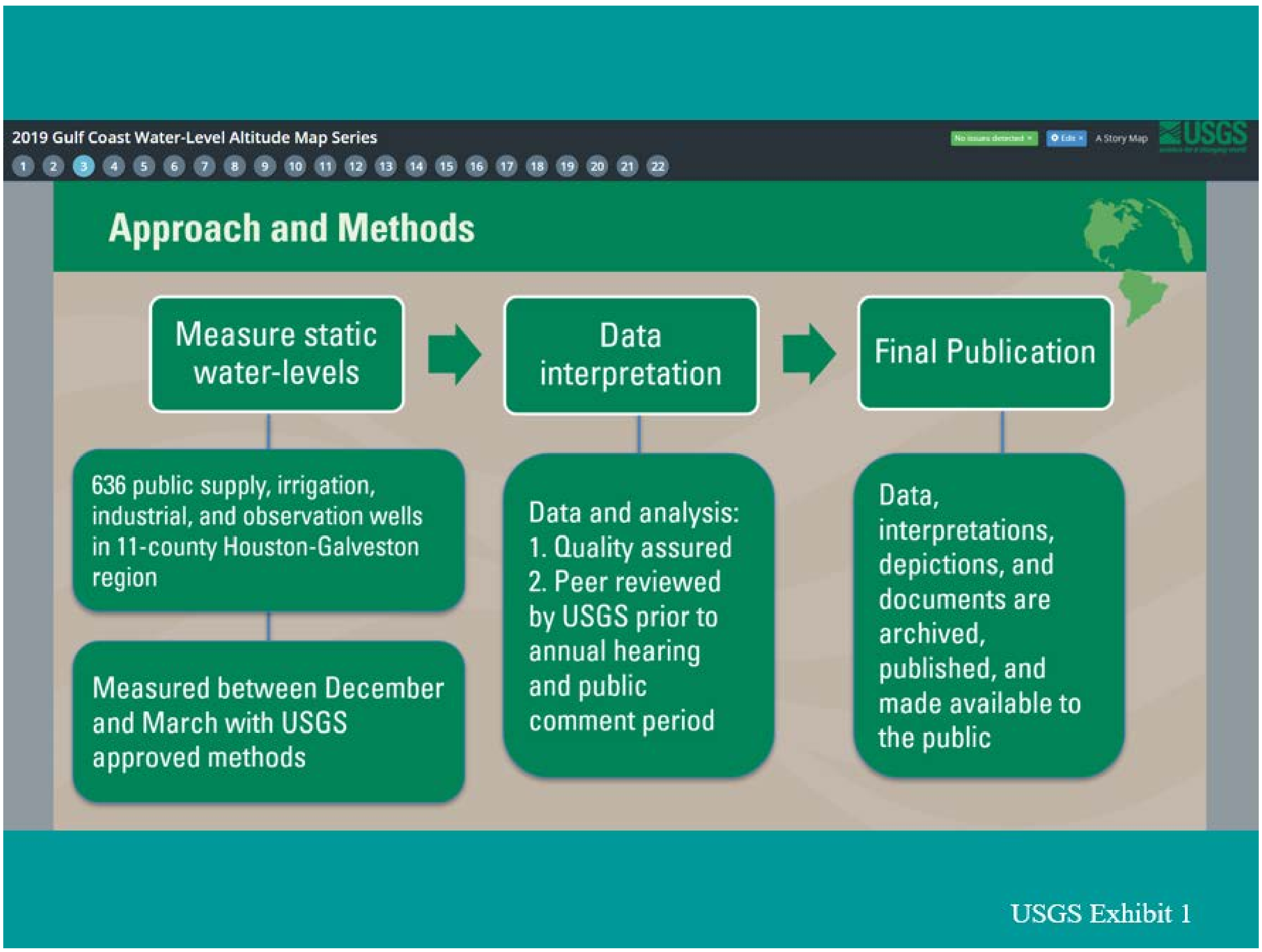
Mr. Ramage gave a brief description of the history of the USGS and an overview of the project.


2019 Gulf Coast Water-Level Altitude Map Series
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
A Story Map
USGS
Overview
Approach and Methods
Gulf Coast Aquifer System
Groundwater Monitoring Network
Groundwater-Level Maps by Aquifer
Current water-level altitudes
1-year and 5-year water-level change
Long term water-level altitude change
Cumulative Compaction
USGS

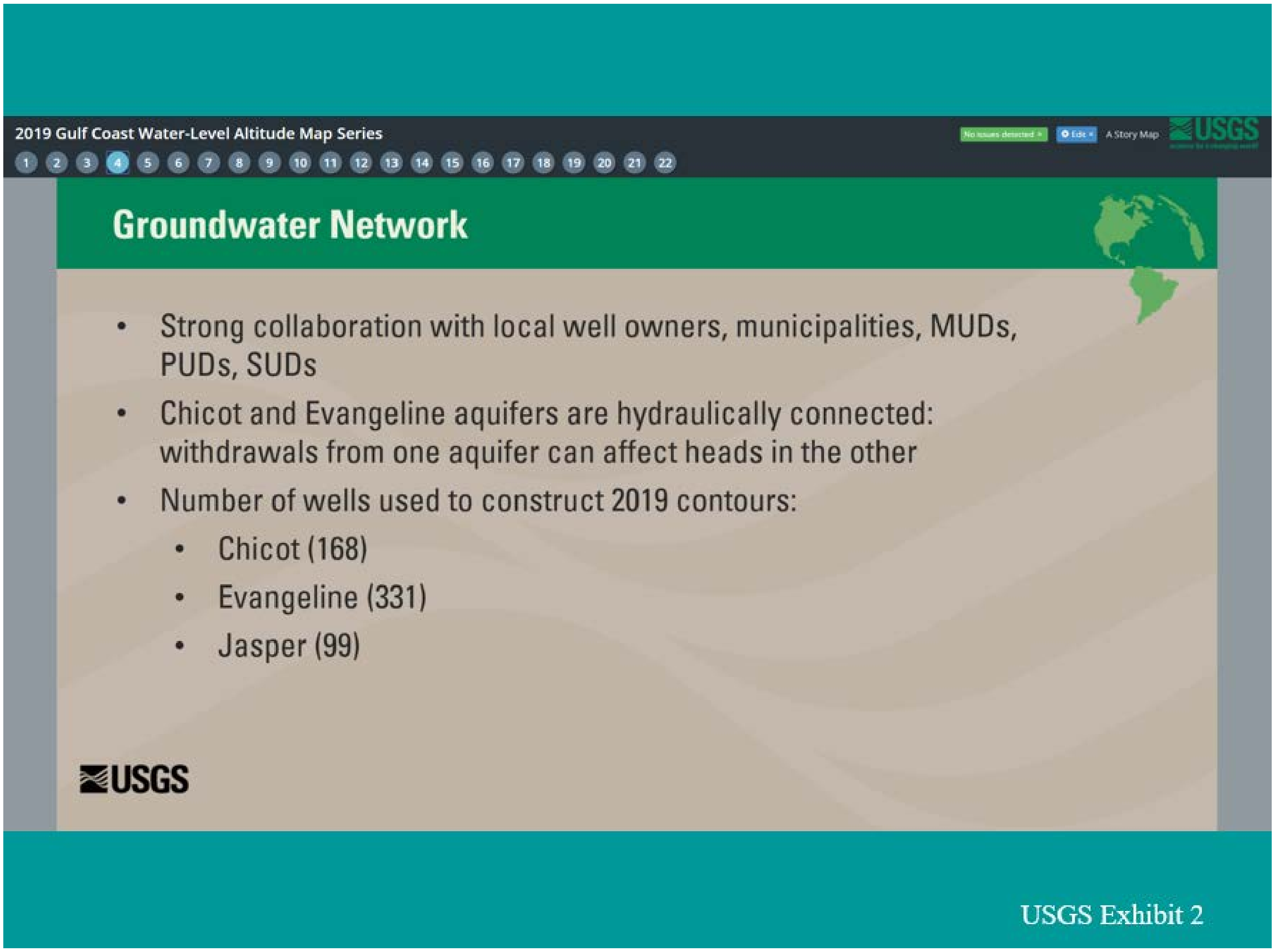
MEASURED WATER-LEVEL CHANGES IN THE CHICOT AND EVANGELINE AQUIFERS

Mr. Ramage presented 23 exhibits describing the network of monitor wells and the changes in aquifer pressures (water-level changes) which occurred from 2018 to 2019 and from 1990 to 2019, including water-level altitude maps for the Chicot and Evangeline aquifers.

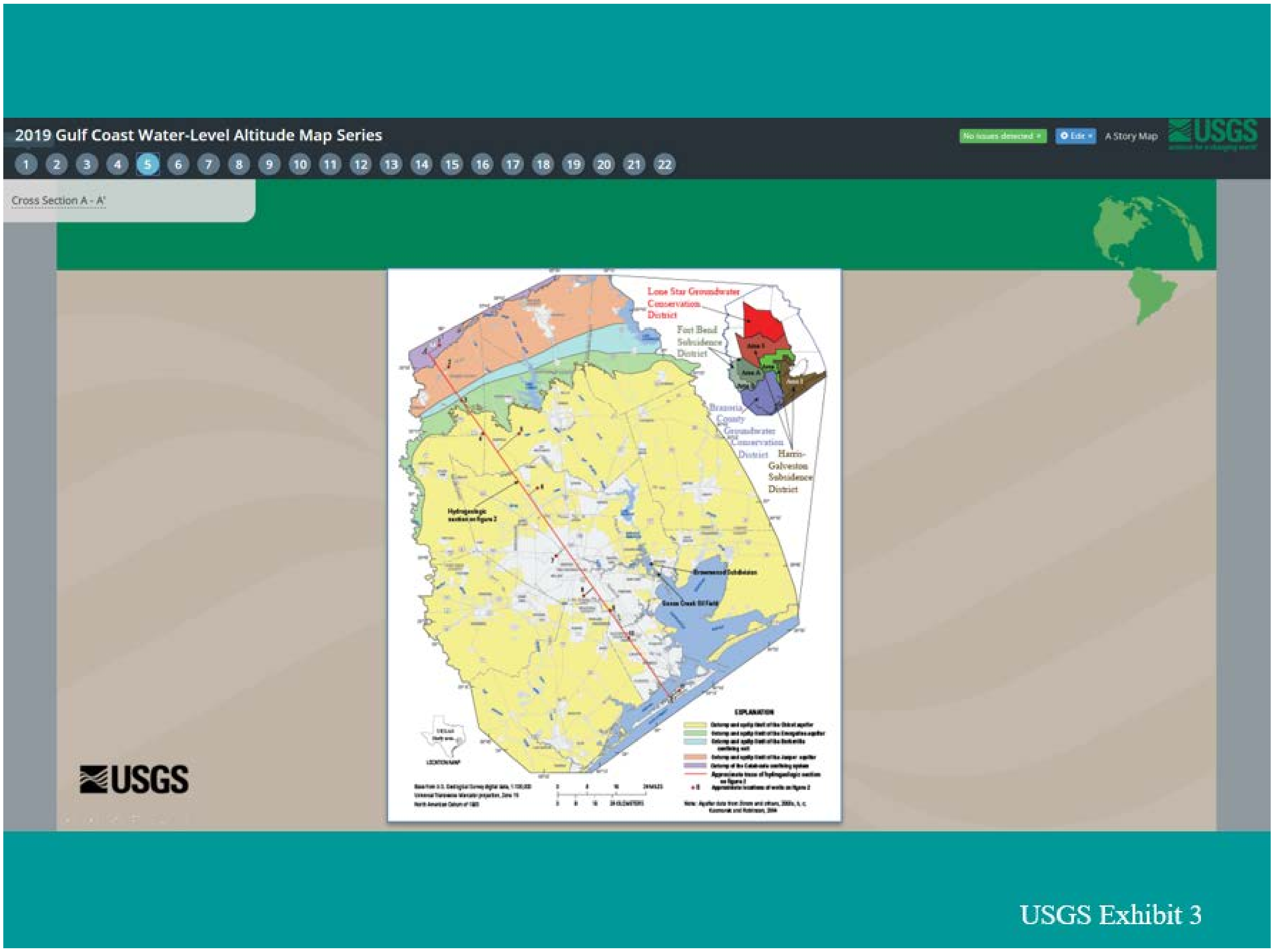
USGS EXHIBIT NO. 1: APPROACH AND METHODS



USGS Exhibit 1


2019 Gulf Coast Water-Level Altitude Map Series
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
A Story Map
USGS
Groundwater Network
• Strong collaboration with local well owners, municipalities, MUDs, PUDs, SUDs
• Chicot and Evangeline aquifers are hydraulically connected: withdrawals from one aquifer can affect heads in the other
• Number of wells used to construct 2019 contours:
• Chicot (168)
• Evangeline (331)
• Jasper (99)
USGS
USGS Exhibit 2

The area involved in the ongoing study of water level-changes is depicted in the map below.



USGS EXHIBIT NO. 4: HYDROGEOLOGIC SECTION OF THE GULF COAST AQUIFER SYSTEM

The Gulf Coast Aquifer System has three main aquifers within the greater Houston area. The Chicot Aquifer is the shallowest aquifer and generally has supplied Galveston County and southern Harris County. The Evangeline Aquifer lies beneath the Chicot Aquifer and has supplied much of Fort Bend County and surrounding counties. The Jasper Aquifer lies beneath the Evangeline Aquifer, and is generally considered too poor of quality to be used for municipal supply without considerable treatment throughout most of the District. In the region, the Jasper is a primary municipal water source in Montgomery County and in more recent years has been developed in northern Harris County. Currently, there is one well completed in the Jasper Aquifer in Fort Bend County, but it is not in operation at this time. The cross section depicts aquifer depths and thicknesses along a line from Grimes County to Galveston County based on recorded well logs throughout the area.

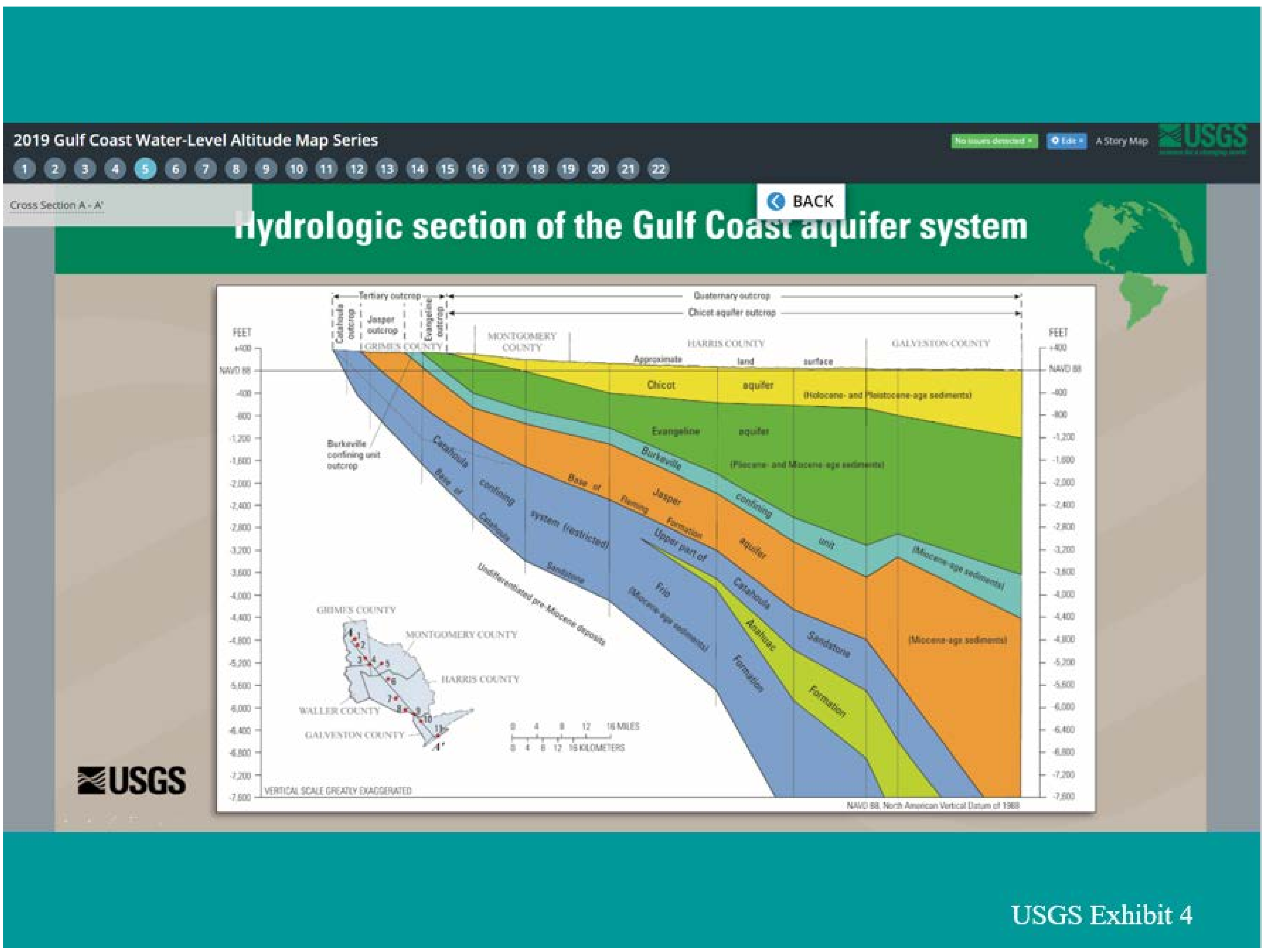
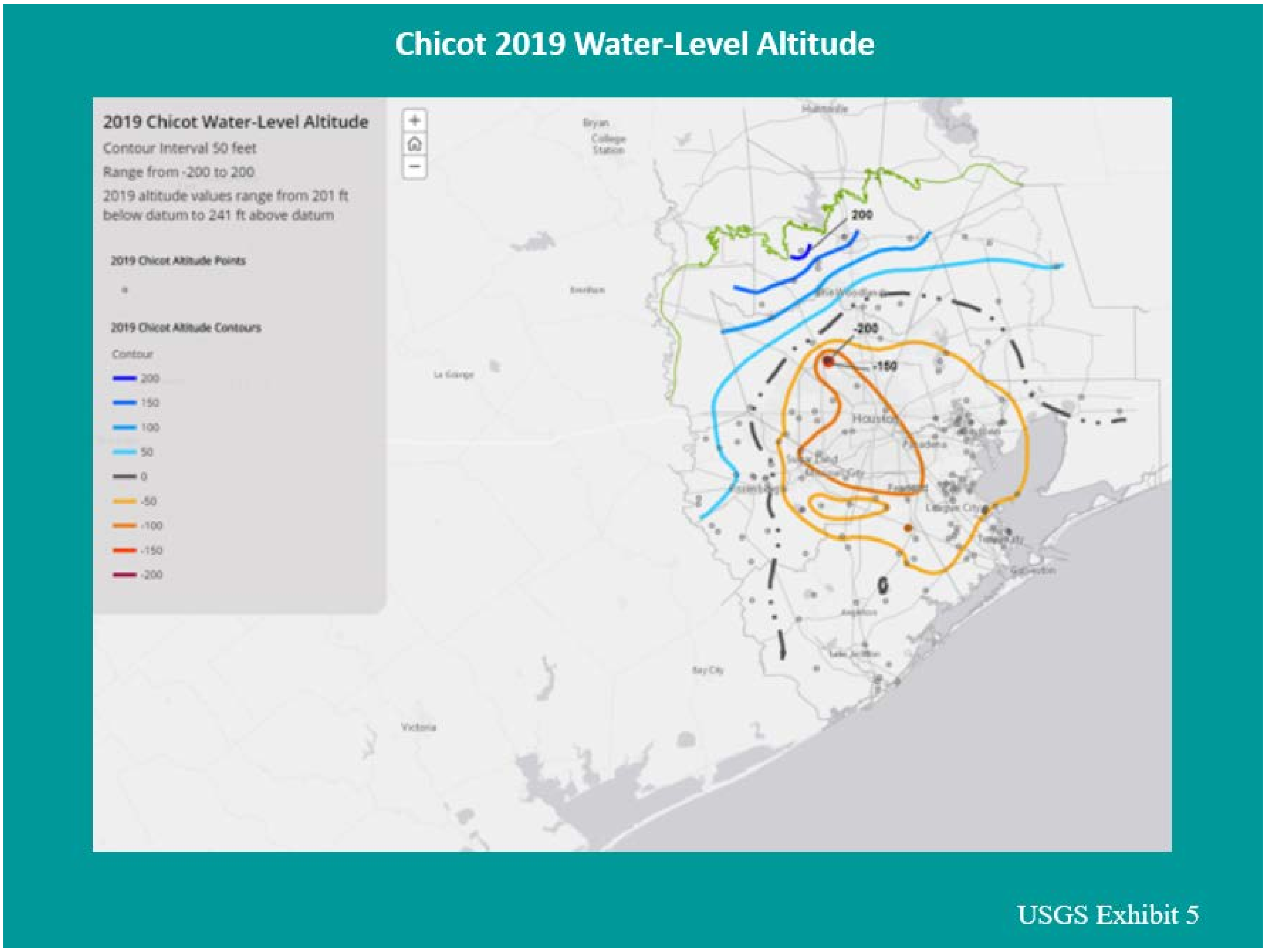
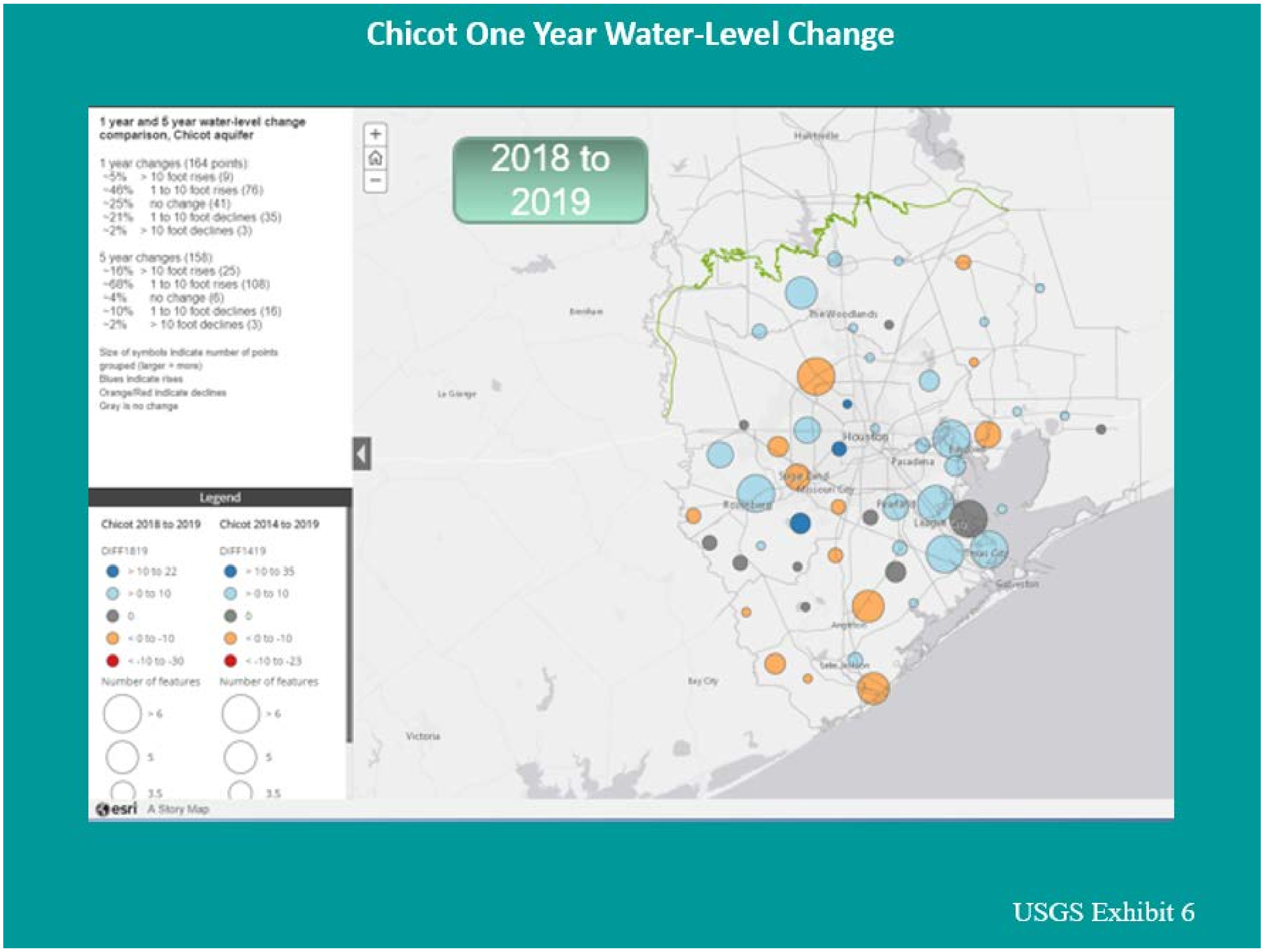


Exhibit 5-Water-level altitudes measured in 2019 are depicted in relationship to sea level. Altitudes for the Chicot Aquifer in Fort Bend and surrounding counties were drawn based on 168 water wells screened solely in the Chicot Aquifer out of the total of 598 measurements taken. Brown shades represent elevations above mean sea level, while blue shades represent elevations below mean sea level.



USGS EXHIBIT NO. 6: 2018-2019 CHICOT AQUIFER WATER-LEVEL CHANGE

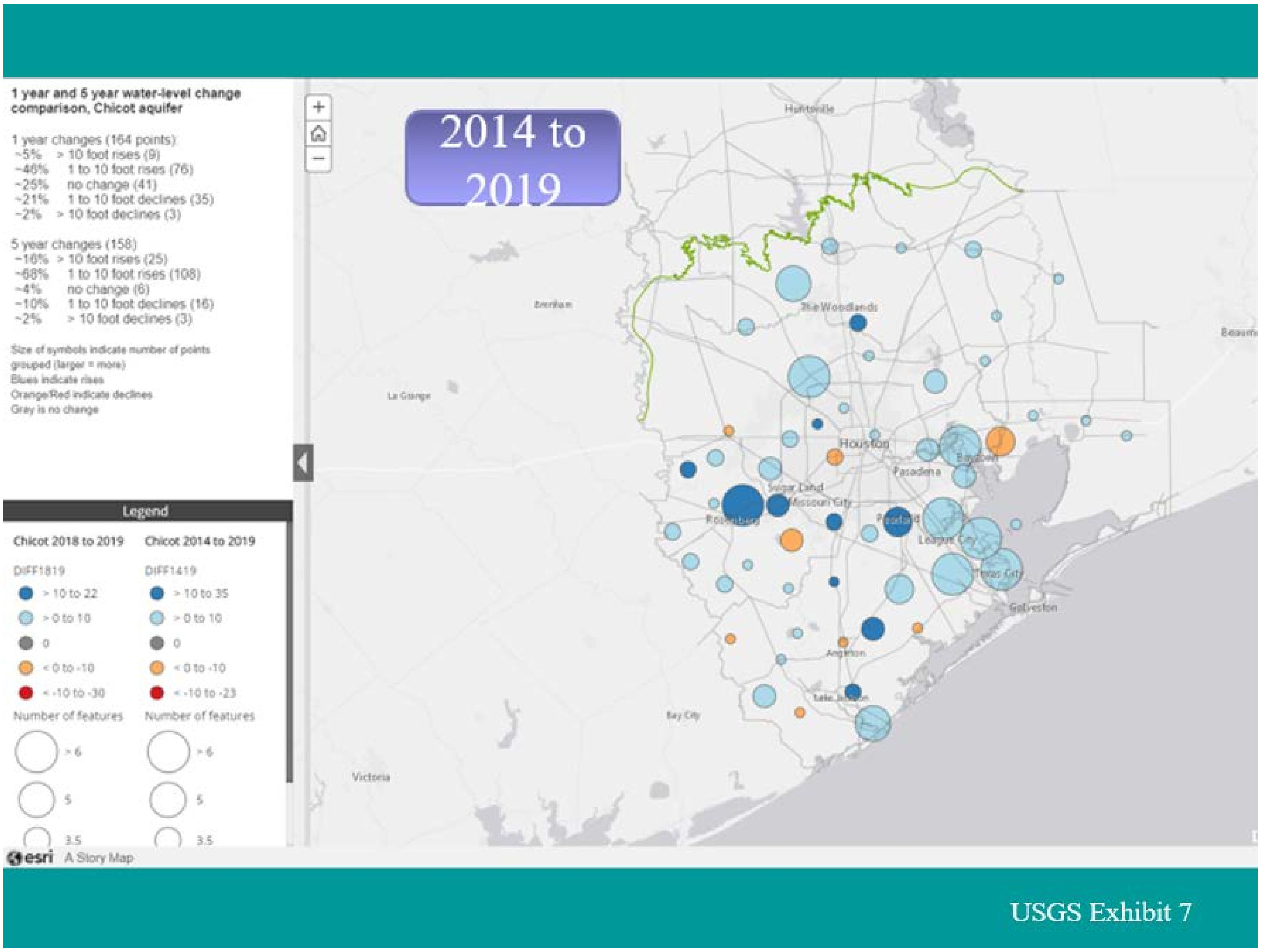
Blue shading represents water level rises, gray shading represents no change and red shading represents declines in elevation. The size of the circle represents the number of records in that location. Exhibit 6 shows the one-year water-level changes for wells in the Chicot Aquifer.



Changes in altitudes in the Chicot Aquifer in Fort Bend County ranged from a rise of 18 feet near Smithers Lake to a decline of nine feet near Meadows Place.

USGS EXHIBIT NO. 7: 2014-2019 CHICOT AQUIFER WATER-LEVEL CHANGE

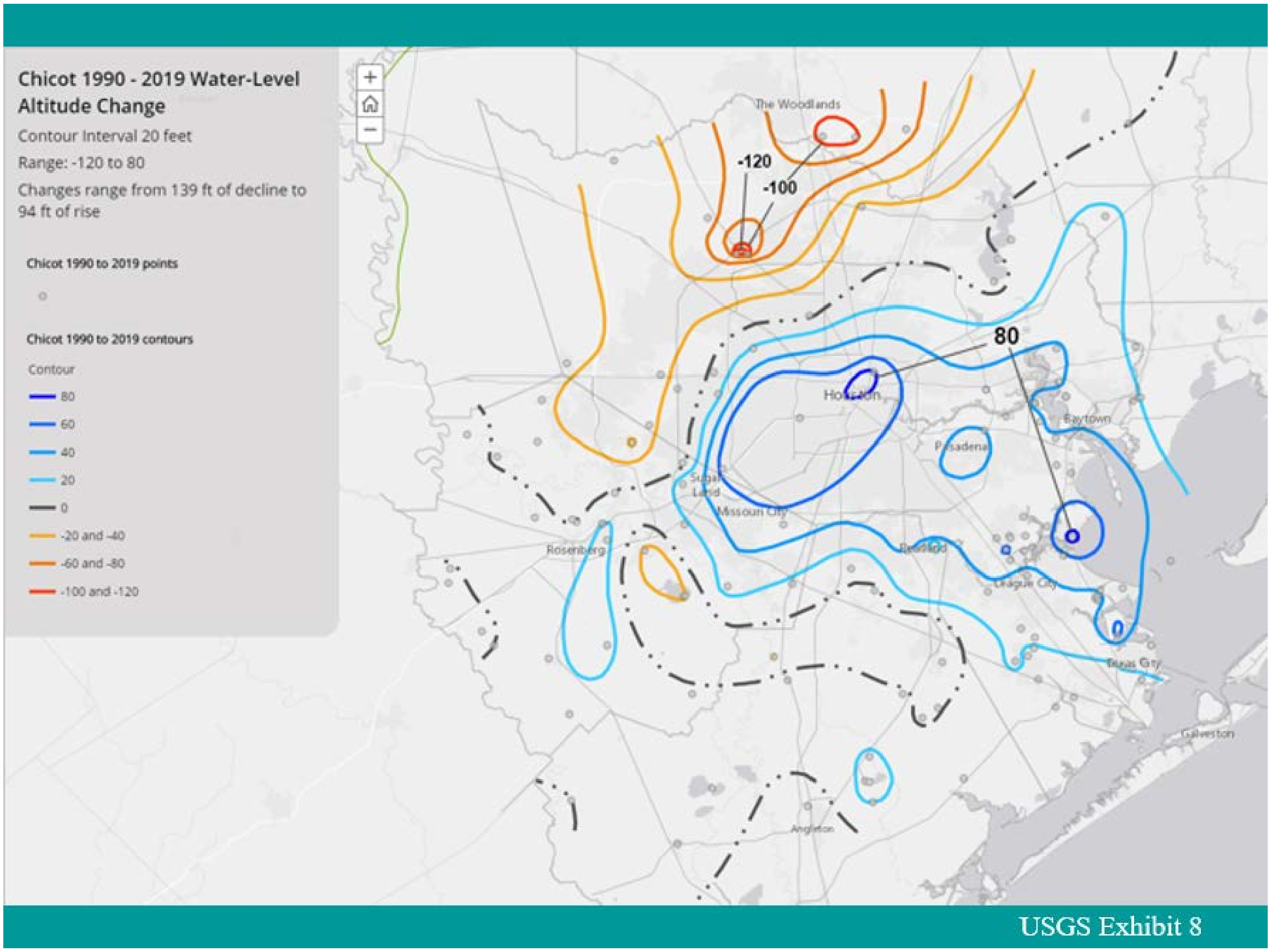
Exhibit 7 shows the water-level changes for the last five years.



Changes in altitudes in the Chicot Aquifer in Fort Bend County ranged from a rise of 33 feet near Arcola to an area of decline of 23 feet near Smithers Lake.

USGS EXHIBIT NO. 8: 1990-2019 CHICOT AQUIFER WATER-LEVEL CHANGE

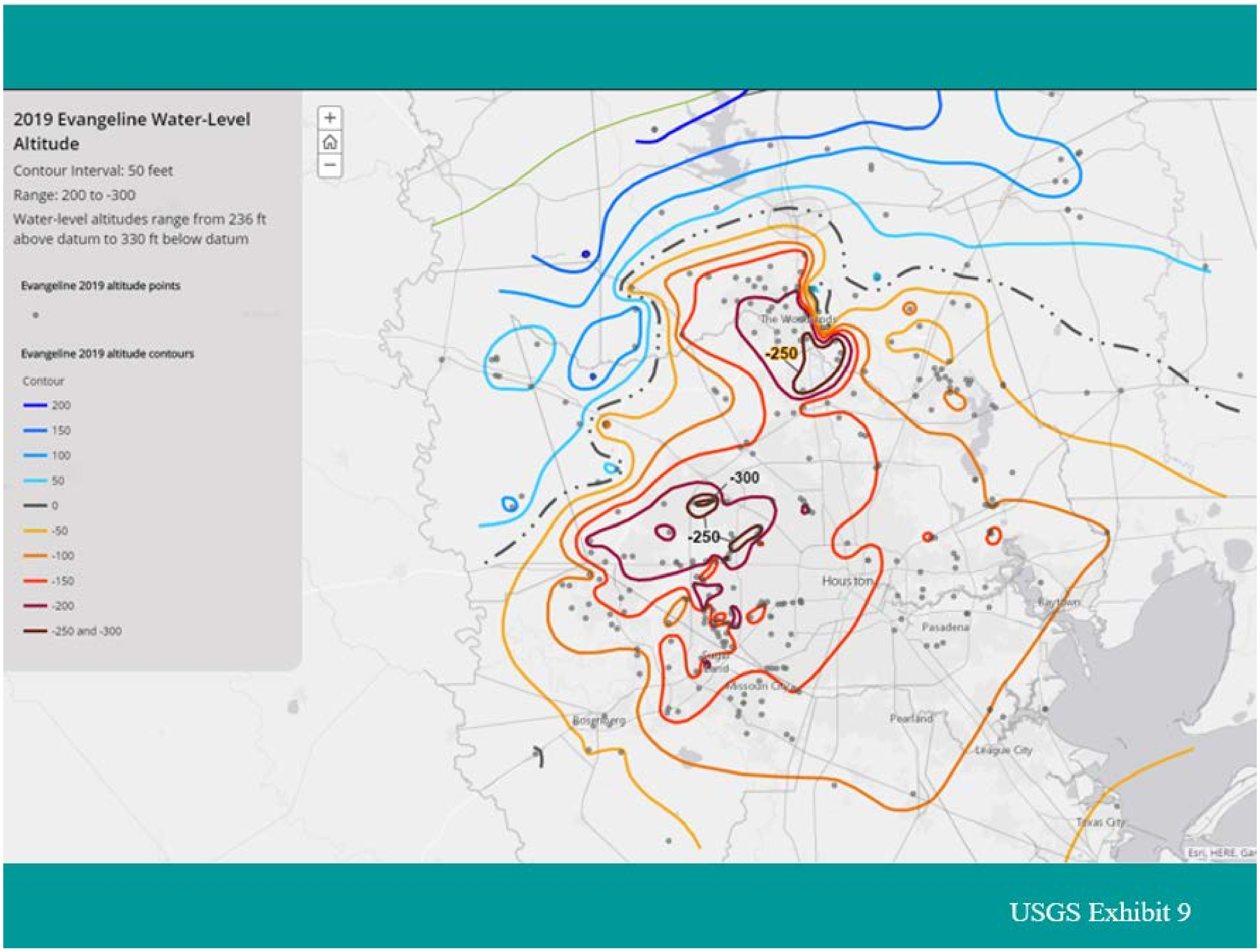
This exhibit shows the changes in water levels in the Chicot Aquifer (since the creation of the Fort Bend Subsidence District) as groundwater withdrawal regulations changed and groundwater dependence decreased.



The above map shows there has been rises of 60 feet near Sugar Land and declines of as much as 40 feet near the Barker Reservoir.

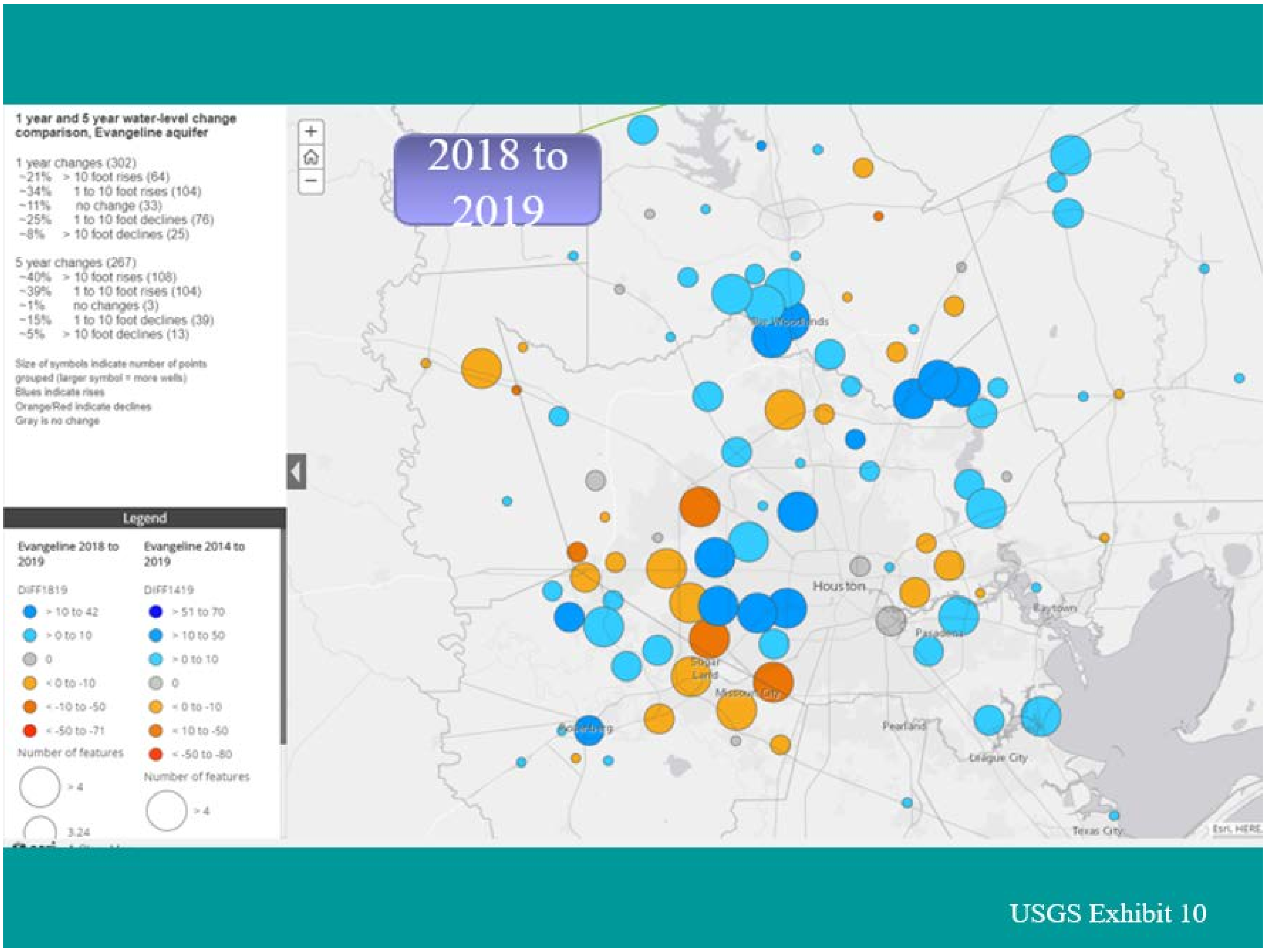
USGS EXHIBIT NO. 9: 2019 WATER-LEVEL ALTITUDES - EVANGELINE AQUIFER

Exhibit 9 shows the altitudes of the Evangeline Aquifer for 2019. Altitudes for the Evangeline Aquifer in Fort Bend and surrounding counties were drawn based on 331 water wells screened solely in the Evangeline Aquifer out of the total of 598 measurements taken.



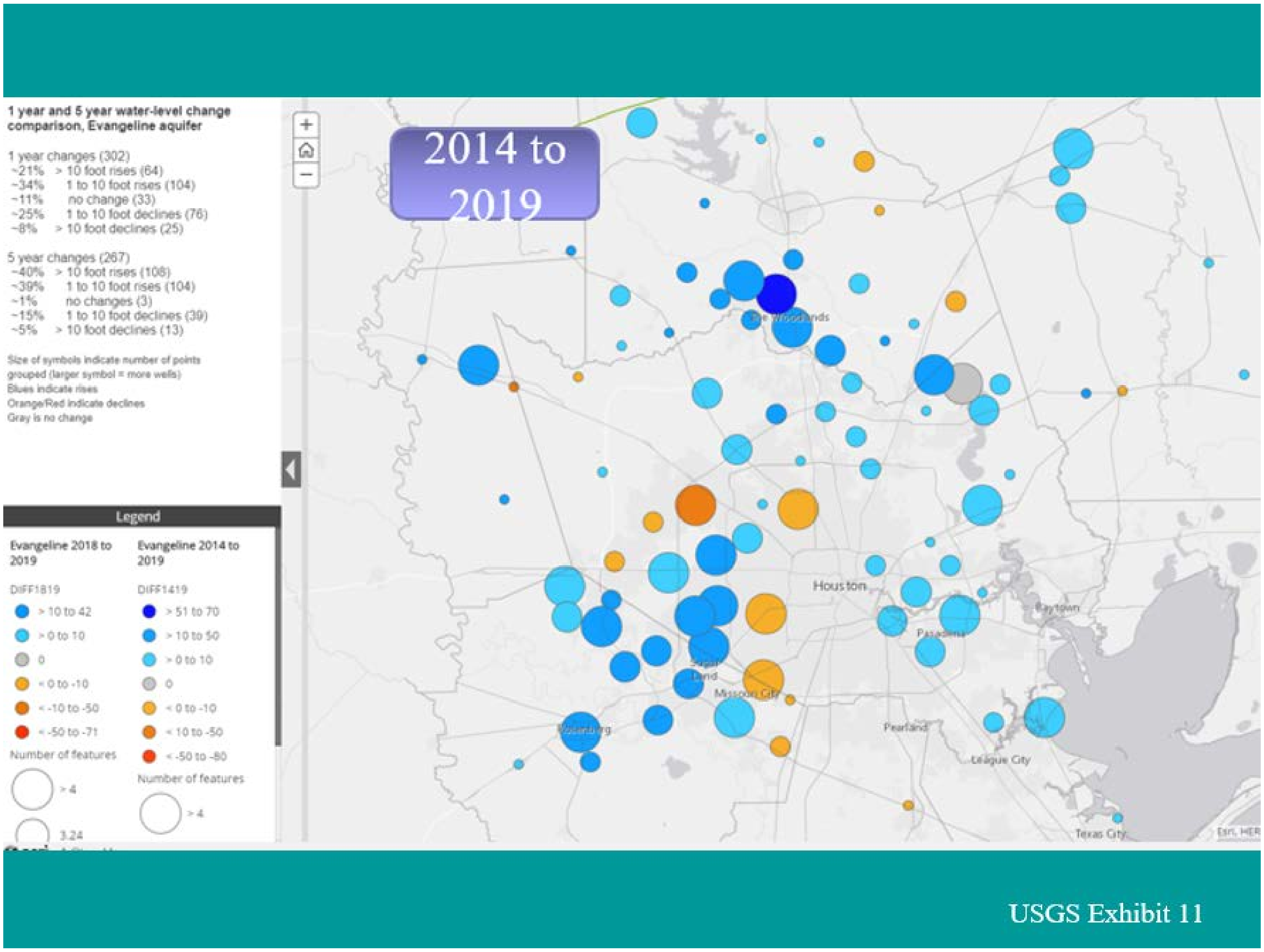
USGS EXHIBIT NO. 10: 2018-2019 EVANGELINE AQUIFER WATER-LEVEL CHANGE

Blue shading represents water level rises, gray shading represents no change and red shading represents declines in elevation. The size of the circle represents the number of records in that location. Exhibit 10 shows the one-year water-level changes for wells in the Evangeline Aquifer.



Changes in altitudes in the Evangeline Aquifer in Fort Bend County ranged from a rise of 30 feet near Fulshear to an area of decline of 13 feet near Missouri City.

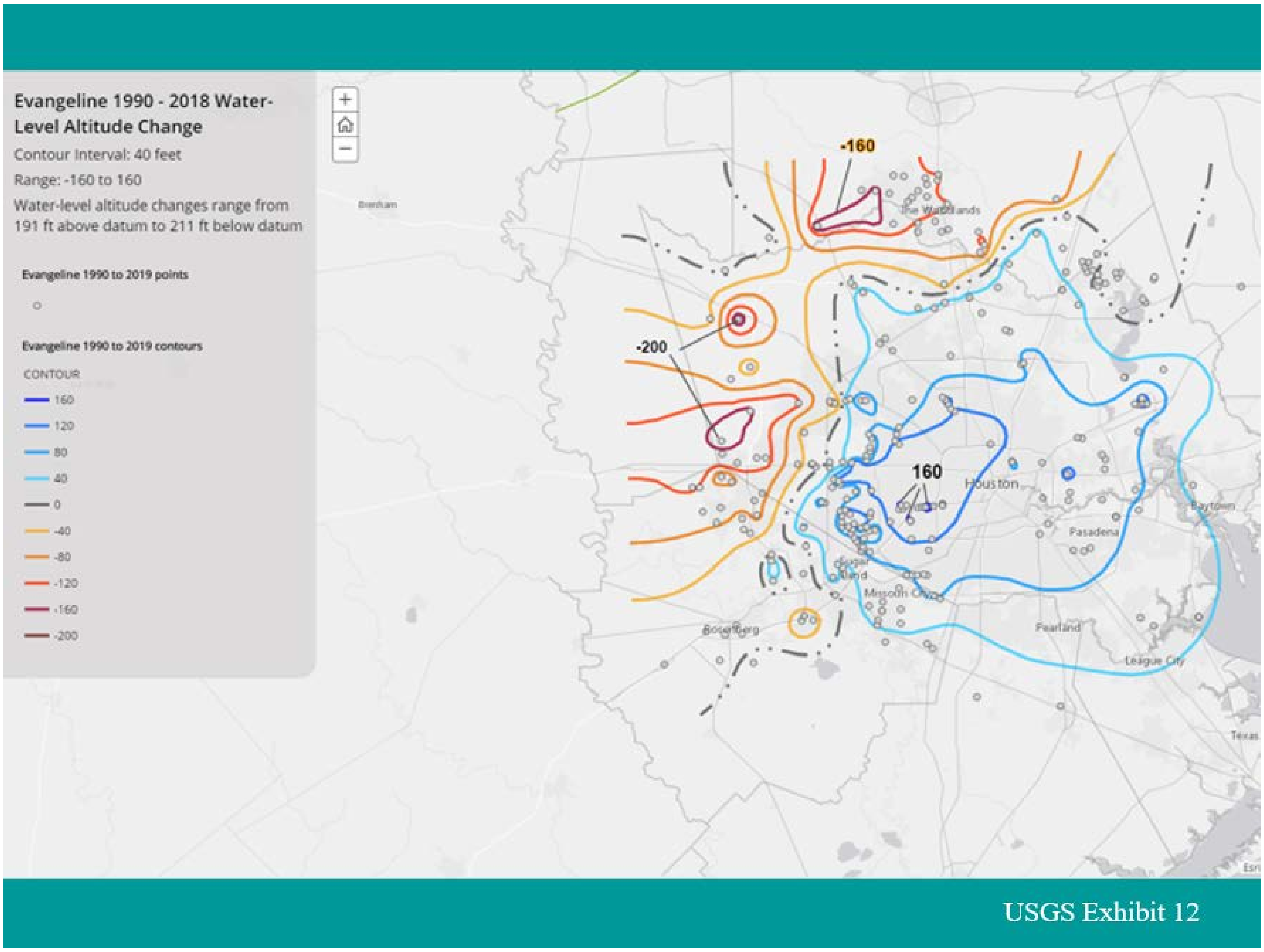
Exhibit 11 shows the water-level changes for the last five years.



Changes in altitudes in the Evangeline Aquifer shows a rise of 40 feet near Fulshear and Rosenberg, and a decline of 18 feet, also near Fulshear.

USGS EXHIBIT NO. 12: 1990-2019 EVANGELINE AQUIFER WATER-LEVEL CHANGE

This exhibit shows the changes in water levels in the Evangeline Aquifer (since the creation of the Fort Bend Subsidence District) as groundwater withdrawal regulations changed and groundwater dependence decreased.

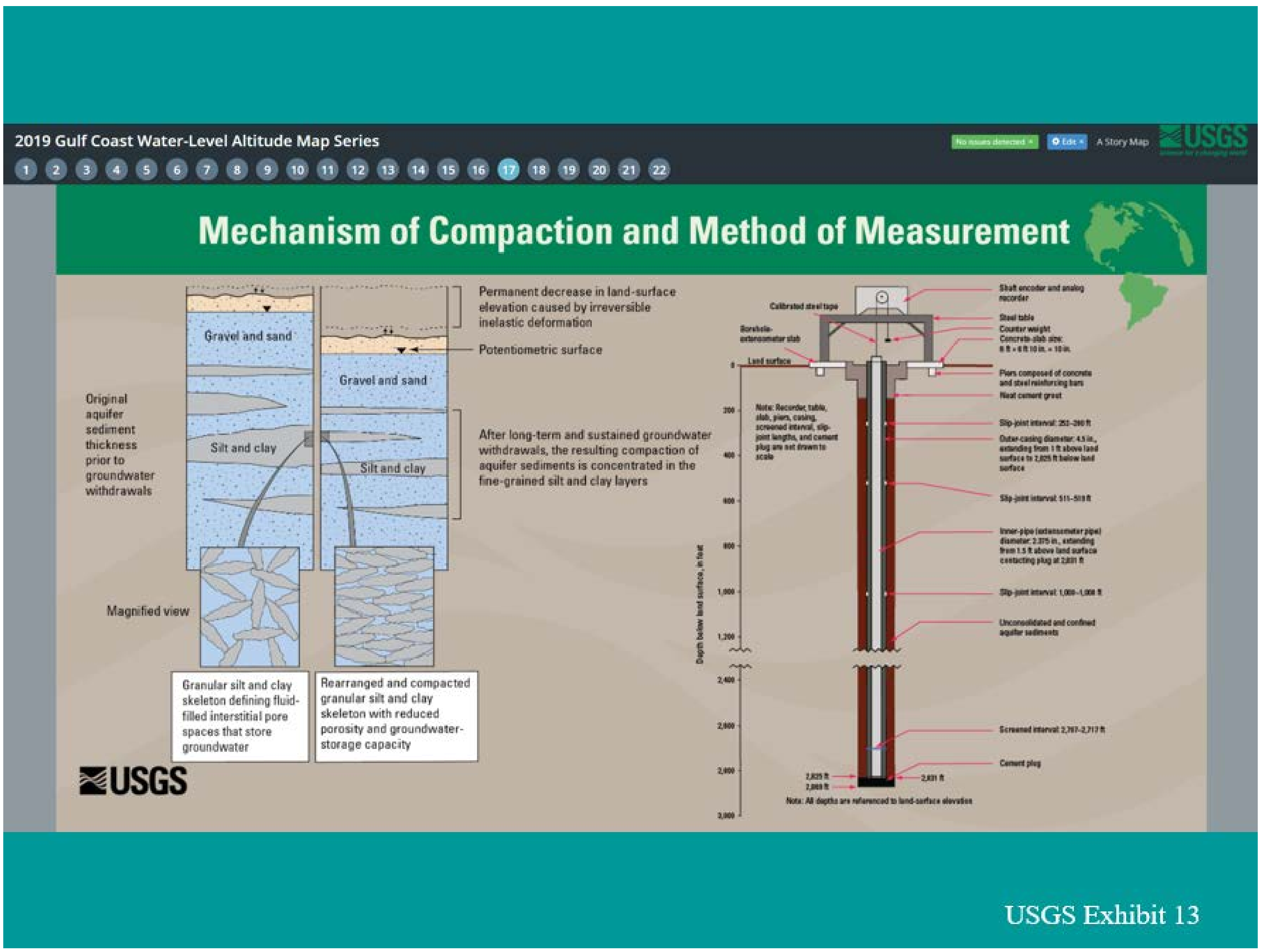


The above map shows there has been as much as 80 feet of rise near Sugar Land and as much 120 feet of decline near Katy.

Mr. Ramage presented eight exhibits including a location map depicting the fourteen extensometers in Fort Bend, Harris and Galveston Counties, and six graphs showing the compaction measured at the extensometers. The site compaction measurements are continuously chart recorded with a modified Type F Recorder and read approximately every twenty-eight days.

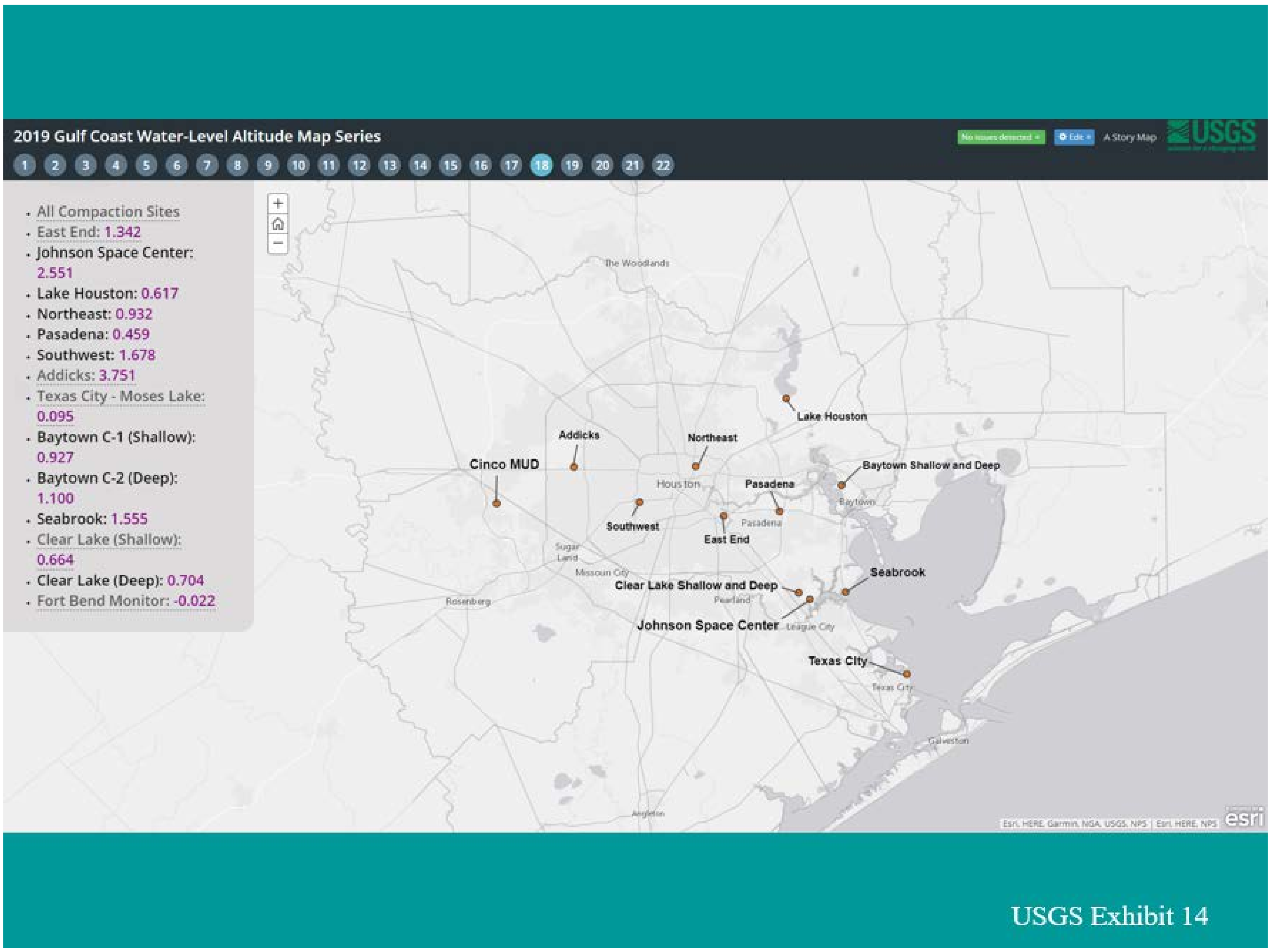
USGS EXHIBIT NO. 13: OVERVIEW OF SUBSIDENCE MECHANISMS

The diagram below depicts an overview of how groundwater withdrawal leads to the compaction that is associated with land subsidence in the region.



USGS EXHIBIT NO. 14: EXTENSOMETER LOCATIONS MAP

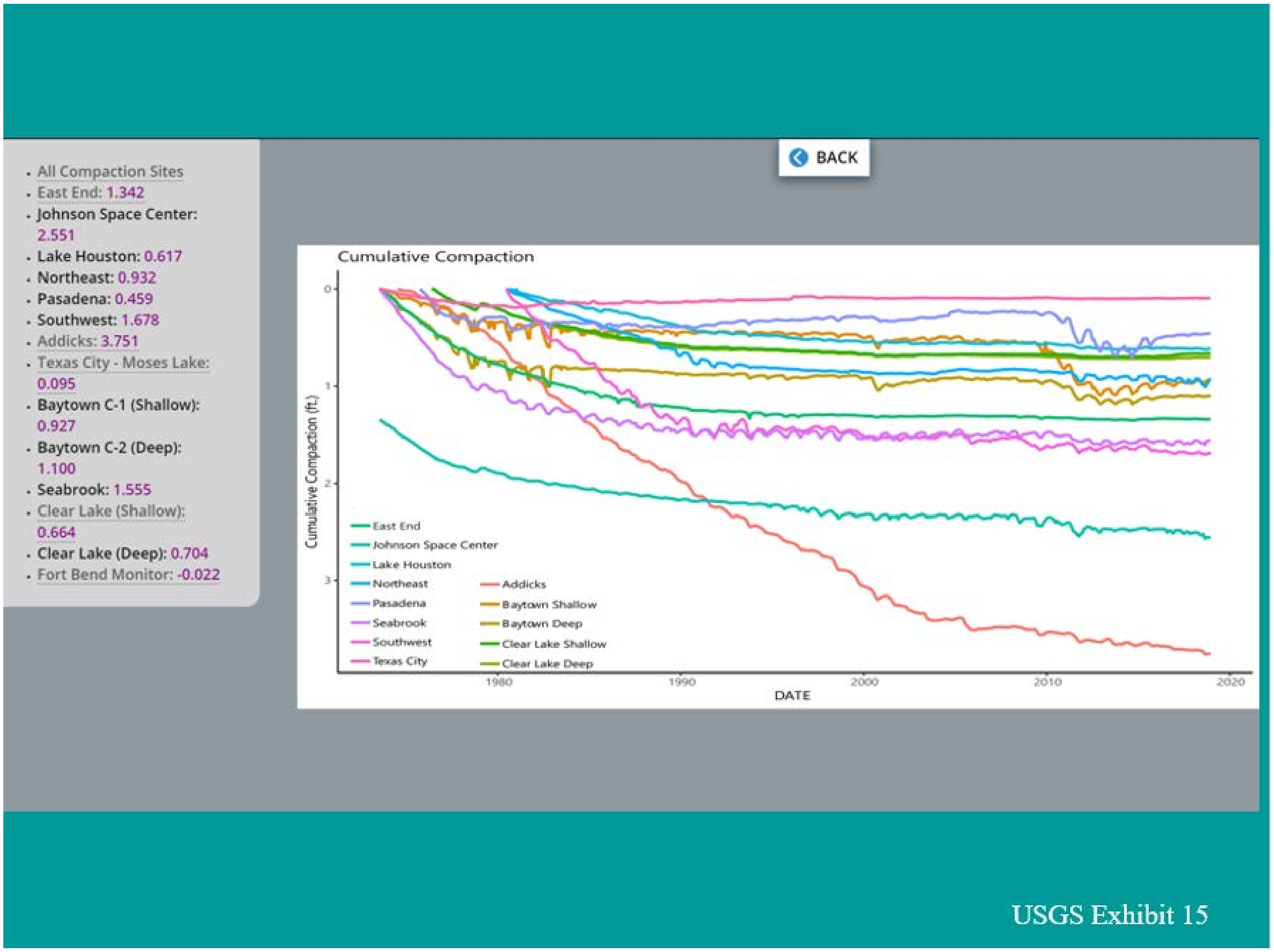
This map shows the location of the extensometer sites (two extensometers, one shallow and one deep located at both the Baytown and Clear Lake sites); and three extensometer sites (Addicks, Northeast Houston and Lake Houston) are equipped with GPS antennas atop the extensometer's inner pipe and are included in the National Geodetic Survey Continuous Operating Reference Station (CORS) Program. The Cinco MUD Extensometer site is in Fort Bend County.



USGS Exhibit 14

USGS EXHIBIT NO. 15: CHART SHOWING COMPACTION FOR ALL EXTENSOMETER SITES

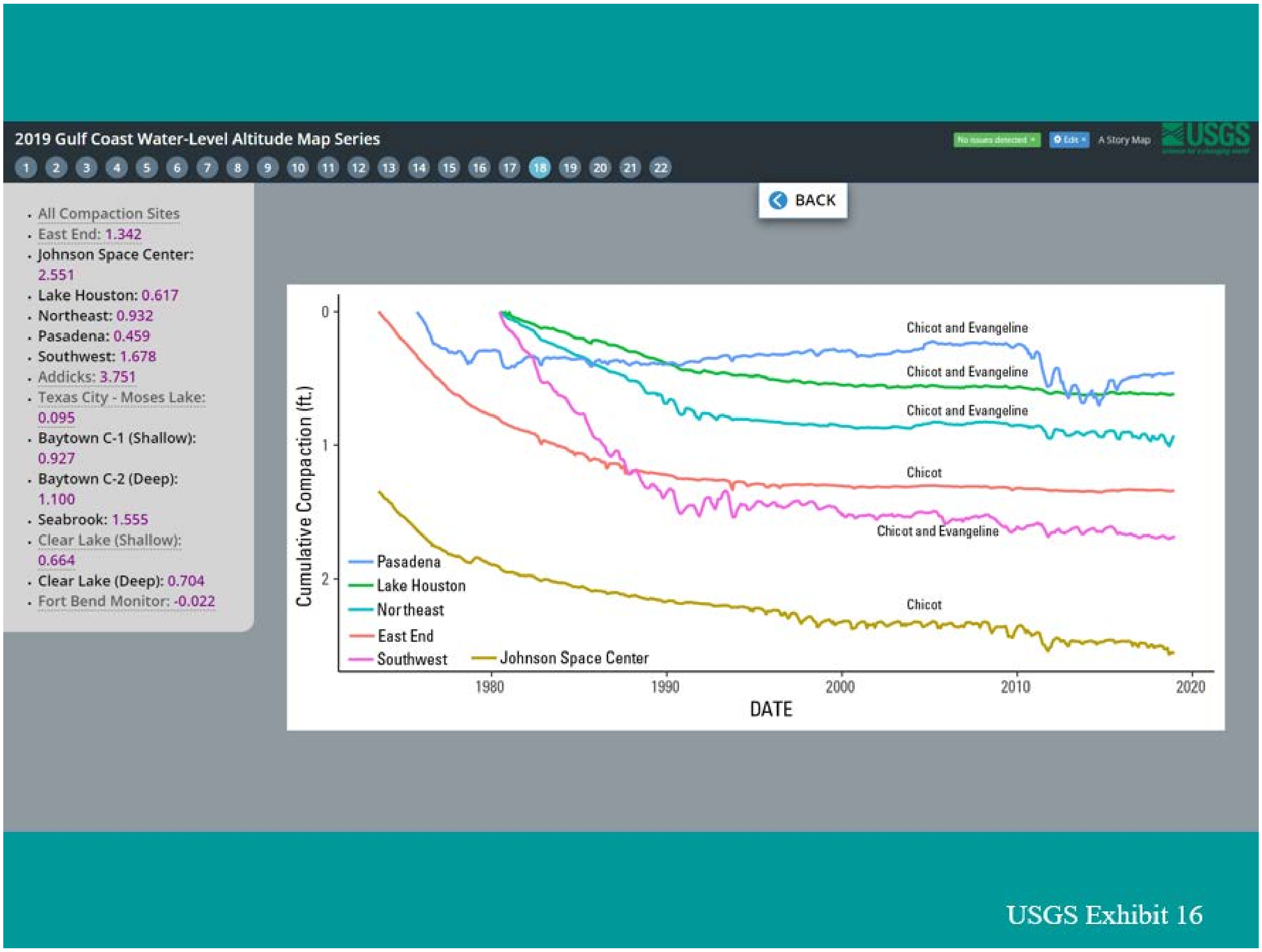
The chart below shows the traces for all of the sites except Cinco MUD. (The chart for the Cinco MUD site is shown separately on Exhibit 20.) Scaling is in one-foot increments from top to bottom (0-3 feet) and in ten-year increments, left to right (1980 to 2020).



USGS Exhibit 15

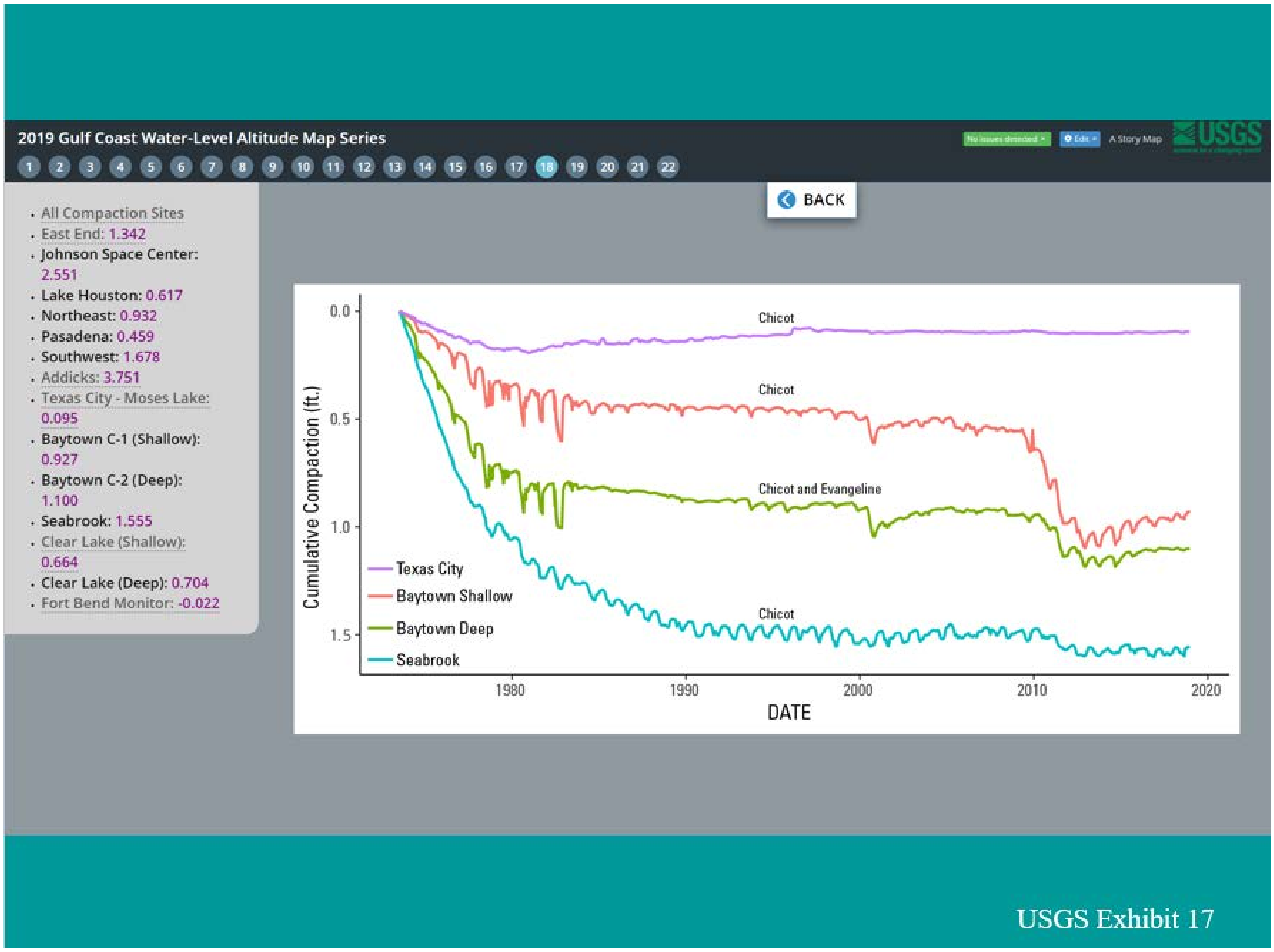
USGS EXHIBIT NO. 16: LAKE HOUSTON, NORTHEAST, EAST END, SOUTHWEST, JSC NASA AND PASADENA EXTENSOMETERS (1974 – 2018)

Exhibit 16 shows the Lake Houston (green line), Northeast Houston (blue-green line), East End (brown line), Southwest Houston (plum line), Johnson Space Center (gold line) and Pasadena (blue line) extensometers. Scaling is in one-foot increments from top to bottom (0-2 feet) and in ten-year increments, left to right (1980 to 2020).

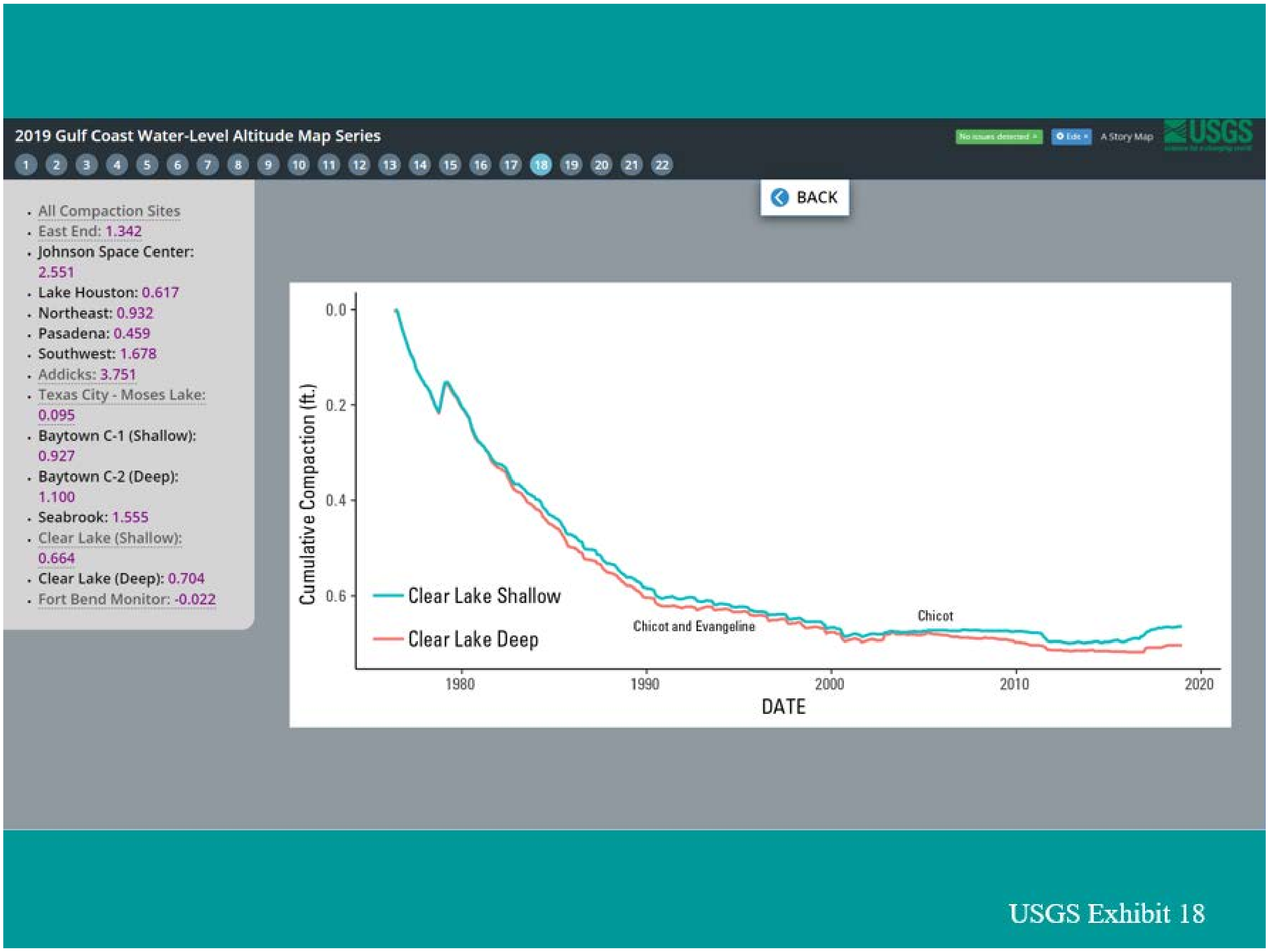


USGS EXHIBIT NO. 17: TEXAS CITY, BAYTOWN (SHALLOW AND DEEP) AND SEABROOK EXTENSOMETERS (1974 – 2018)

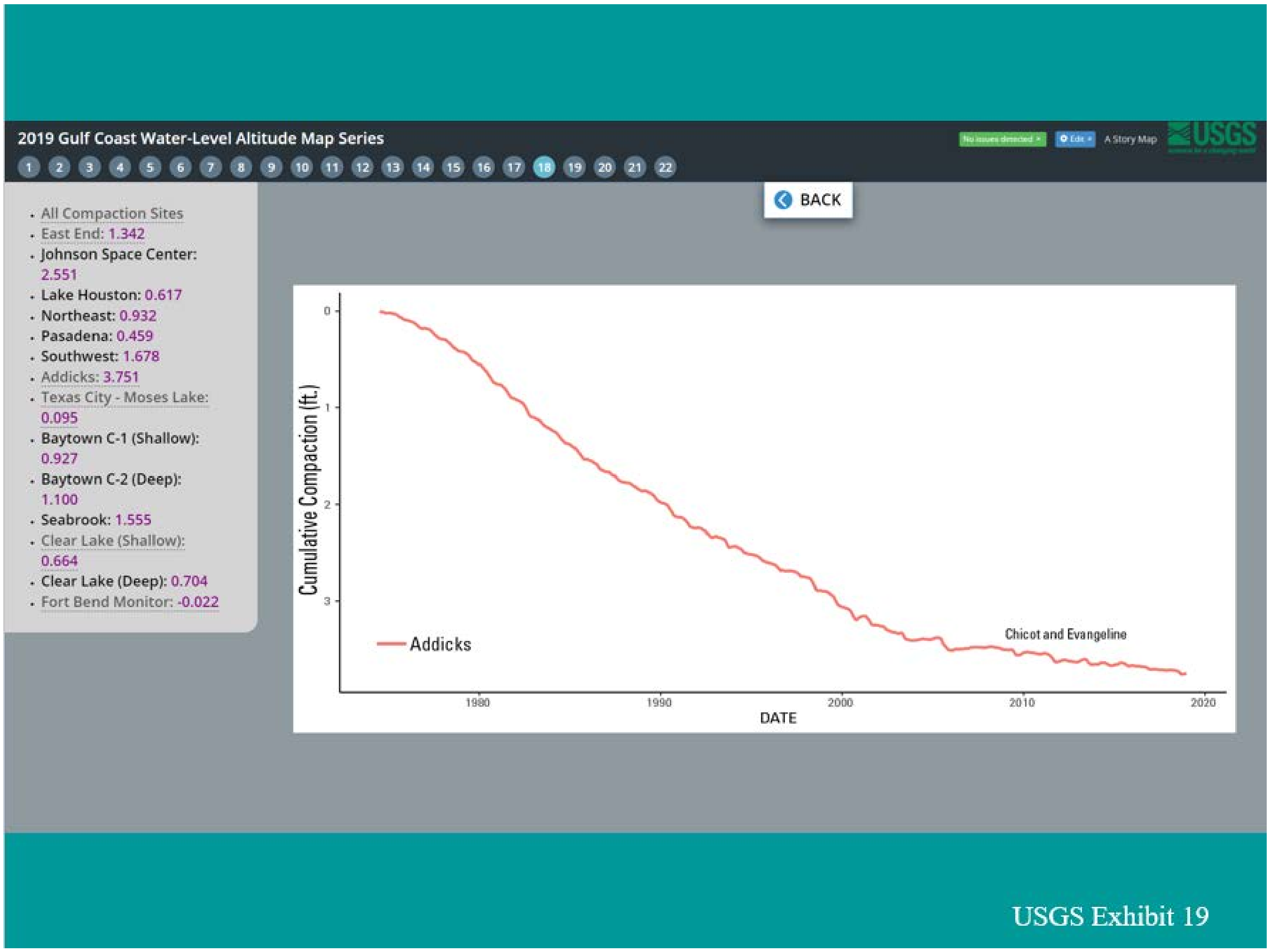
This graph shows the measurements for Texas City (plum line), Baytown Shallow (brown line), Baytown Deep (green line) and Seabrook (blue line) extensometers.



This graph shows the measurements for the Clear Lake Shallow (green line) and Clear Lake Deep (brown line) extensometers. They were both installed in 1977.



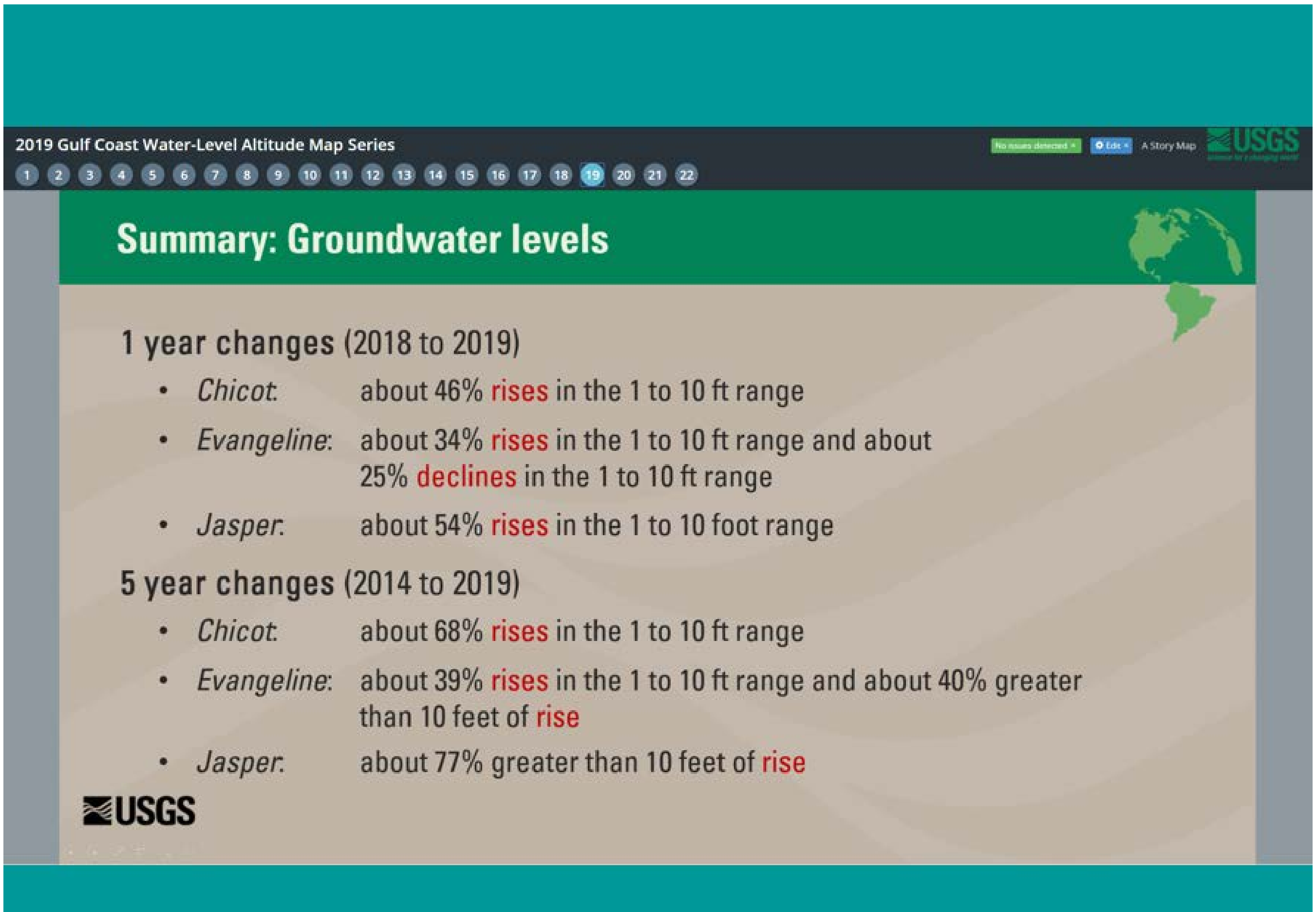
The Addicks site was installed in 1974 and has shown the most compaction of all of the extensometers. It is currently showing 3.751 feet.



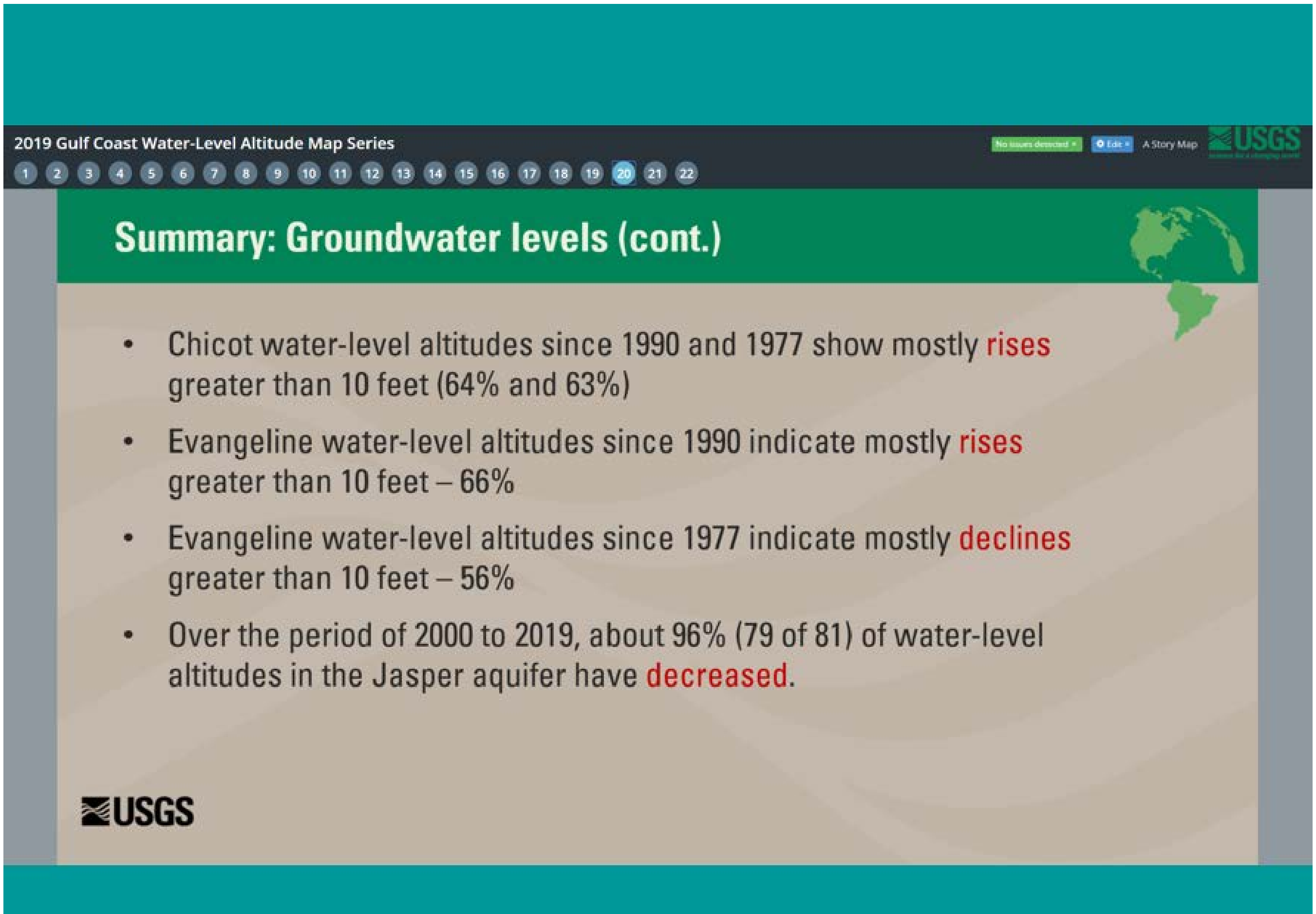
USGS EXHIBIT NO. 20: CINCO MUD EXTENSOMETER

The Cinco MUD Extensometer was installed in 2016 and started recording data in January 2017. The record shows that there has been a slight rise (-0.022 feet), or uplift, since it was installed, as a result of swelling of the clays at the surface.

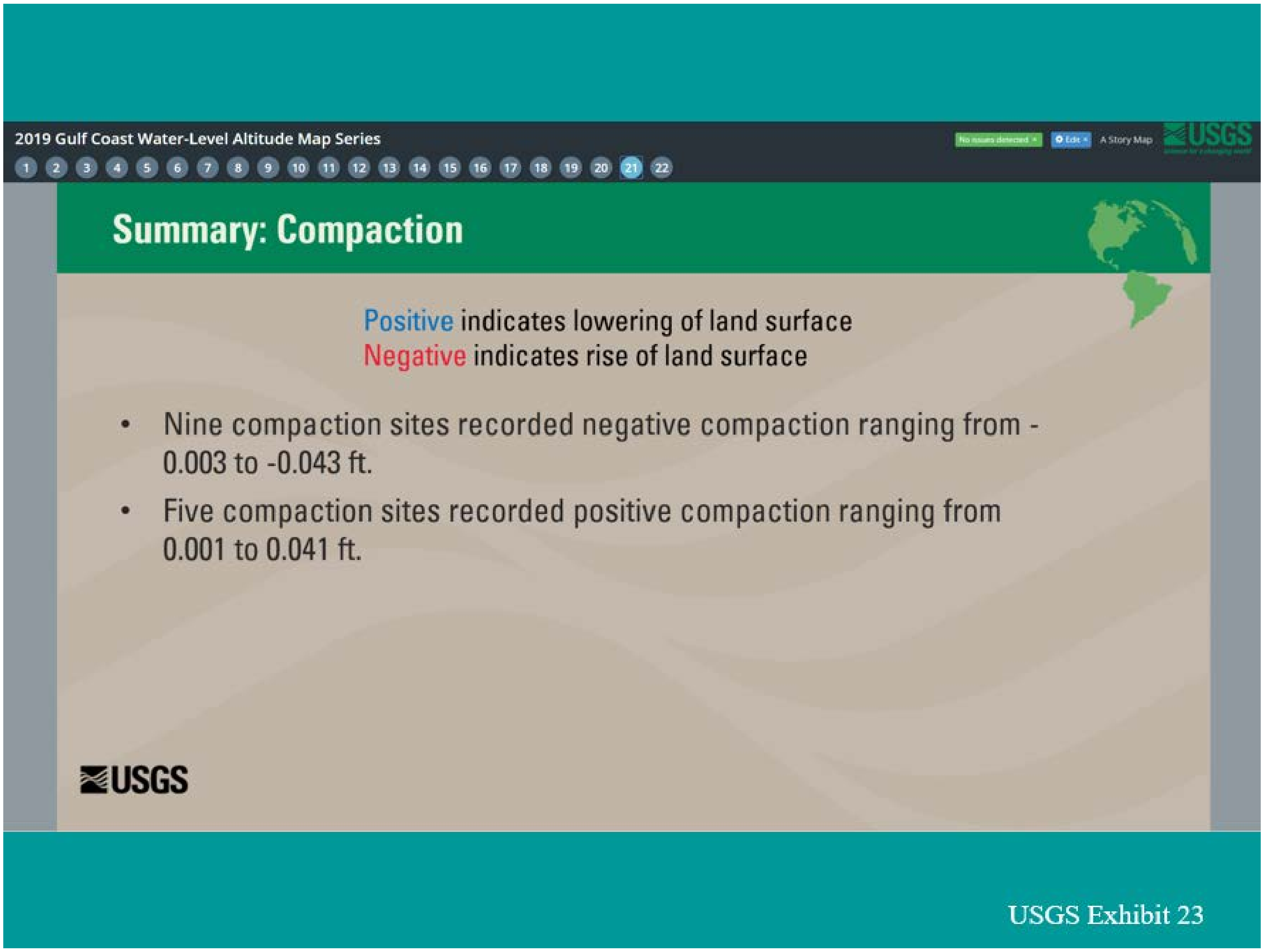
Mr. Ramage summarized his comments in the final three exhibits.



USGS Exhibit 21



USGS Exhibit 22



The water-level report by Ramage, Jason K., and Braun, Chris L. entitled “Groundwater-Level Altitudes and Changes in the Chicot, Evangeline, and Jasper Aquifers (2019) and Compaction in the Chicot and Evangeline Aquifers (1973-2018), for the Houston-Galveston Region, Texas” can be found at the following link: https://doi.org/10.5066/P9LKT49P.

The above site will also have the final report when it has been approved later this summer.

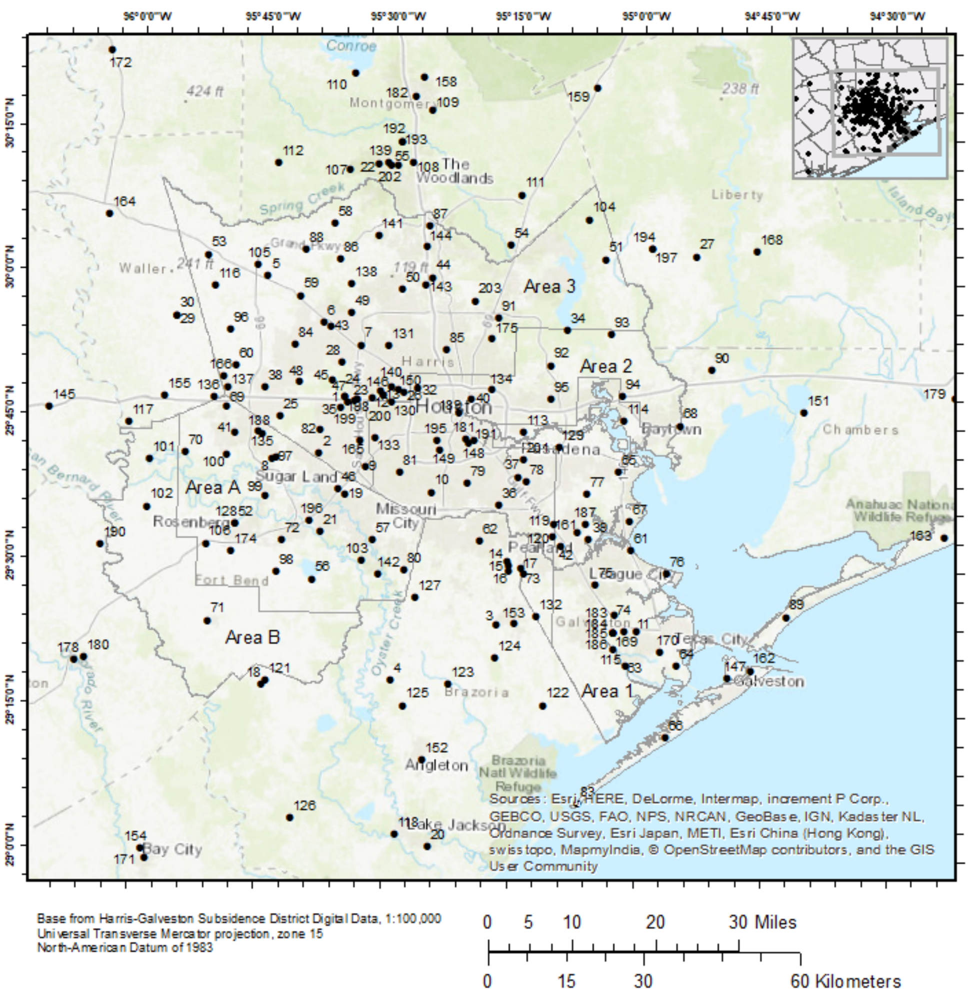
This concluded Mr. Ramage’s testimony.

Mr. Thompson returned to present three exhibits including two location maps and one subsidence chart. The chart shows data from three types of sites across ten counties.

Measurement Methodology and Notes

GPS heights are derived at each of the occupied sites every thirty seconds during the duration of monitoring (generally a seven-day period, every eight weeks). The data for each site is processed against the stable Houston reference frame Houston 16 and published as a daily height.

This map that shows the locations of the GPS sites within the District and the surrounding counties. There are almost 200 sites throughout the area.



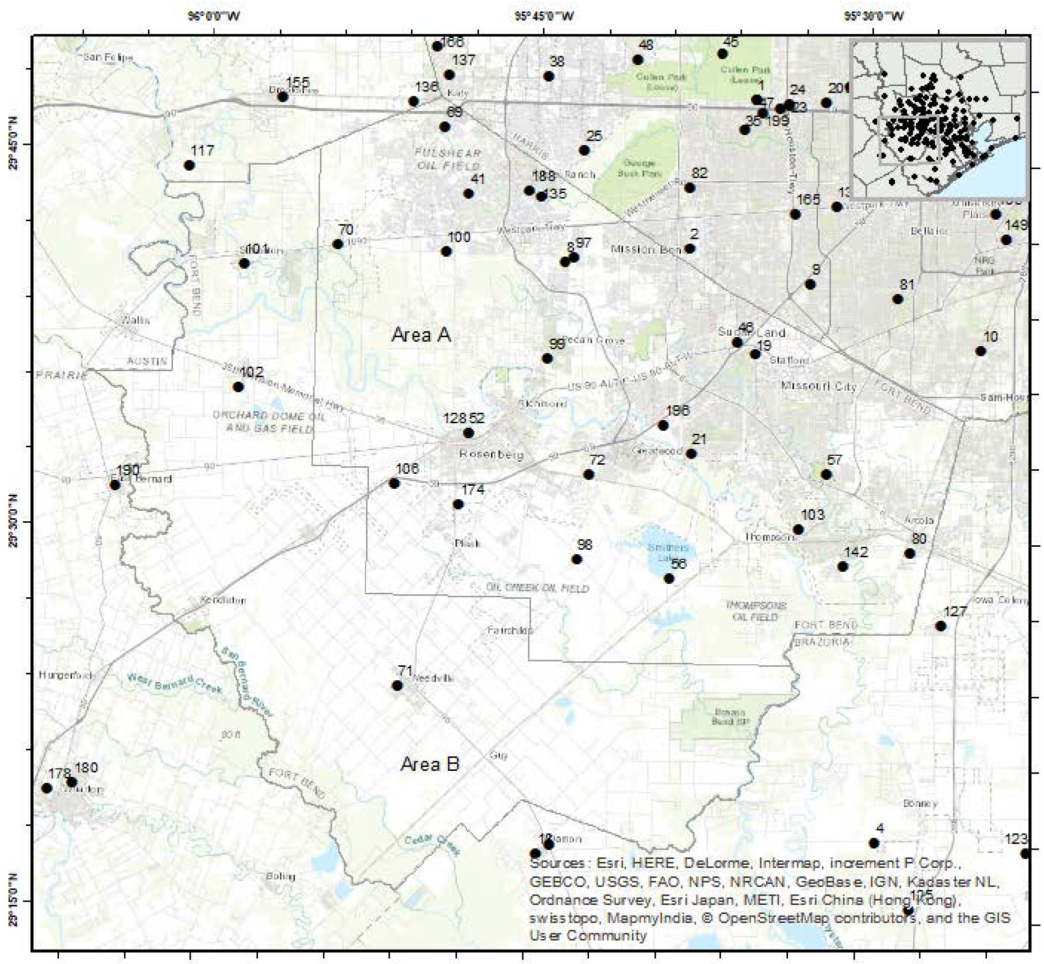
FBSD EXHIBIT 11. Subsidence monitoring network in Harris, Galveston, Fort Bend, and surrounding counties operated in cooperation with the University of Houston, Lone Star Groundwater Conservation District, and the Brazoria County Groundwater Conservation District, 2018

EXPLANATION

• Subsidence monitoring station and map ID. (see appendix)

FBSD EXHIBIT NO. 12: GPS MONITORING NETWORK IN FORT BEND COUNTY

This map shows the locations of the GPS sites within the District.



Base from Harris-Galveston Subsidence District Digital Data, 1:100,000
Universal Transverse Mercator projection, zone 15
North-American Datum of 1983

0 2.75 5.5 11 16.5 Miles

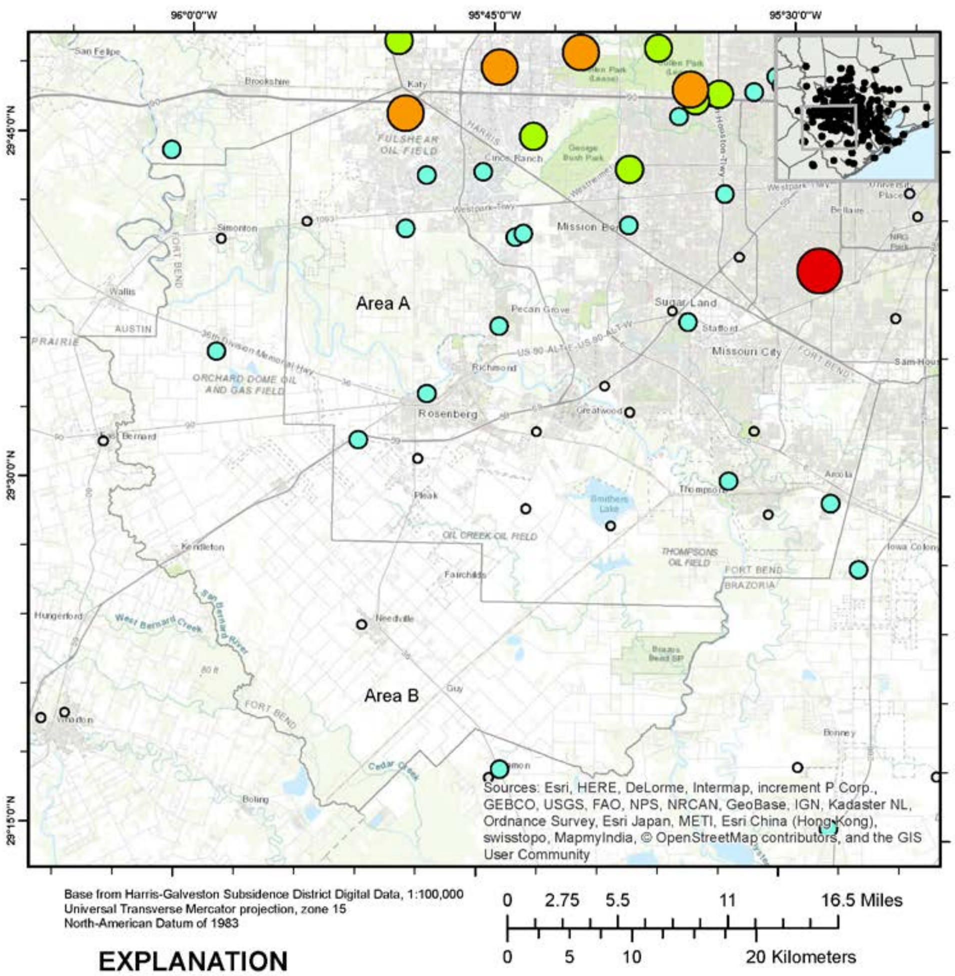
0 5 10 20 Kilometers

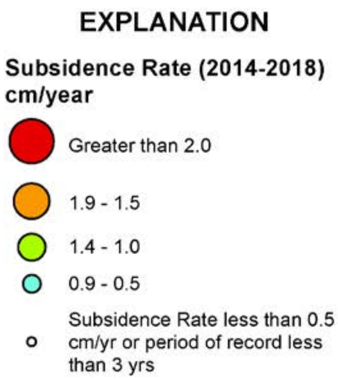
EXPLANATION

• Subsidence monitoring station and map id. (see appendix)

FBSD EXHIBIT 11. Annual subsidence rate, in centimeters per year, estimated from three or more years of periodic and continuous GPS data measured at subsidence monitoring sites, Fort Bend County, 2014-2018.

This map shows the rates of subsidence across the District in cm/year. Katy is showing the highest rate of subsidence in the District. The rate is 1.68 cm/year.





FBSD EXHIBIT 13. Annual Subsidence rate, in centimeters per year, estimated from three or more years of periodic and continuous GPS data measured at subsidence monitoring sites, Fort Bend County, 2014-2018.

HEARING CONCLUSION

Ms. Truscott asked for additional testimony. There was no additional testimony given.

Ms. Truscott opened it up for questions. There were two questions from the public, which Mr. Ramage and Mr. Thompson answered during the hearing.

WRITTEN COMMENTS

The record was left open until June 4, 2019 at 5:00 p.m. to allow for written comments and corrections.

There were no written comments or corrections.

APPENDIX: GPS ELLIPSOID MONITORING SITES CHANGE TABLE

The following table includes a list of all of the active GPS sites in the area. It shows the total vertical movement for each site and the estimated annual rate of movement.

Map ID FBSD (Exhibit 12)	Site Name	Longitude (decimal degrees)	Latitude (decimal degrees)	Start of Period of Record (decimal year)	End of Period of Record (decimal year)	Length of Period of Record (years)	Number of samples days	Total Change in Ellipsoid Height Over Period of Record(cm)	Annual Rate of Change in Ellipsoid Height 2014-2018 (cm)
1	ADKS	-95.586	29.791	1993.518	2018.987	25.469	5926	0.06	-0.36
2	ALEF	-95.635	29.692	2014.259	2019.108	4.849	1705	-2.25	-0.81
3	ALVN	-95.278	29.401	2012.463	2017.24	4.778	1710	-0.69	-0.12
4	ANG5	-95.485	29.301	2003.447	2019.108	15.661	5007	-1.28	-0.19
5	AULT	-95.745	29.998	2015.557	2019.108	3.551	1165	-3.42	-1.
6	CFHS	-95.632	29.919	2015.595	2019.108	3.513	1092	-5.51	-1.49
7	CFJV	-95.556	29.882	2015.773	2019.102	3.329	1152	-3.75	-1.19
8	CMFB	-95.729	29.681	2014.409	2019.108	4.698	1675	-1.36	-0.5
9	COH1	-95.543	29.67	2009.019	2017.719	8.701	2734	-3.18	-0.49
10	COH2	-95.412	29.629	2009.005	2019.108	10.103	3249	-2.54	-0.26
11	COTM	-94.998	29.394	2015.099	2019.108	4.008	1455	-1.13	-0.34
12	CSTA	-95.512	29.796	2013.147	2015.324	2.177	747	0.53	n/a
13	CSTE	-95.511	29.796	2015.387	2019.108	3.721	1350	-2.8	-0.84
14	DEN1	-95.258	29.51	2011.778	2017.339	5.561	1927	0.37	-0.31
15	DEN2	-95.254	29.505	2011.778	2017.084	5.306	1506	1.21	-0.1
16	DEN3	-95.255	29.494	2011.778	2017.339	5.561	1992	0.85	-0.23
17	DEN4	-95.23	29.5	2015.825	2017.339	1.514	509	-0.37	n/a
18	DISD	-95.74	29.289	2015.48	2019.108	3.628	1275	0.11	-0.08
19	DMFB	-95.584	29.623	2014.771	2019.108	4.337	1575	-2.29	-0.89
20	DWI1	-95.404	29.014	2009.399	2019.108	9.708	3178	-0.86	0.06
21	FSFB	-95.63	29.556	2014.371	2019.108	4.737	1721	0.45	-0.1
22	GAL7	-94.737	29.33	1996.033	2003.521	7.488	2673	-3.55	n/a
23	GSEC	-95.528	30.197	2015.756	2019.108	3.351	1215	-0.97	-0.77
24	HCC1	-95.561	29.788	2012.914	2019.108	6.193	2244	-4.06	-0.93
25	HCC2	-95.562	29.788	2013.139	2019.086	5.947	1993	-5.77	-1.08
26	HPEK	-95.716	29.755	2014.396	2018.393	3.997	1425	-4.15	-1.13
27	HSMN	-95.47	29.8	2013.298	2019.108	5.81	2105	-2.34	-0.68
28	JGS2	-94.891	30.045	2012.463	2019.108	6.645	2179	0.34	0.04
29	KKES	-95.595	29.85	2015.598	2019.108	3.51	1218	-4.16	-1.24
30	KPCD	-95.924	29.926	2016.441	2019.08	2.639	914	-2.29	-0.57
31	KPCS	-95.924	29.926	2016.441	2019.08	2.639	934	-1.89	-0.47
32	LCBR	-96.602	30.182	2010.538	2016.09	5.552	1947	-0.35	-0.06
33	LCI1	-95.443	29.807	2012.463	2019.108	6.645	2076	-1.74	-0.52
34	LGC1	-94.075	30.045	2013.531	2019.108	5.577	2023	-0.5	-0.16
35	LKHU	-95.146	29.913	1993.515	2018.998	25.483	5371	2.49	0.03
36	MDWD	-95.595	29.771	2013.303	2019.108	5.804	2067	-4.6	-0.72
37	ME01	-95.276	29.608	2015.477	2017.665	2.188	790	-0.16	-0.15
38	MEPD	-95.24	29.658	2014.04	2019.108	5.068	1840	1.33	0.12
39	MRHK	-95.745	29.804	2014.396	2019.108	4.712	1570	-7.3	-1.6
40	NASA	-95.096	29.552	2014.201	2018.667	4.466	1531	-1.16	-0.1
41	NETP	-95.334	29.791	1993.515	2018.998	25.483	5459	-0.14	0.1
42	OKEK	-95.803	29.725	2014.579	2019.108	4.528	1522	-2.28	-0.87
43	PA00	-95.152	29.539	1996.	2018.94	22.94	1521	-5.02	-0.42
44	PA01	-95.617	29.912	1994.162	2018.995	24.833	1982	-70.9	-2.69
45	PA02	-95.416	30.001	1994.315	2018.858	24.542	1991	-61.44	-1.68
46	PA03	-95.613	29.821	1994.326	2018.945	24.619	1574	-57.64	-1.21
47	PA04	-95.597	29.63	1994.658	2018.849	24.192	1865	-27.9	-0.32
48	PA05	-95.586	29.791	1996.694	2018.463	21.769	1535	-35.08	-1.52

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49	PA06	-95.678	29.816	1997.616	2018.789	21.173	1352	-58.39	-1.9
50	PA07	-95.577	29.936	1999.112	2018.992	19.88	1277	-55.1	-1.29
51	PA08	-95.476	29.98	1999.608	2018.885	19.277	1192	-42.91	-1.74
52	PA09	-95.071	30.038	1999.342	2018.995	19.652	1284	-8.85	-0.66
53	PA10	-95.799	29.566	1999.263	2018.904	19.641	1512	-7.93	-0.93
54	PA11	-95.865	30.032	1999.34	2018.885	19.545	1346	-14.69	-0.86
55	PA12	-95.263	30.06	2000.891	2018.964	18.074	1204	-12.95	-0.87
56	PA13	-95.49	30.195	2000.91	2018.858	17.948	1190	-26.6	-0.74
57	PA14	-95.644	29.474	2000.874	2018.959	18.085	1055	-8.18	-0.2
58	PA16	-95.527	29.544	2000.855	2018.995	18.139	1120	-5.74	-0.29
59	PA17	-95.615	30.091	2000.891	2018.849	17.959	1066	-31.05	-1.99
60	PA18	-95.678	29.965	2000.858	2018.819	17.961	1102	-33.99	-1.41
61	PA19	-95.805	29.841	2000.888	2018.923	18.035	988	-15.72	-0.81
62	PA20	-95.013	29.533	2002.038	2018.923	16.885	1031	1.66	0.21
63	PA21	-95.312	29.545	2002.088	2018.959	16.871	976	-5.37	-0.66
64	PA22	-95.021	29.335	2002.038	2018.992	16.953	986	-7.16	-0.87
65	PA23	-94.918	29.335	2002.057	2018.995	16.937	1053	0.52	0.06
66	PA24	-95.041	29.669	2002.118	2018.934	16.816	1024	3.59	0.19
67	PA26	-94.938	29.21	2002.192	2018.995	16.803	1533	-2.6	-0.22
68	PA27	-95.016	29.583	2002.364	2018.923	16.559	998	-7.39	-0.53
69	PA28	-94.918	29.751	2002.192	2018.959	16.767	981	0.65	-0.06
70	PA29	-95.822	29.769	2007.318	2018.863	11.545	532	-19.32	-1.68
71	PA30	-95.902	29.689	2007.348	2018.866	11.518	520	-4.62	-0.45
72	PA31	-95.848	29.398	2007.348	2018.964	11.616	528	0.55	0.13
73	PA32	-95.707	29.541	2007.348	2018.94	11.592	543	-0.67	-0.14
74	PA33	-95.224	29.49	2006.321	2018.959	12.638	648	-1.69	-0.32
75	PA34	-95.042	29.422	2010.353	2018.995	8.641	2972	-3.86	-0.34
76	PA35	-95.082	29.473	2006.622	2018.901	12.279	543	2.91	0.03
77	PA36	-94.942	29.494	2006.964	2018.904	11.94	564	-5.06	-0.88
78	PA37	-95.101	29.631	2007.367	2018.943	11.575	577	3.27	0.21
79	PA38	-95.223	29.649	2007.353	2018.984	11.63	570	-0.08	-0.45
80	PA39	-95.339	29.645	2011.09	2018.984	7.893	374	-1.33	-0.05
81	PA40	-95.463	29.493	2007.351	2018.984	11.633	491	-5.69	-0.95
82	PA41	-95.476	29.662	2007.334	2018.967	11.633	574	-6.6	-2.33
83	PA42	-95.635	29.732	2007.332	2018.923	11.592	542	-8.03	-1.47
84	PA43	-95.111	29.093	2006.542	2018.995	12.452	1128	-0.58	-0.36
85	PA44	-95.687	29.88	2007.318	2018.959	11.641	530	-15.53	-1.91
86	PA45	-95.385	29.876	2007.332	2018.879	11.548	547	-3.56	-0.18
87	PA46	-95.6	30.03	2007.318	2018.849	11.532	564	-23.42	-2.47
88	PA47	-95.424	30.09	2007.334	2018.866	11.531	542	-20.62	-1.04
89	PA48	-95.672	30.045	2007.318	2018.866	11.548	550	-16.95	-2.02
90	PA49	-94.702	29.422	2006.277	2018.995	12.718	1003	-3.82	-0.75
91	PA50	-94.856	29.848	2007.104	2018.959	11.855	572	-1.27	0.46
92	PA51	-95.284	29.933	2007.337	2018.901	11.564	532	-5.79	-0.21
93	PA52	-95.177	29.852	2007.337	2018.901	11.564	519	-0.21	0.29
94	PA53	-95.057	29.908	2007.337	2018.981	11.644	535	3.36	0.62
95	PA54	-95.034	29.801	2006.814	2018.984	12.17	573	-0.17	-0.13
96	PA55	-95.177	29.794	2006.797	2018.923	12.126	568	2.28	0.12

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97	PA56	-95.817	29.903	2007.318	2018.904	11.586	532	-6.19	-1.2
98	PA57	-95.722	29.684	2009.134	2018.849	9.715	444	-5.02	-0.51
99	PA58	-95.715	29.485	2010.589	2018.943	8.354	396	-2.9	0.11
100	PA59	-95.74	29.617	2010.57	2018.921	8.351	389	-3.59	-0.65
101	PA60	-95.82	29.686	2012.066	2018.866	6.8	278	-5.62	-0.94
102	PA61	-95.972	29.675	2011.126	2018.885	7.759	374	-4.69	-0.2
103	PA62	-95.974	29.593	2011.126	2018.885	7.759	349	-4.17	-0.59
104	PA63	-95.547	29.508	2011.43	2018.995	7.564	331	-1.43	-0.59
105	PA65	-95.107	30.106	2012.429	2018.995	6.566	290	-4.42	-0.73
106	PA66	-95.767	30.017	2011.164	2018.712	7.548	361	-13.33	-1.93
107	PA67	-95.855	29.532	2011.107	2018.923	7.817	358	-4.25	-0.62
108	PA68	-95.587	30.185	2011.797	2018.926	7.129	427	-7.53	-1.08
109	PA69	-95.459	30.199	2011.745	2018.869	7.123	436	-9.48	-1.11
110	PA70	-95.424	30.291	2011.759	2018.995	7.236	341	-3.51	-0.47
111	PA71	-95.579	30.353	2011.781	2018.904	7.123	430	-4.77	-0.82
112	PA72	-95.242	30.147	2011.992	2018.795	6.803	305	-3.27	0.62
113	PA73	-95.73	30.193	2012.049	2018.849	6.8	419	-6.73	-1.
114	PA74	-95.231	29.736	2011.97	2018.923	6.953	331	-0.12	0.25
115	PA75	-95.031	29.758	2012.434	2018.94	6.505	302	-0.88	-0.35
116	PA76	-95.045	29.361	2012.637	2018.869	6.232	269	-4.61	-0.87
117	PA77	-95.85	29.979	2013.195	2018.904	5.709	272	-4.05	-1.13
118	PA78	-96.016	29.739	2014.329	2018.885	4.556	236	-3.26	-0.69
119	PA79	-95.471	29.035	2014.825	2018.929	4.104	1340	0.42	0.06
120	PA80	-95.165	29.578	2014.86	2018.995	4.134	1397	1.45	0.14
121	PA81	-95.17	29.556	2014.852	2018.995	4.142	1370	0.67	0.1
122	PA82	-95.731	29.296	2016.107	2018.959	2.852	152	-1.74	-0.81
123	PA83	-95.182	29.262	2016.011	2018.995	2.984	149	-3.	-0.99
124	PA84	-95.37	29.297	2016.049	2018.901	2.852	134	0.09	-0.17
125	PA85	-95.278	29.343	2016.03	2018.882	2.852	137	-0.21	-0.37
126	PA86	-95.458	29.258	2016.068	2018.921	2.852	130	-1.56	-0.79
127	PA87	-95.677	29.058	2016.087	2018.94	2.852	145	-2.84	-0.85
128	PA88	-95.438	29.446	2016.126	2018.981	2.855	135	-2.2	-0.64
129	PA89	-95.799	29.566	2015.764	2018.904	3.14	146	-1.69	-0.69
130	PA90	-95.16	29.71	2015.973	2018.956	2.984	227	1.01	-0.14
131	PA91	-95.493	29.783	2016.317	2018.995	2.678	266	-3.1	-1.24
132	PA92	-95.501	29.881	2016.317	2018.904	2.587	204	-1.47	-0.3
133	PA93	-95.197	29.417	2017.236	2018.885	1.649	97	-4.22	n/a
134	PA94	-95.524	29.722	2017.296	2018.995	1.699	139	-0.73	n/a
135	PA95	-95.294	29.808	2017.197	2018.943	1.745	136	0.26	n/a
136	PA96	-95.748	29.724	2017.625	2018.995	1.37	467	3.41	n/a
137	PA97	-95.847	29.785	2018.101	2018.923	0.822	73	-1.81	n/a
138	PA98	-95.82	29.803	2018.118	2018.923	0.806	82	-0.29	n/a
139	PA99	-95.579	29.986	2018.137	2018.94	0.803	75	-0.51	n/a
140	PWES	-95.511	30.199	2015.223	2019.108	3.885	1411	-3.64	-0.75
141	RDCT	-95.495	29.81	2013.563	2019.108	5.544	1775	-1.71	-0.72
142	ROD1	-95.527	30.072	2007.003	2019.099	12.096	4113	-15.01	-0.78
143	RPFB	-95.514	29.484	2014.773	2019.108	4.334	1574	0.12	-0.16
144	SESG	-95.43	29.987	2014.678	2019.108	4.43	1608	-3.49	-0.92

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145	SHSG	-95.43	30.054	2014.721	2019.108	4.386	1592	-3.57	-1.12
146	SISD	-96.174	29.762	2015.176	2019.108	3.932	1285	-1.21	-0.38
147	SPBH	-95.515	29.802	2013.303	2019.108	5.804	2106	-3.21	-0.75
148	TDAM	-94.817	29.314	2013.435	2019.108	5.673	1952	-1.43	-0.21
149	THSU	-95.34	29.714	2012.953	2019.108	6.155	2139	0.27	0.
150	TMCC	-95.395	29.702	2003.268	2018.995	15.726	3407	3.83	-0.36
151	TSFT	-95.48	29.806	2013.38	2019.108	5.728	2076	-3.79	-0.64
152	TXAC	-94.671	29.778	2011.124	2019.102	7.978	2851	-0.19	0.02
153	TXAG	-95.419	29.164	2005.58	2019.108	13.528	4883	-0.07	0.04
154	TXAV	-95.242	29.403	2017.147	2019.108	1.96	675	0.02	n/a
155	TXBC	-95.972	29.	2009.405	2019.108	9.703	3506	-2.46	-0.21
156	TXBH	-95.946	29.786	2017.15	2019.108	1.958	685	-0.55	n/a
157	TXBM	-94.18	30.162	1996.077	2013.804	17.728	5958	-6.54	n/a
158	TXCF	-96.572	29.704	2012.463	2015.964	3.502	1310	0.26	n/a
159	TXCM	-96.577	29.703	2010.437	2018.705	8.268	2976	-0.53	-0.19
160	TXCN	-95.441	30.349	2005.58	2019.091	13.511	4913	-15.45	-0.77
161	TXCV	-95.094	30.335	2012.665	2019.108	6.442	2085	-2.6	-0.53
162	TXED	-96.634	28.968	2009.429	2019.108	9.678	2629	-1.21	-0.09
163	TXEX	-95.119	29.564	2010.879	2018.992	8.112	2670	0.99	0.14
164	TXGA	-94.773	29.328	2005.58	2019.108	13.528	4839	-2.08	-0.18
165	TXGV	-94.789	29.285	2007.129	2011.548	4.419	1268	0.3	n/a
166	TXH2	-94.391	29.563	2016.09	2019.108	3.017	955	0.31	-0.16
167	TXHE	-96.063	30.099	2005.58	2019.108	13.528	4901	-7.22	-0.34
168	TXHS	-95.556	29.716	2012.463	2019.108	6.645	2256	-3.16	-0.7
169	TXHU	-95.433	29.779	1996.049	2007.962	11.912	3320	-5.4	n/a
170	TXKY	-95.829	29.822	2012.463	2017.24	4.778	1576	-4.74	-1.01
171	TXLG	-96.848	29.917	2010.877	2019.108	8.23	2920	-1.21	-0.12
172	TXLI	-94.771	30.056	2005.58	2019.108	13.528	4852	1.18	0.13
173	TXLM	-95.024	29.392	2005.58	2019.108	13.528	4910	-3.16	-0.16
174	TXLQ	-94.953	29.358	2013.065	2019.108	6.043	2160	-0.06	0.04
175	TXMG	-95.964	28.983	2013.309	2019.108	5.799	1738	-1.22	-0.21
176	TXNV	-96.067	30.382	2012.463	2019.108	6.645	2364	-2.47	-0.47
177	TXPV	-96.619	28.638	2010.292	2019.108	8.816	3185	1.34	0.06
178	TXRO	-95.807	29.519	2005.58	2011.439	5.859	2124	-3.73	n/a
179	TXRS	-95.805	29.519	2011.447	2019.108	7.661	2881	-1.44	-0.28
180	TXTG	-95.297	29.898	2015.466	2019.108	3.641	1288	-1.06	-0.4
181	TXVA	-96.91	28.835	2005.092	2019.094	14.001	5032	-0.95	-0.01
182	TXVC	-96.958	28.834	2015.31	2019.108	3.797	1355	-0.17	0.01
183	TXWH	-96.112	29.325	2010.426	2019.108	8.682	3106	-2.42	-0.49
184	TXWI	-94.371	29.806	2015.483	2019.108	3.625	1297	-0.98	-0.45
185	TXWN	-96.092	29.329	2015.003	2019.108	4.104	1453	0.13	-0.15
186	UH01	-95.345	29.722	2012.745	2019.108	6.363	2229	0.59	-0.17
187	UH02	-95.457	30.315	2015.003	2019.108	4.104	1422	-1.77	-0.59
188	UHC0	-95.044	29.39	2014.138	2018.943	4.805	1680	-2.14	-0.53
189	UHC1	-95.044	29.39	2014.166	2018.943	4.778	1684	-1.71	-0.33
190	UHC2	-95.044	29.39	2014.138	2018.943	4.805	1682	-1.47	-0.33
191	UHC3	-95.044	29.39	2014.138	2018.943	4.805	1685	-1.99	-0.48
192	UHCL	-95.104	29.578	2014.242	2019.108	4.865	1598	0.58	0.07

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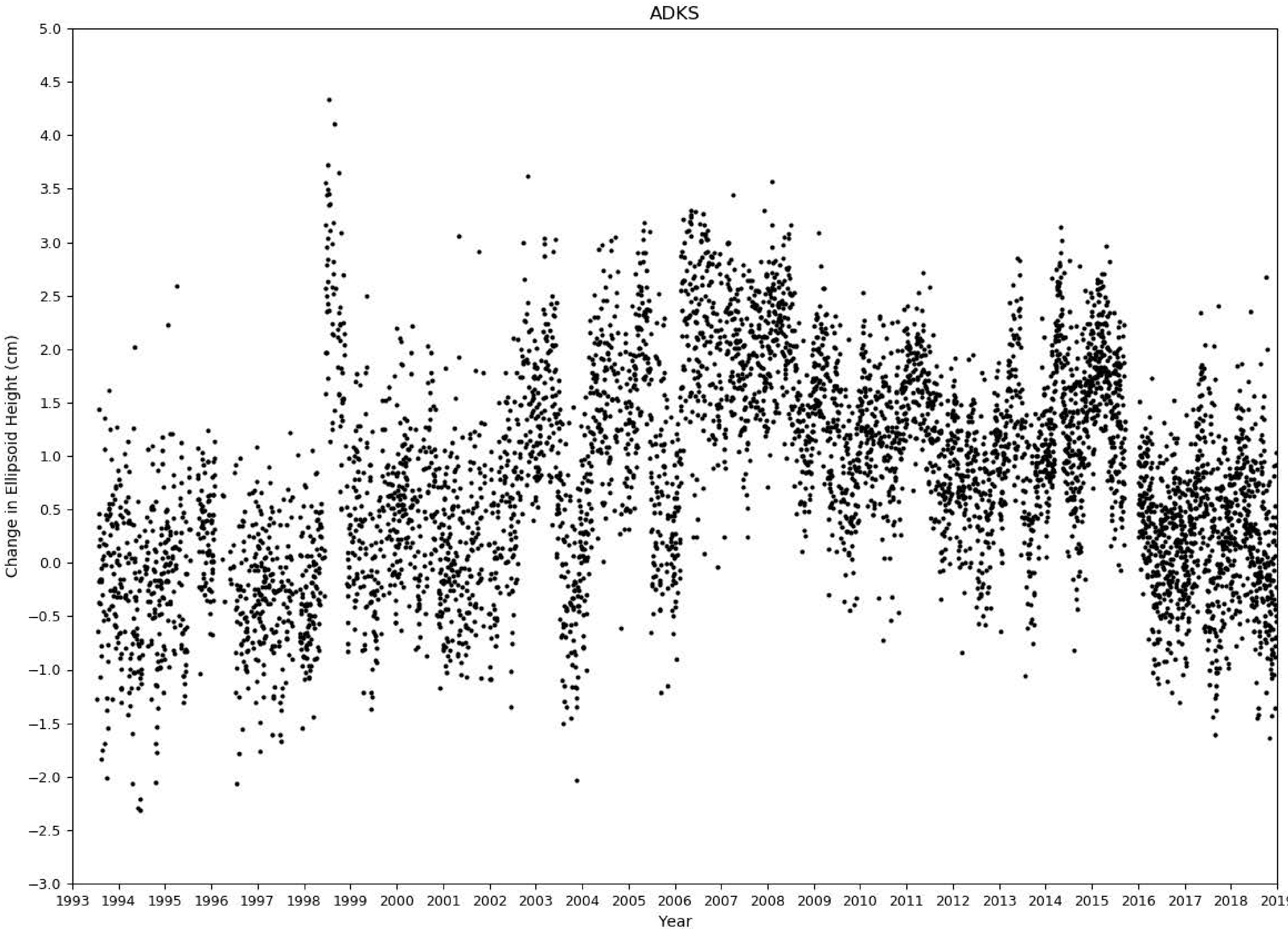
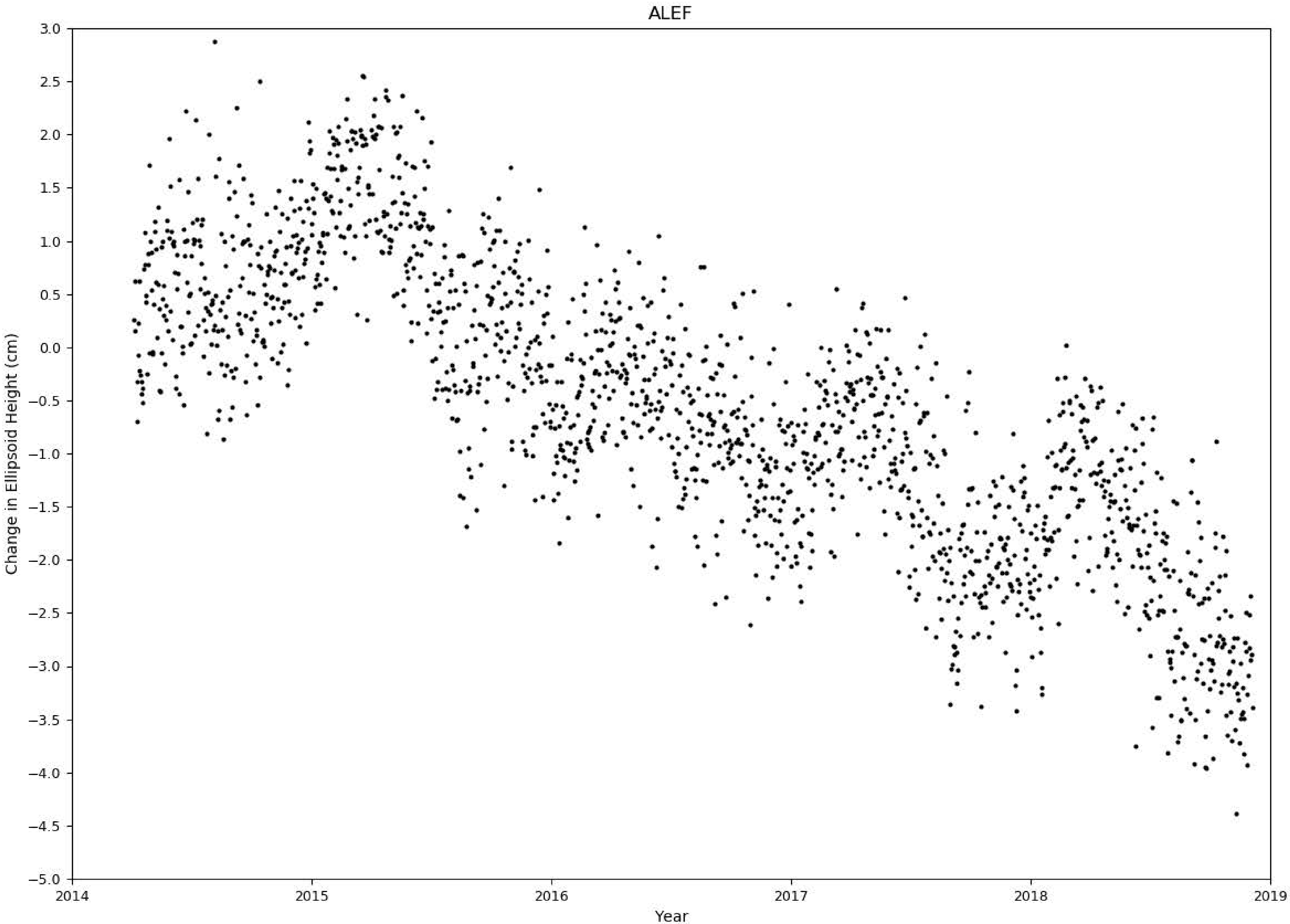
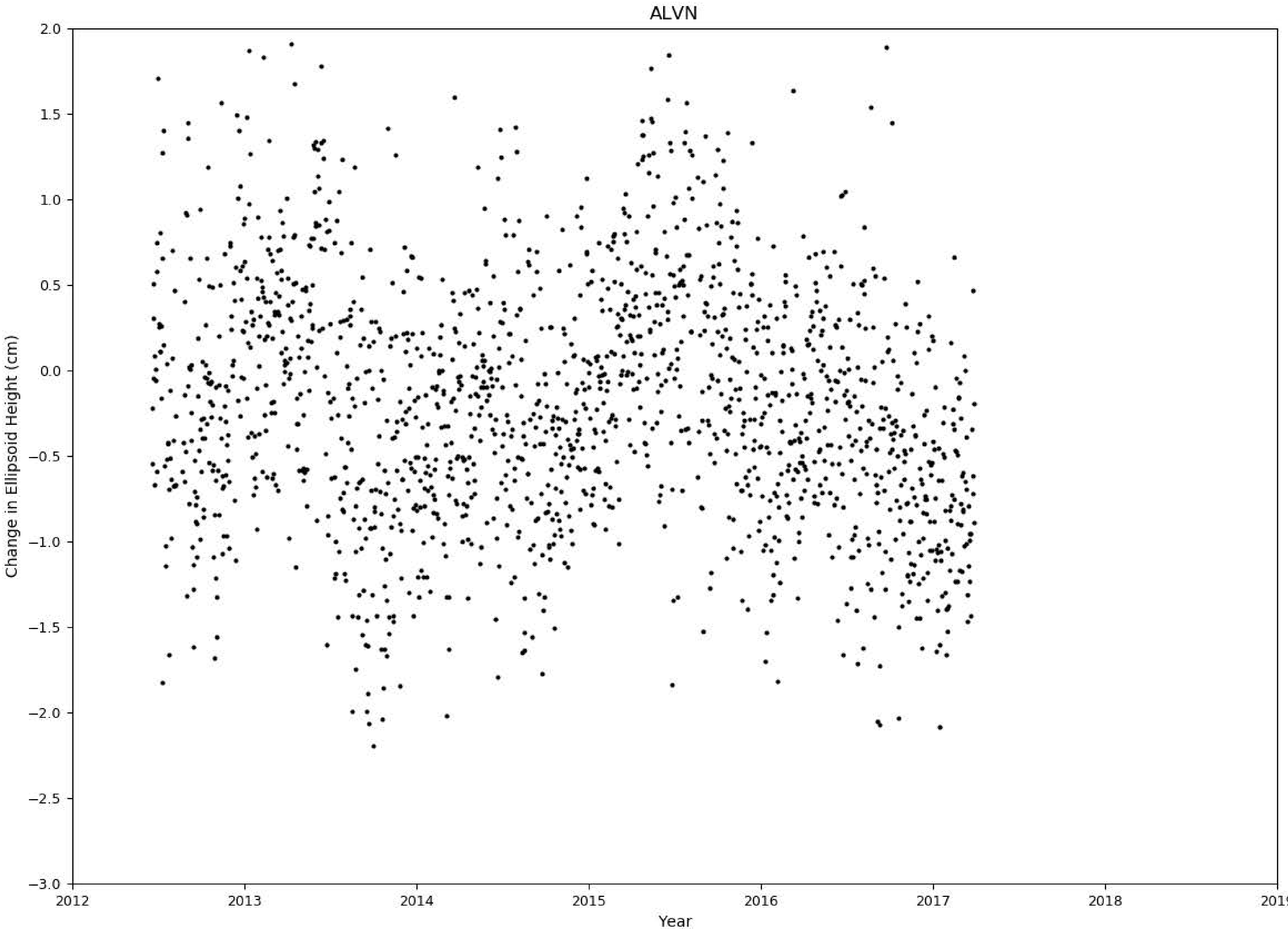
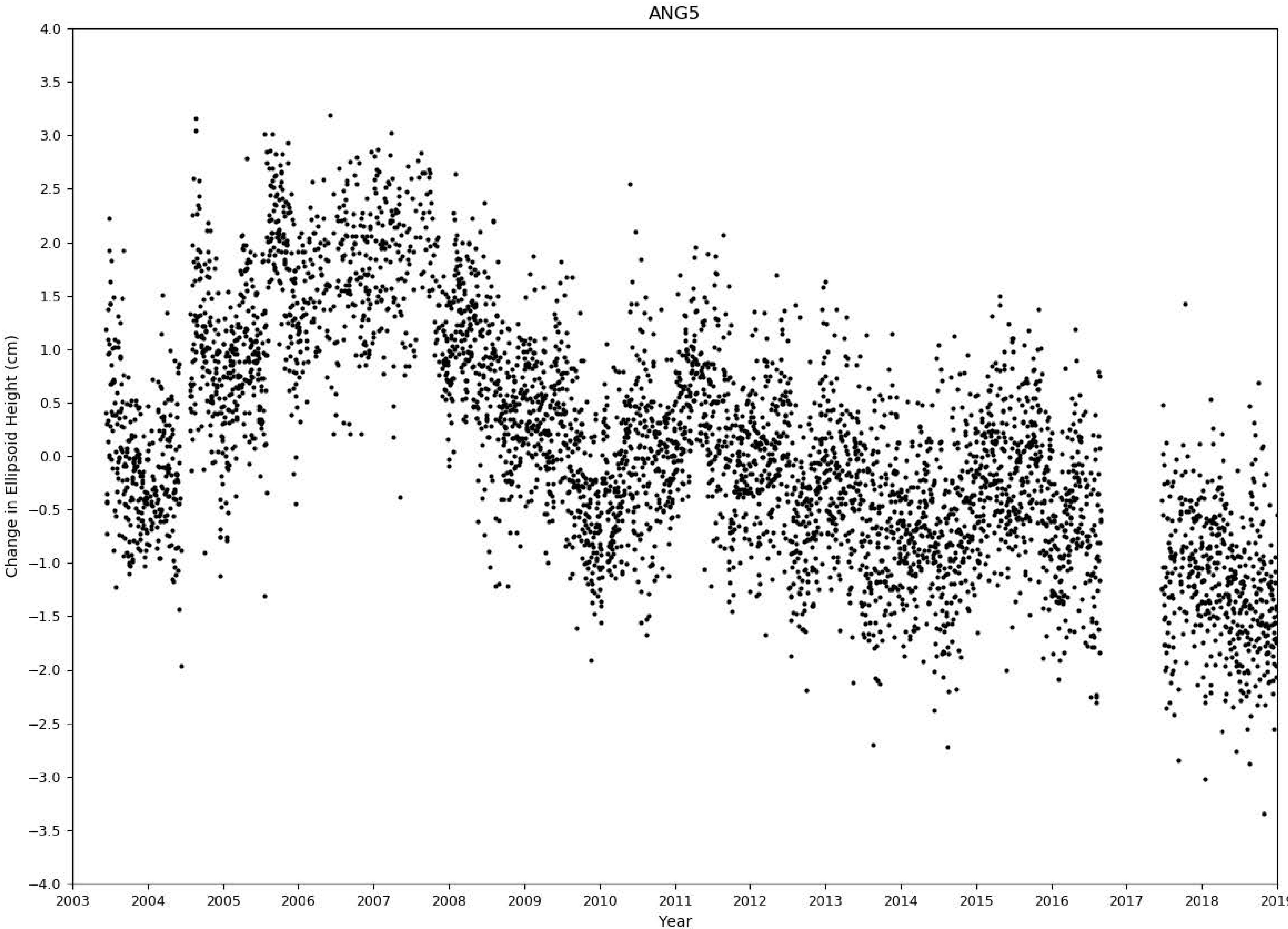
193	UHCR	-95.757	29.728	2014.125	2019.108	4.983	1699	-3.49	-0.89
194	UHDT	-95.359	29.766	2013.563	2019.108	5.544	2013	-0.5	-0.22
195	UHEB	-96.066	29.526	2014.595	2019.108	4.512	1637	-0.35	-0.2
196	UHEP	-95.327	29.719	2014.365	2019.108	4.742	1702	0.09	-0.15
197	UHF1	-95.483	30.236	2014.39	2019.108	4.717	1680	-3.36	-0.54
198	UHJF	-95.483	30.236	2014.39	2019.108	4.717	1452	-2.53	-0.34
199	UHL1	-94.978	30.058	2014.357	2019.108	4.75	1610	3.22	0.26
200	UHRI	-95.403	29.719	2014.33	2019.108	4.778	1722	-0.94	-0.29
201	UHSL	-95.652	29.575	2014.188	2019.091	4.903	1661	-0.68	-0.3
202	UHWL	-94.978	30.058	2014.357	2019.108	4.75	1726	0.1	-0.08
203	UTEX	-95.568	29.786	2012.496	2019.108	6.612	2405	-3.95	-0.95
204	WCHT	-95.581	29.783	2013.295	2019.108	5.812	2002	-6.85	-1.25
205	WDVW	-95.533	29.79	2013.32	2019.108	5.788	2034	-3.54	-0.77
206	WEPD	-95.229	29.688	2014.078	2019.108	5.03	1825	1.29	0.27
207	WHCR	-95.505	30.194	2014.779	2019.108	4.329	1568	-1.16	-0.5
208	WLA1	-95.625	30.096	2009.358	2009.558	0.2	68	-0.01	n/a
209	ZHU1	-95.331	29.962	2003.042	2019.108	16.066	5544	-11.09	-0.64

n/a: rate of change in ellipsoid height not calculated


ADKS
Change in Ellipsoid Height (cm)
Year
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


ALEF
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


ALVN
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2012
2013
2014
2015
2016
2017
2018
2019
Year


ANG5
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2003
2004
2005
2006
2007
2008
2009
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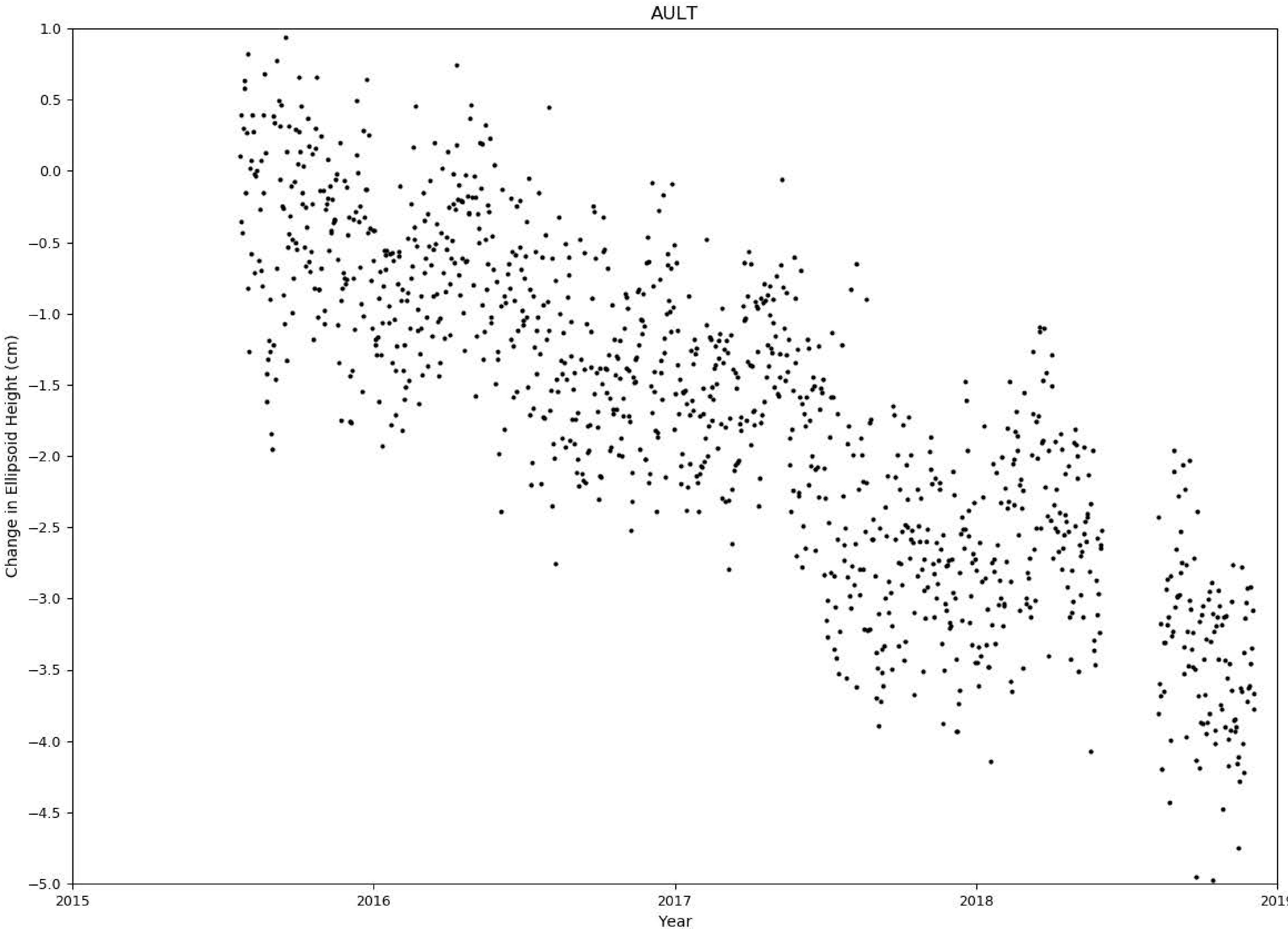
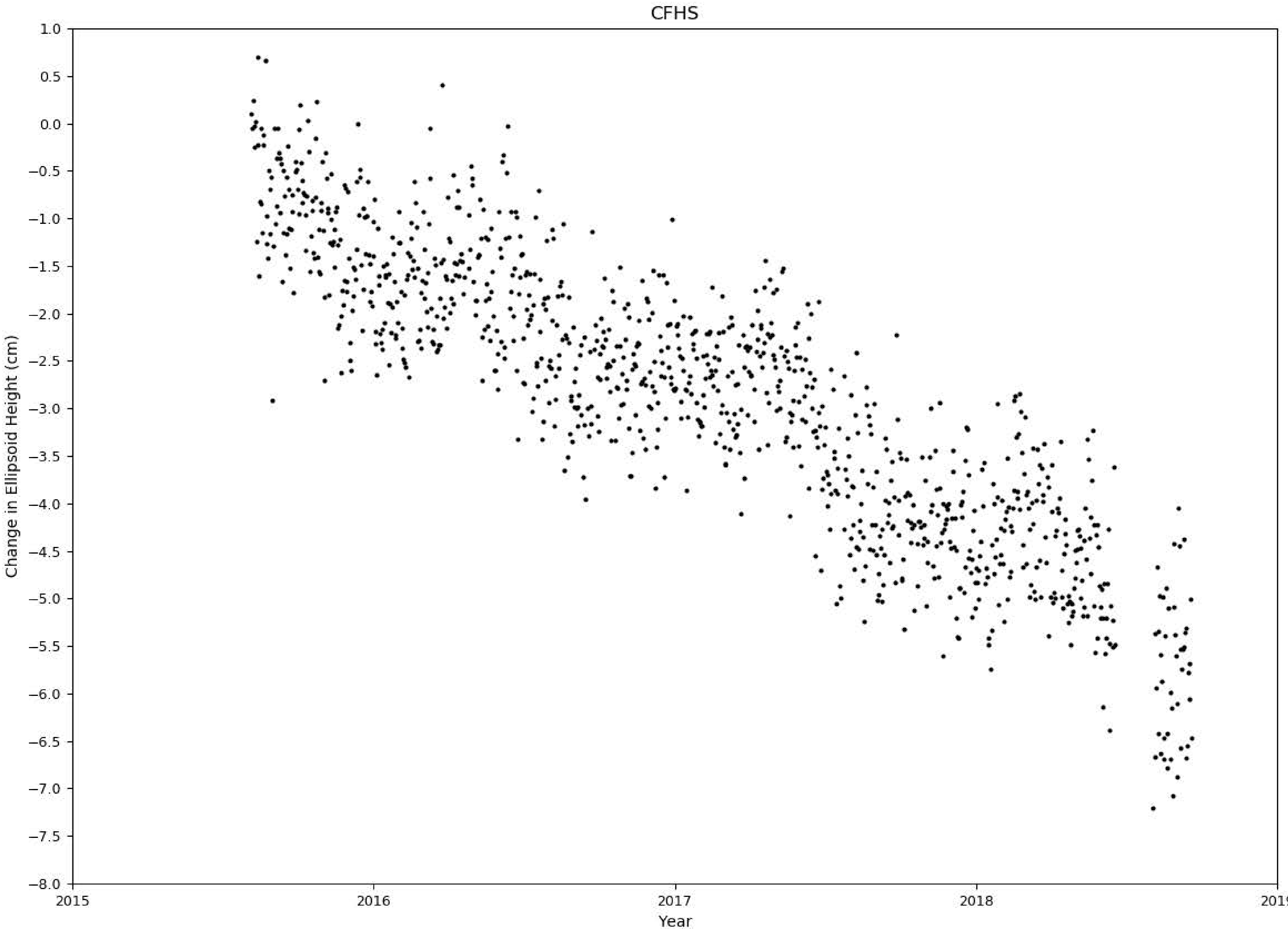
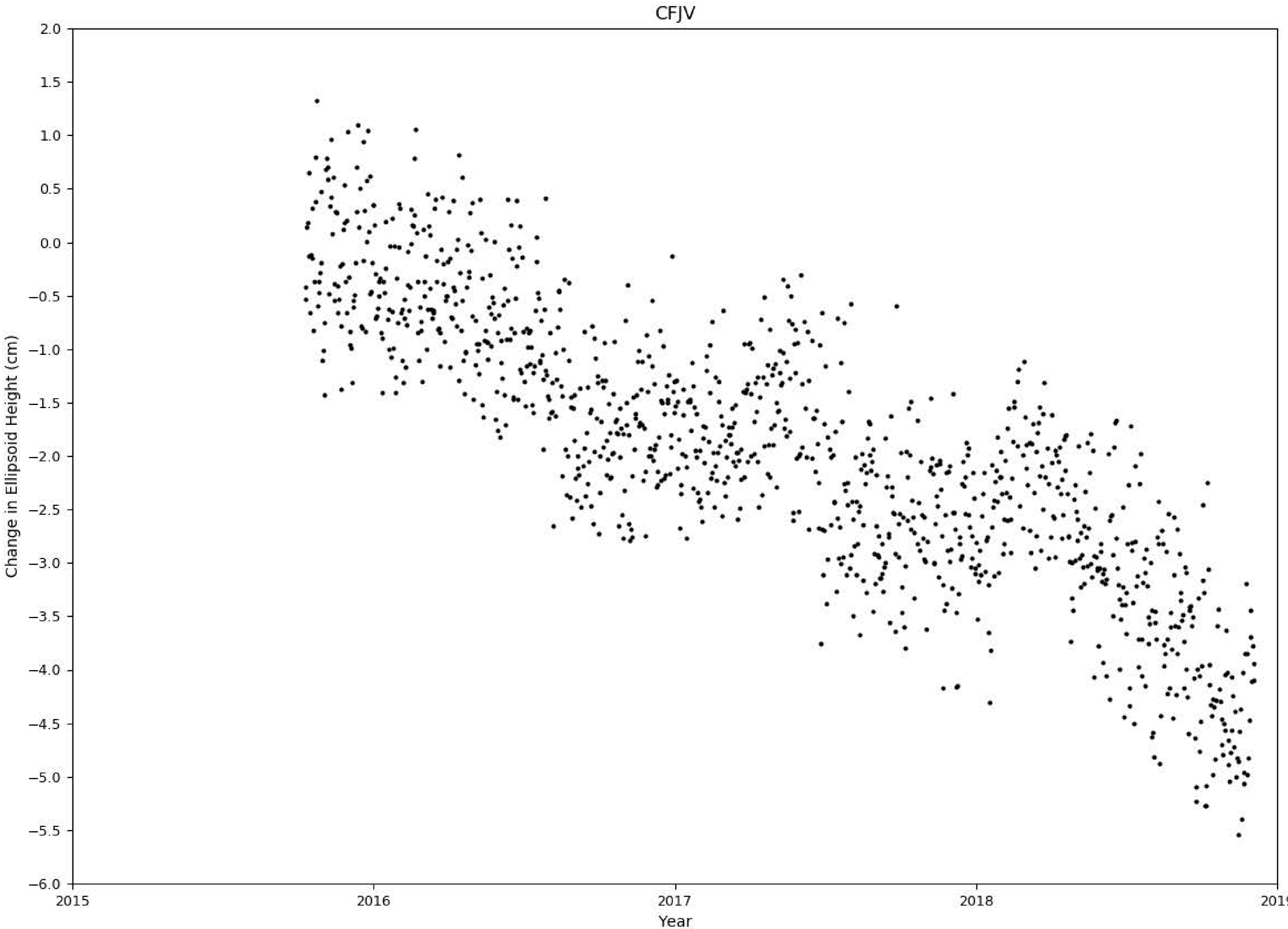
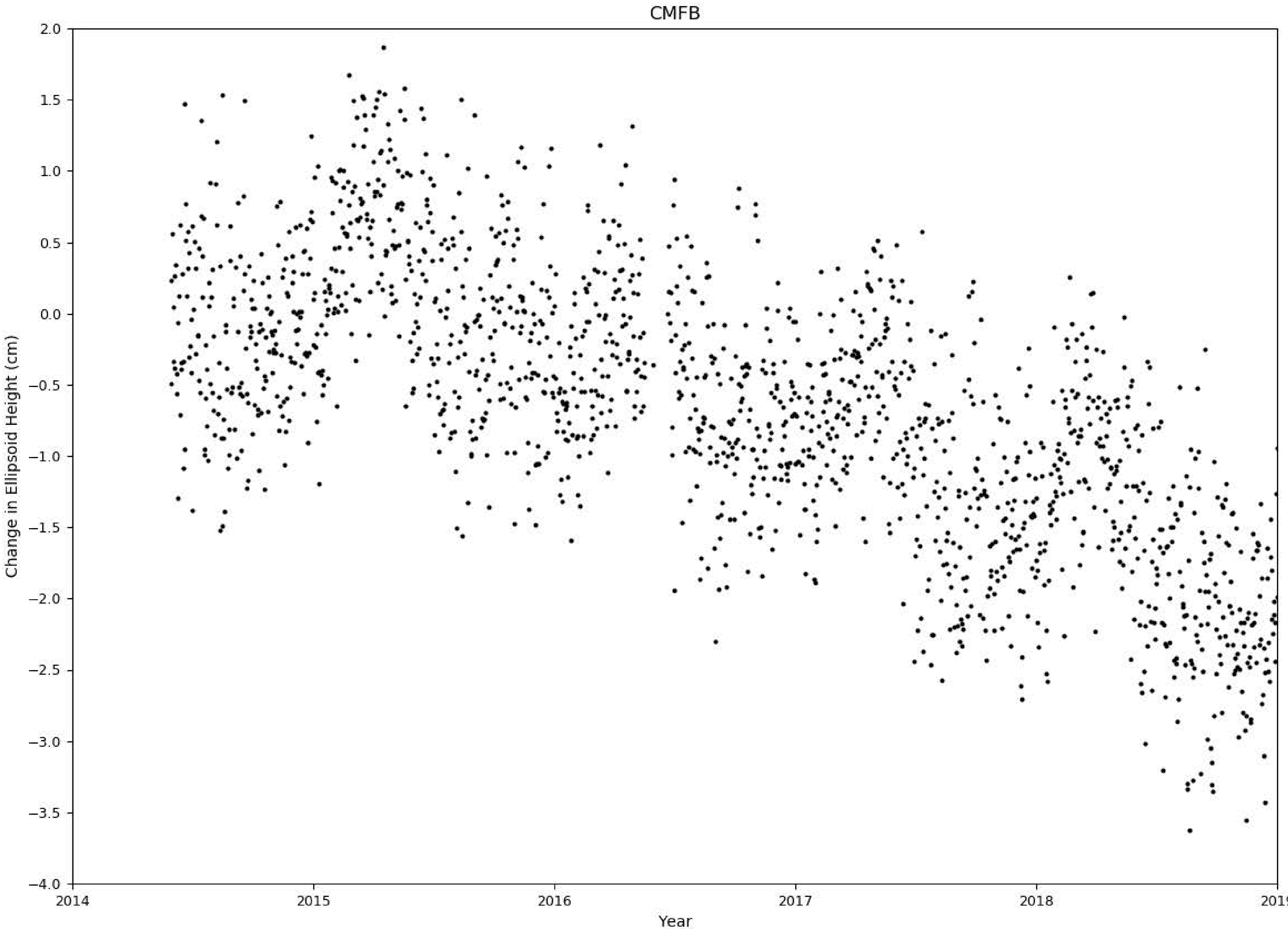
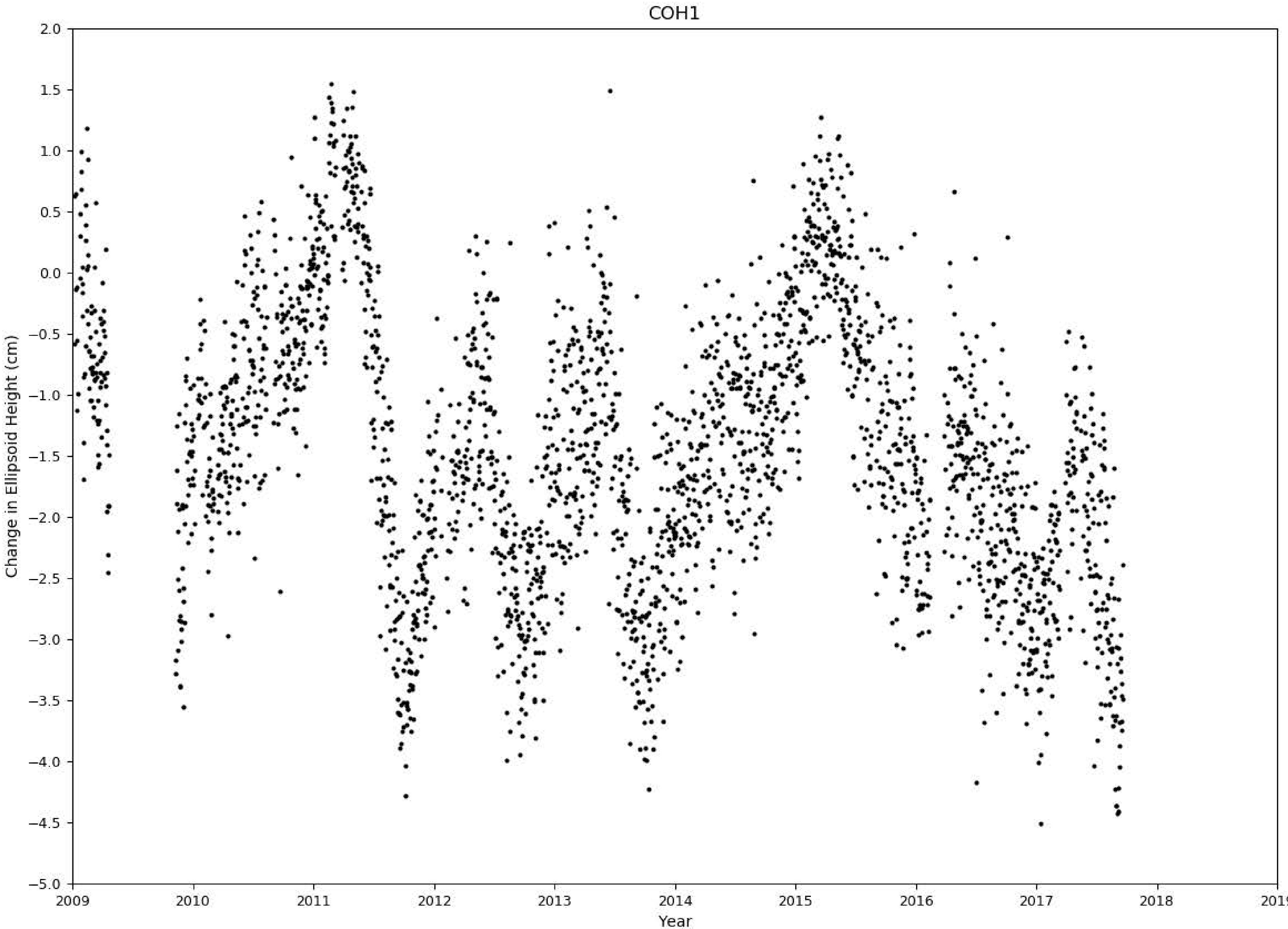
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

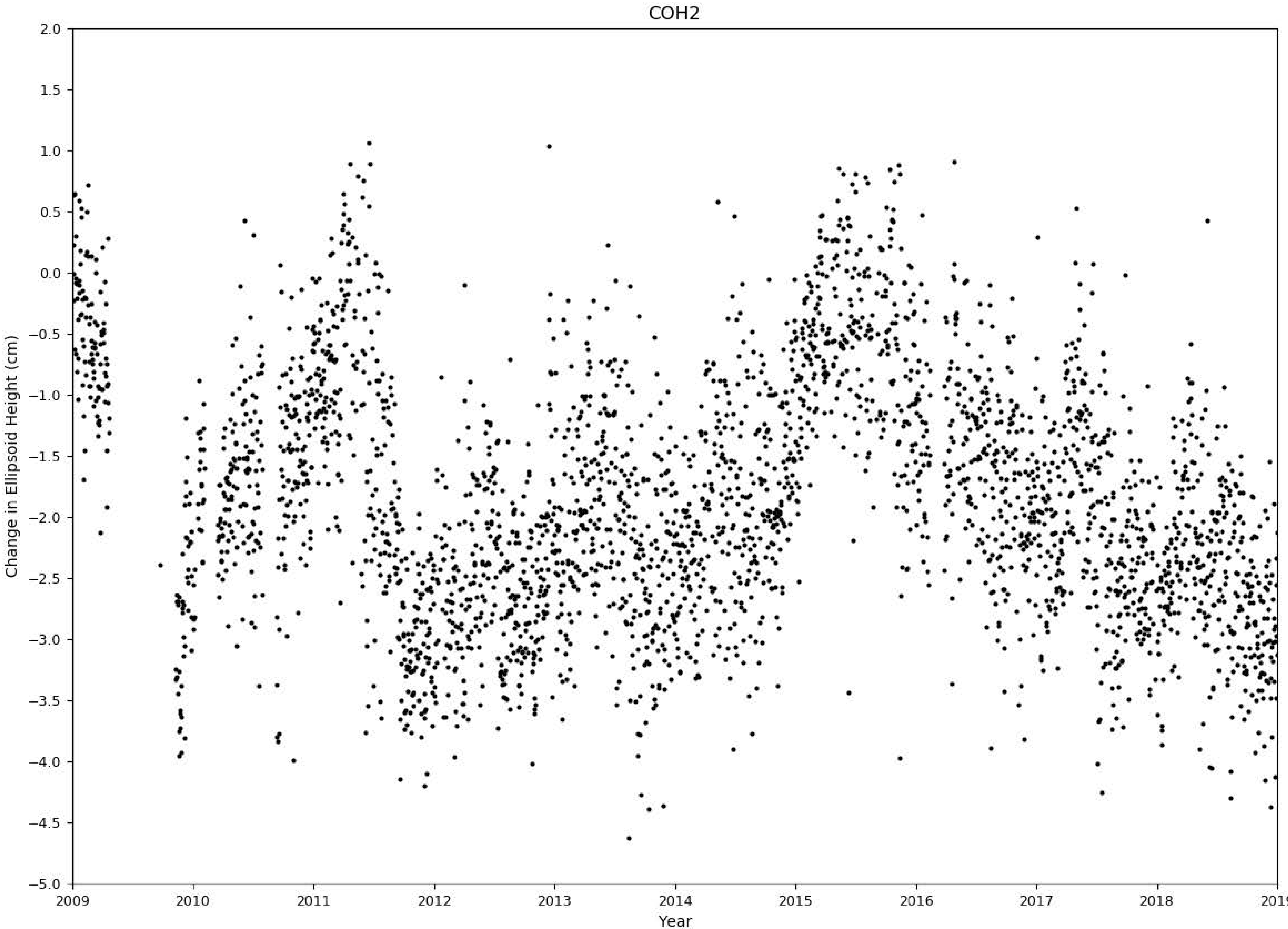

AULT
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2015
2016
2017
2018
2019
Year

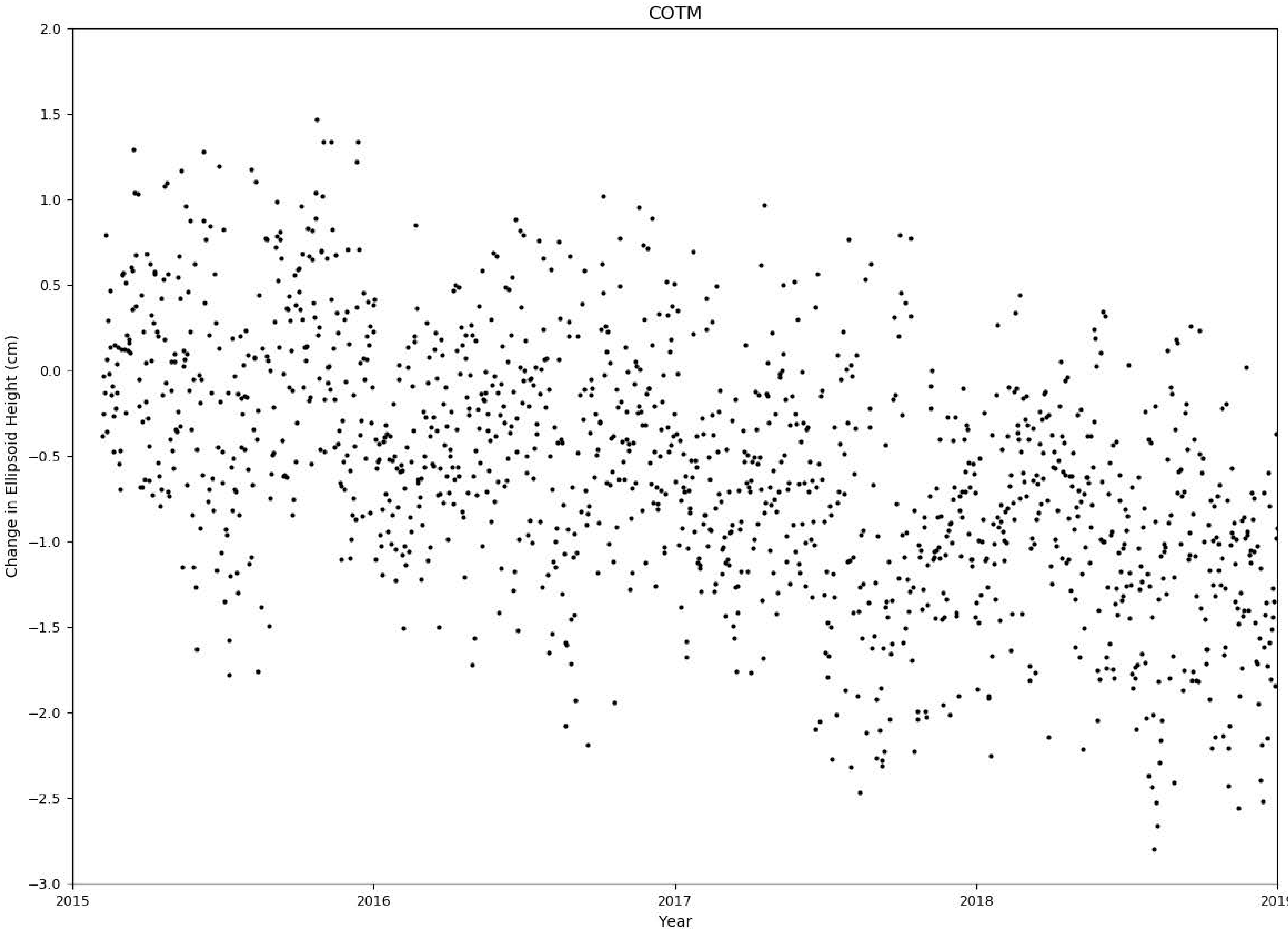

CFHS
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2015
2016
2017
2018
2019
Year

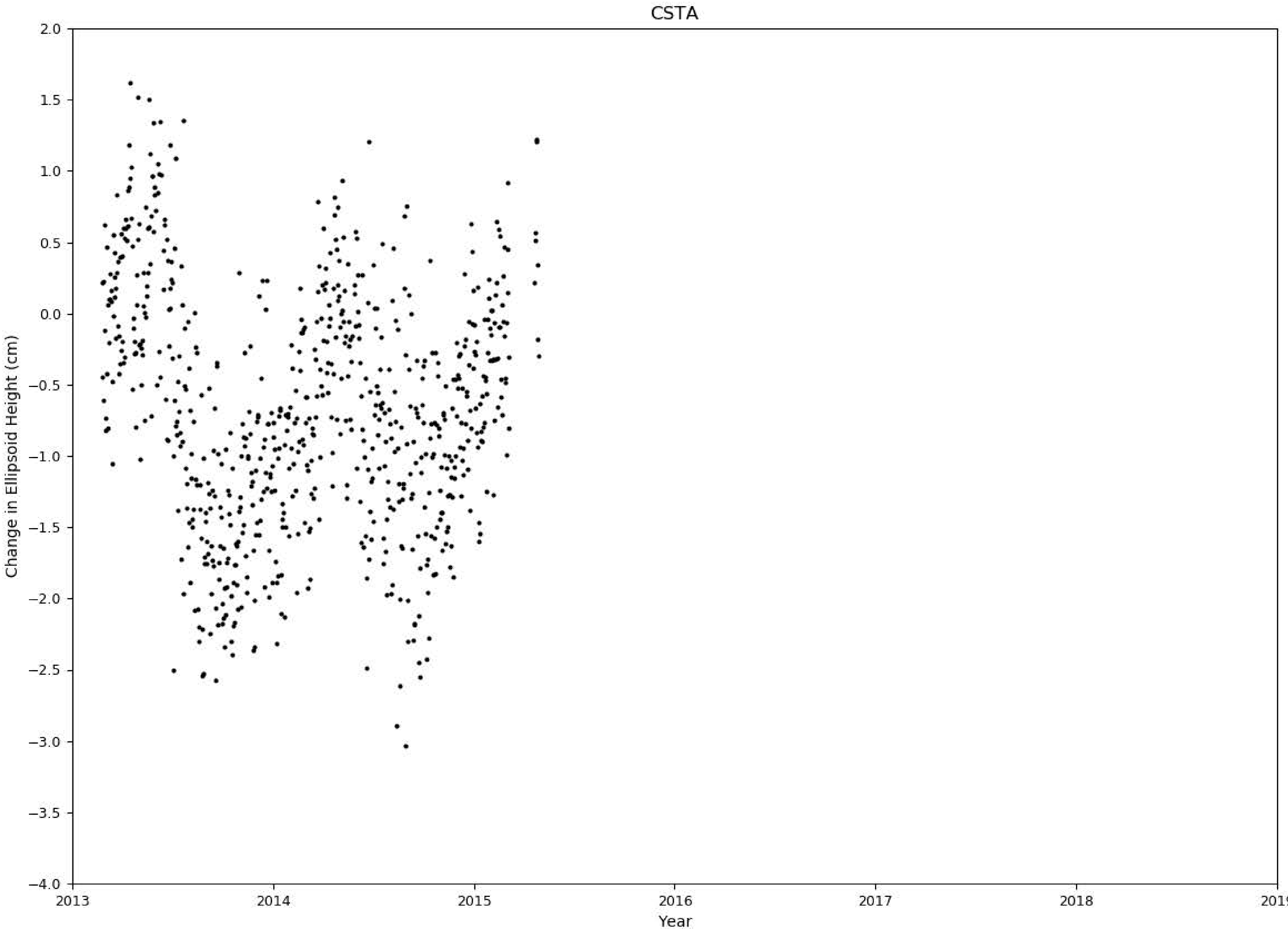

CFJV
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2015
2016
2017
2018
2019

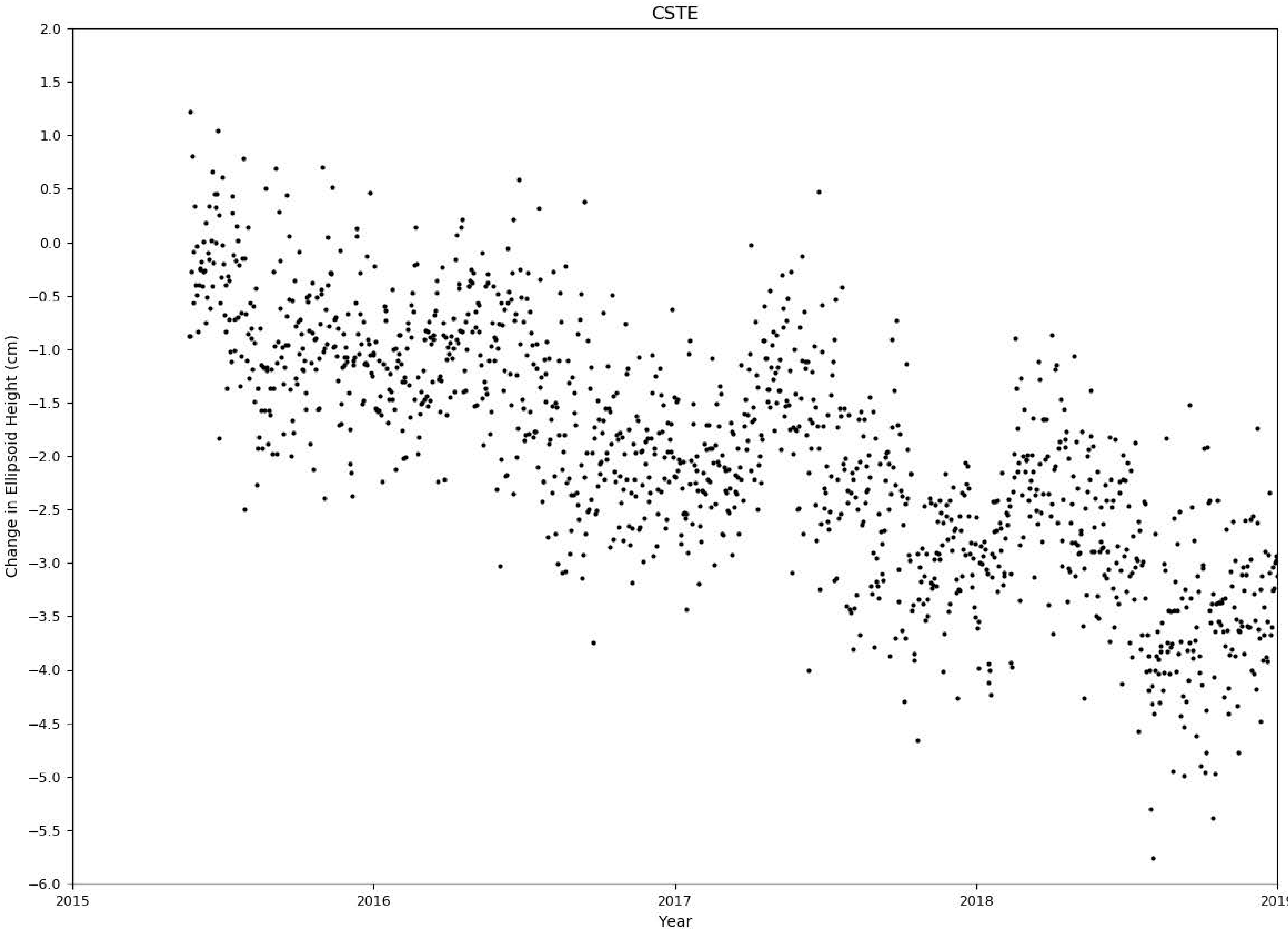

CMFB
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year

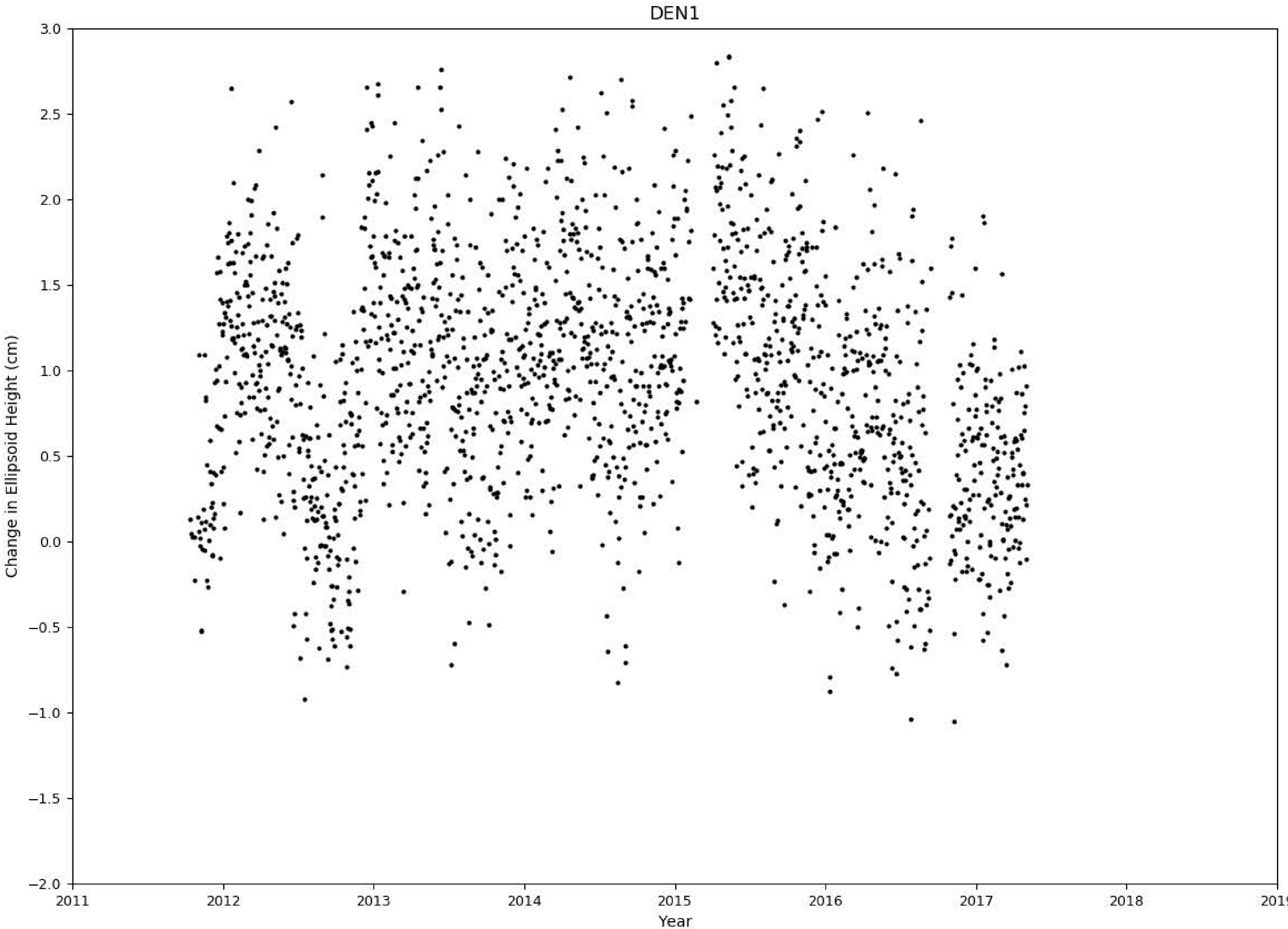

COH1
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

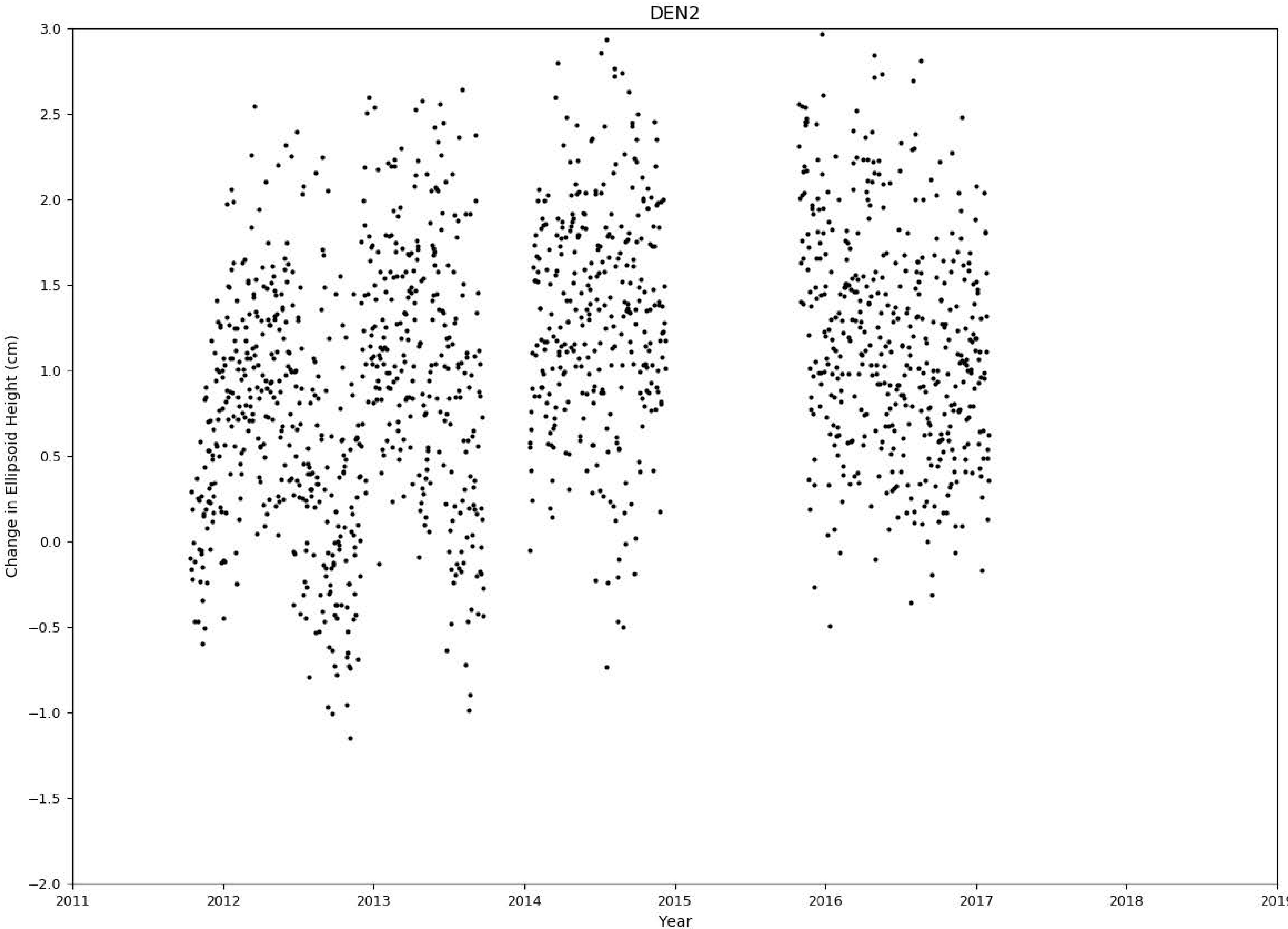

COH2
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

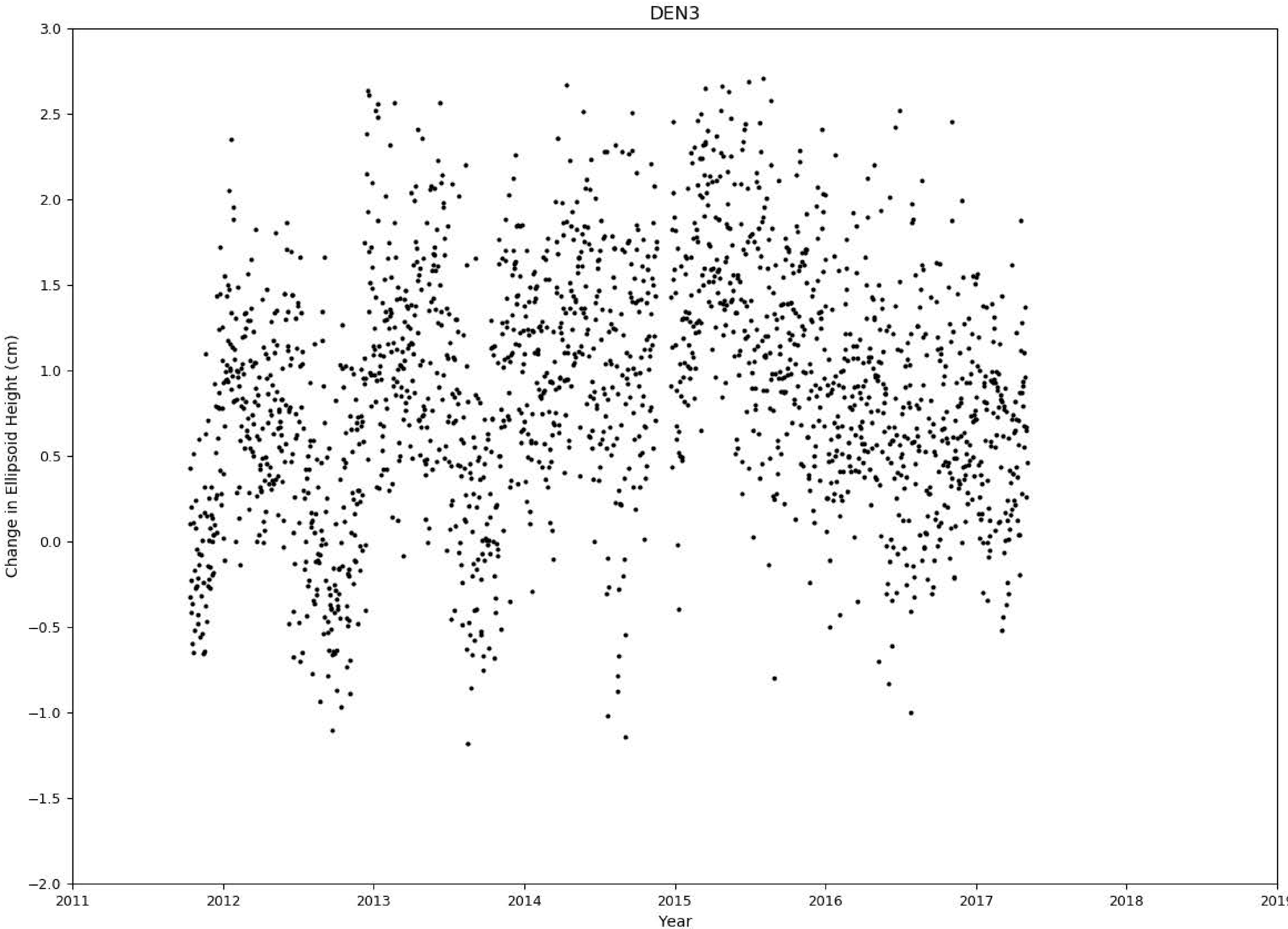

COTM
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year

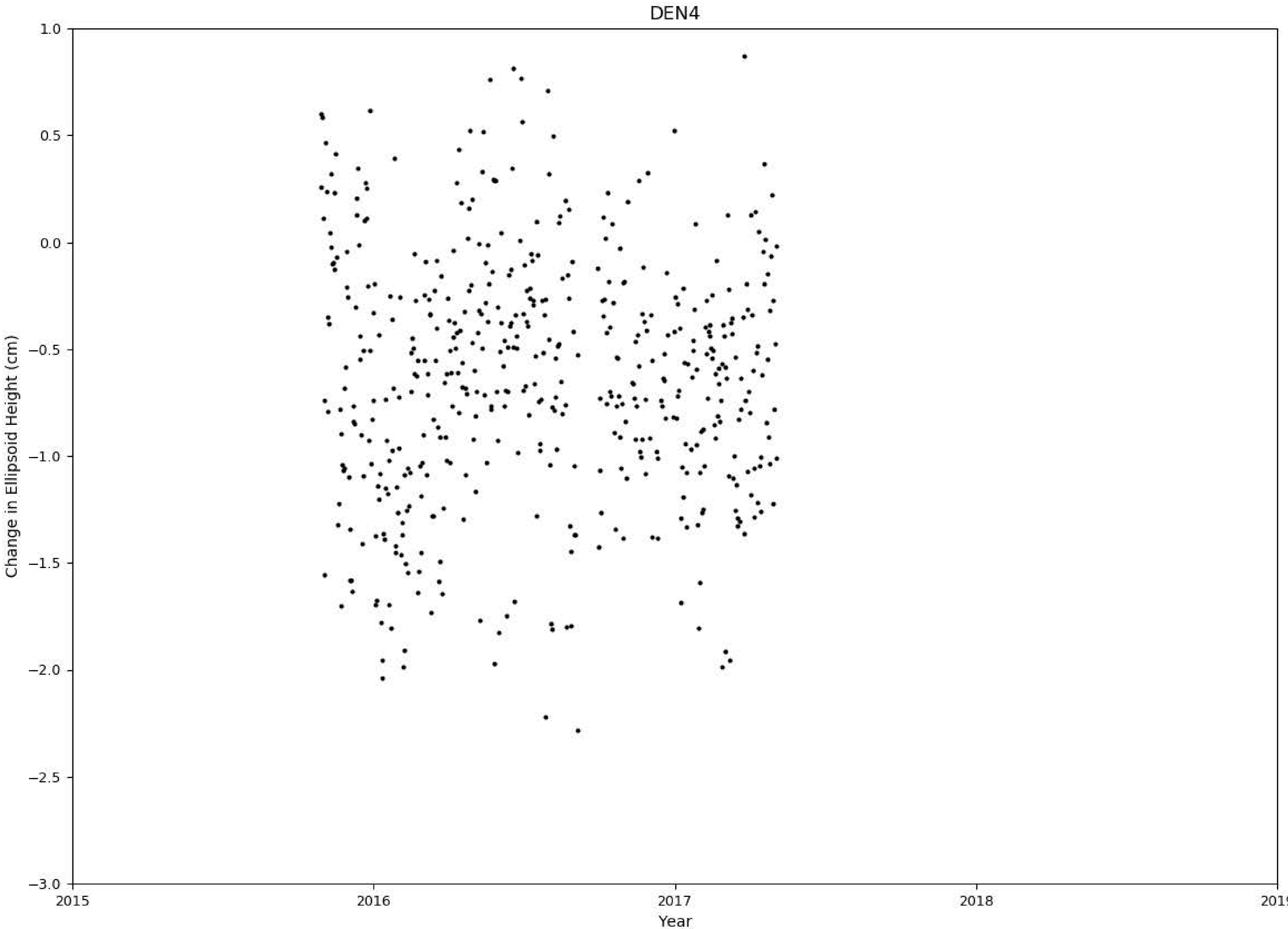

CSTA
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year

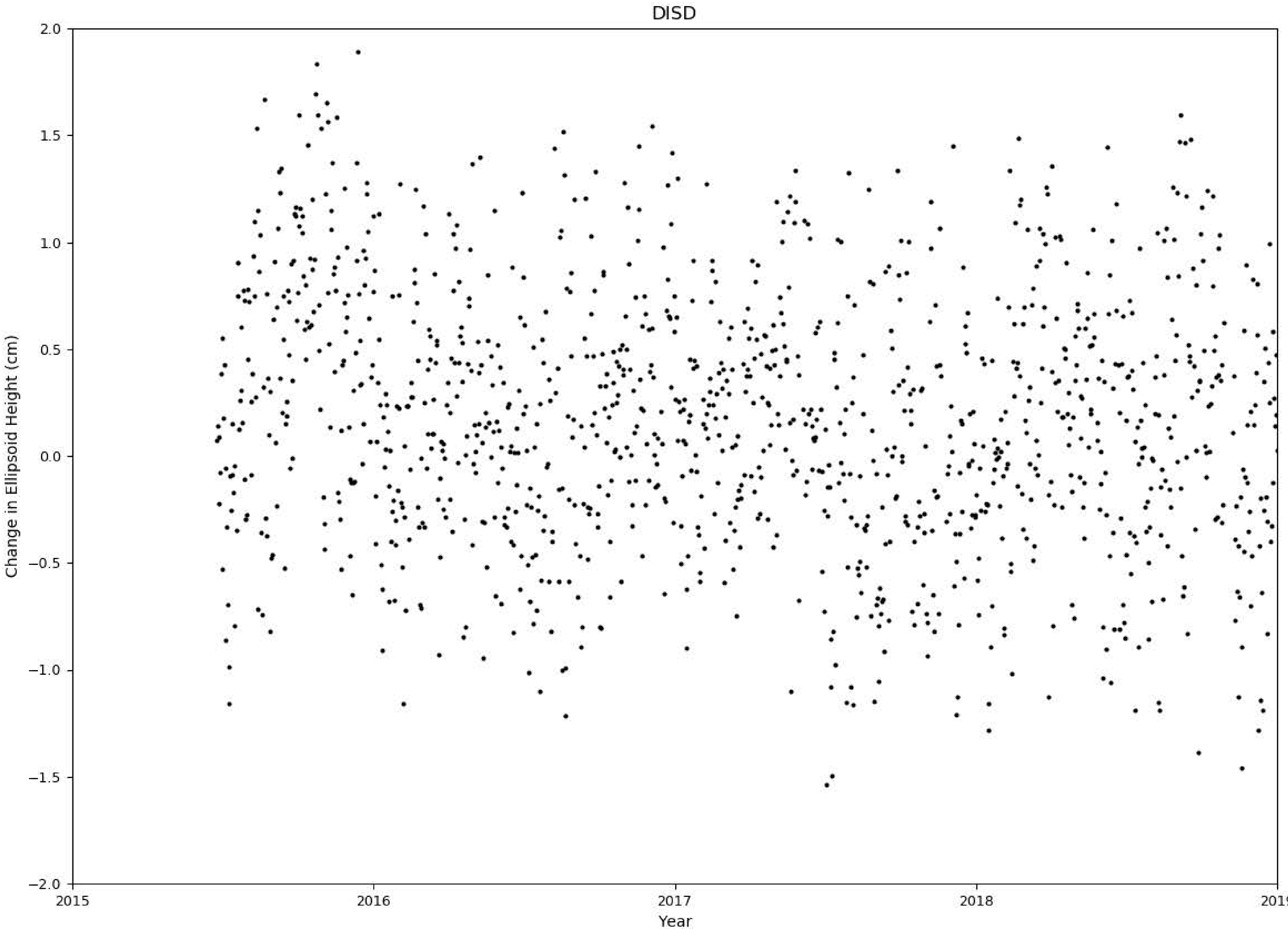

CSTE
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year

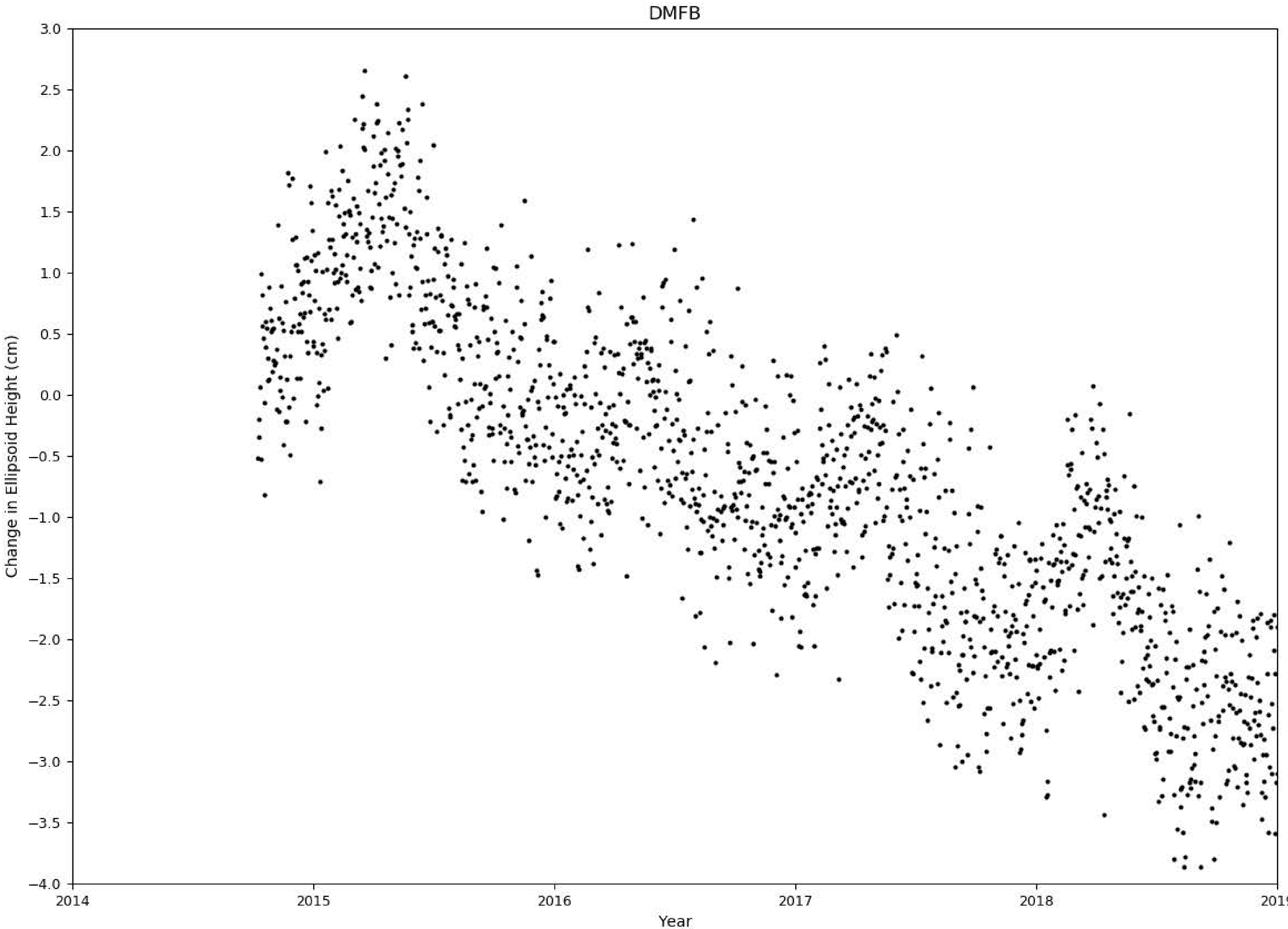

DEN1
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

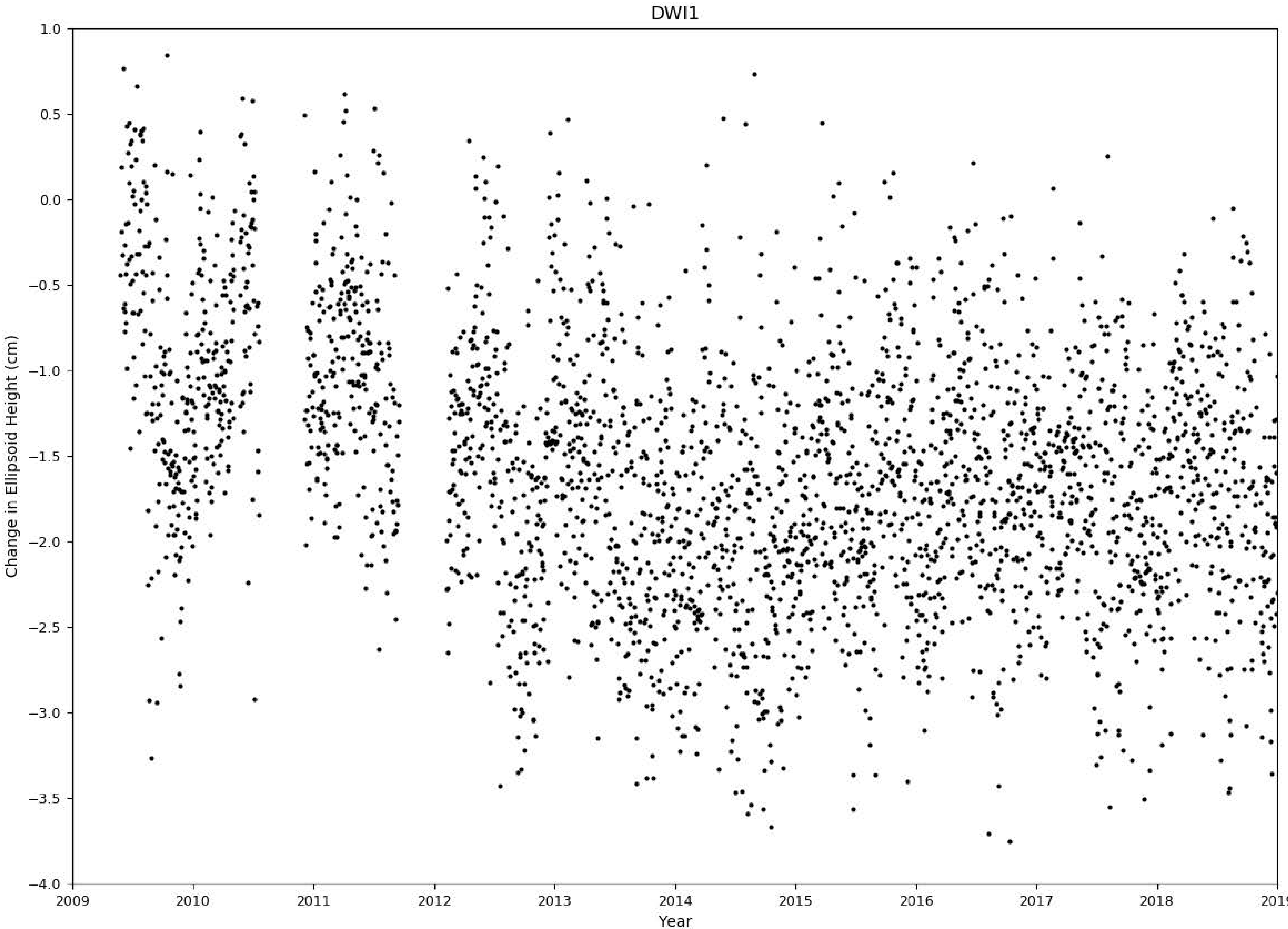

DEN2
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


DEN3
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


DEN4
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


DISD
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


DMFB
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


DWI1
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2009
2010
2011
2012
2013
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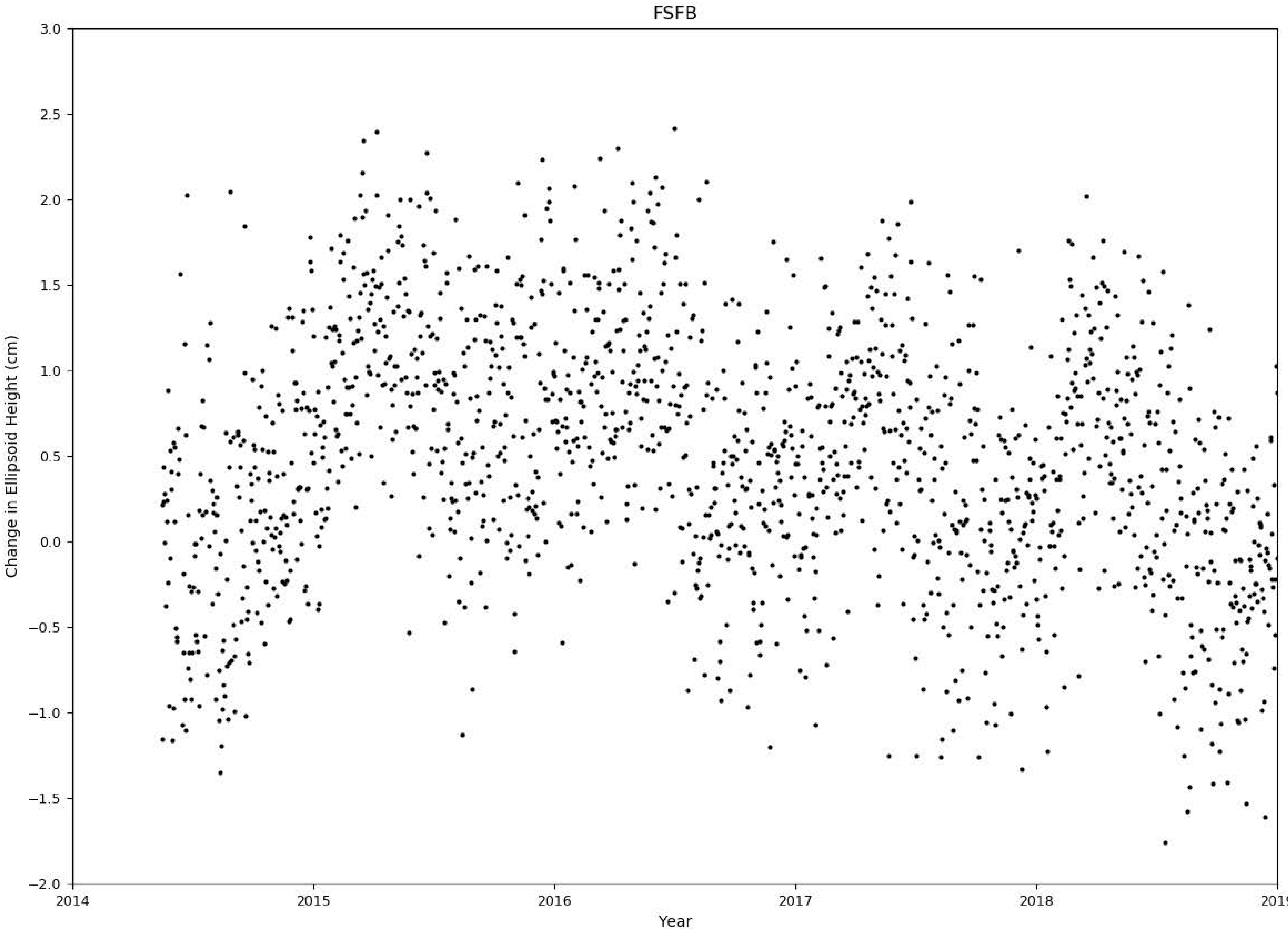
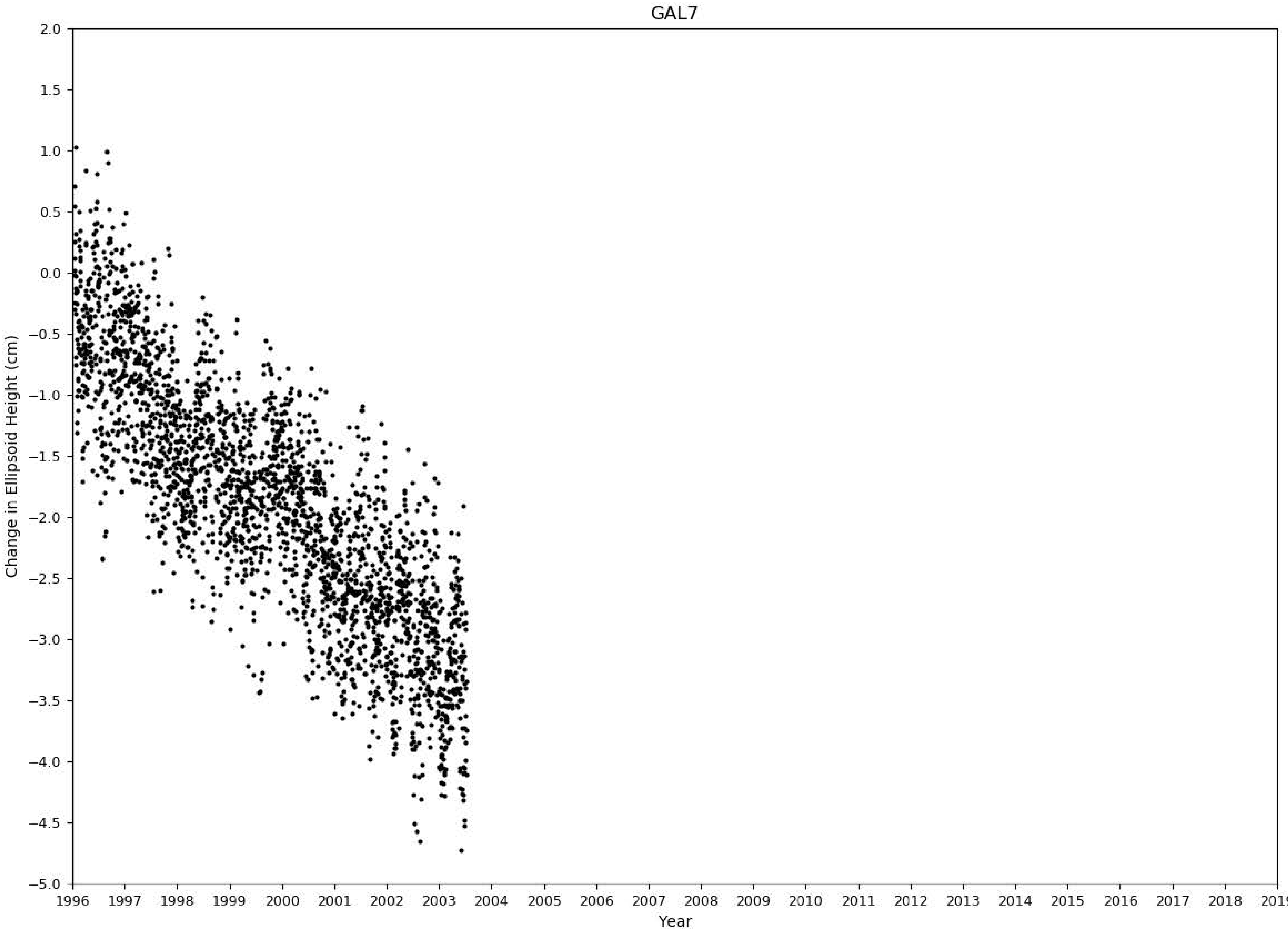
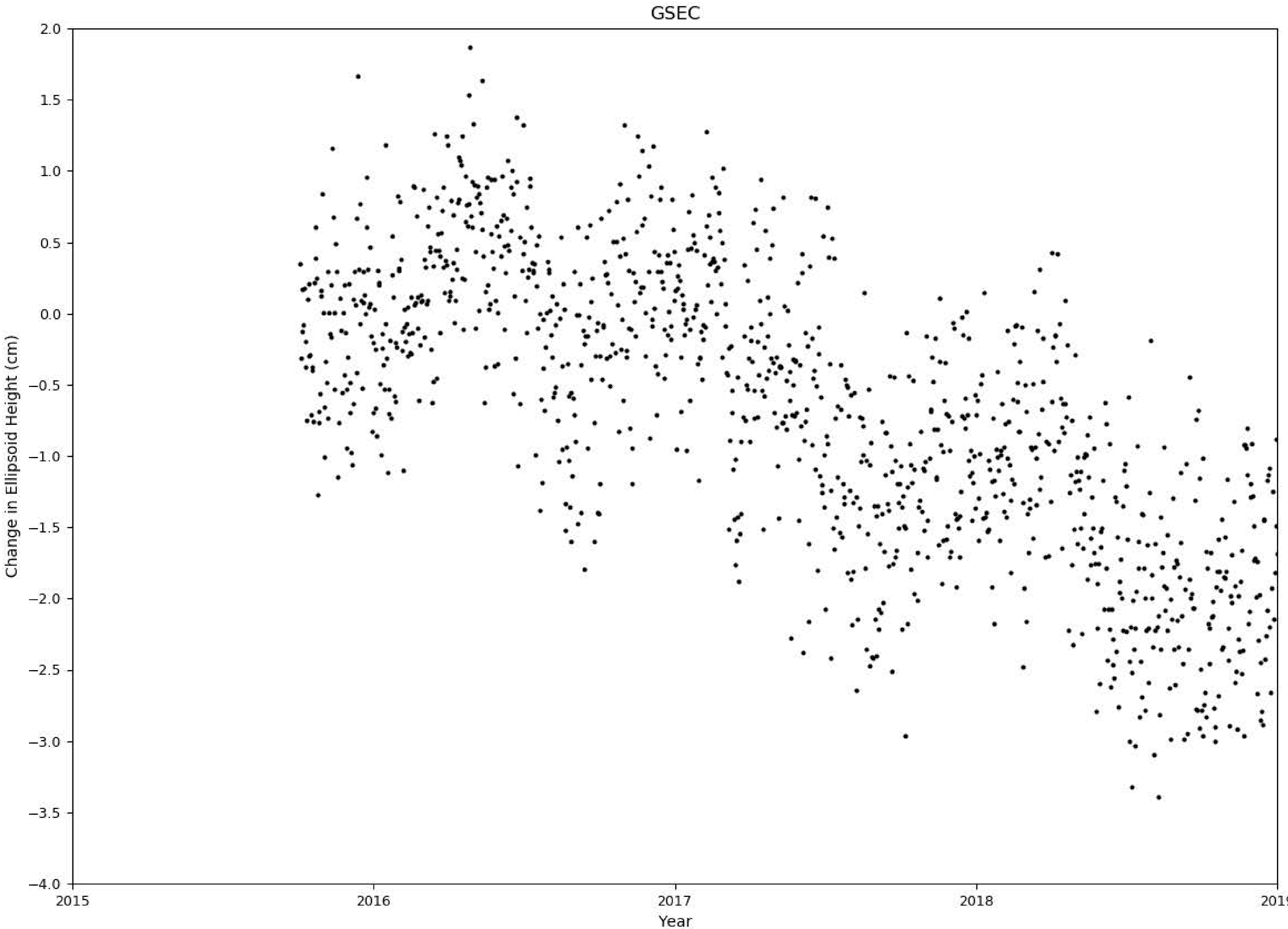
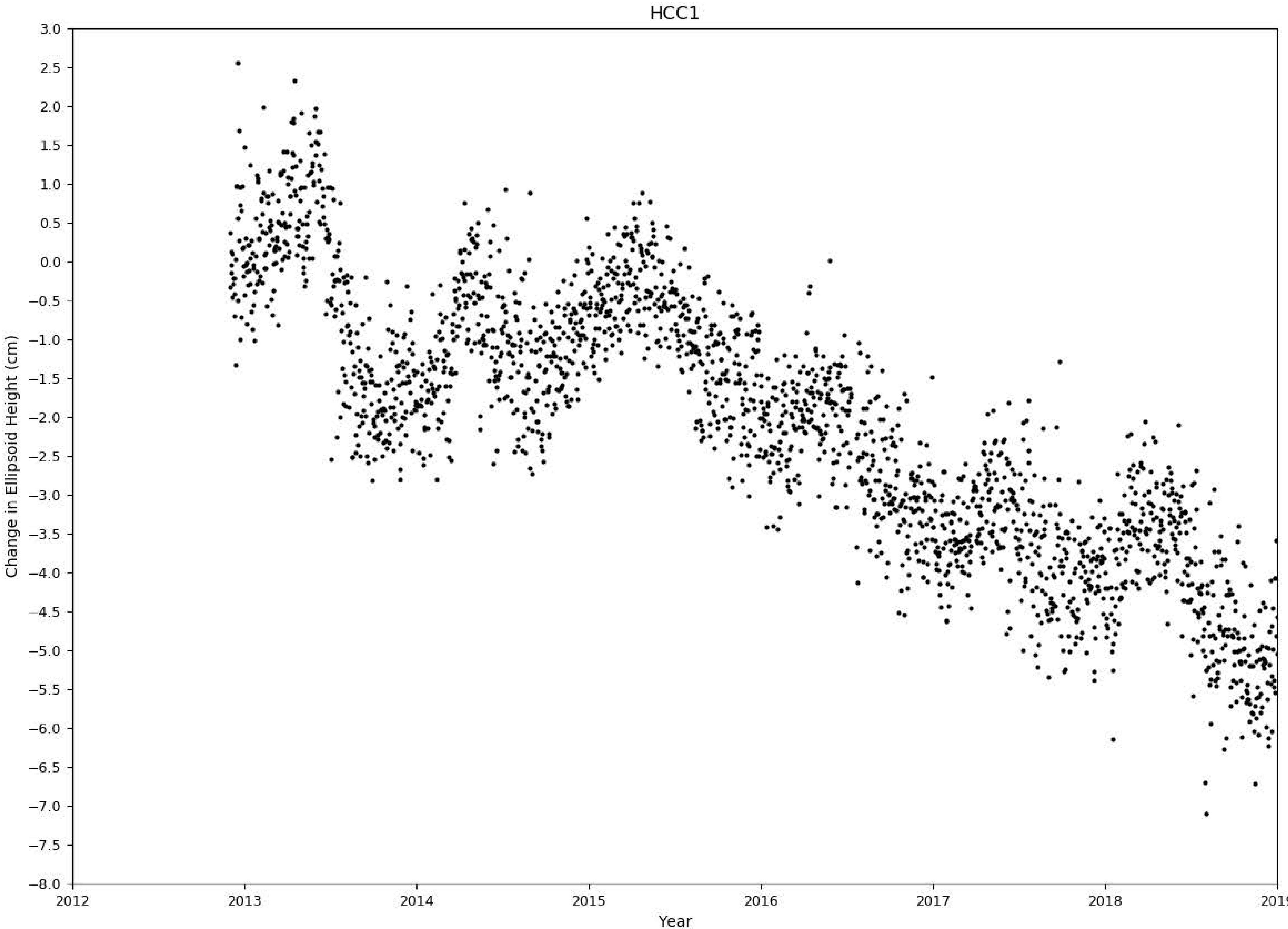
2015
2016
2017
2018
2019
Year


FSFB
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2014
2015
2016
2017
2018
2019
Year


GAL7
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year


GSEC
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2015
2016
2017
2018
2019
Year


HCC1
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
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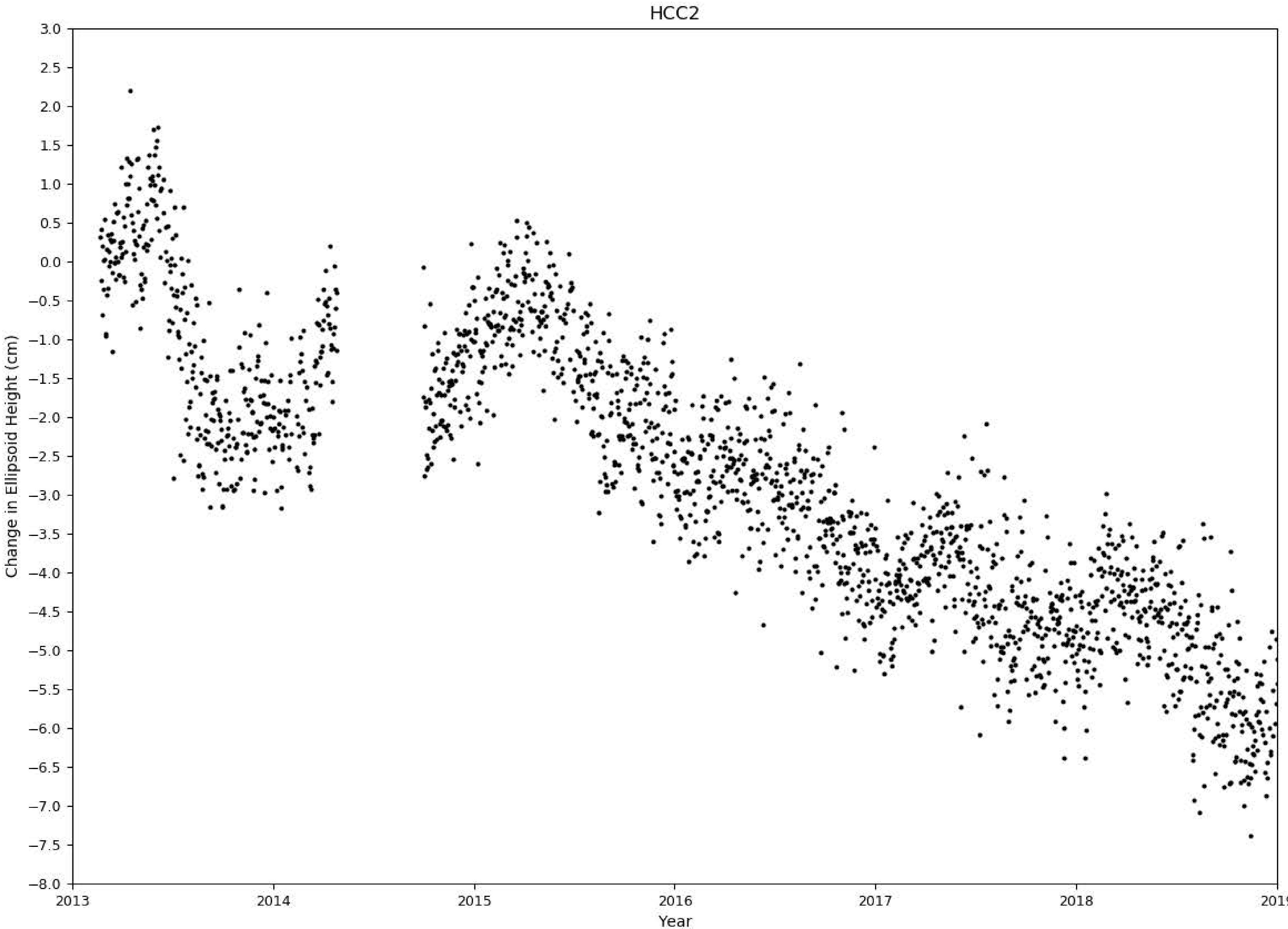
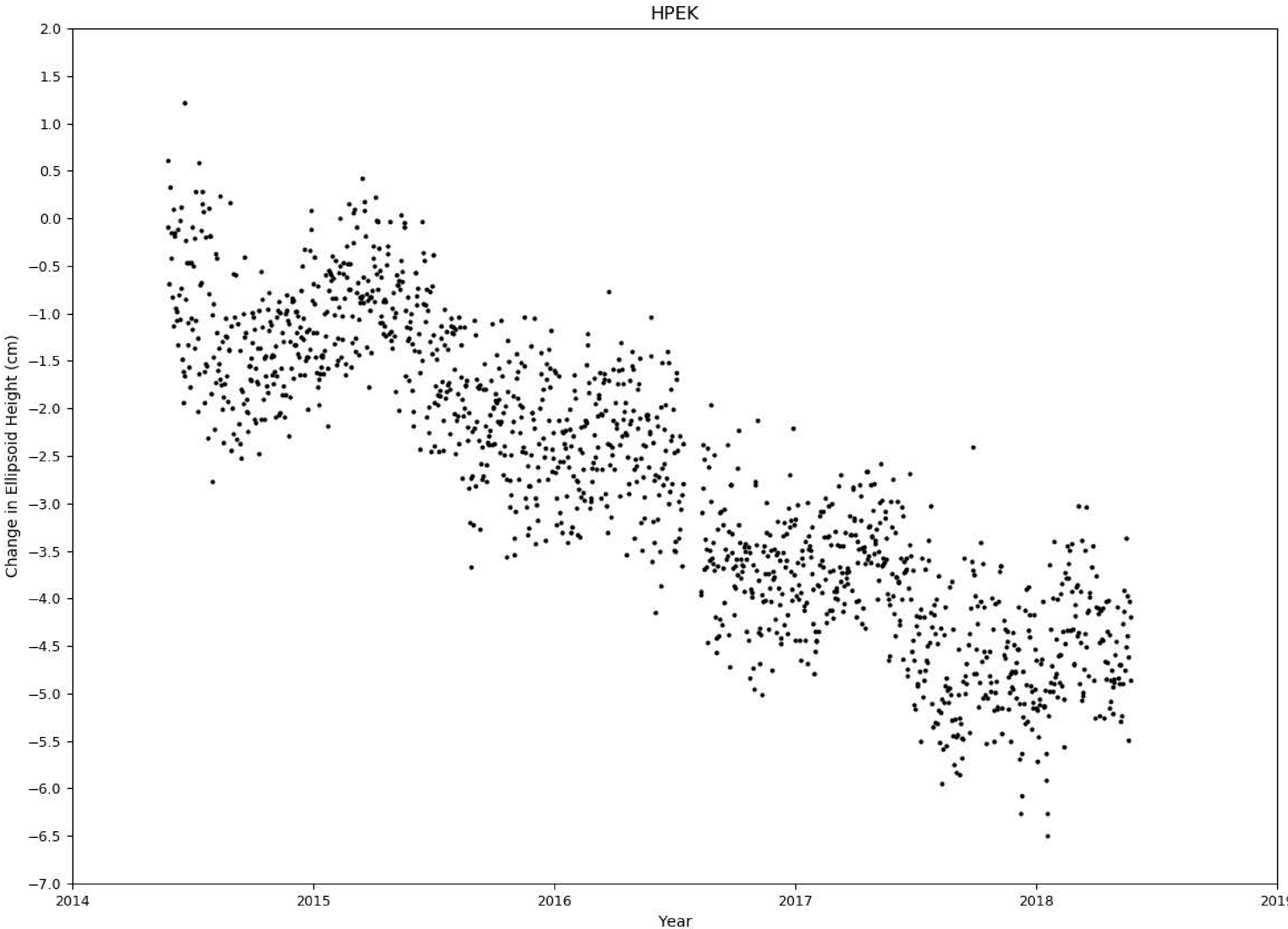
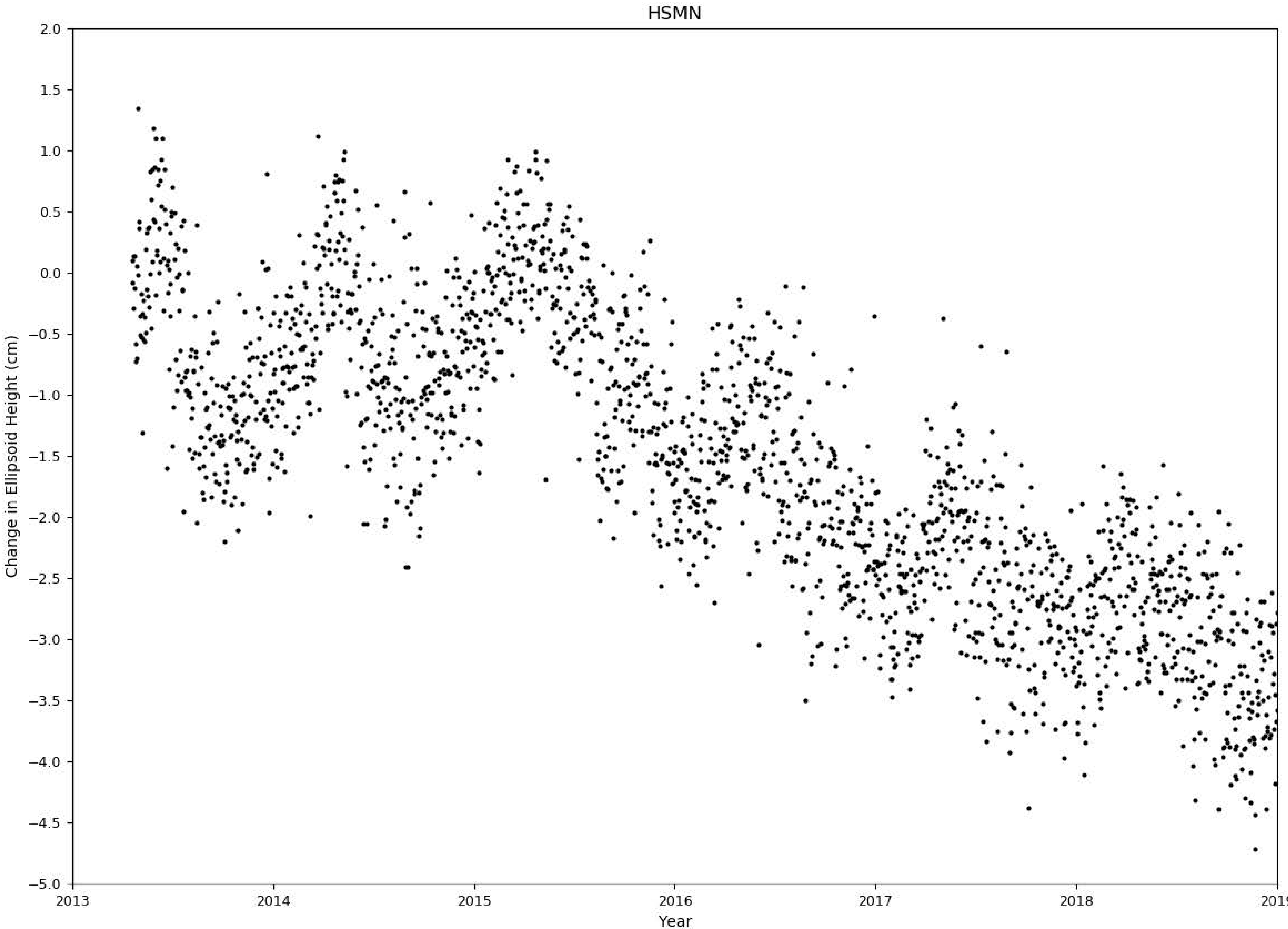
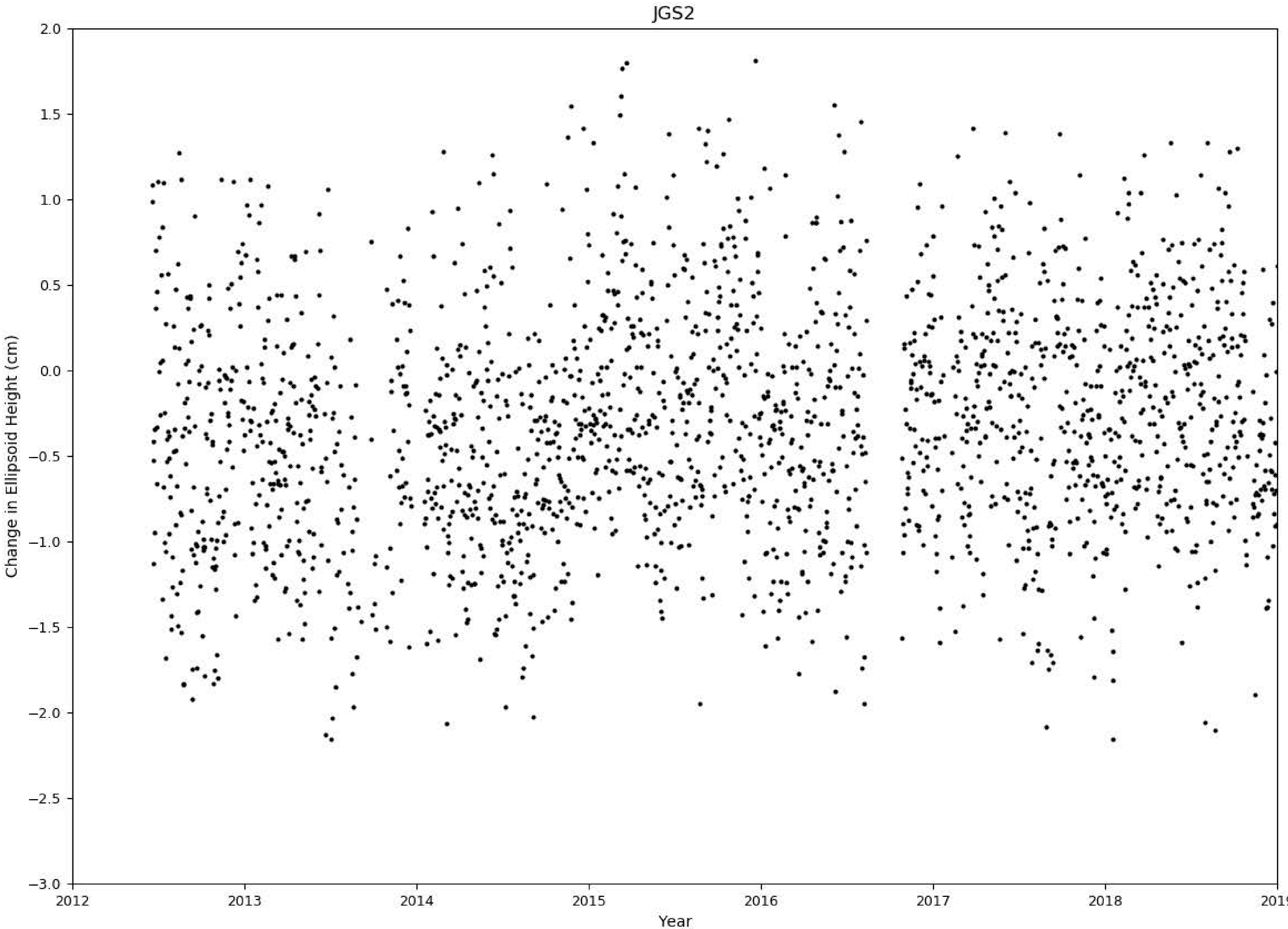
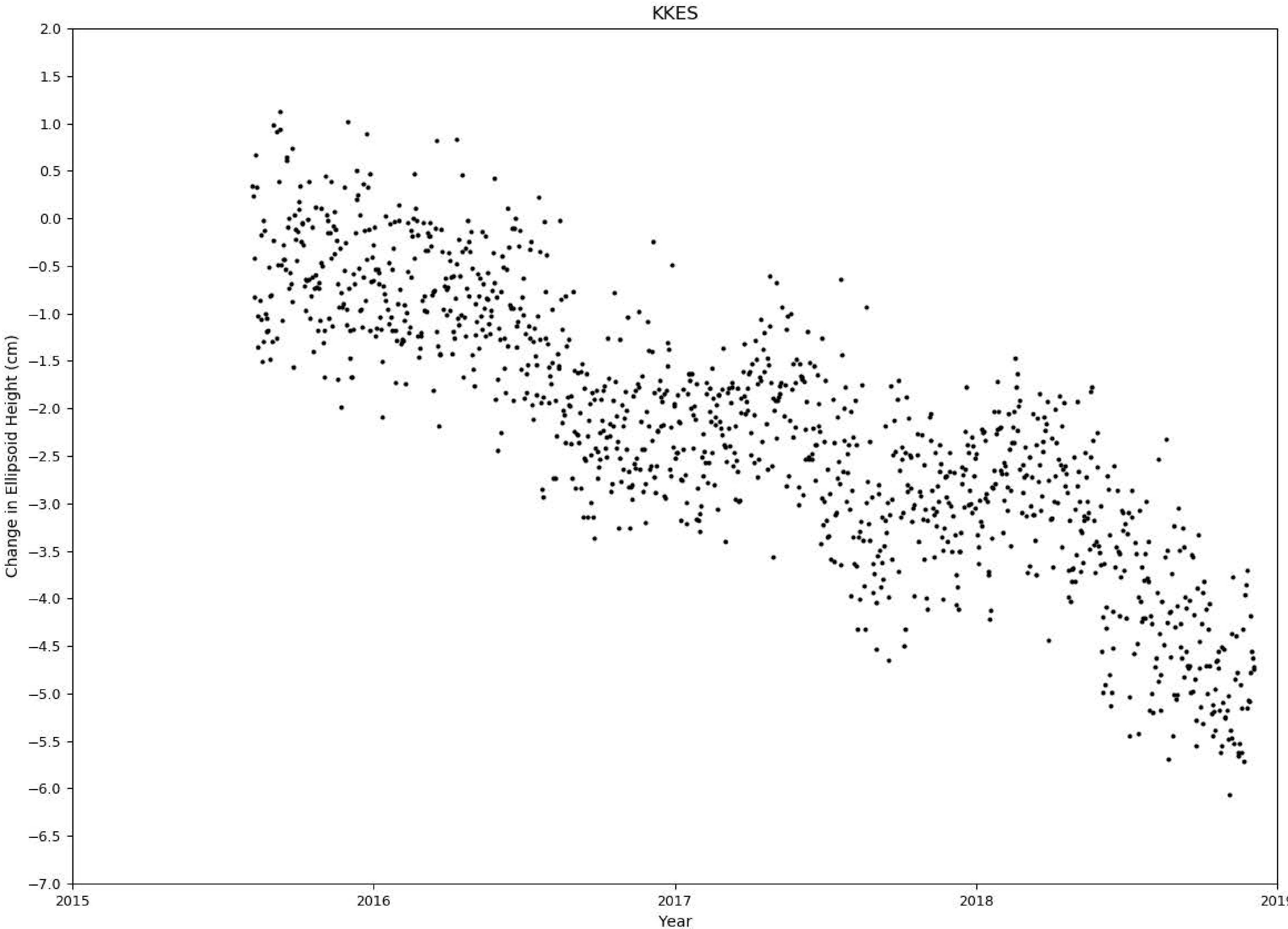
2015
2016
2017
2018
2019

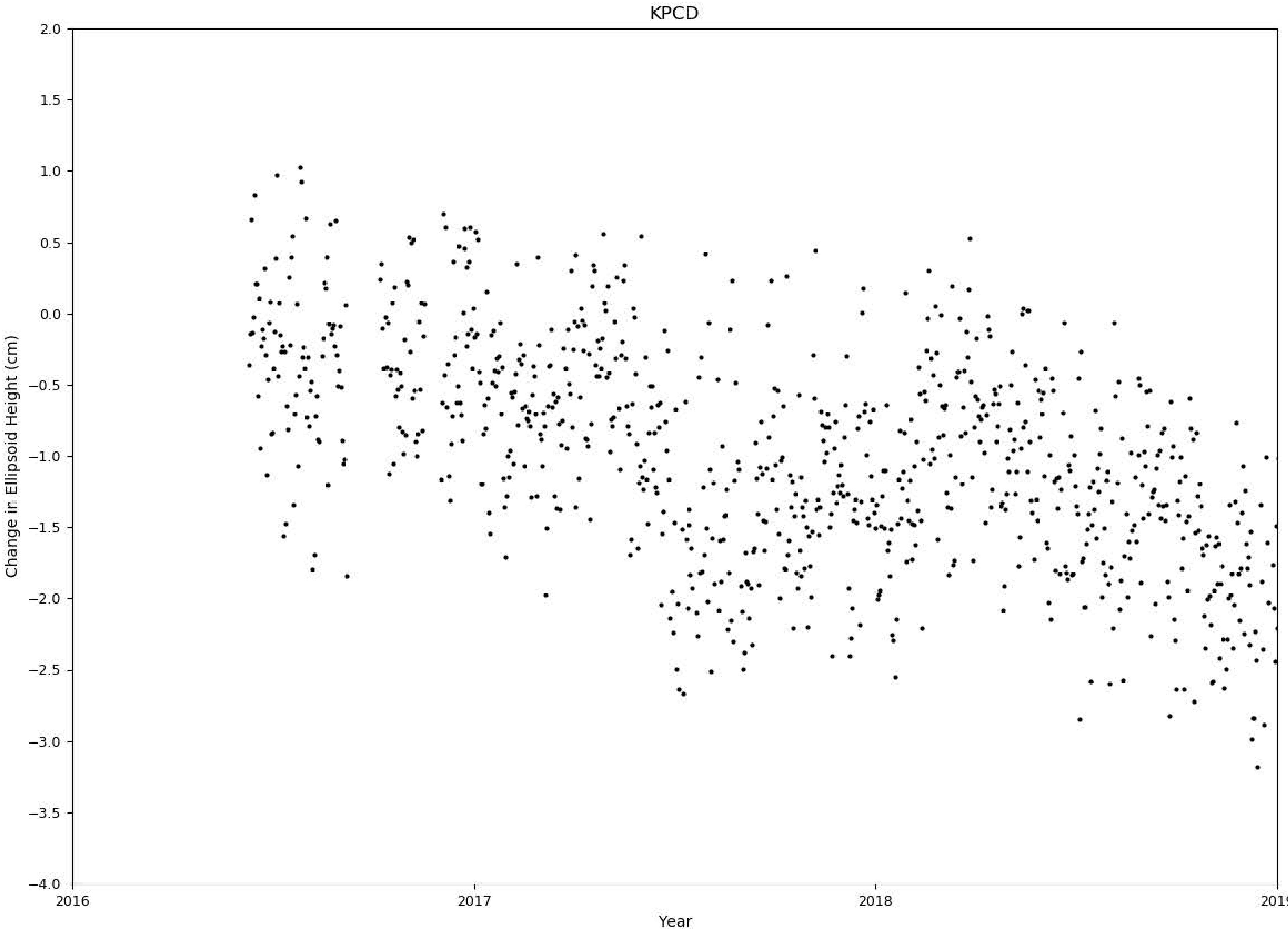

HCC2
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2013
2014
2015
2016
2017
2018
2019

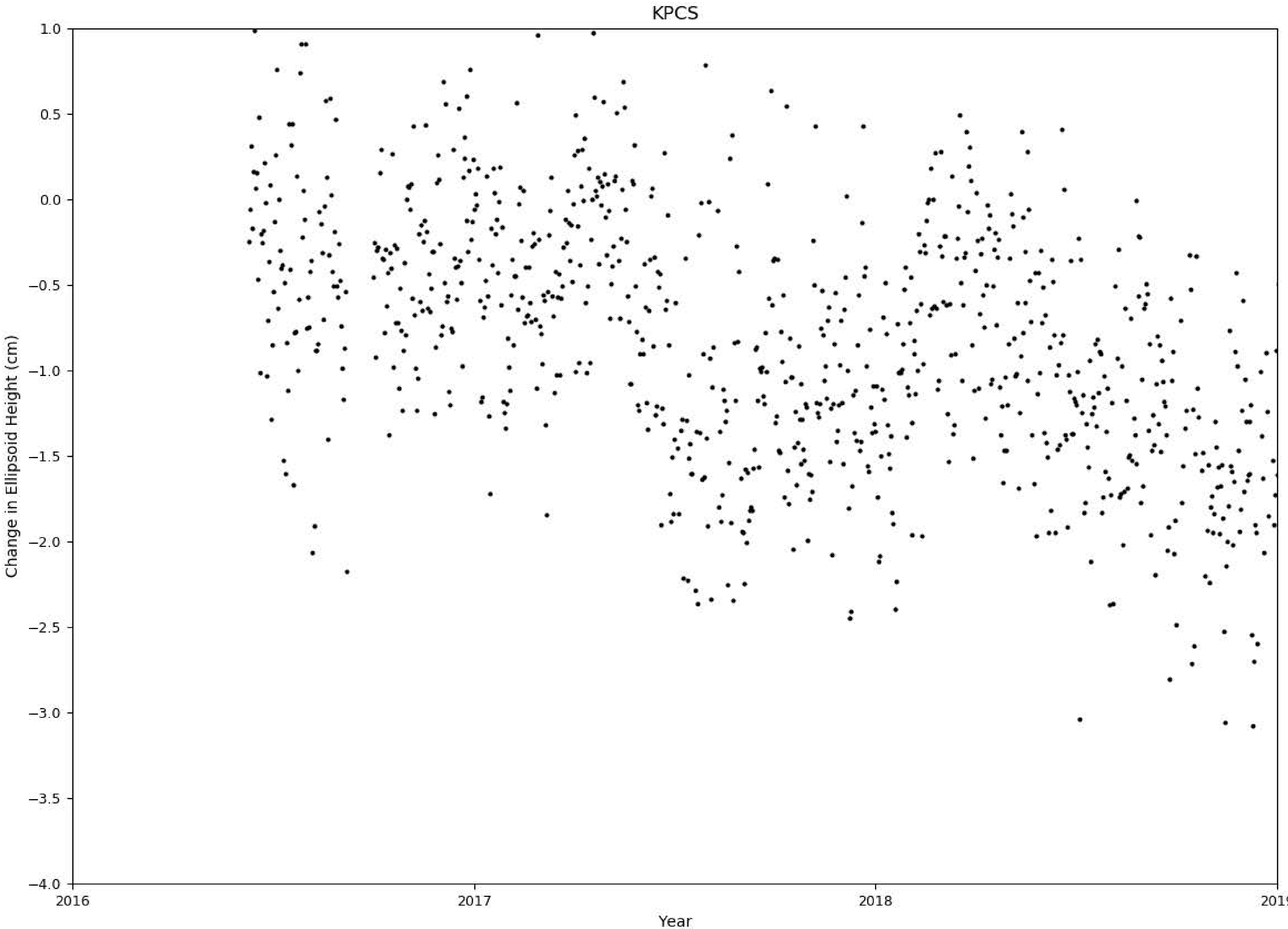

HPEK
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year

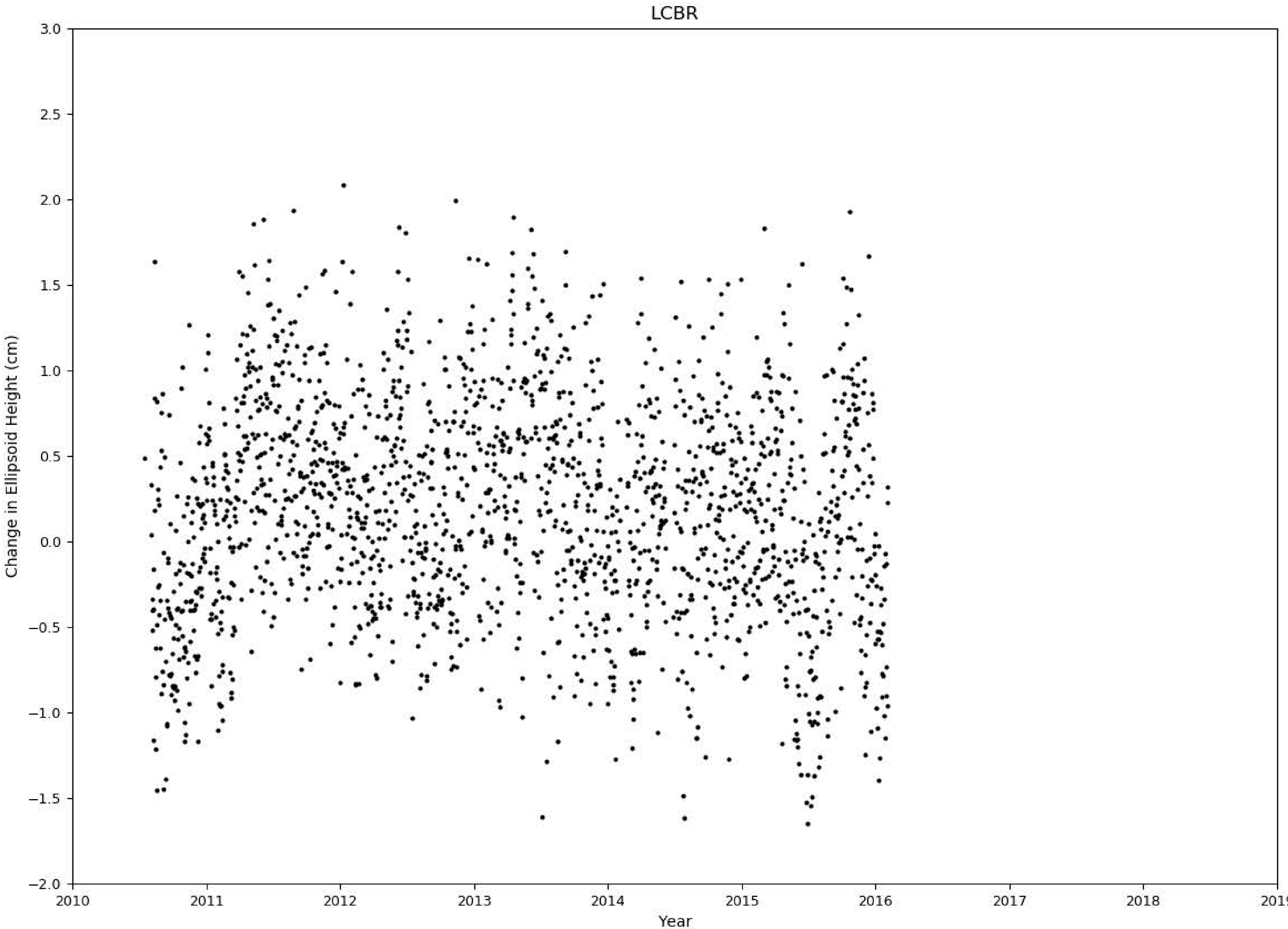

HSMN
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2013
2014
2015
2016
2017
2018
2019


JGS2
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2012
2013
2014
2015
2016
2017
2018
2019


KKES
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


KPCD
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year


KPCS
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2016
2017
2018
2019
Year


LCBR
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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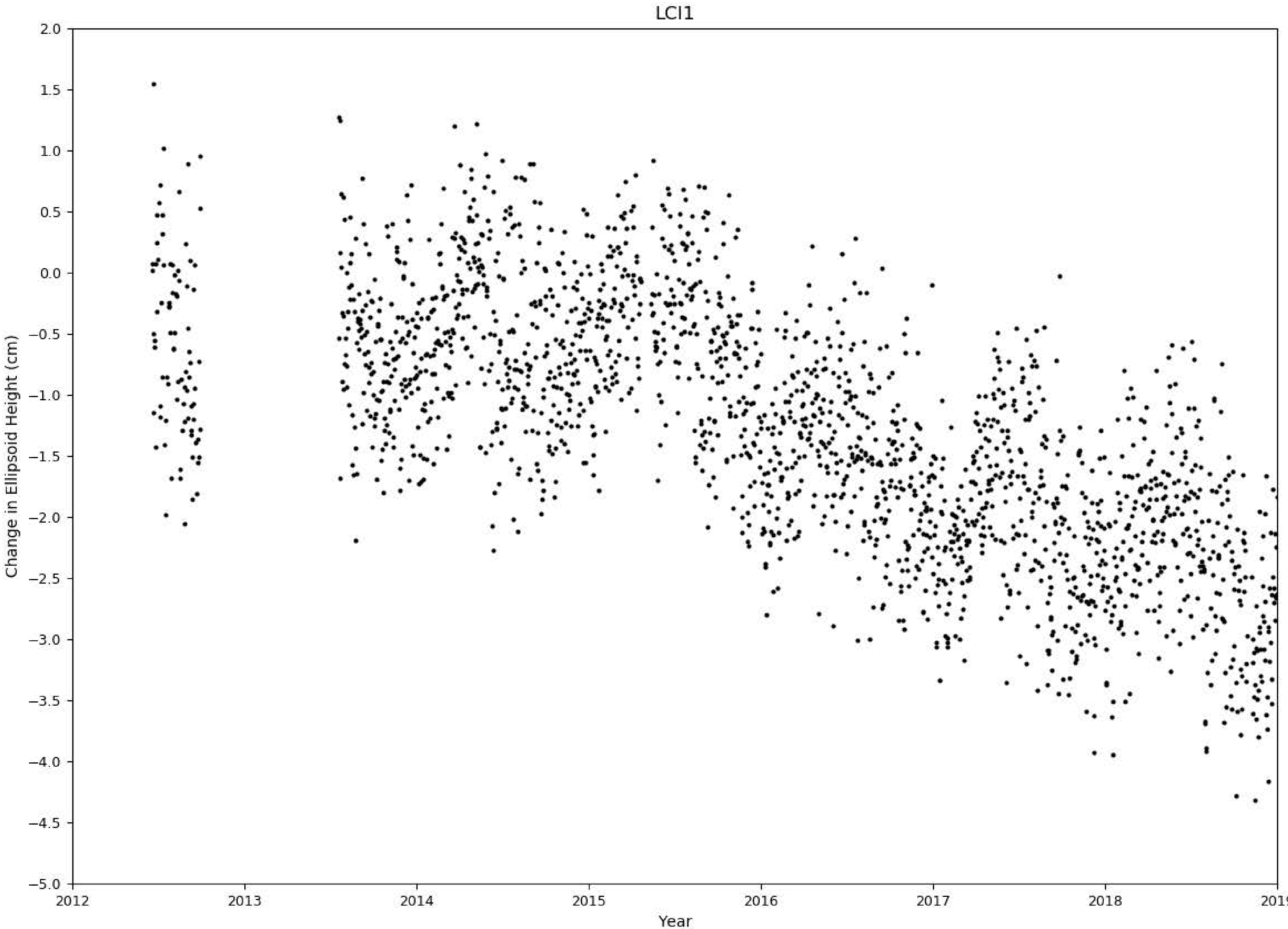
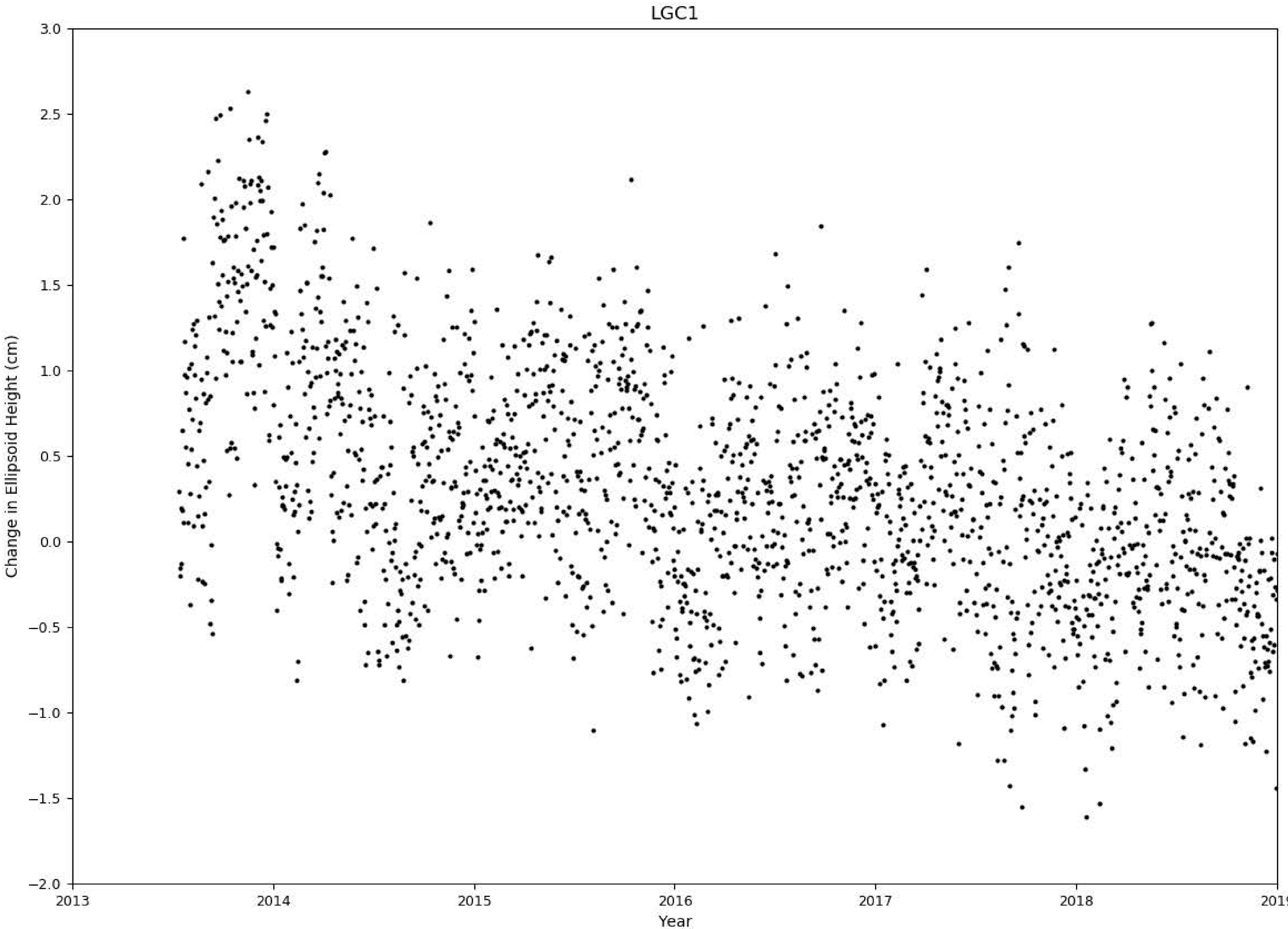
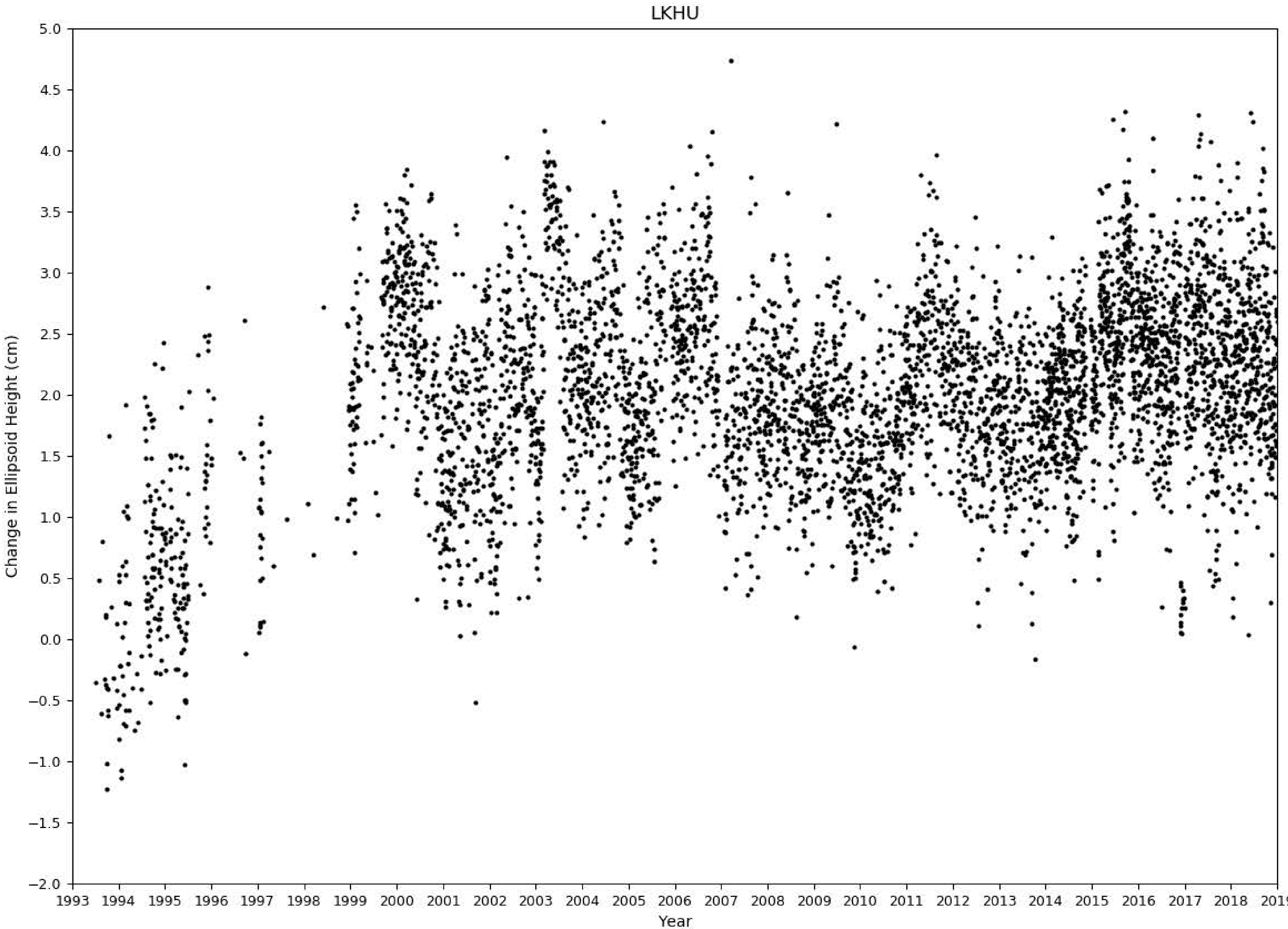
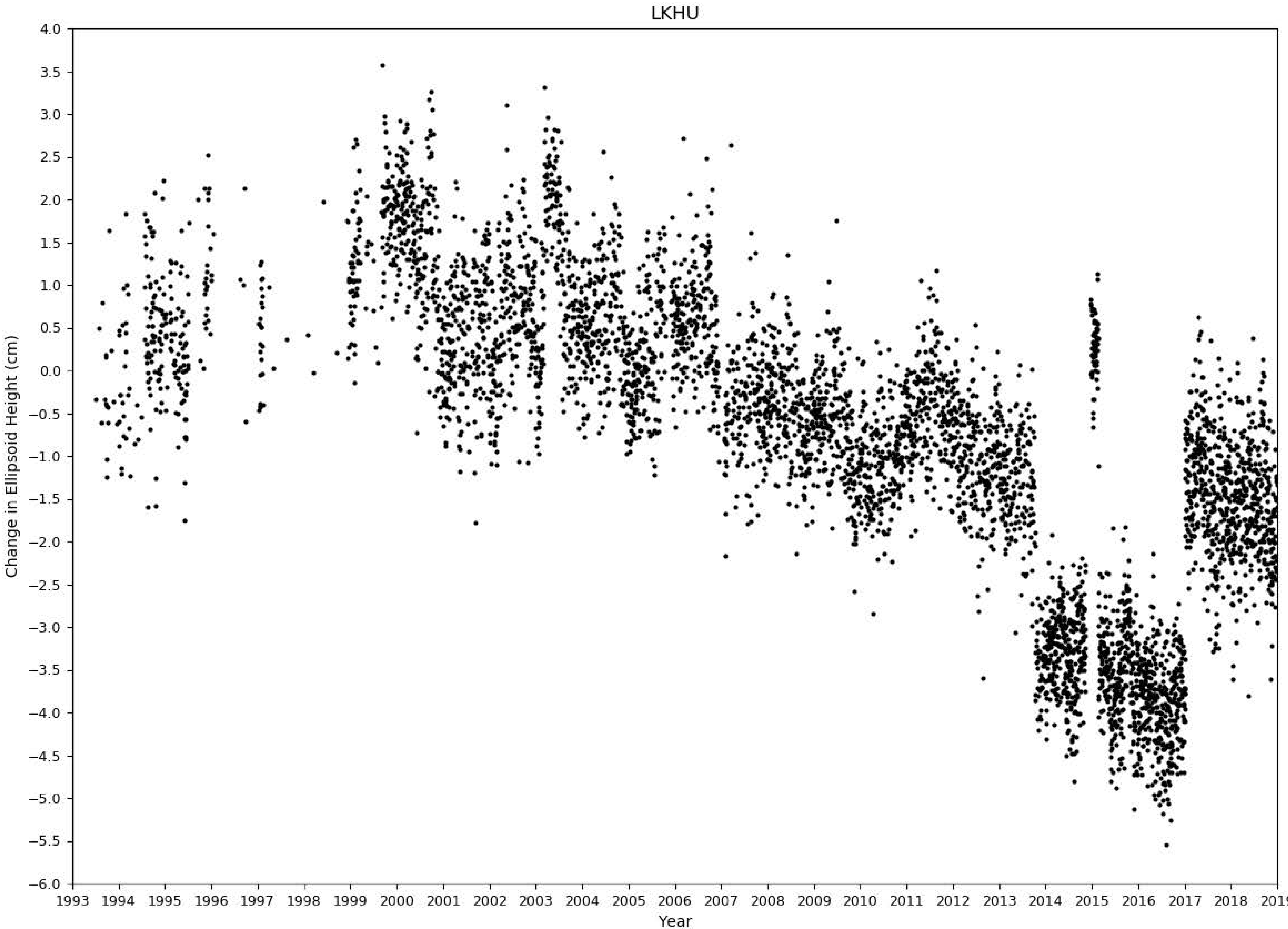
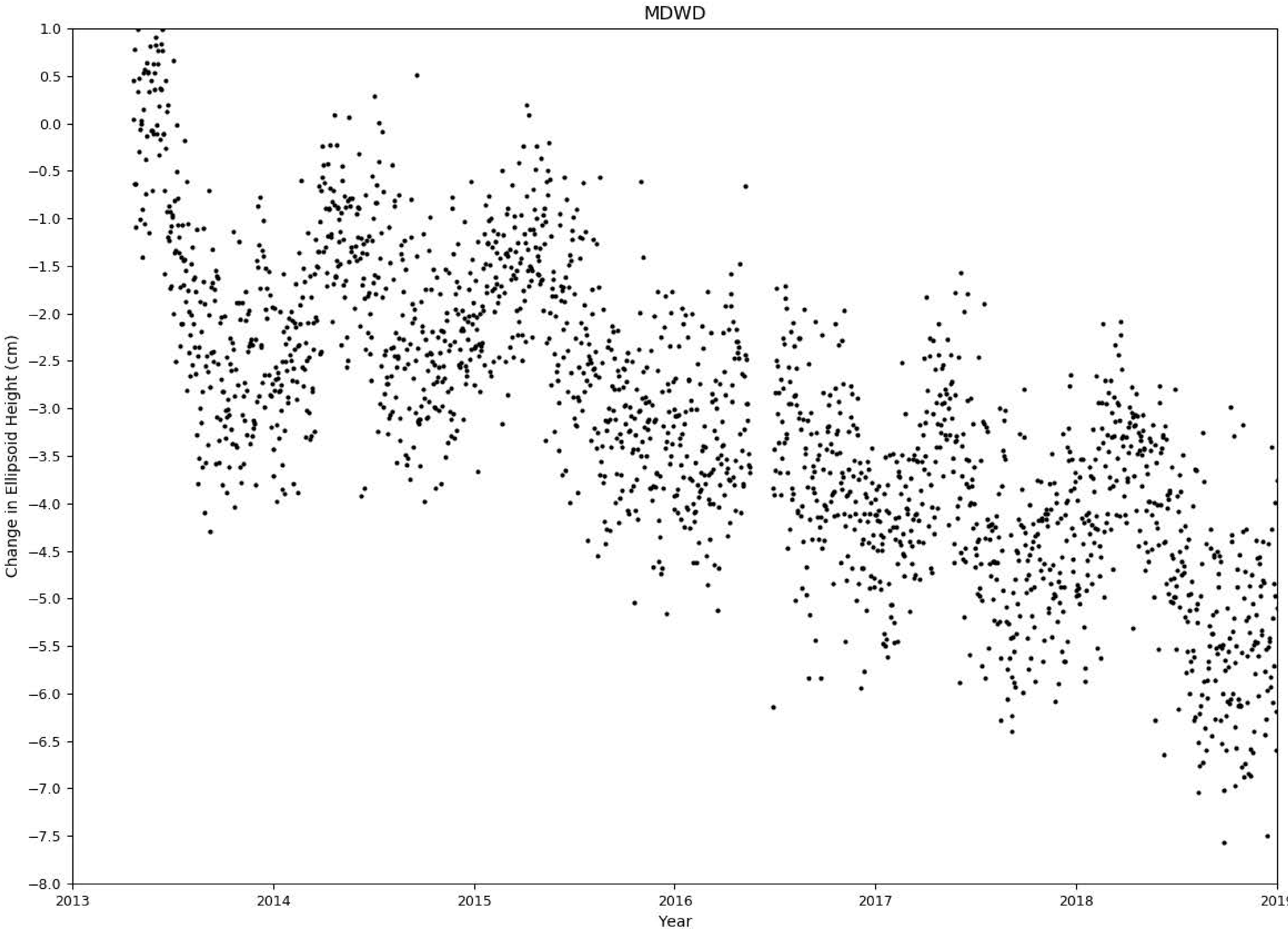
−1.5
−2.0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

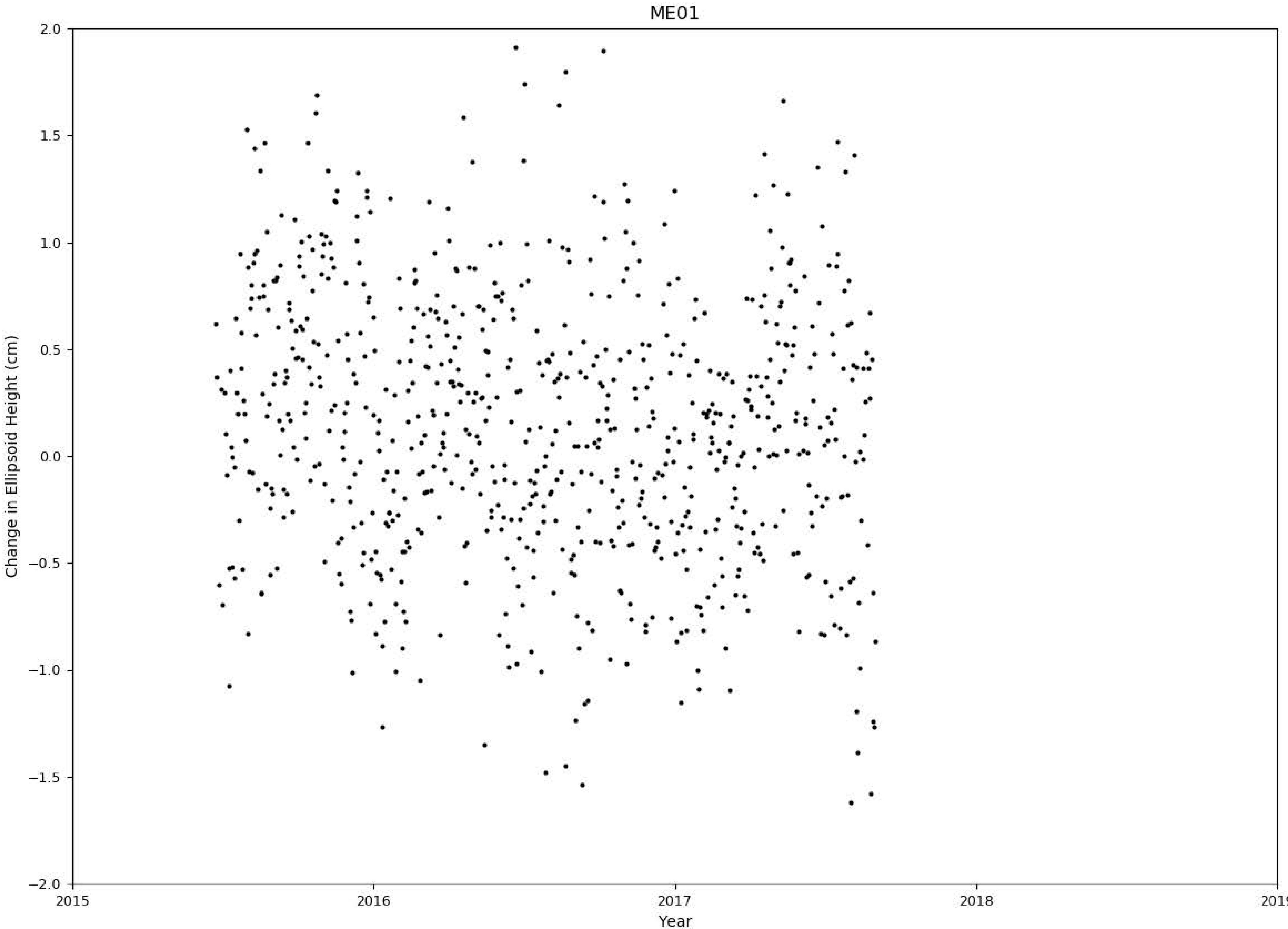

LCI1
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2012
2013
2014
2015
2016
2017
2018
2019

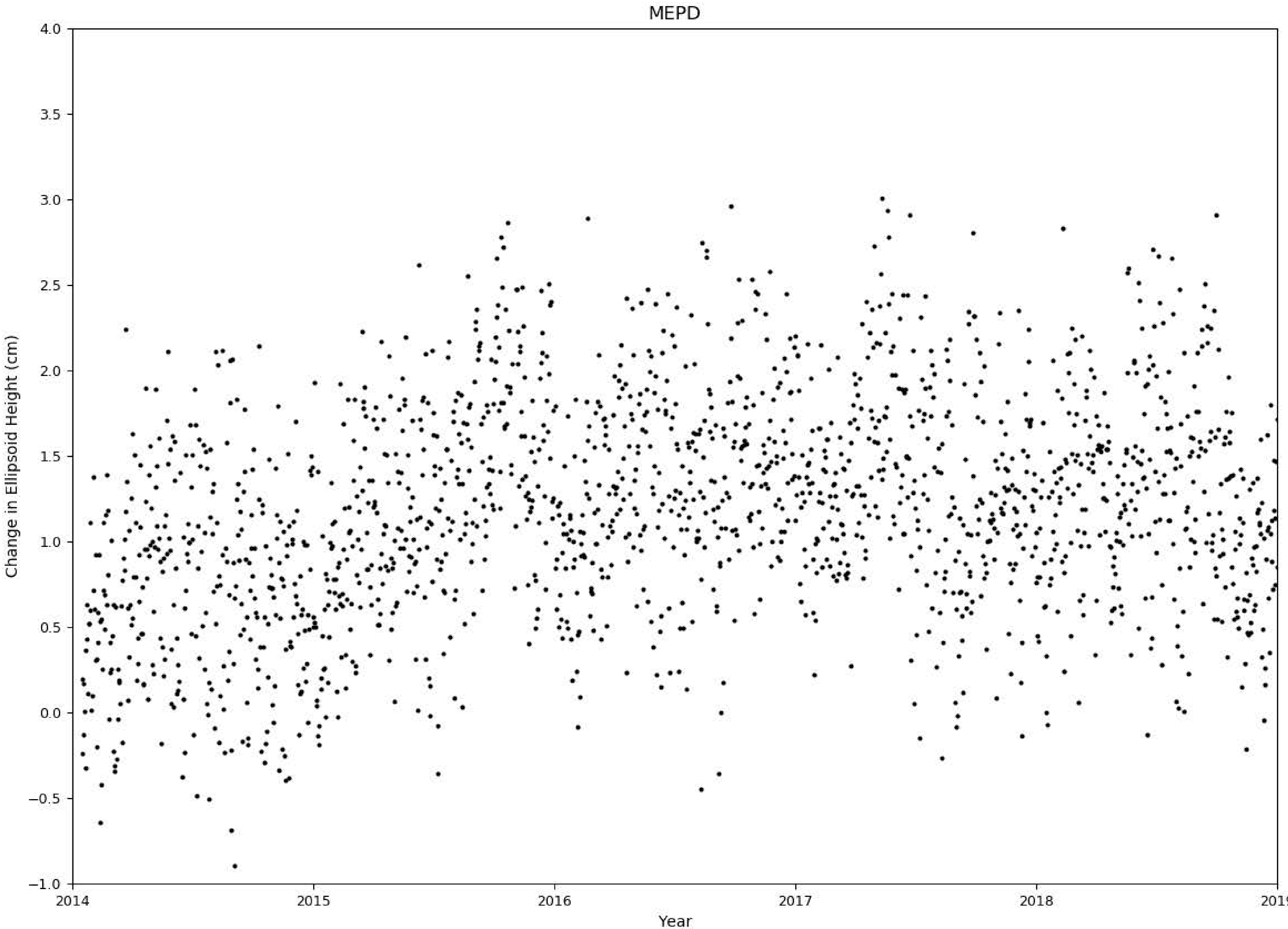

LGC1
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year

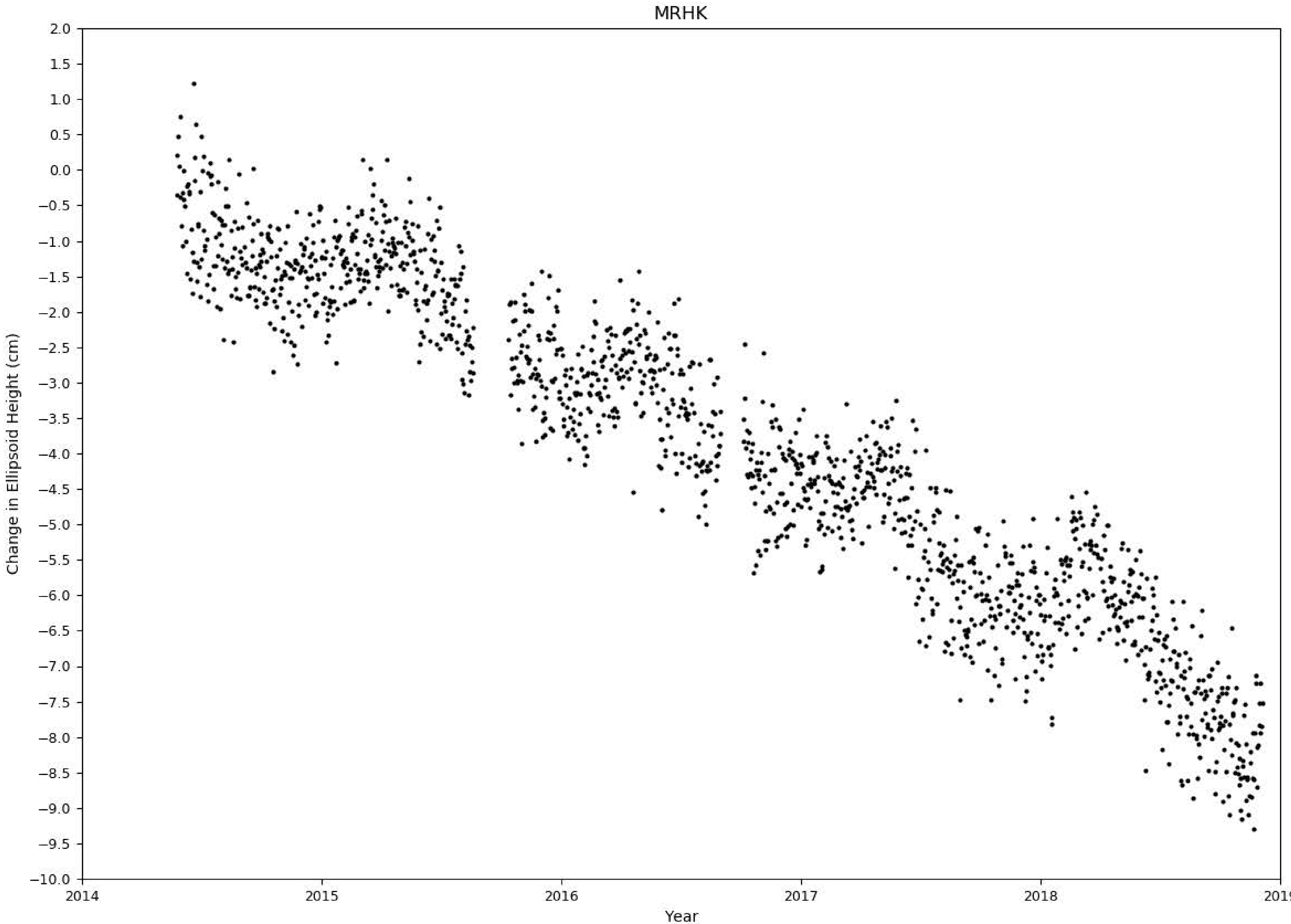

LKHU
Change in Ellipsoid Height (cm)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year

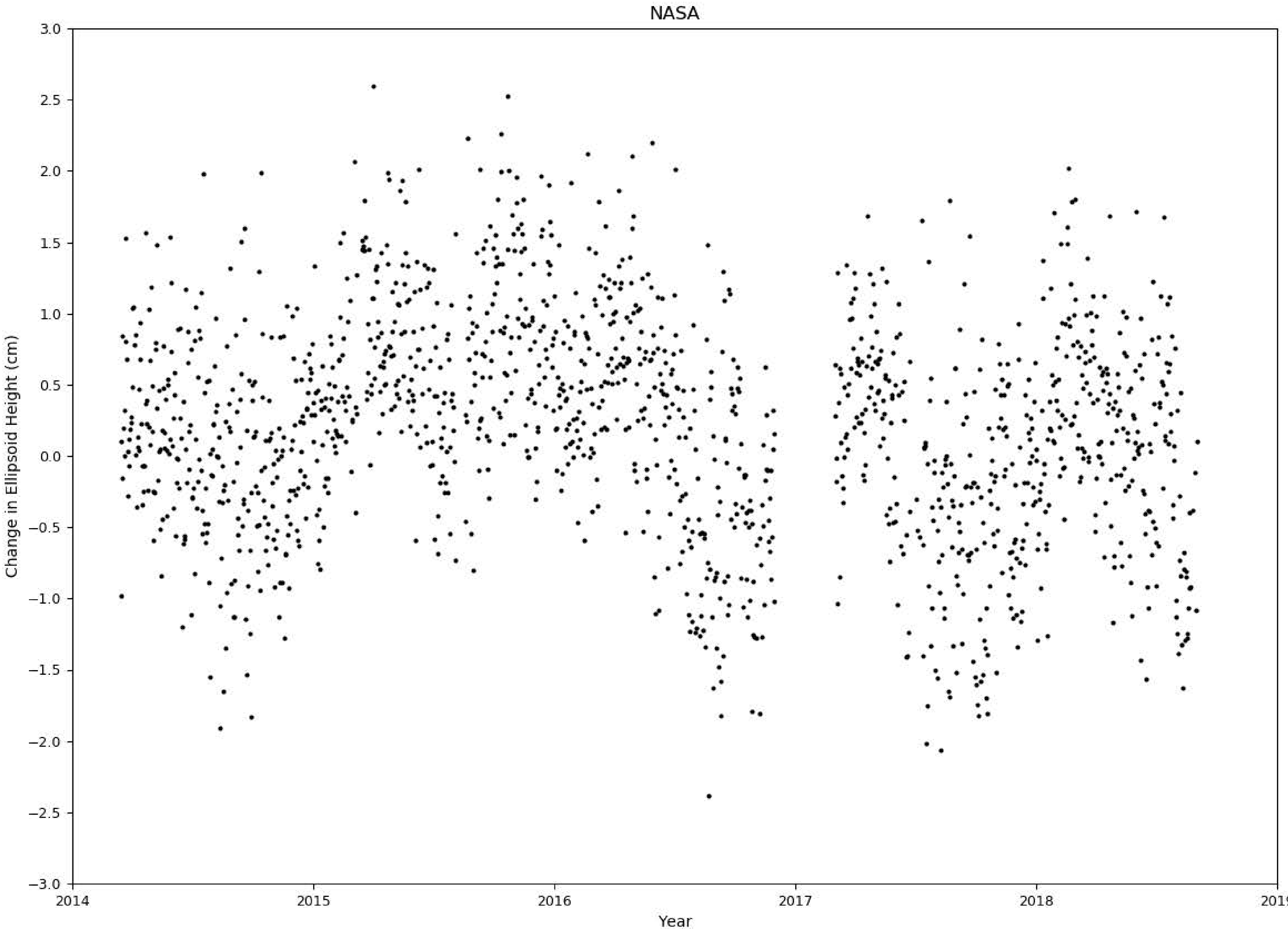

LKHU
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year

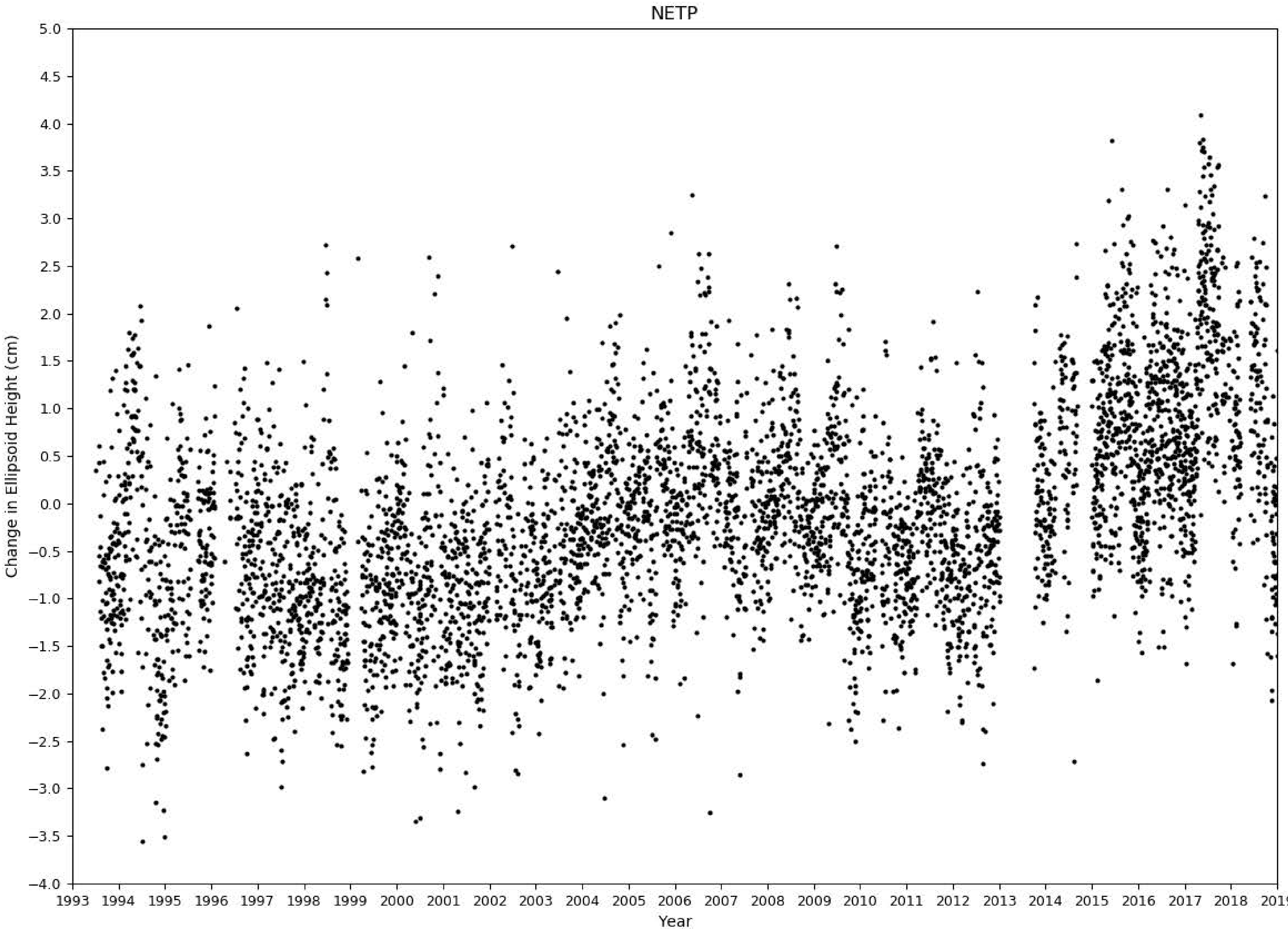

MDWD
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year

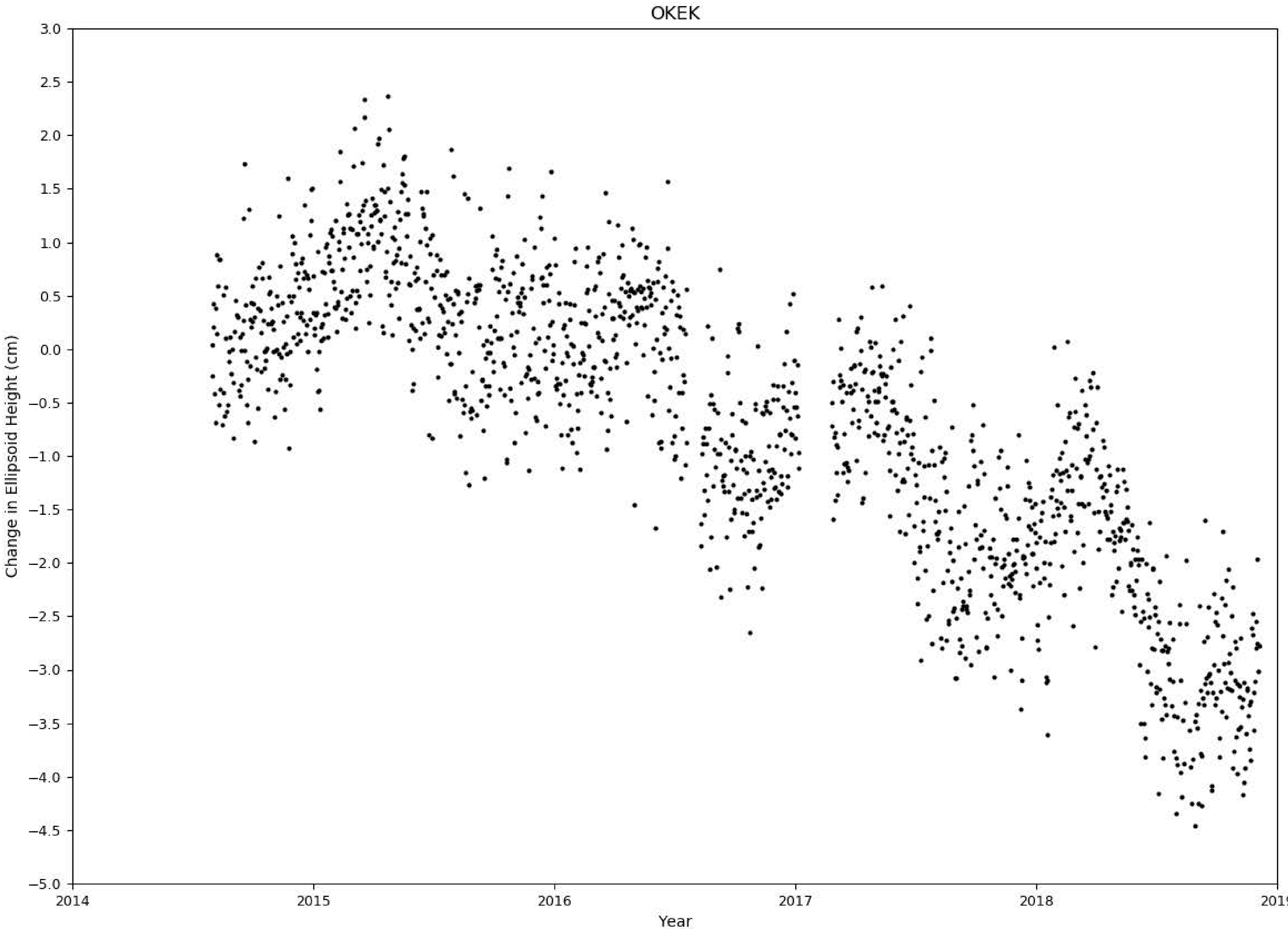

ME01
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year

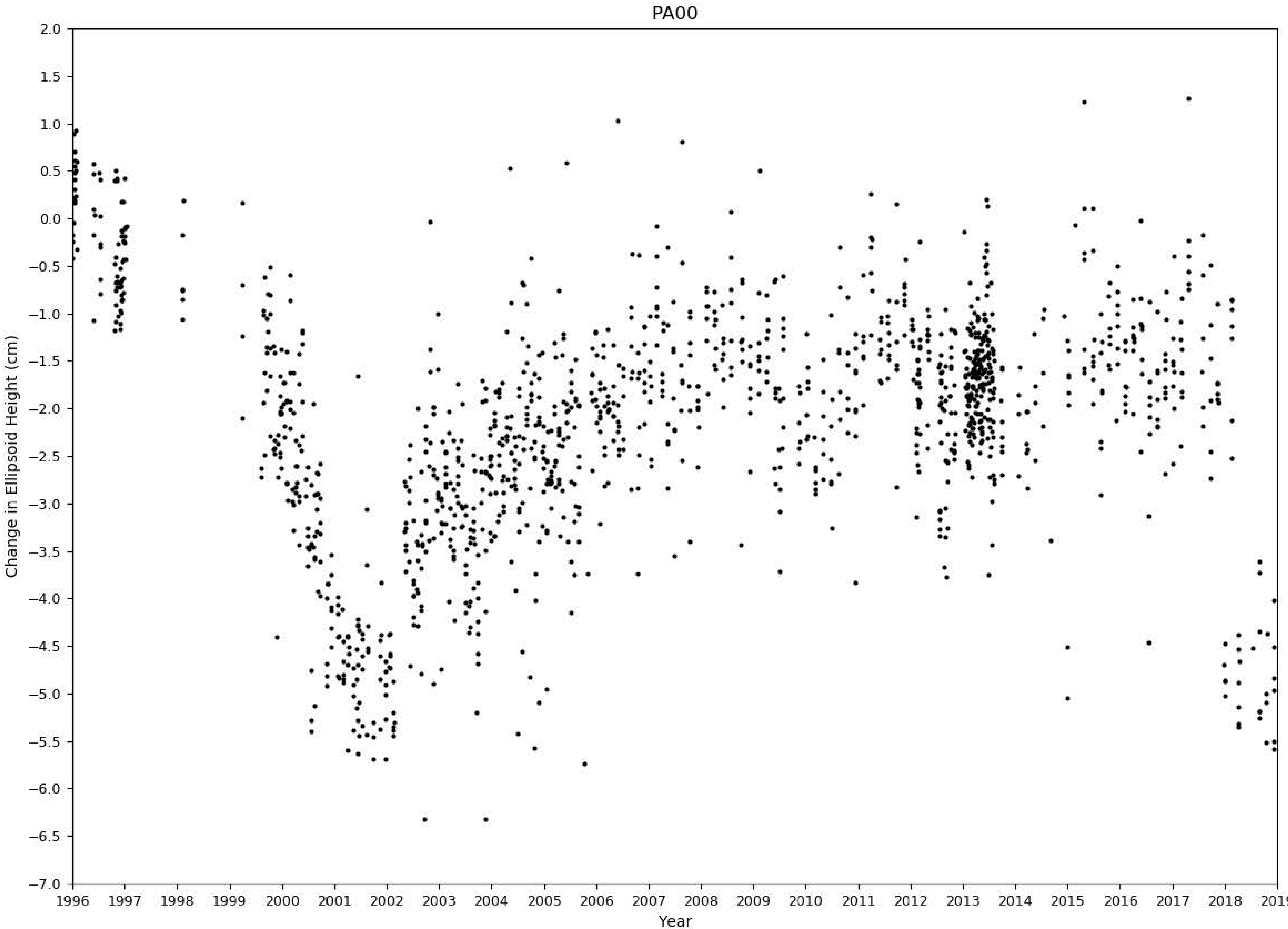

MEPD
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
2014
2015
2016
2017
2018
2019
Year

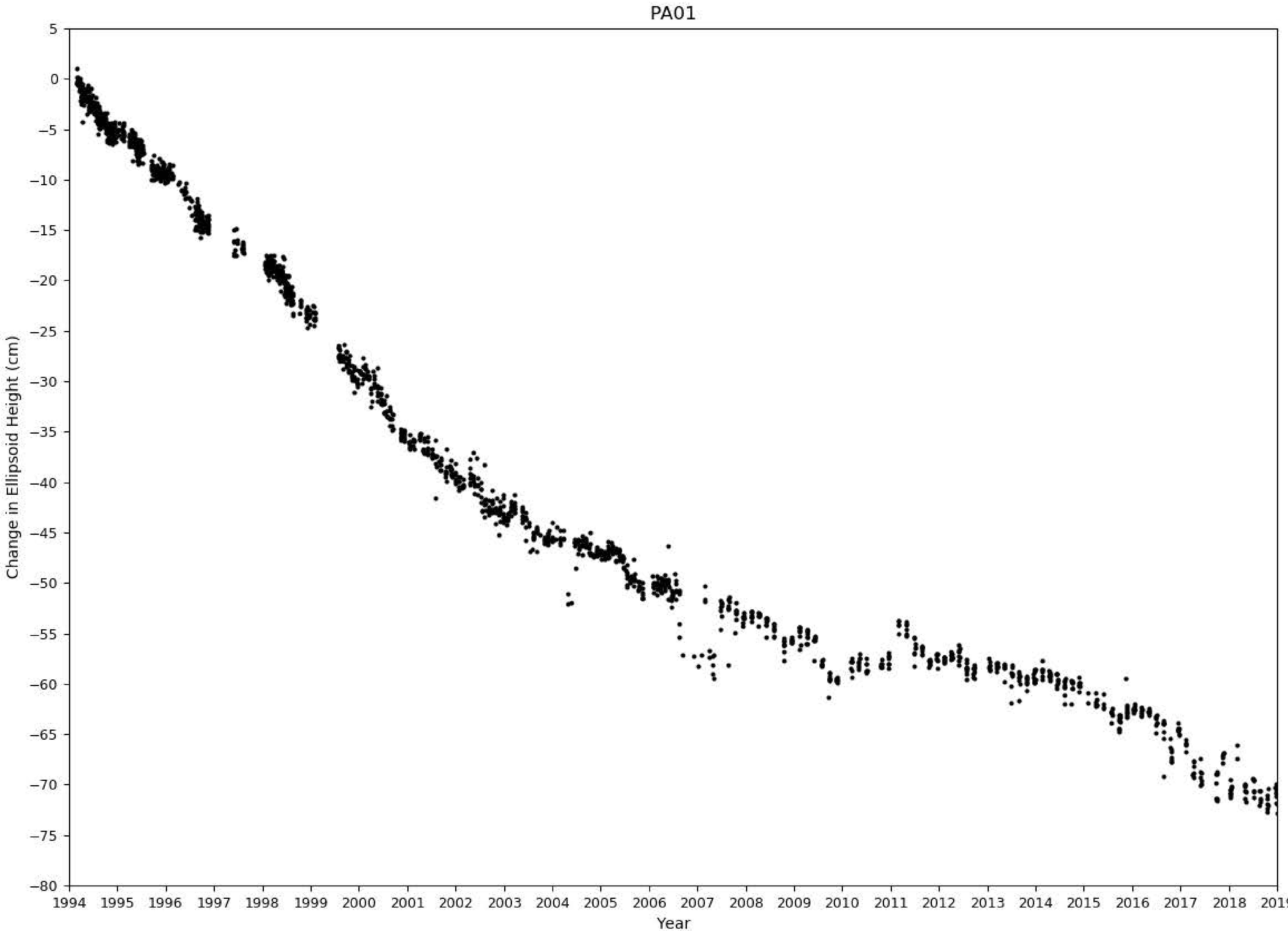

MRHK
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
2014
2015
2016
2017
2018
2019
Year

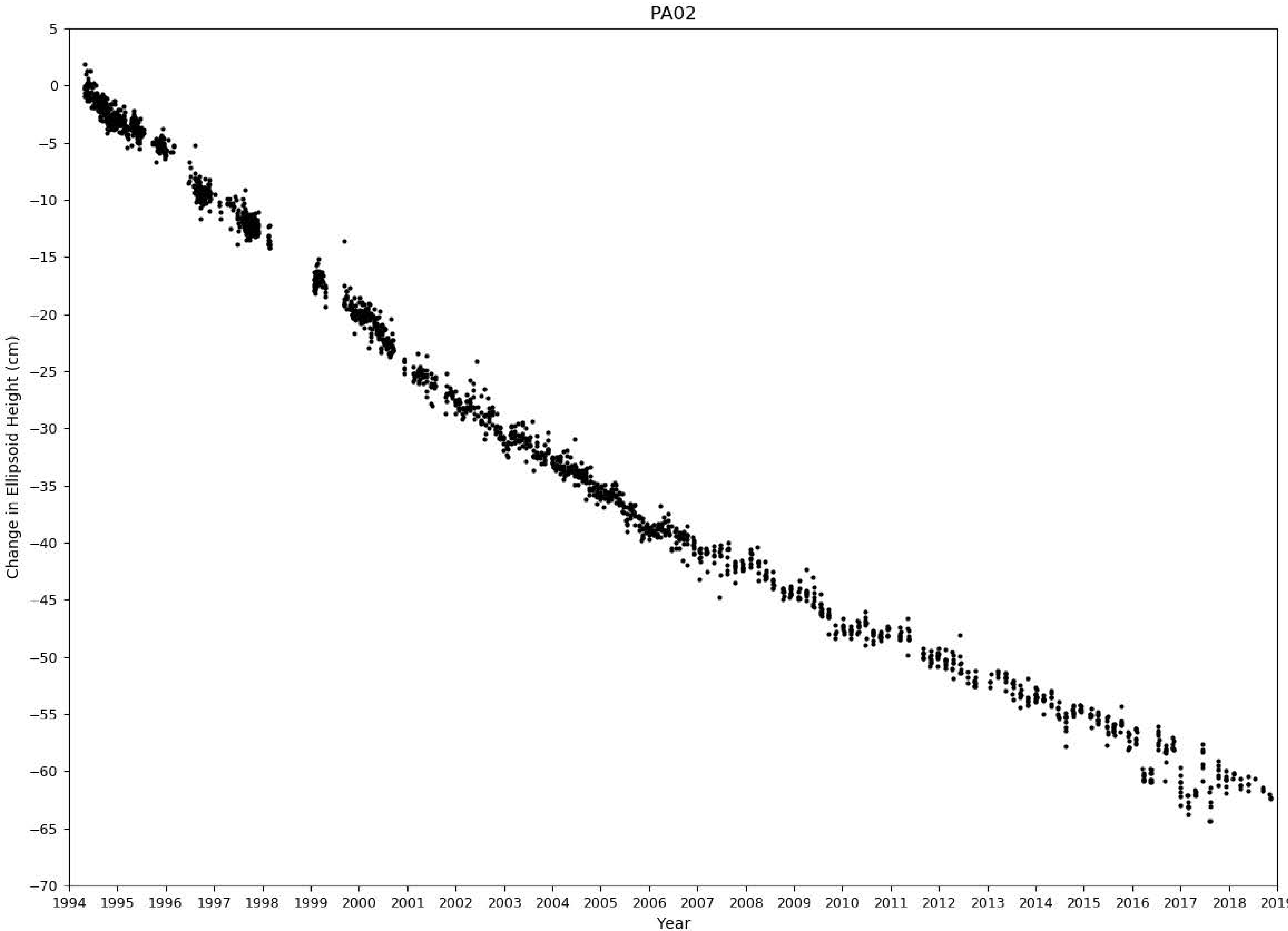

NASA
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2014
2015
2016
2017
2018
2019

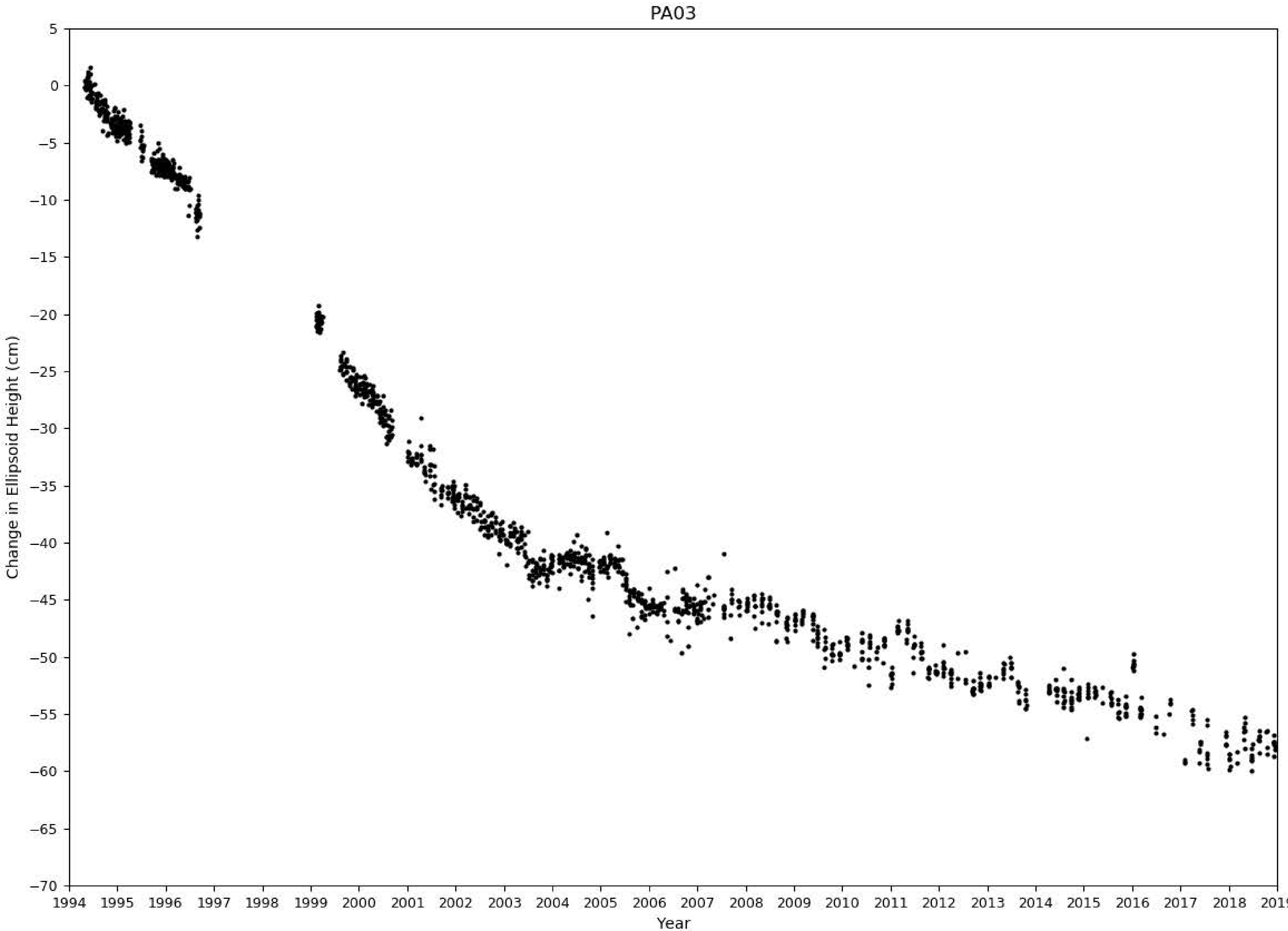

NETP
Change in Ellipsoid Height (cm)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year

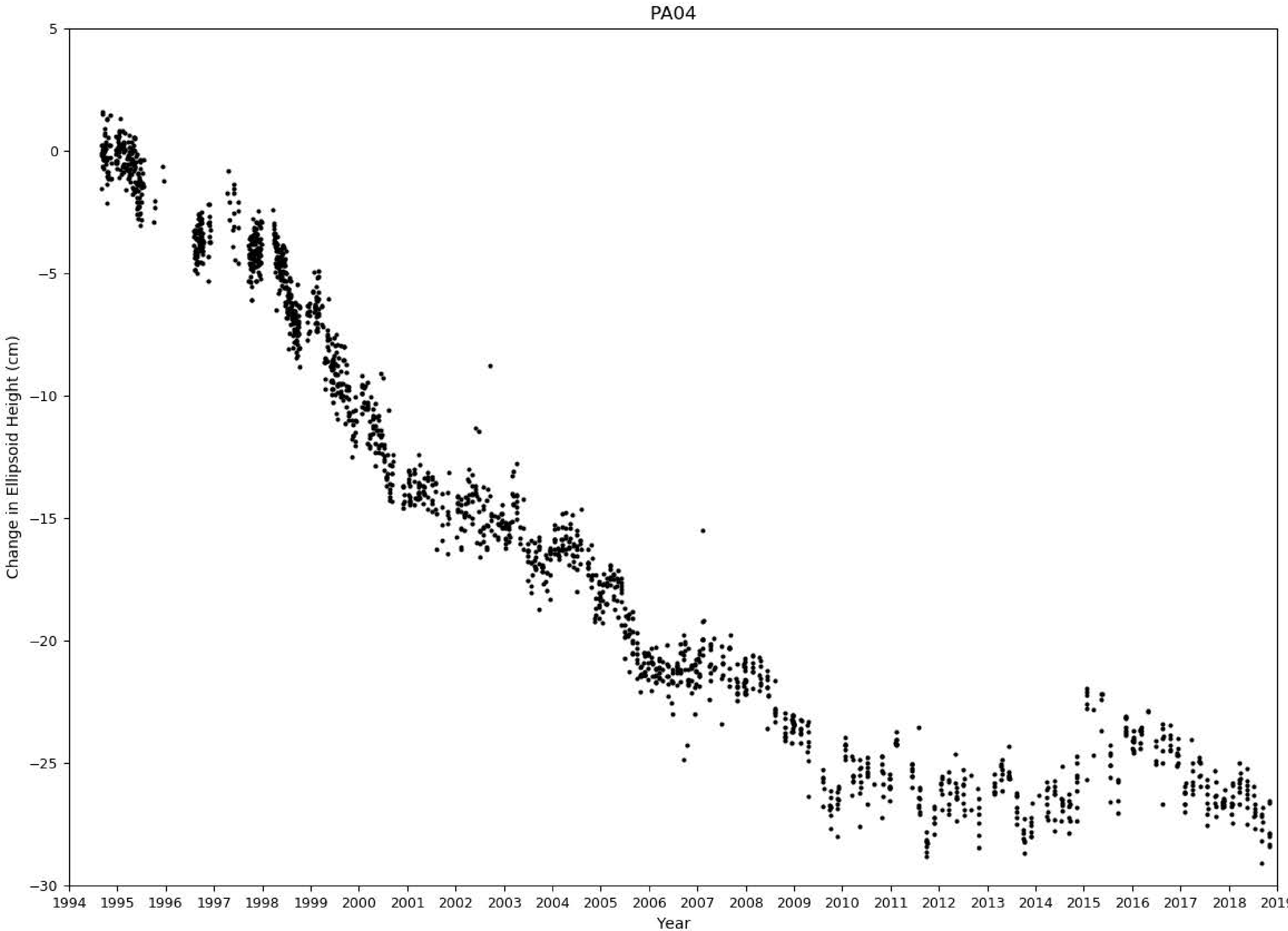

OKEK
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year

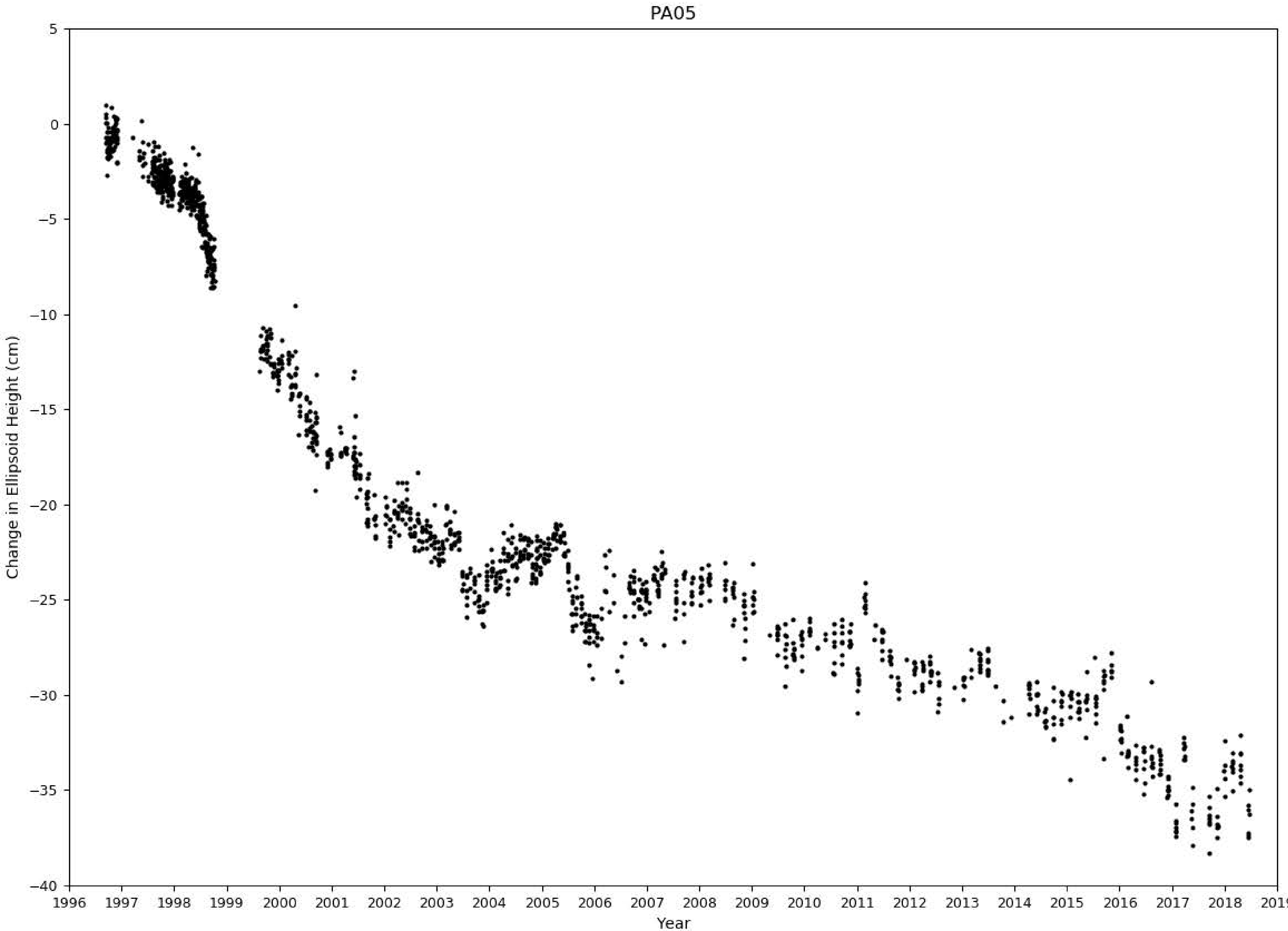

PA00
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
Change in Ellipsoid Height (cm)
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

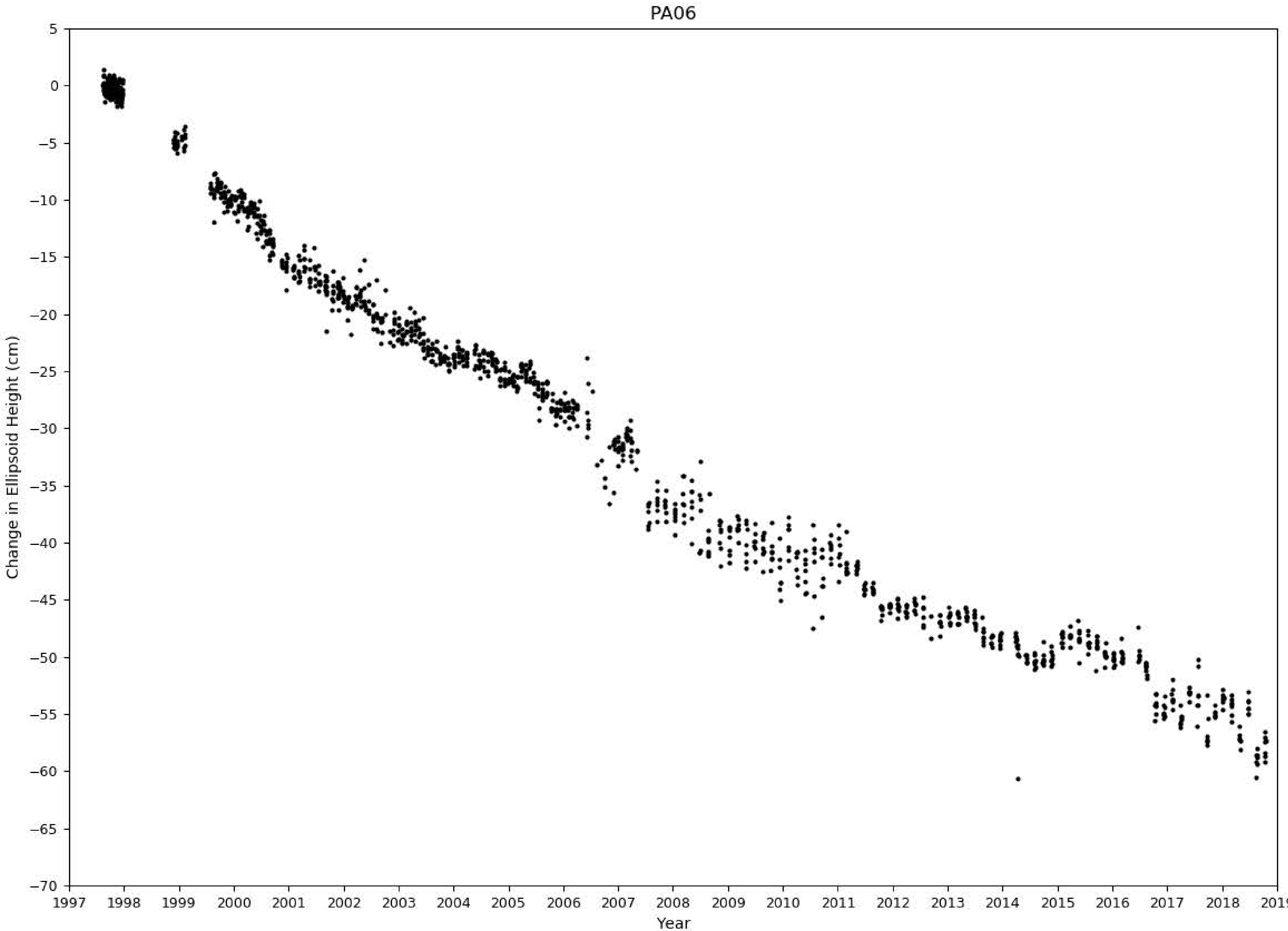

PA01
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
−65
−70
−75
−80
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PA02
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
−65
−70
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PA03
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
−65
−70
Change in Ellipsoid Height (cm)
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year


PA04
5
0
−5
−10
−15
−20
−25
−30
Change in Ellipsoid Height (cm)
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Year


PA05
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PA06
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
−65
−70
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
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2008
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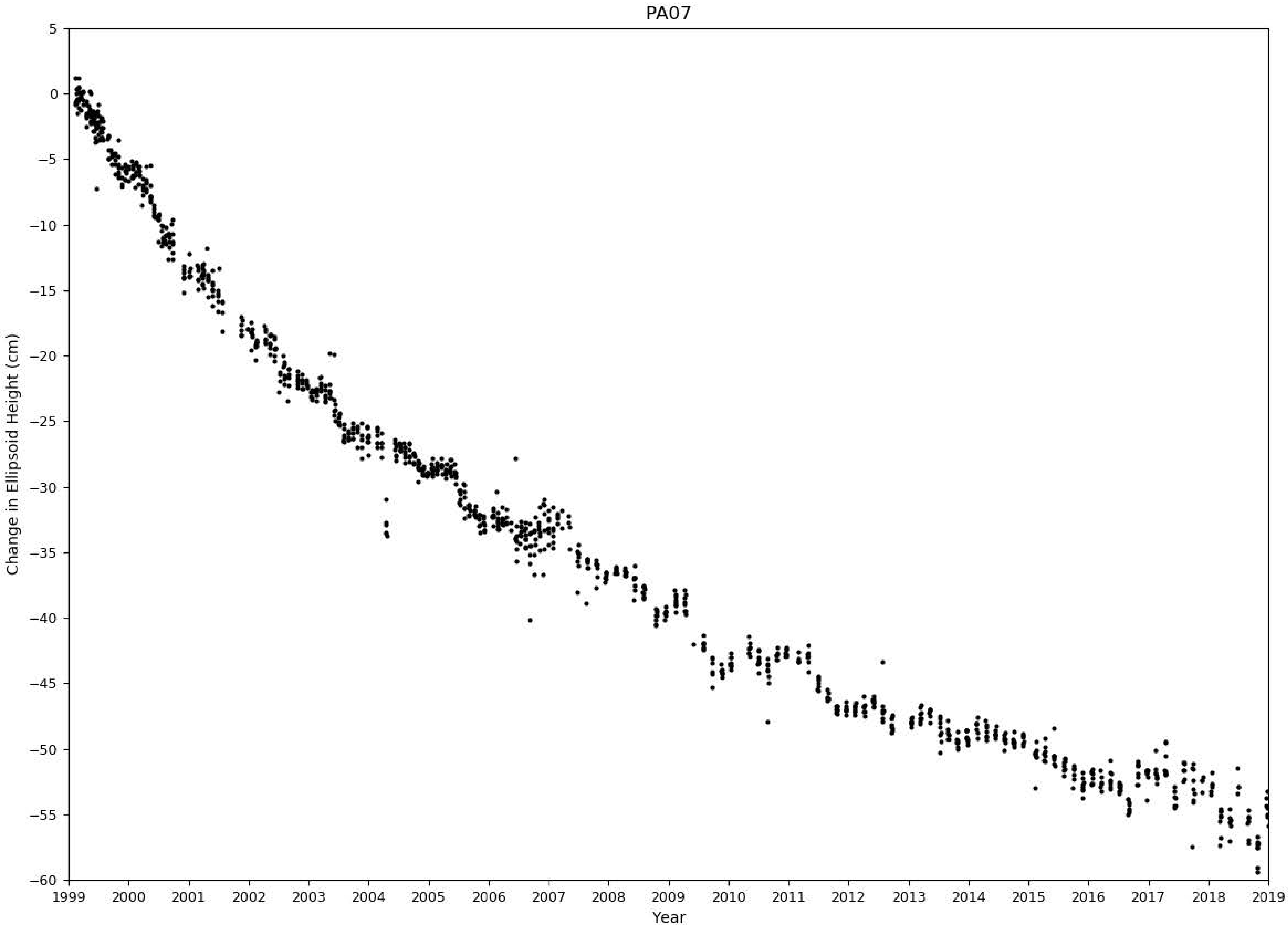
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA07
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
1999
2000
2001
2002
2003
2004
2005
2006
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2008
2009
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2011
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2014
2015
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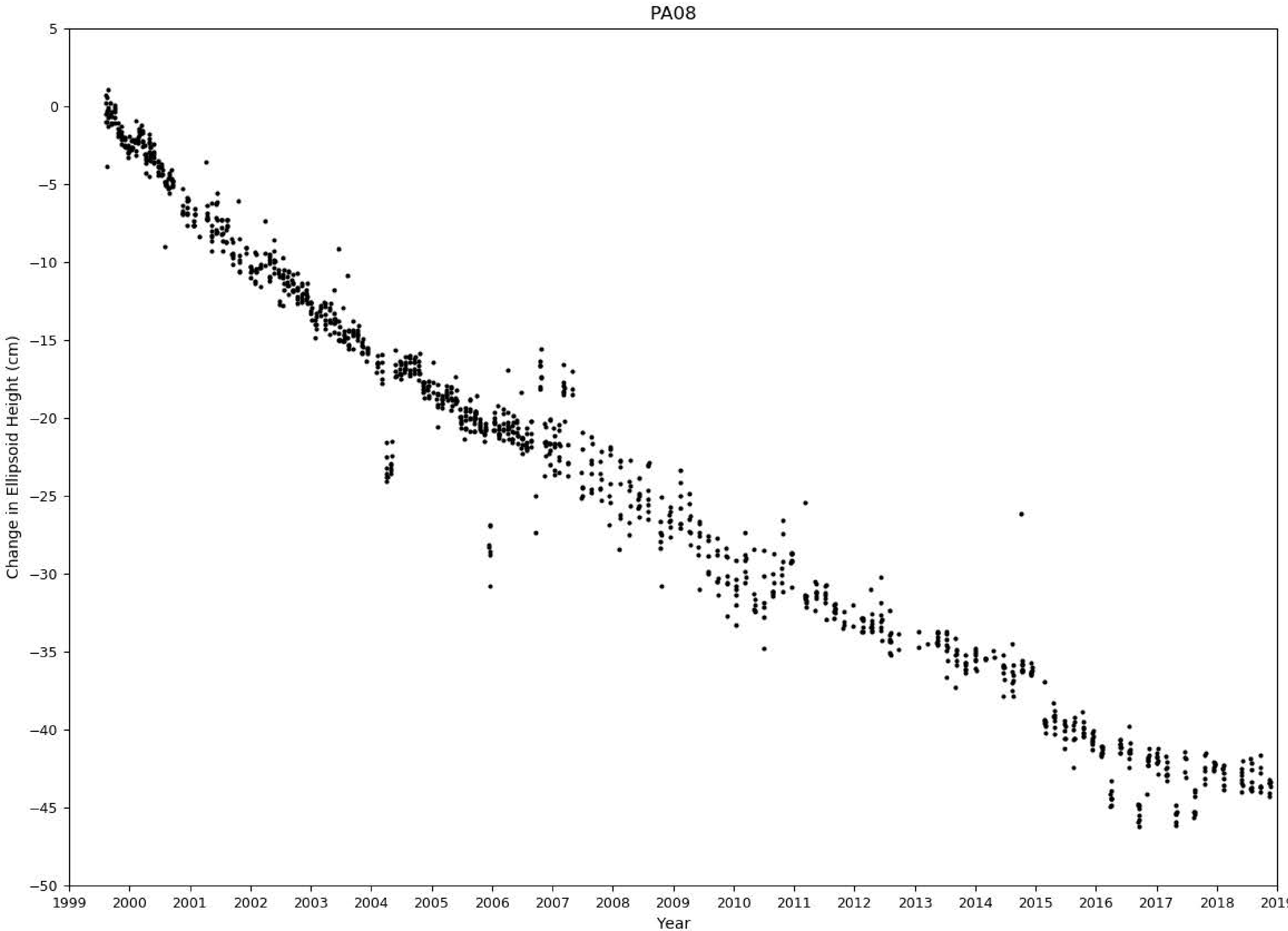
2017
2018
2019
Year


PA08
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
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2012
2013
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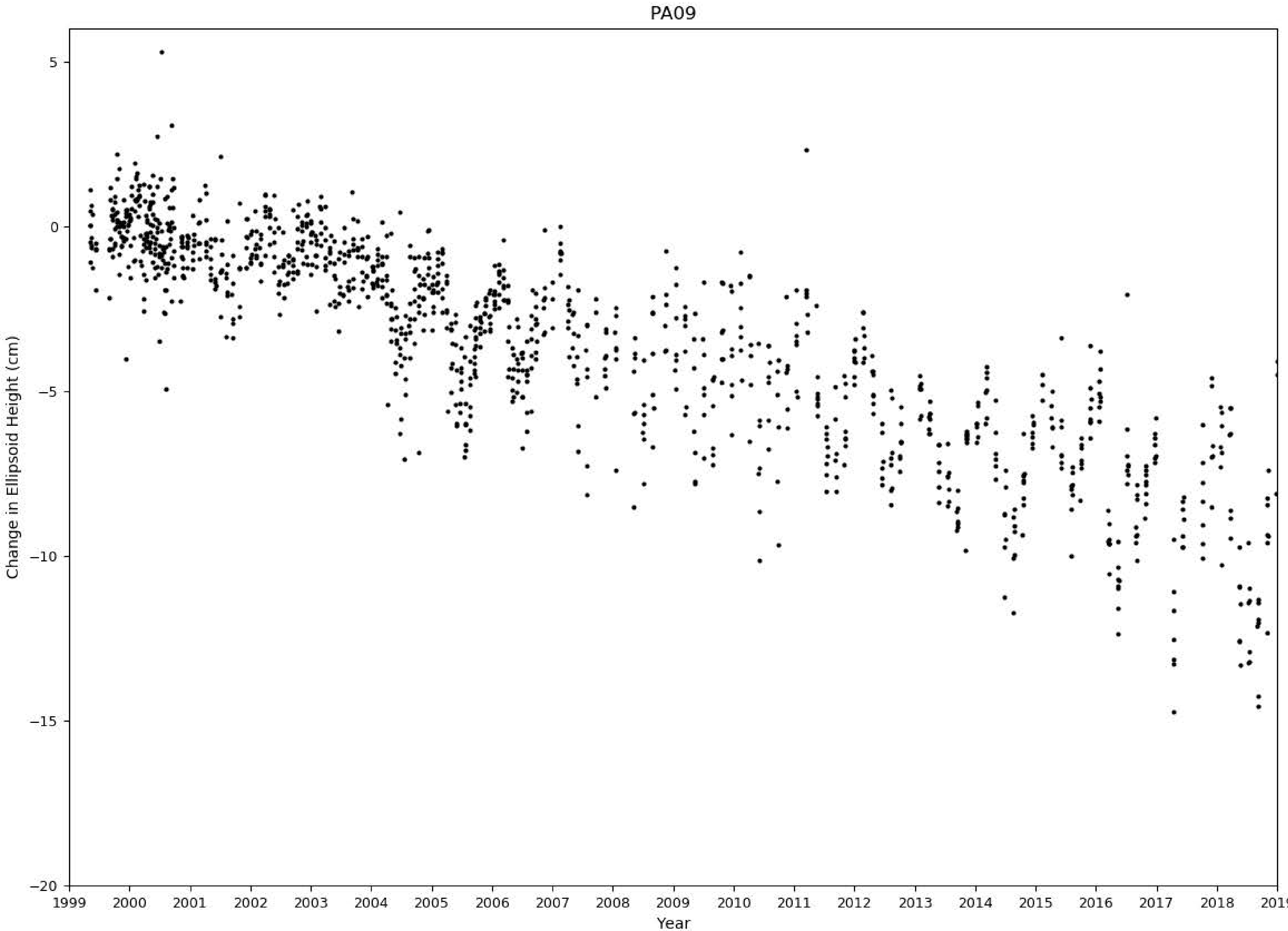
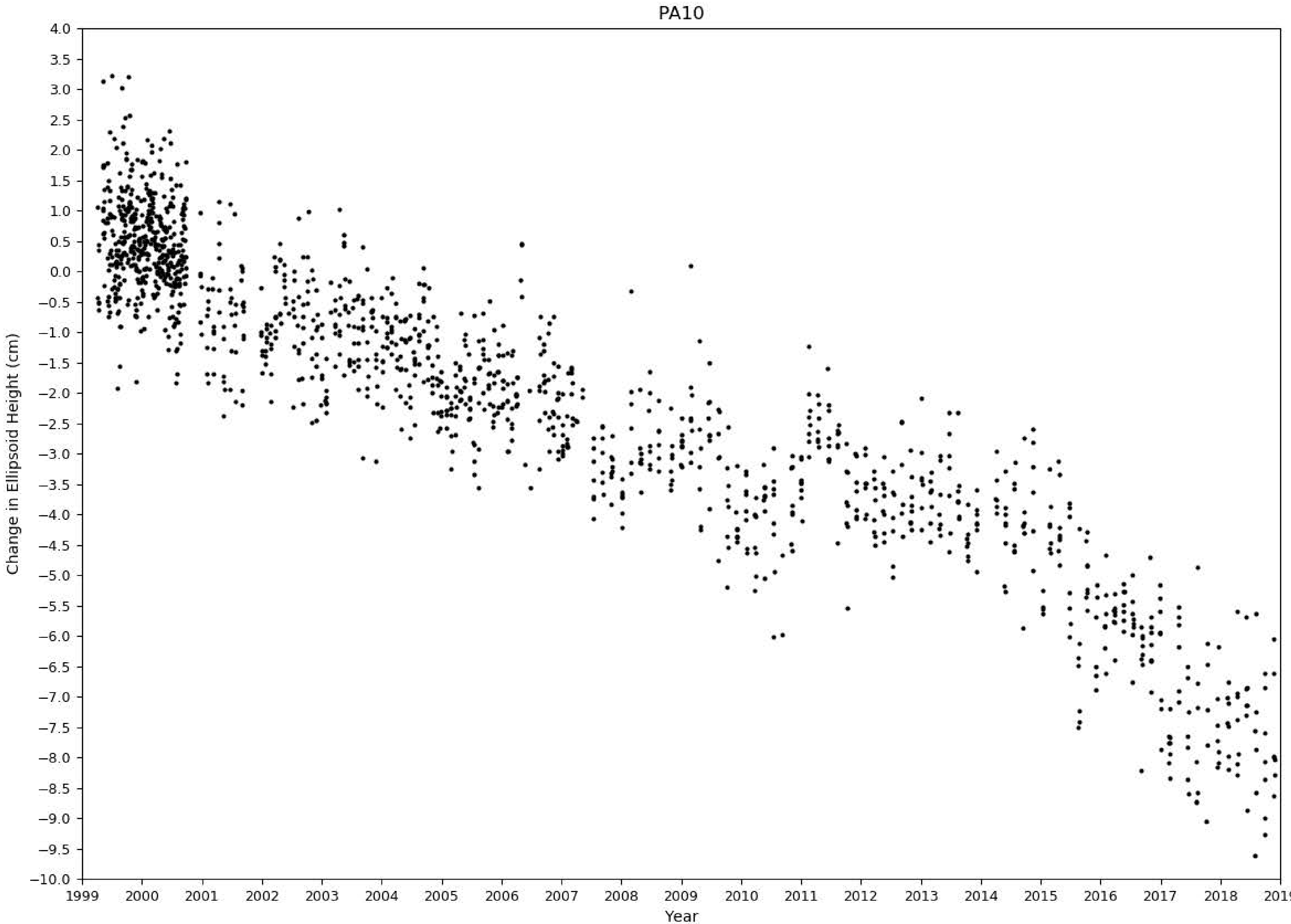
2015
2016
2017
2018
2019


PA09
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA10
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
1999
2000
2001
2002
2003
2004
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2006
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2008
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2010
2011
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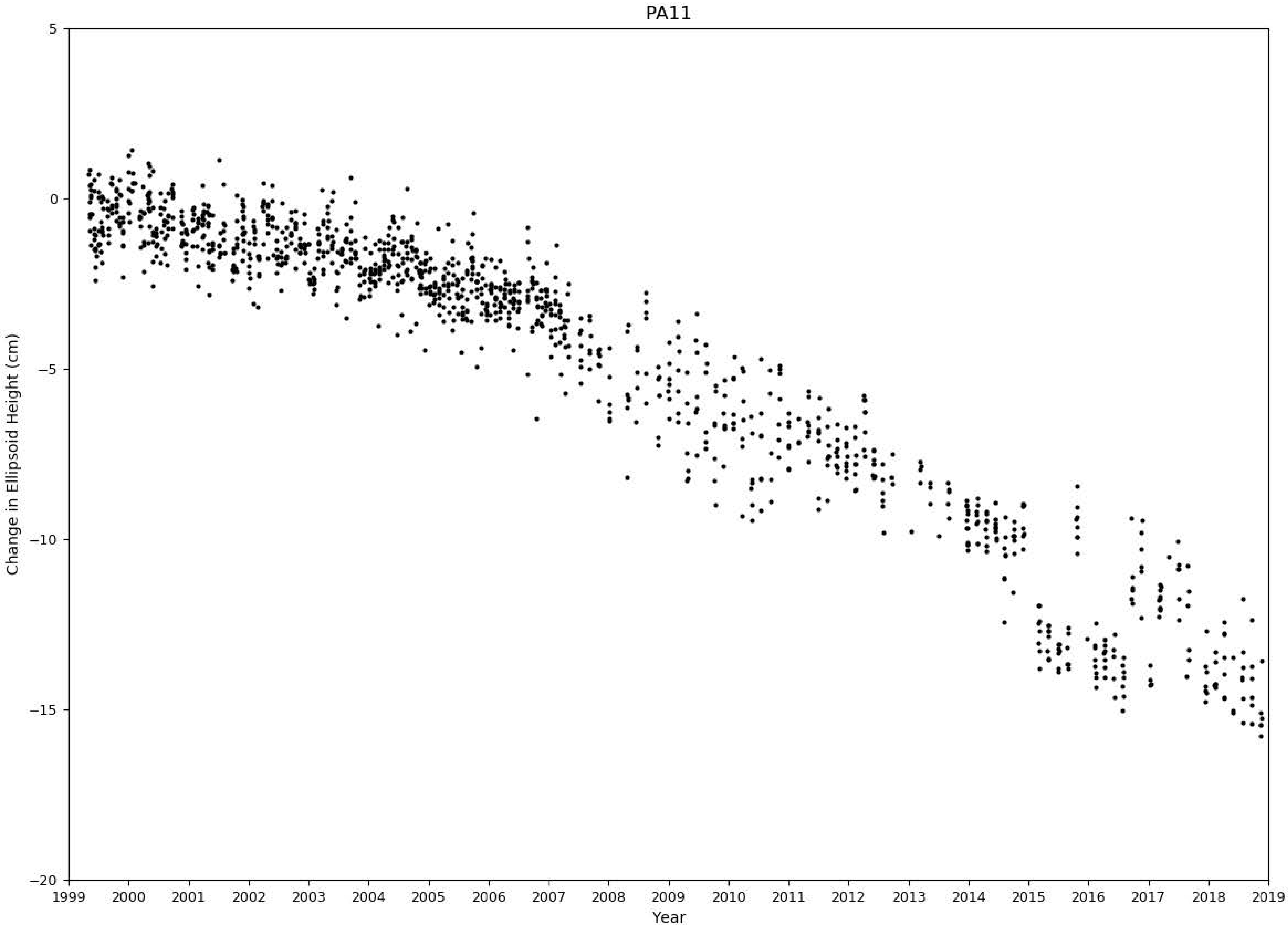
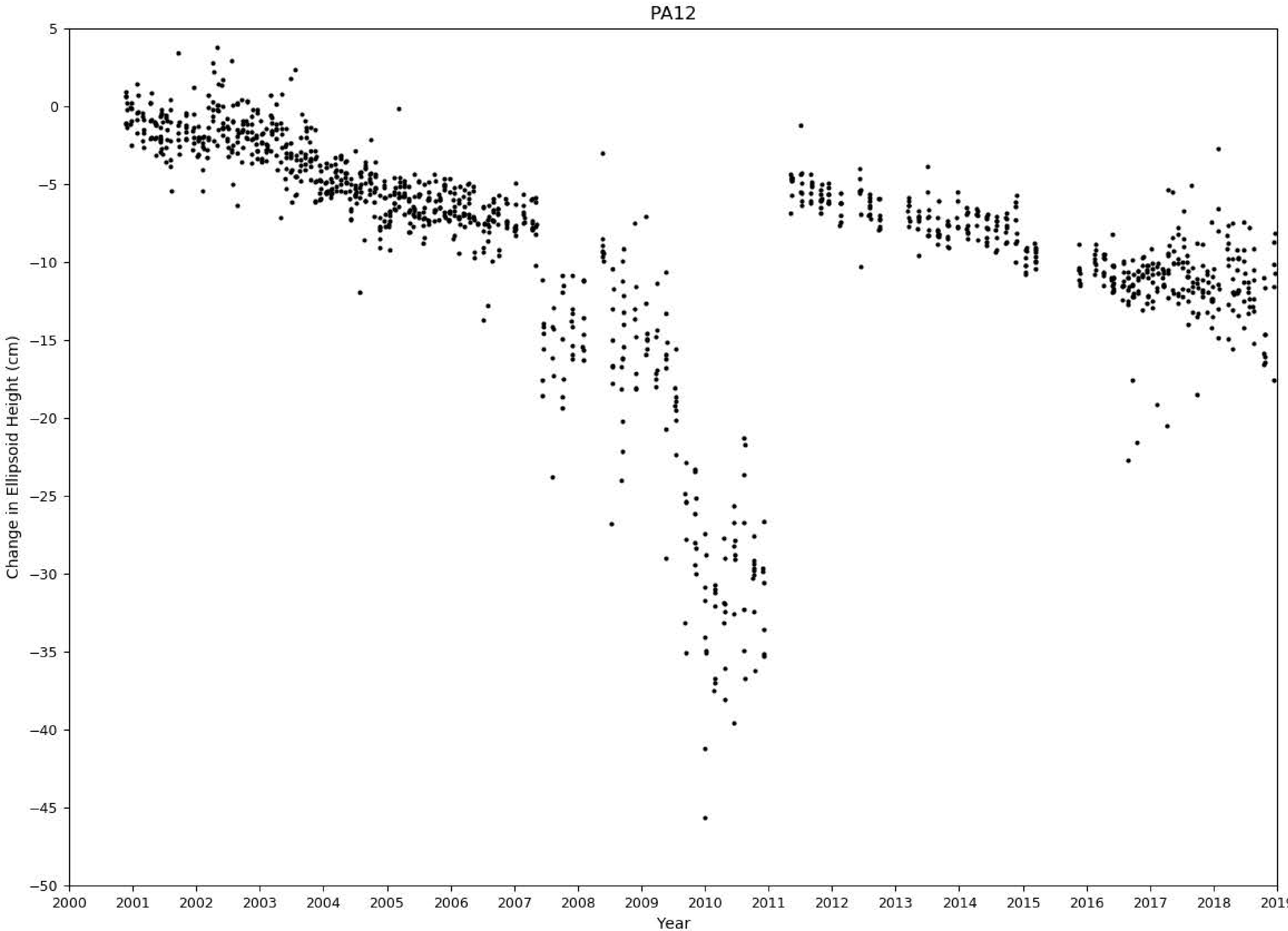
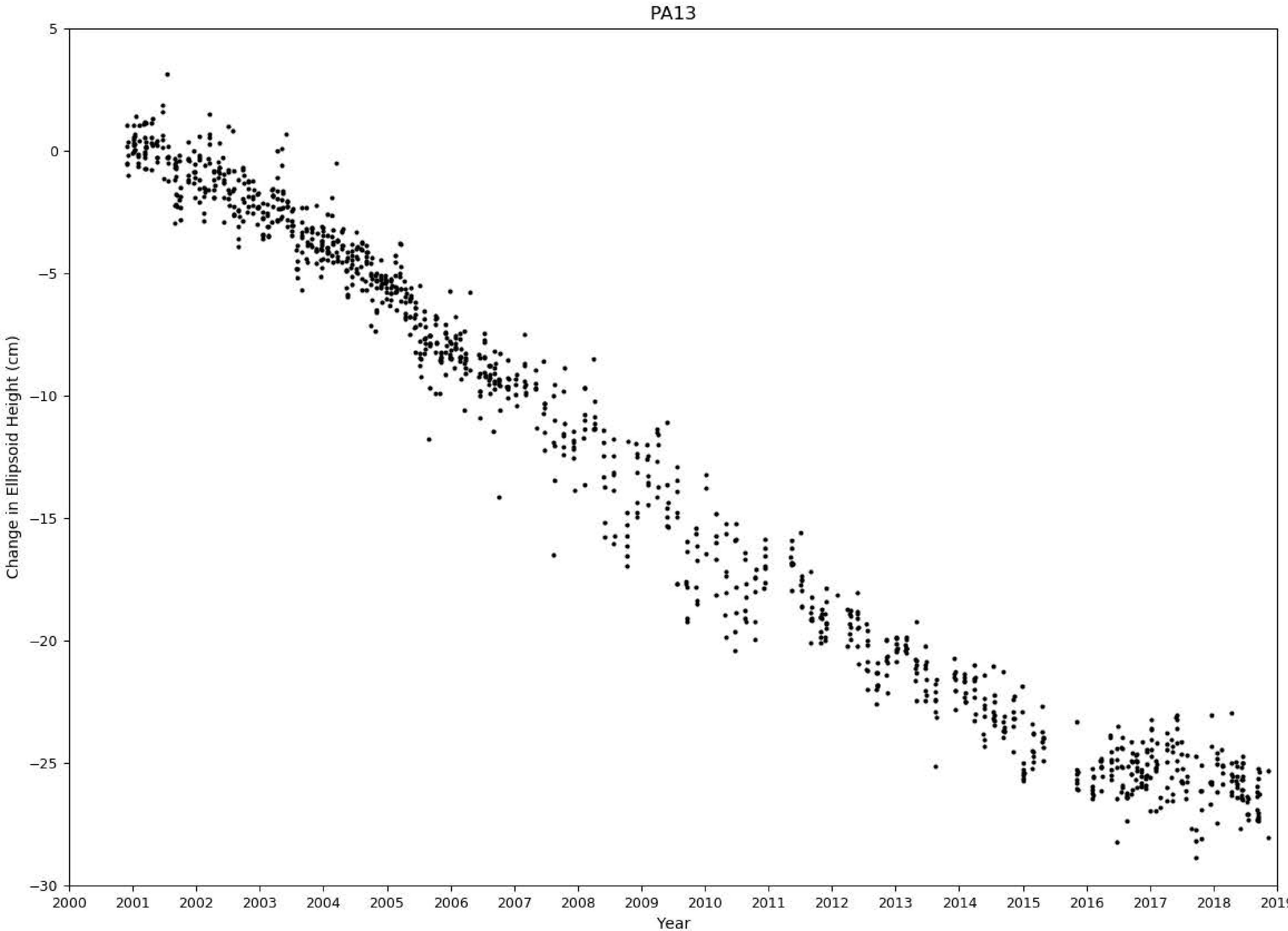
2013
2014
2015
2016
2017
2018
2019
Year


PA11
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA12
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


PA13
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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2014
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2016
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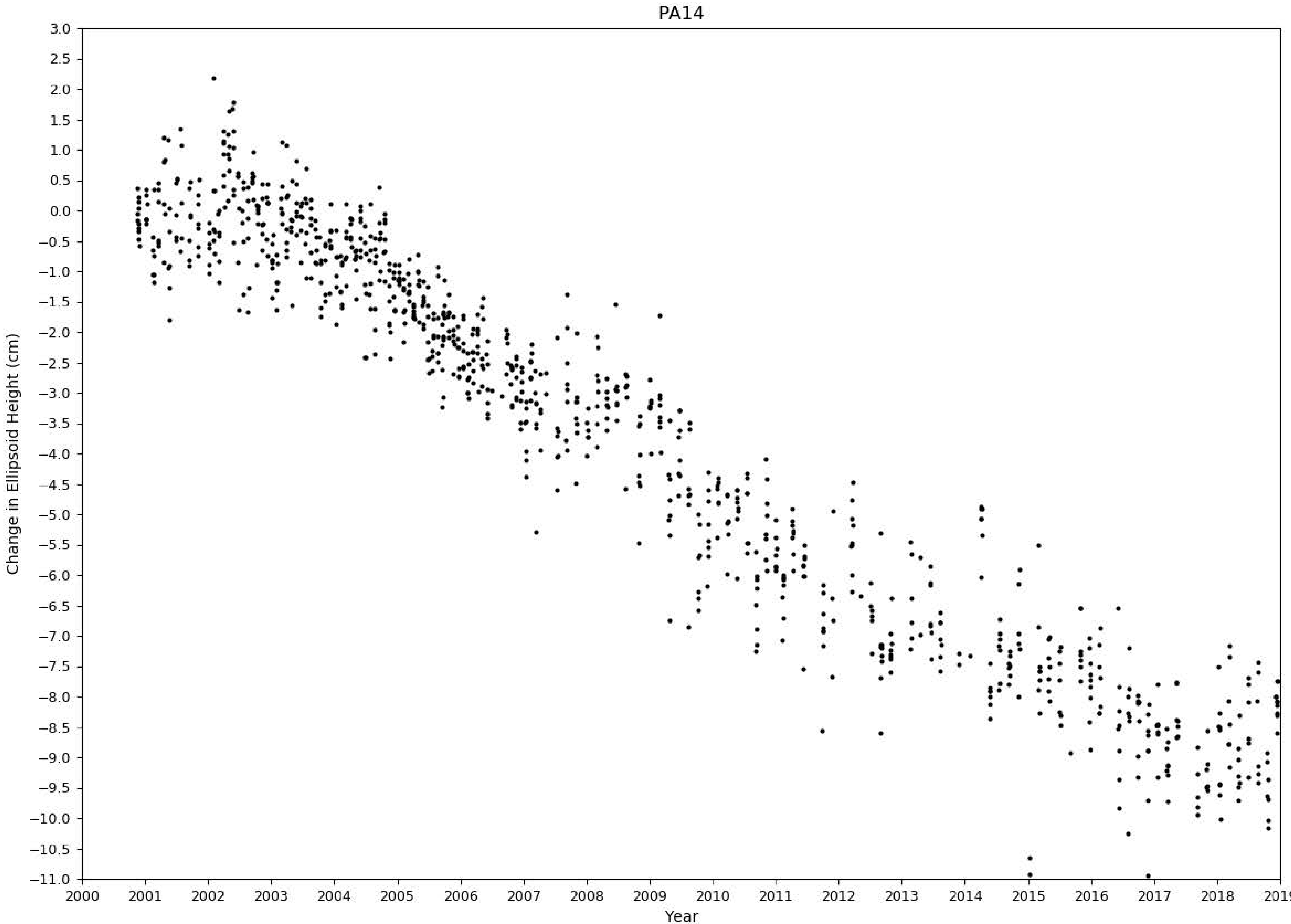
2018
2019


PA14
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
−11.0
2000
2001
2002
2003
2004
2005
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2007
2008
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2010
2011
2012
2013
2014
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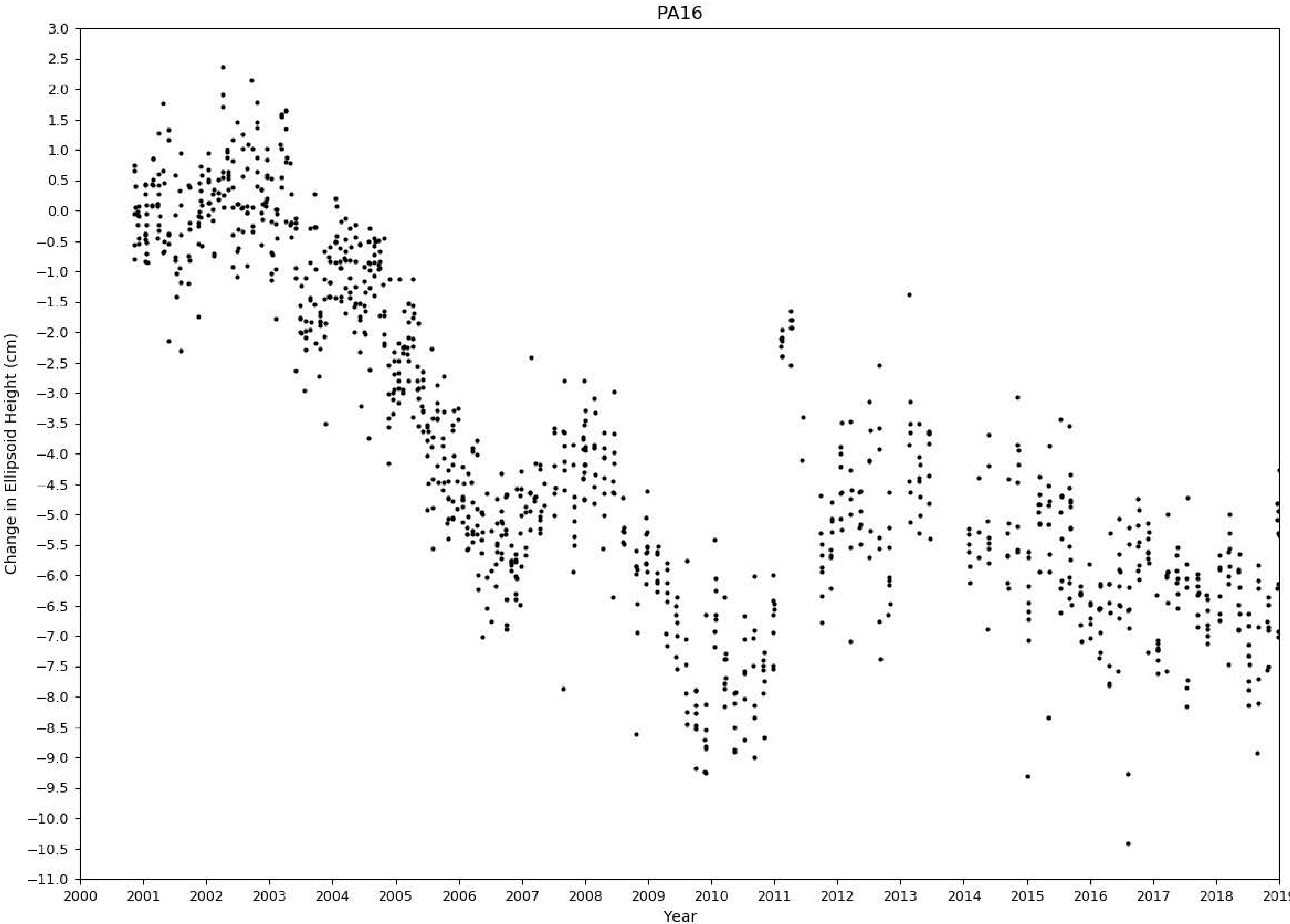
2016
2017
2018
2019


PA16
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
−11.0
2000
2001
2002
2003
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2011
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2013
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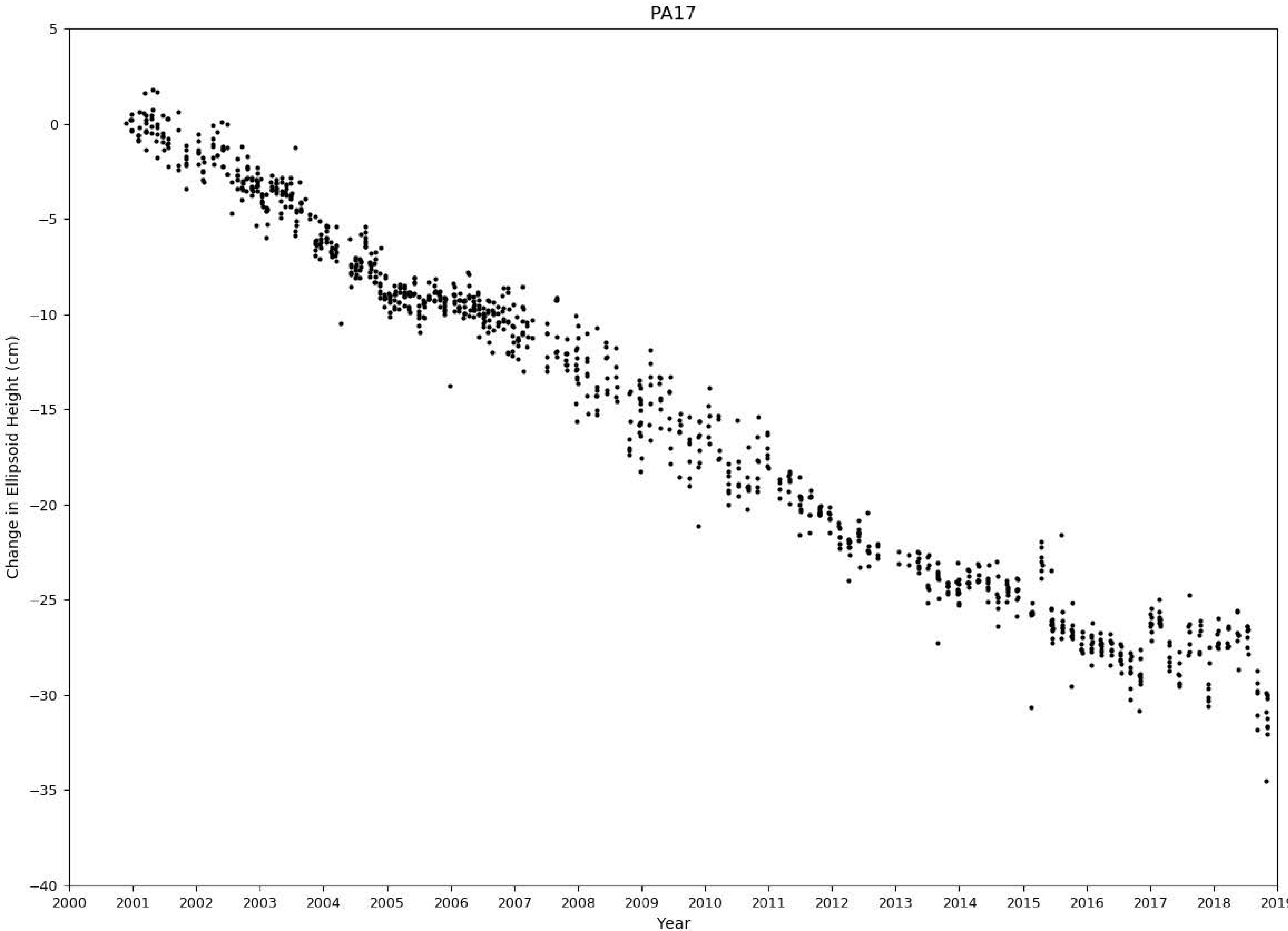
2017
2018
2019
Year


PA17
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
−35
−40
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
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2012
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2016
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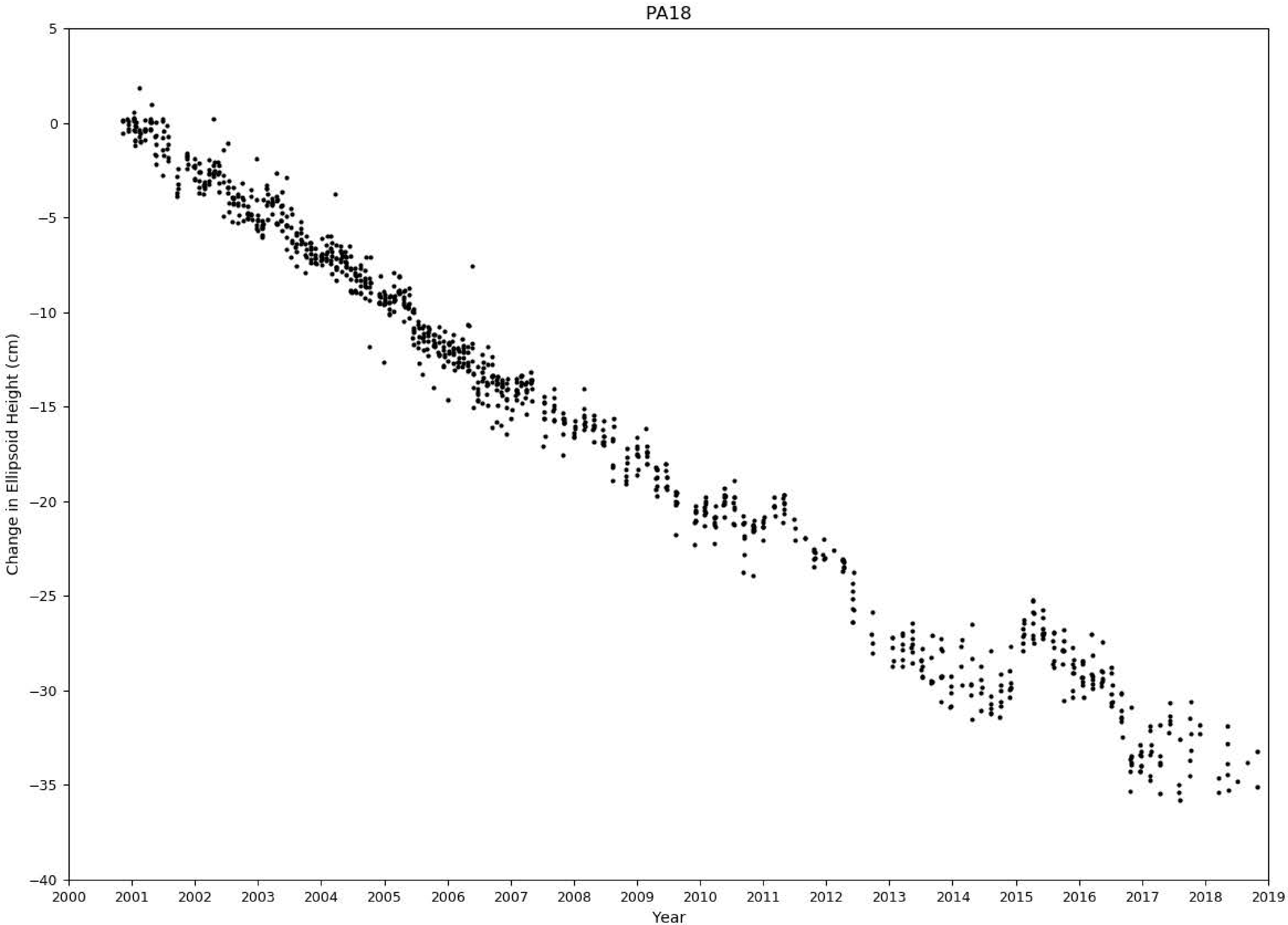
2018
2019


PA18
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
−25
−30
−35
−40
2000
2001
2002
2003
2004
2005
2006
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2008
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2011
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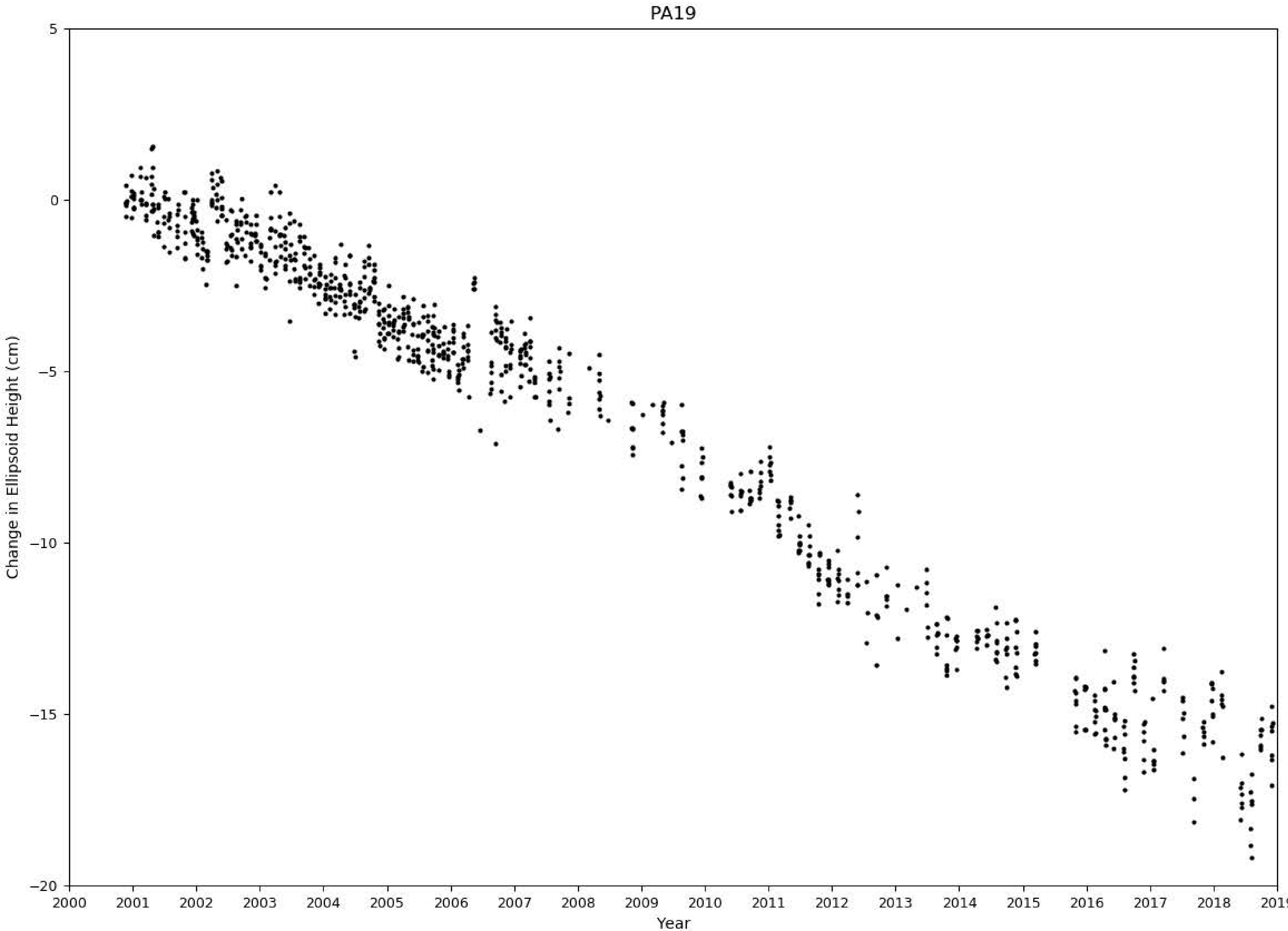
2019
Year


PA19
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2000
2001
2002
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2006
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2008
2009
2010
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2013
2014
2015
2016
2017
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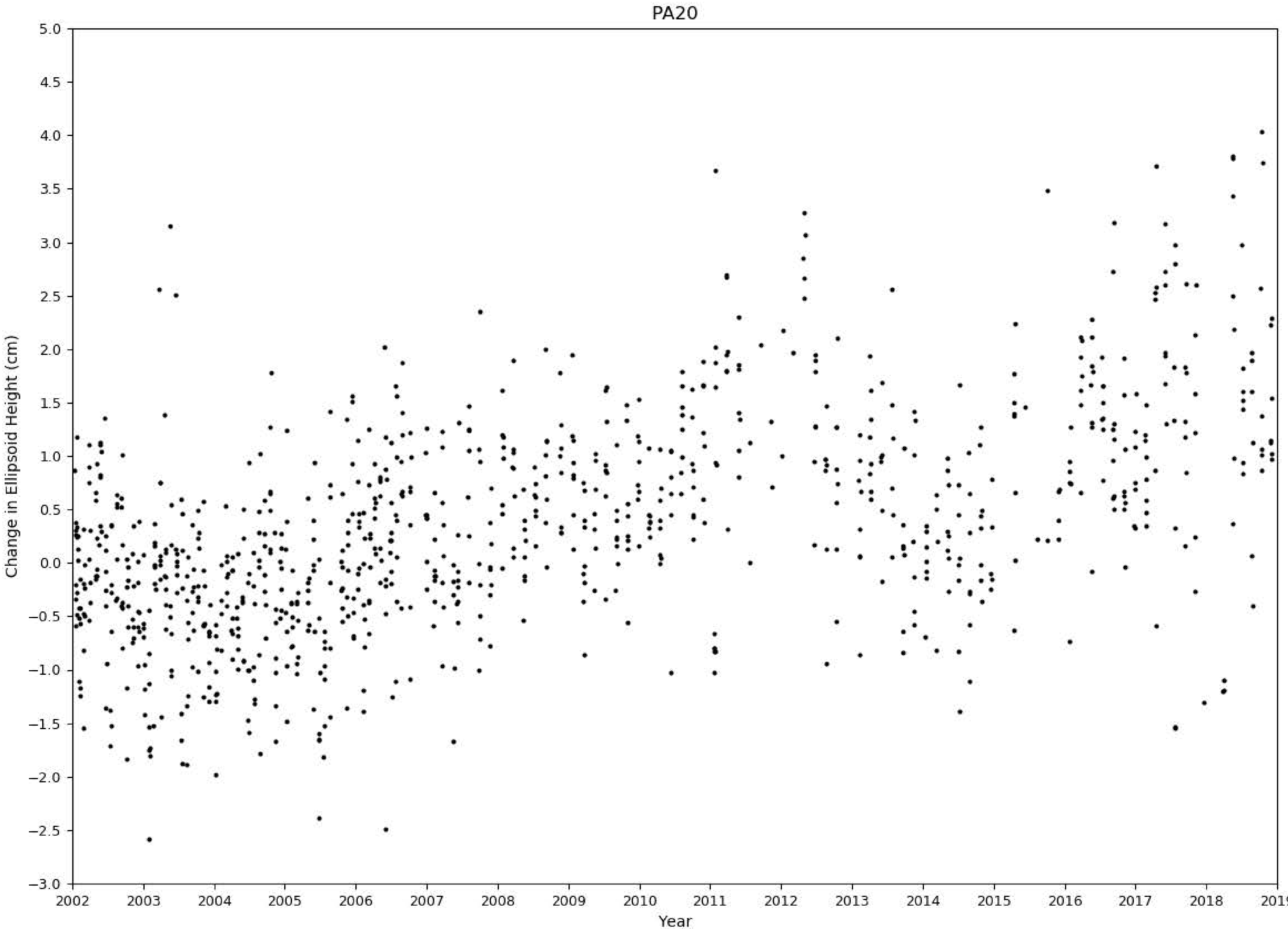
2019
Year


PA20
Change in Ellipsoid Height (cm)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2002
2003
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2010
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2013
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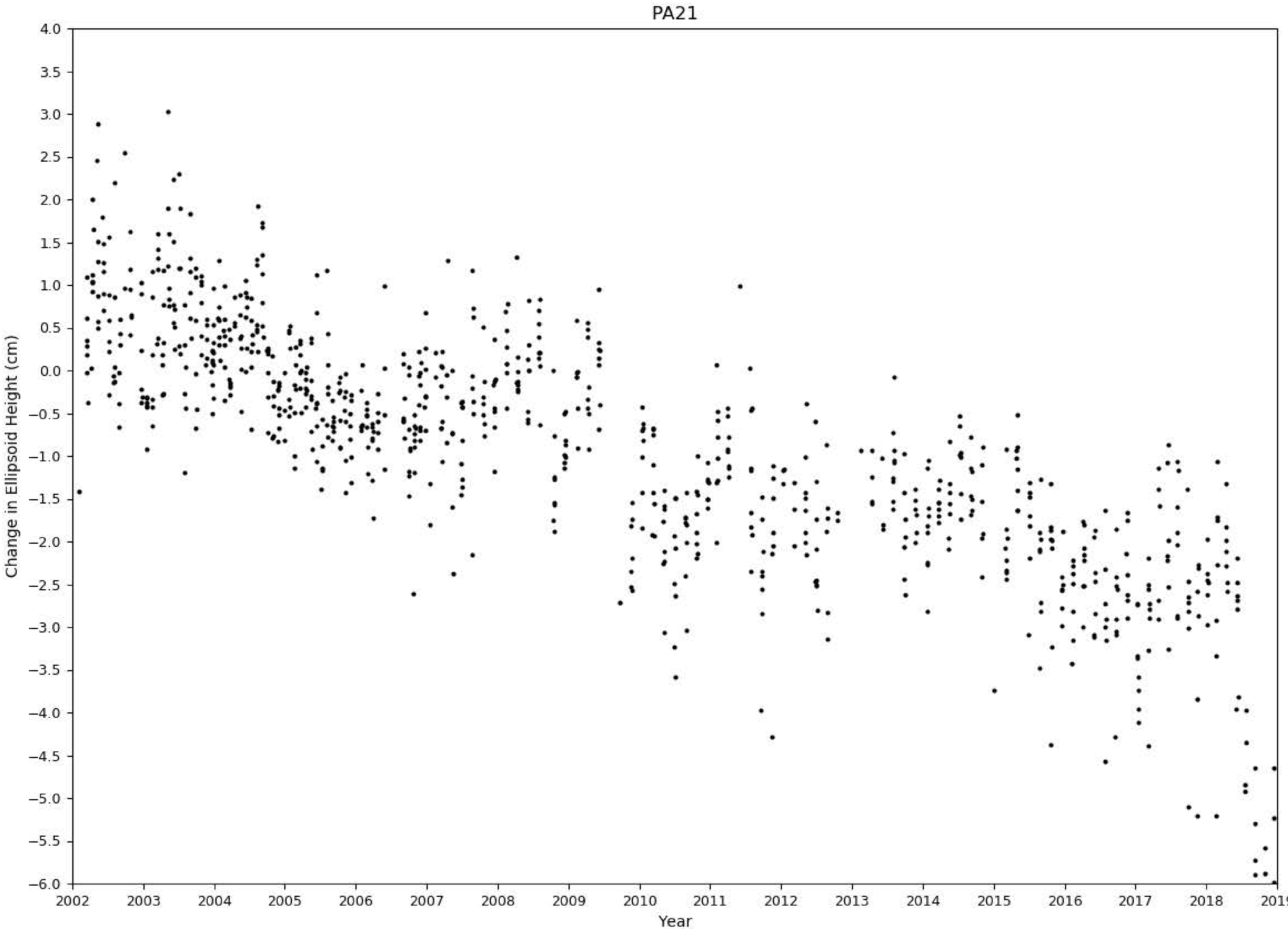
2015
2016
2017
2018
2019
Year


PA21
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2002
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2004
2005
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2016
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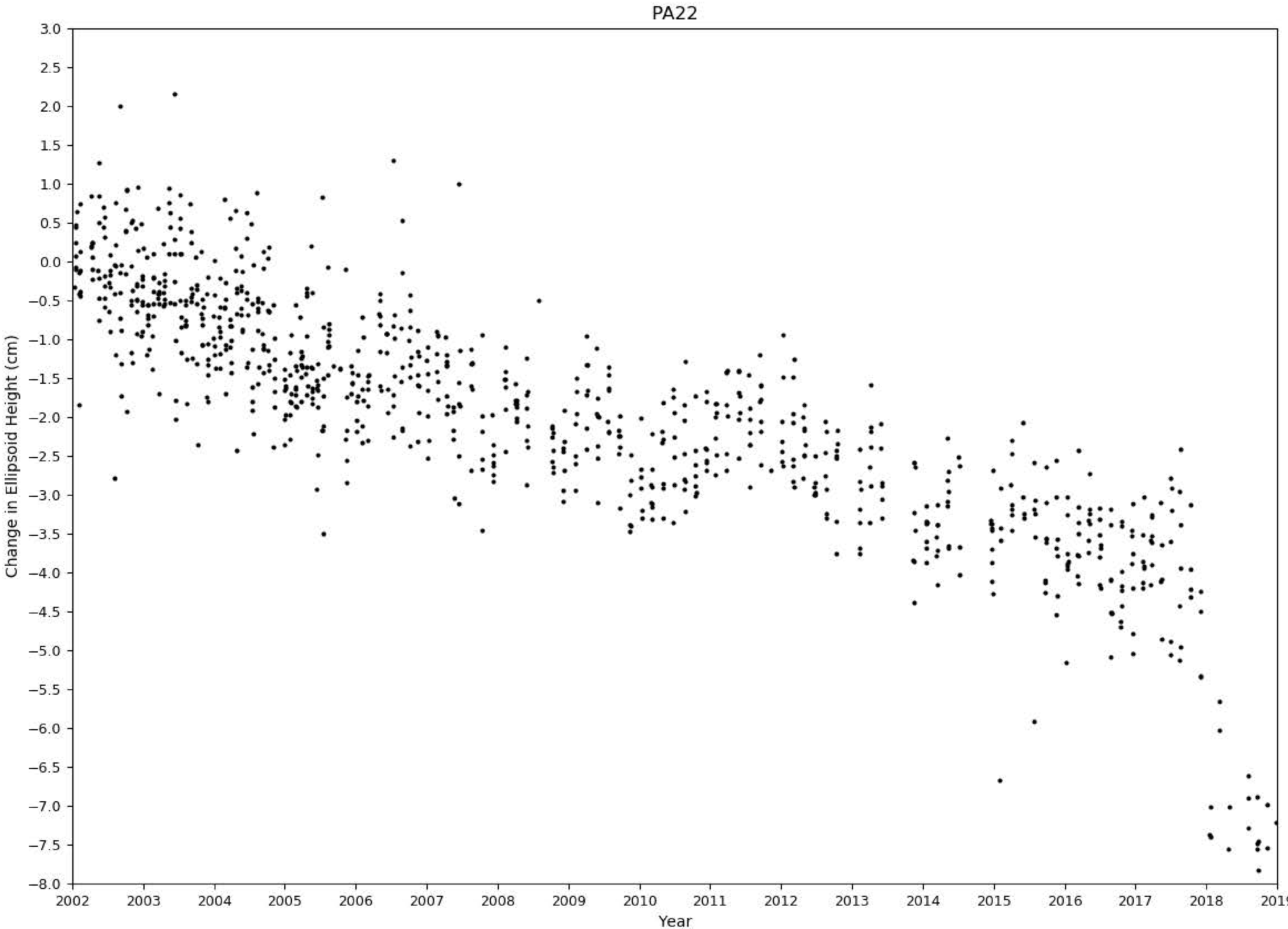
2018
2019


PA22
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2002
2003
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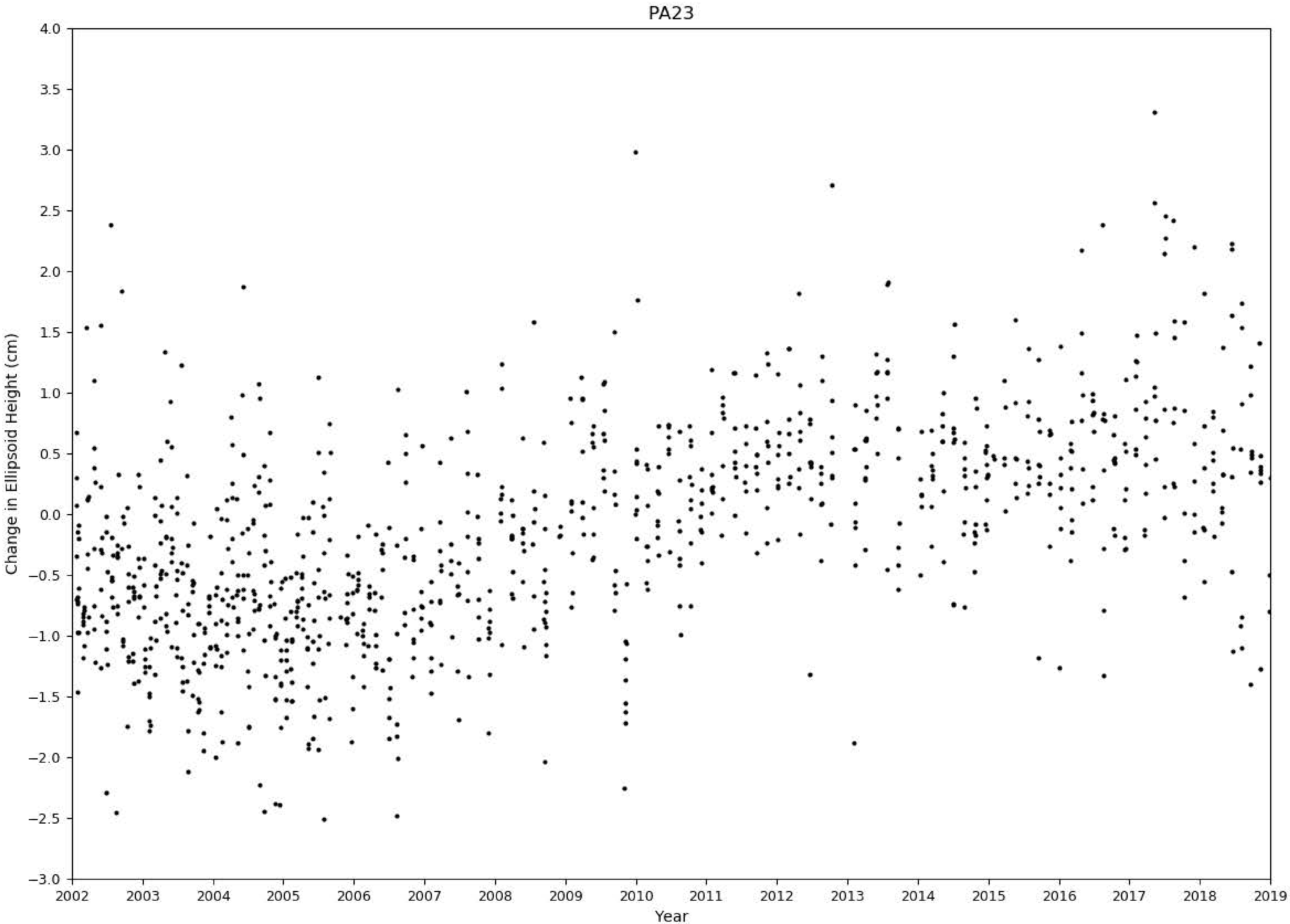
2016
2017
2018
2019
Year


PA23
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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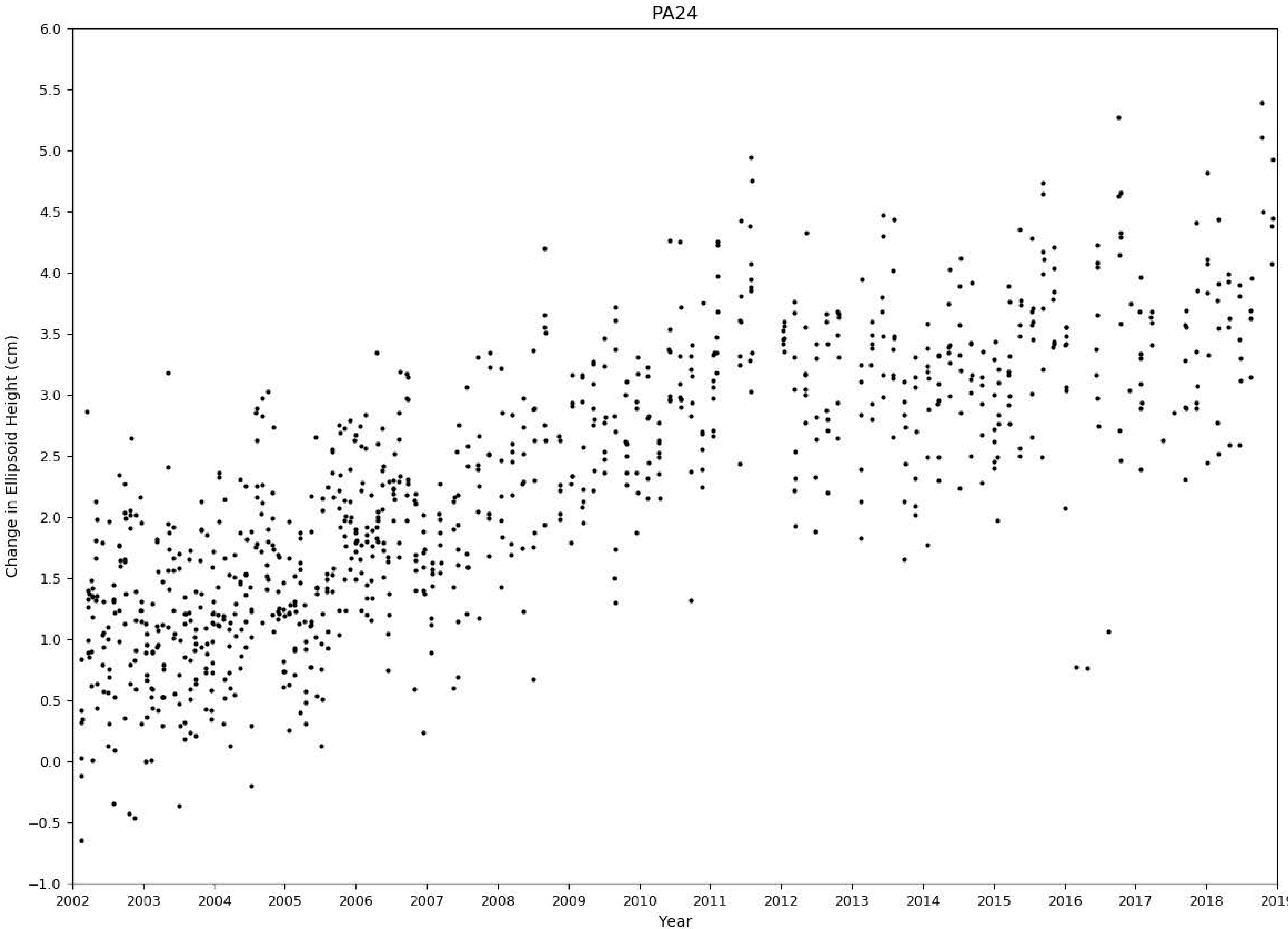
2015
2016
2017
2018
2019
Year


PA24
Change in Ellipsoid Height (cm)
Year
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
2002
2003
2004
2005
2006
2007
2008
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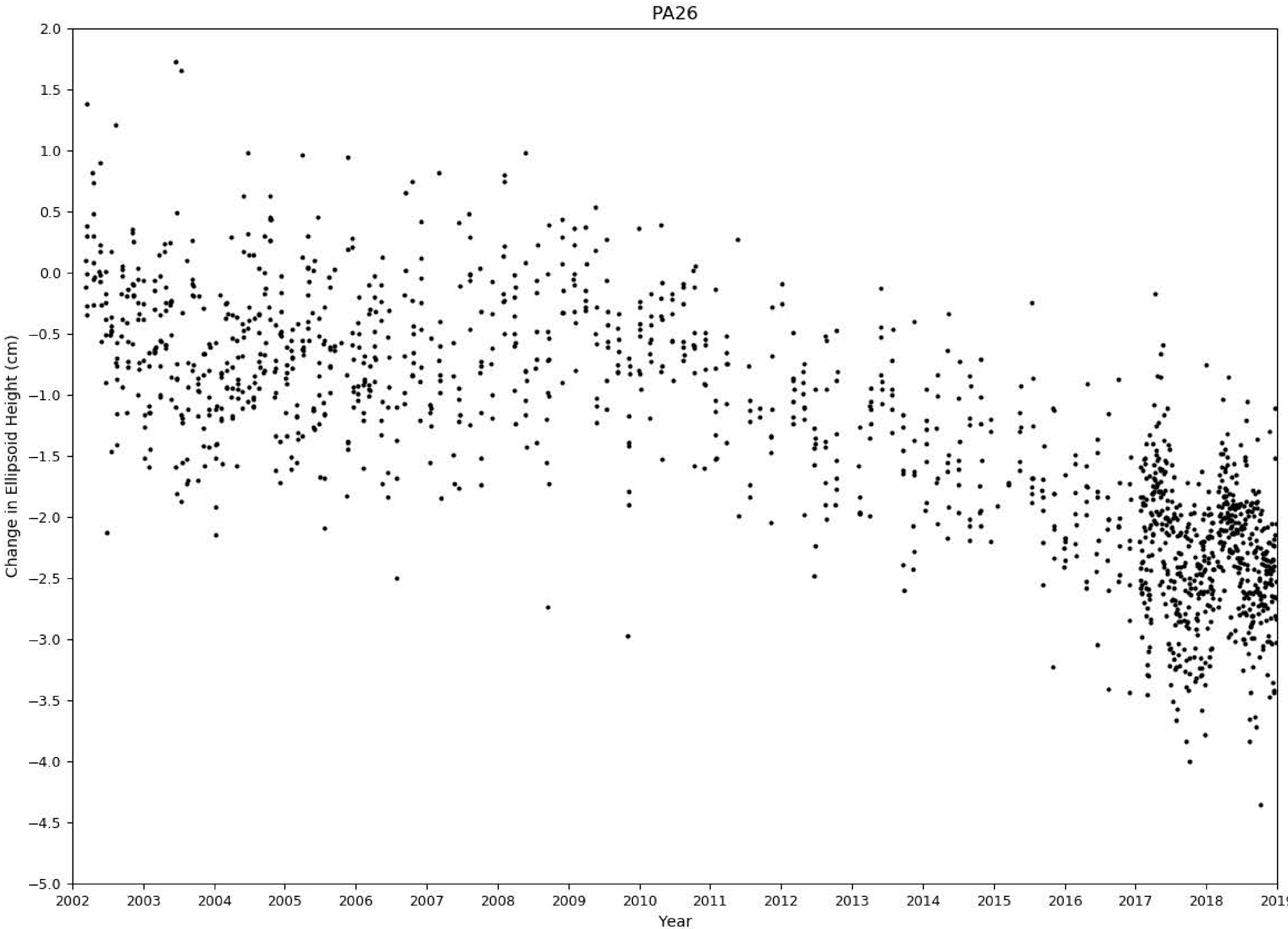
2017
2018
2019


PA26
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2002
2003
2004
2005
2006
2007
2008
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2010
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2014
2015
2016
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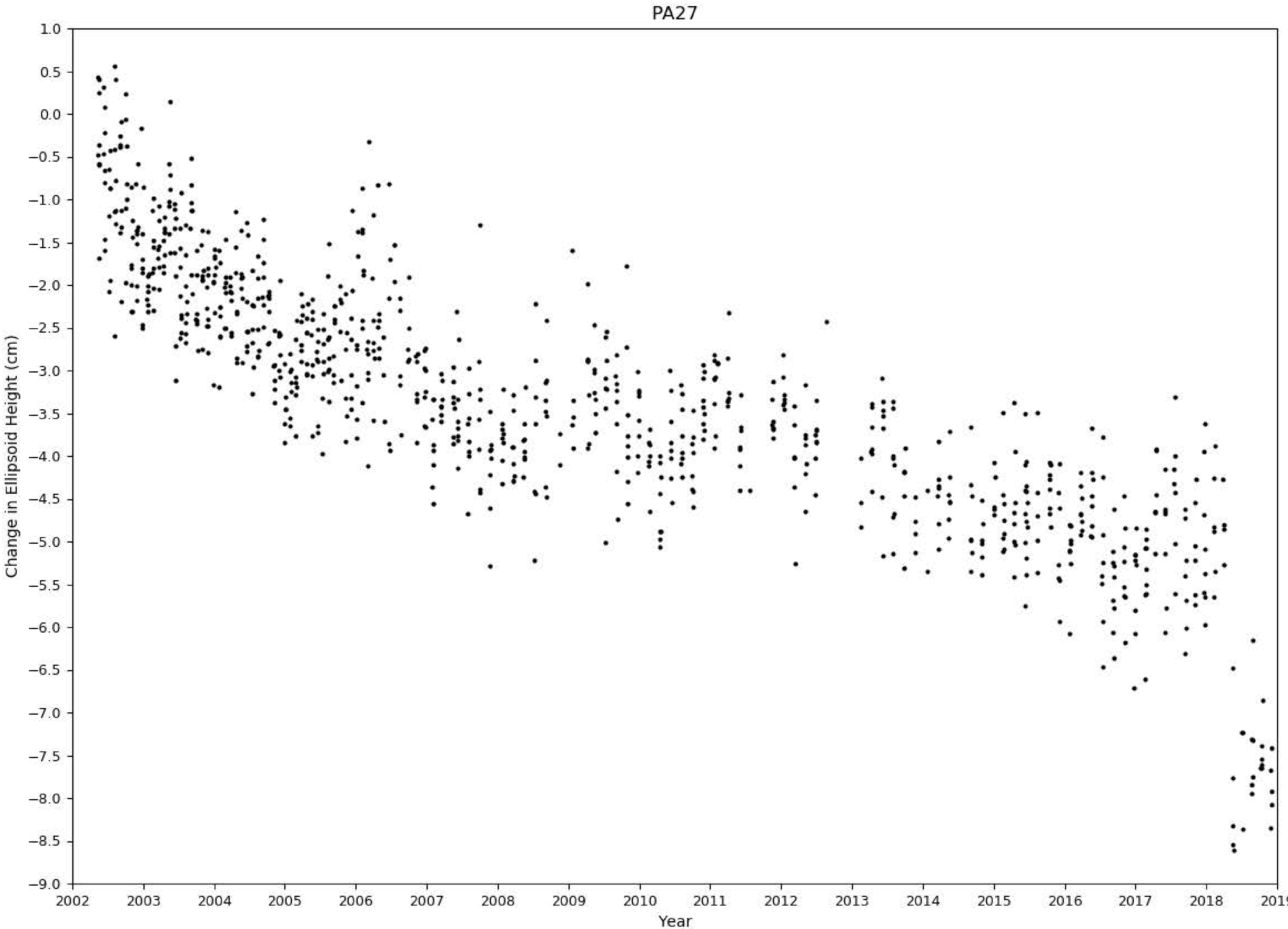
2018
2019


PA27
Change in Ellipsoid Height (cm)
Year
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
2002
2003
2004
2005
2006
2007
2008
2009
2010
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2012
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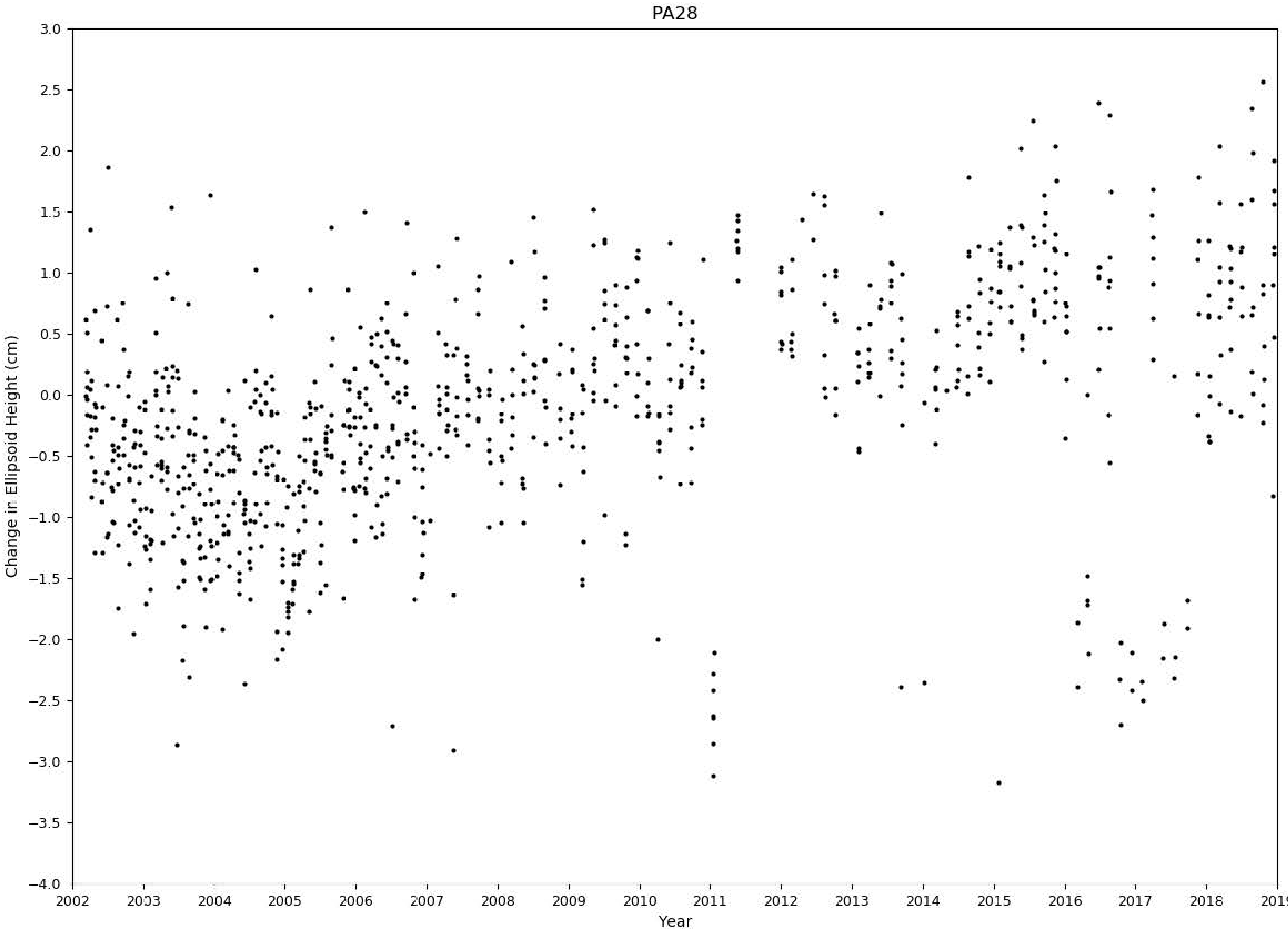
2016
2017
2018
2019


PA28
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2002
2003
2004
2005
2006
2007
2008
2009
2010
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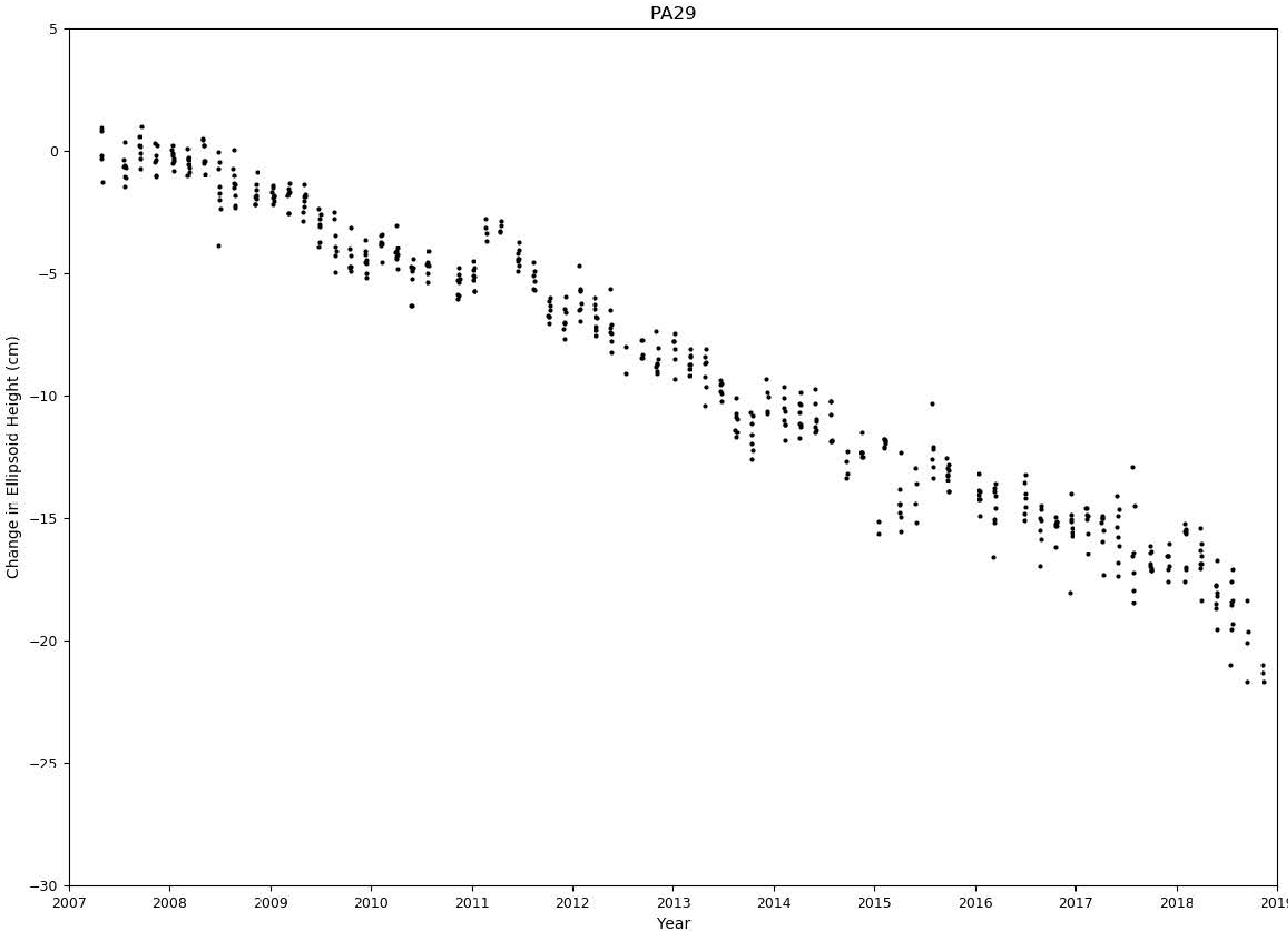
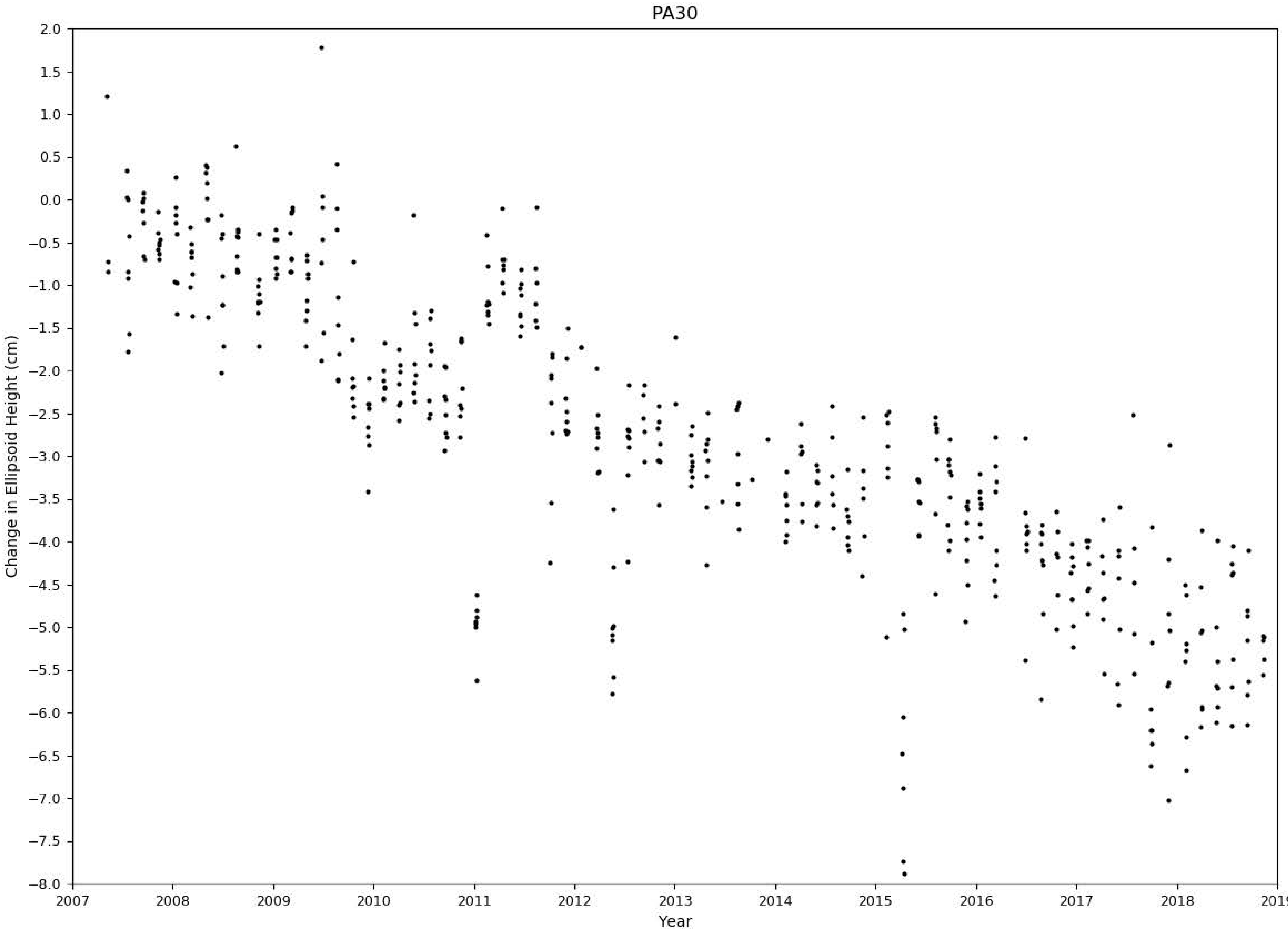
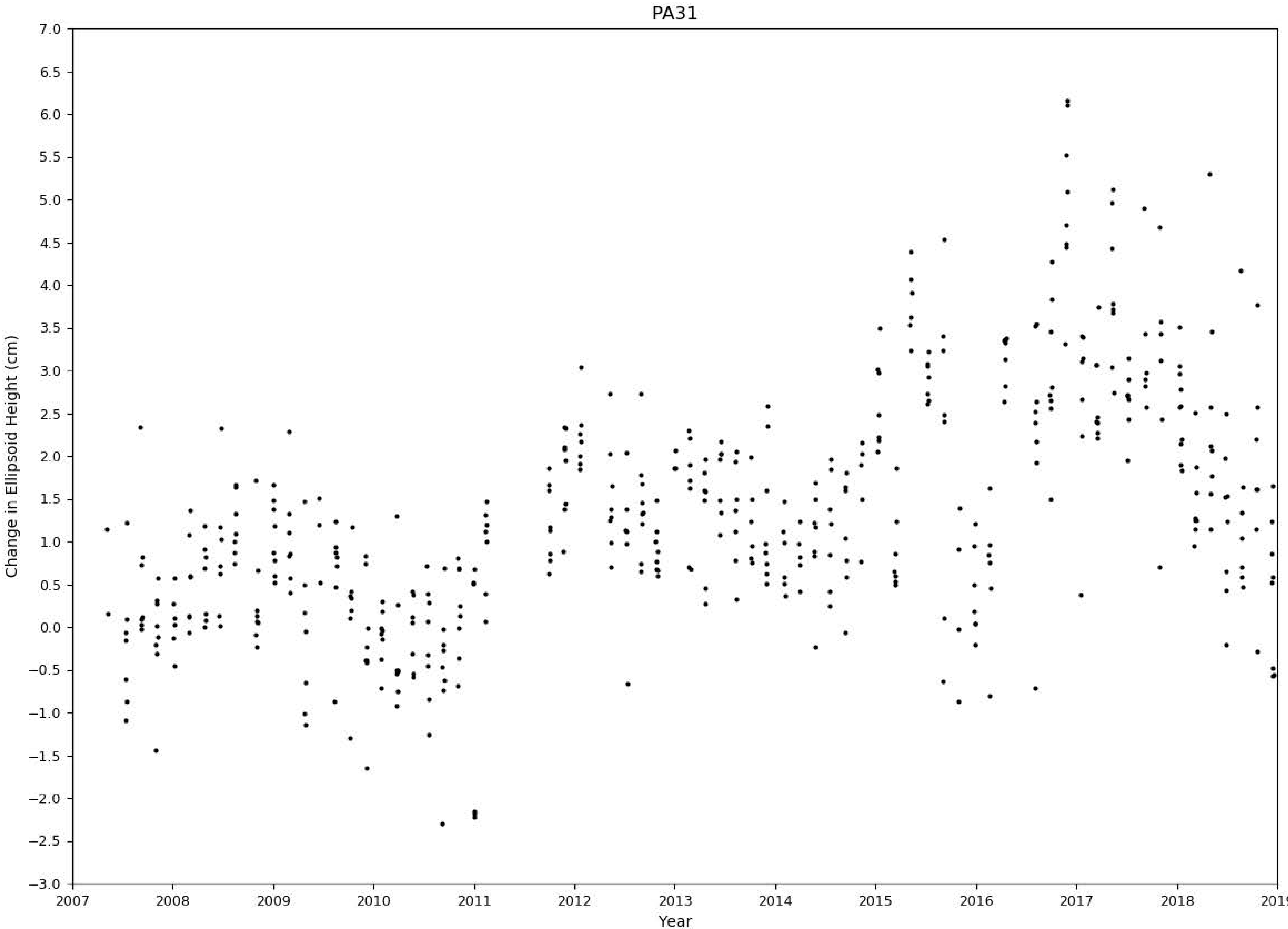
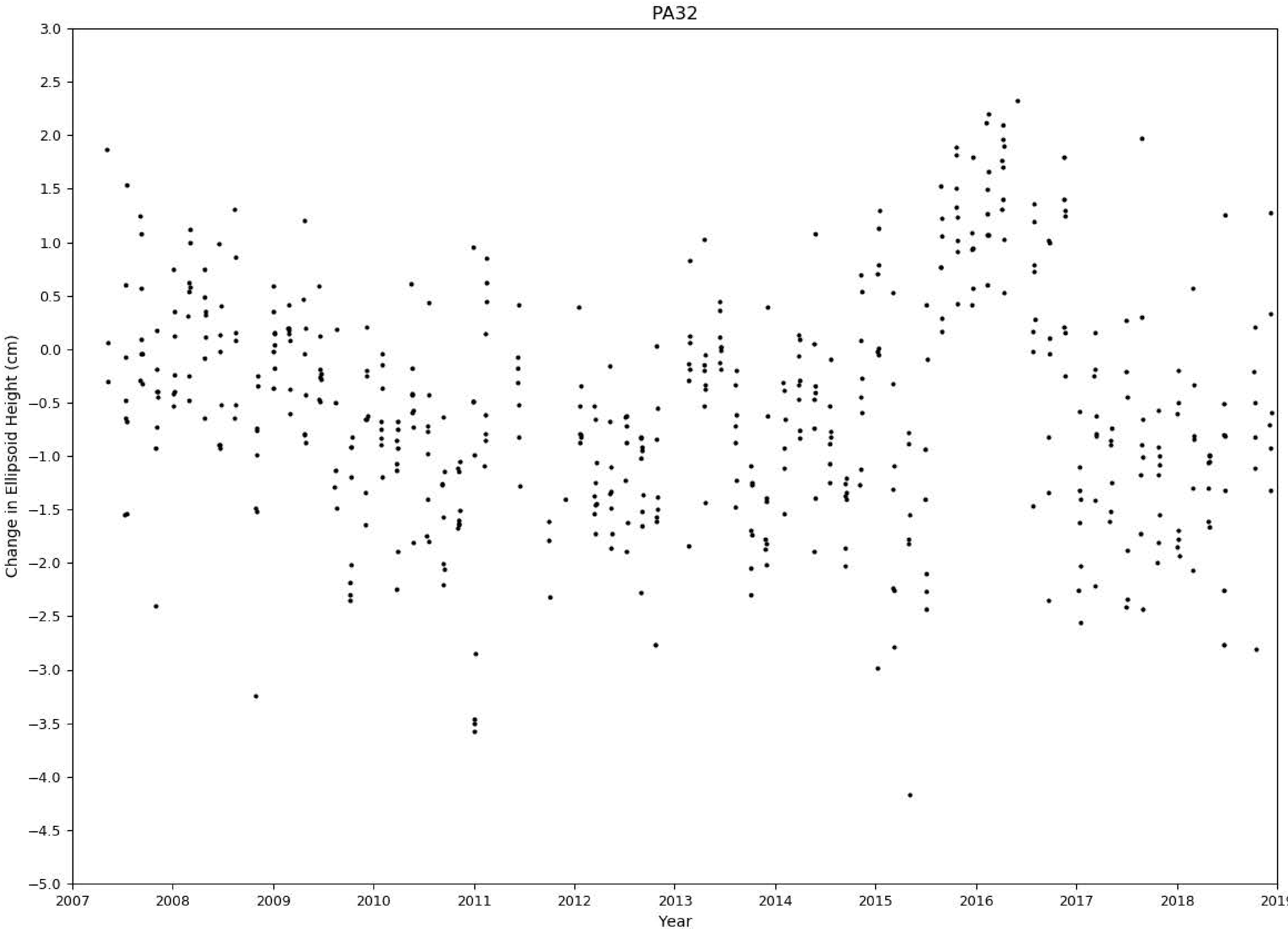
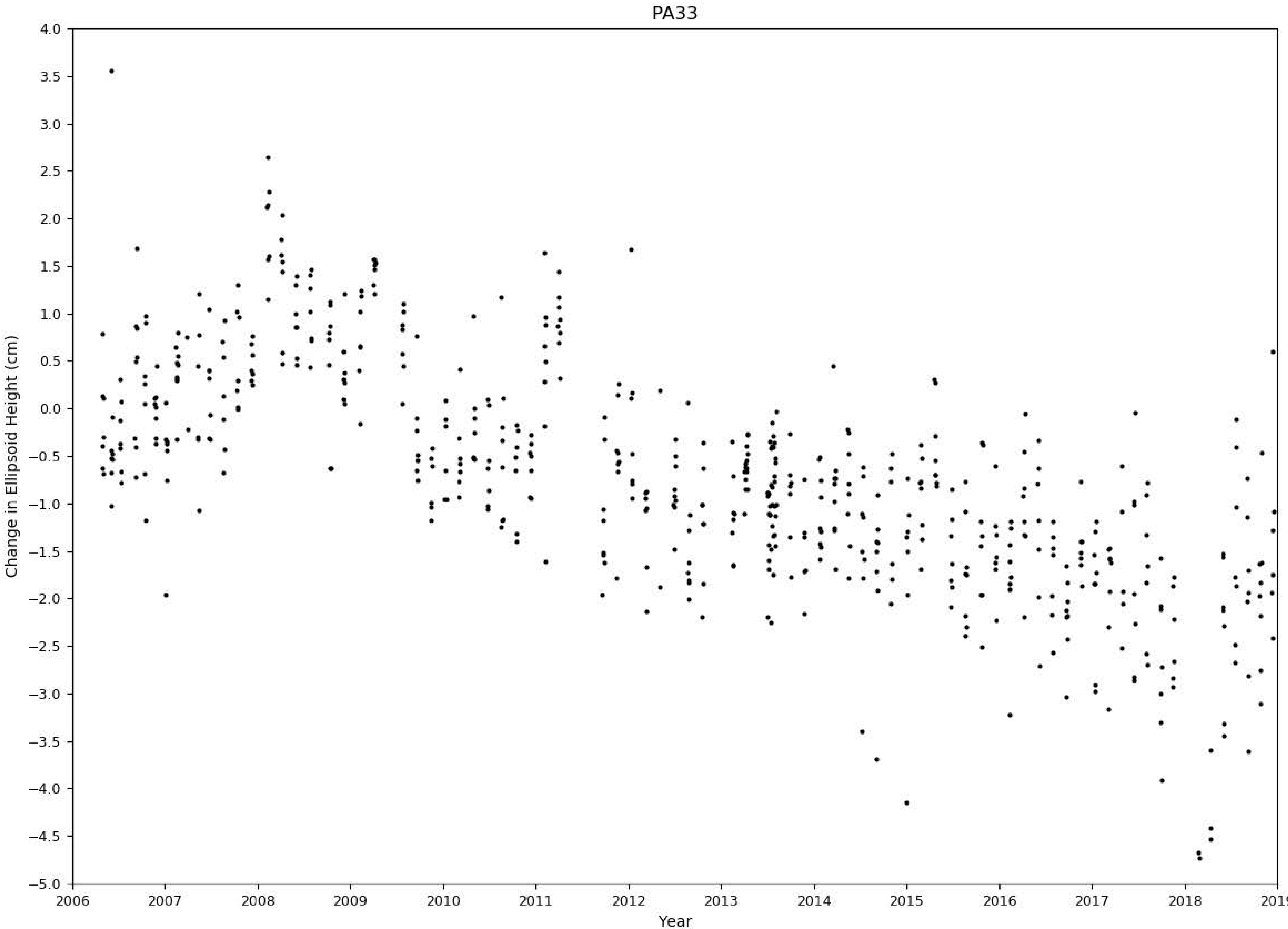
2012
2013
2014
2015
2016
2017
2018
2019

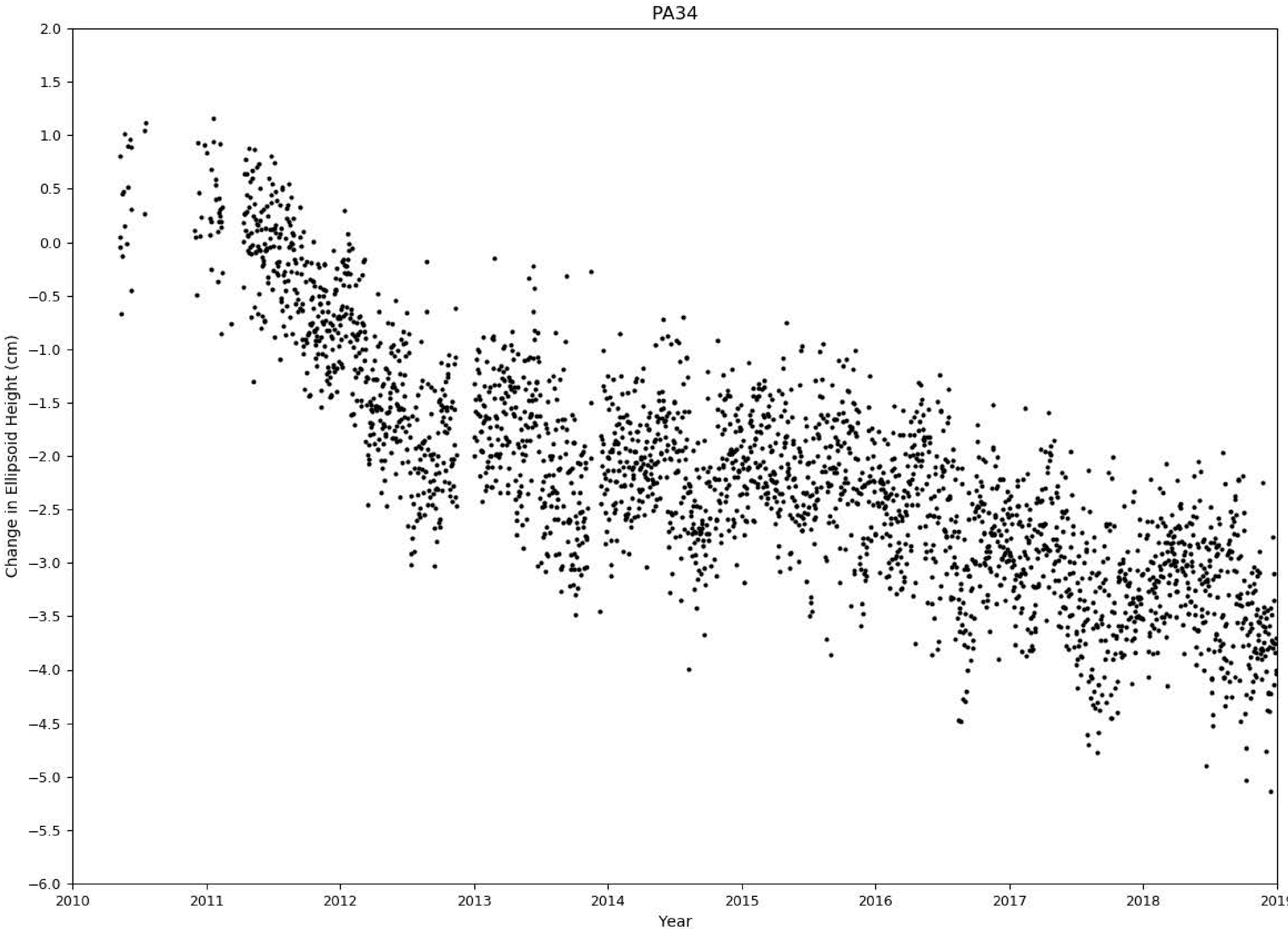

PA29
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
−25
−30
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

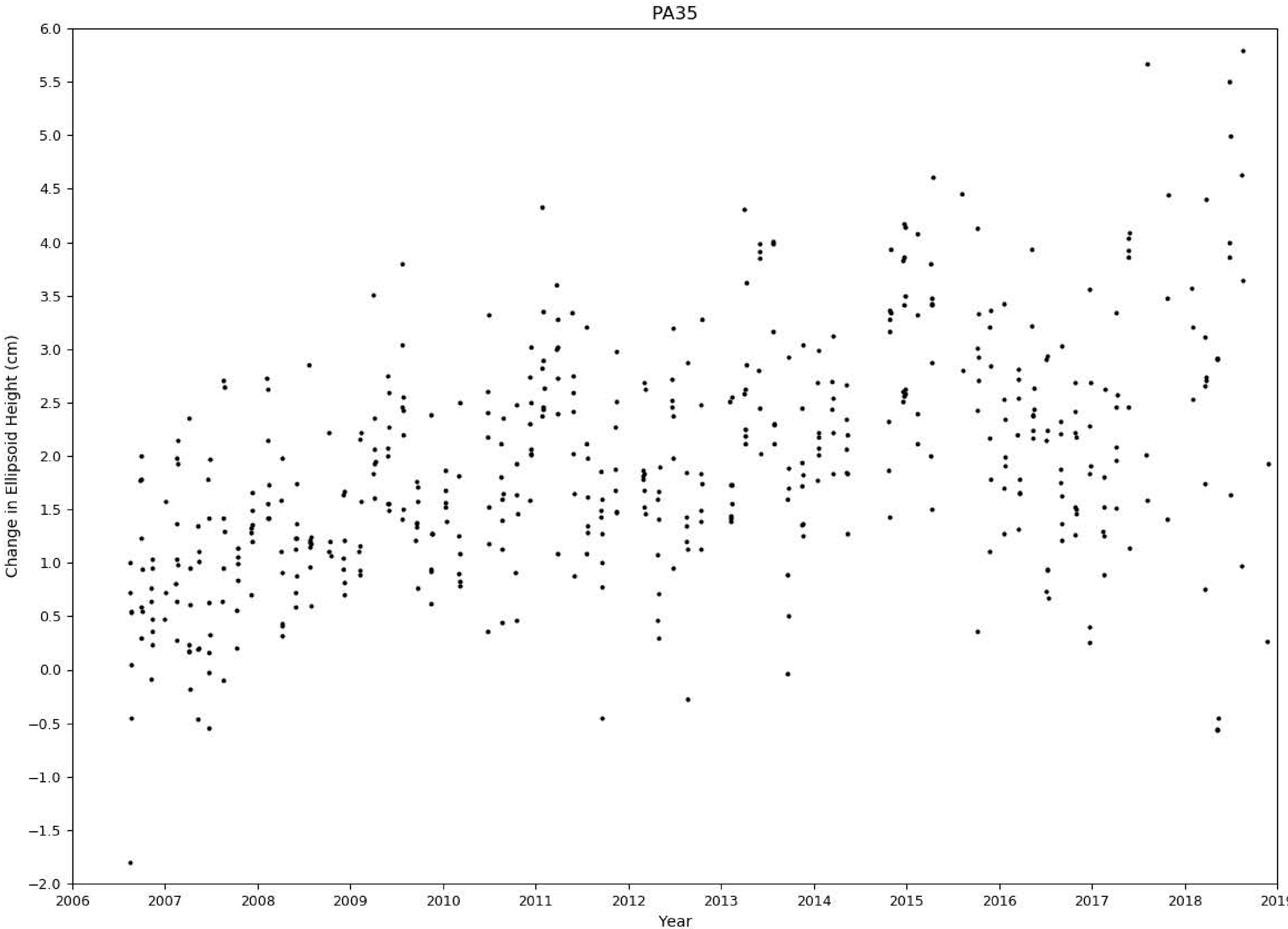

PA30
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

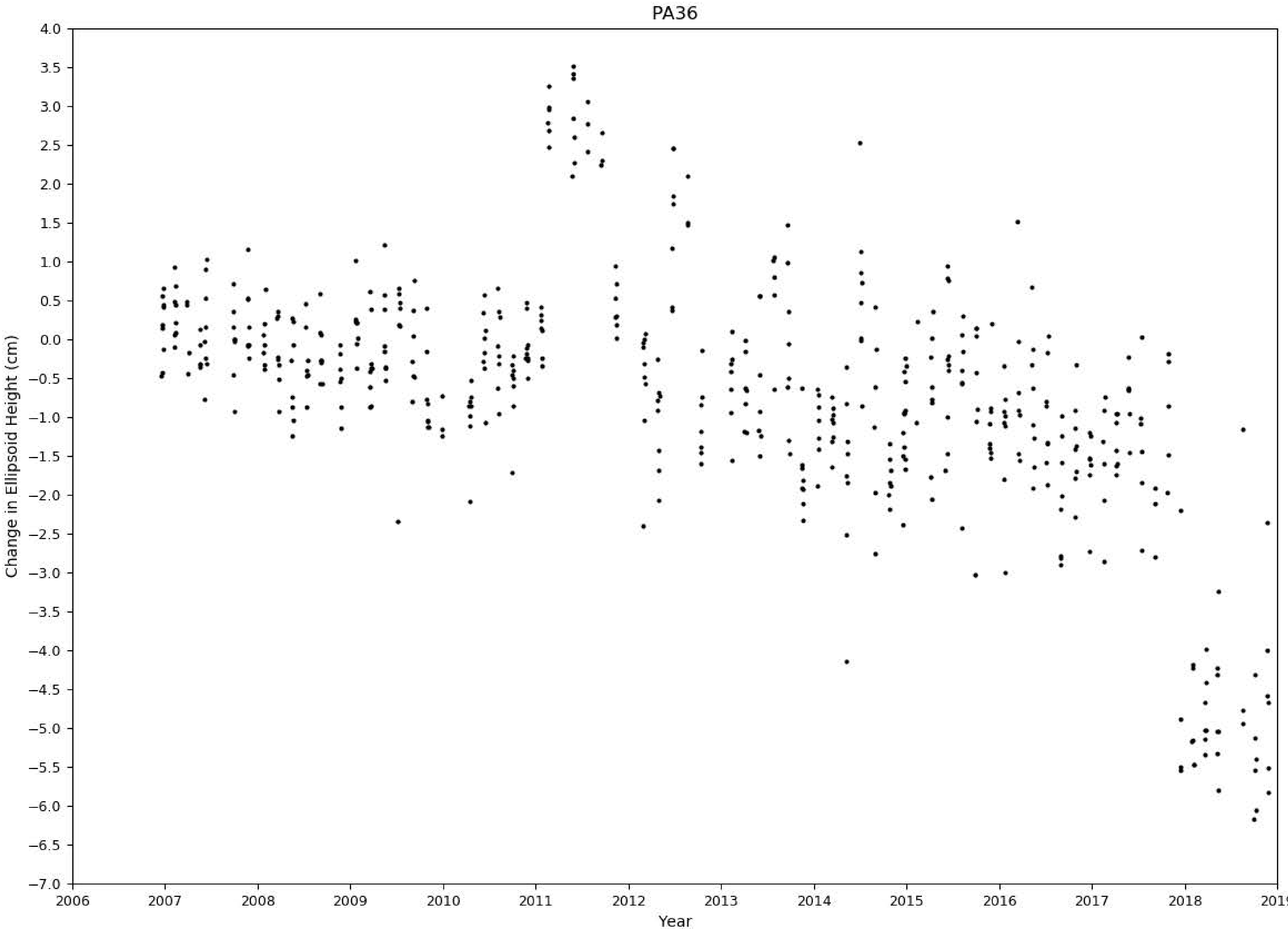

PA31
Change in Ellipsoid Height (cm)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

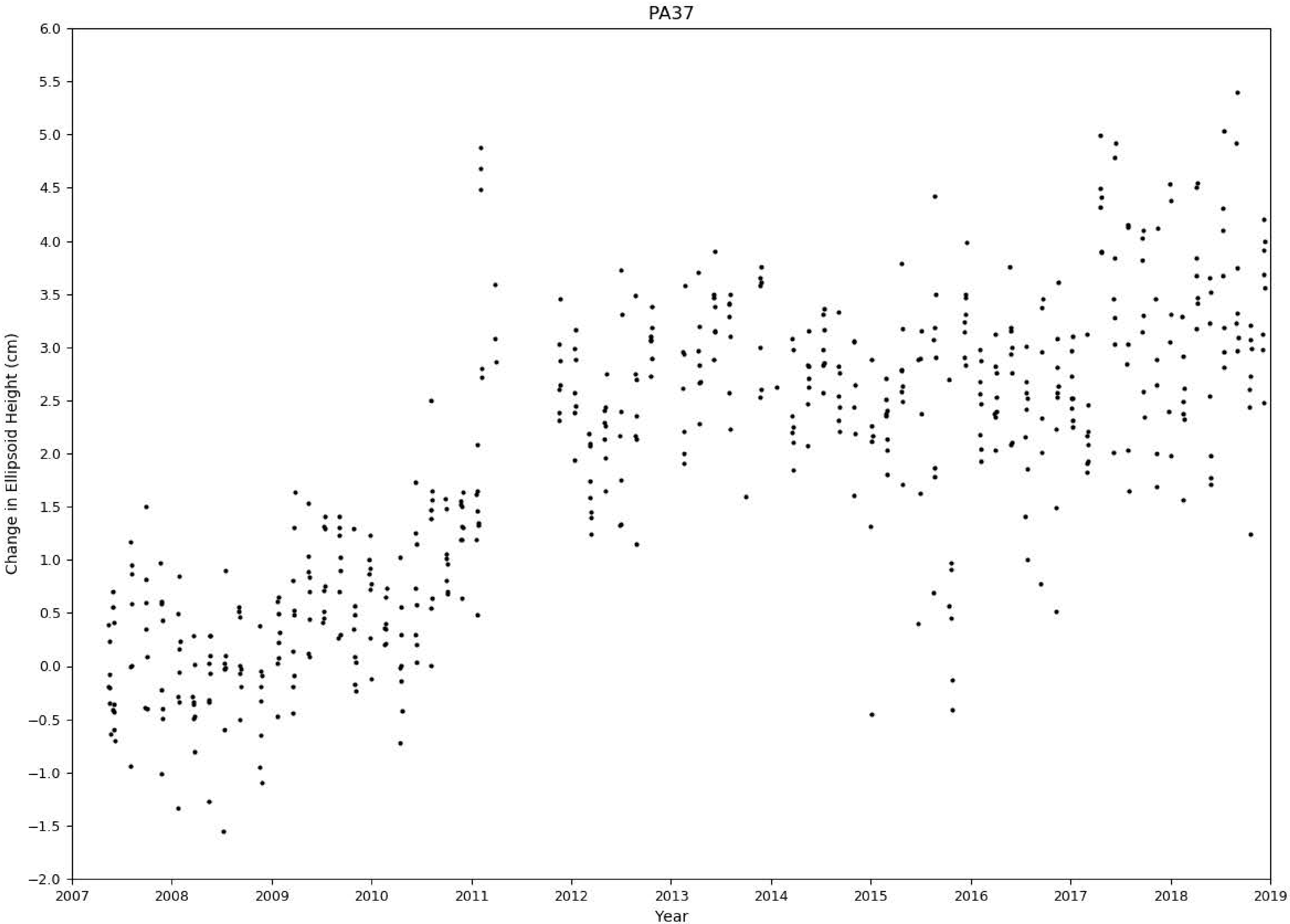

PA32
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

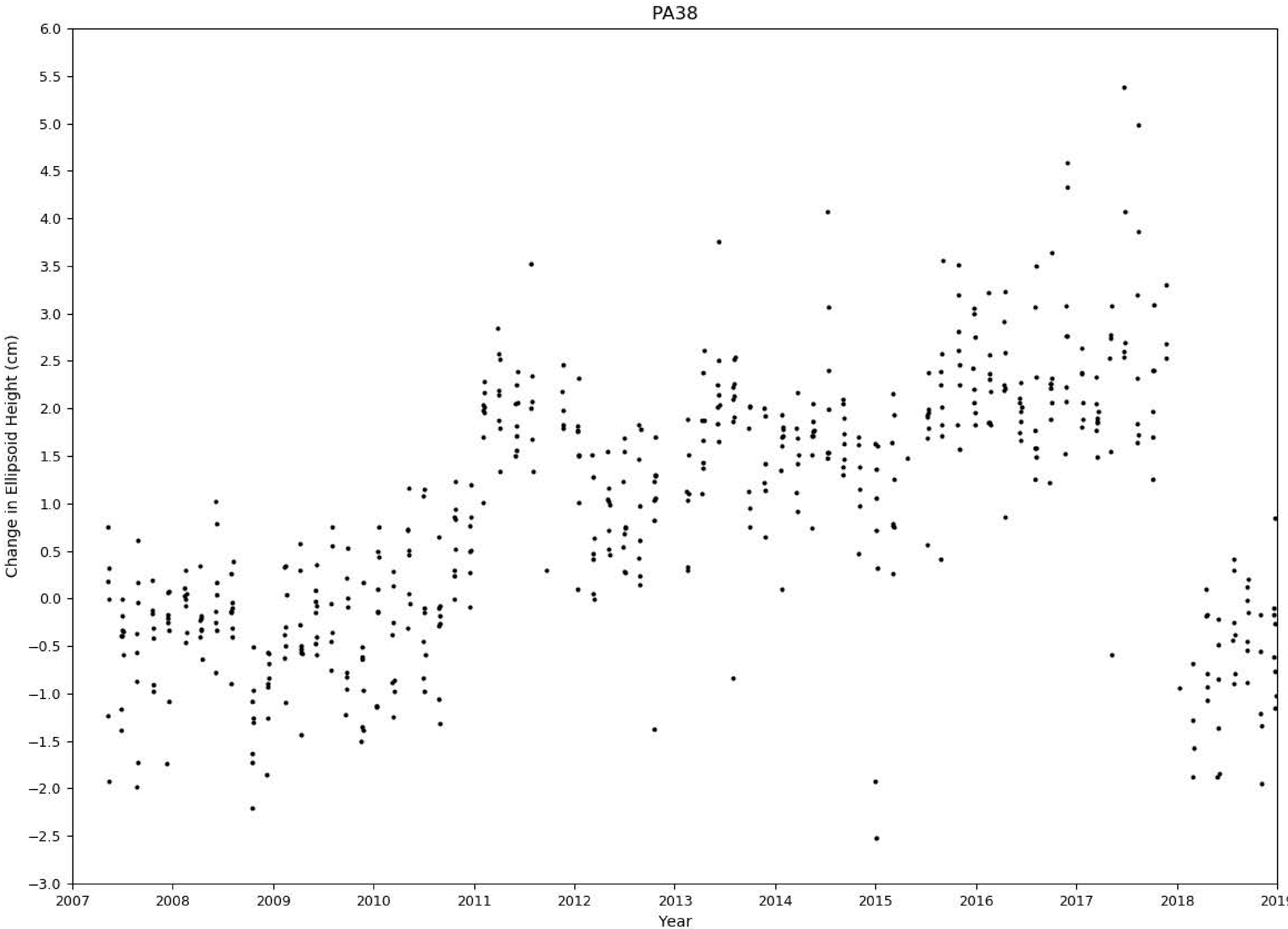

PA33
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

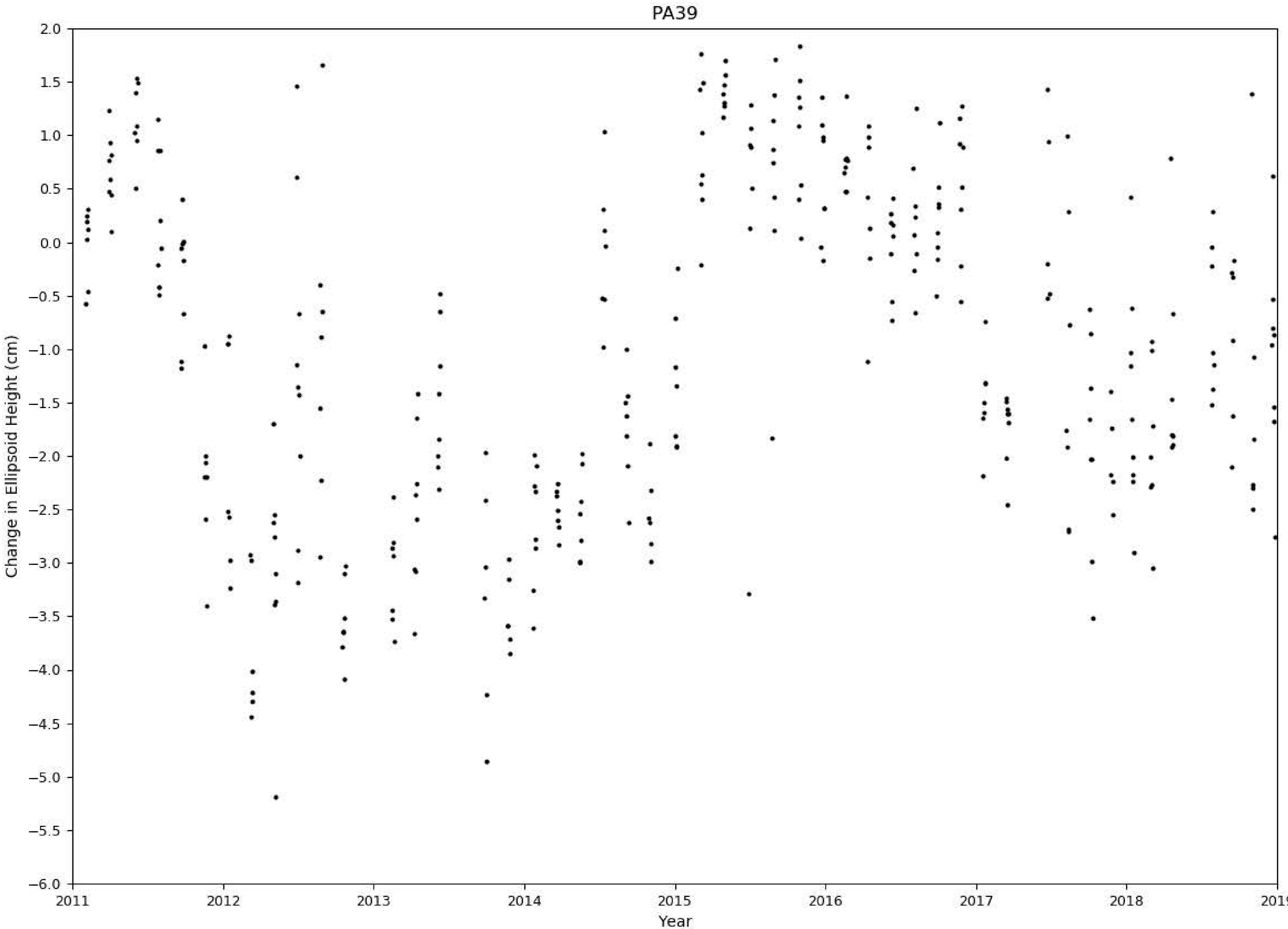

PA34
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

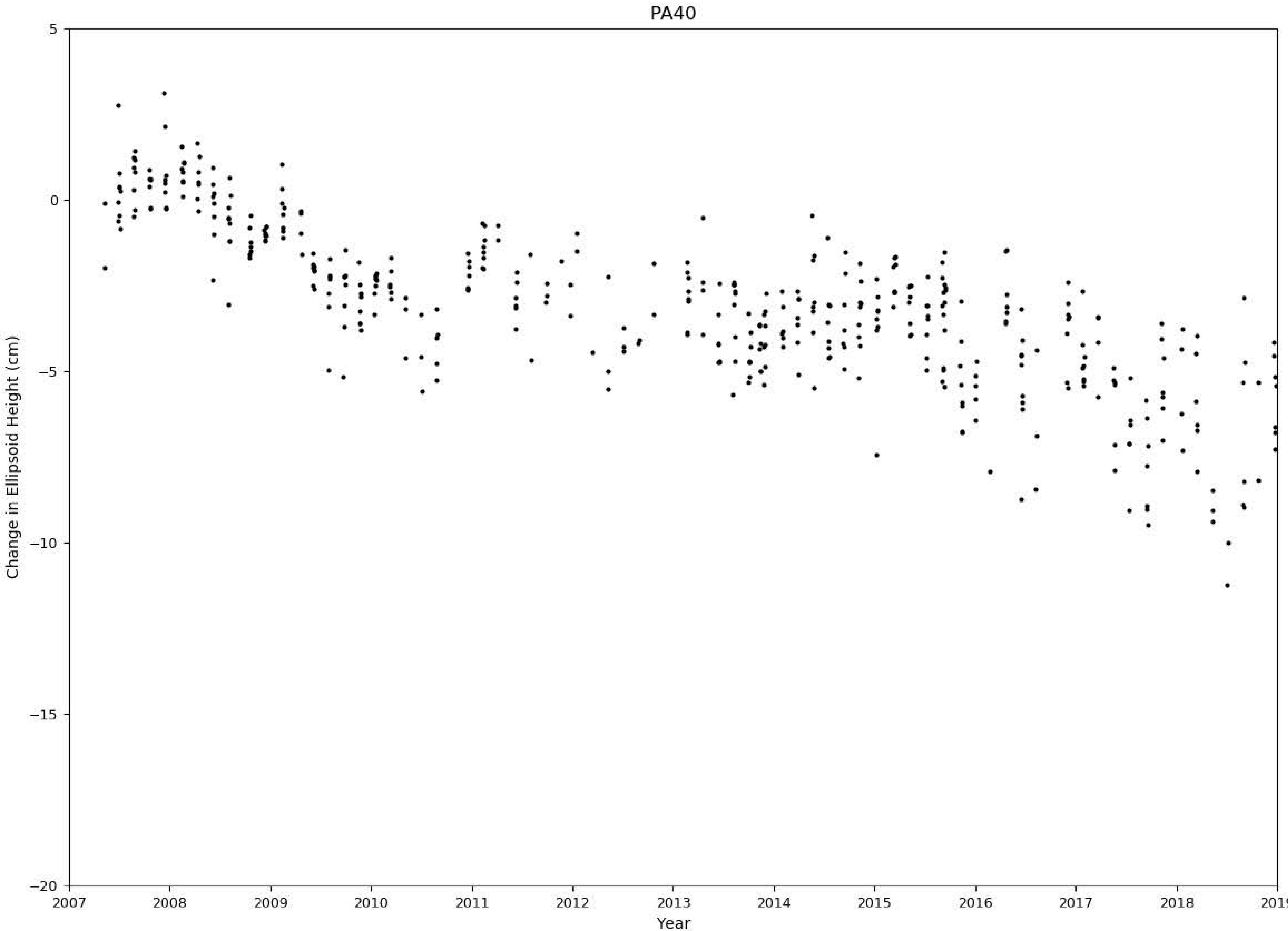

PA35
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

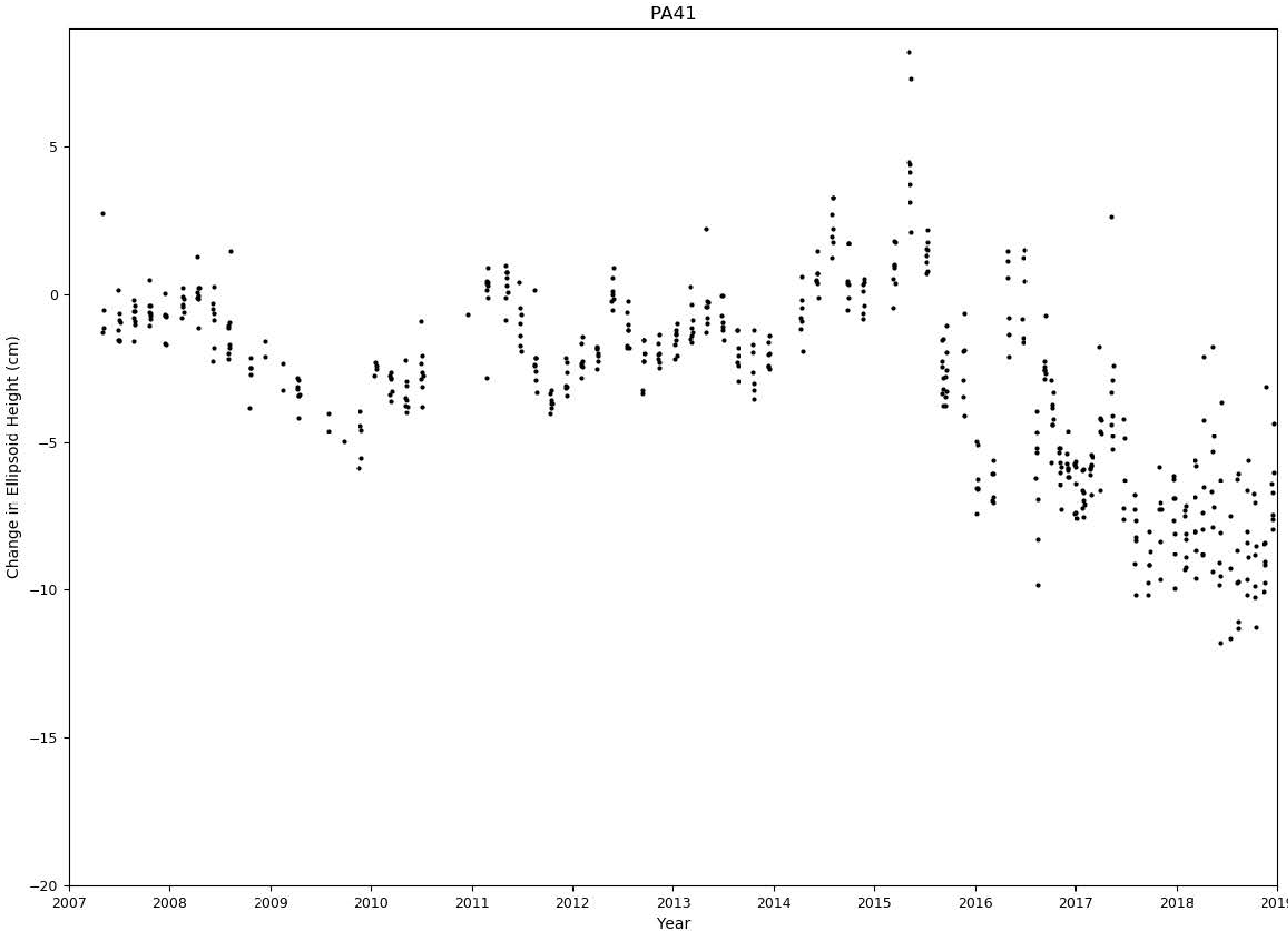

PA36
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

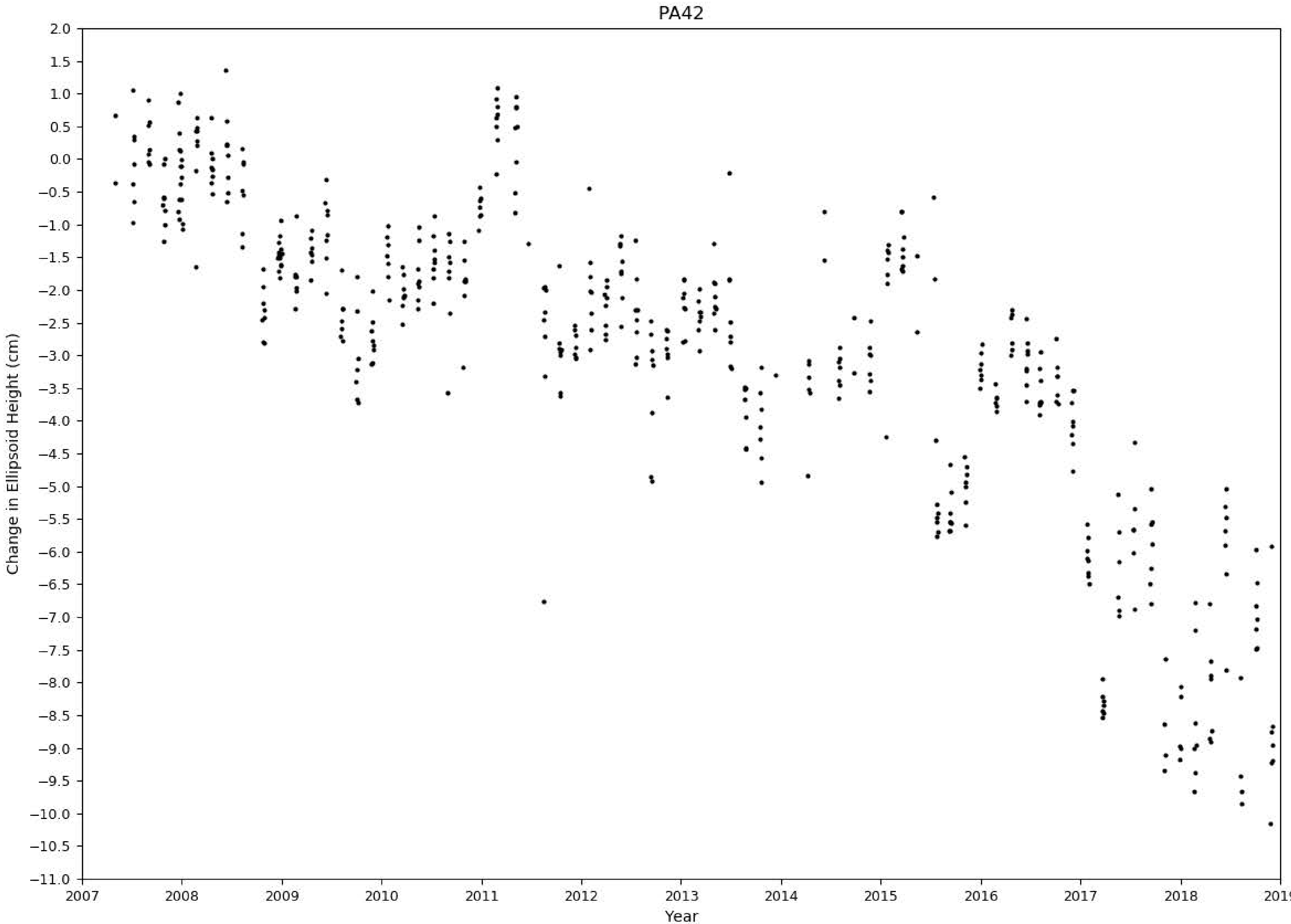

PA37
Change in Ellipsoid Height (cm)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

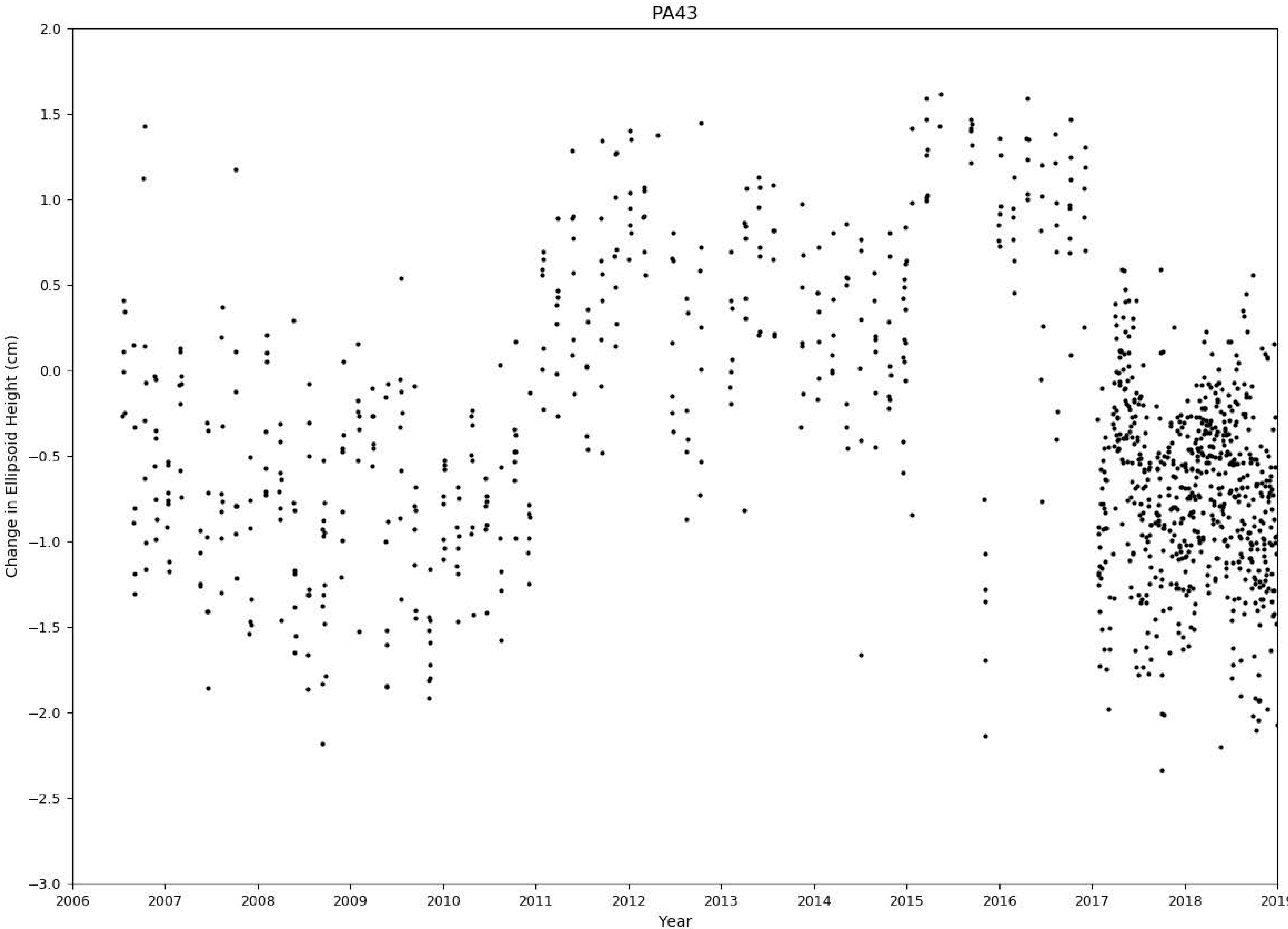

PA38
Change in Ellipsoid Height (cm)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA39
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2011
2012
2013
2014
2015
2016
2017
2018
2019


PA40
5
0
−5
−10
−15
−20
Change in Ellipsoid Height (cm)
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA41
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA42
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
−11.0
Change in Ellipsoid Height (cm)
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA43
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2006
2007
2008
2009
2010
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2012
2013
2014
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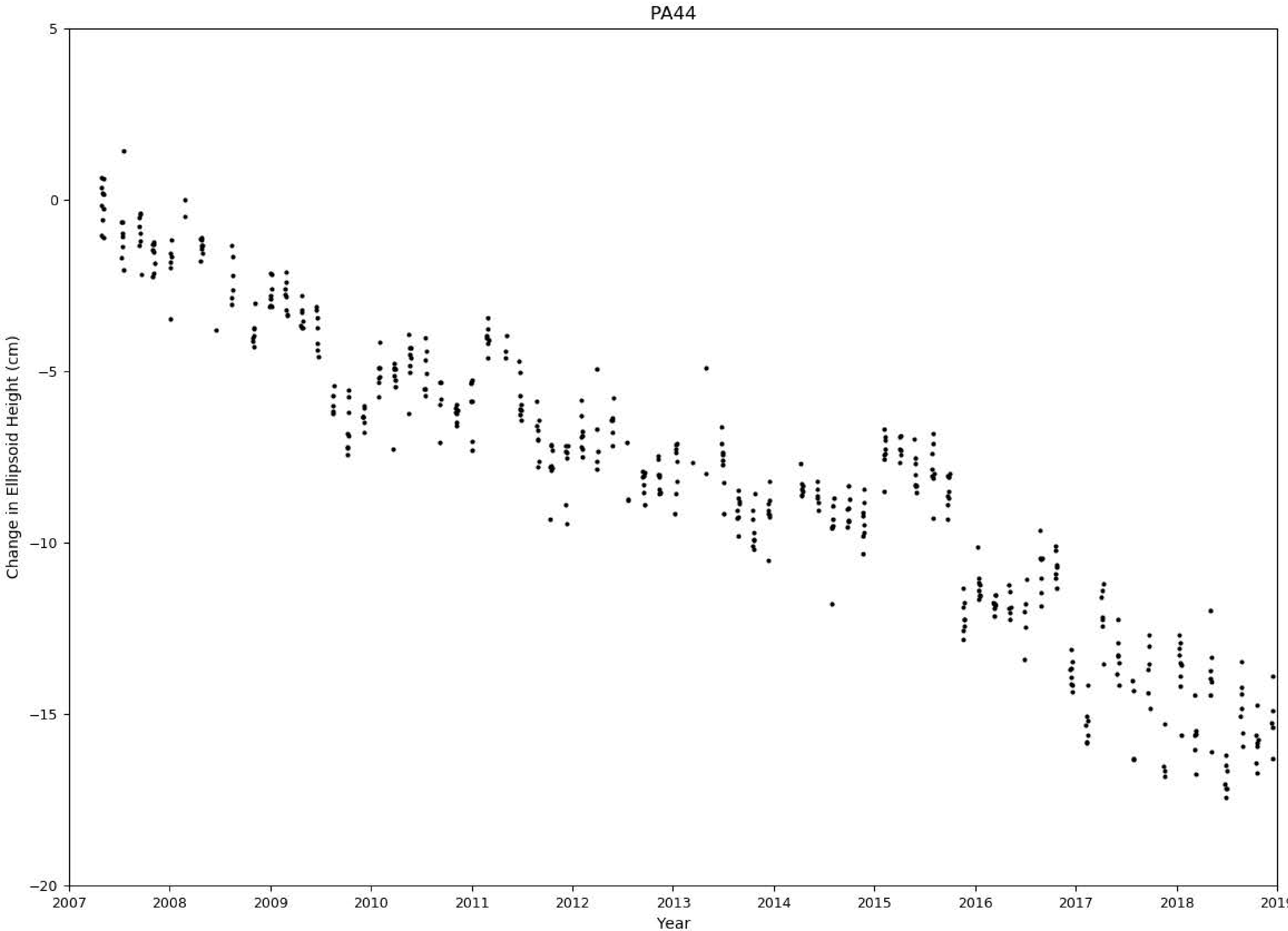
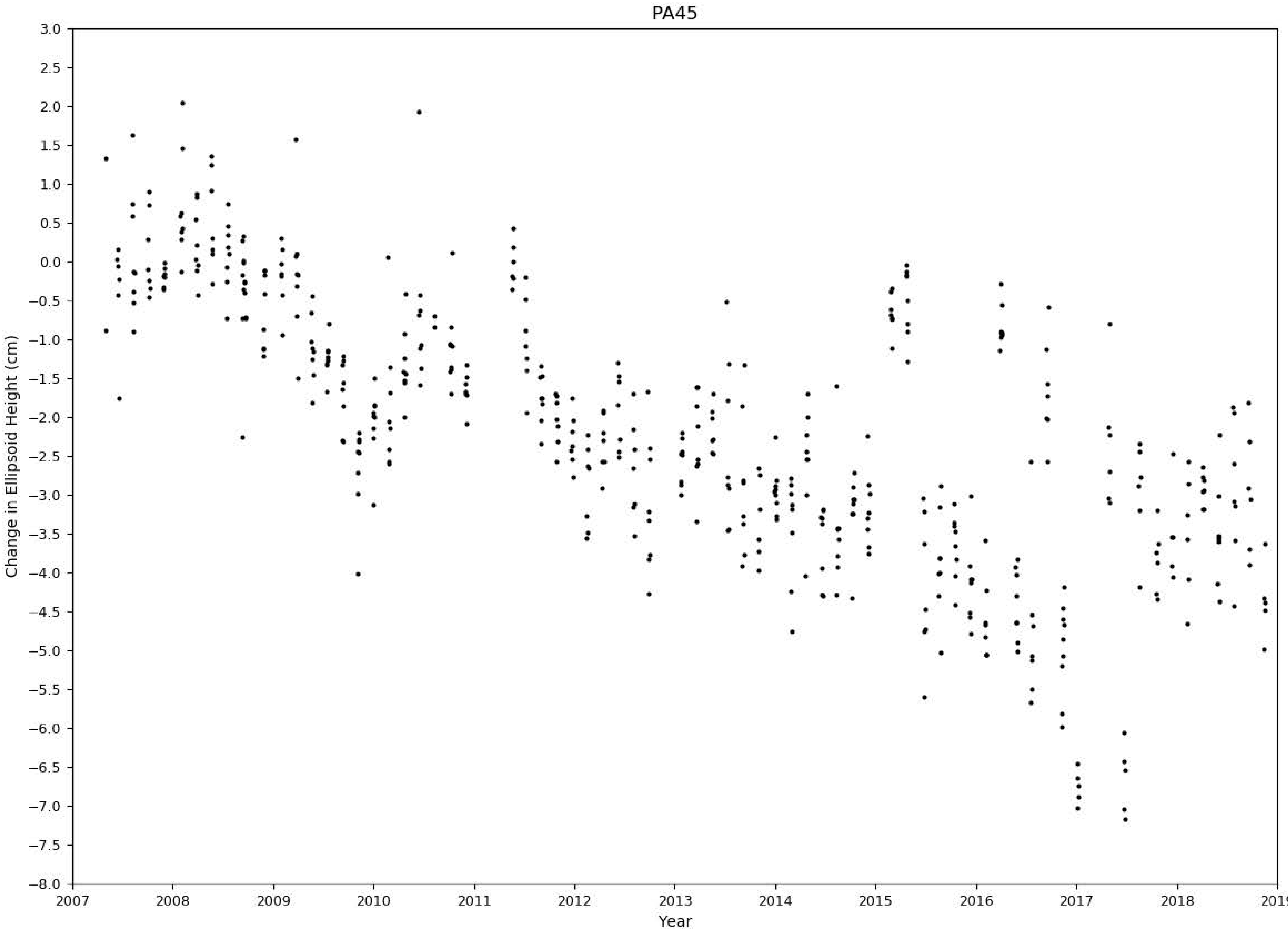
2016
2017
2018
2019


PA44
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA45
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2007
2008
2009
2010
2011
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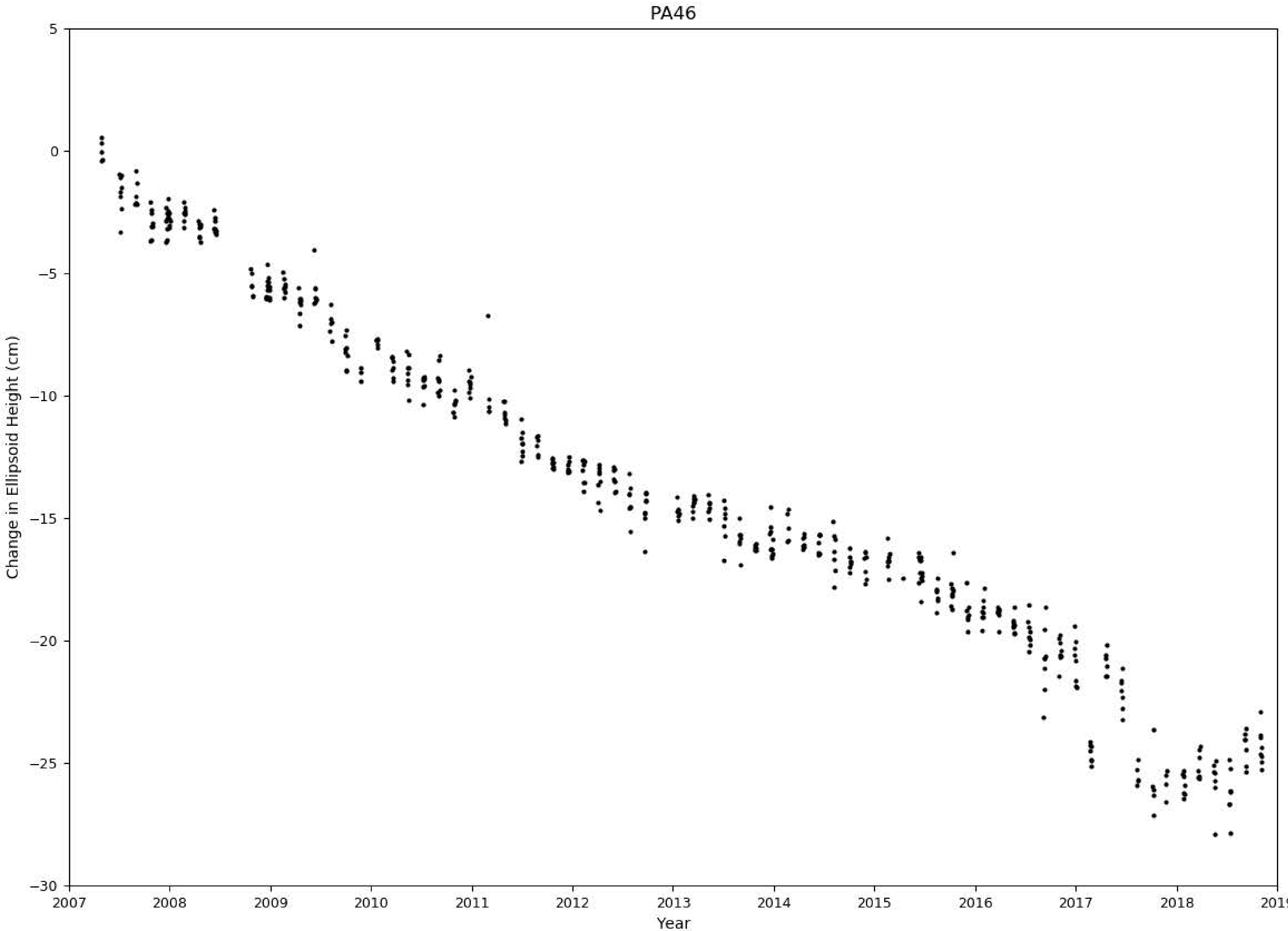
2014
2015
2016
2017
2018
2019
Year


PA46
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
2007
2008
2009
2010
2011
2012
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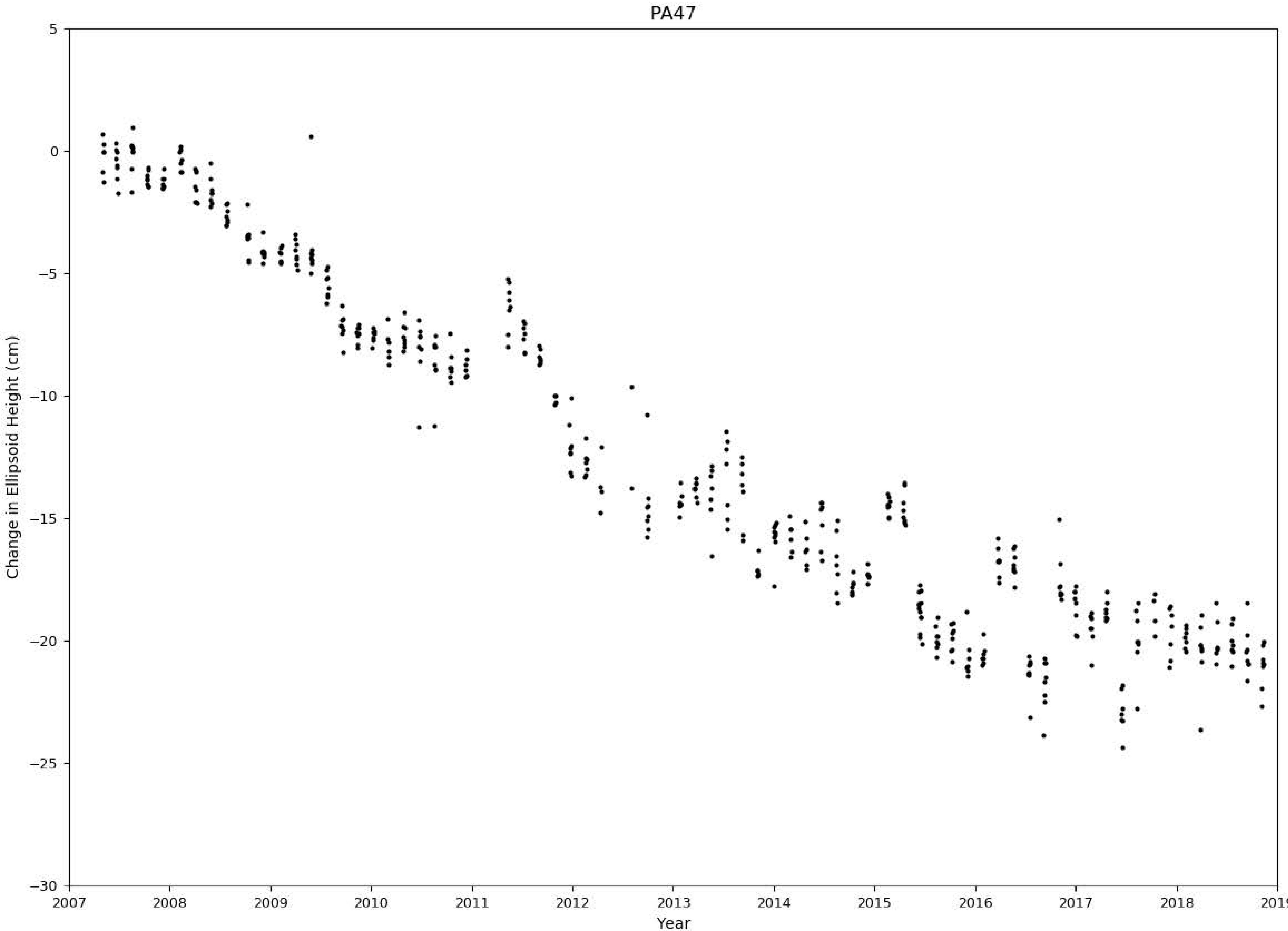
2014
2015
2016
2017
2018
2019


PA47
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
−25
−30
2007
2008
2009
2010
2011
2012
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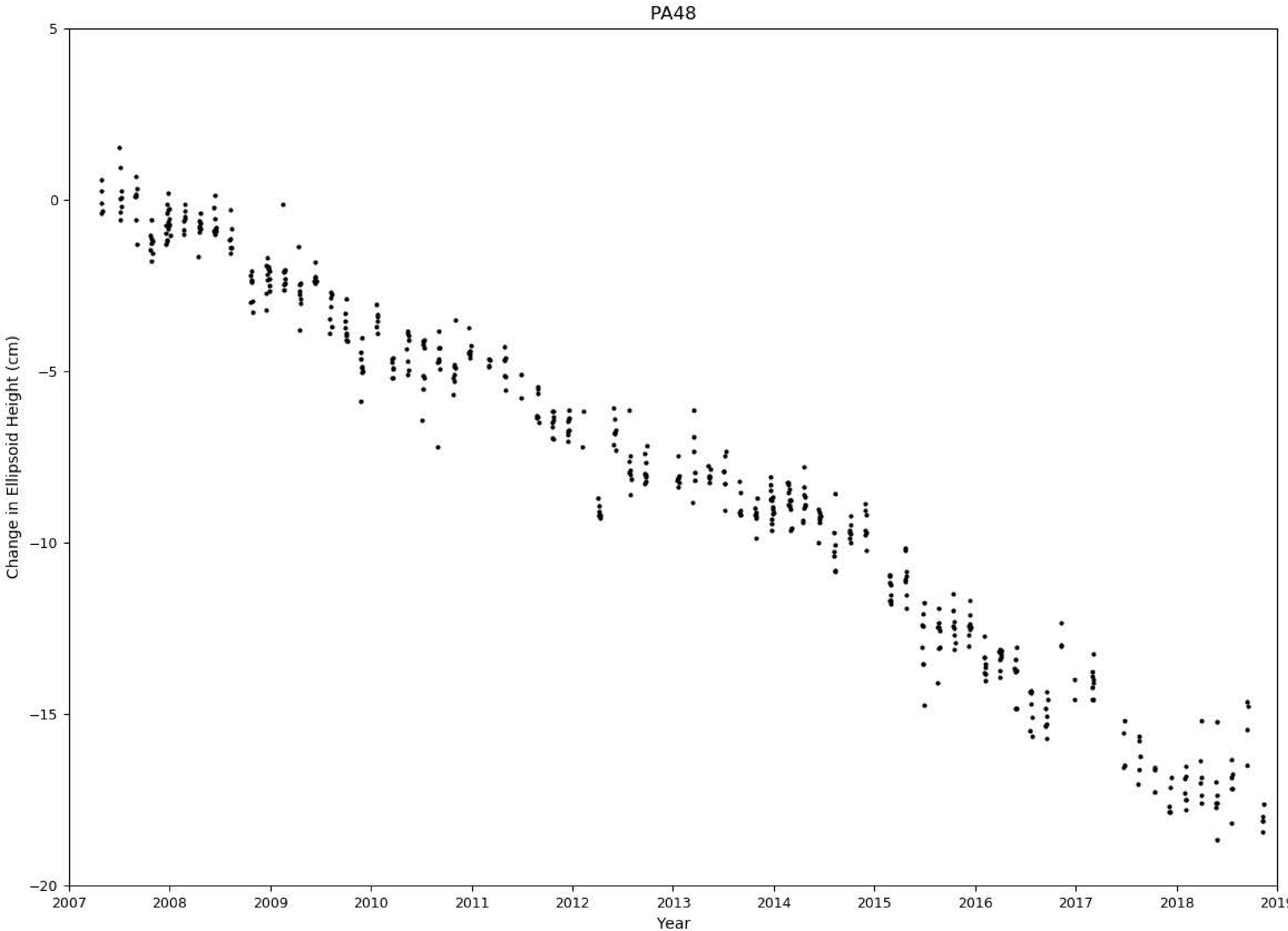
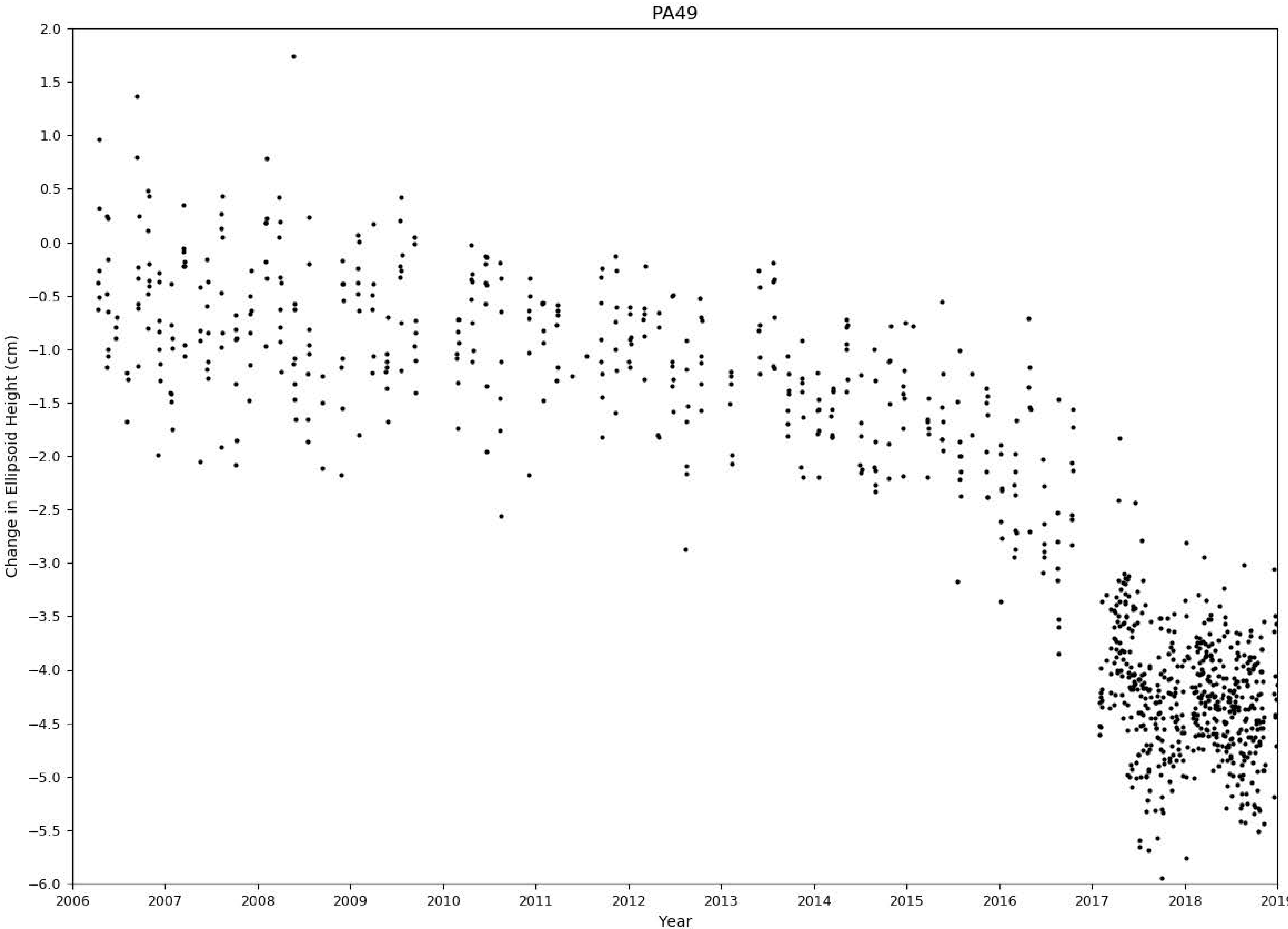
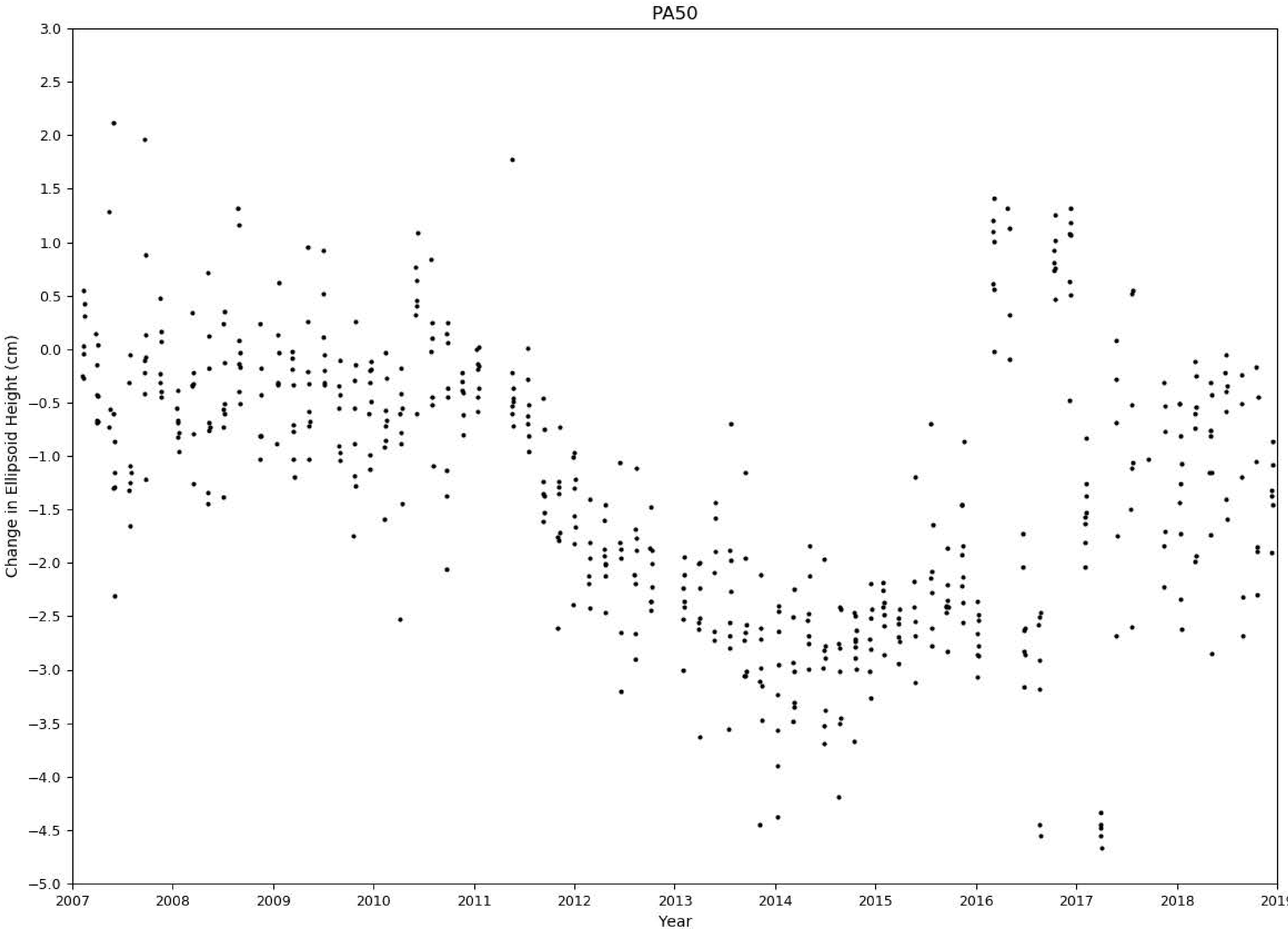
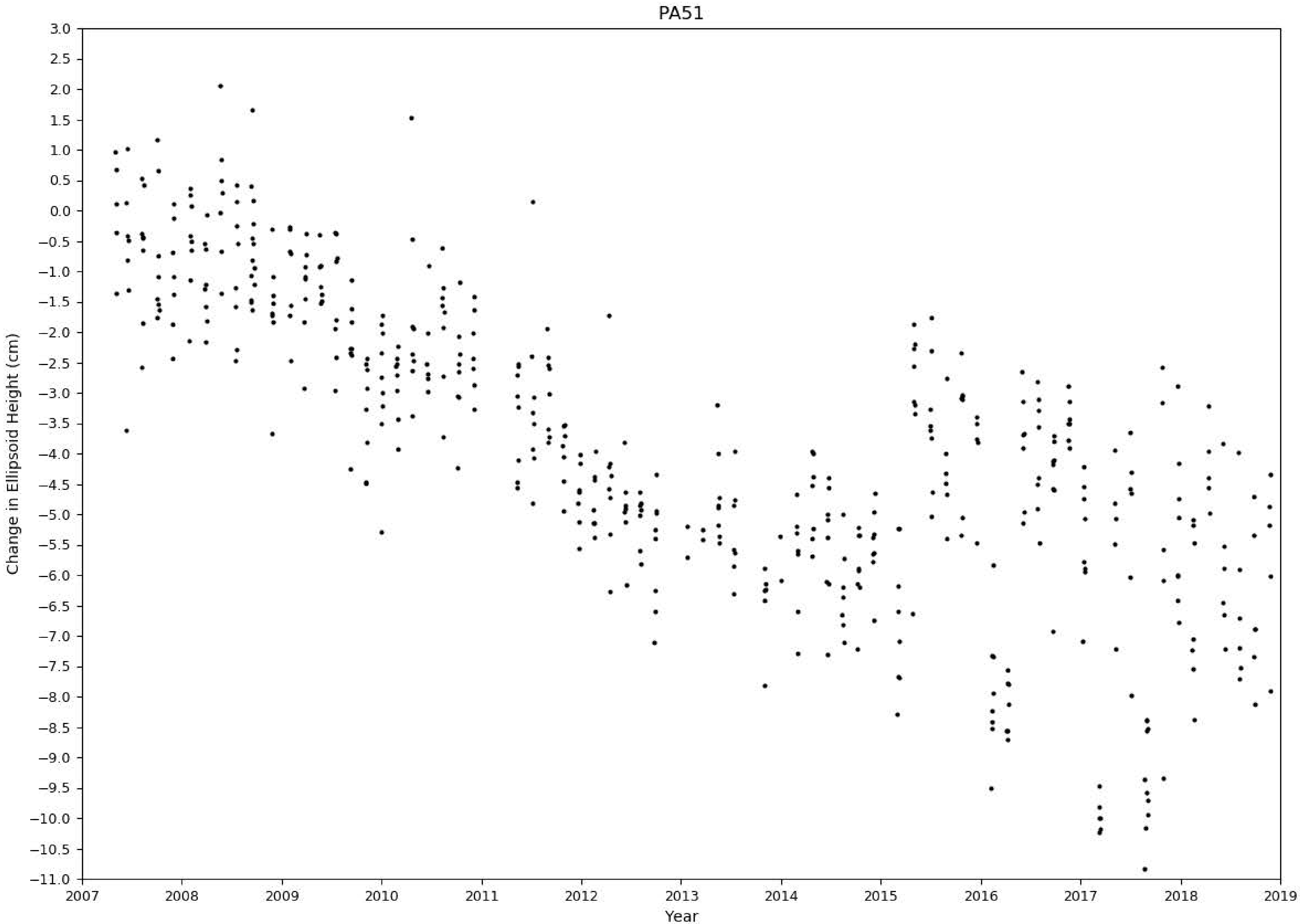
2014
2015
2016
2017
2018
2019


PA48
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA49
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA50
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


PA51
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
−11.0
2007
2008
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2010
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2012
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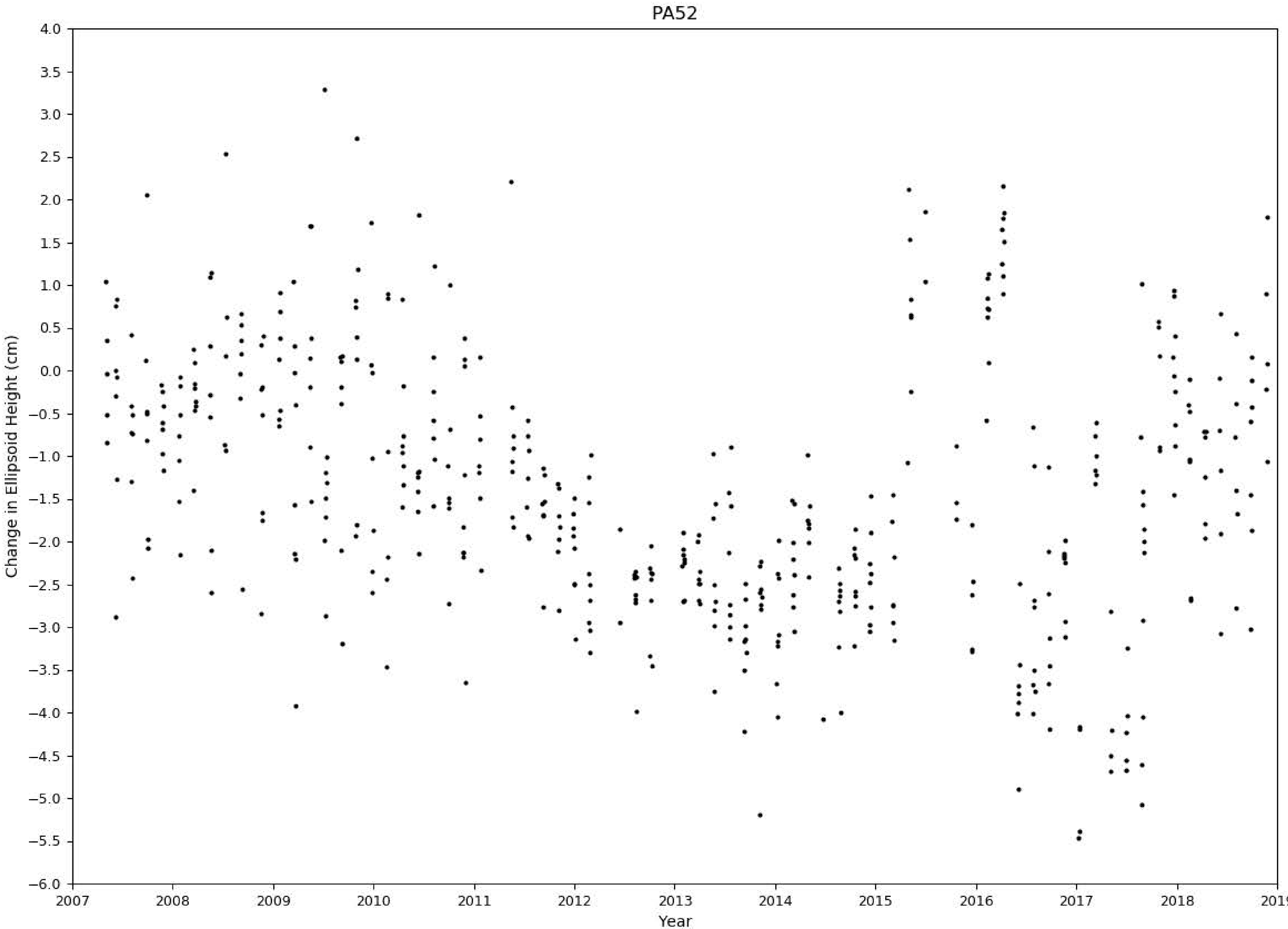
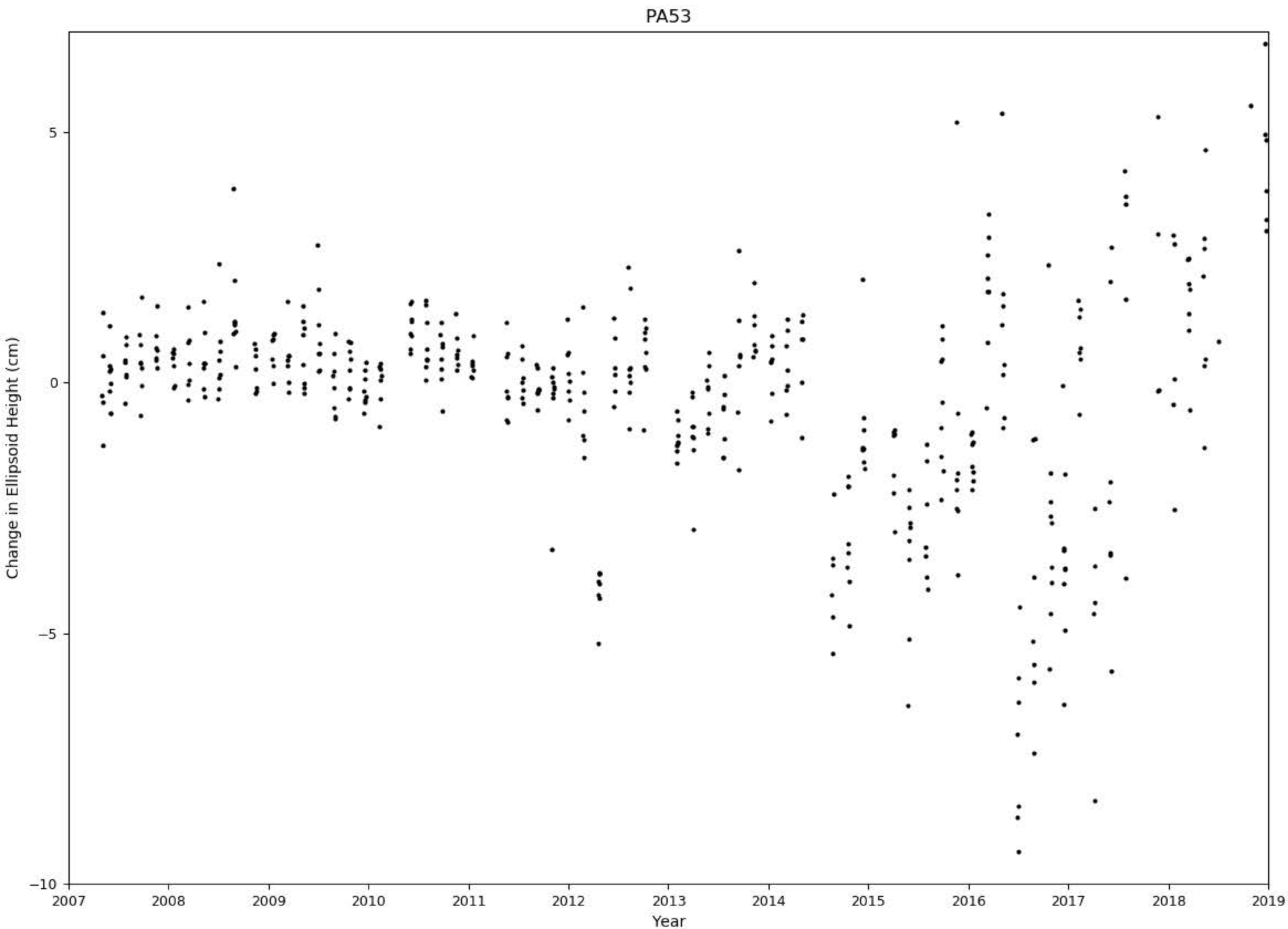
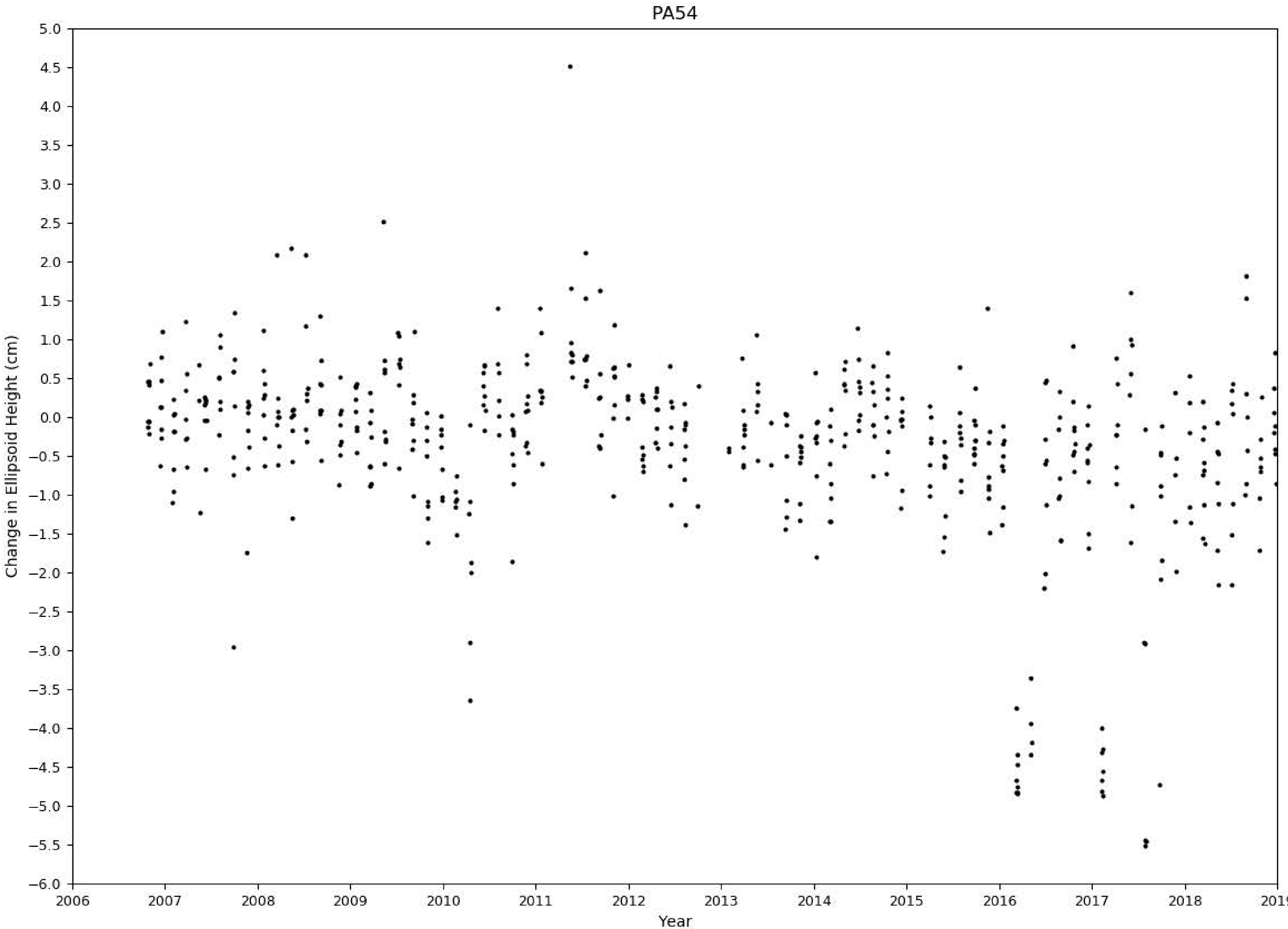
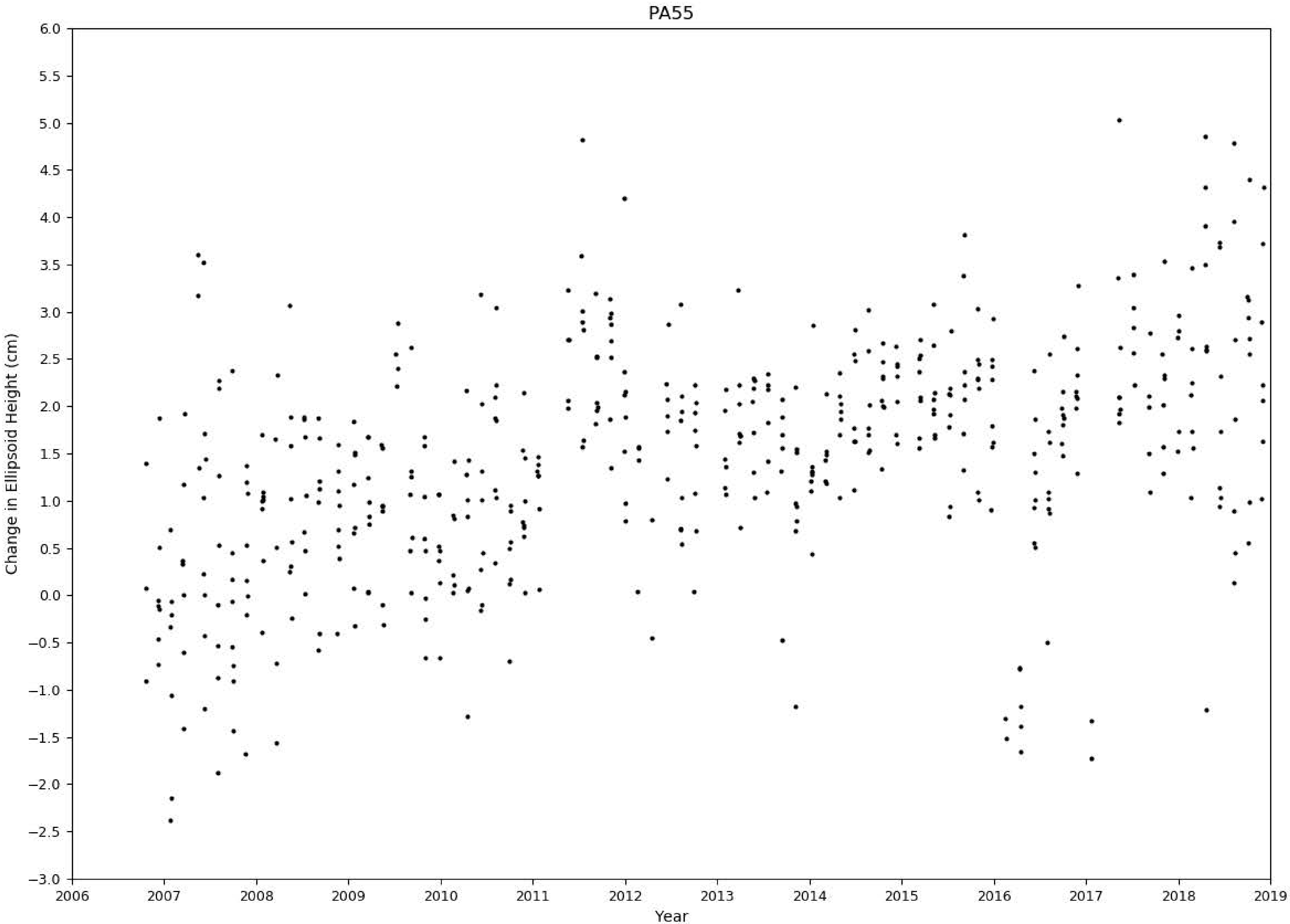
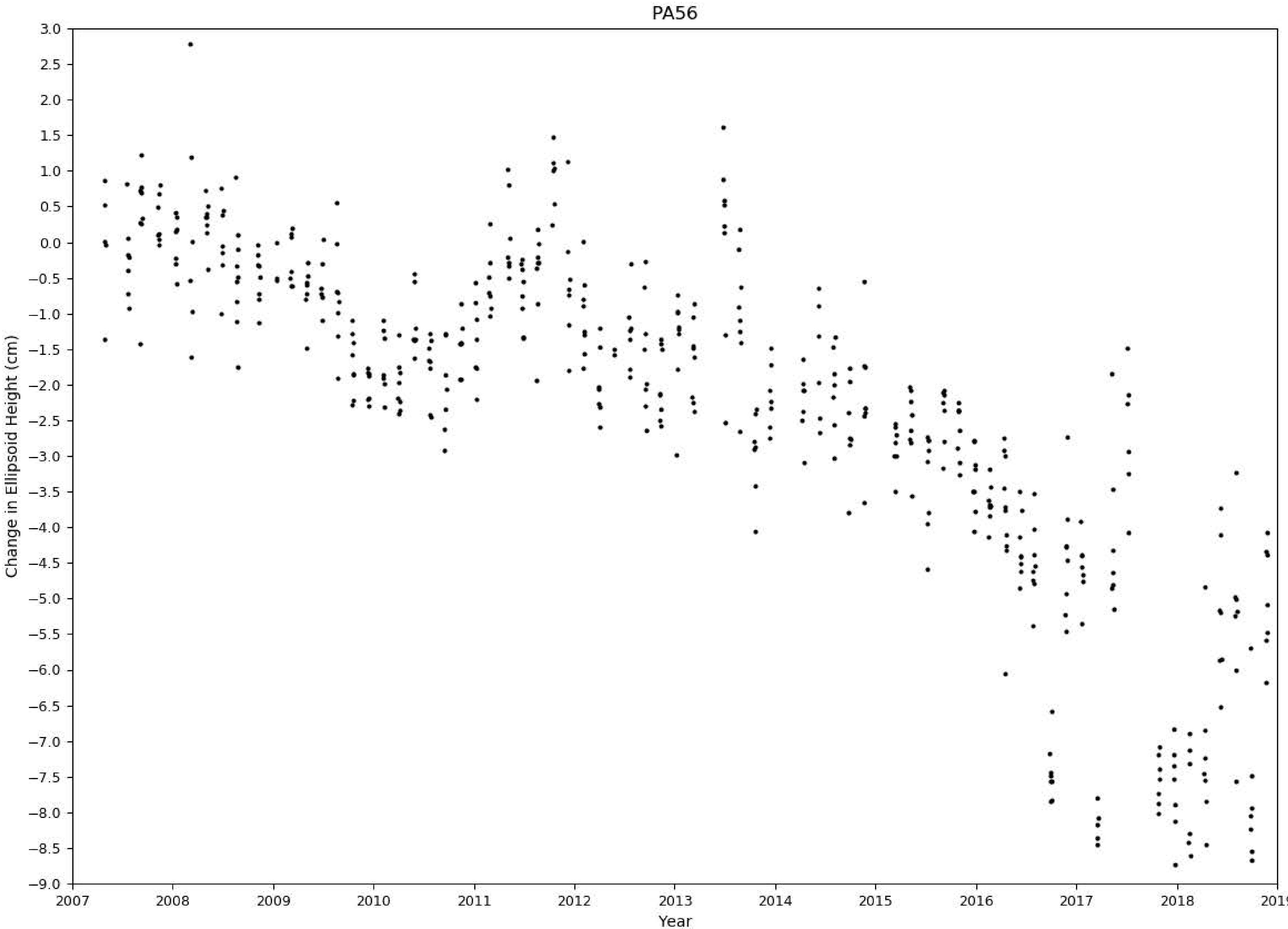
2018
2019

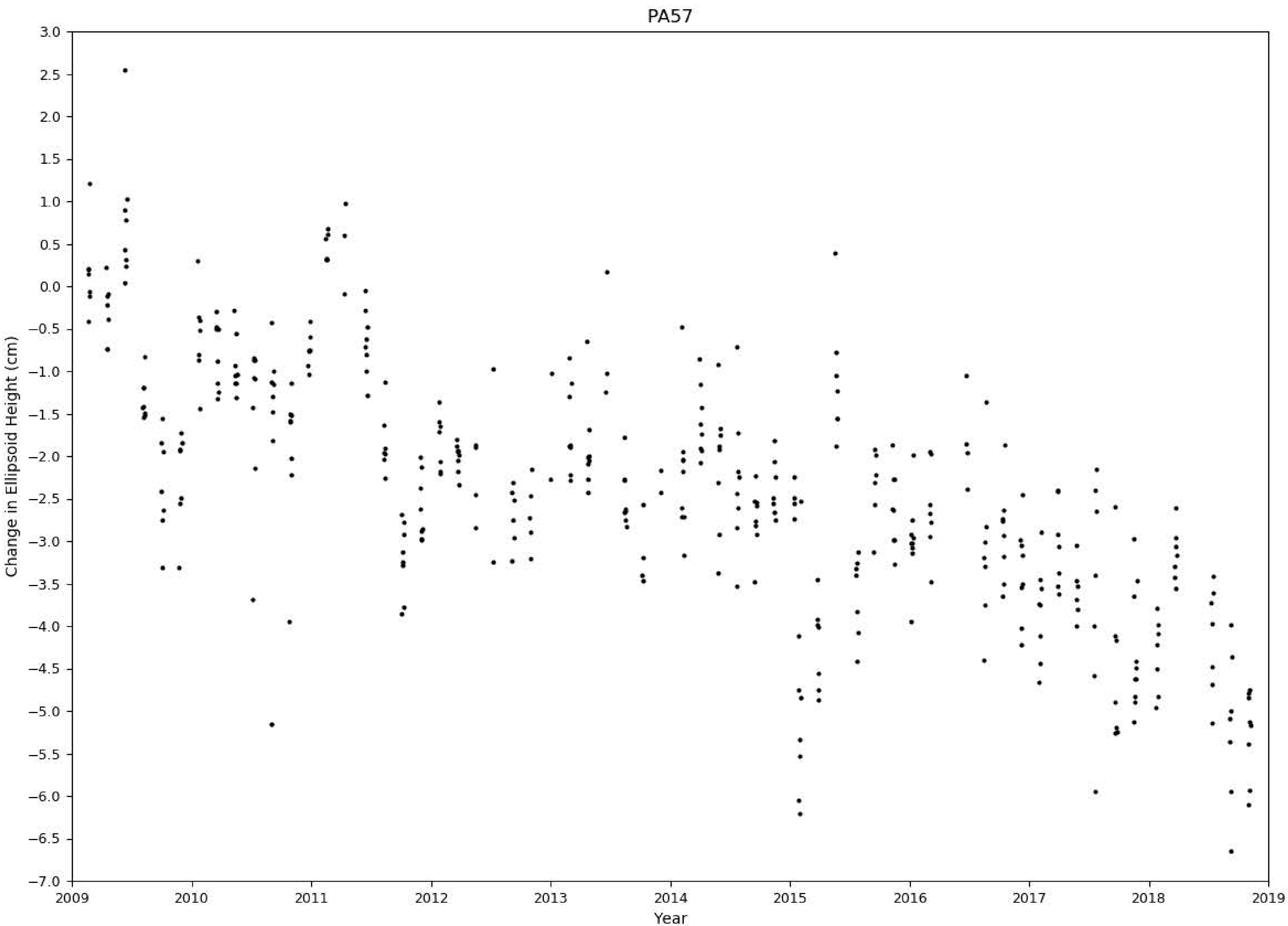

PA52
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

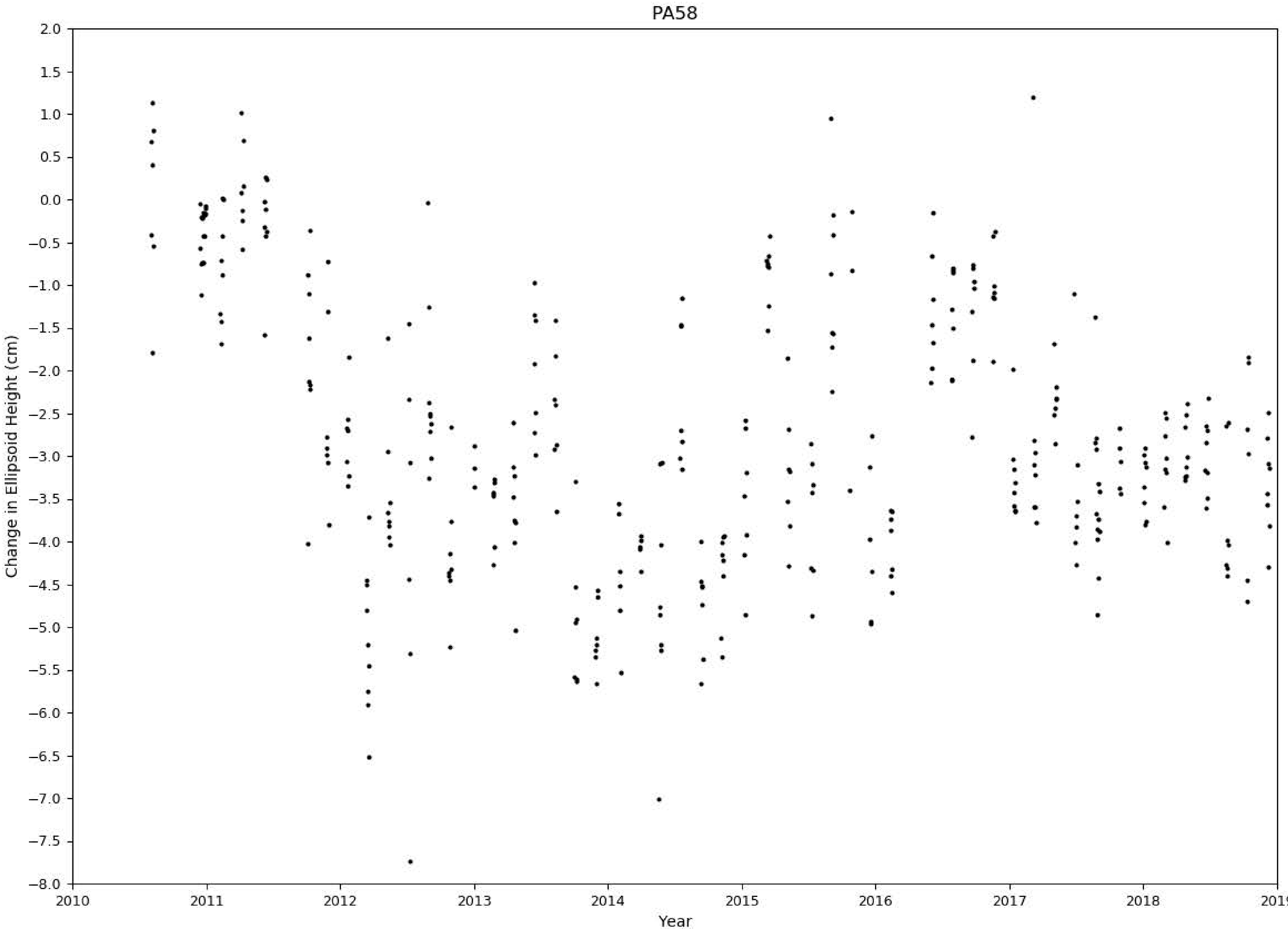

PA53
Change in Ellipsoid Height (cm)
5
0
−5
−10
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

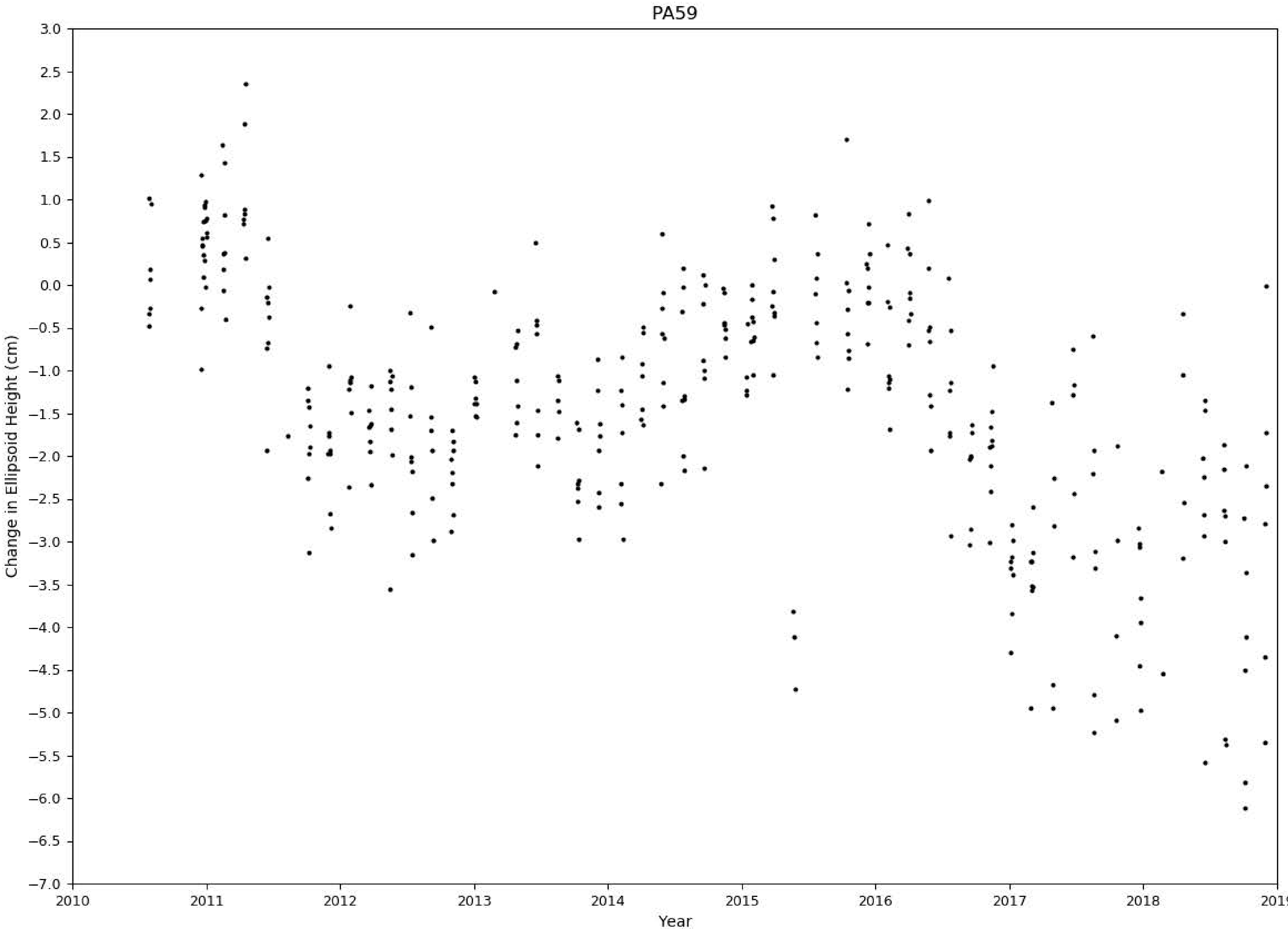

PA54
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

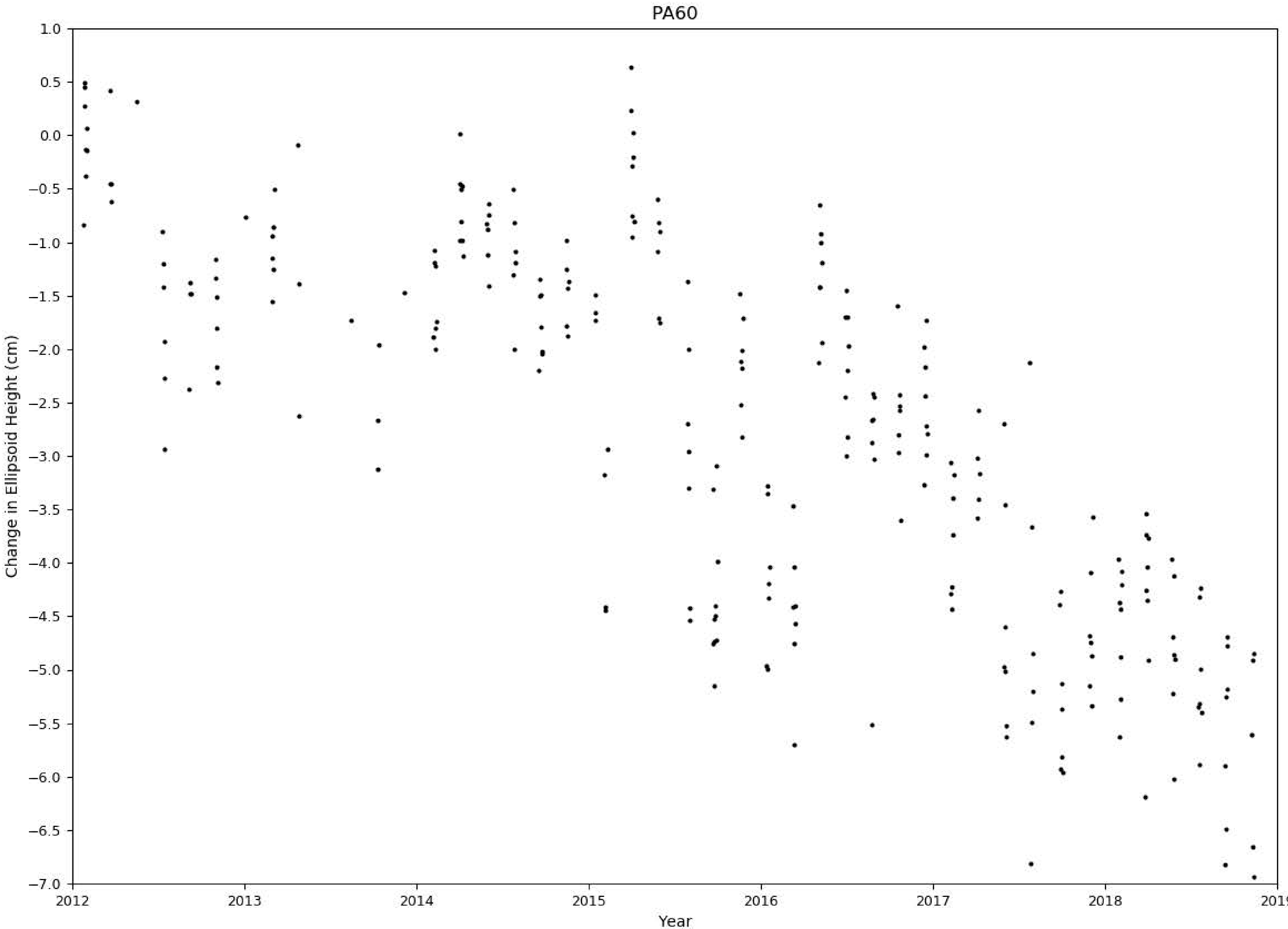

PA55
Change in Ellipsoid Height (cm)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

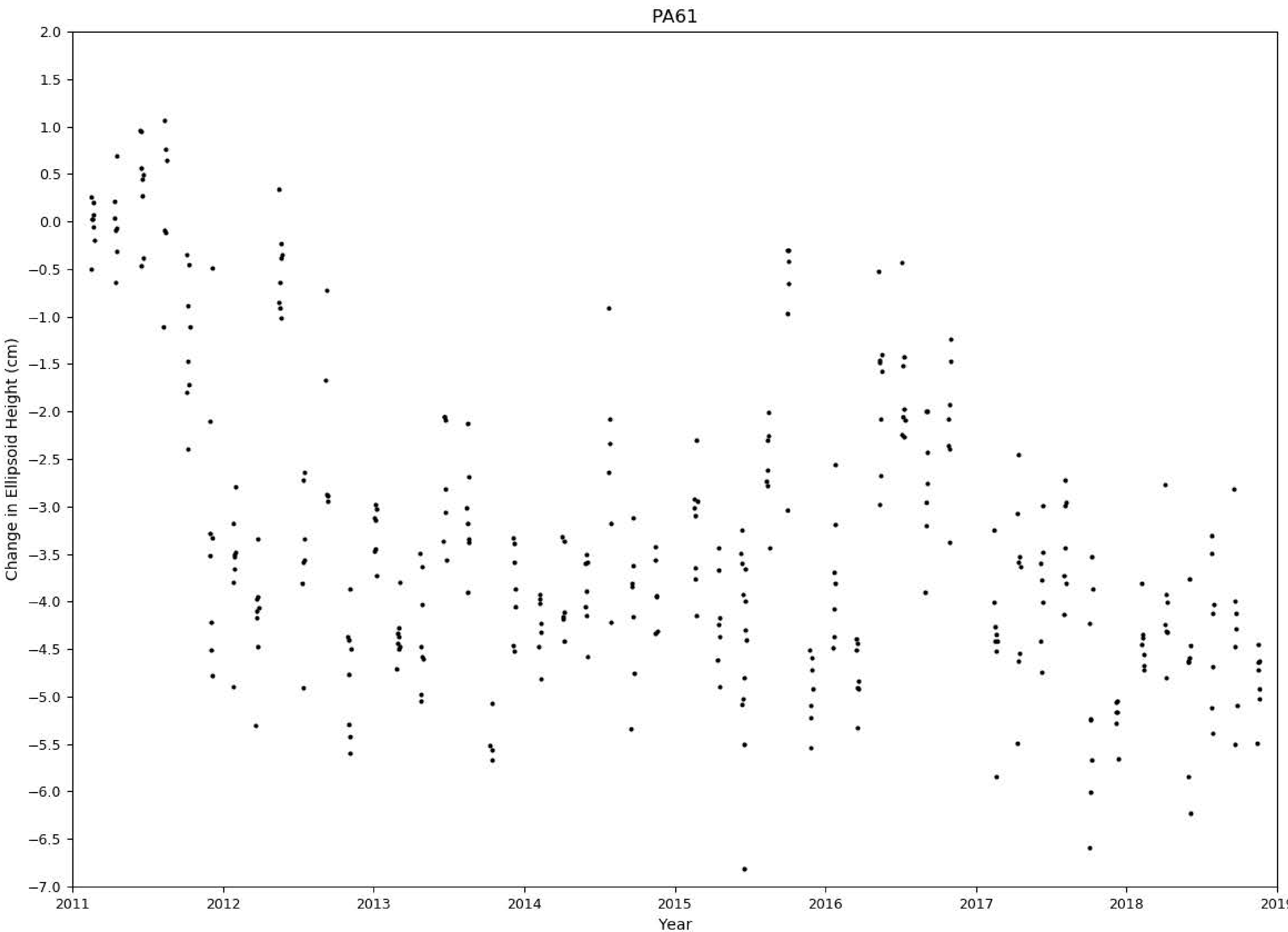

PA56
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

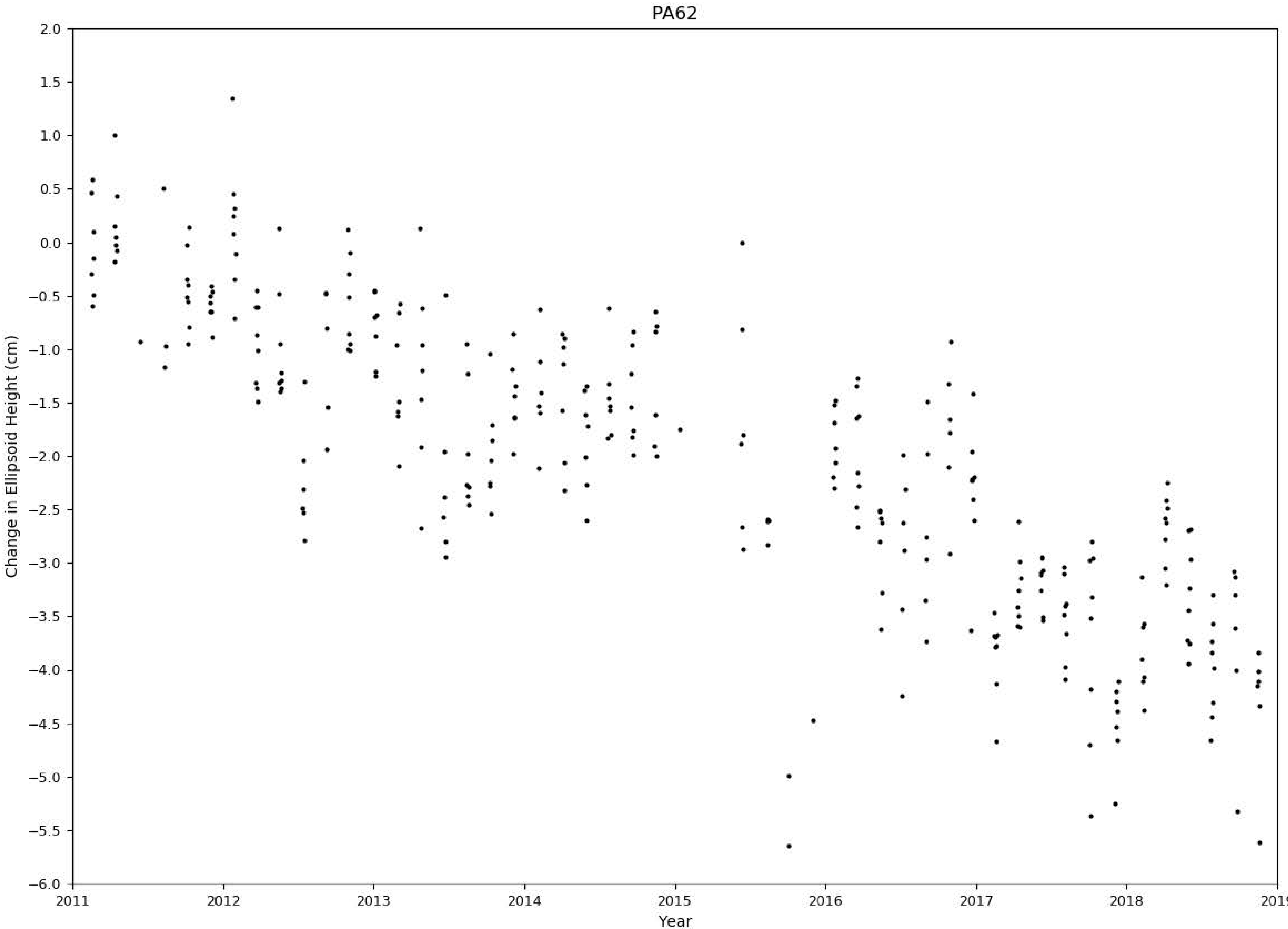

PA57
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

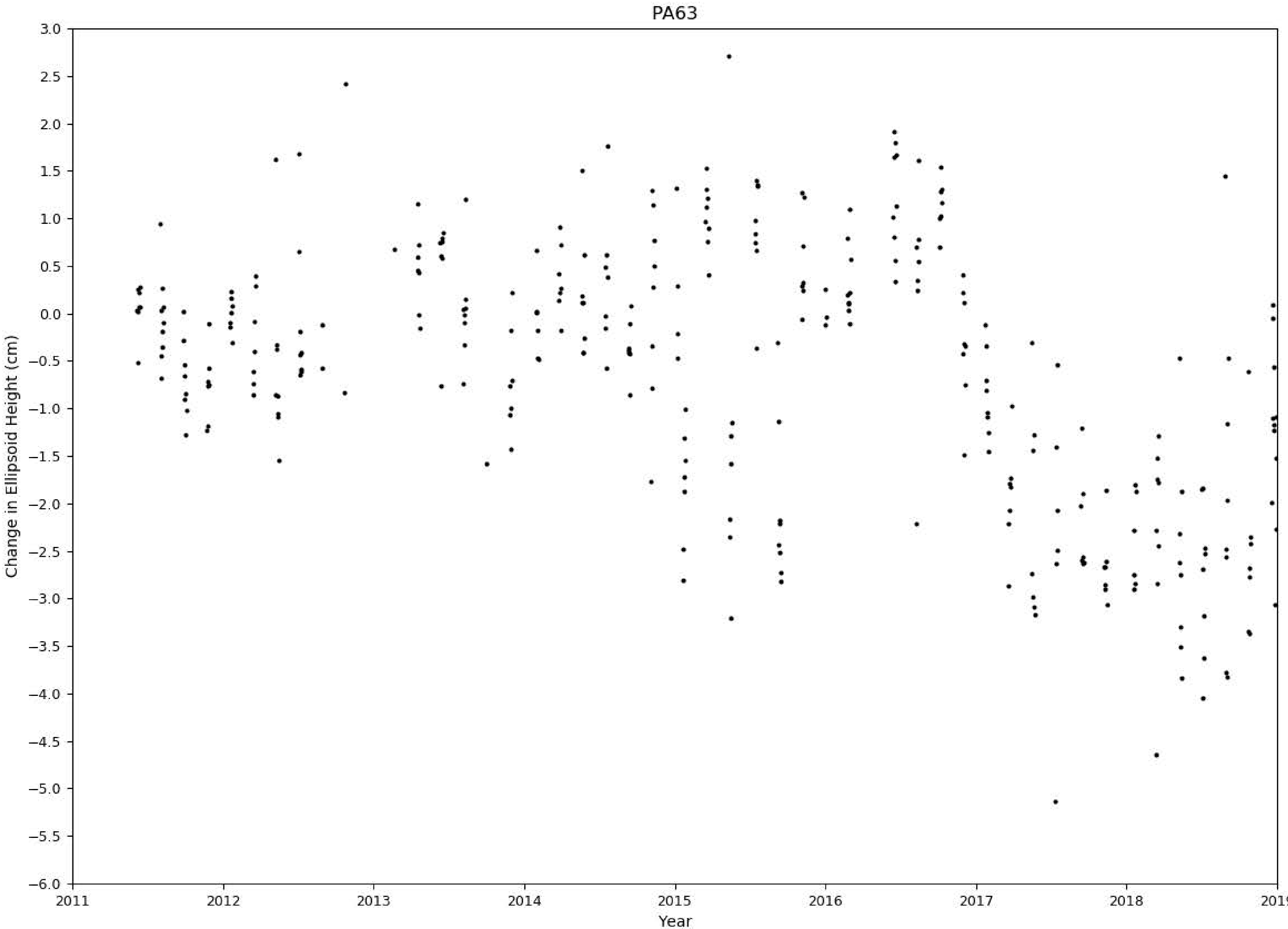

PA58
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

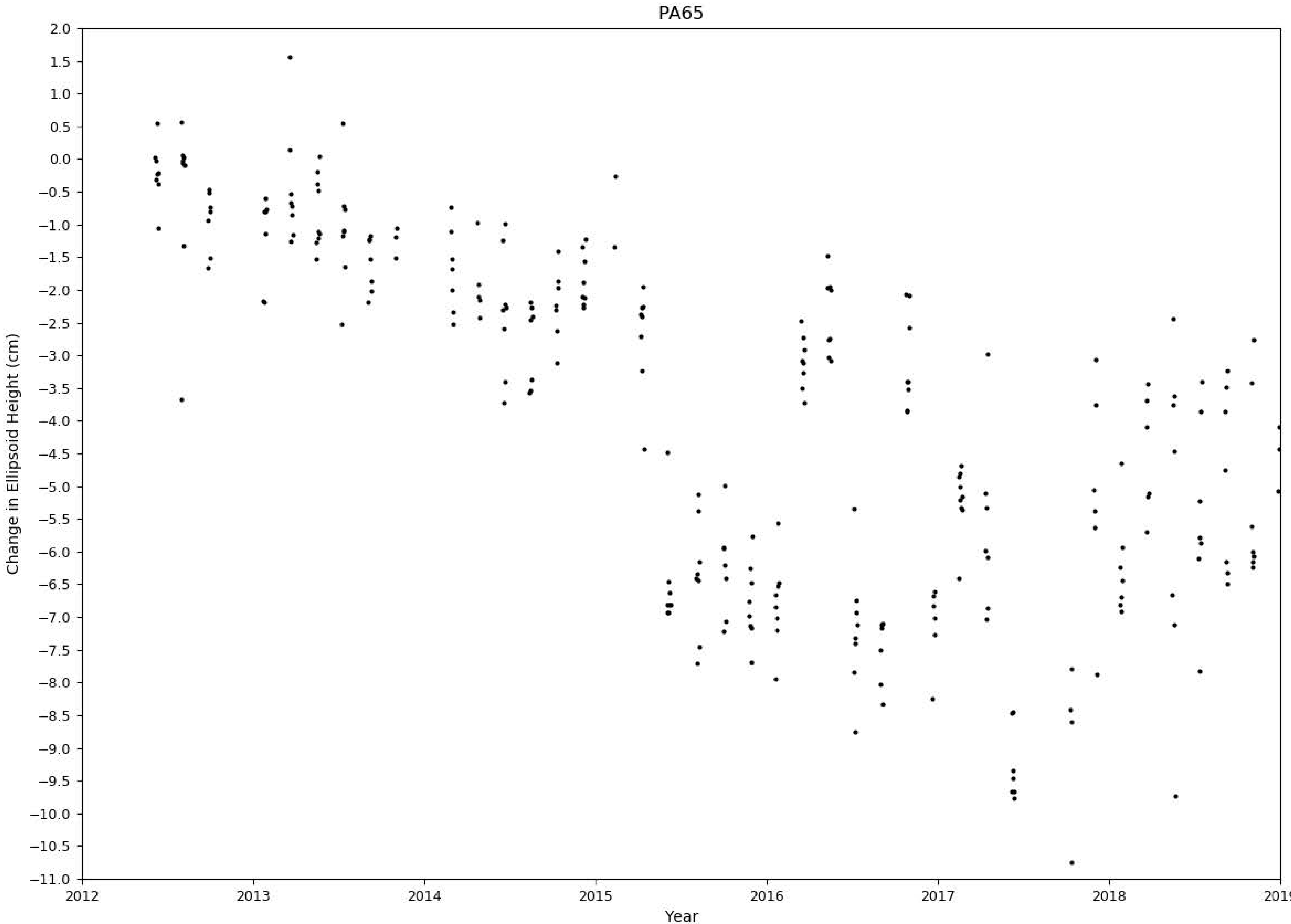

PA59
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

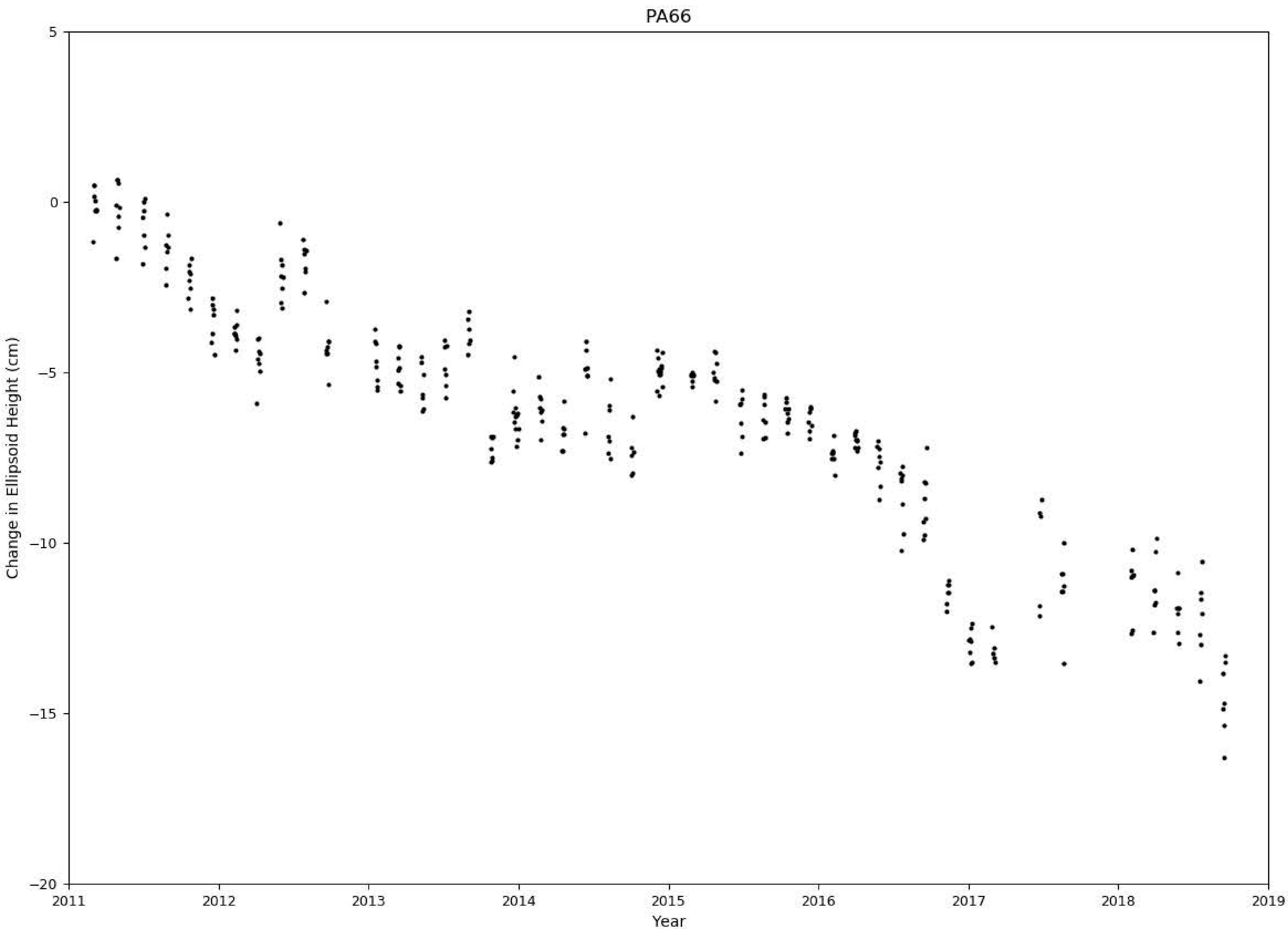

PA60
Change in Ellipsoid Height (cm)
Year
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2012
2013
2014
2015
2016
2017
2018
2019

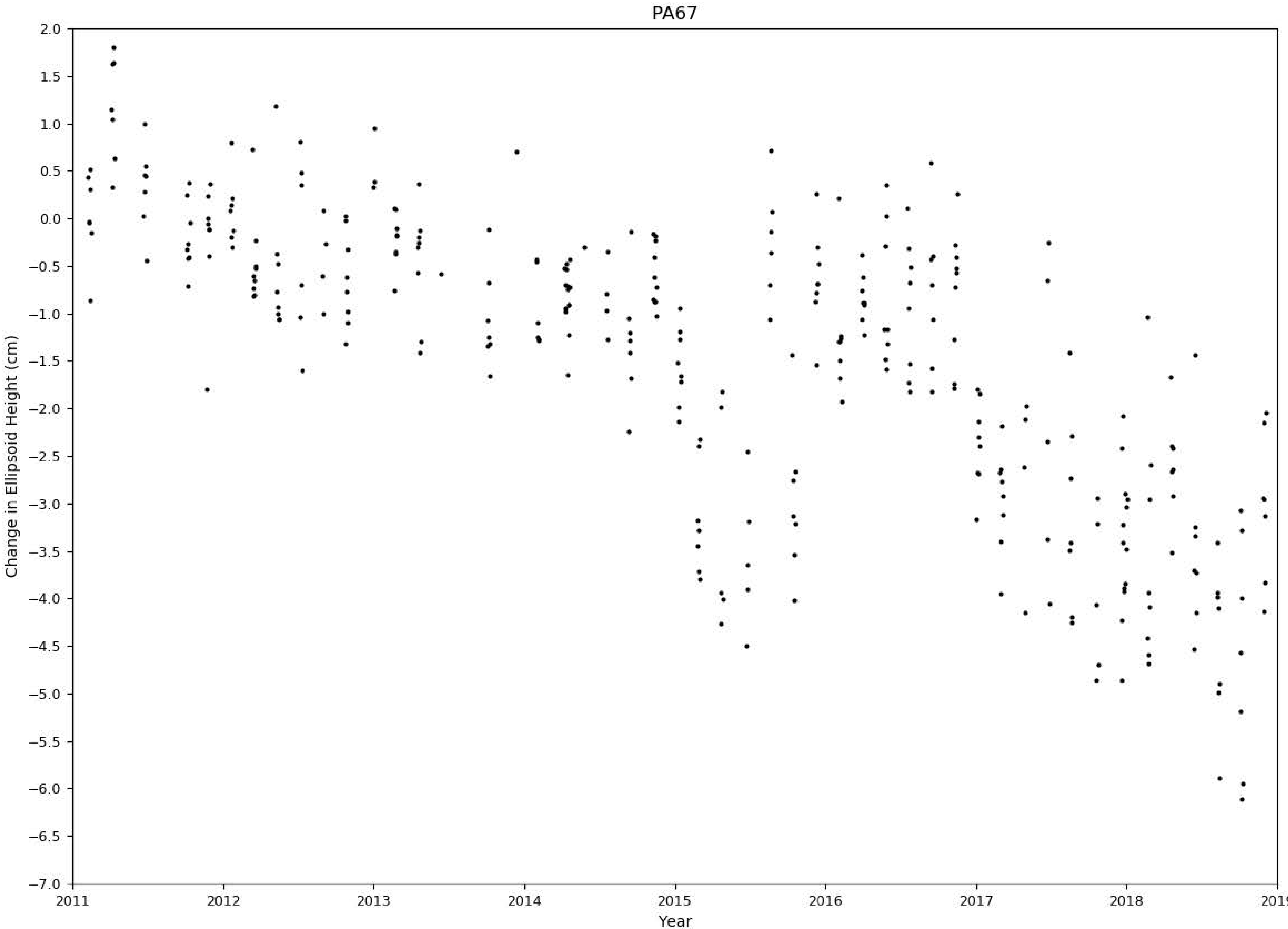

PA61
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

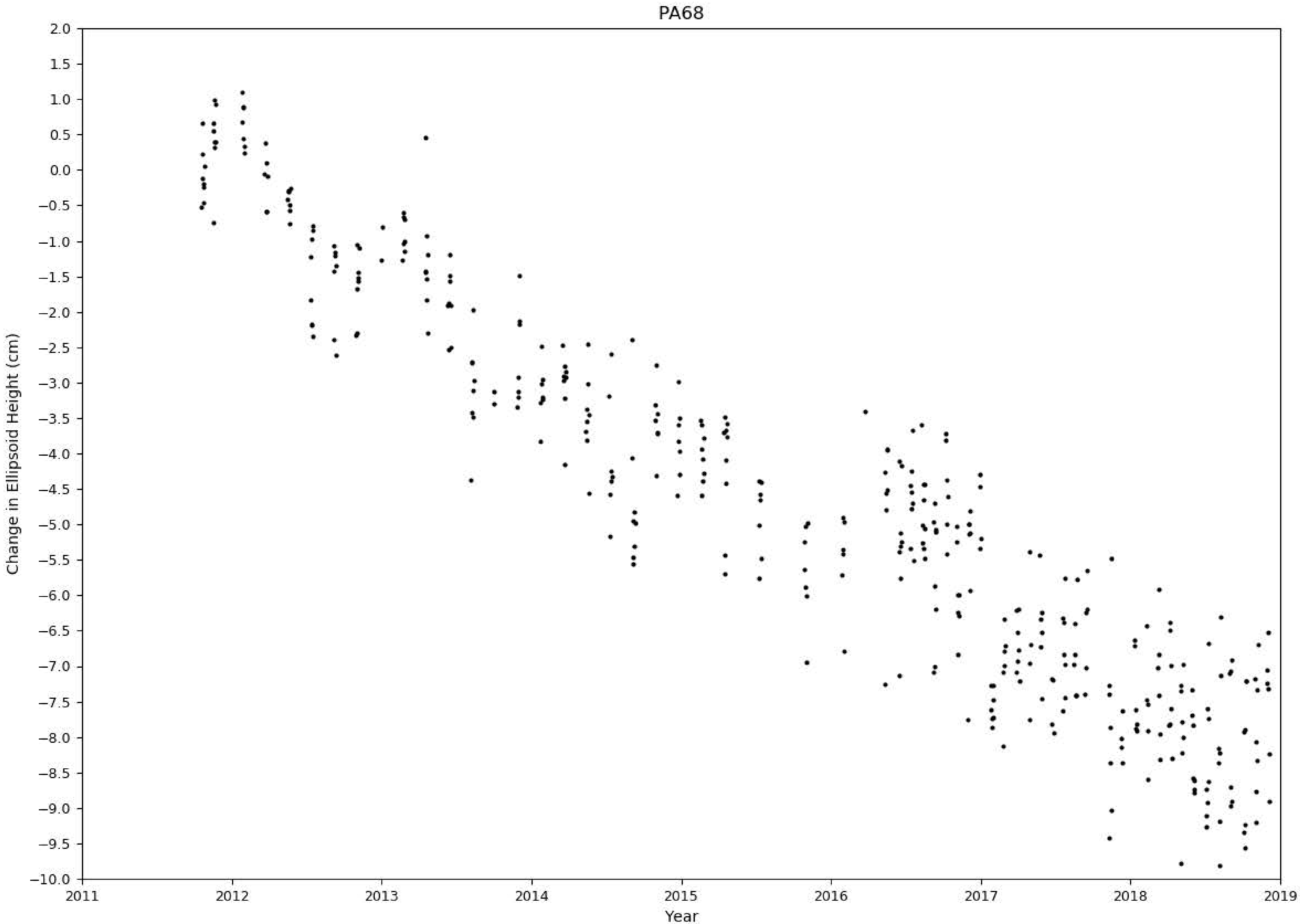

PA62
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

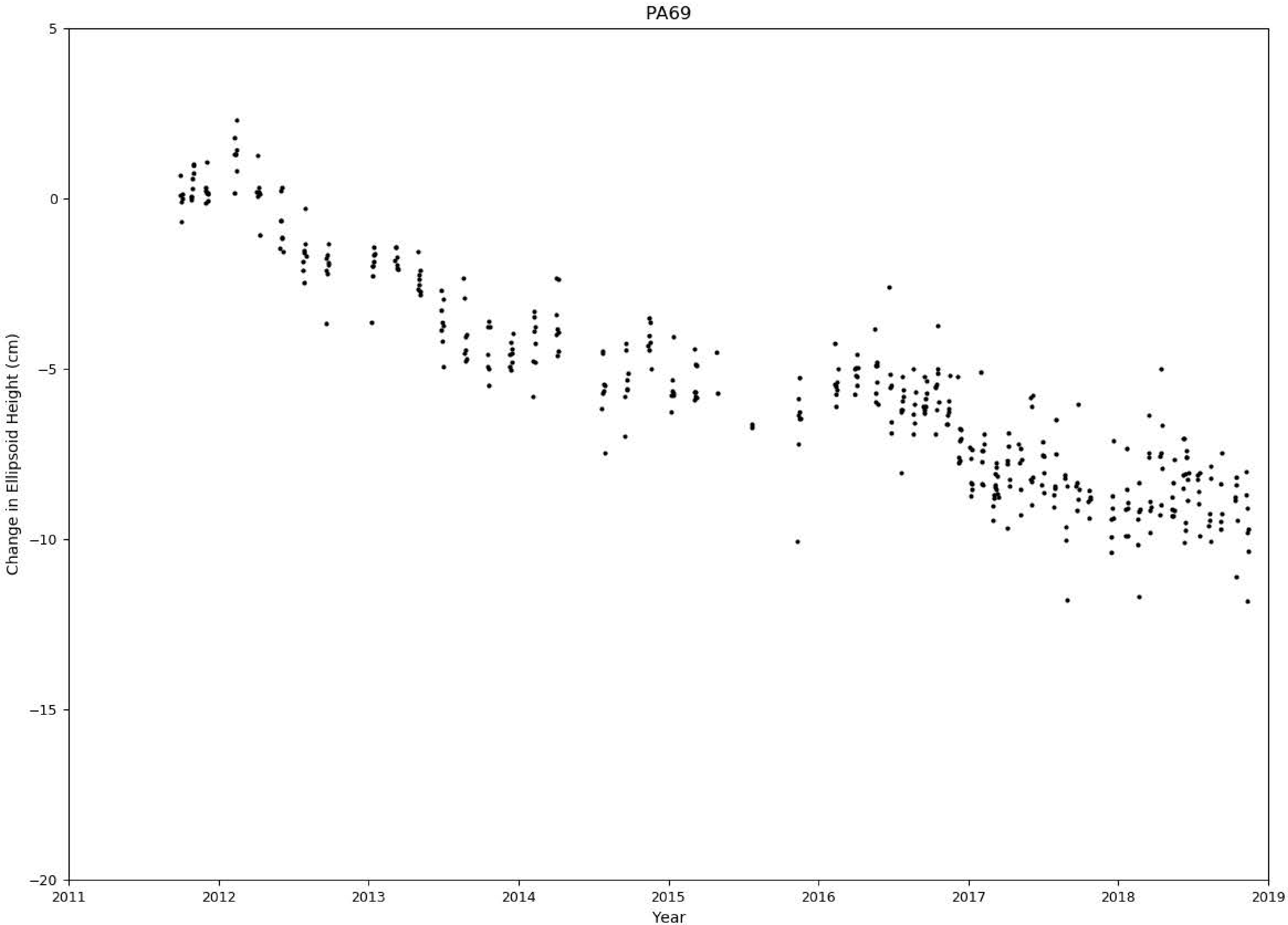

PA63
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

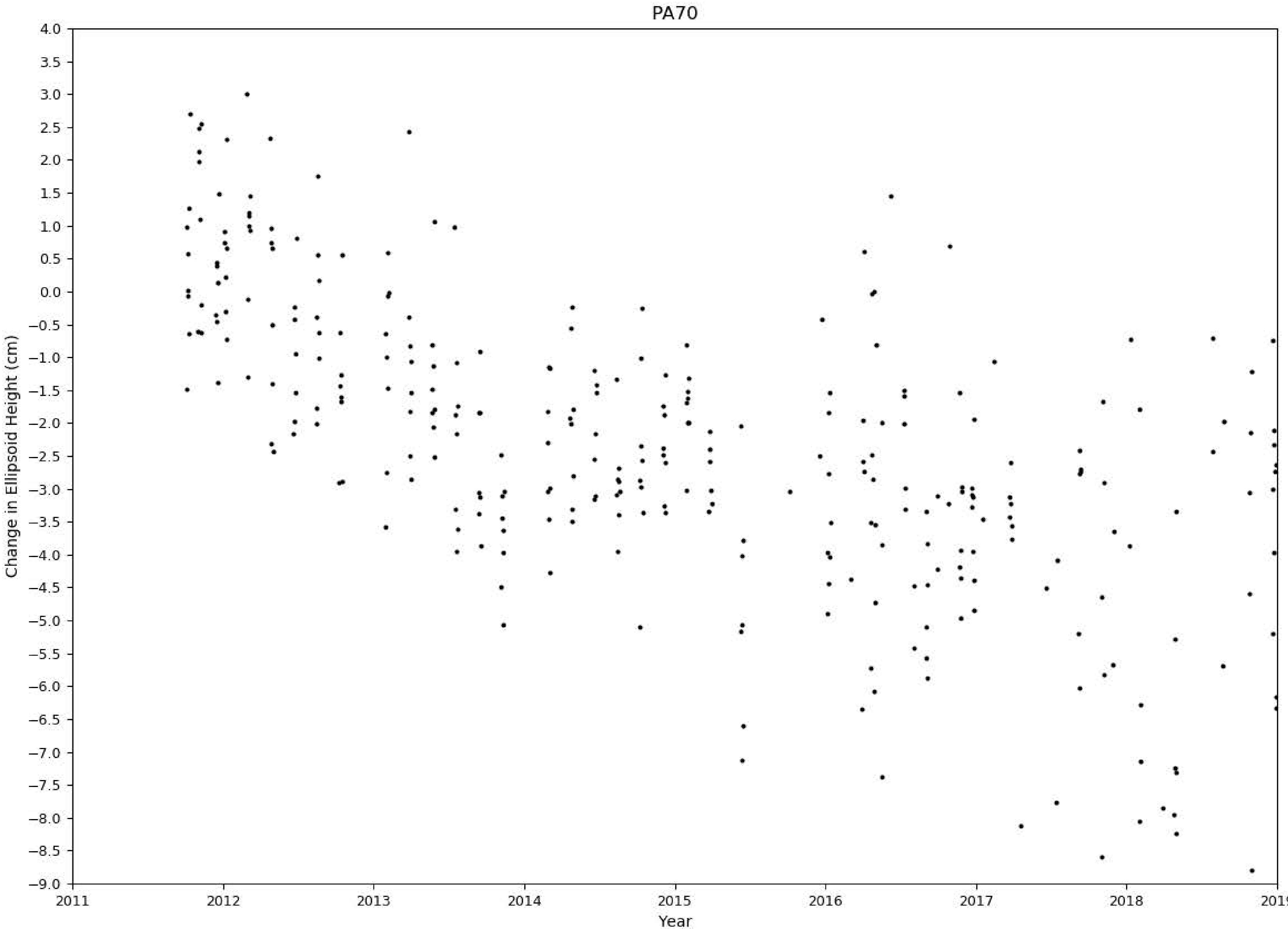

PA65
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
−11.0
2012
2013
2014
2015
2016
2017
2018
2019

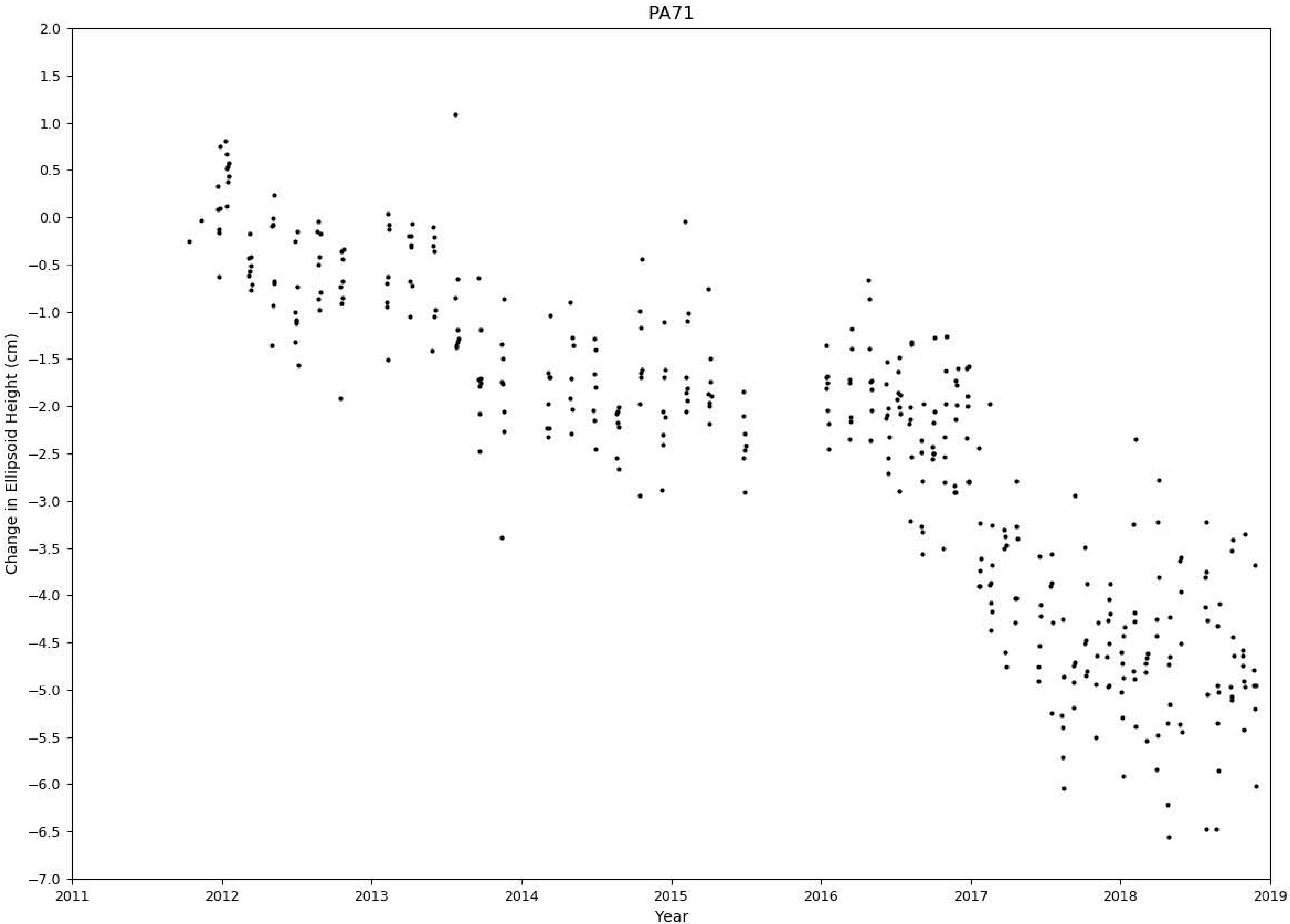

PA66
Change in Ellipsoid Height (cm)
Year
5
0
−5
−10
−15
−20
2011
2012
2013
2014
2015
2016
2017
2018
2019

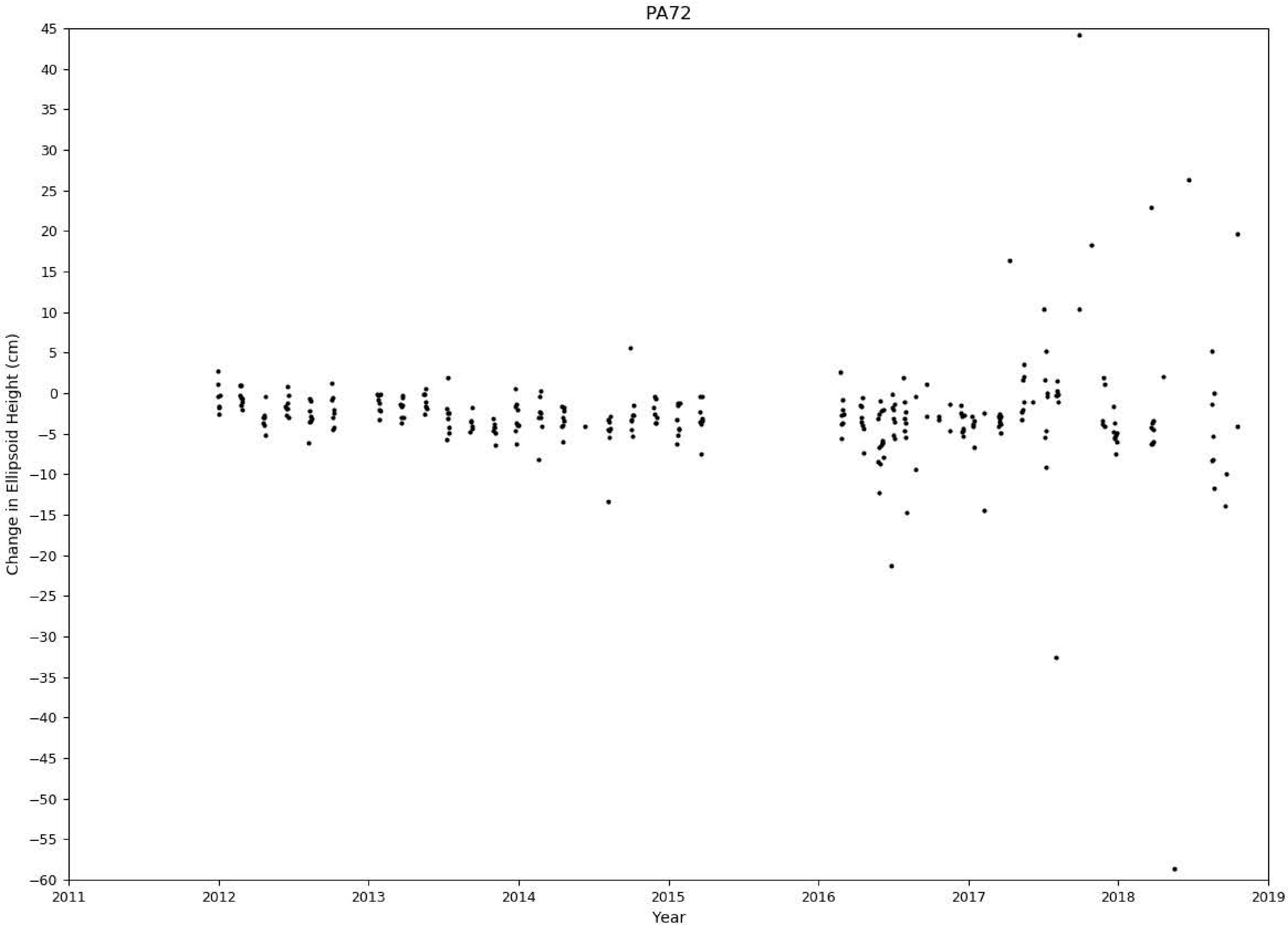

PA67
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2011
2012
2013
2014
2015
2016
2017
2018
2019

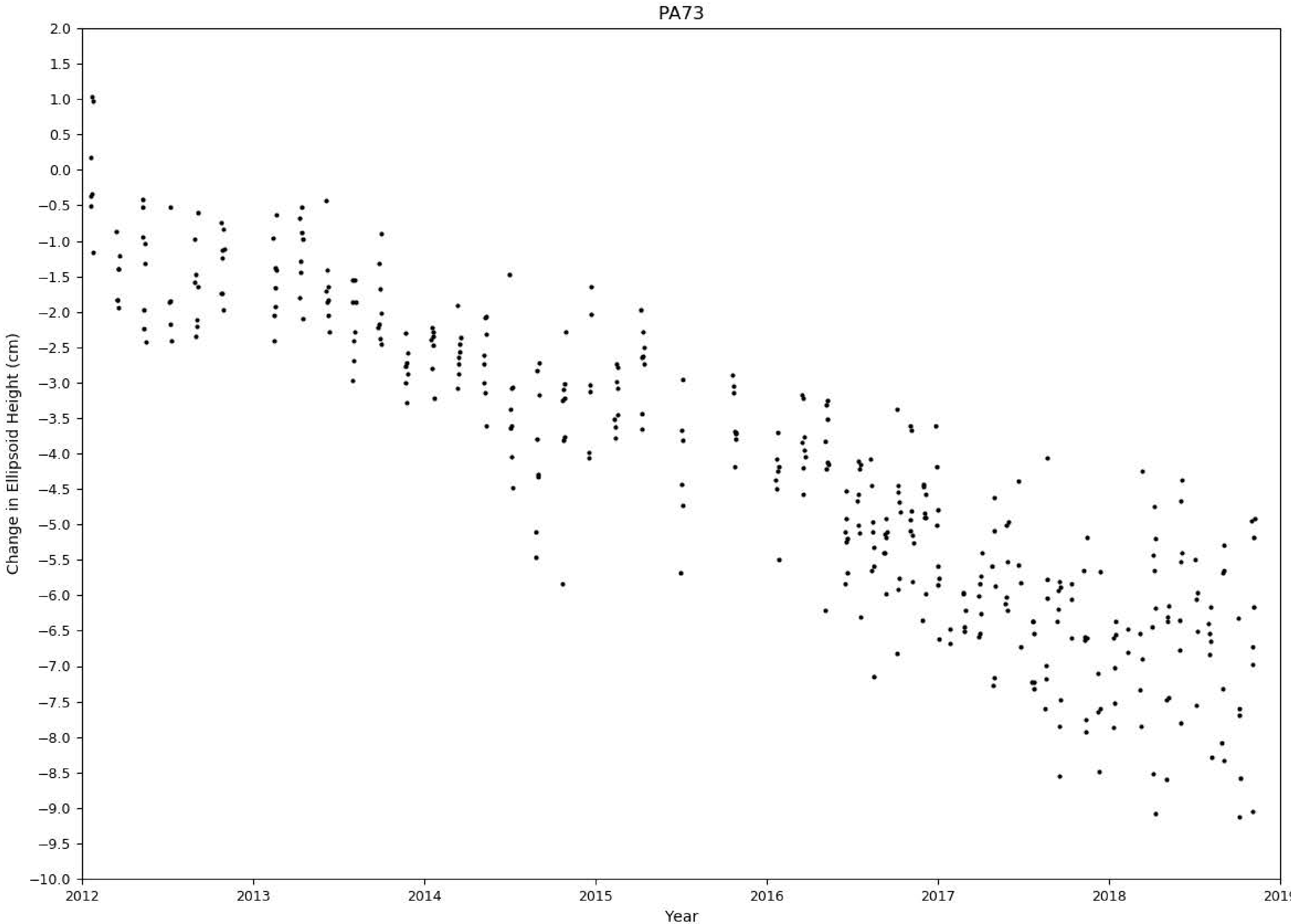

PA68
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
2011
2012
2013
2014
2015
2016
2017
2018
2019

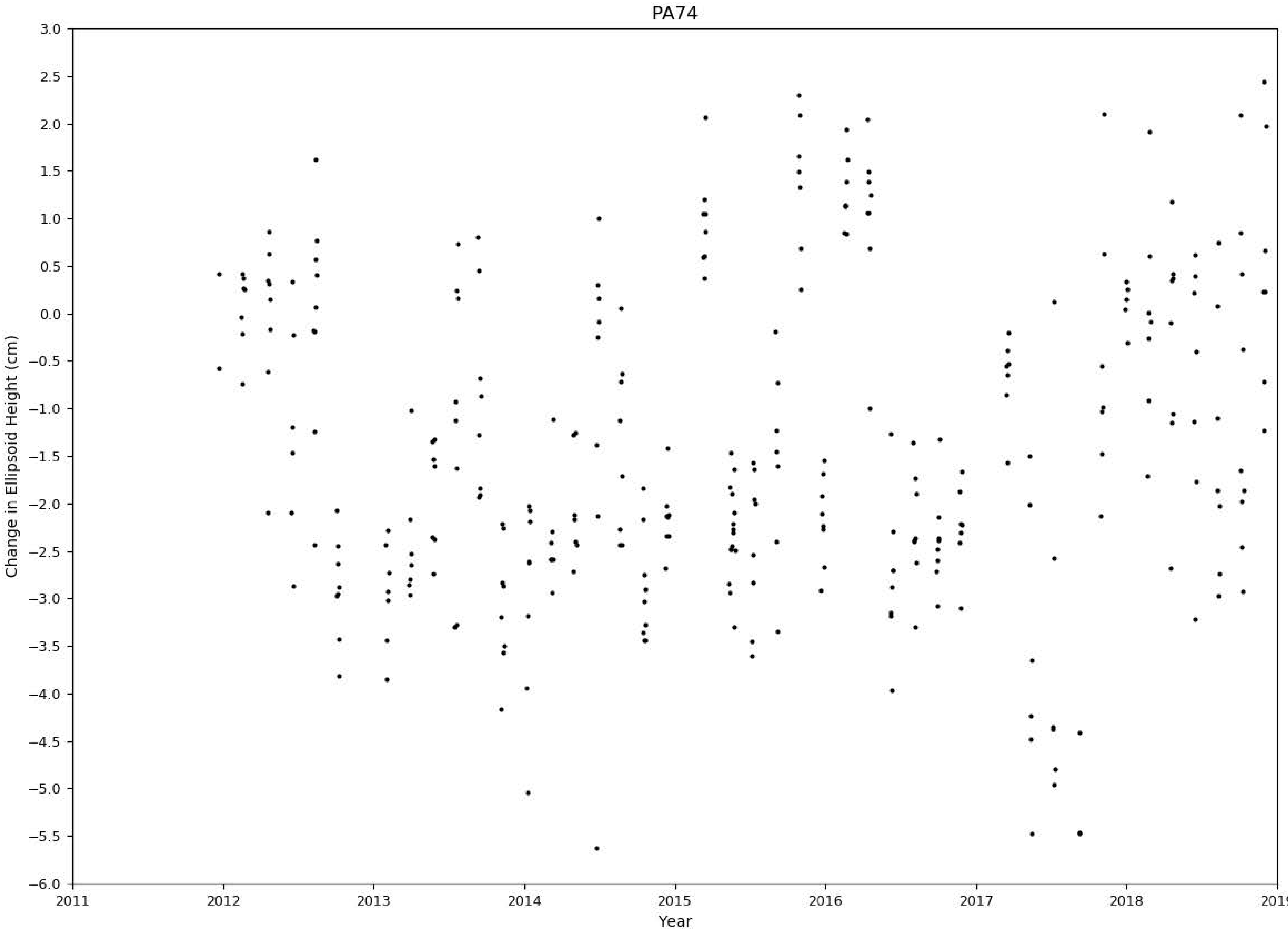

PA69
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

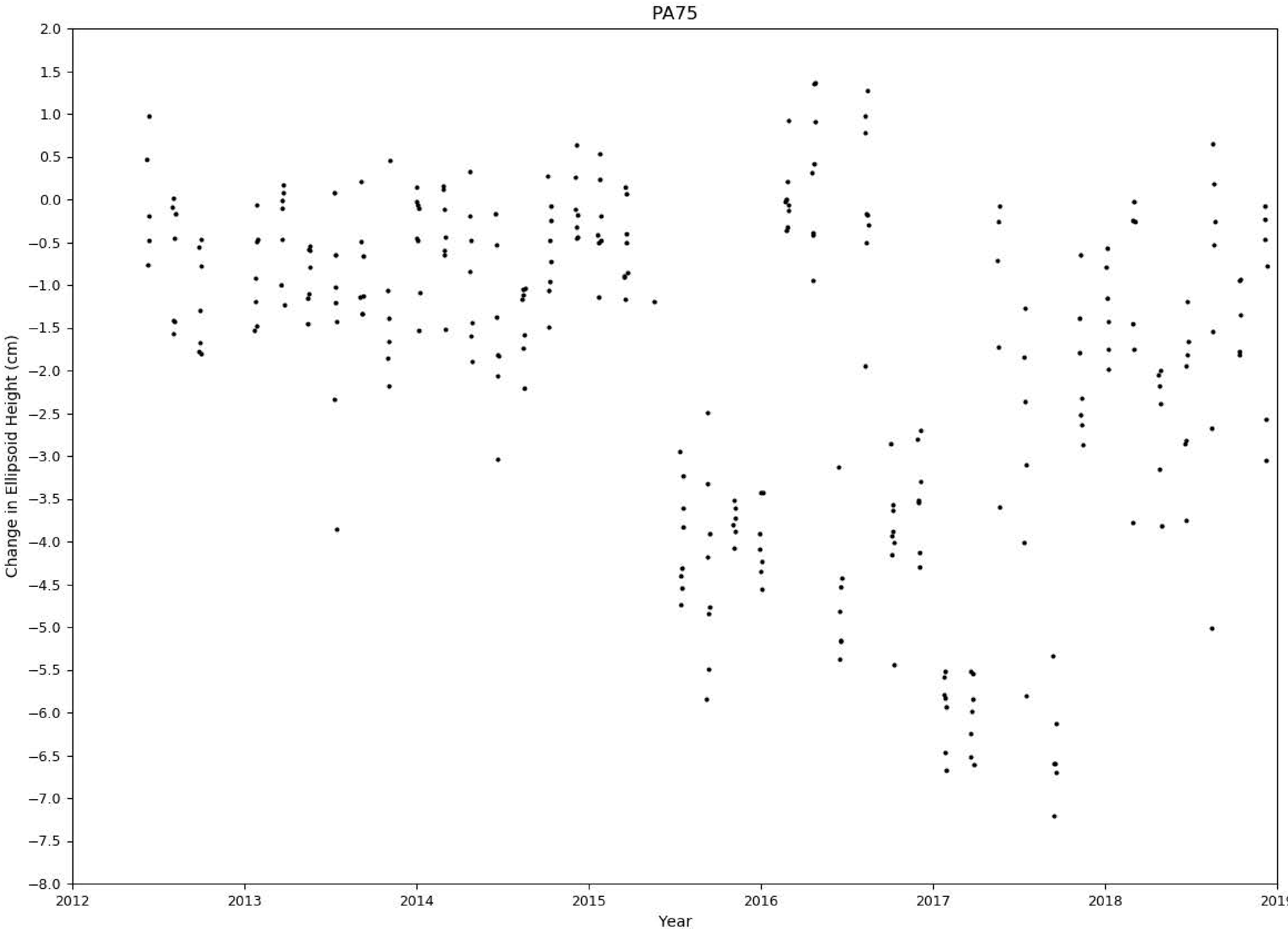

PA70
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

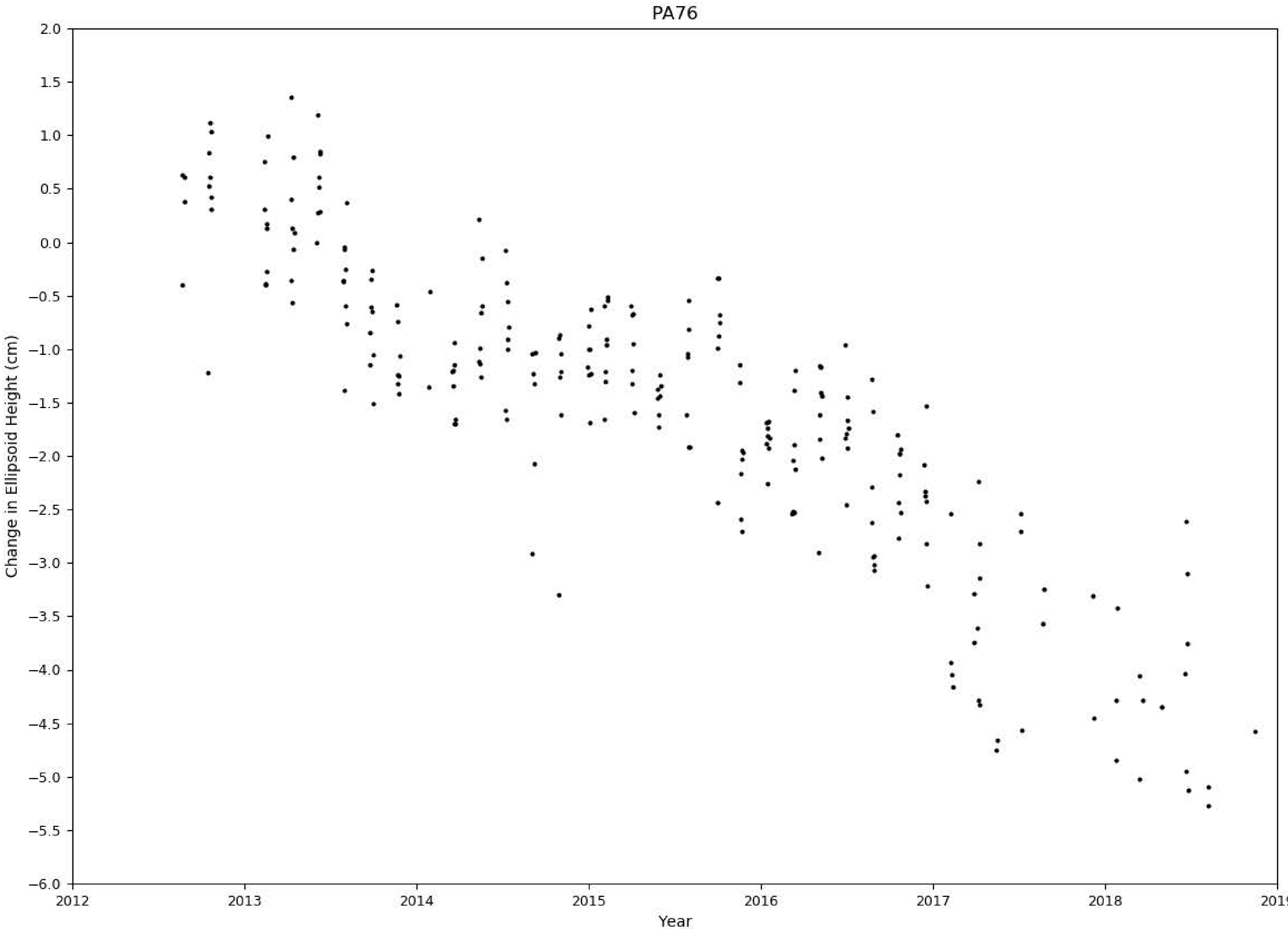

PA71
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2011
2012
2013
2014
2015
2016
2017
2018
2019

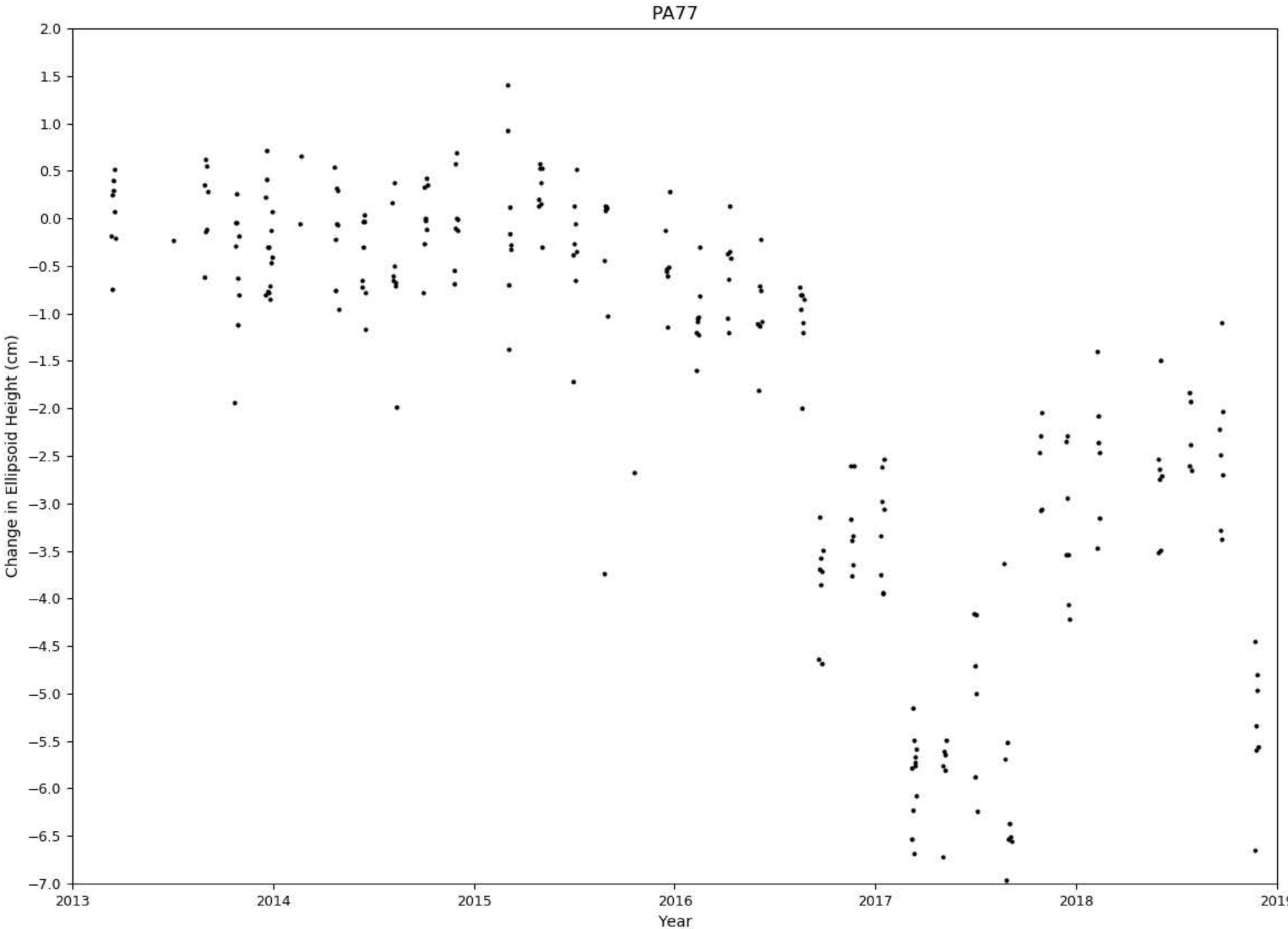

PA72
Change in Ellipsoid Height (cm)
Year
45
40
35
30
25
20
15
10
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
2011
2012
2013
2014
2015
2016
2017
2018
2019

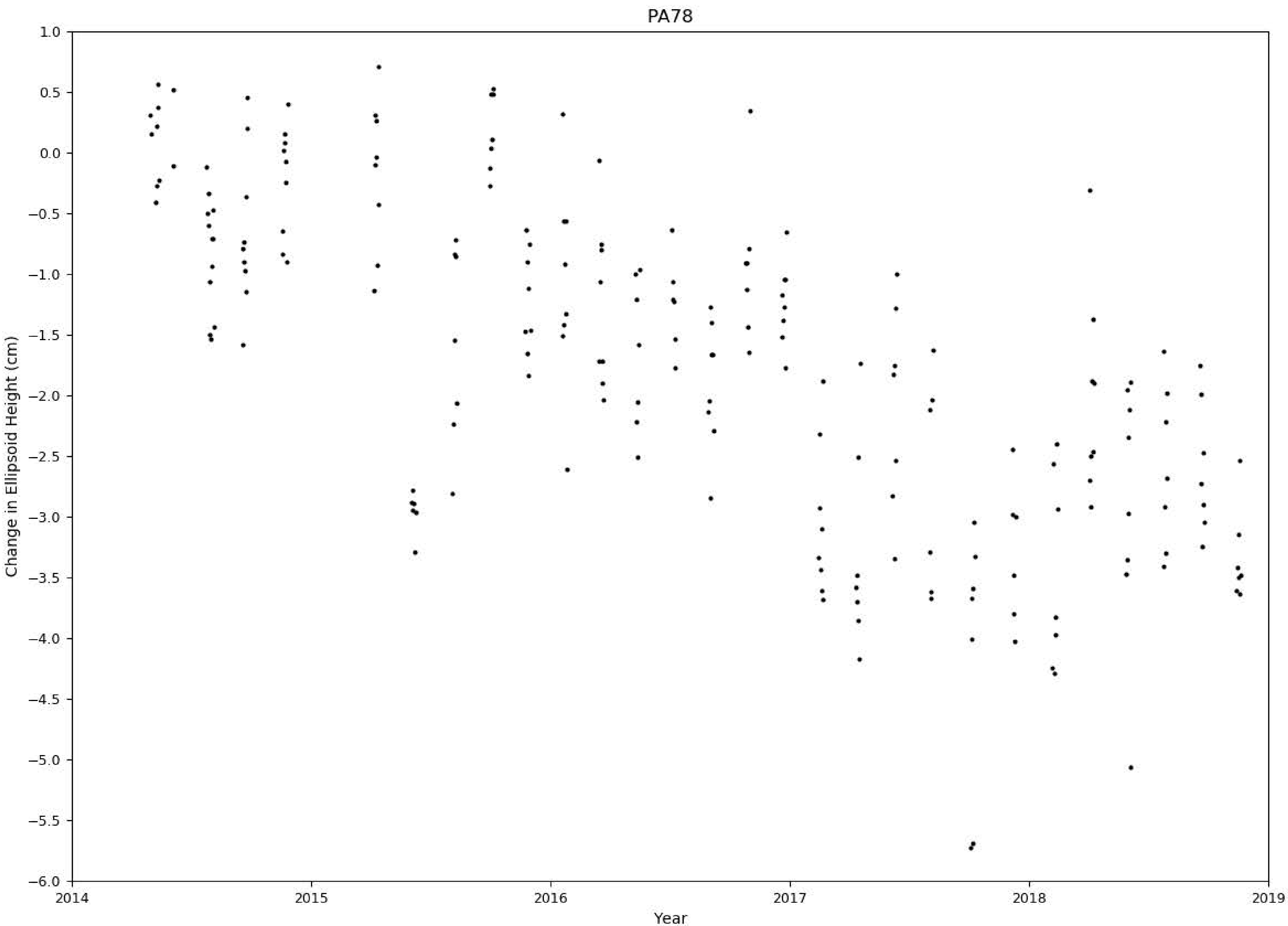

PA73
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
2012
2013
2014
2015
2016
2017
2018
2019

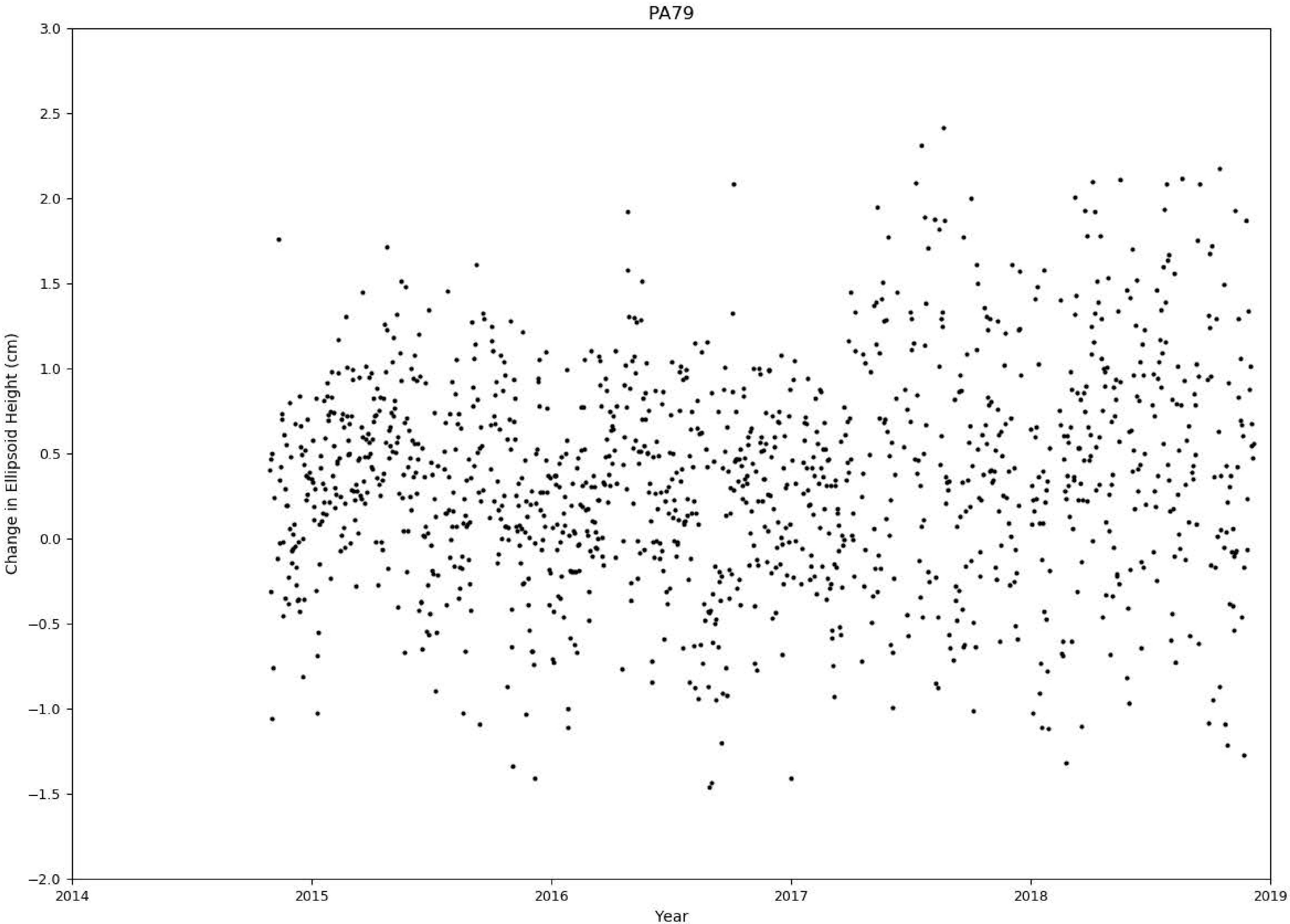

PA74
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2011
2012
2013
2014
2015
2016
2017
2018
2019

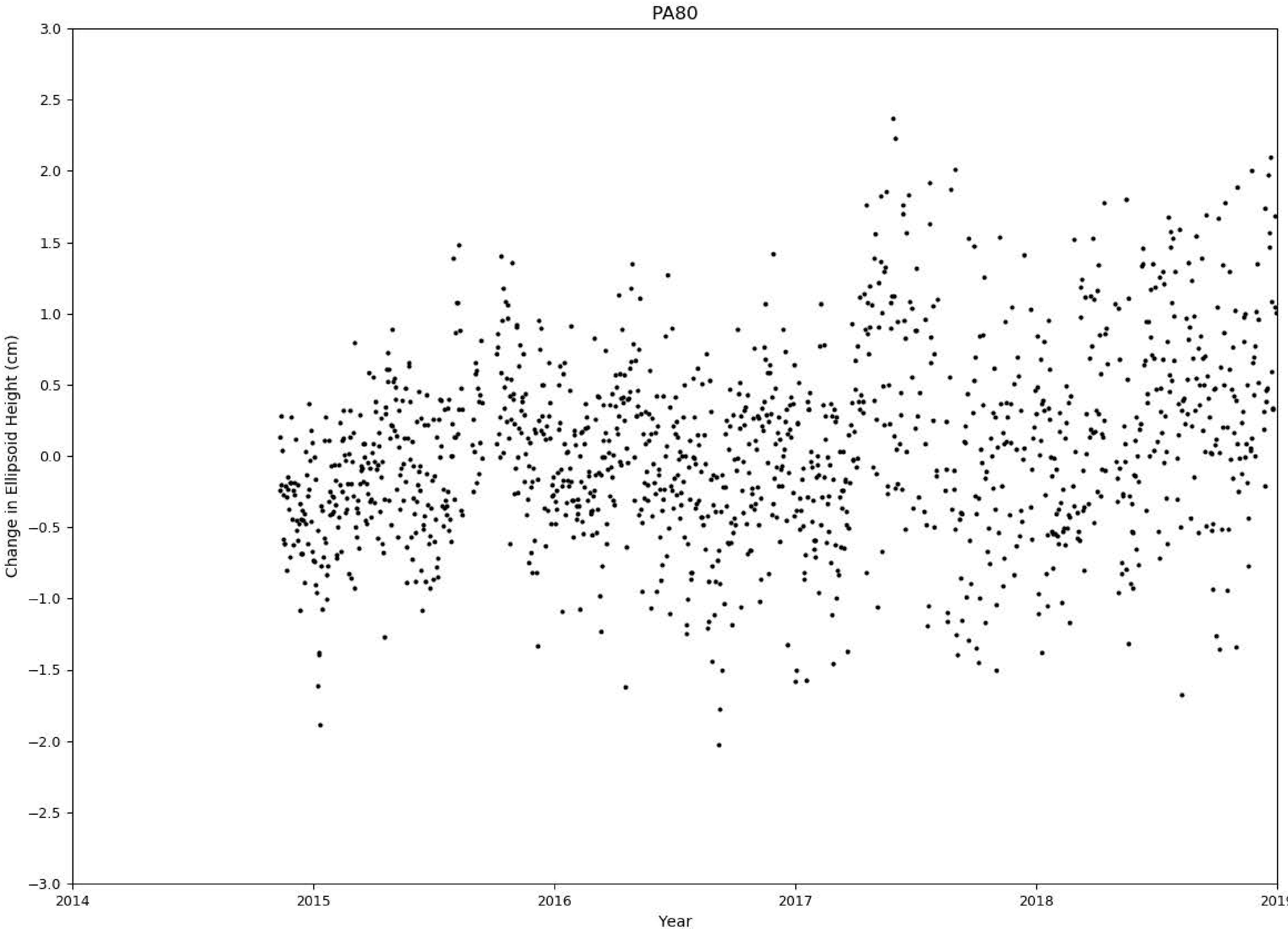

PA75
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
2012
2013
2014
2015
2016
2017
2018
2019
Year

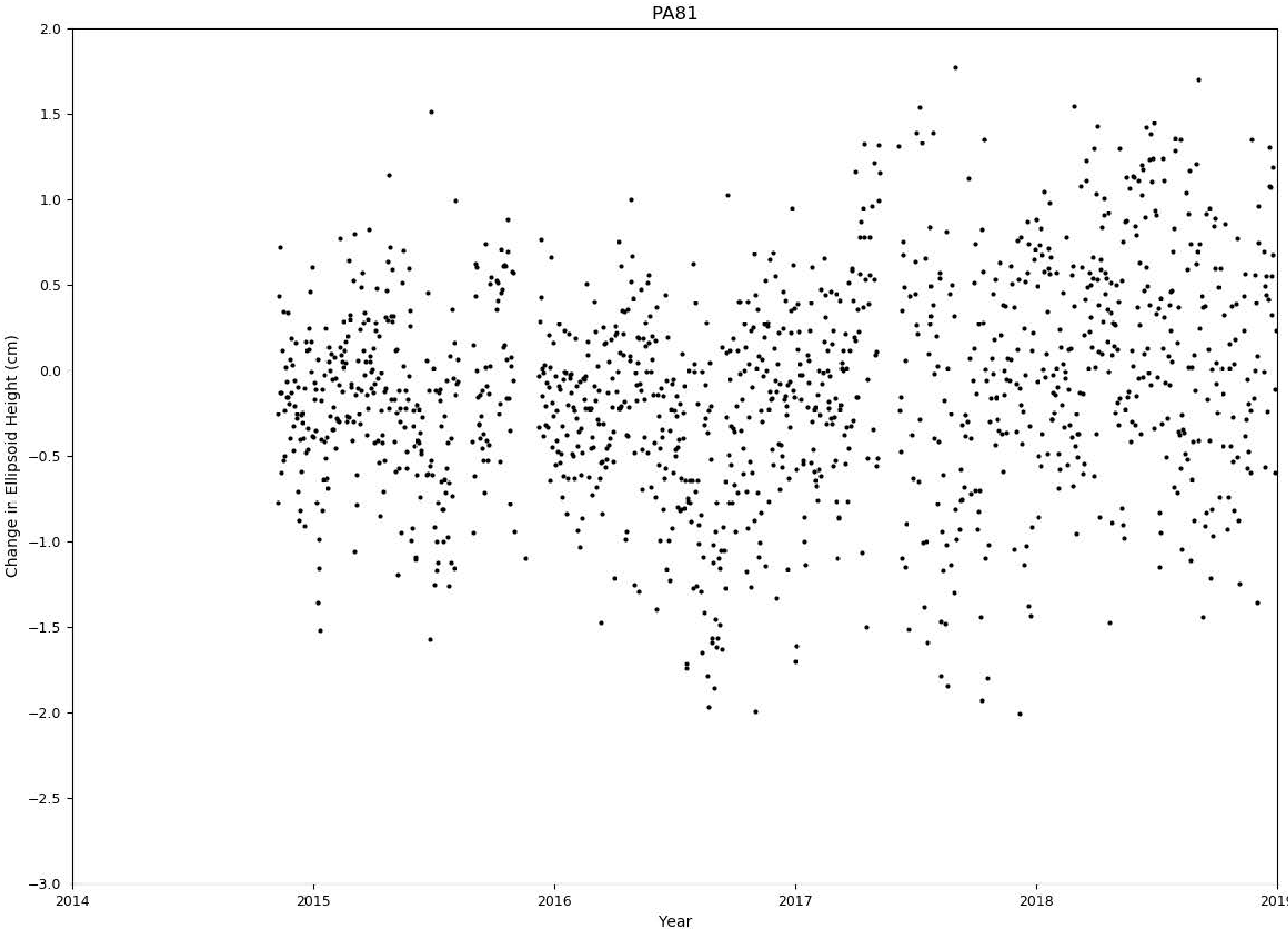

PA76
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2012
2013
2014
2015
2016
2017
2018
2019

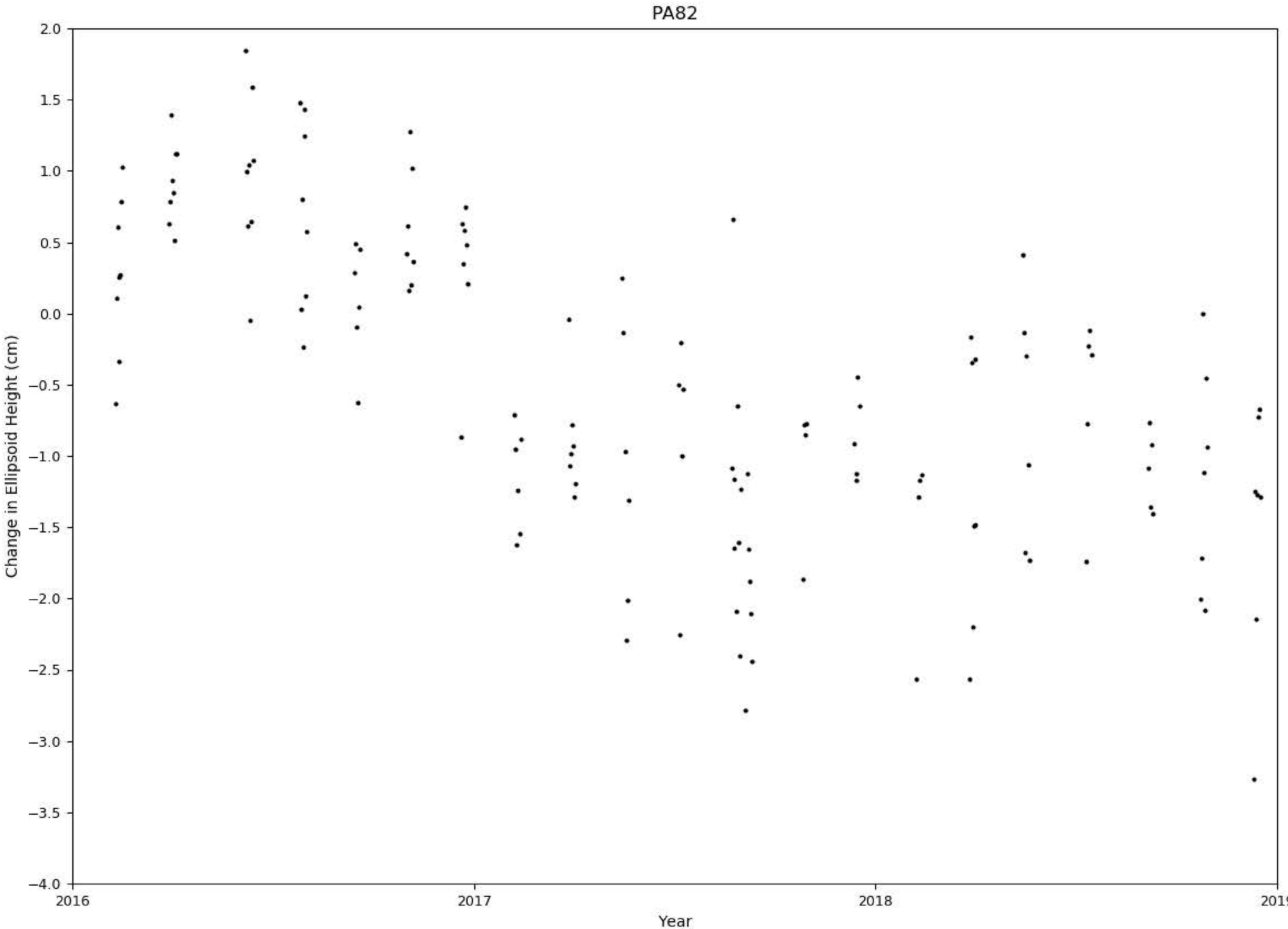

PA77
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year

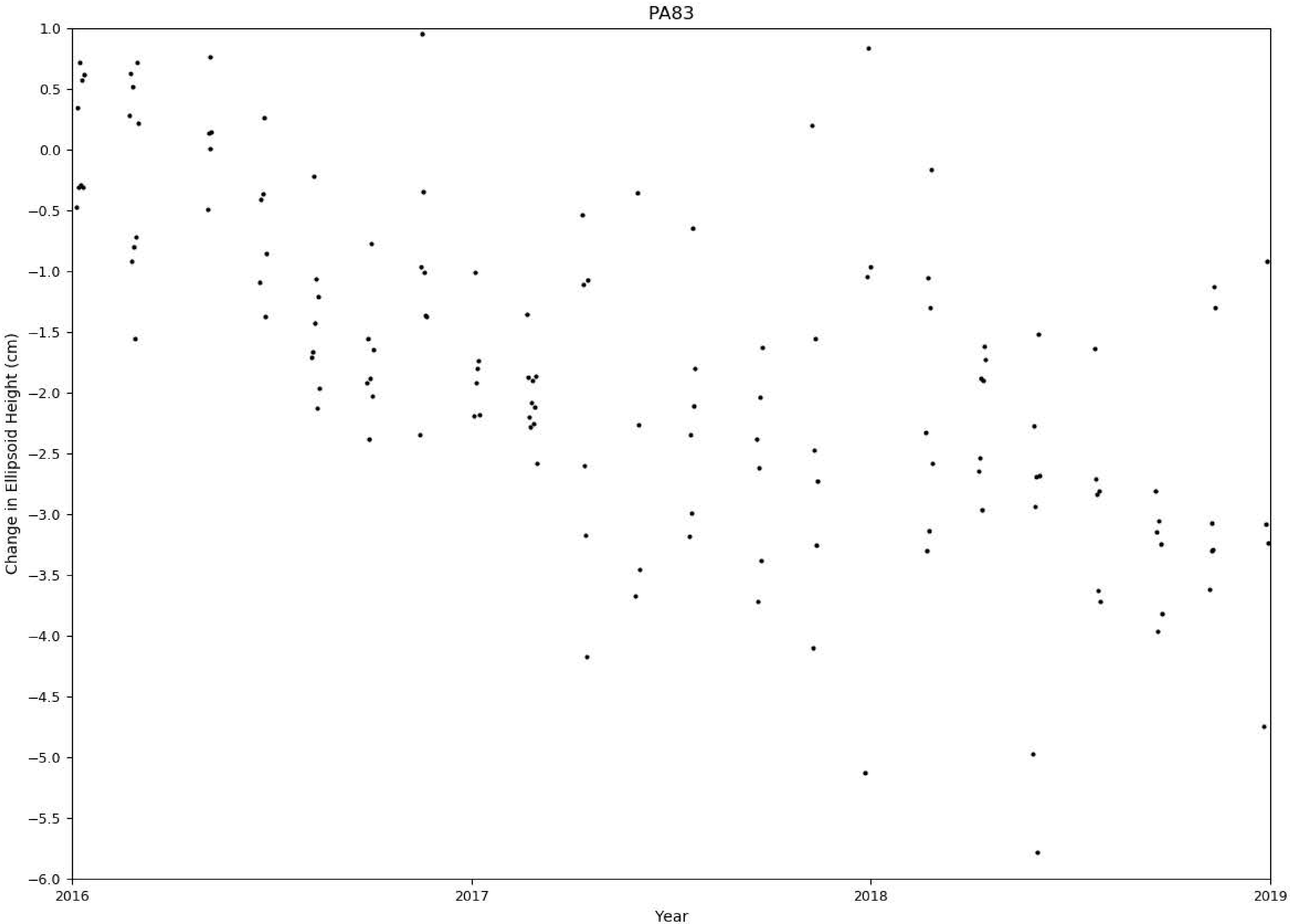

PA78
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2014
2015
2016
2017
2018
2019
Year

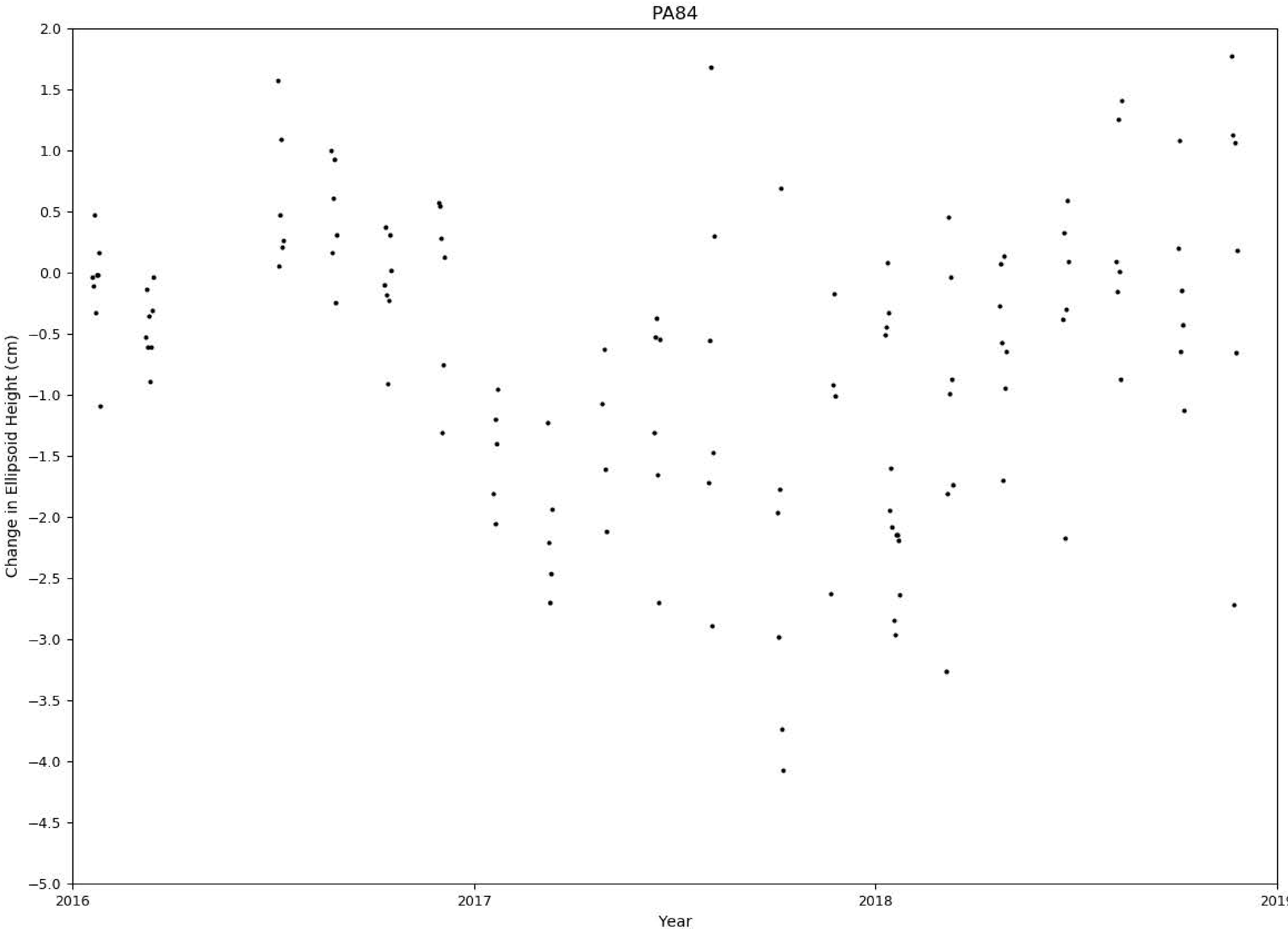

PA79
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2014
2015
2016
2017
2018
2019
Year

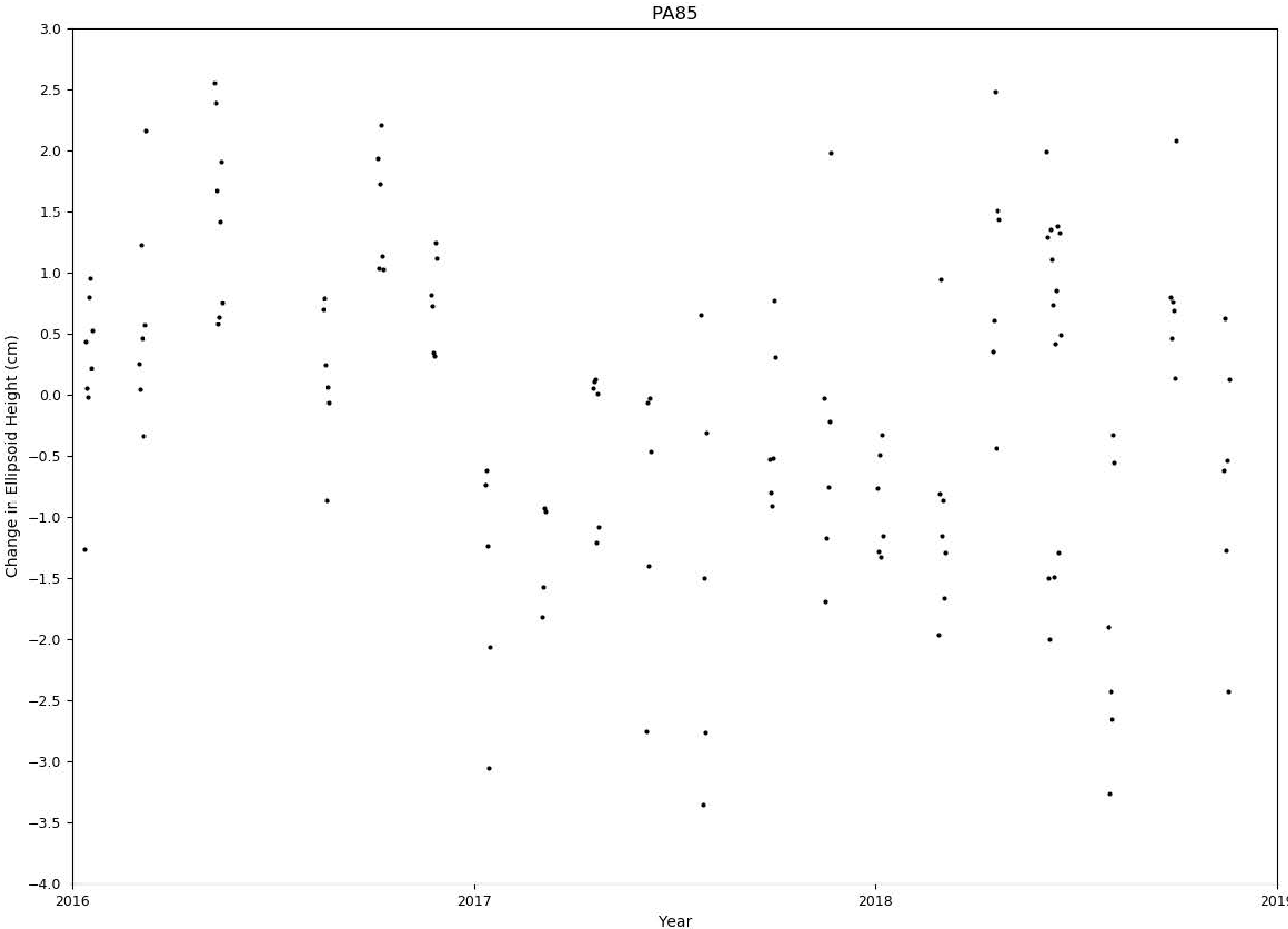

PA80
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year

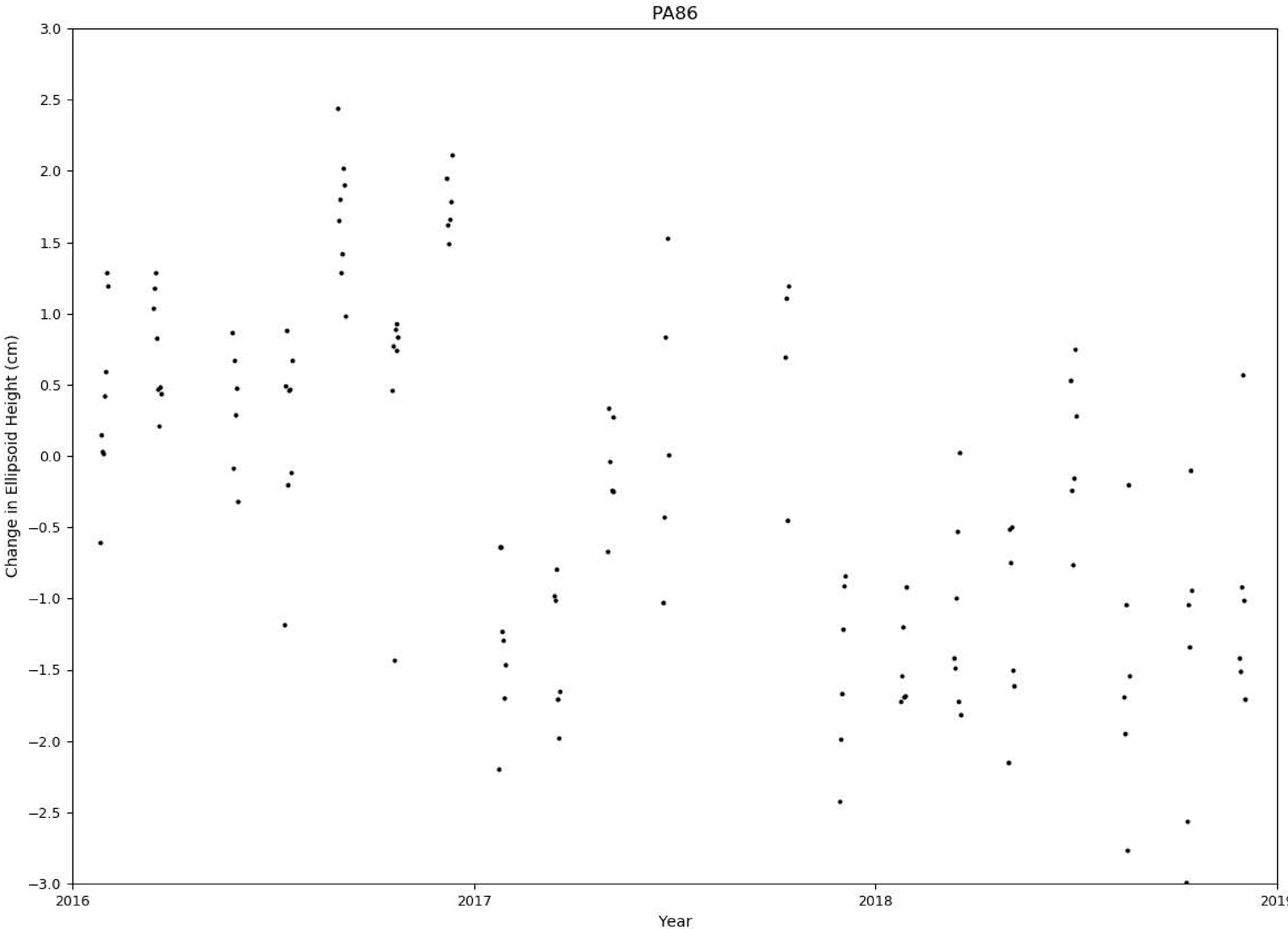

PA81
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2014
2015
2016
2017
2018
2019
Year

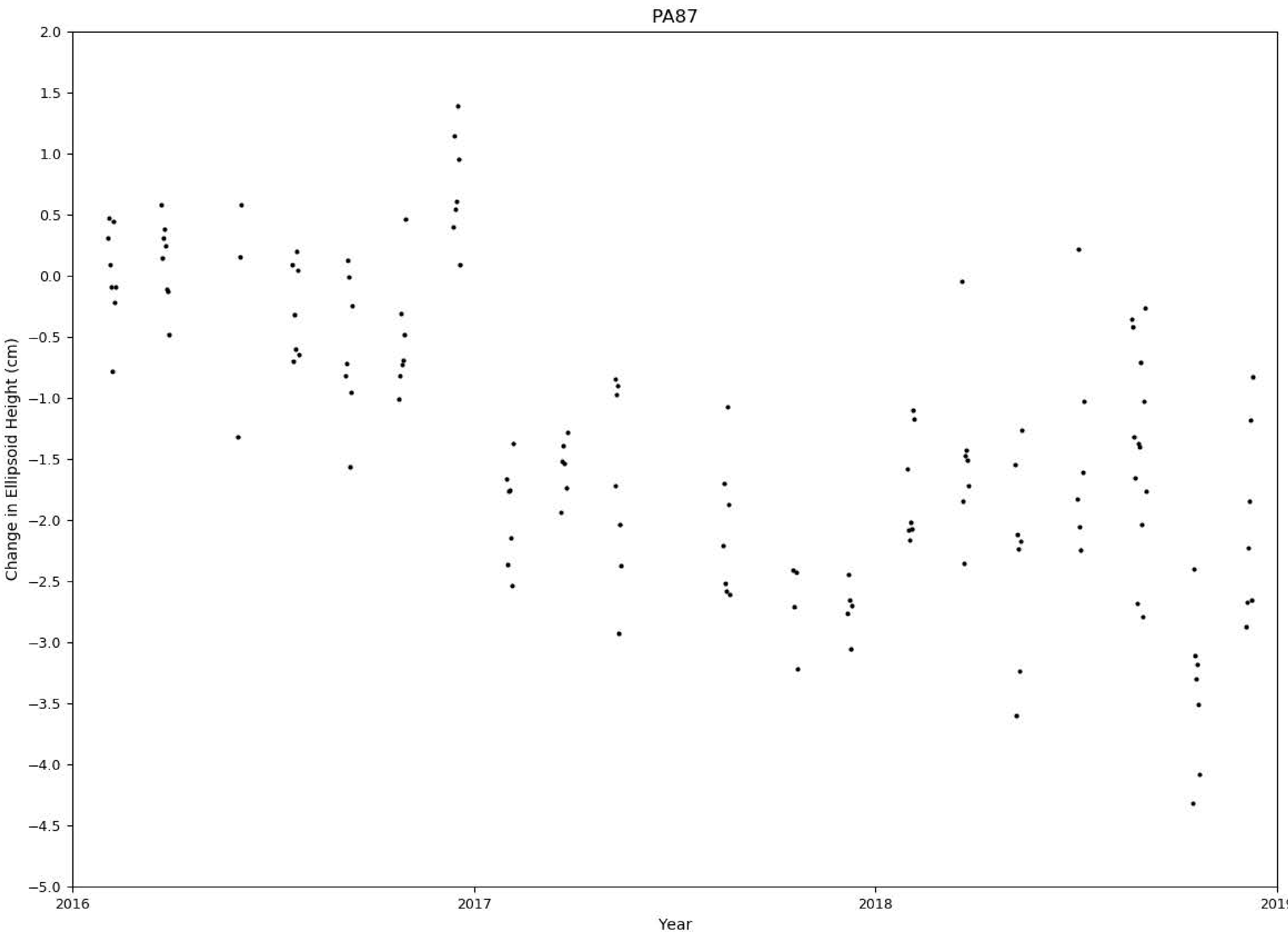

PA82
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2016
2017
2018
2019

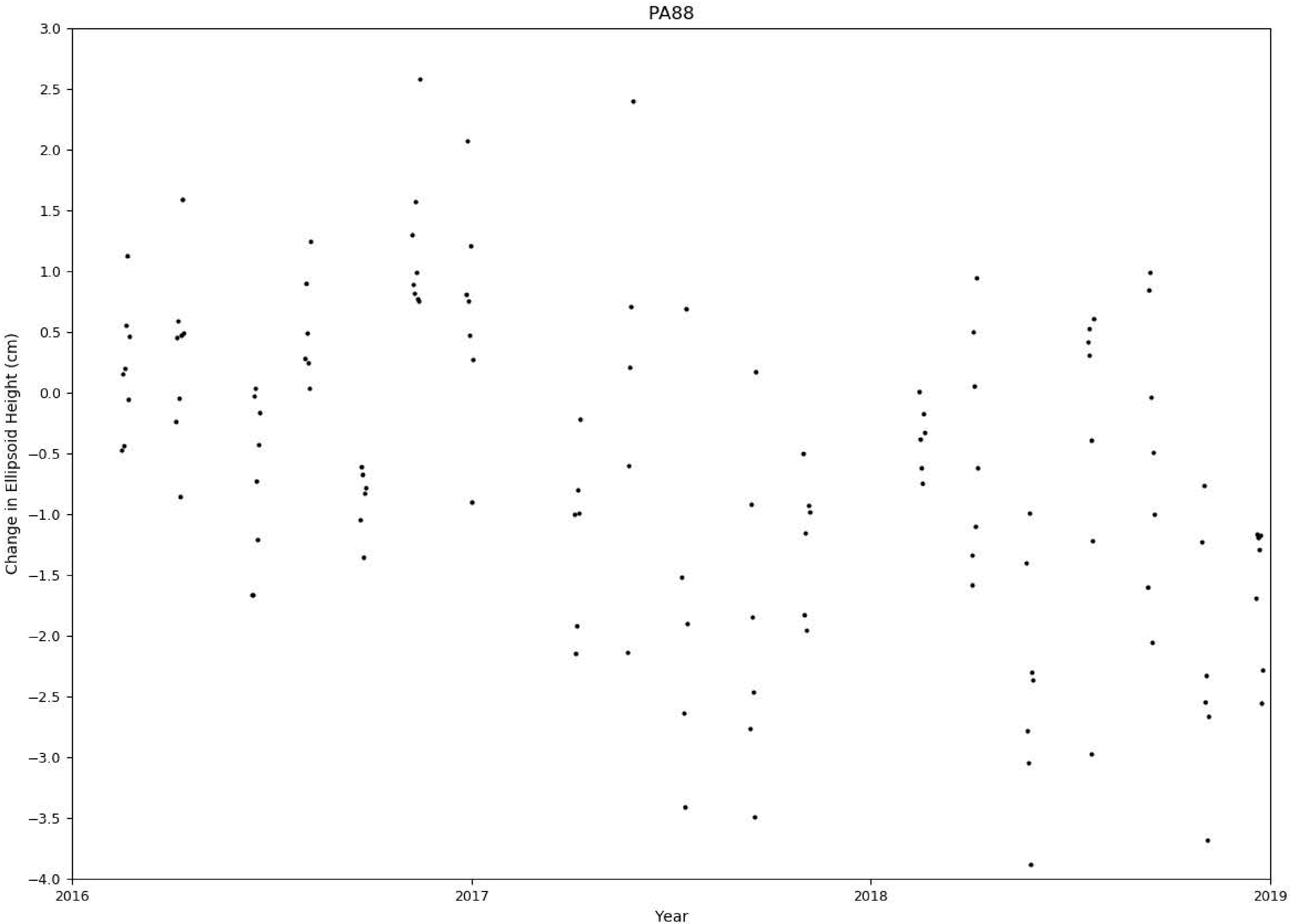

PA83
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year

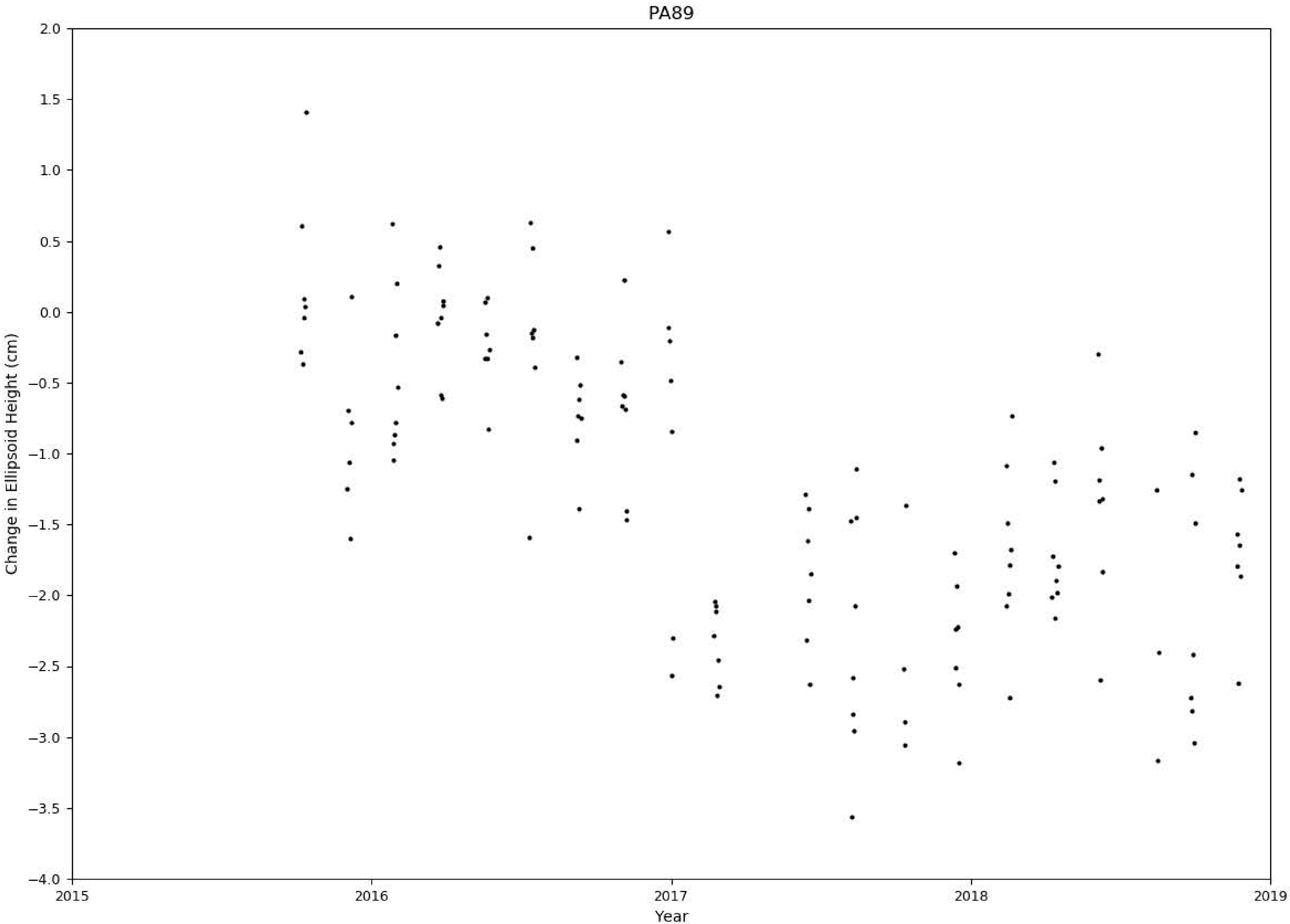

PA84
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year

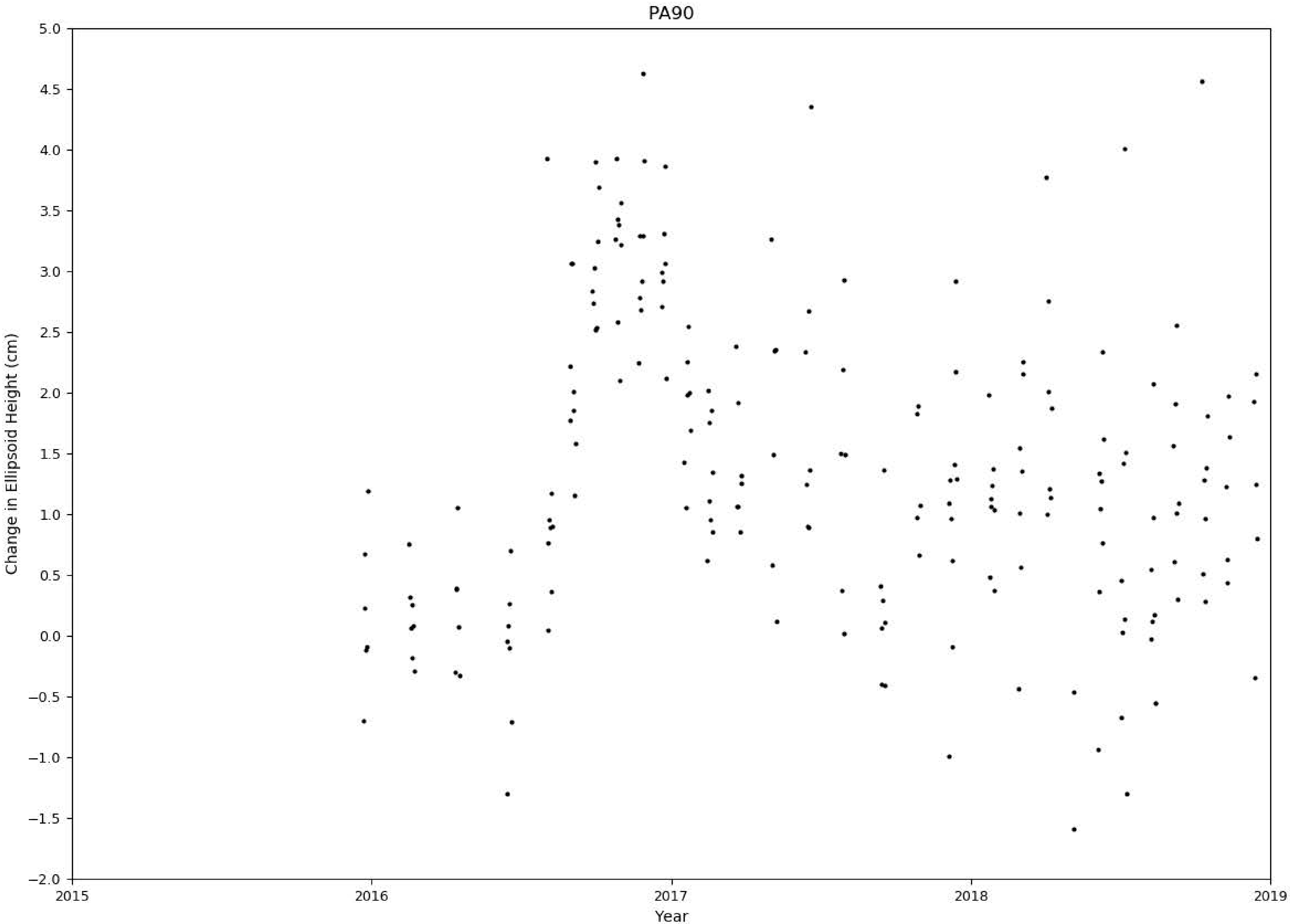

PA85
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year

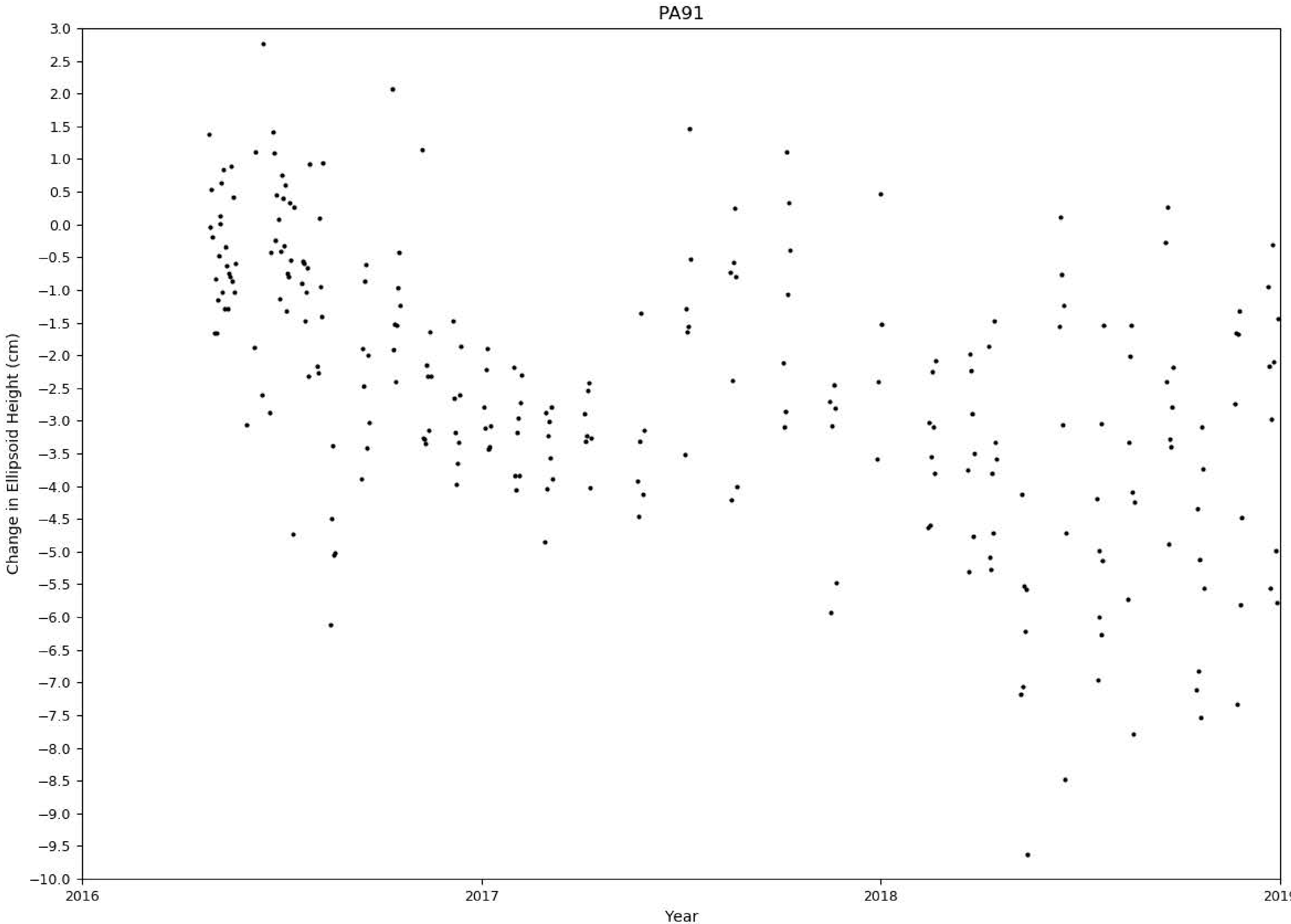

PA86
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year

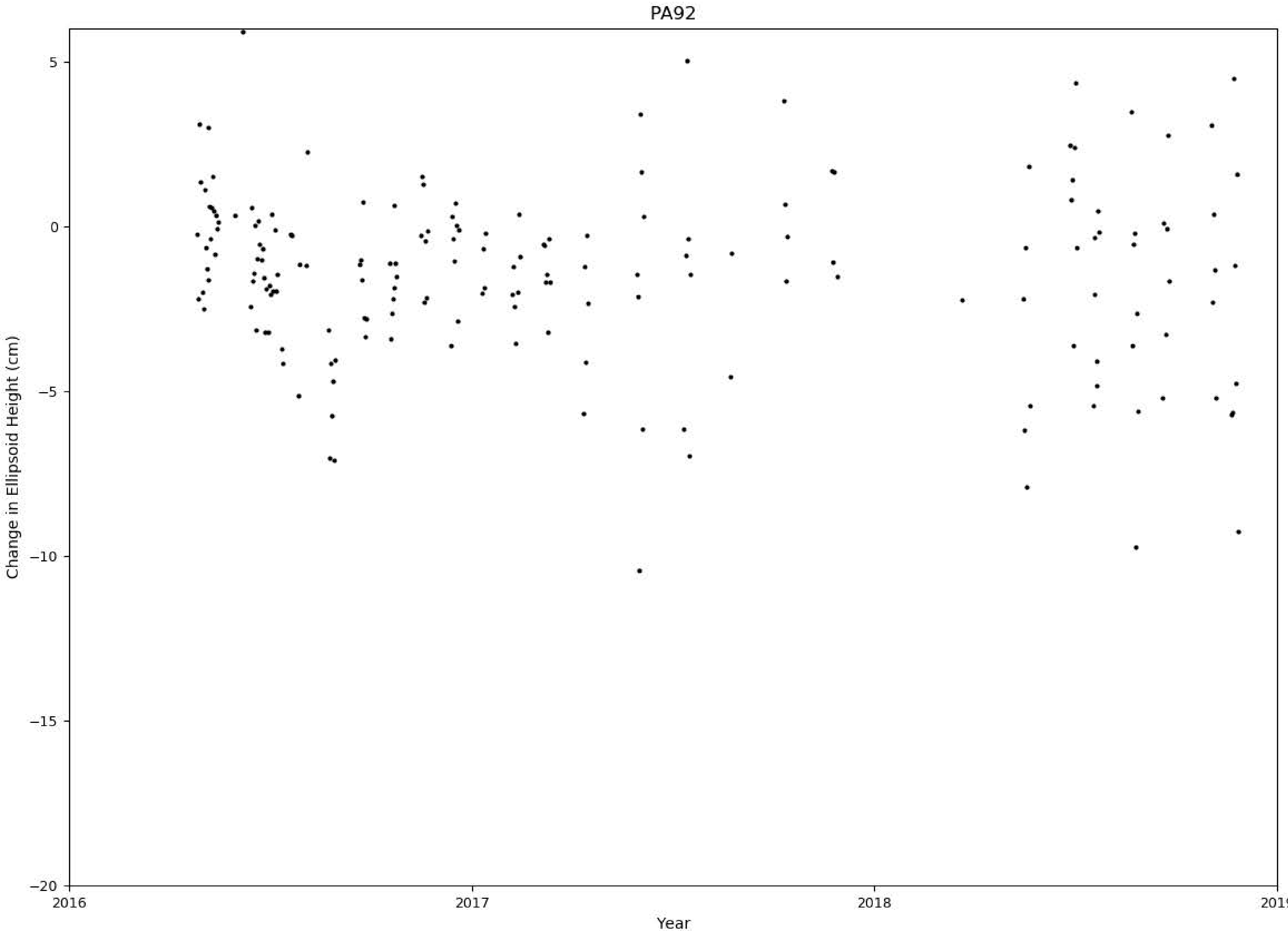

PA87
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year

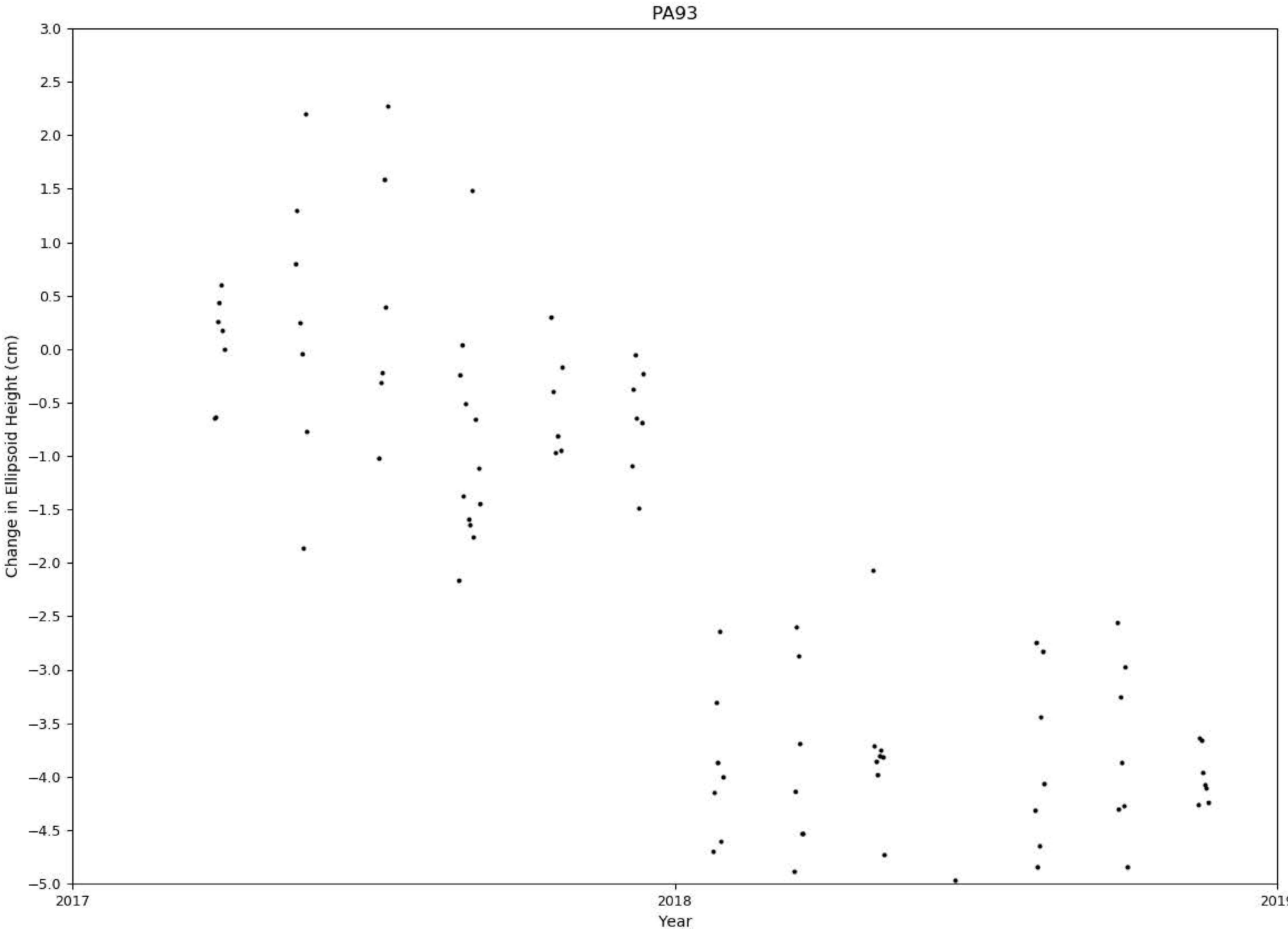

PA88
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2016
2017
2018
2019

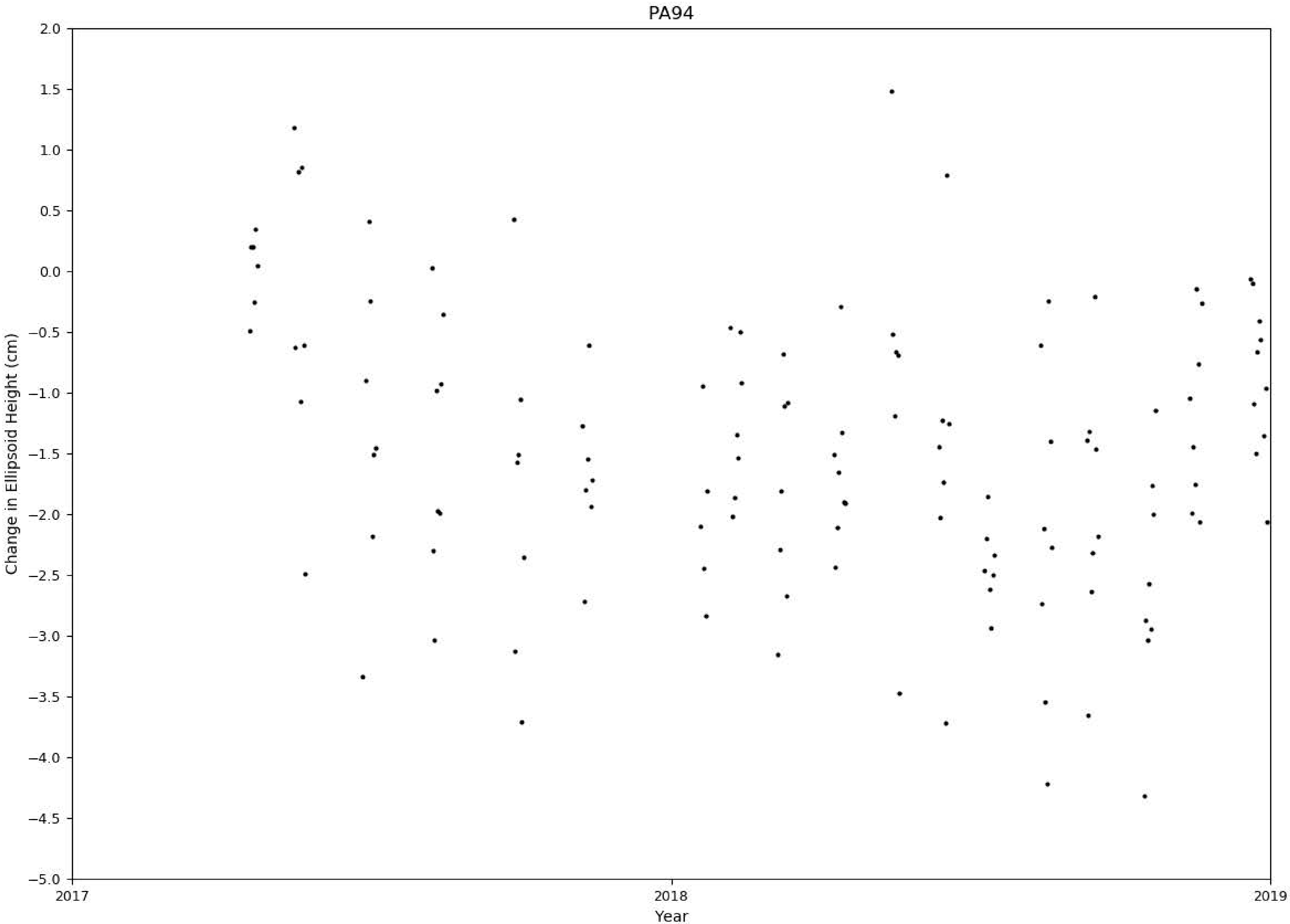

PA89
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year

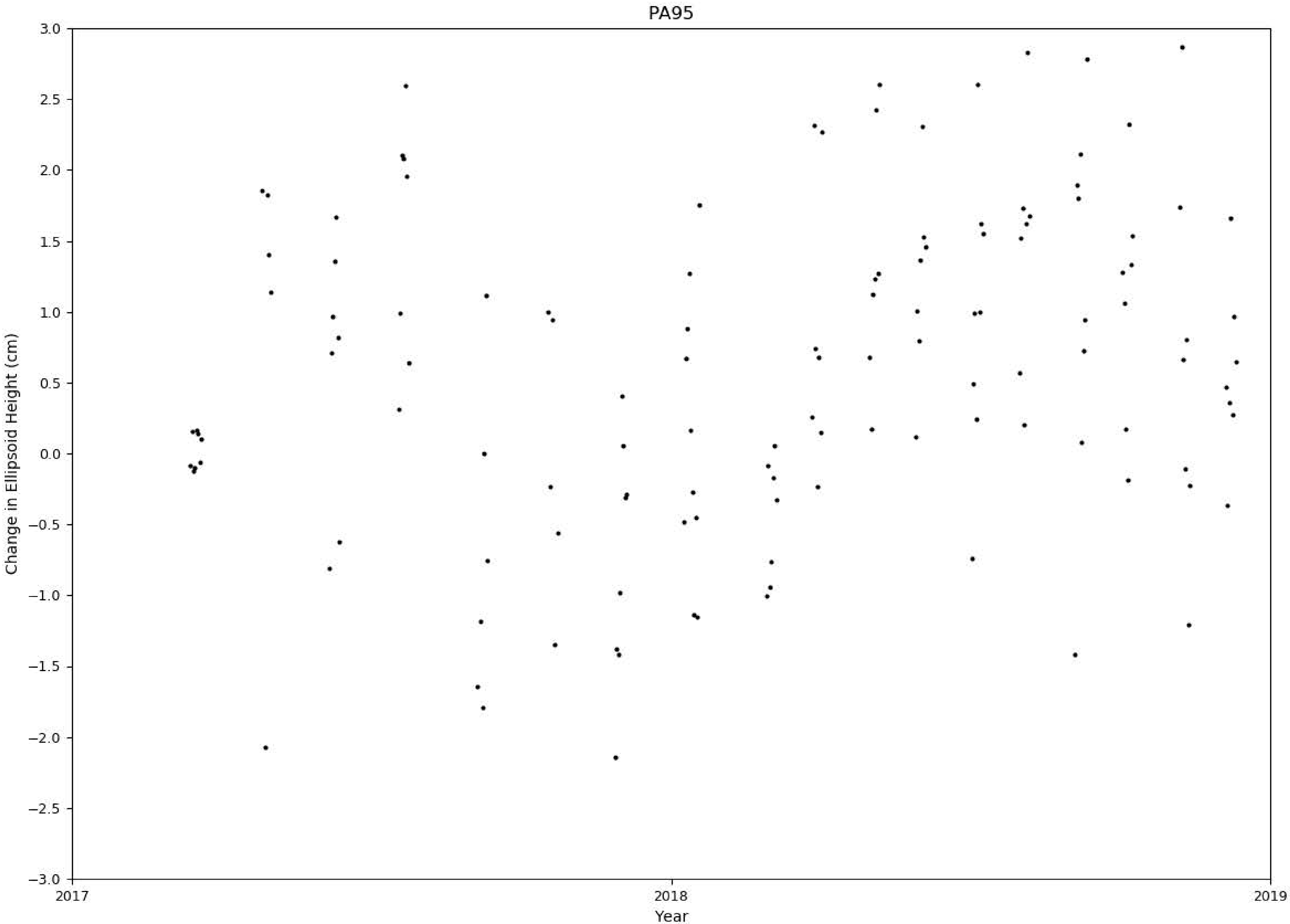

PA90
Change in Ellipsoid Height (cm)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2015
2016
2017
2018
2019
Year

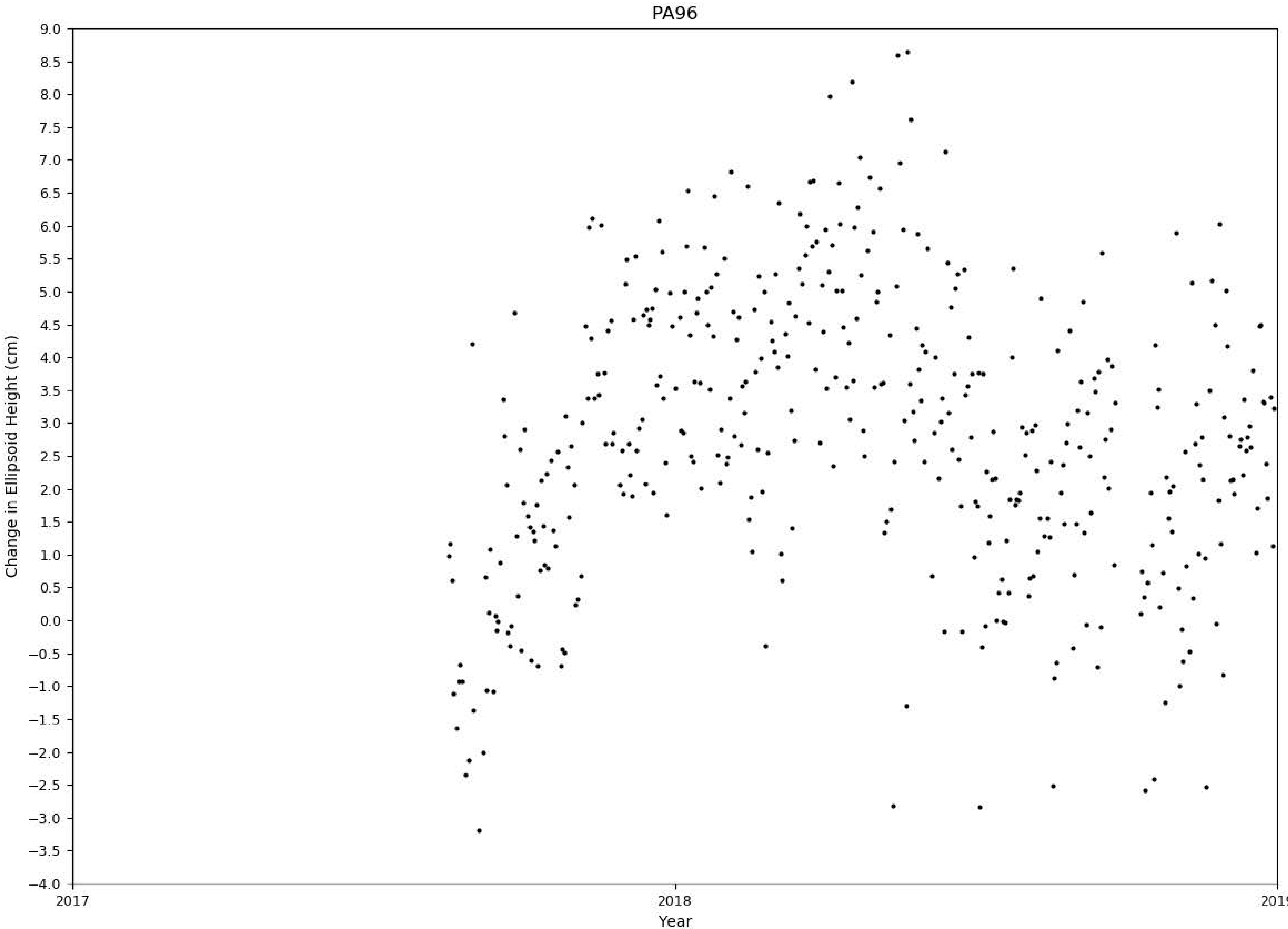

PA91
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
2016
2017
2018
2019
Year

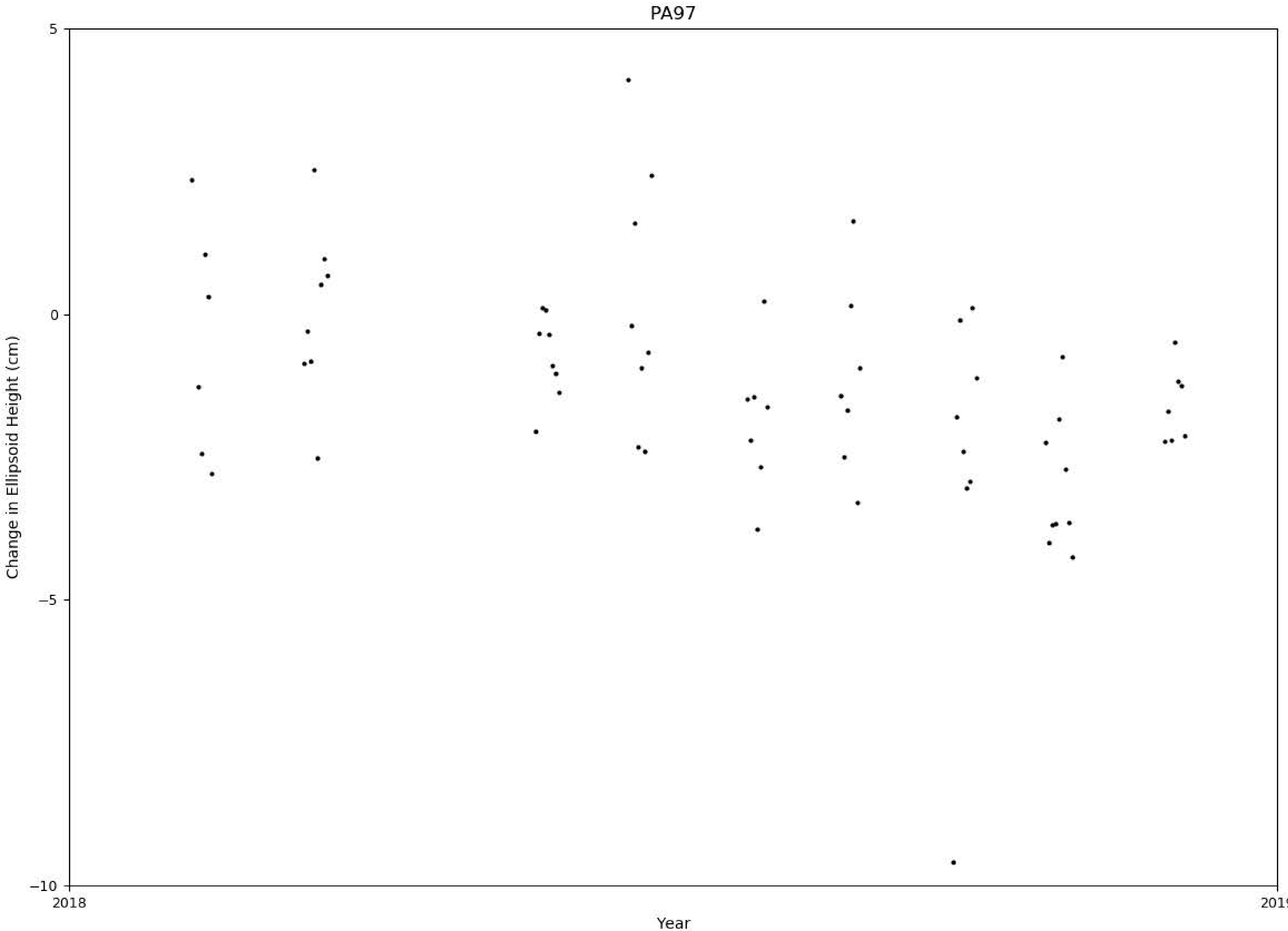

PA92
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2016
2017
2018
2019
Year

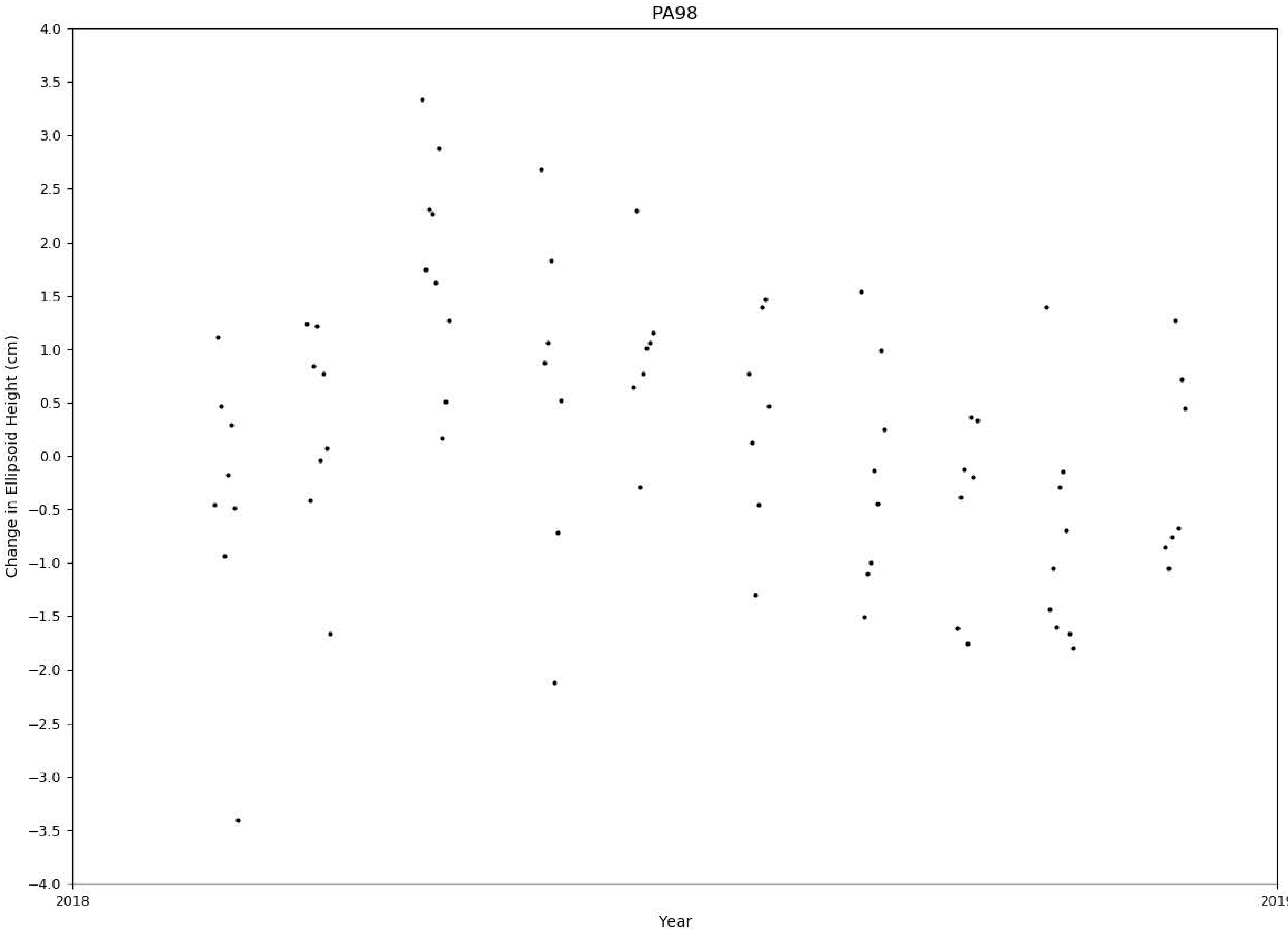

PA93
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2017
2018
2019

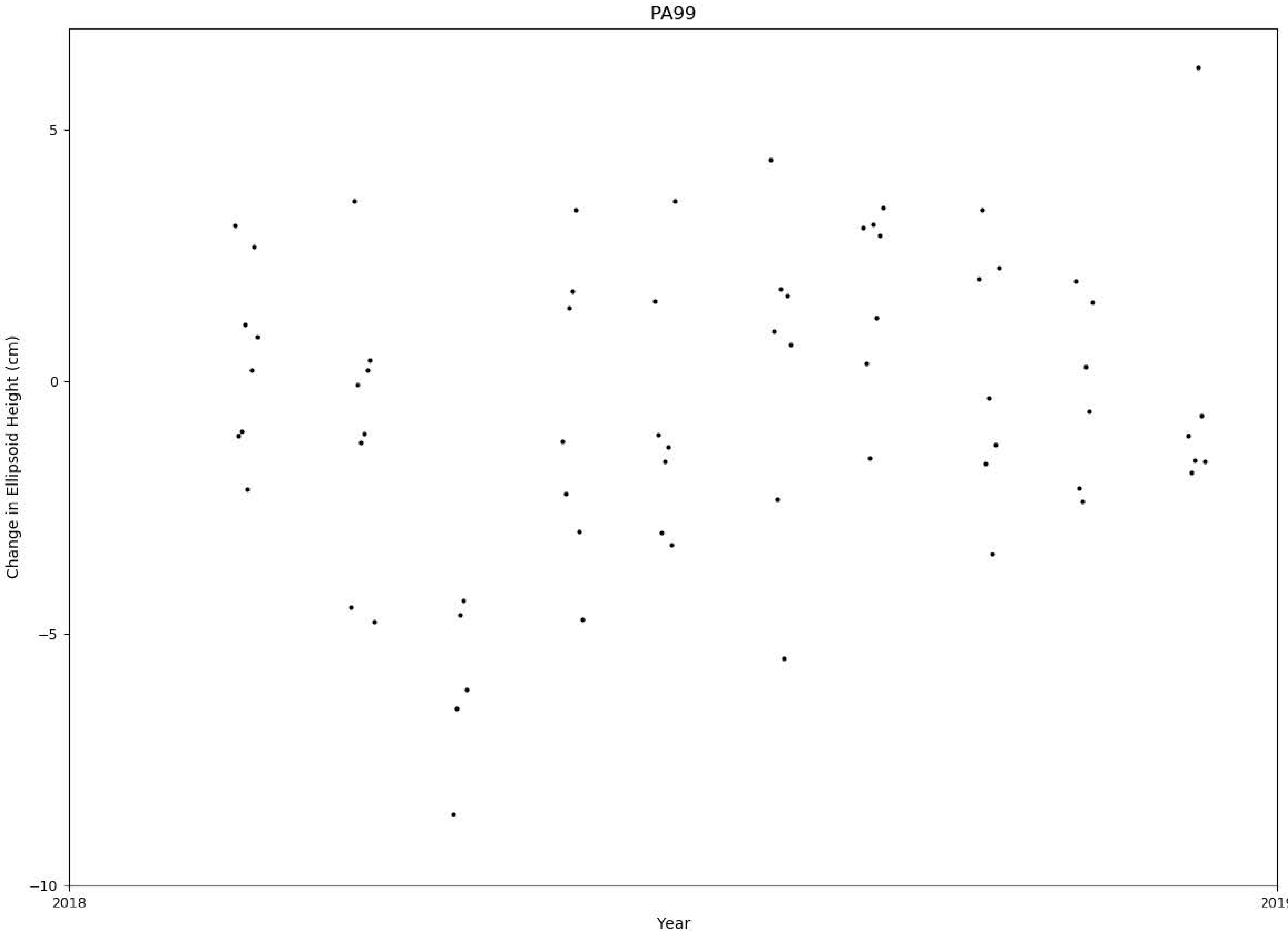

PA94
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2017
2018
2019

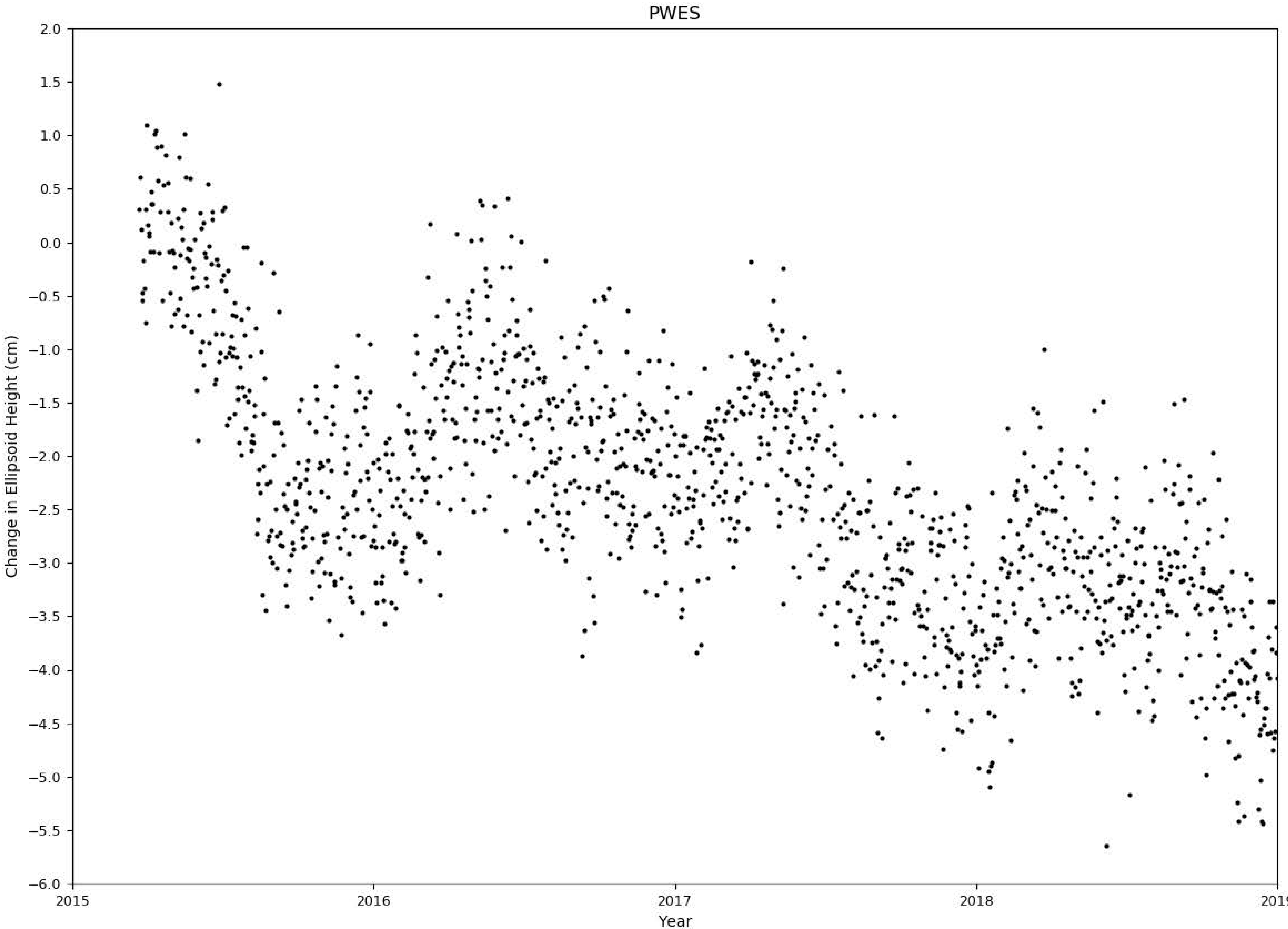

PA95
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2017
2018
2019

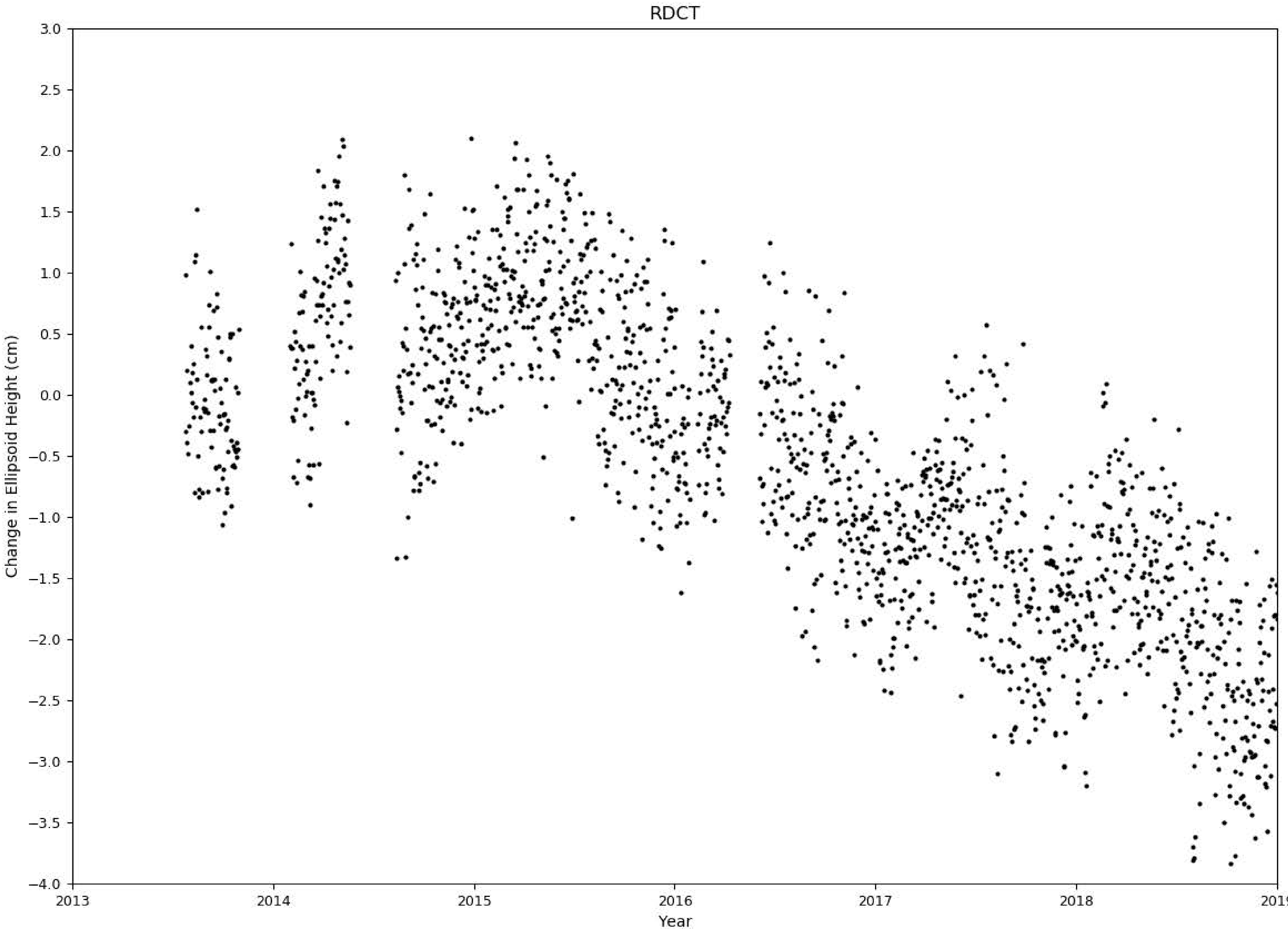

PA96
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2017
2018
2019
Year

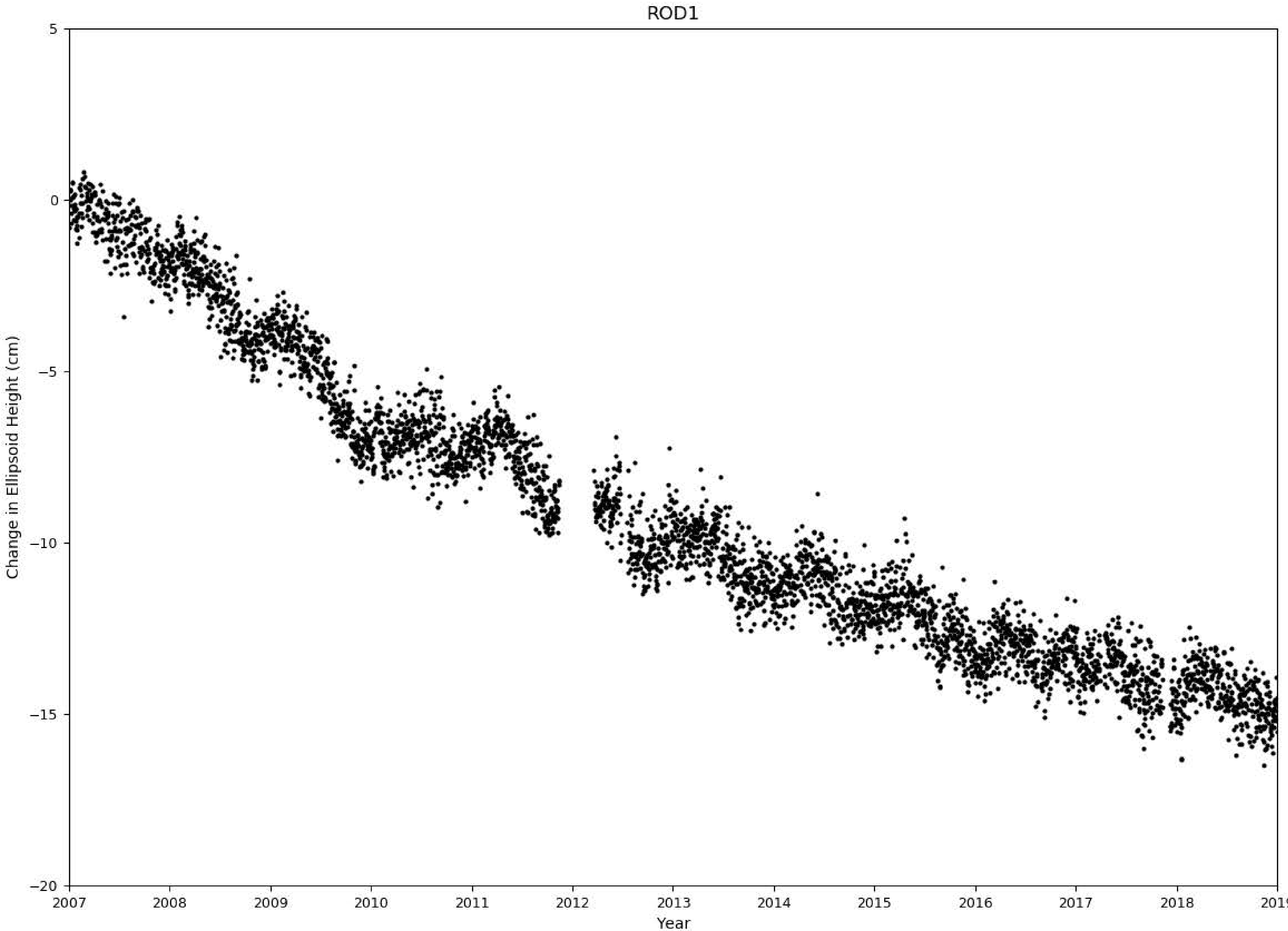

PA97
5
0
−5
−10
Change in Ellipsoid Height (cm)
2018
2019
Year


PA98
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2018
2019
Year


PA99
5
0
−5
−10
Change in Ellipsoid Height (cm)
2018
2019
Year


PWES
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


RDCT
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2013
2014
2015
2016
2017
2018
2019
Year


ROD1
Change in Ellipsoid Height (cm)
Year
5
0
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−15
−20
2007
2008
2009
2010
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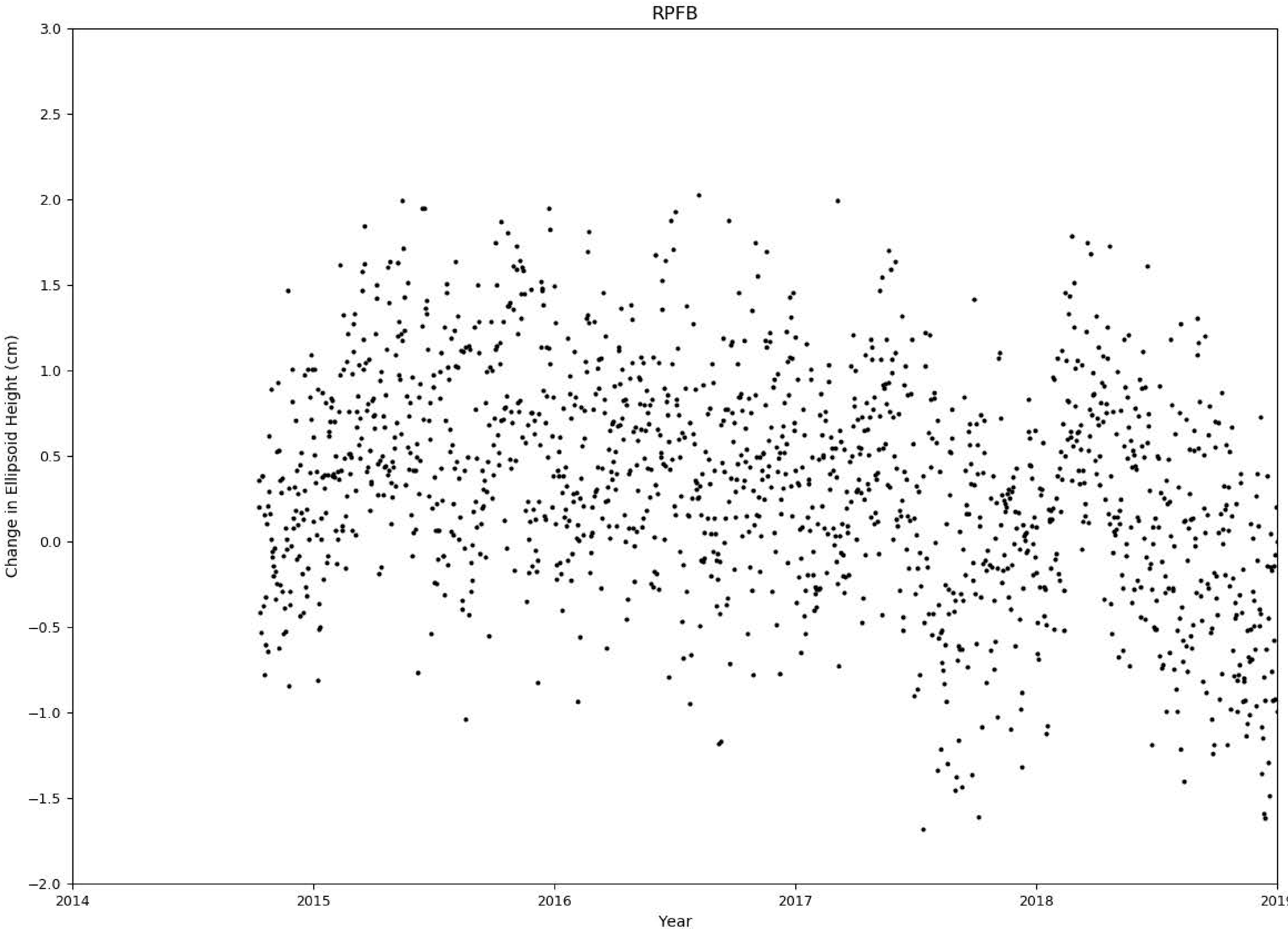
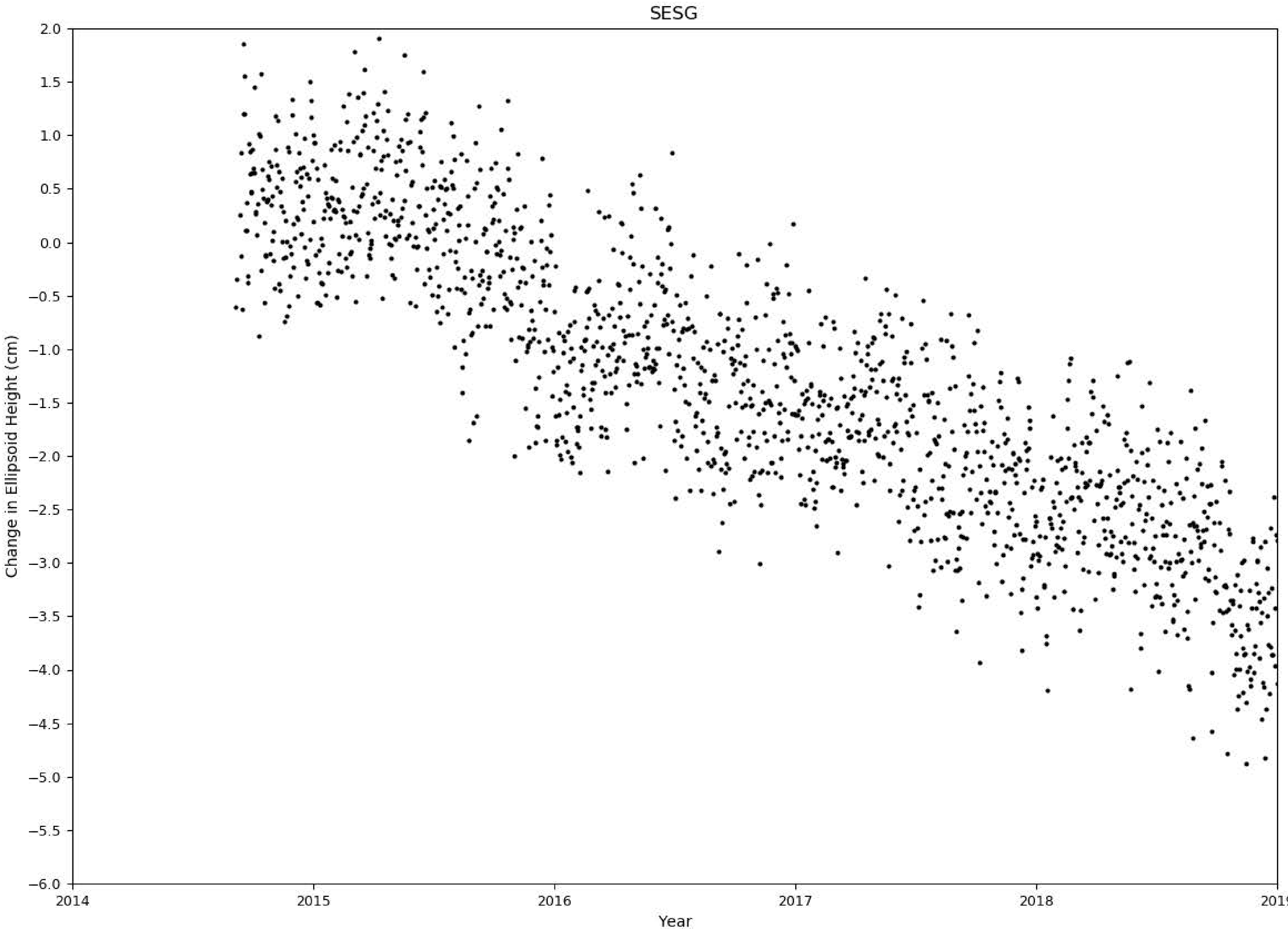
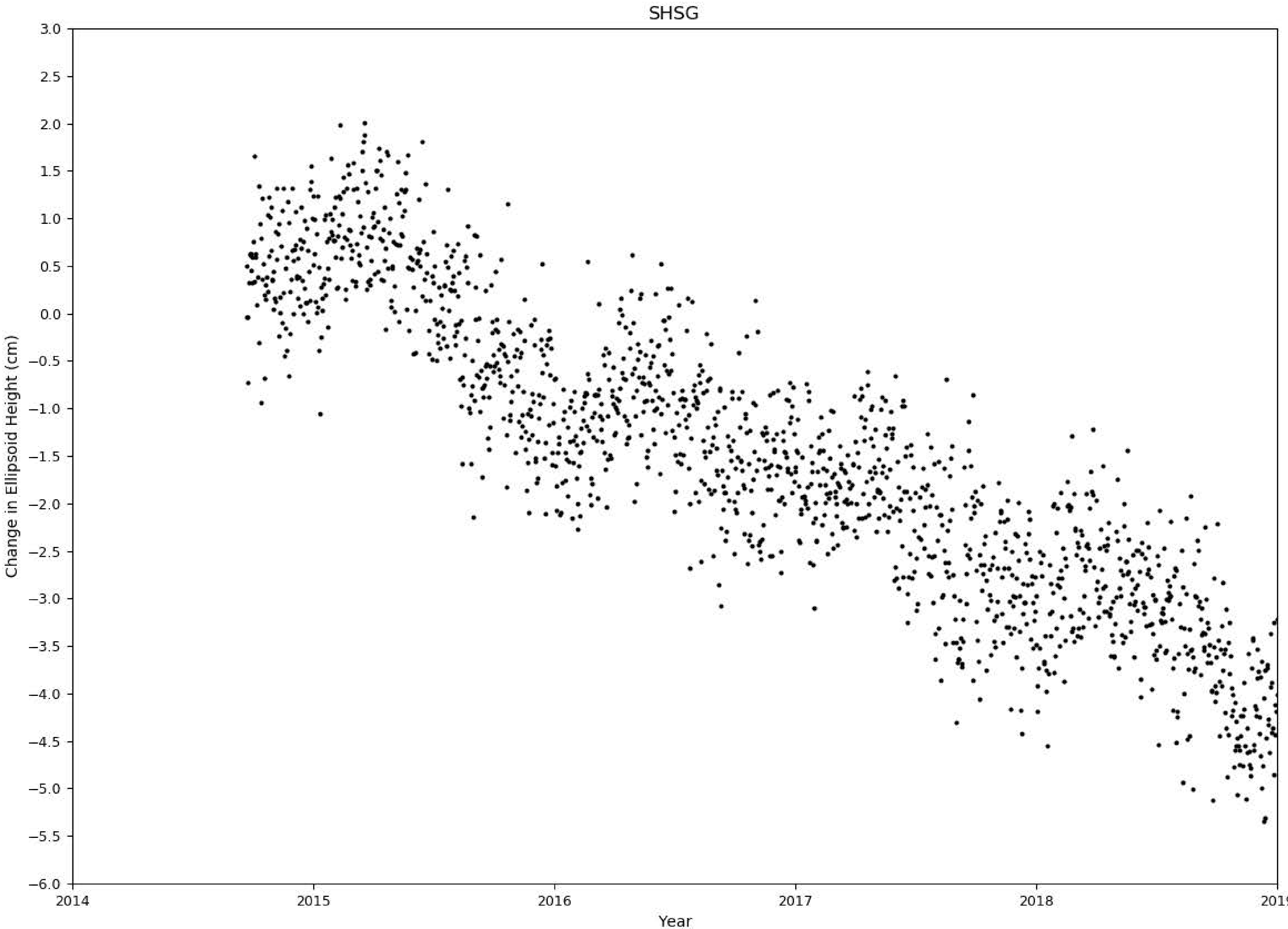
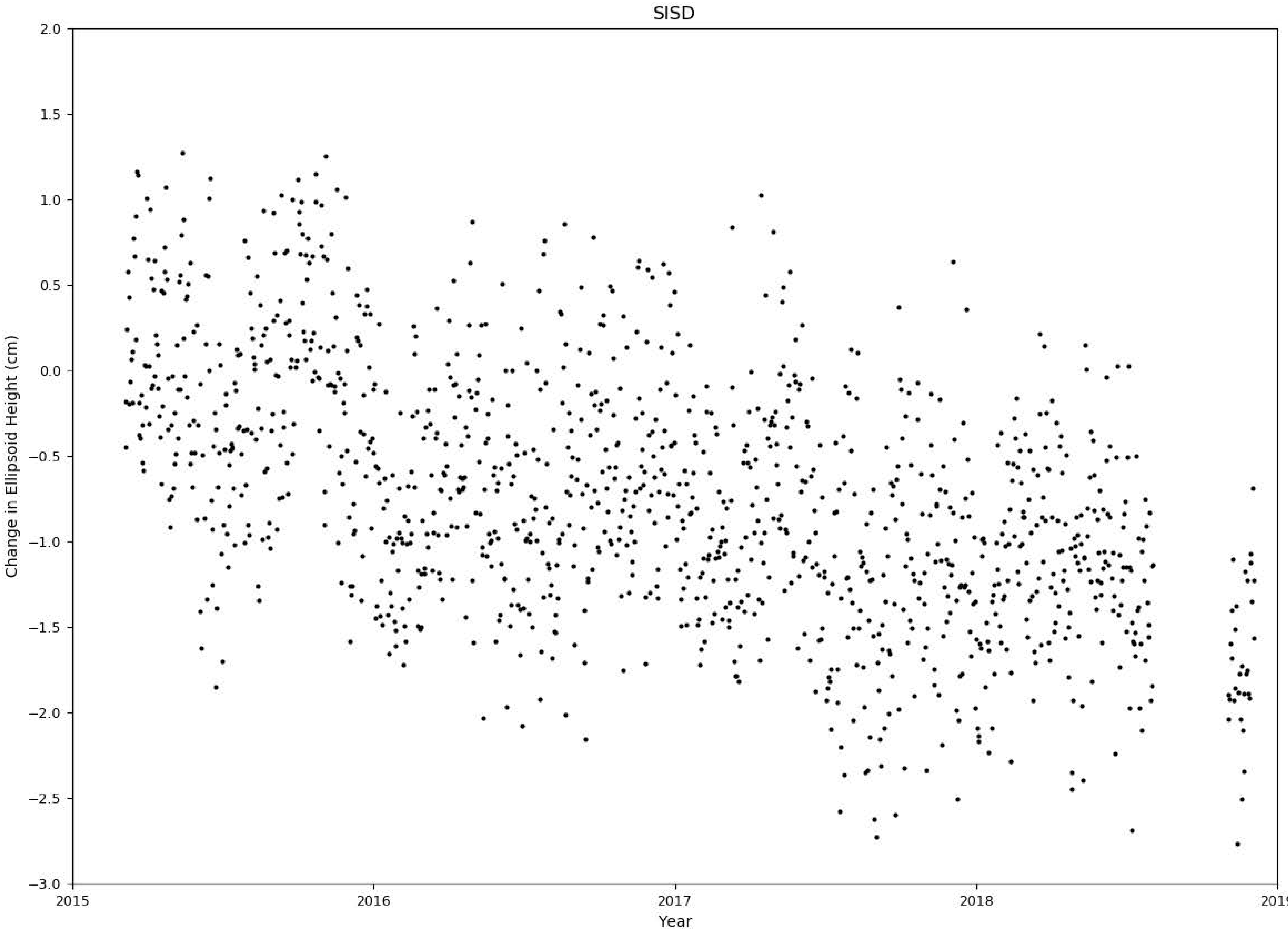
2012
2013
2014
2015
2016
2017
2018
2019


RPFB
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


SESG
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2014
2015
2016
2017
2018
2019
Year


SHSG
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


SISD
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
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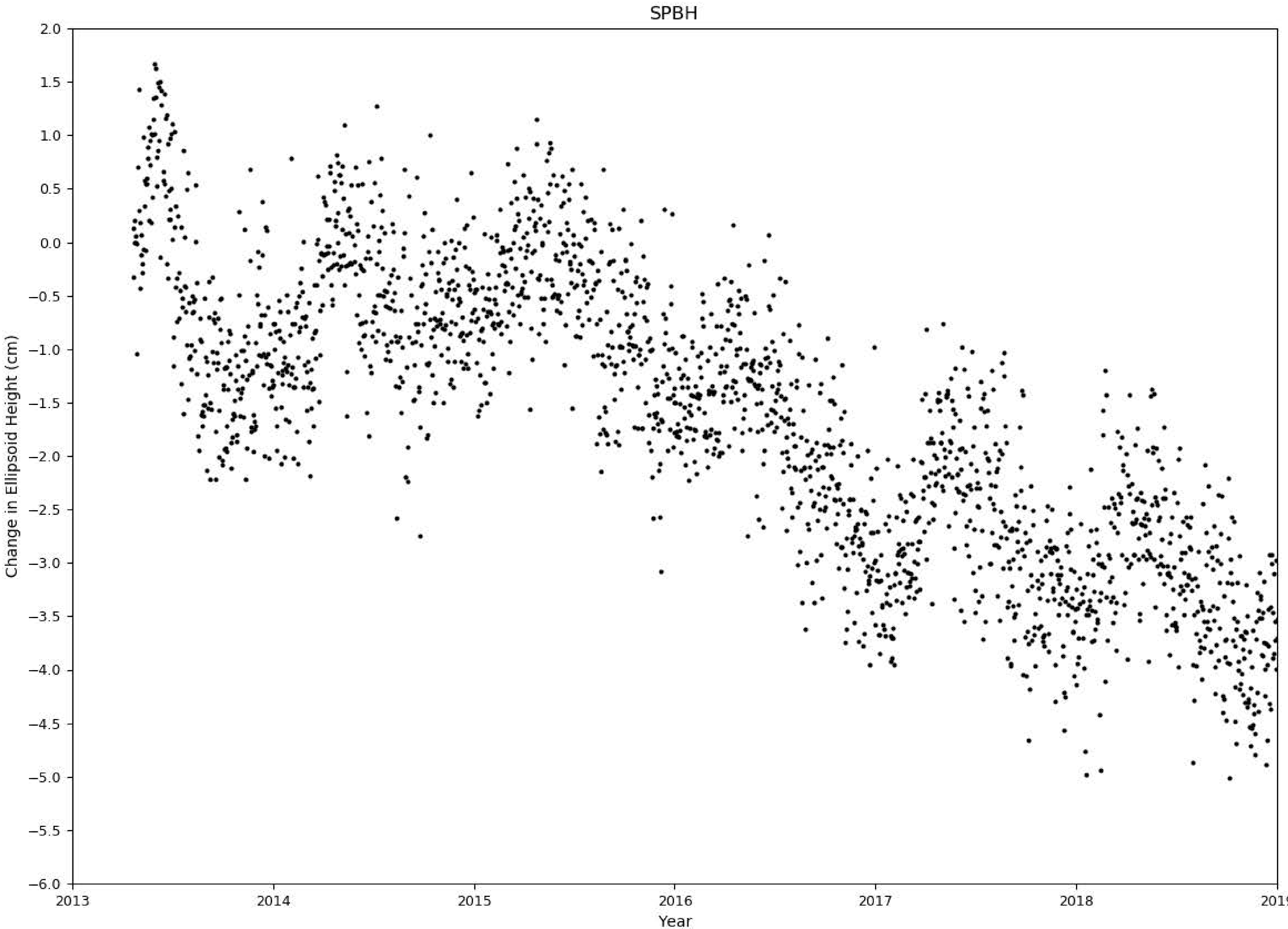
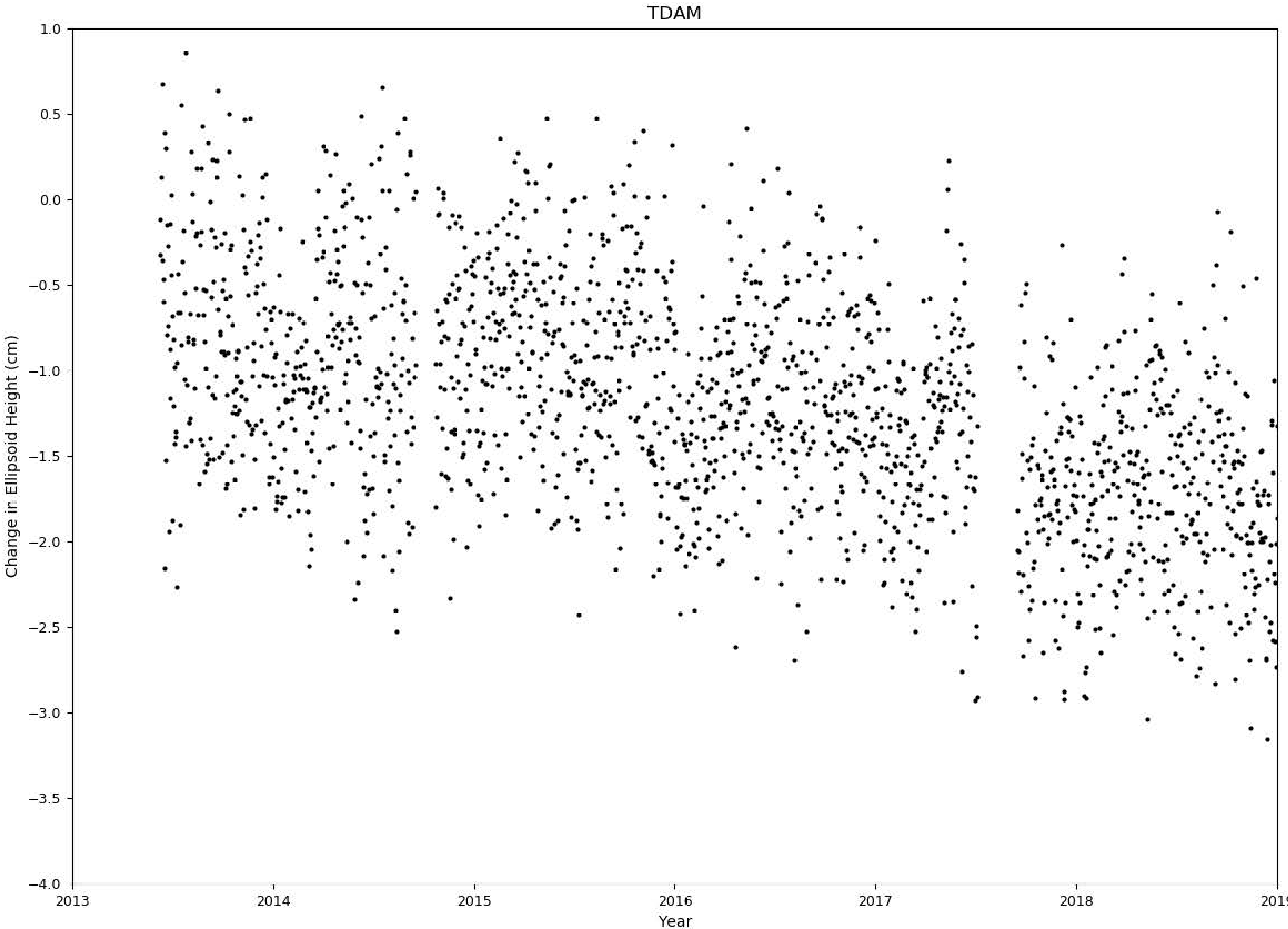
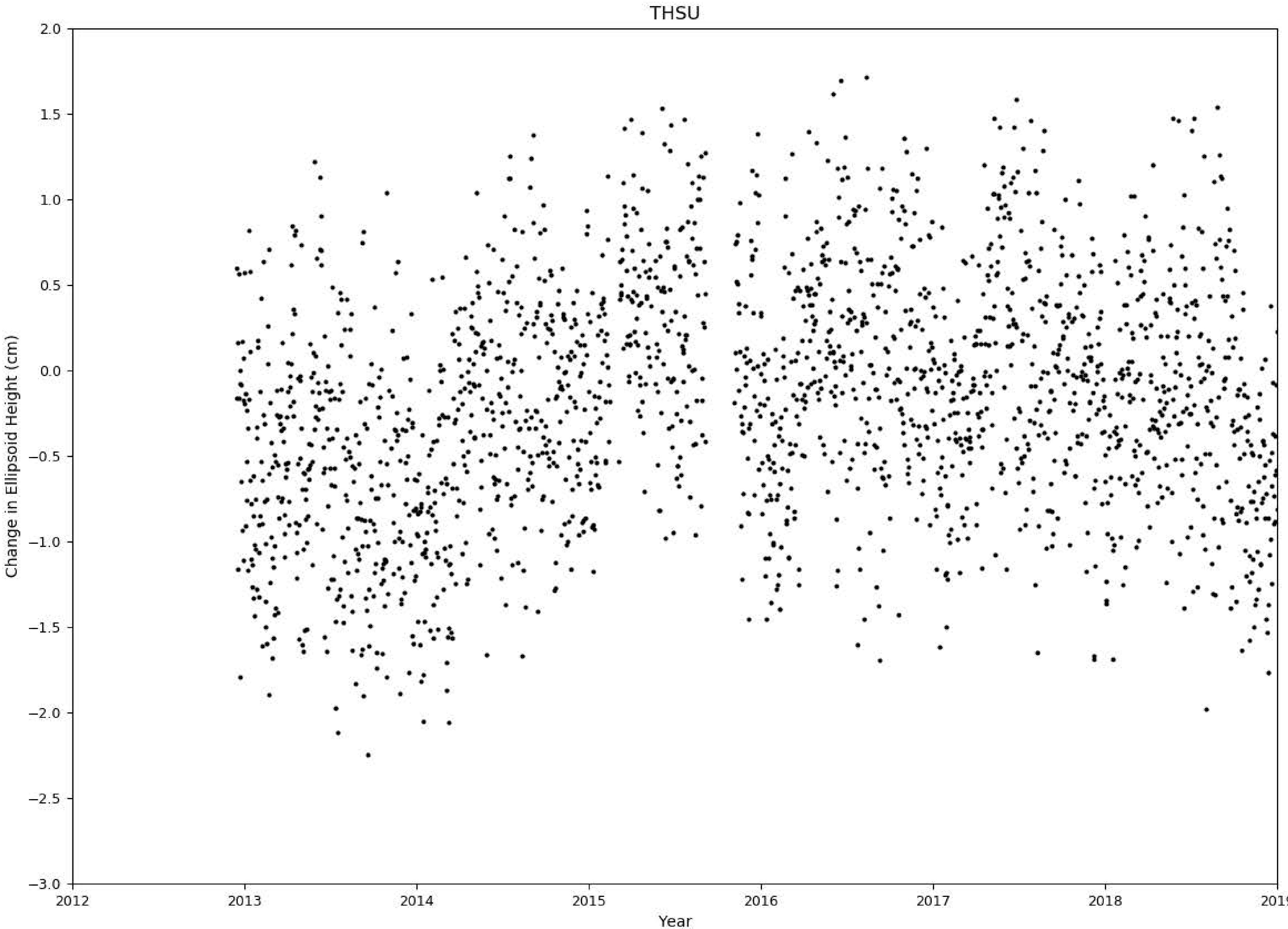
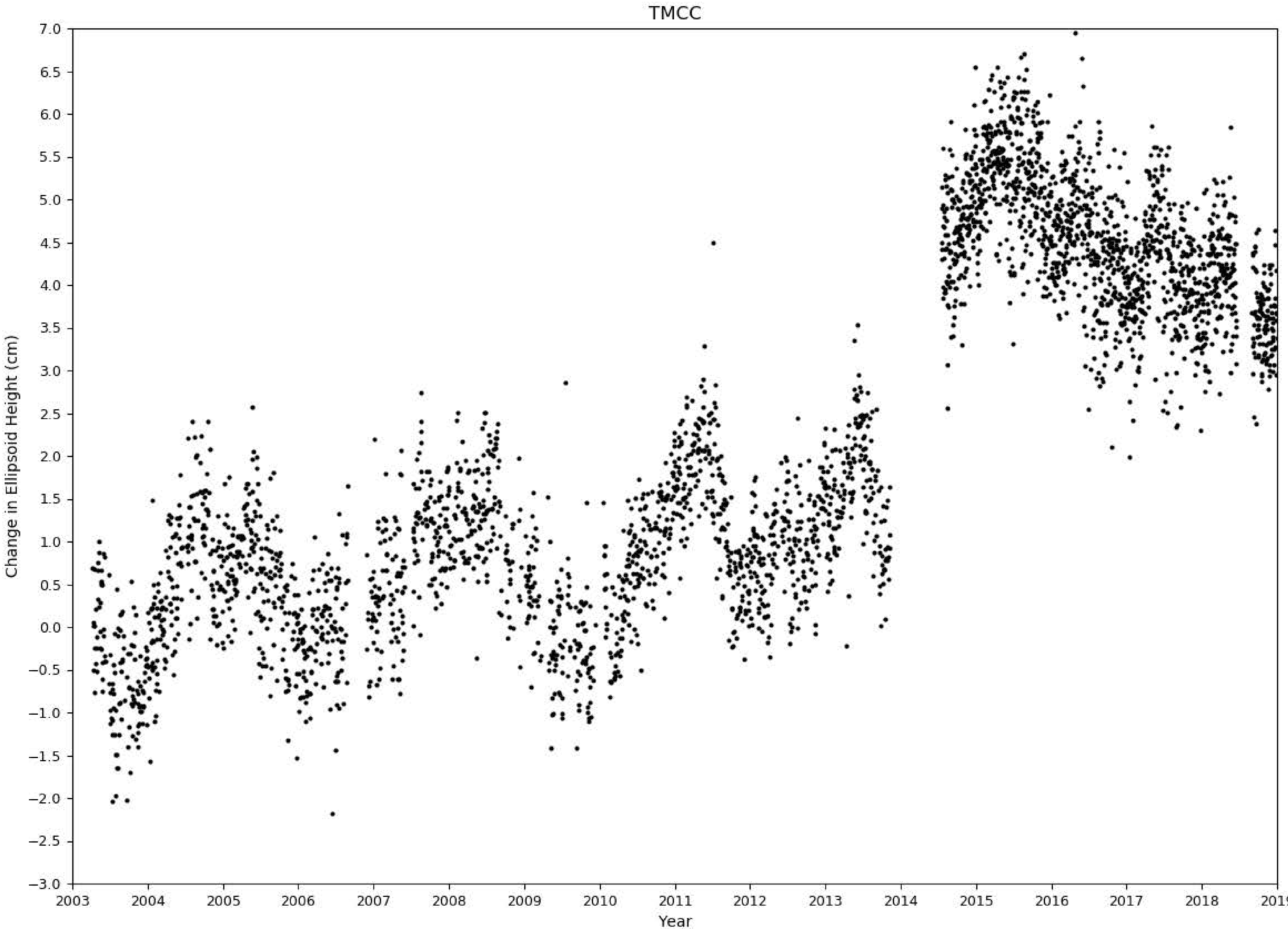
−1.0
−1.5
−2.0
−2.5
−3.0
2015
2016
2017
2018
2019
Year


SPBH
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year


TDAM
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year


THSU
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2012
2013
2014
2015
2016
2017
2018
2019
Year


TMCC
Change in Ellipsoid Height (cm)
Year
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
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2004
2005
2006
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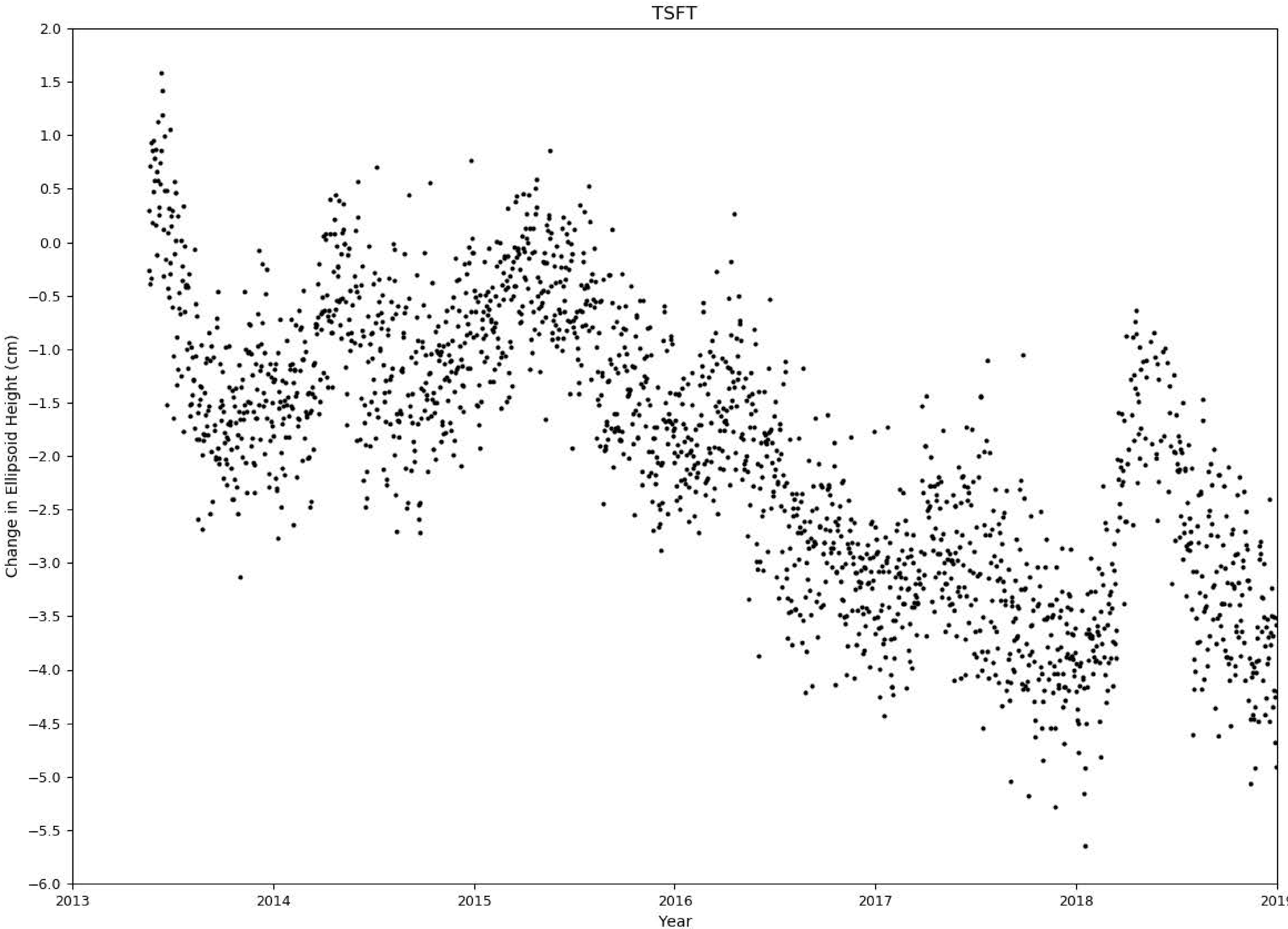
TSFT
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2013
2014
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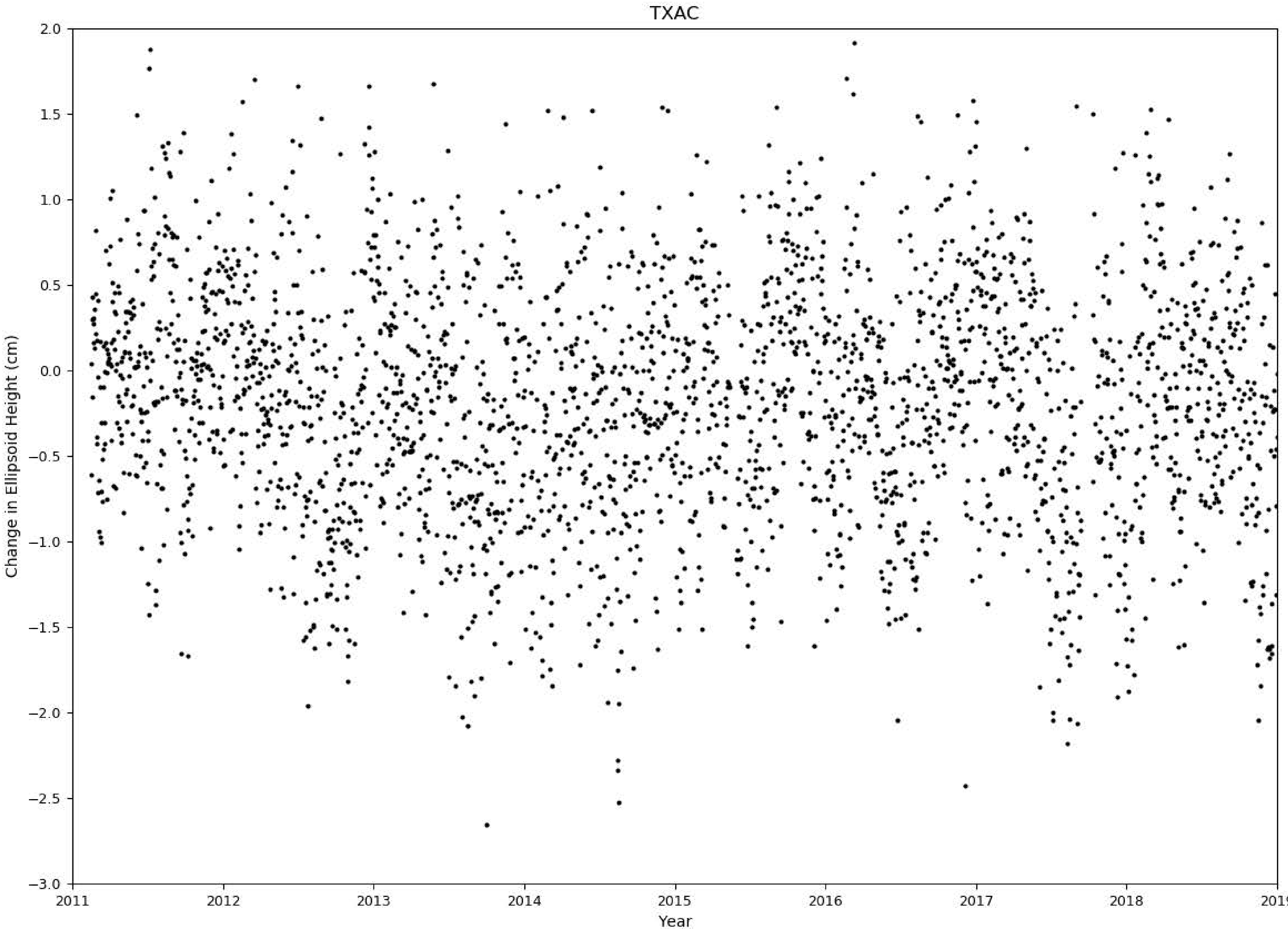
2019
Year


TXAC
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
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−1.5
−2.0
−2.5
−3.0
2011
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2013
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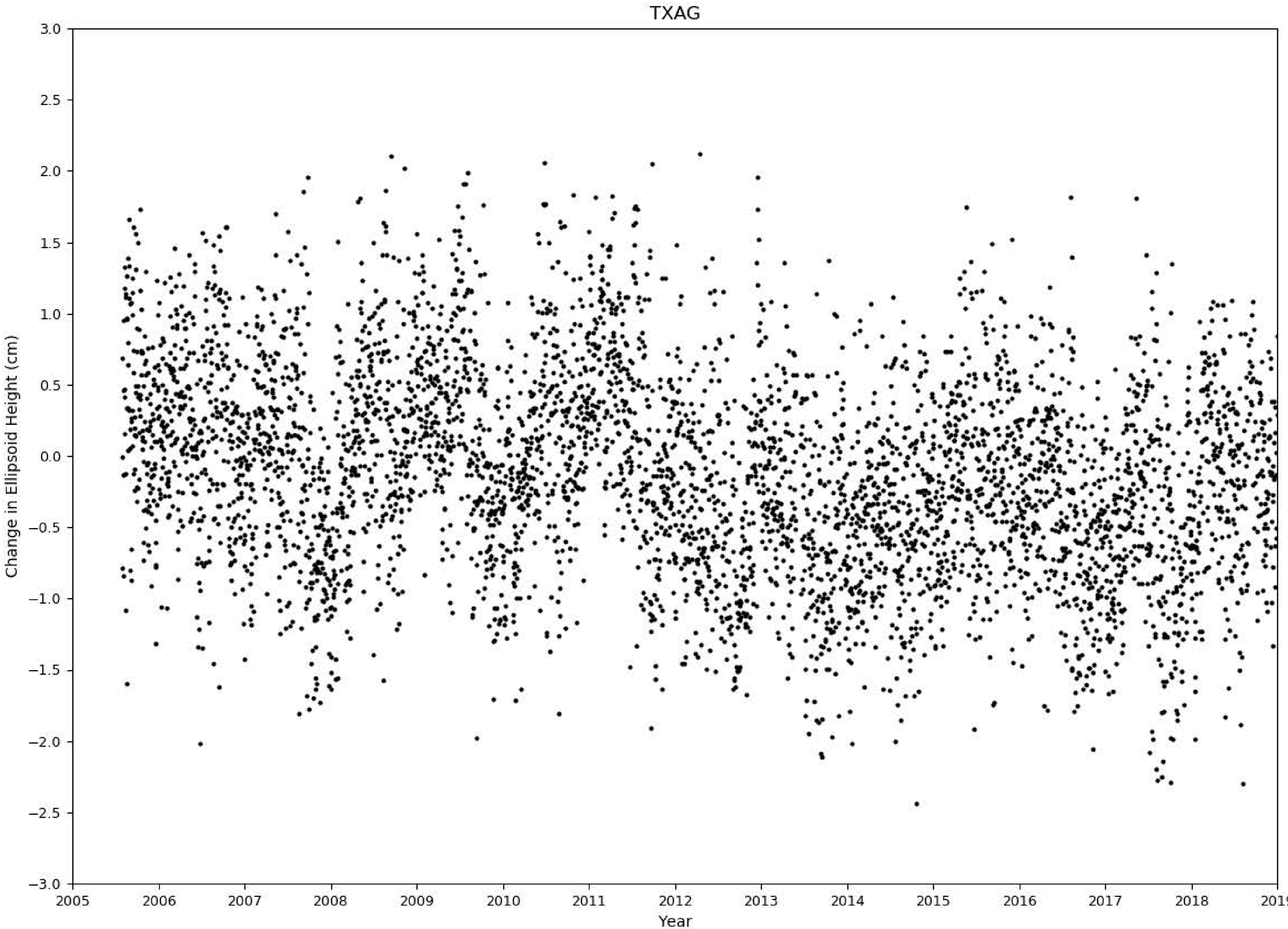
Year


TXAG
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2005
2006
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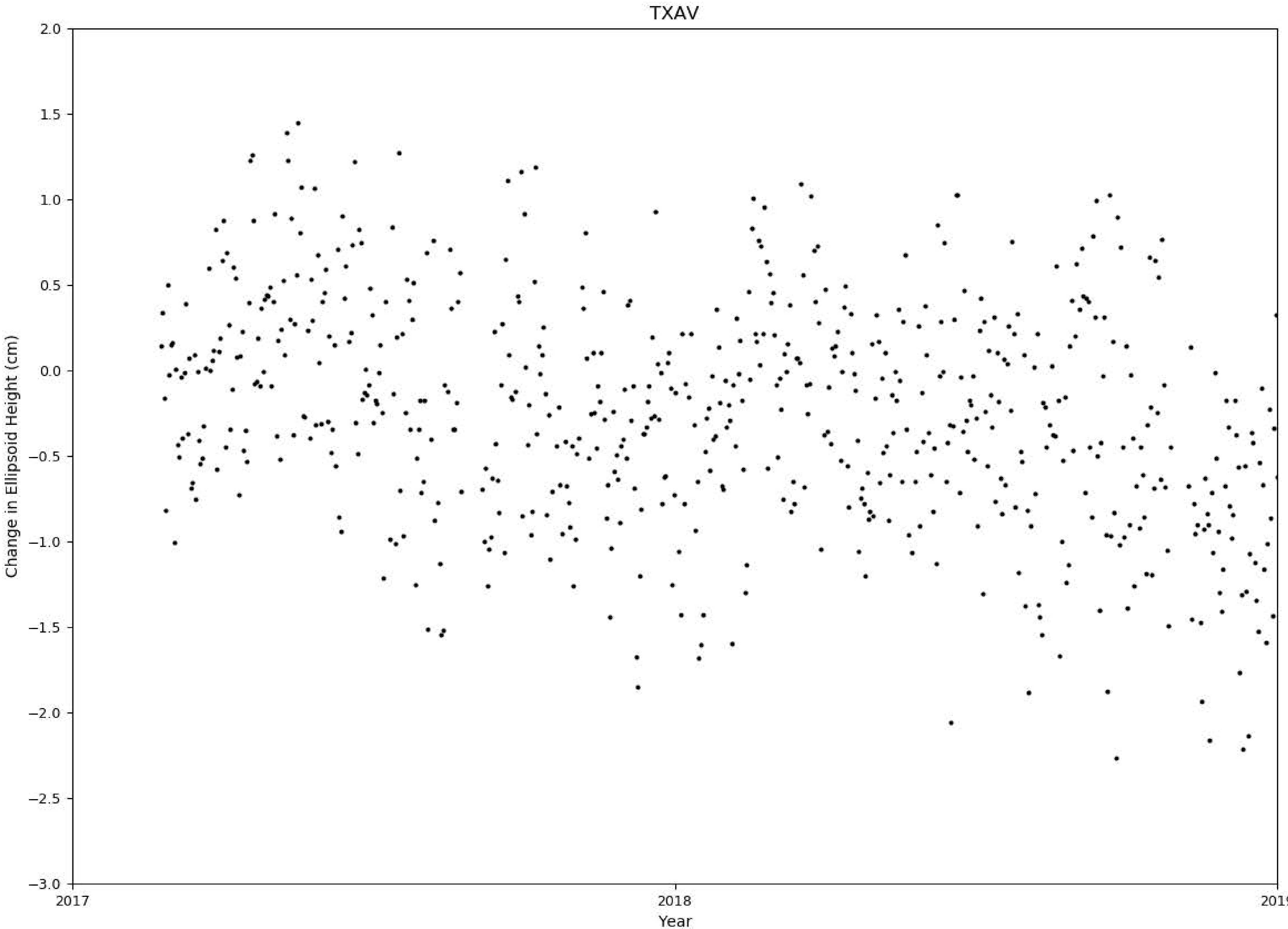
2017
2018
2019


TXAV
2.0
1.5
1.0
0.5
0.0
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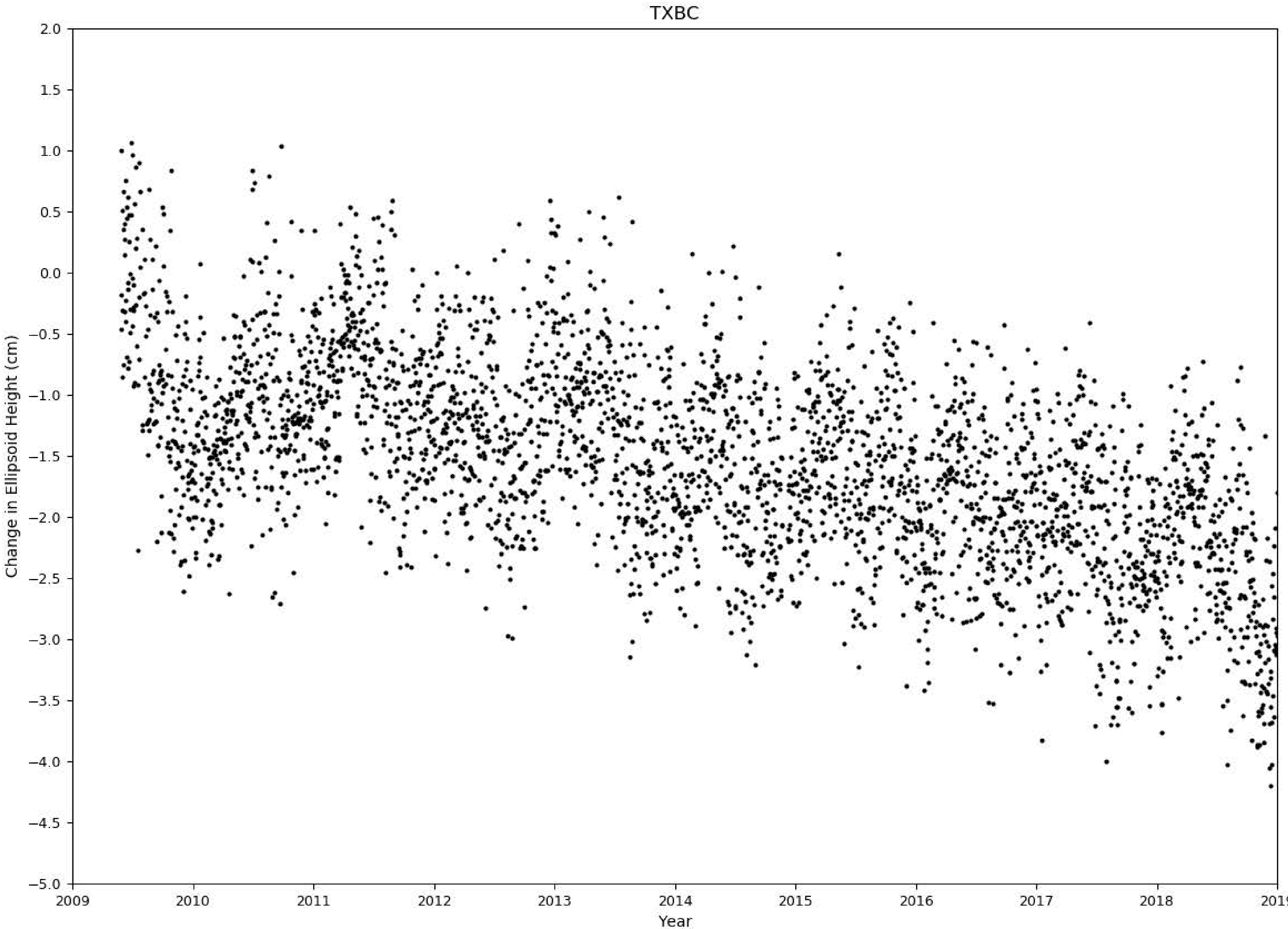
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2017
2018
2019
Year


TXBC
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
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2009
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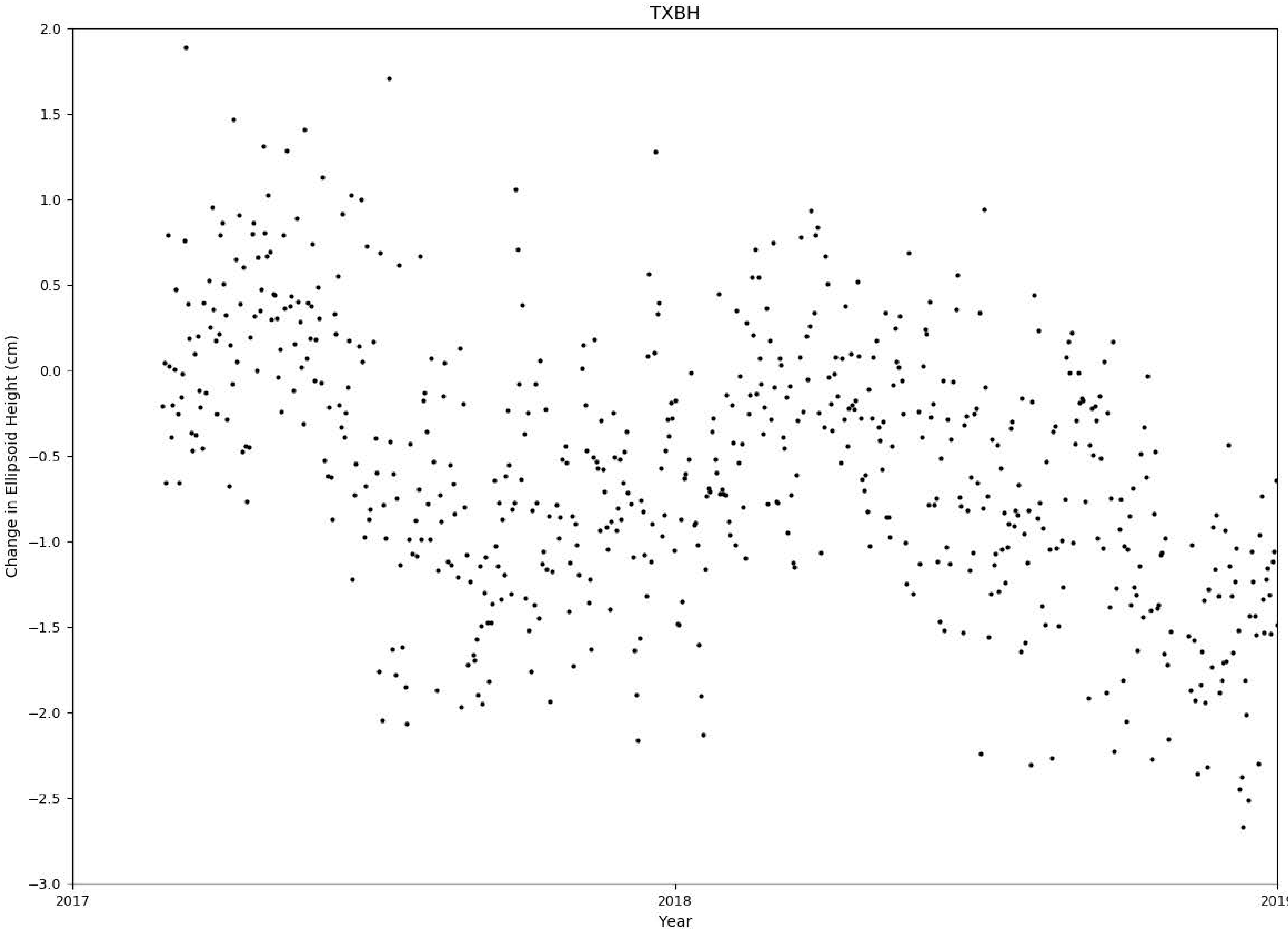
2019
Year


TXBH
2.0
1.5
1.0
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0.0
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−1.5
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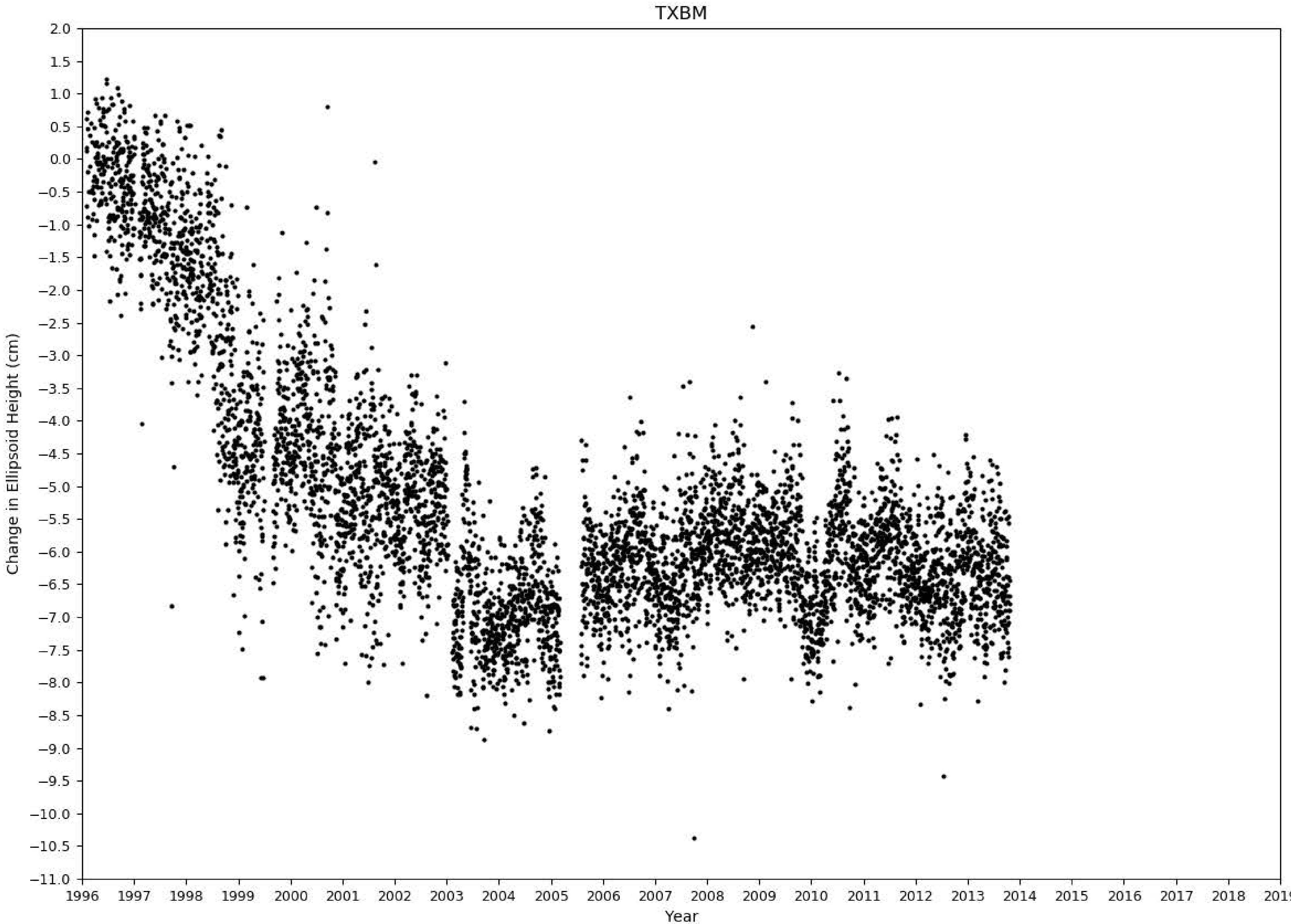
−3.0
Change in Ellipsoid Height (cm)
2017
2018
2019
Year


TXBM
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
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−9.5
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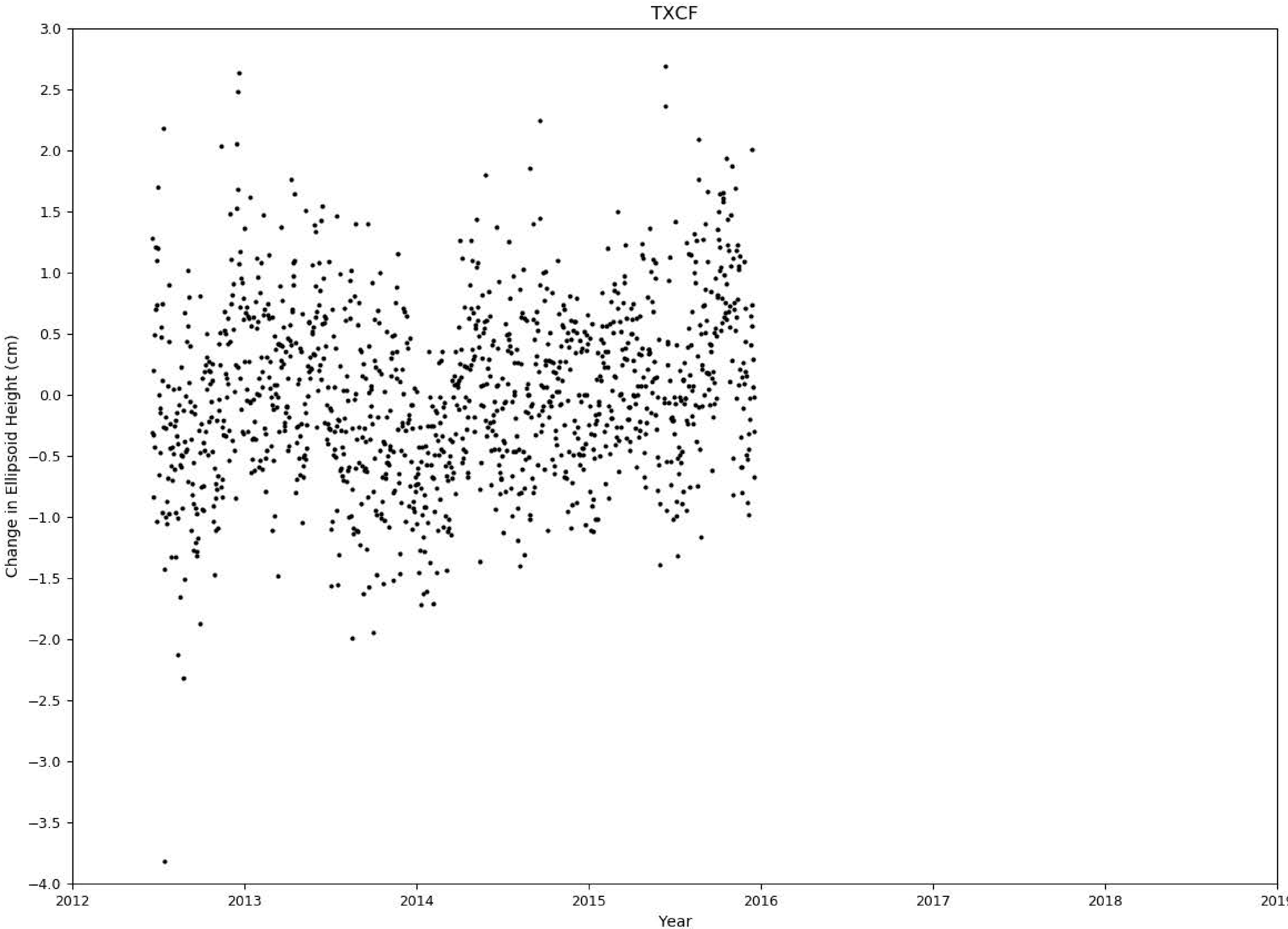
−10.5
−11.0
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


TXCF
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
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−2.5
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−4.0
2012
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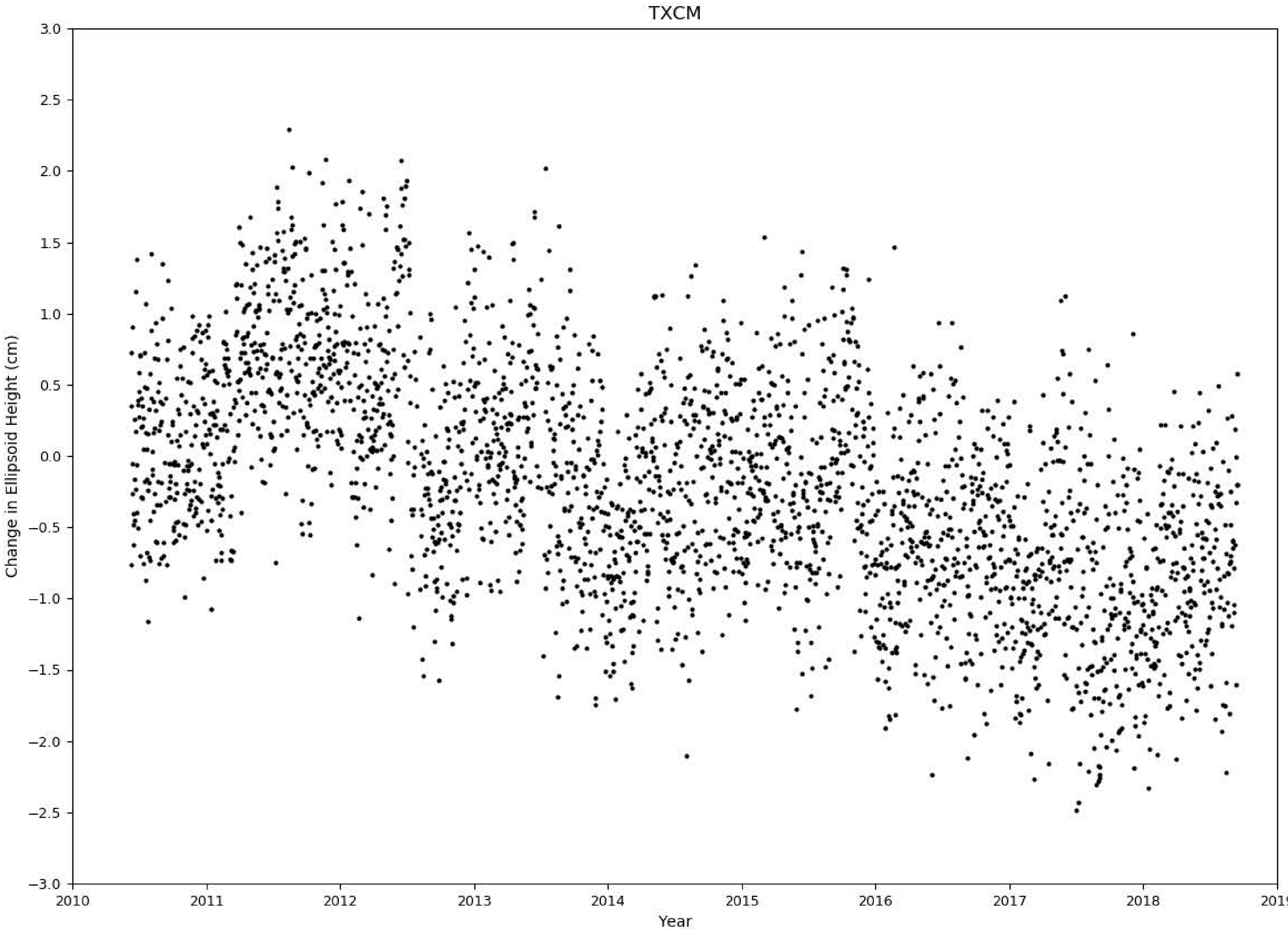
2019


TXCM
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
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−1.5
−2.0
−2.5
−3.0
2010
2011
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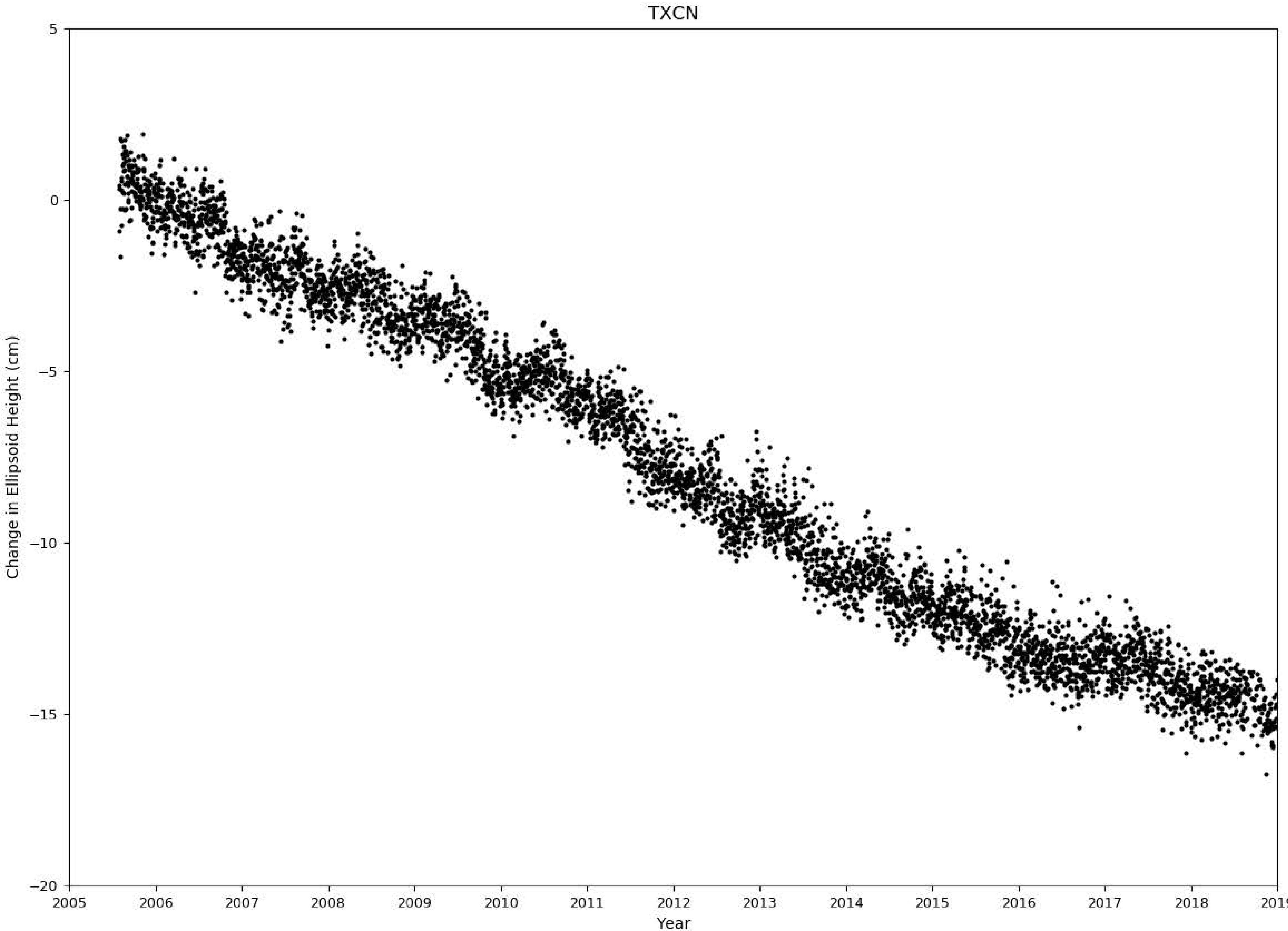
2019


TXCN
Change in Ellipsoid Height (cm)
5
0
−5
−10
−15
−20
2005
2006
2007
2008
2009
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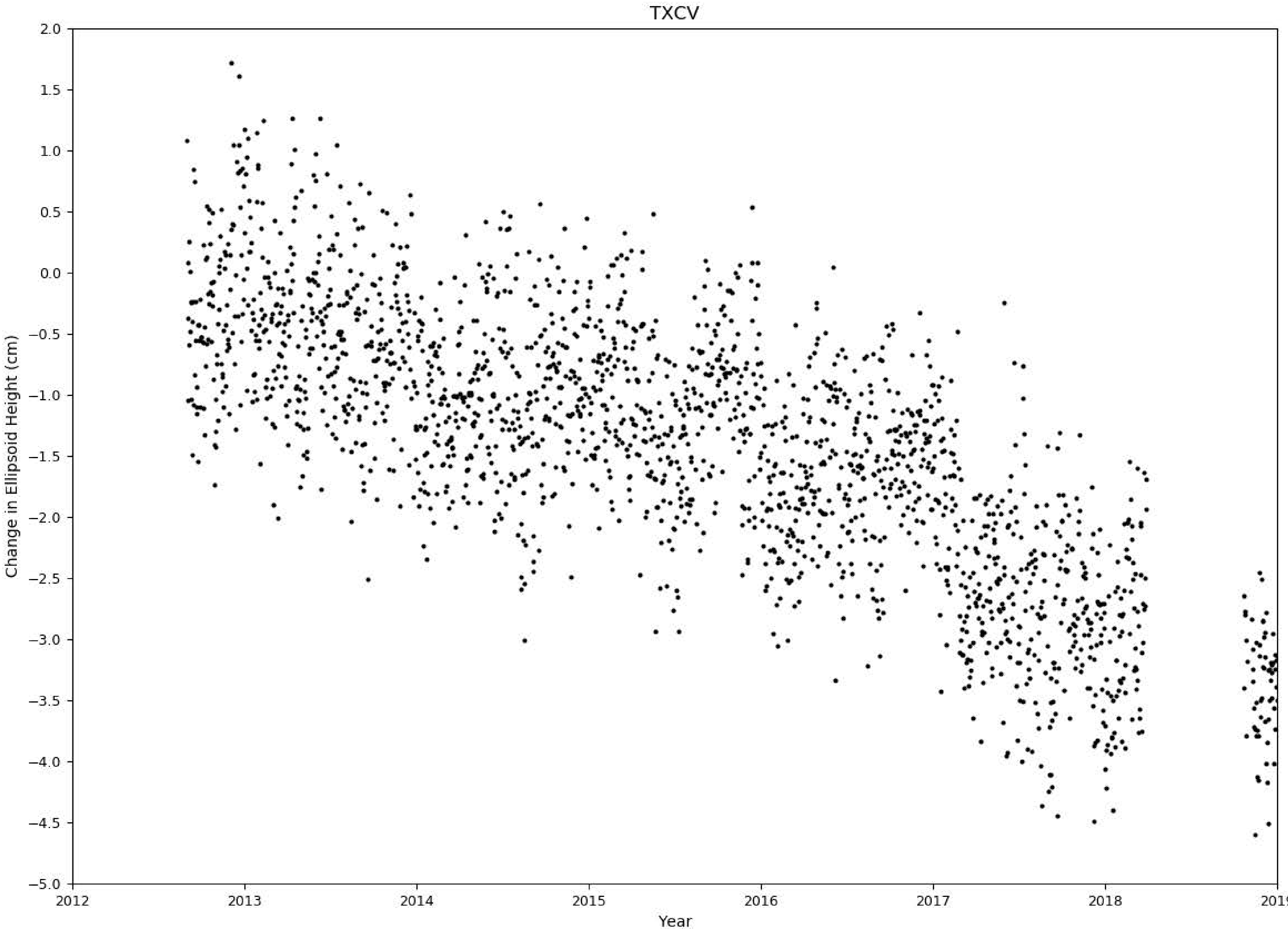
2017
2018
2019
Year


TXCV
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
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−4.0
−4.5
−5.0
2012
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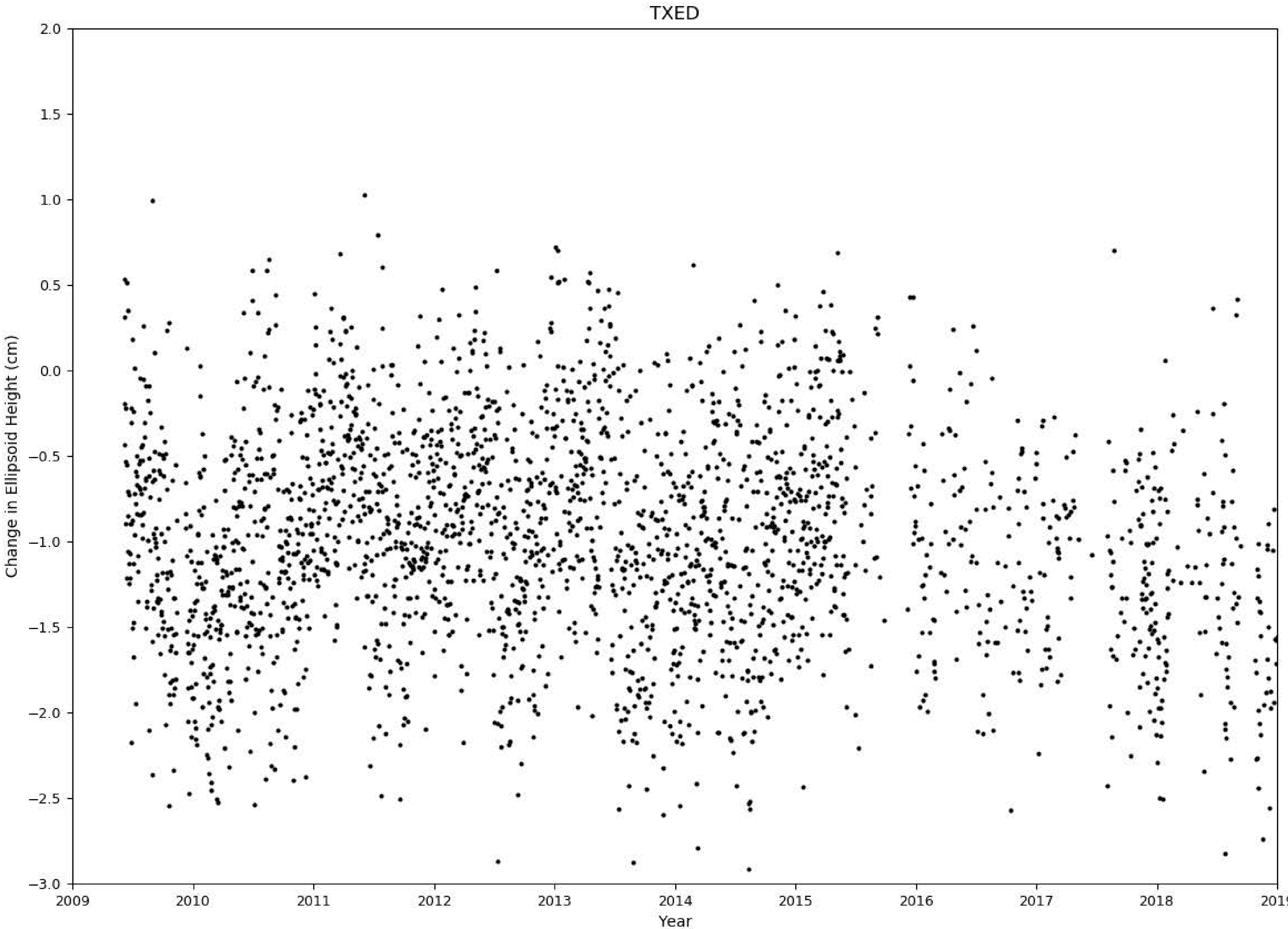
2019
Year


TXED
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2009
2010
2011
2012
2013
2014
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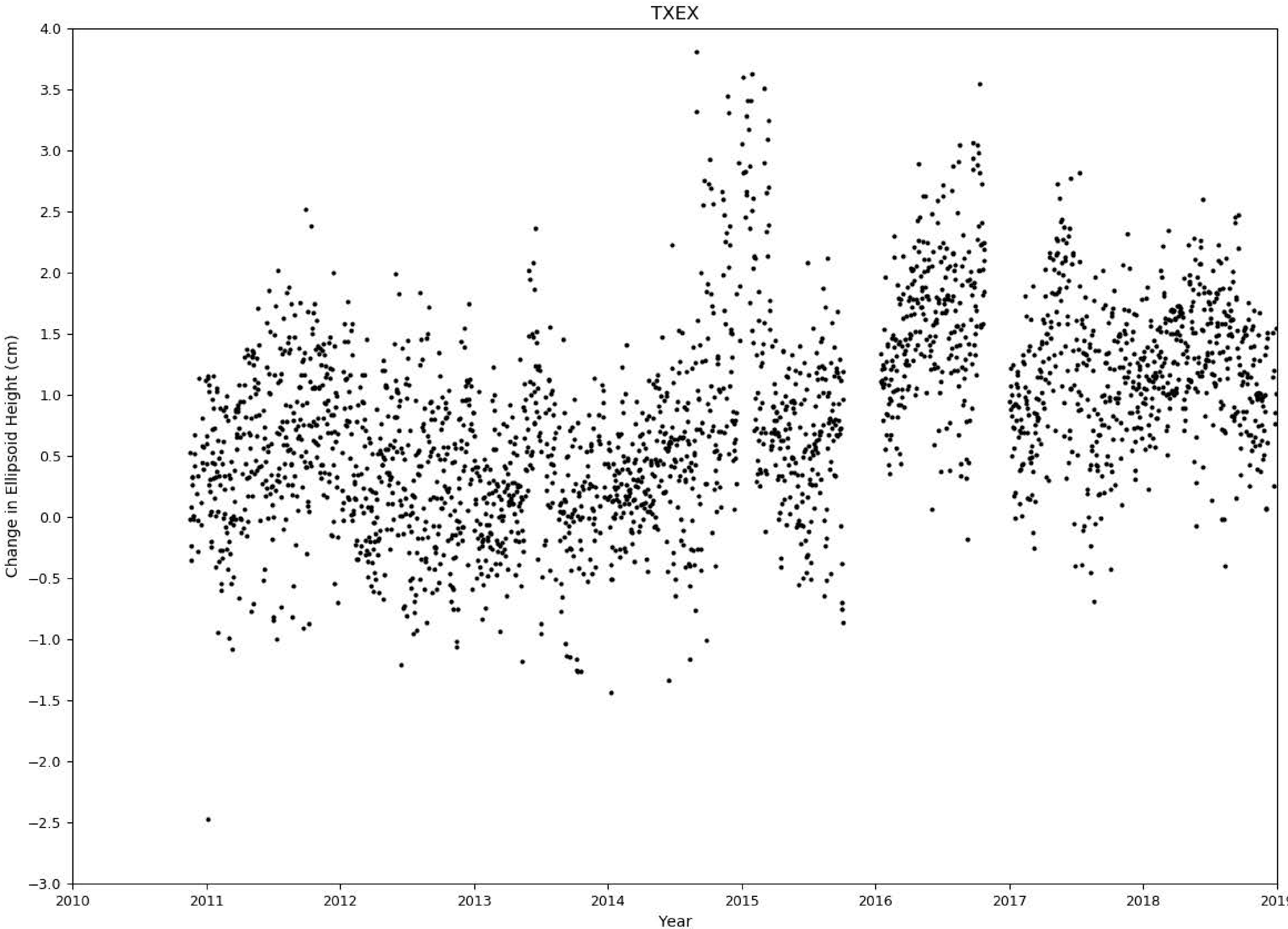
2016
2017
2018
2019
Year


TXEX
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2010
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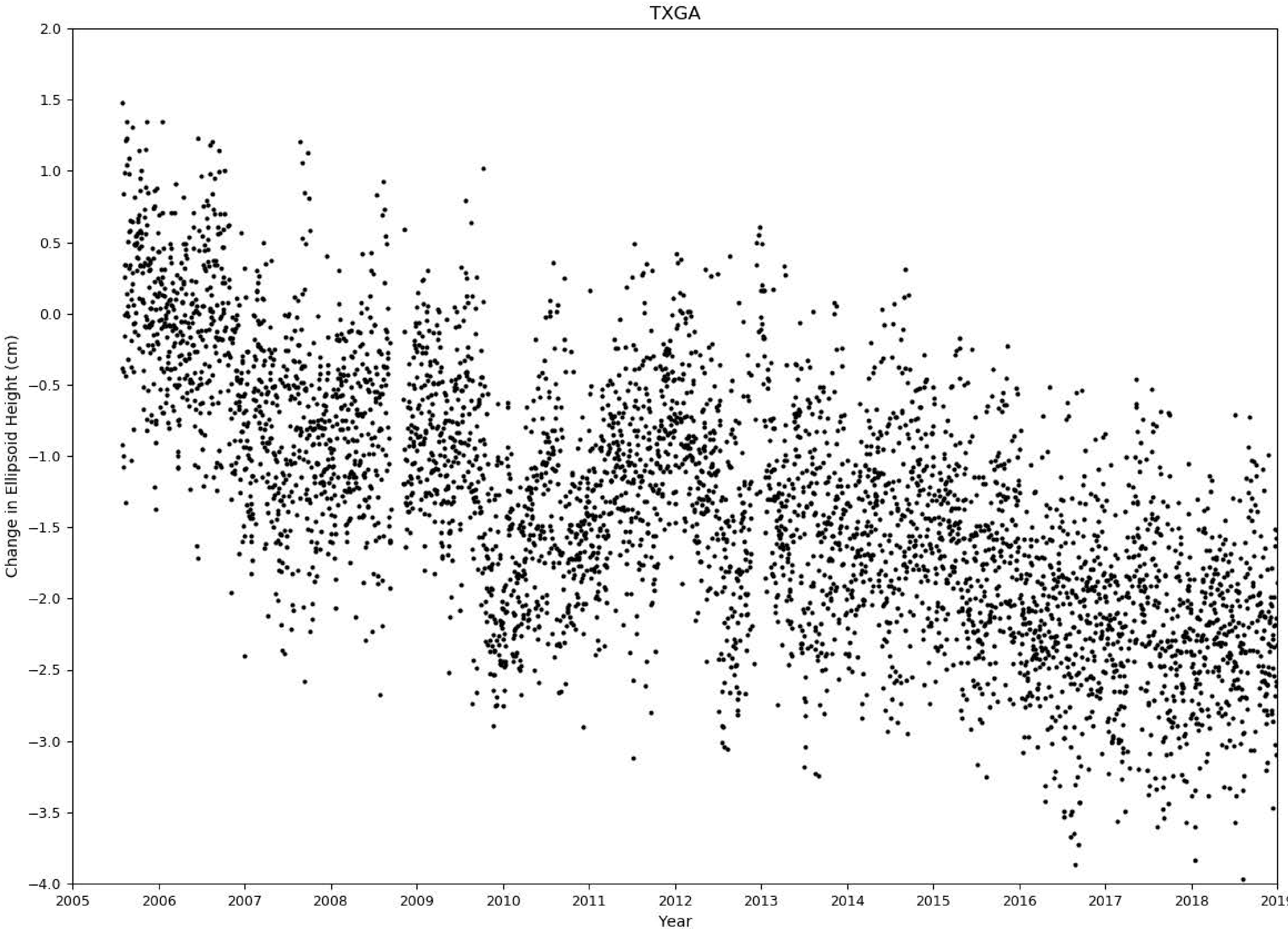
2019


TXGA
Change in Ellipsoid Height (cm)
Year
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1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
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2005
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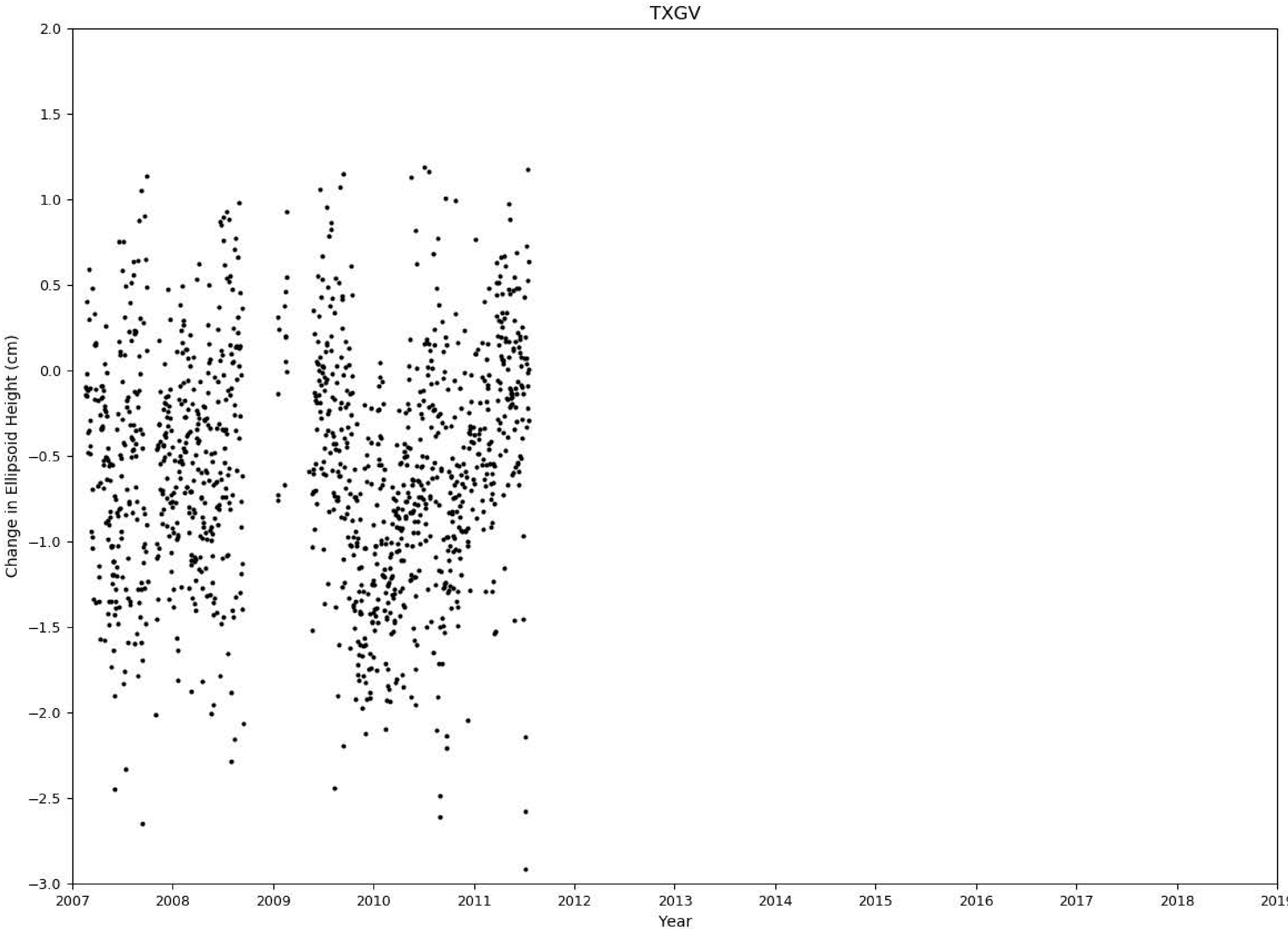
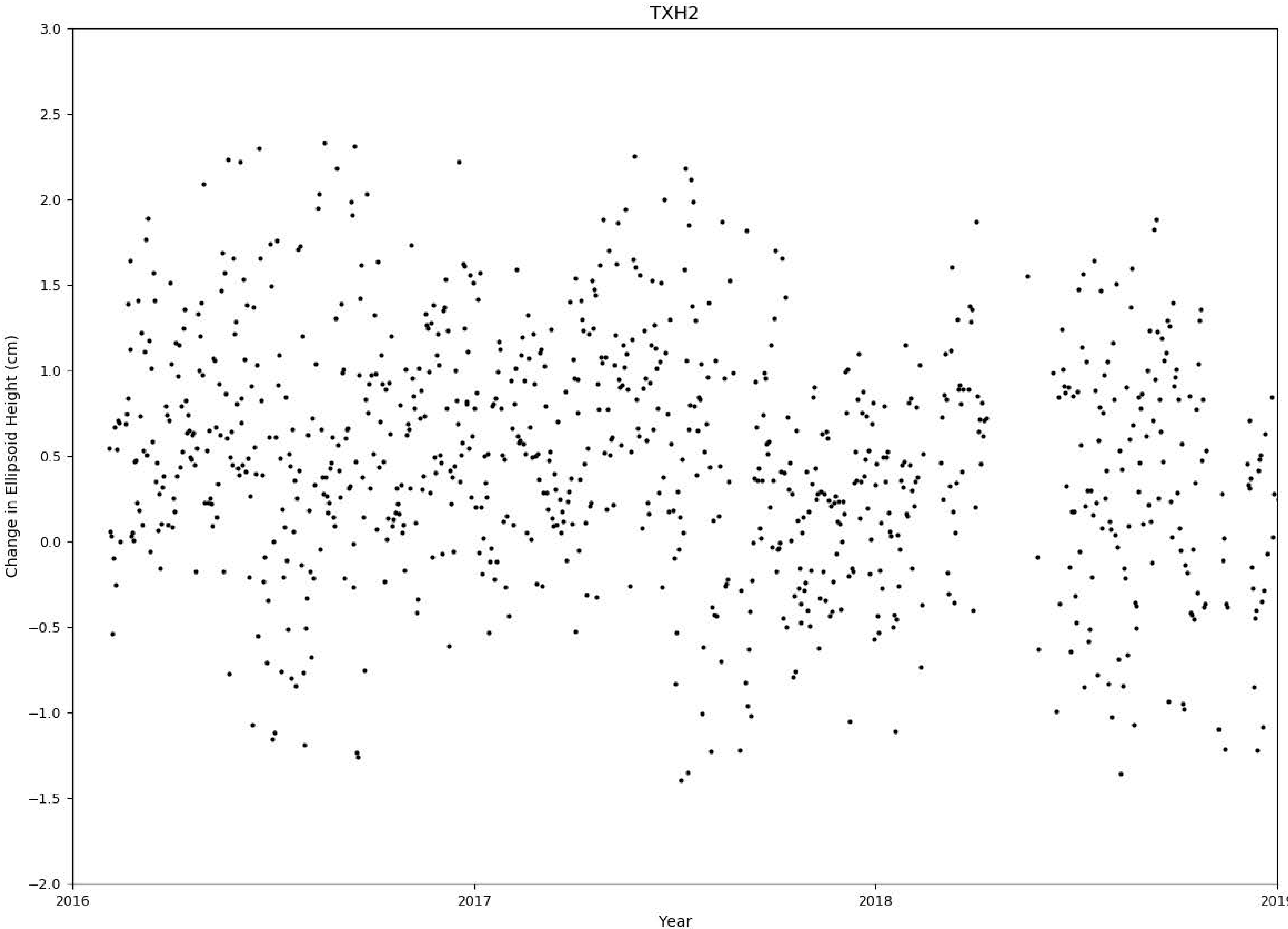
2018
2019


TXGV
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


TXH2
3.0
2.5
2.0
1.5
1.0
0.5
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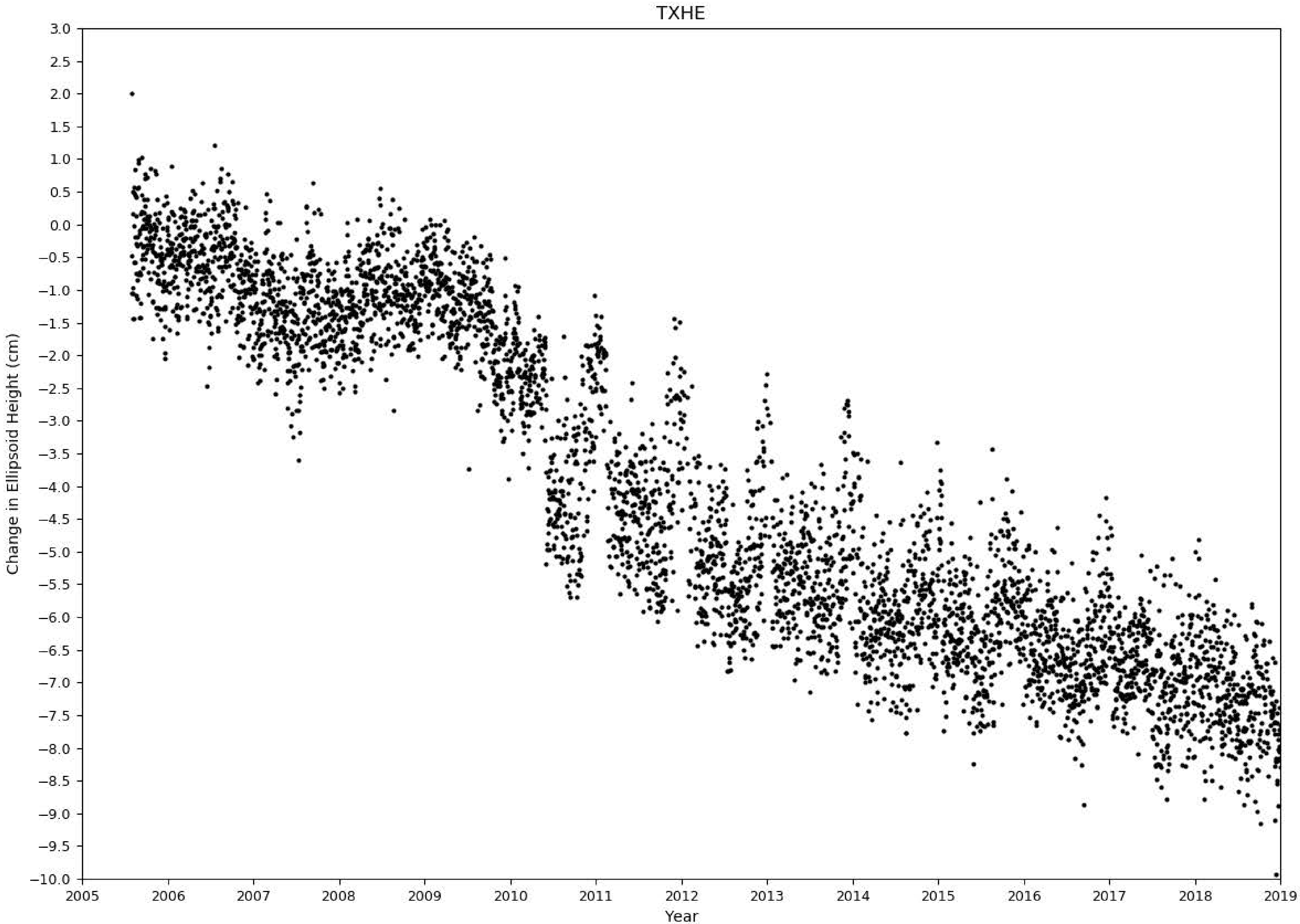
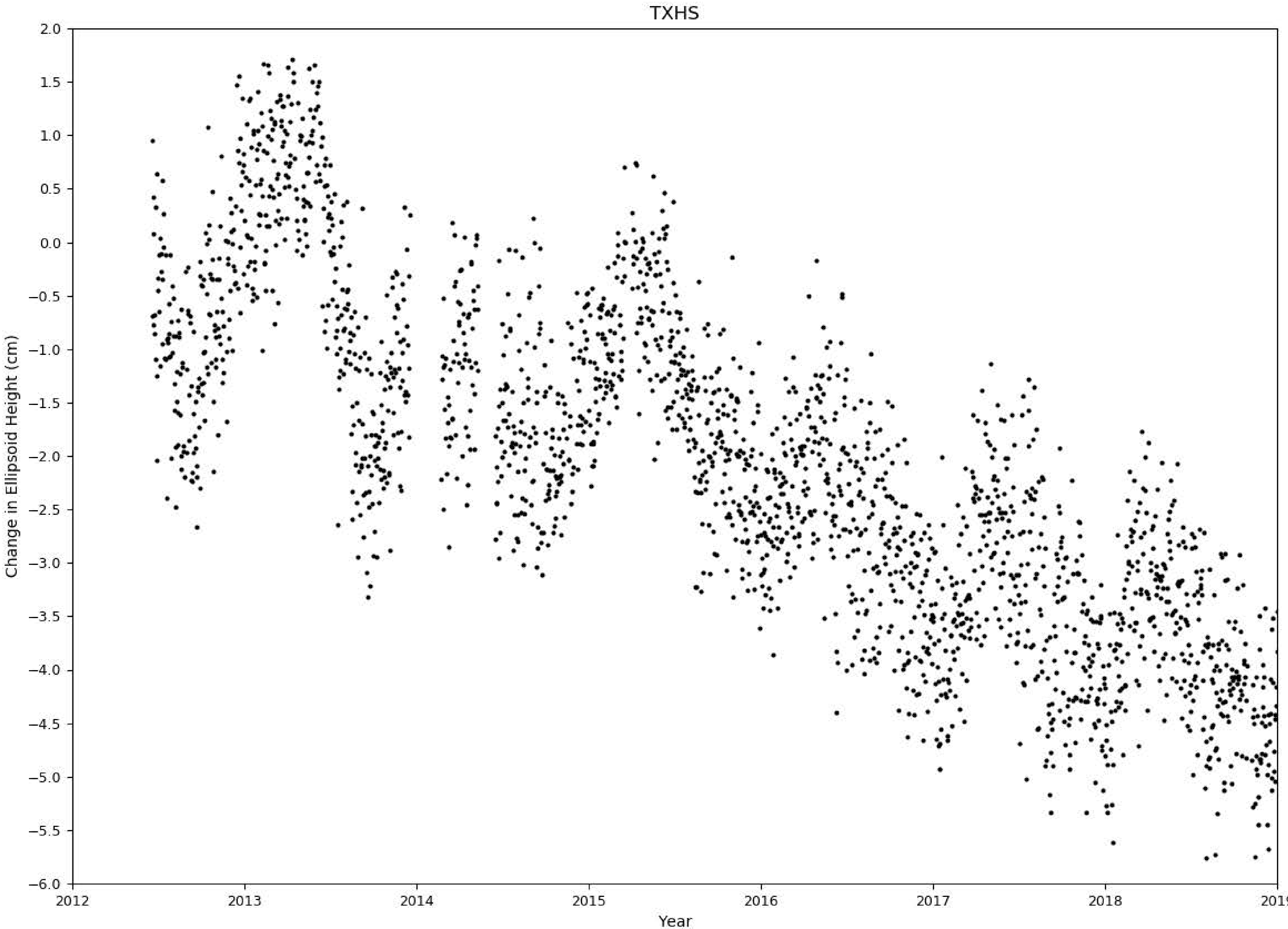
−1.0
−1.5
−2.0
Change in Ellipsoid Height (cm)
2016
2017
2018
2019
Year


TXHE
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
Change in Ellipsoid Height (cm)
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


TXHS
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1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
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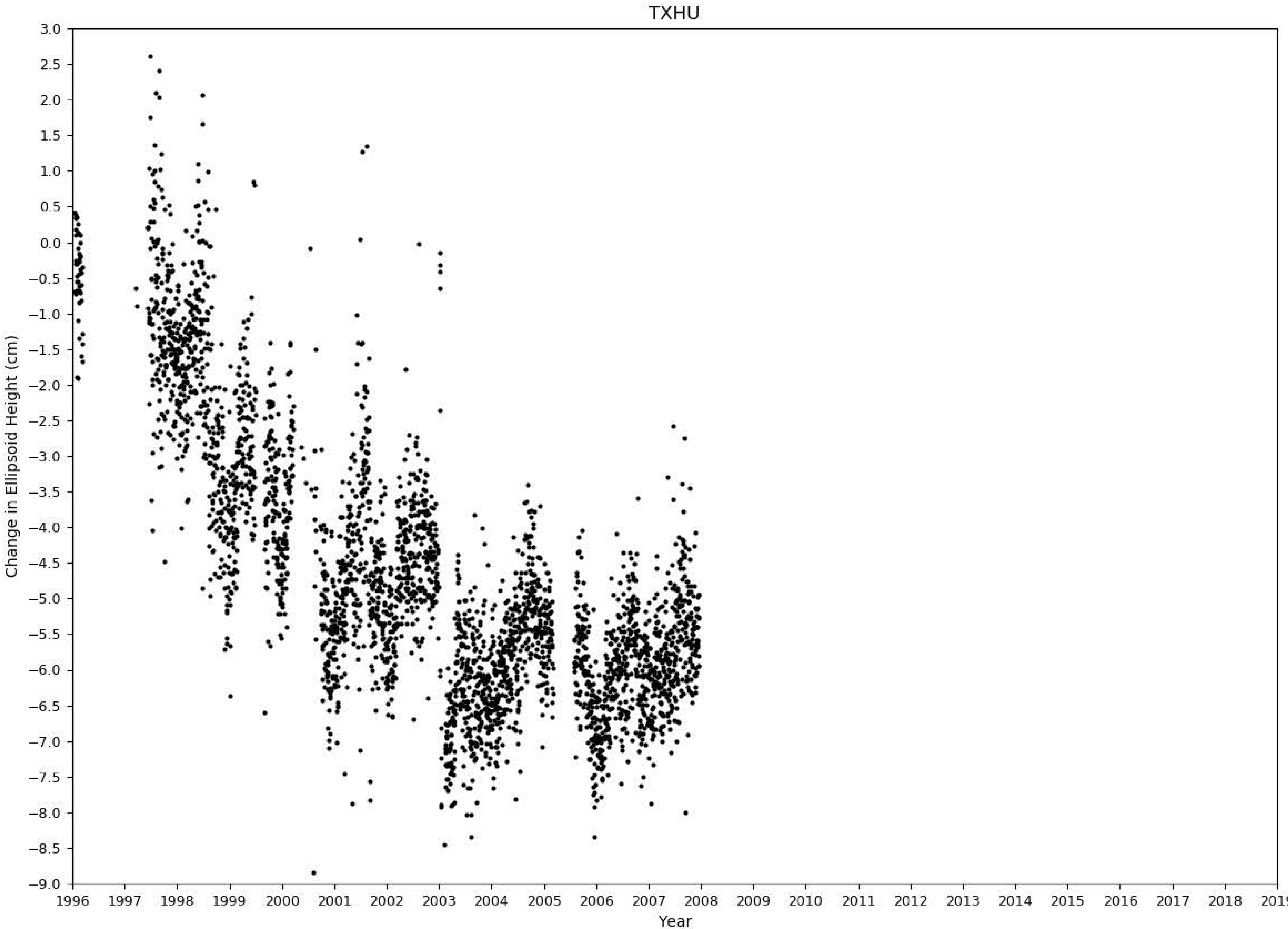
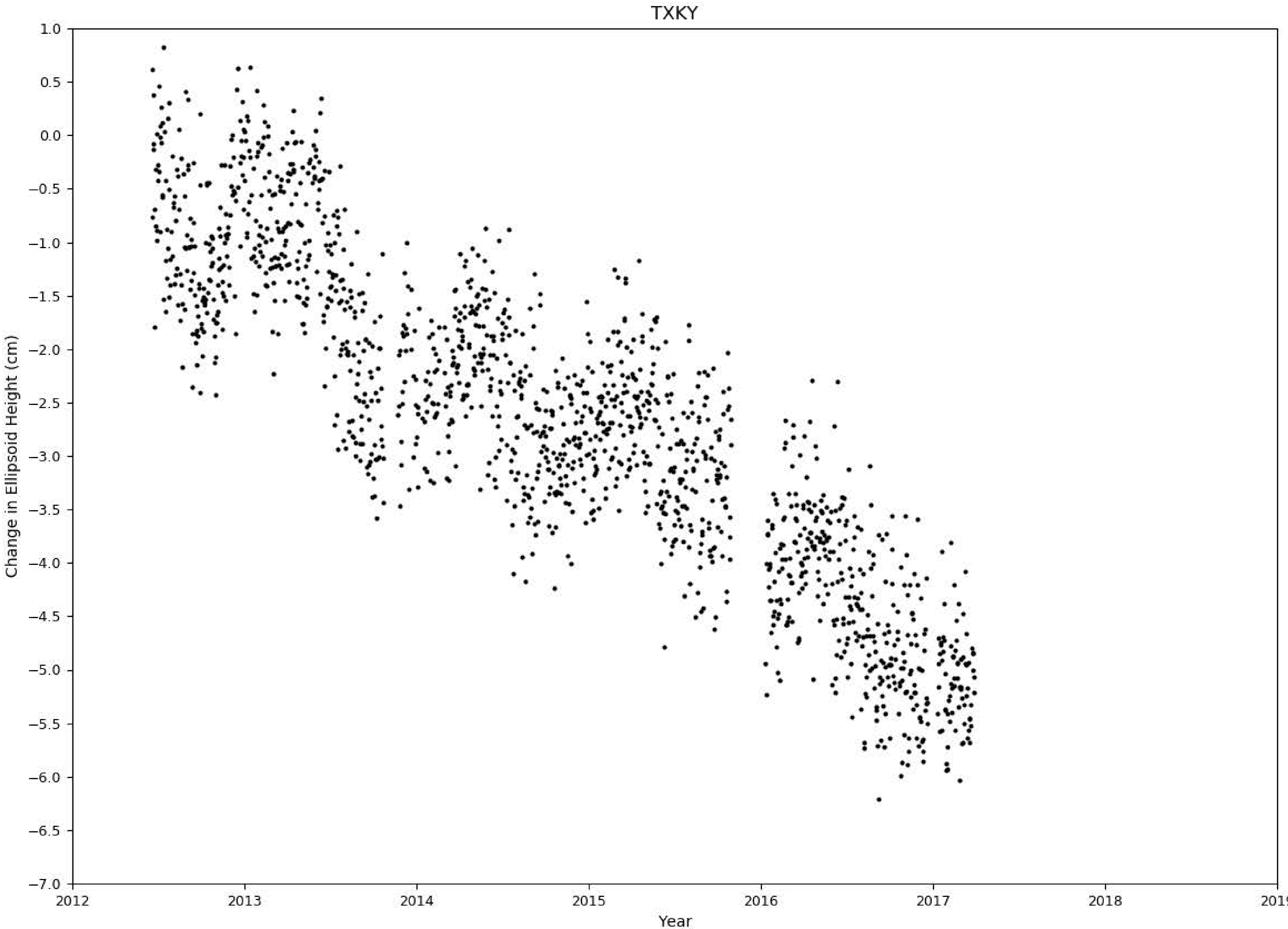
−6.0
Change in Ellipsoid Height (cm)
2012
2013
2014
2015
2016
2017
2018
2019
Year


TXHU
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


TXKY
Change in Ellipsoid Height (cm)
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
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−7.0
2012
2013
2014
2015
2016
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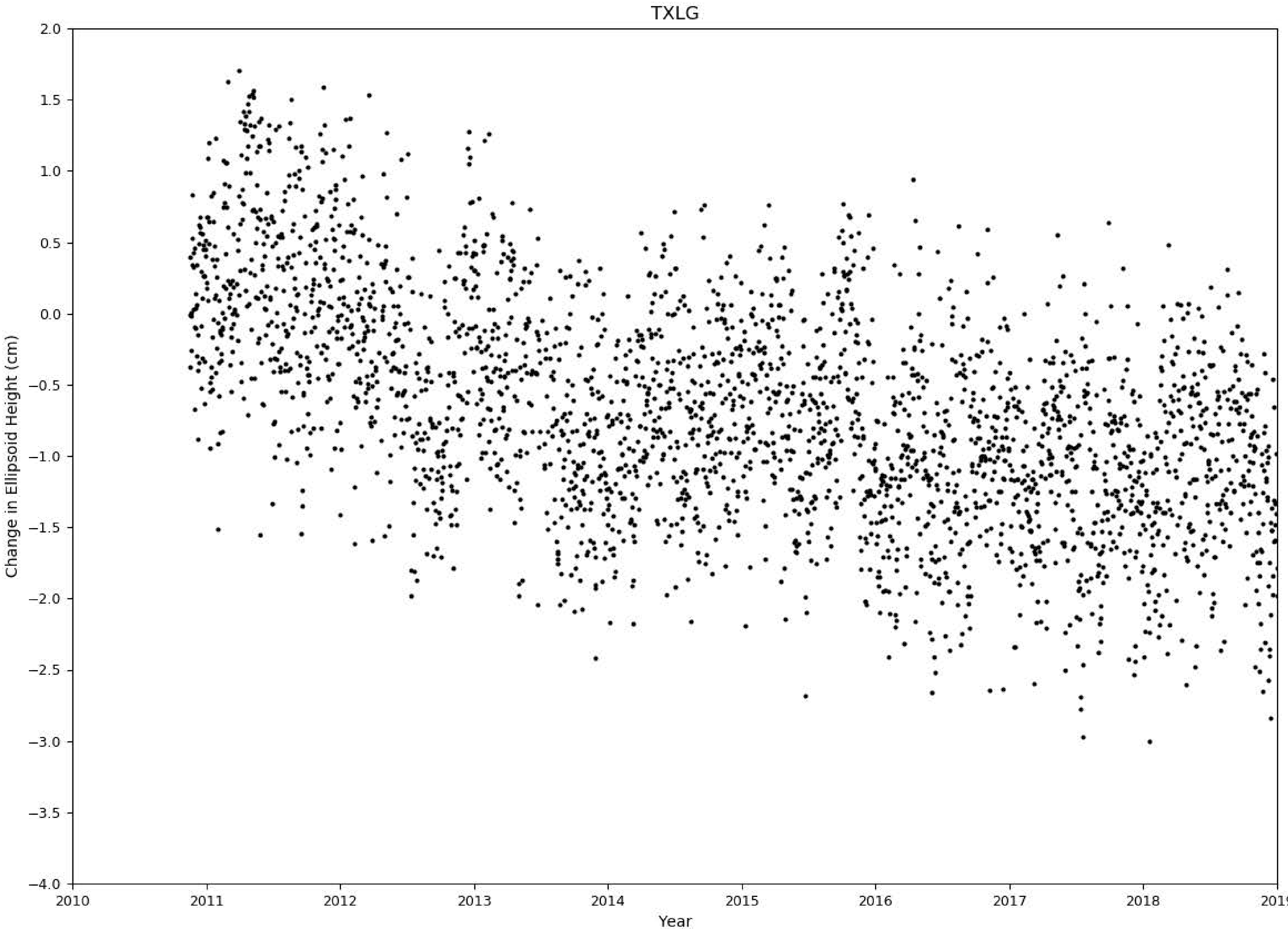
2018
2019
Year


TXLG
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2010
2011
2012
2013
2014
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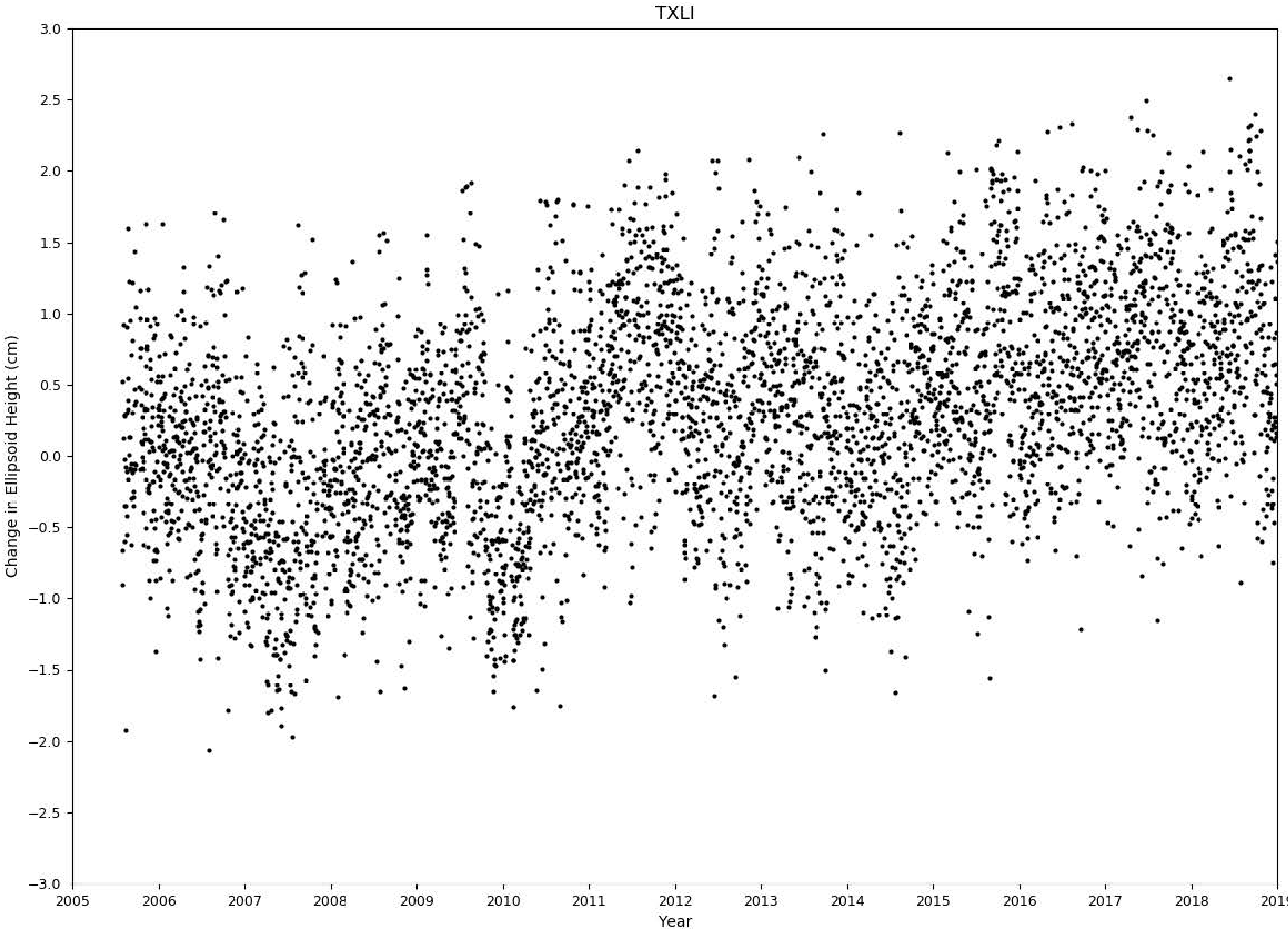
2018
2019
Year


TXLI
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2005
2006
2007
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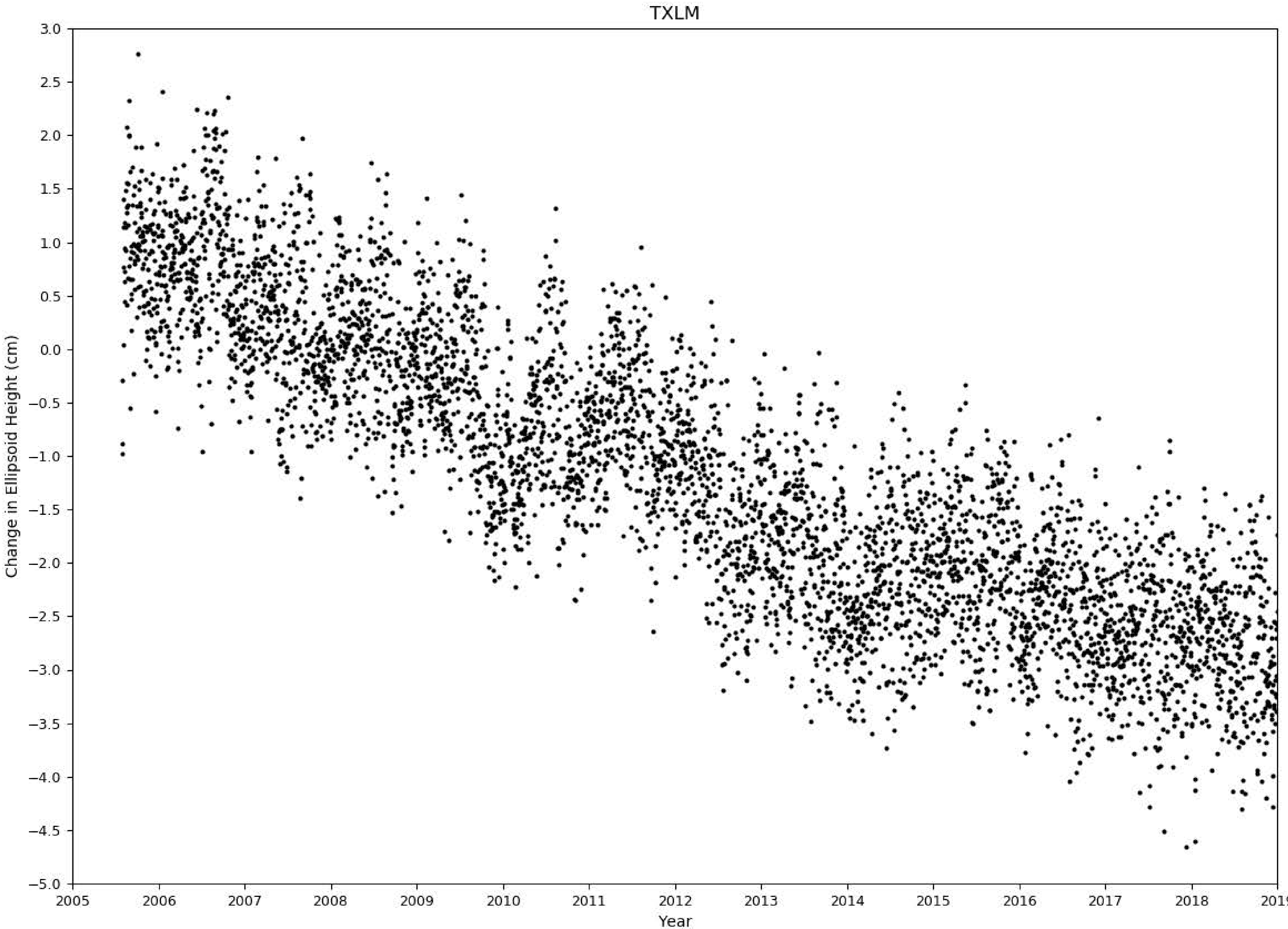
2019
Year


TXLM
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2005
2006
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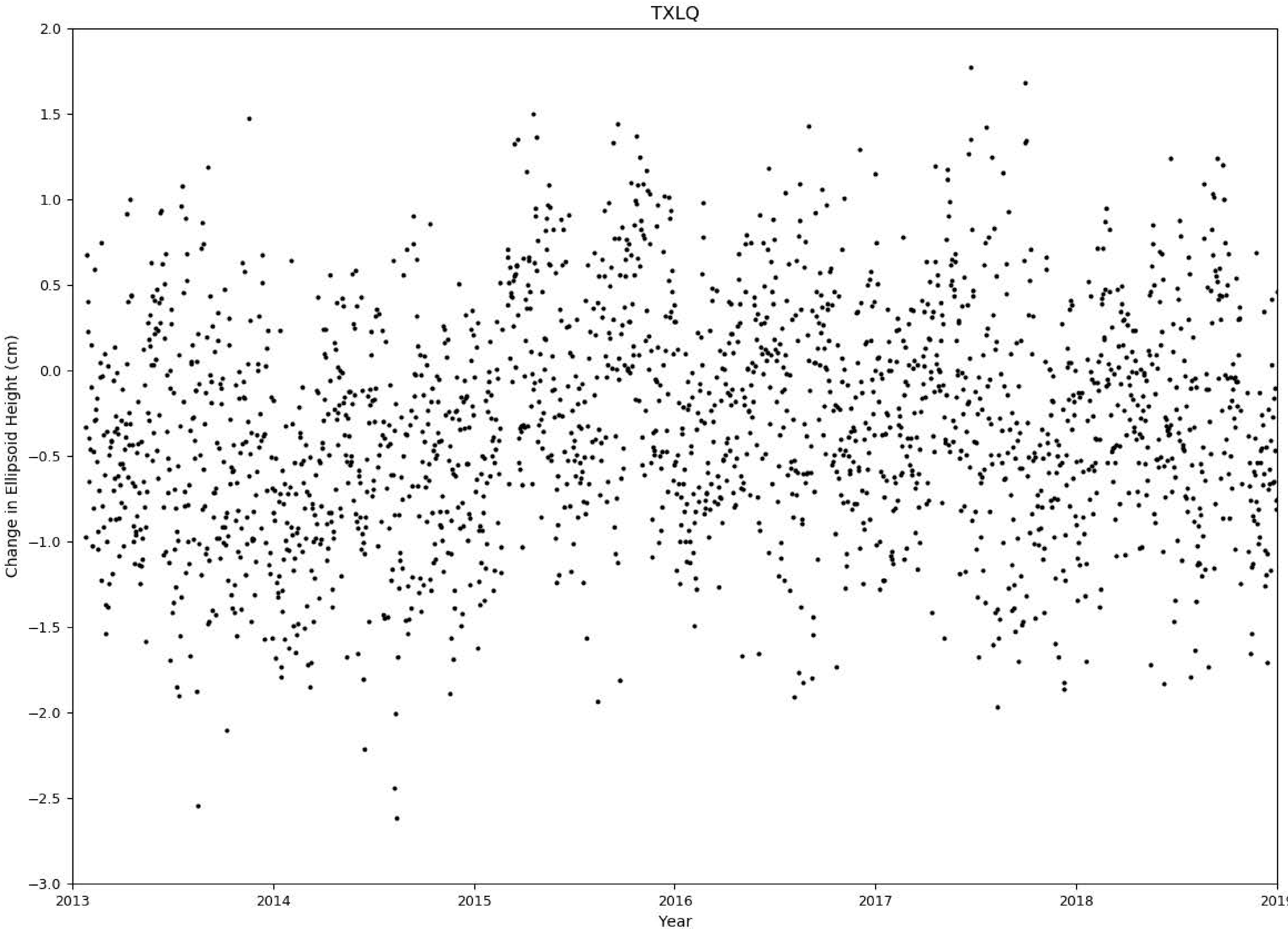
TXLQ
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
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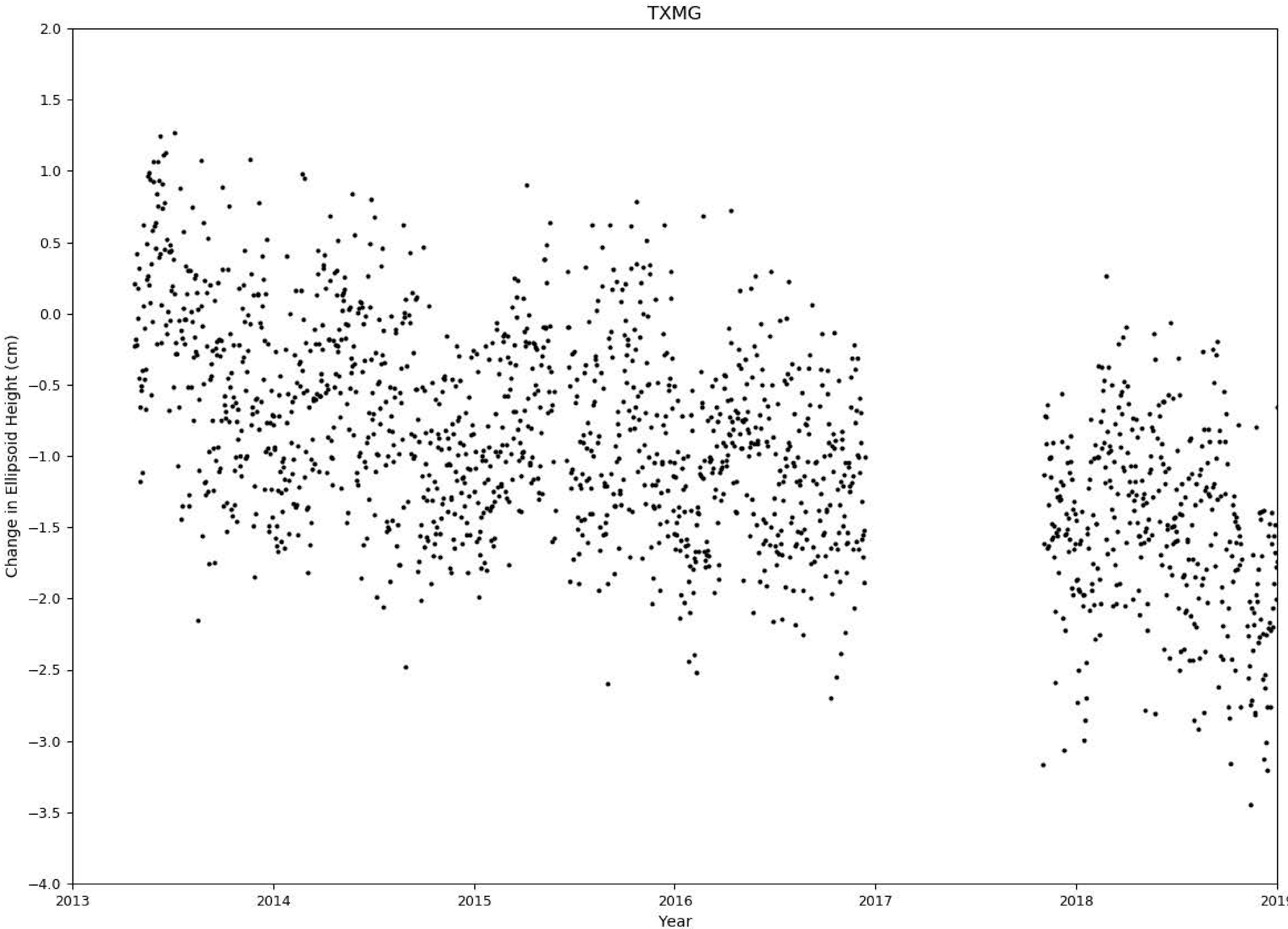
−2.5
−3.0
Change in Ellipsoid Height (cm)
2013
2014
2015
2016
2017
2018
2019
Year


TXMG
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2013
2014
2015
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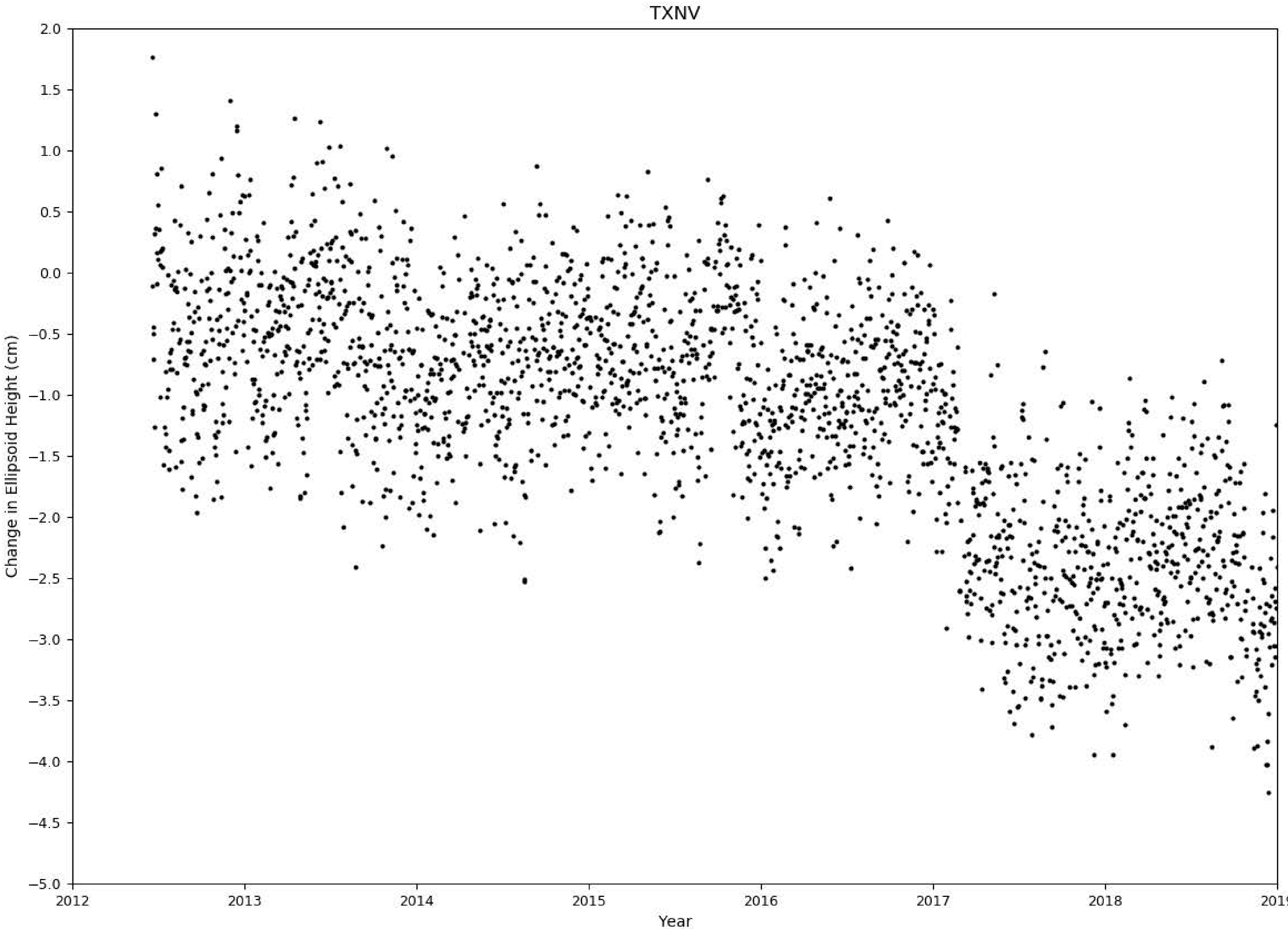
2019
Year


TXNV
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
2012
2013
2014
2015
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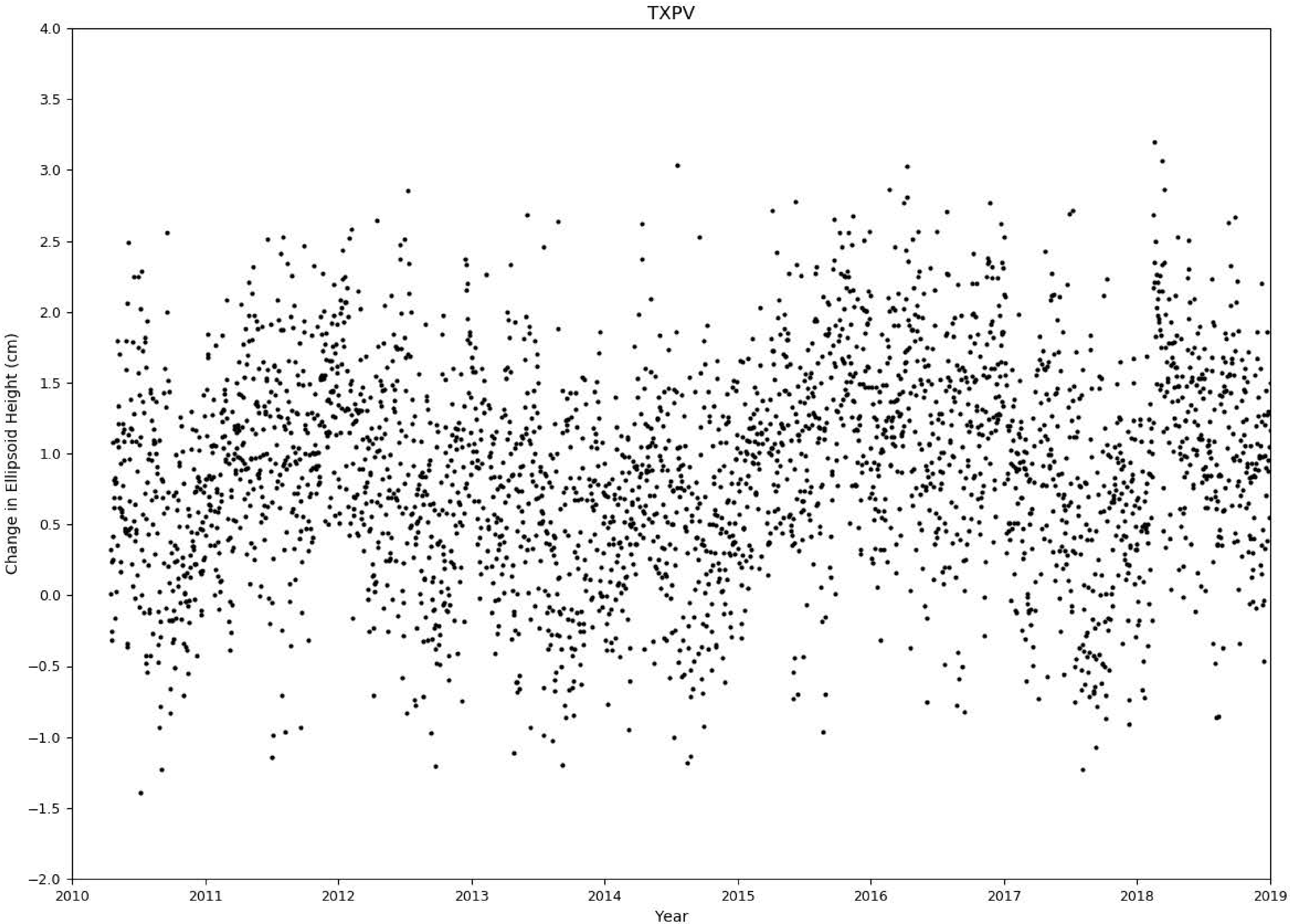
2017
2018
2019
Year


TXPV
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2010
2011
2012
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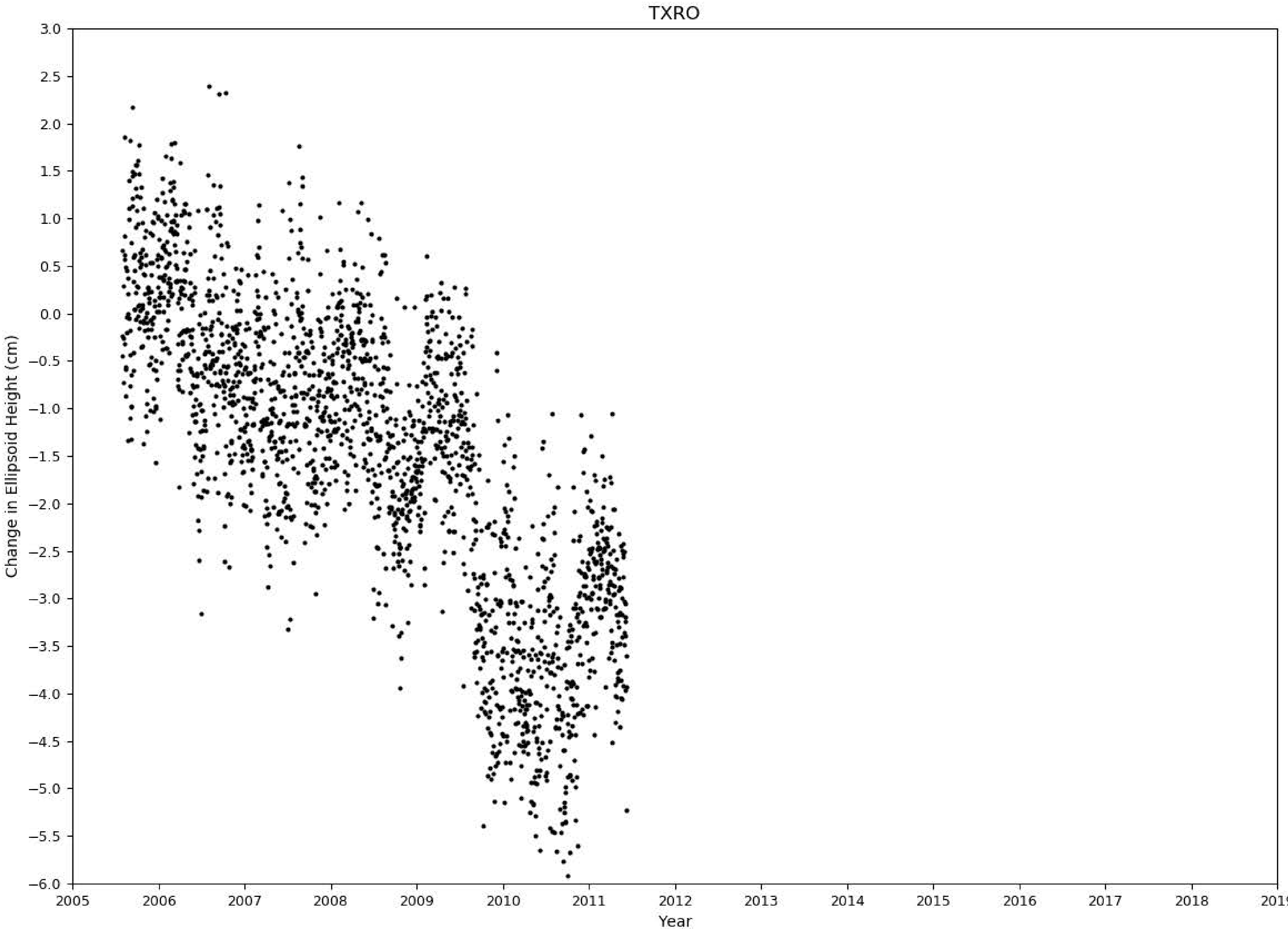
2018
2019


TXRO
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
2005
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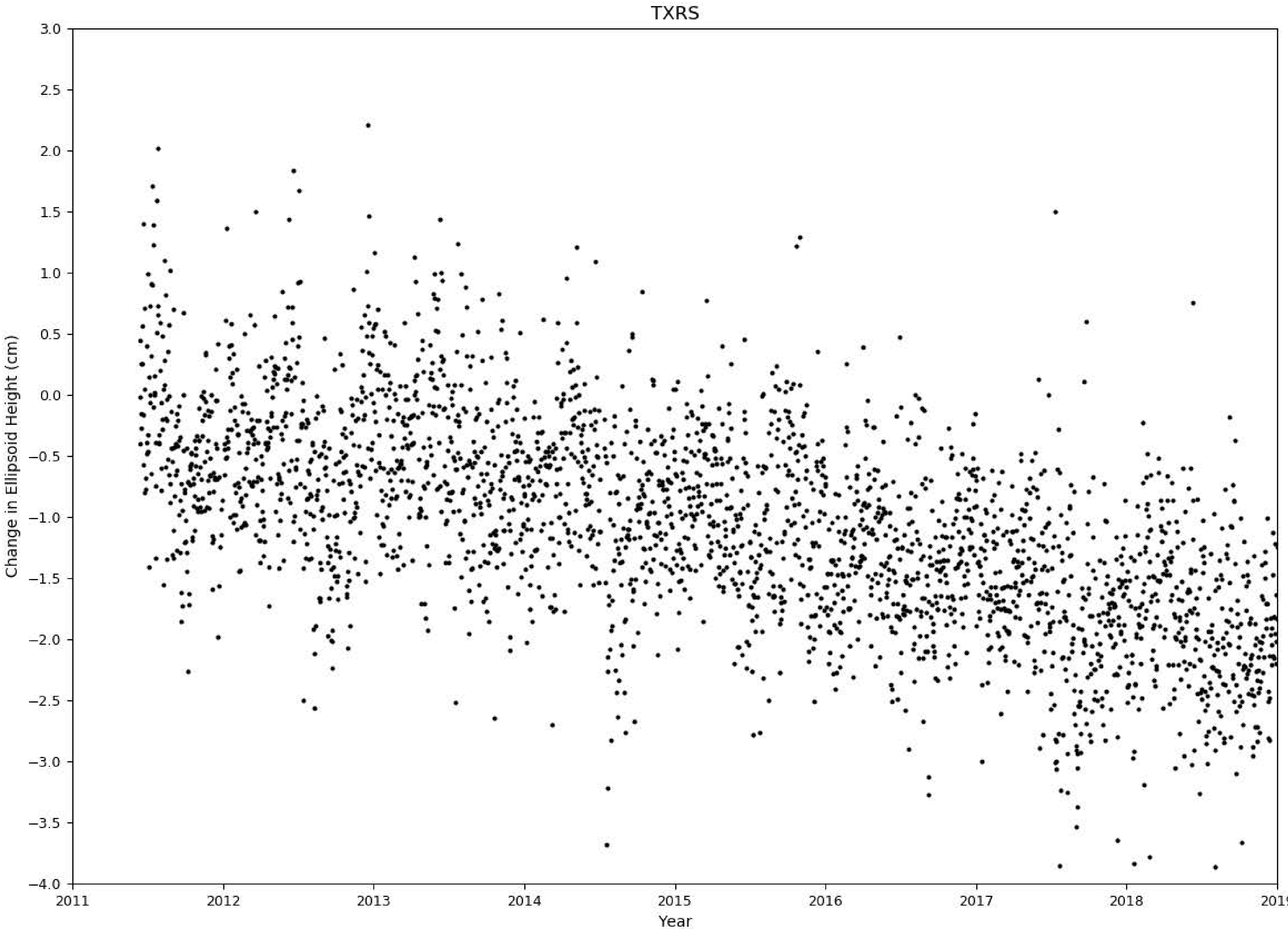
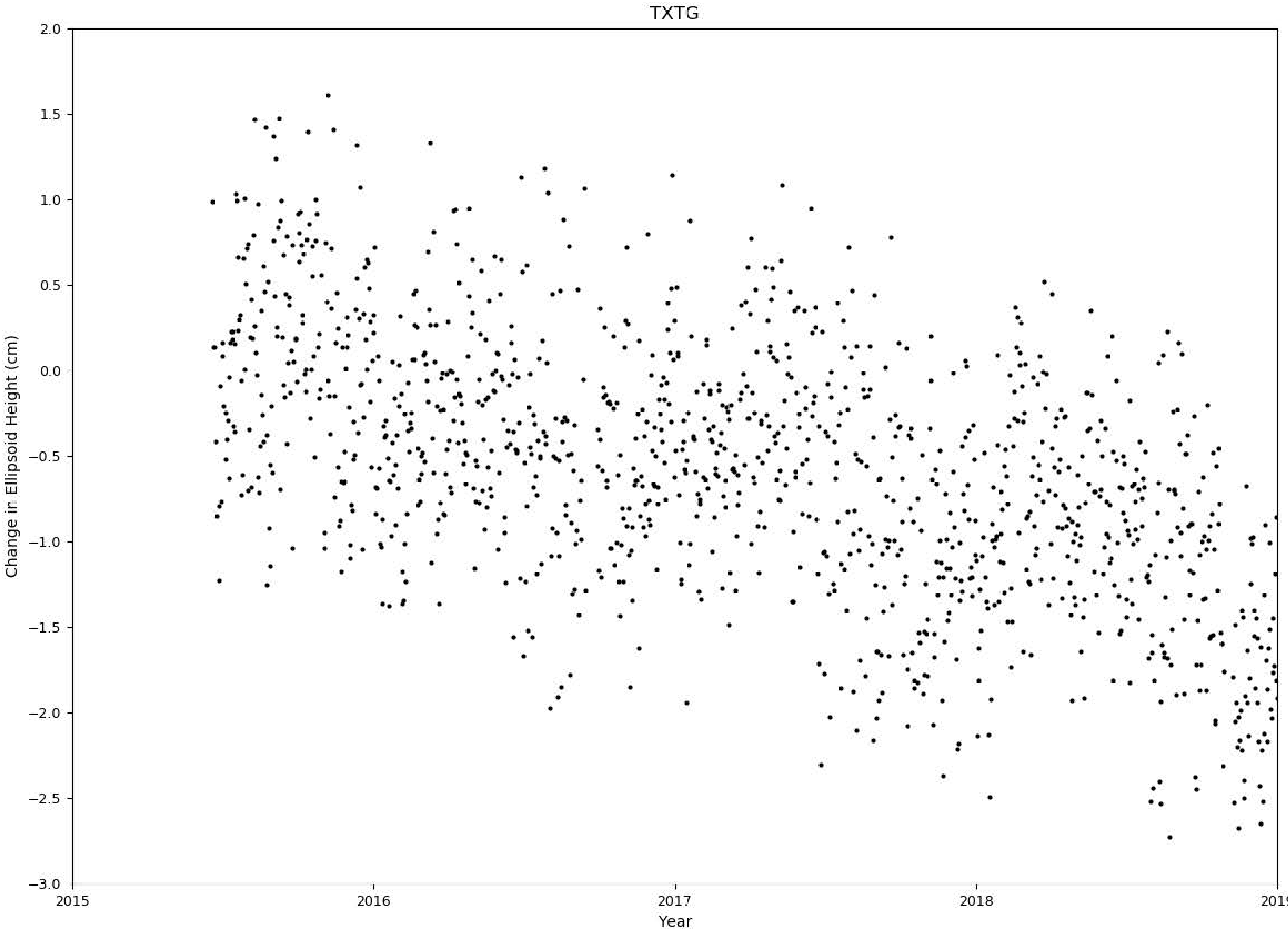
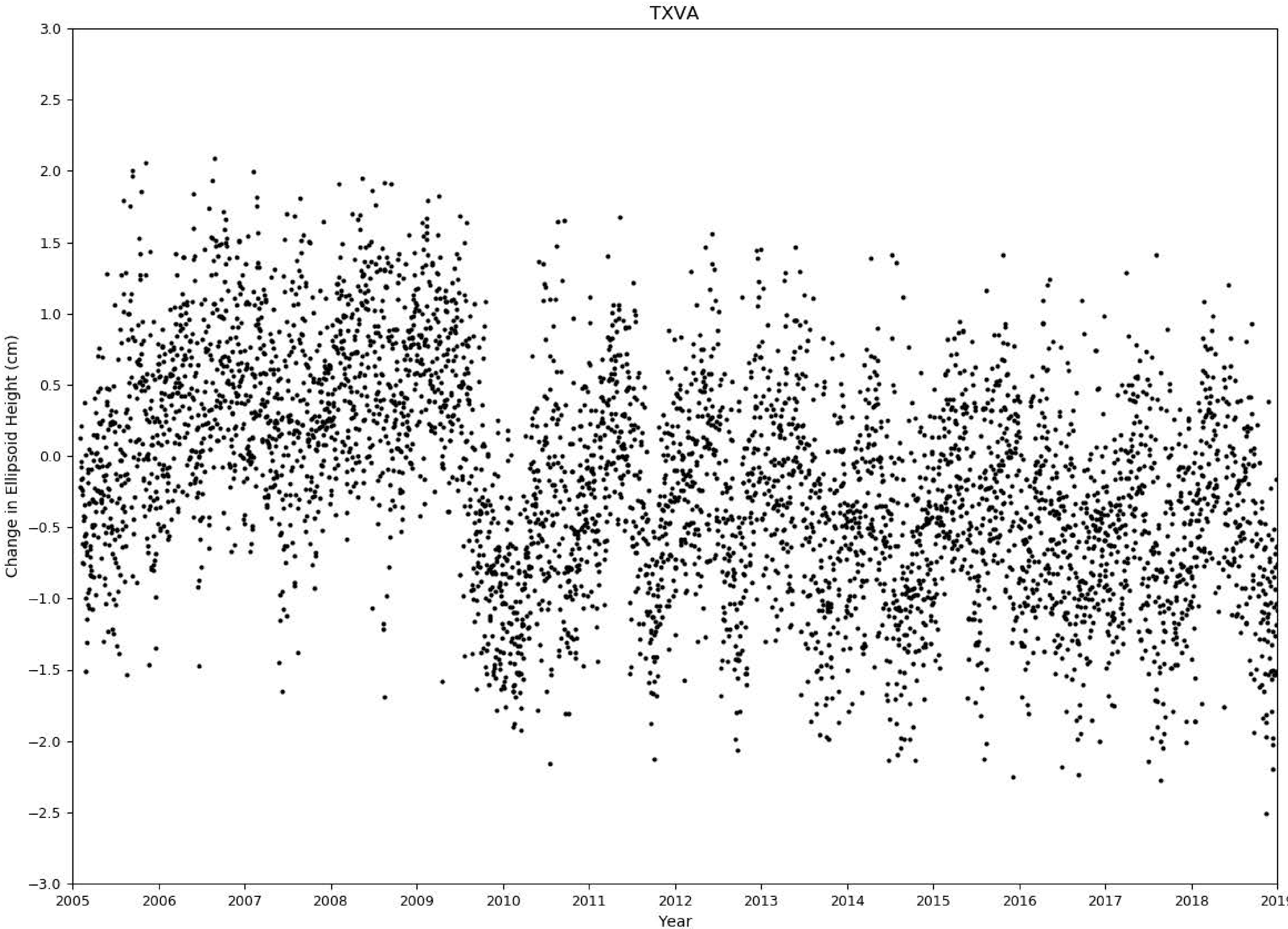
Year


TXRS
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


TXTG
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


TXVA
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2005
2006
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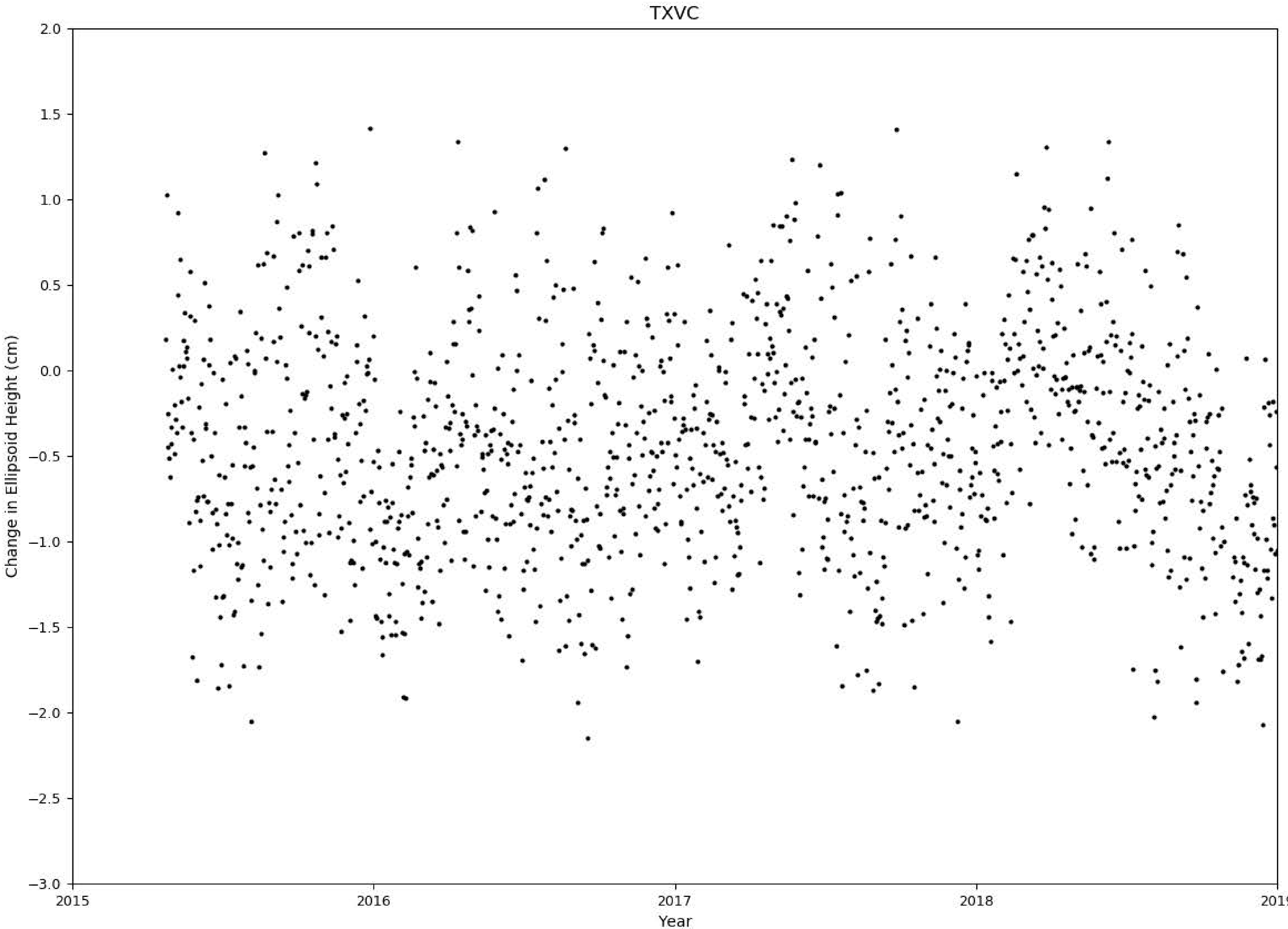
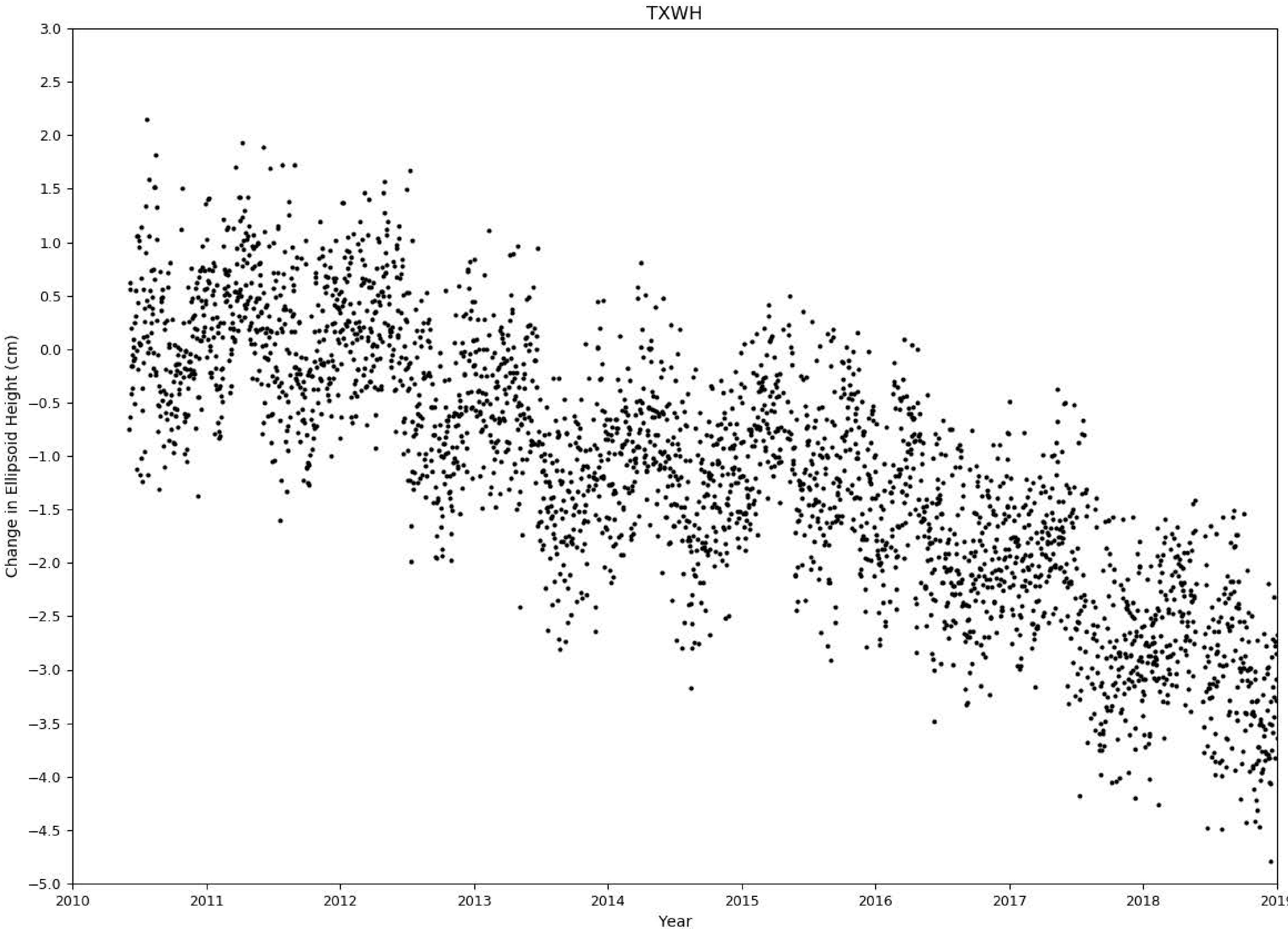
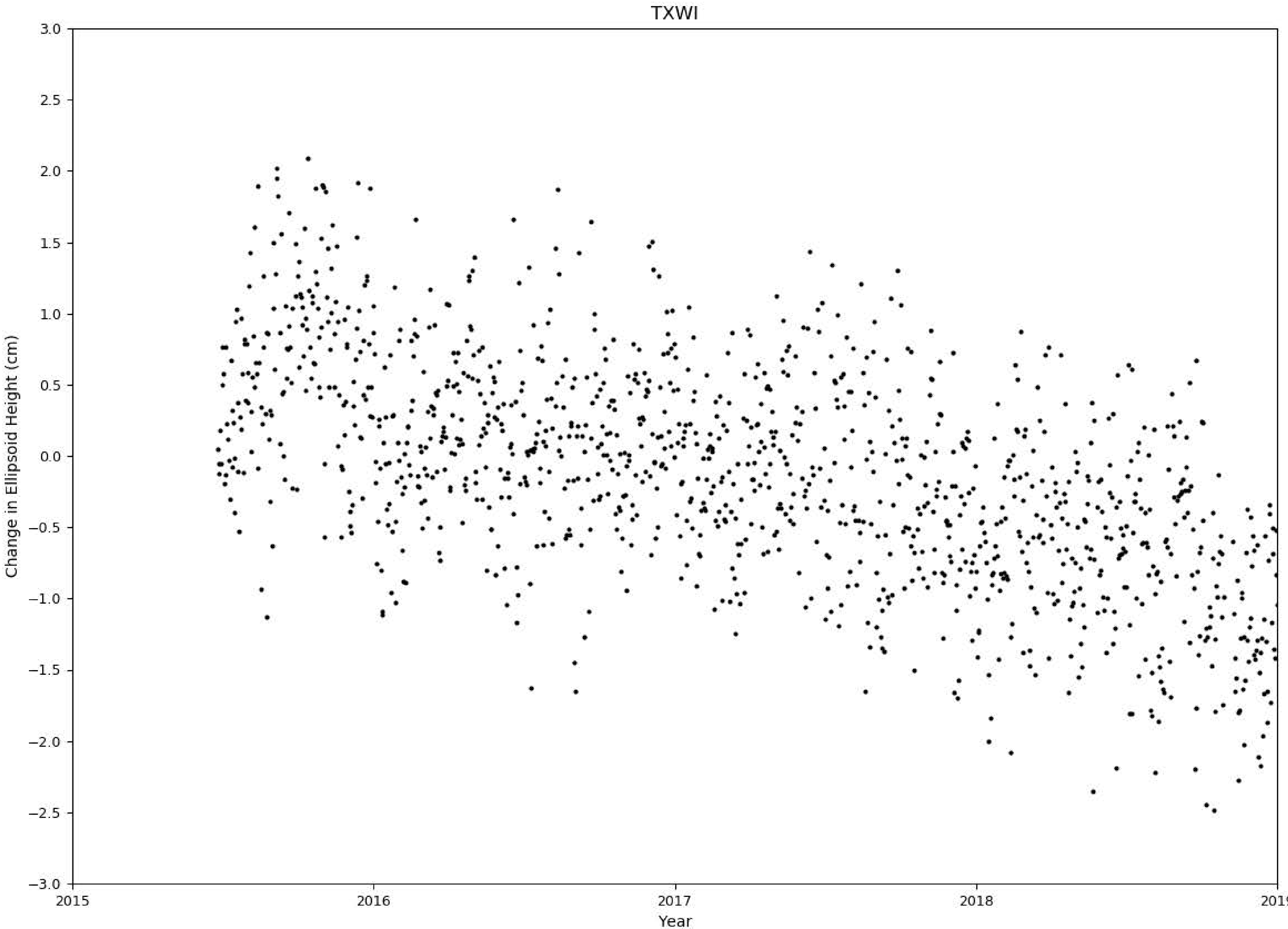
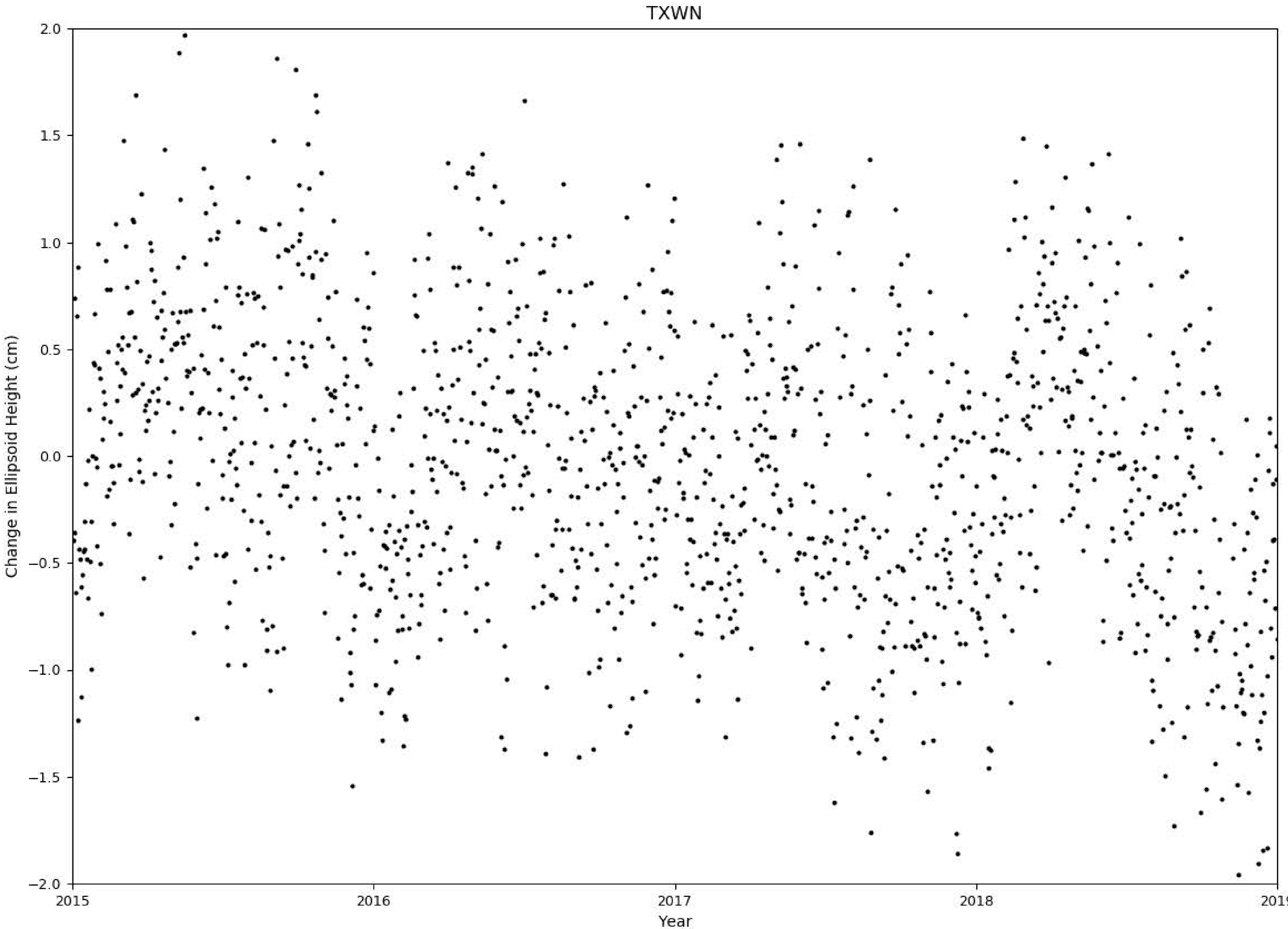
2019
Year

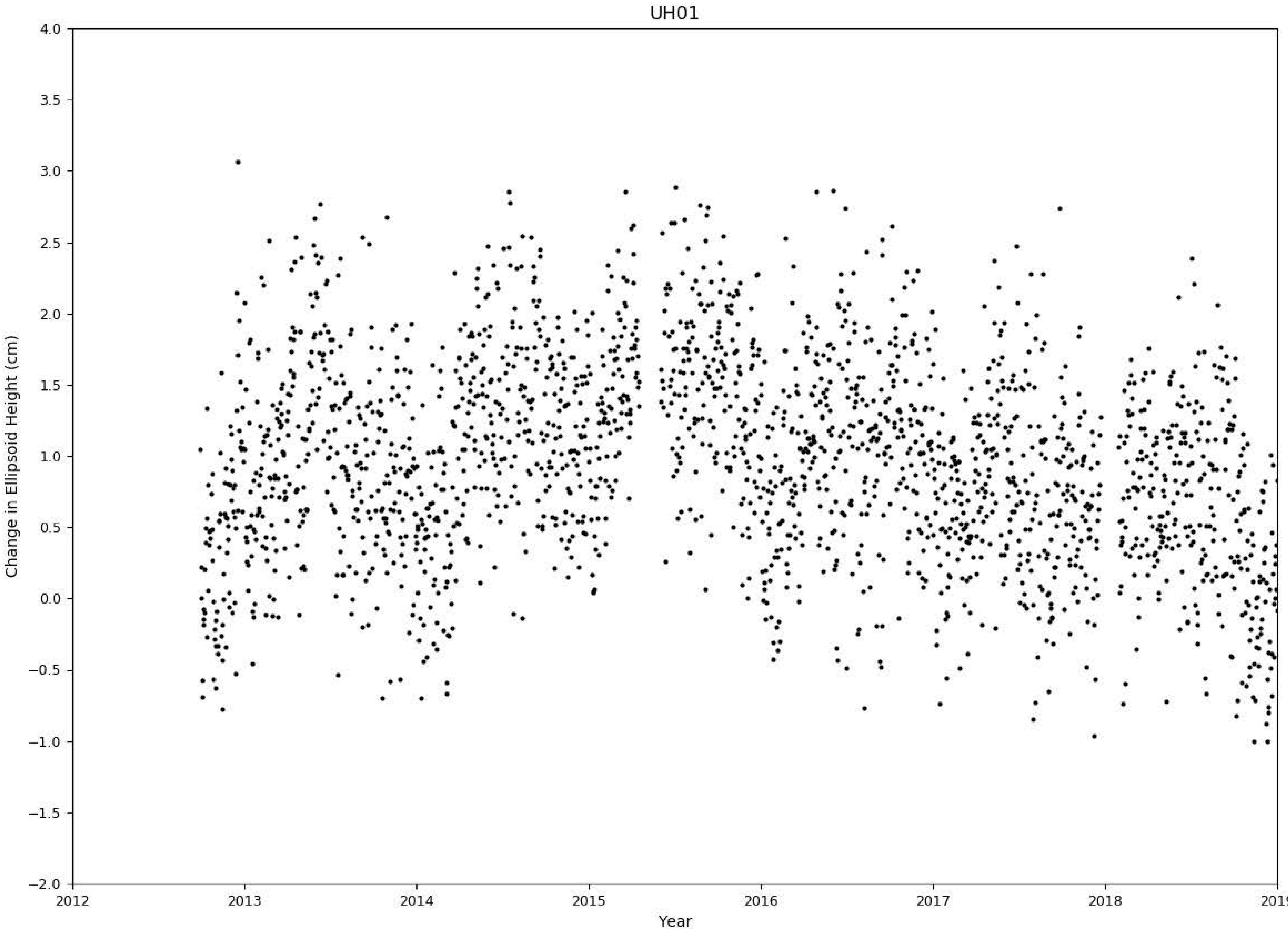

TXVC
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
2015
2016
2017
2018
2019
Year

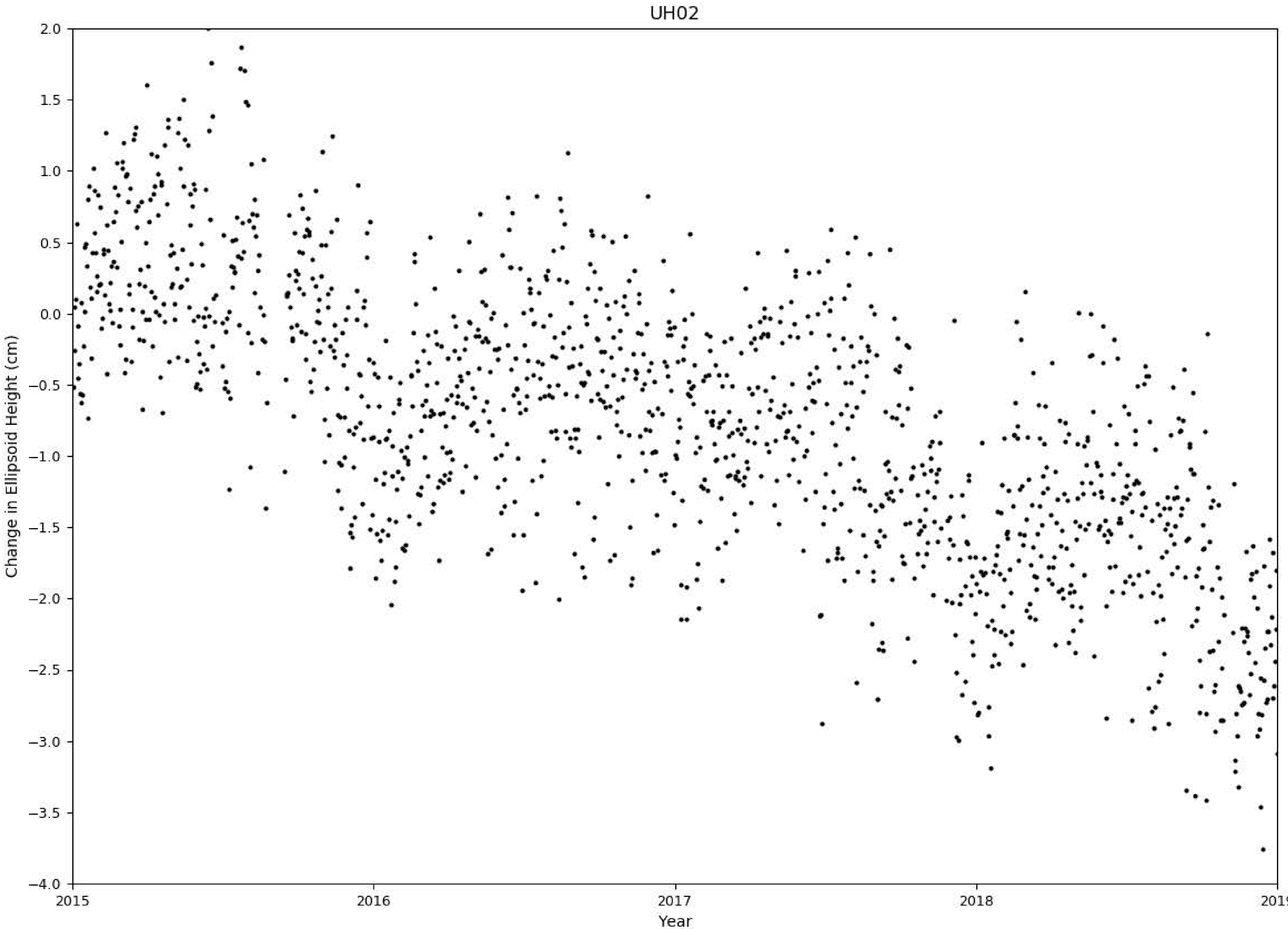


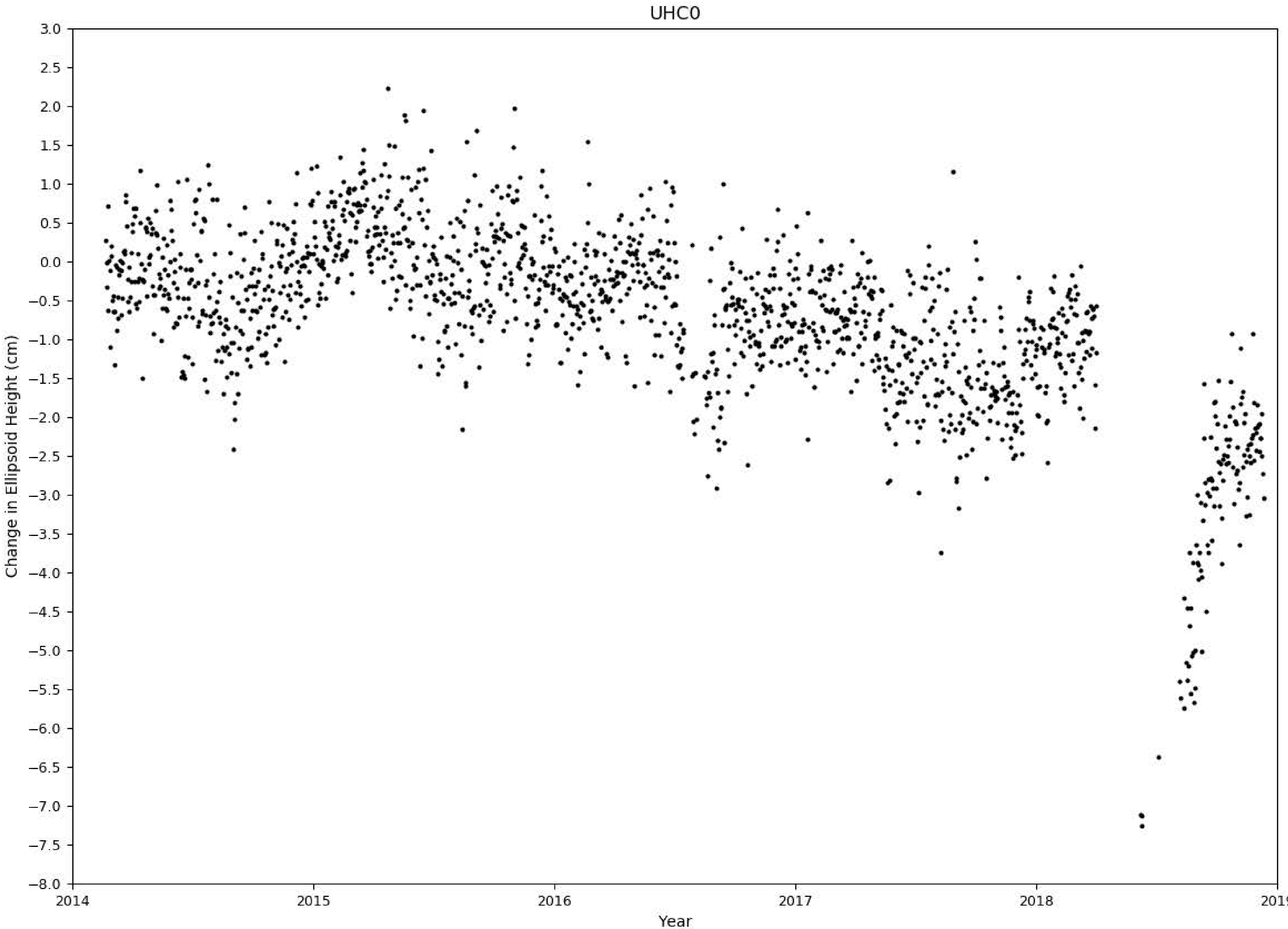
TXWH
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
Change in Ellipsoid Height (cm)
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year


TXWI
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2015
2016
2017
2018
2019
Year


TXWN
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2015
2016
2017
2018
2019
Year


UH01
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2012
2013
2014
2015
2016
2017
2018
2019


UH02
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
2015
2016
2017
2018
2019
Year


UHC0
Change in Ellipsoid Height (cm)
Year
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
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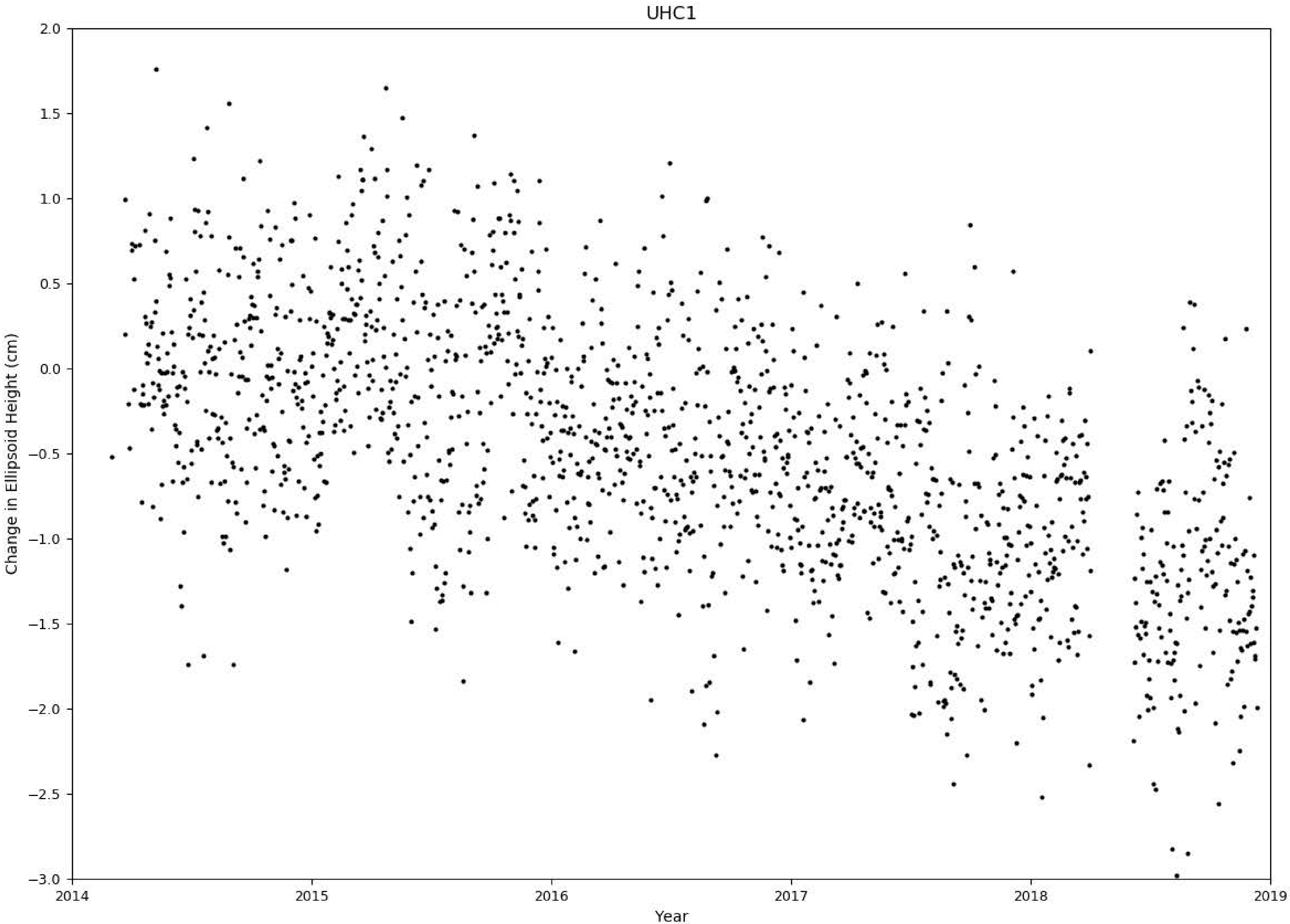
2016
2017
2018
2019


UHC1
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
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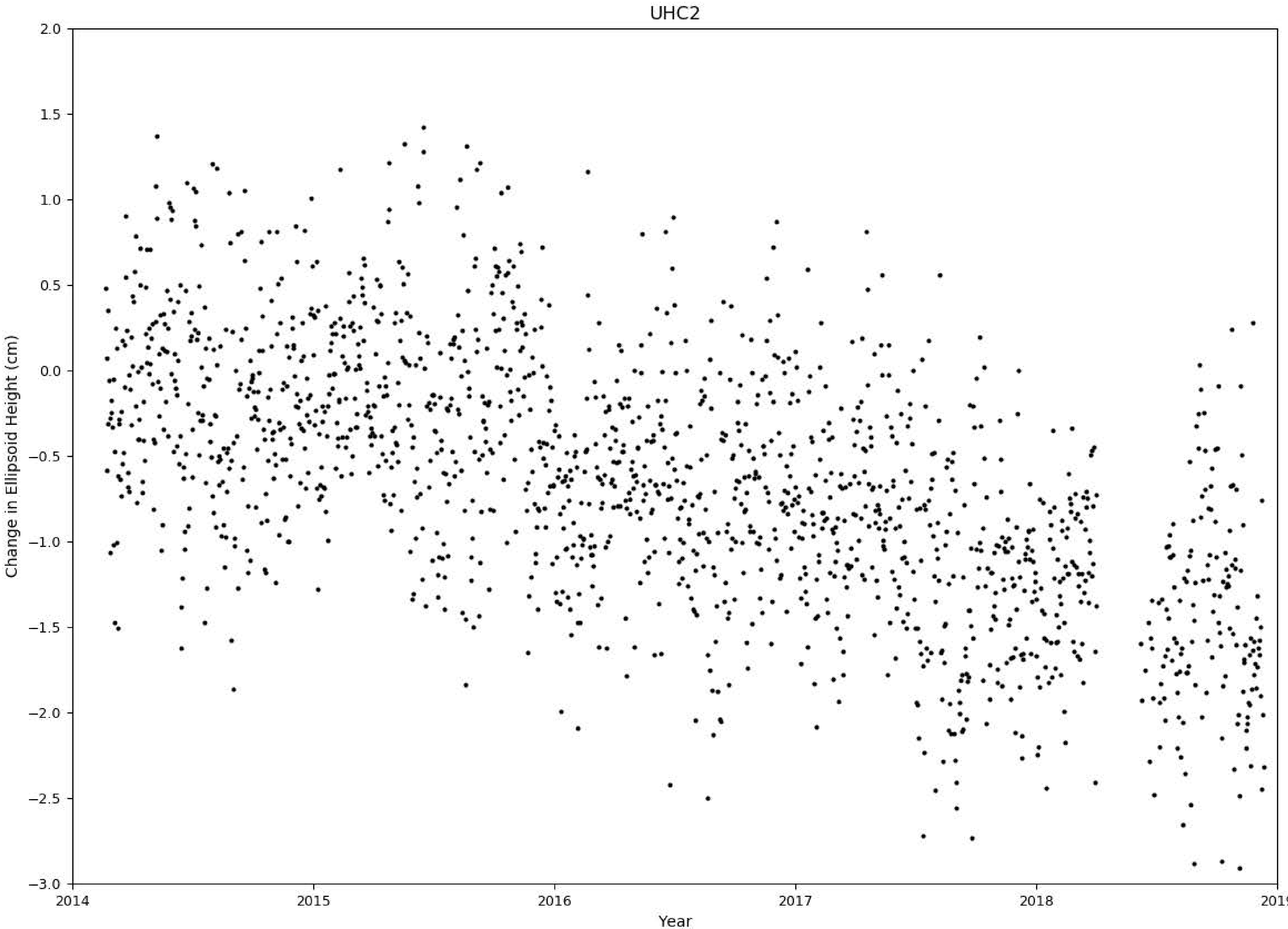
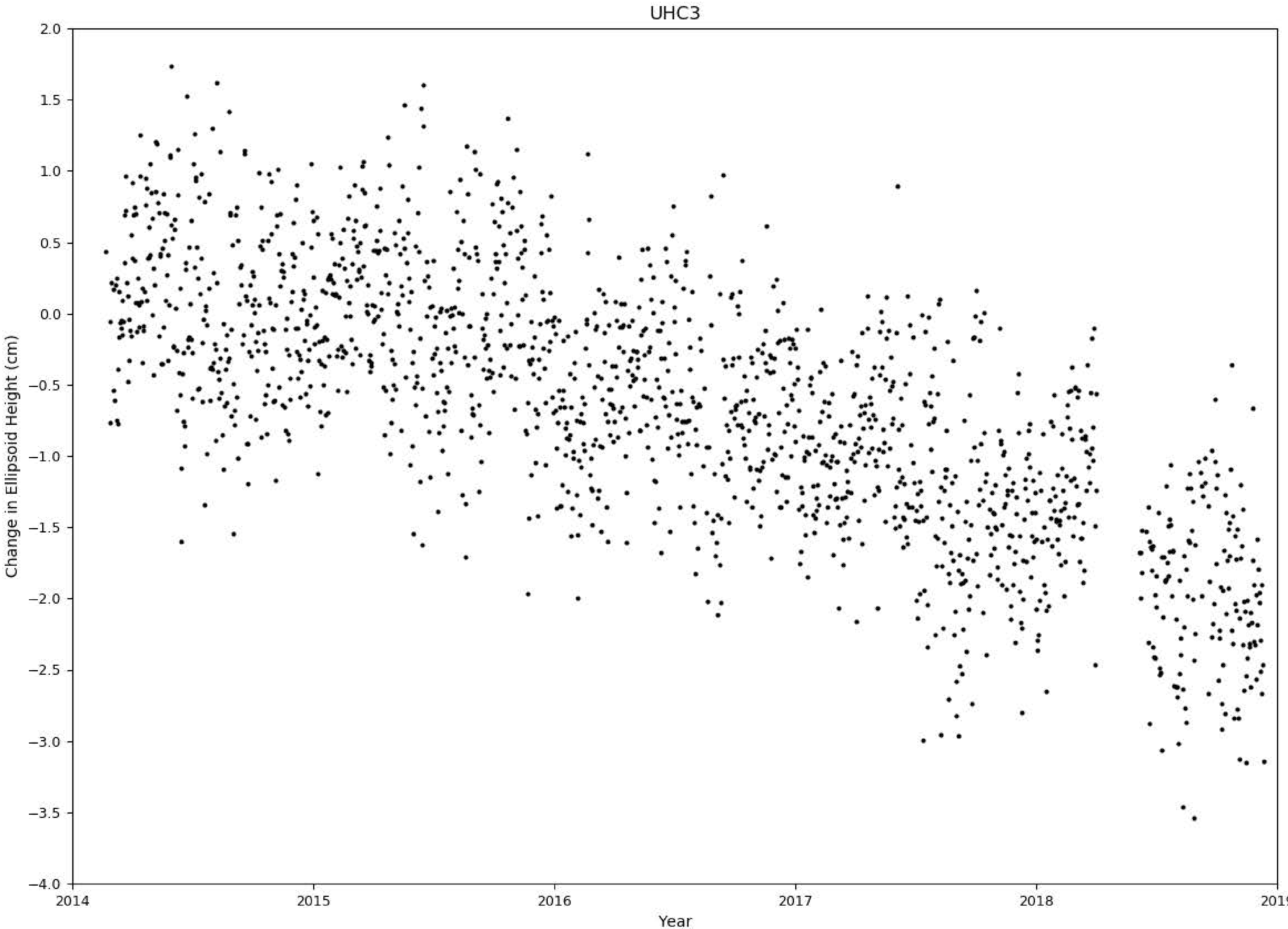
−1.0
−1.5
−2.0
−2.5
−3.0
2014
2015
2016
2017
2018
2019
Year


UHC2
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHC3
2.0
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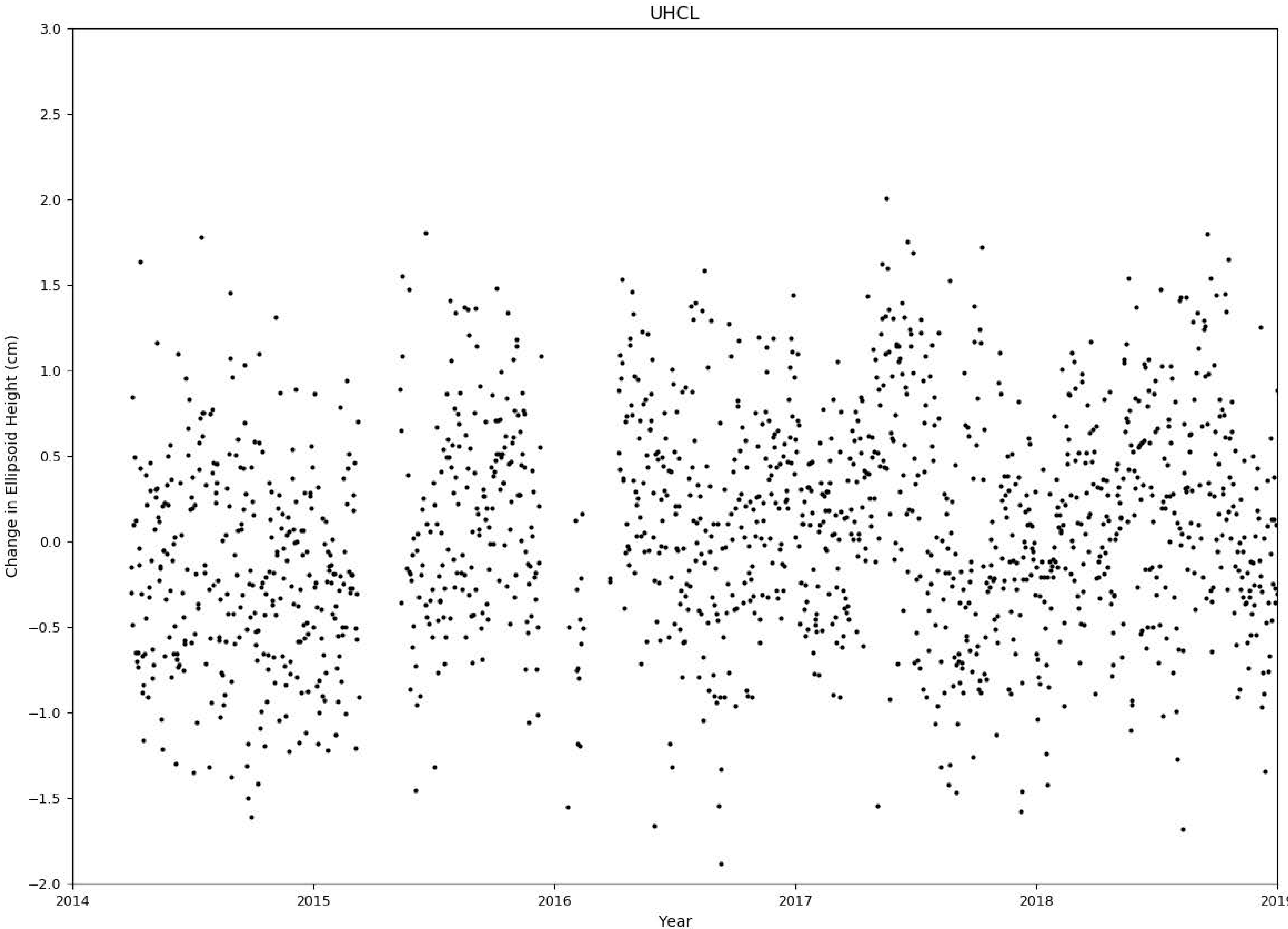
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHCL
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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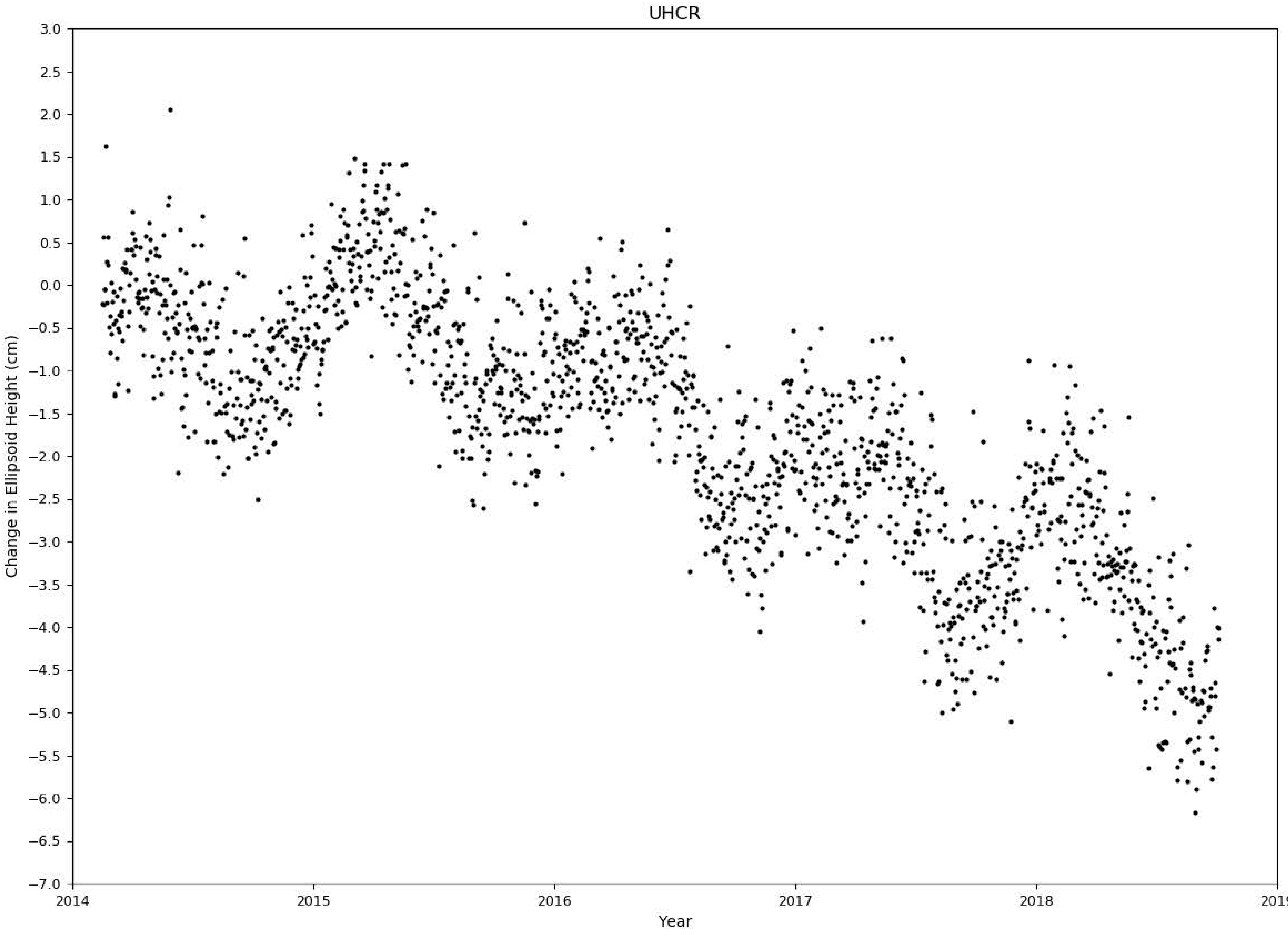
−1.5
−2.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHCR
Change in Ellipsoid Height (cm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
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−5.5
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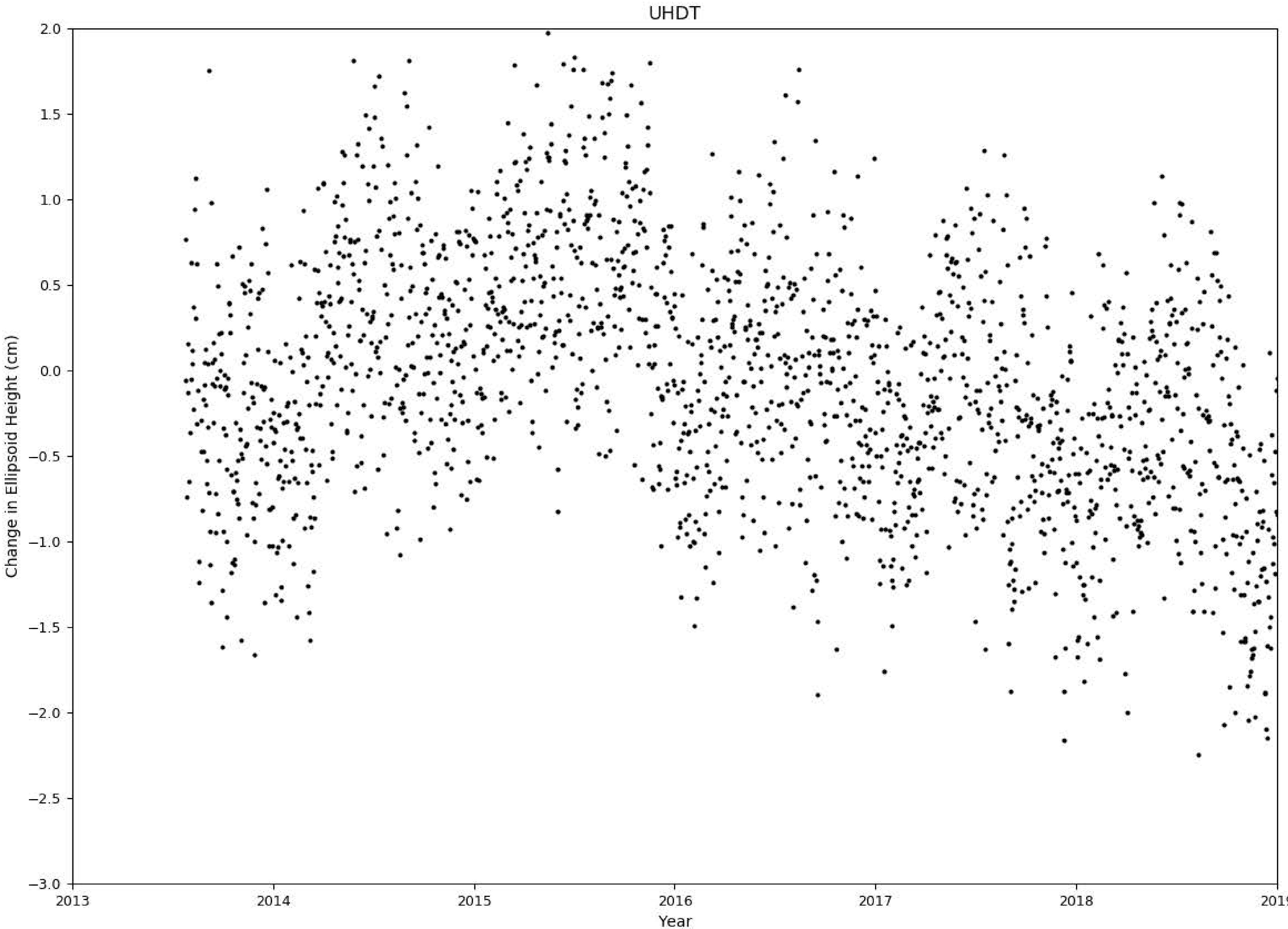
2014
2015
2016
2017
2018
2019
Year


UHDT
Change in Ellipsoid Height (cm)
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1.5
1.0
0.5
0.0
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−1.5
−2.0
−2.5
−3.0
2013
2014
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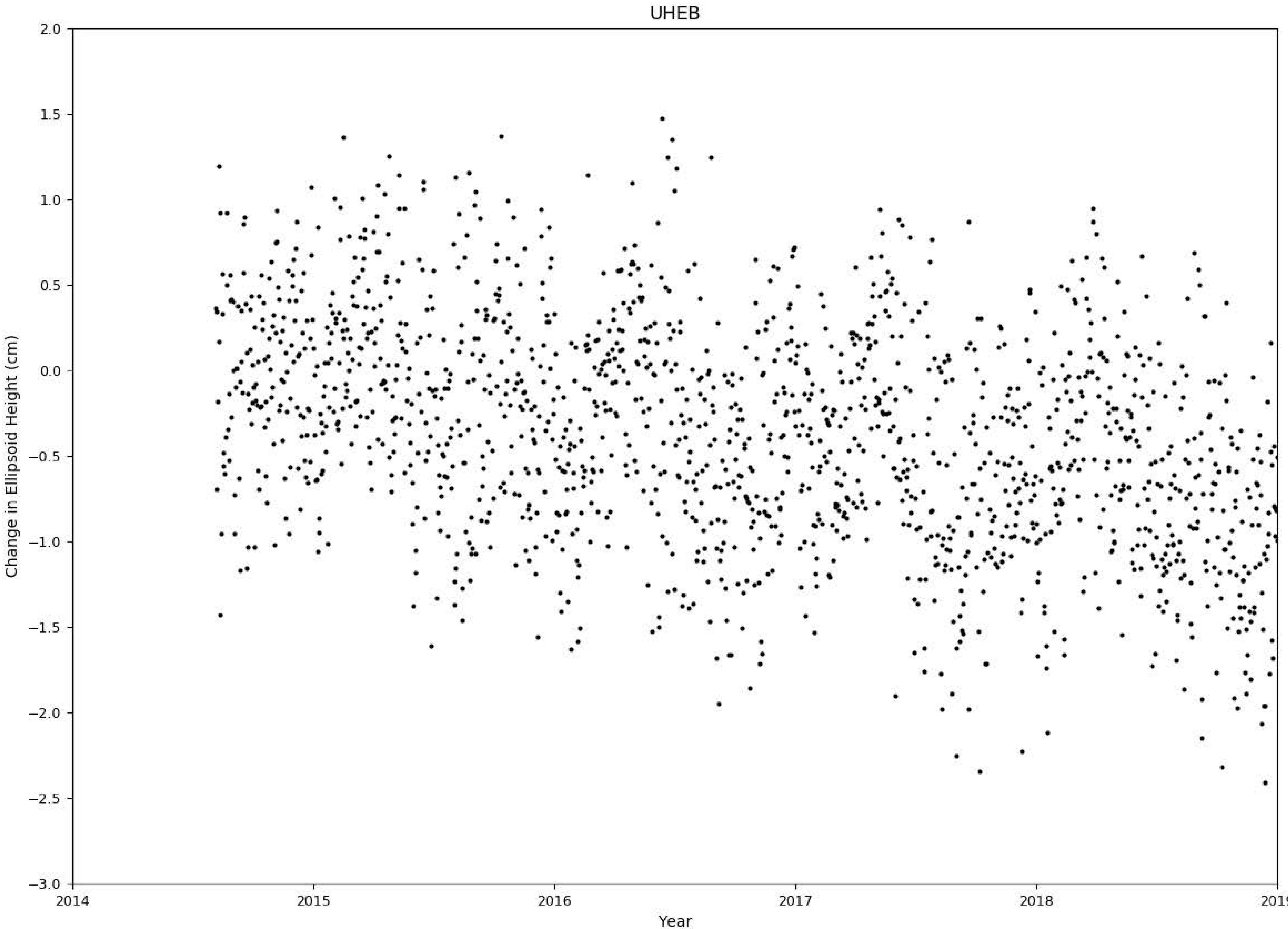
2018
2019
Year


UHEB
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
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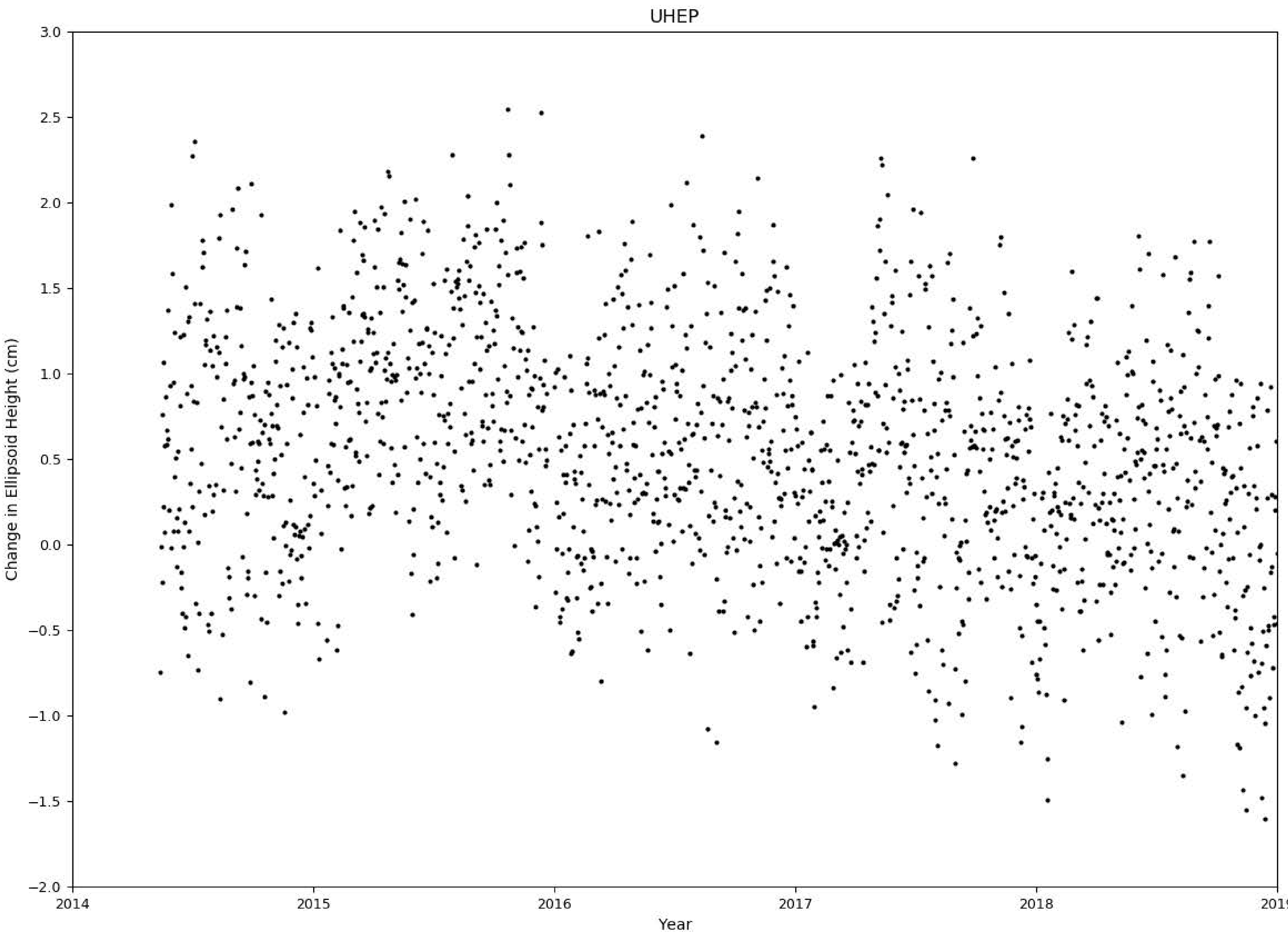
−1.5
−2.0
−2.5
−3.0
2014
2015
2016
2017
2018
2019
Year


UHEP
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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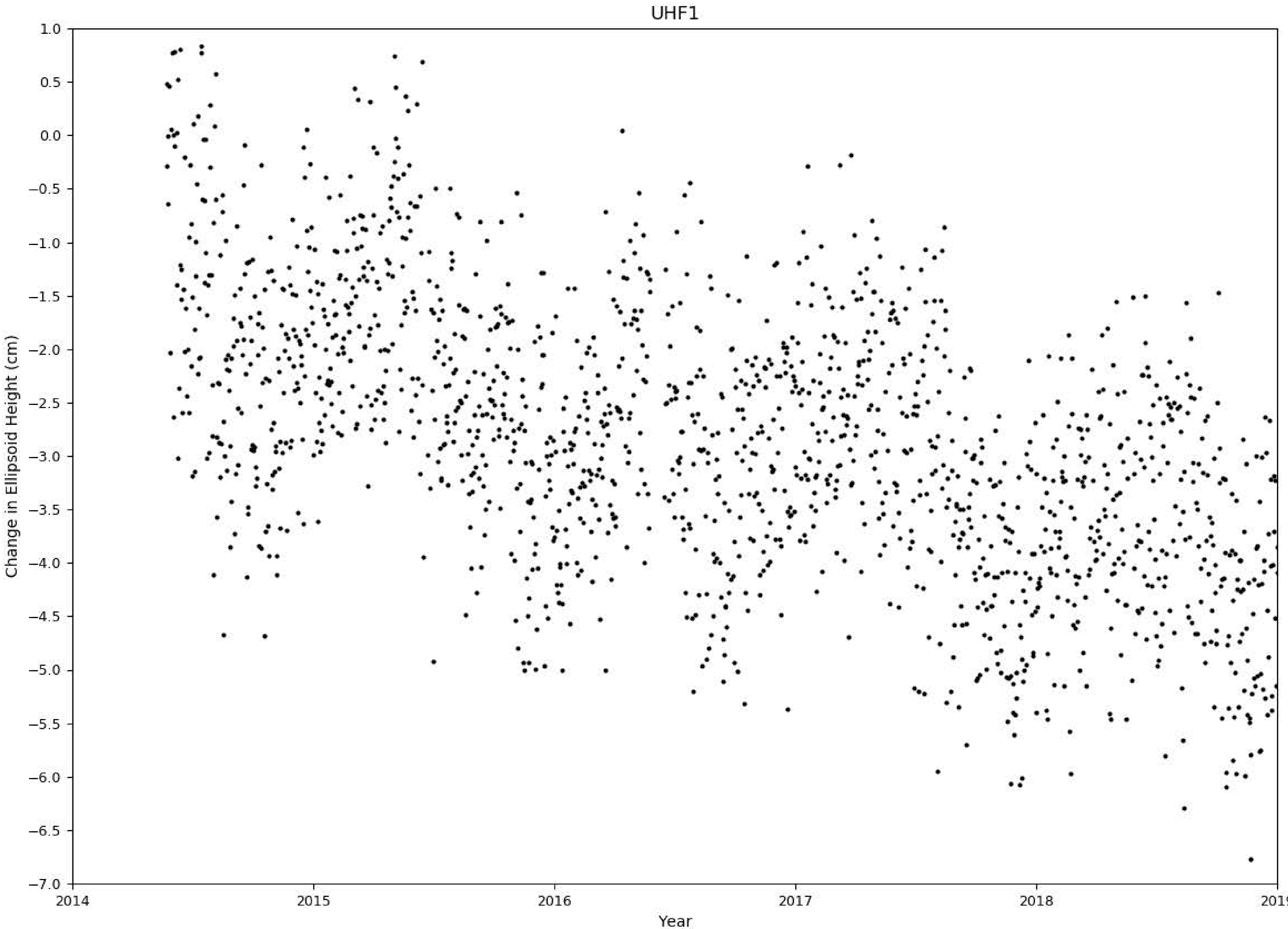
−1.5
−2.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHF1
1.0
0.5
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−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
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−4.0
−4.5
−5.0
−5.5
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−6.5
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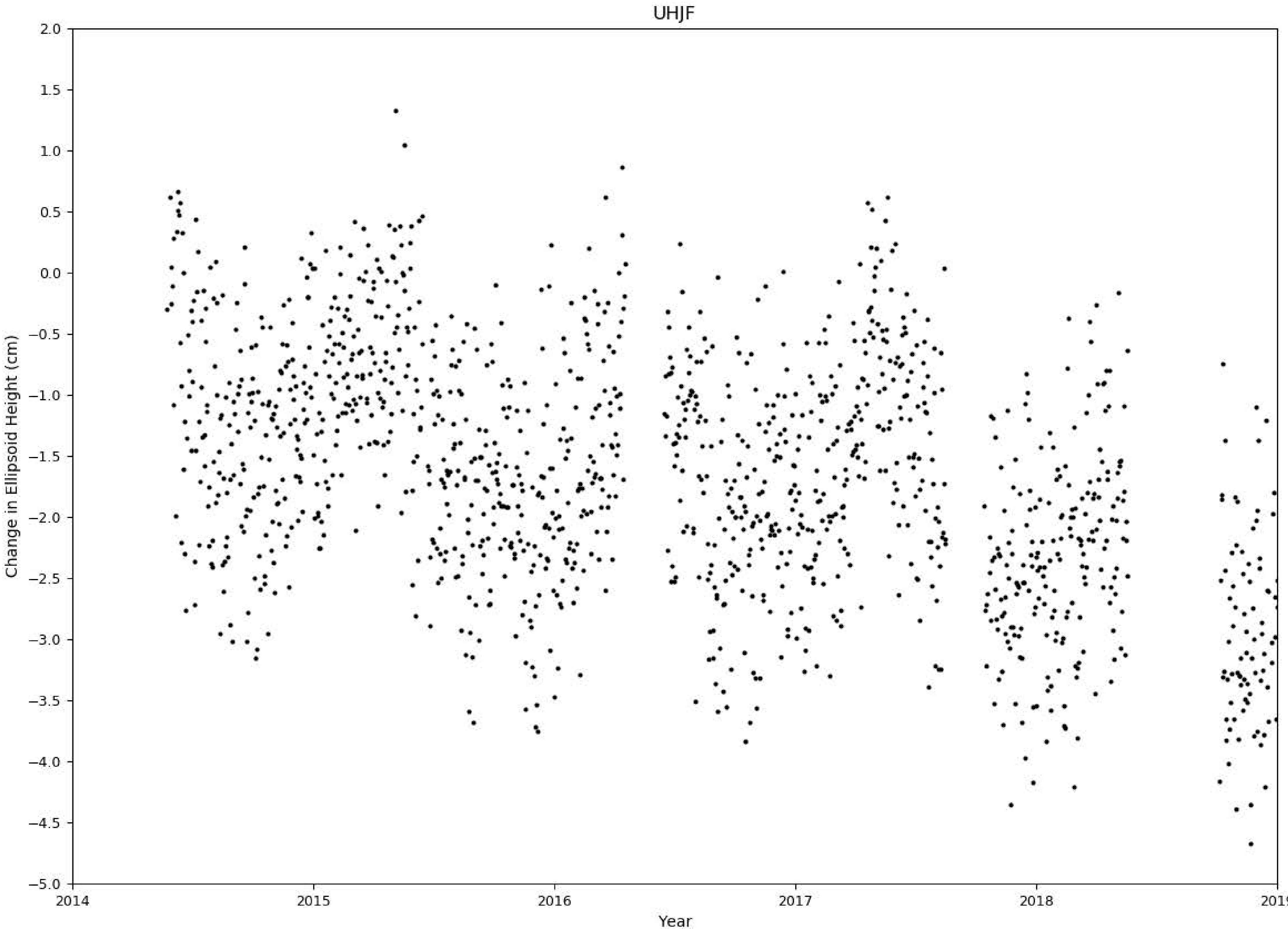
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHJF
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
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−2.5
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−3.5
−4.0
−4.5
−5.0
2014
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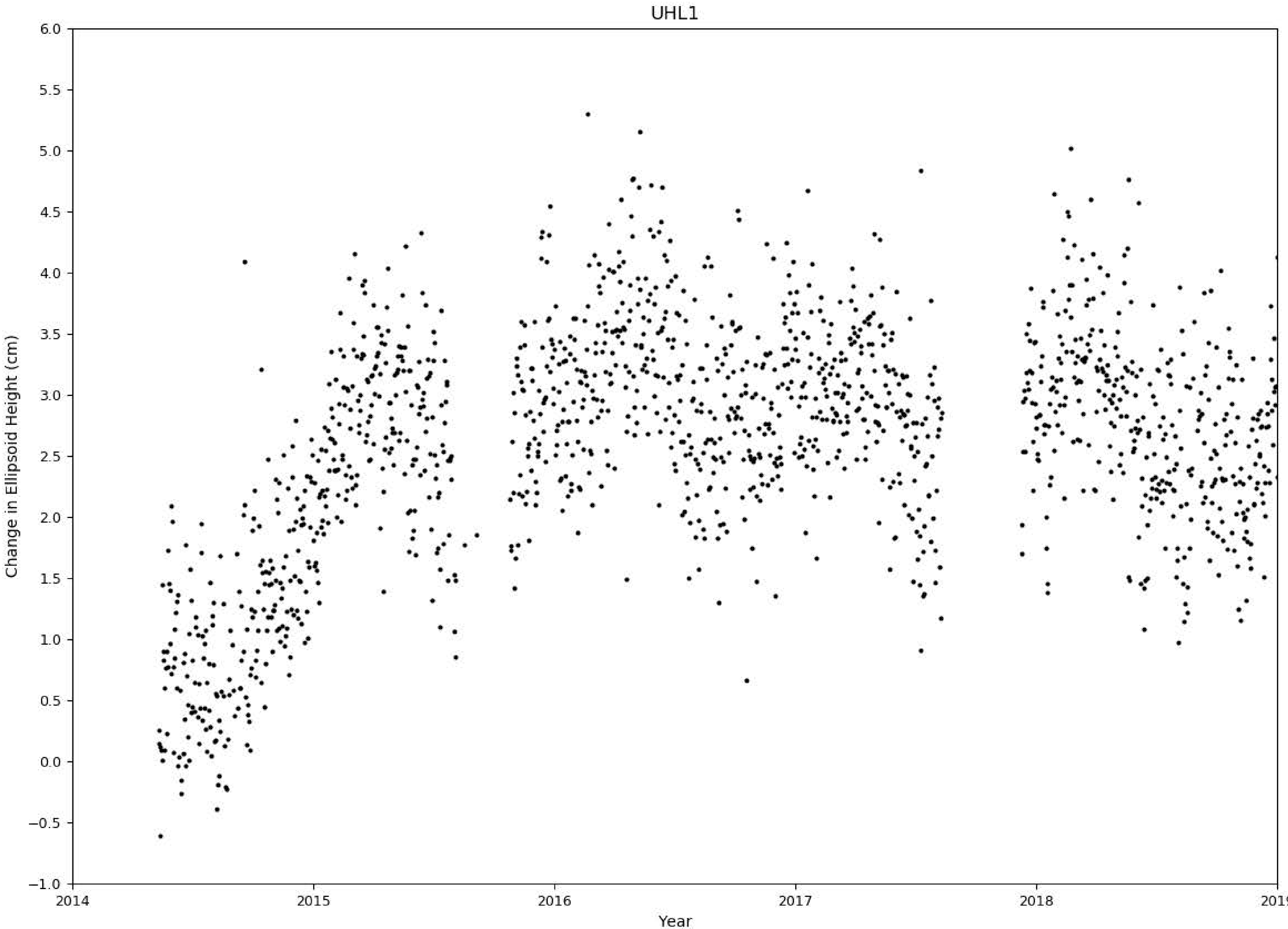
2018
2019
Year


UHL1
Change in Ellipsoid Height (cm)
Year
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
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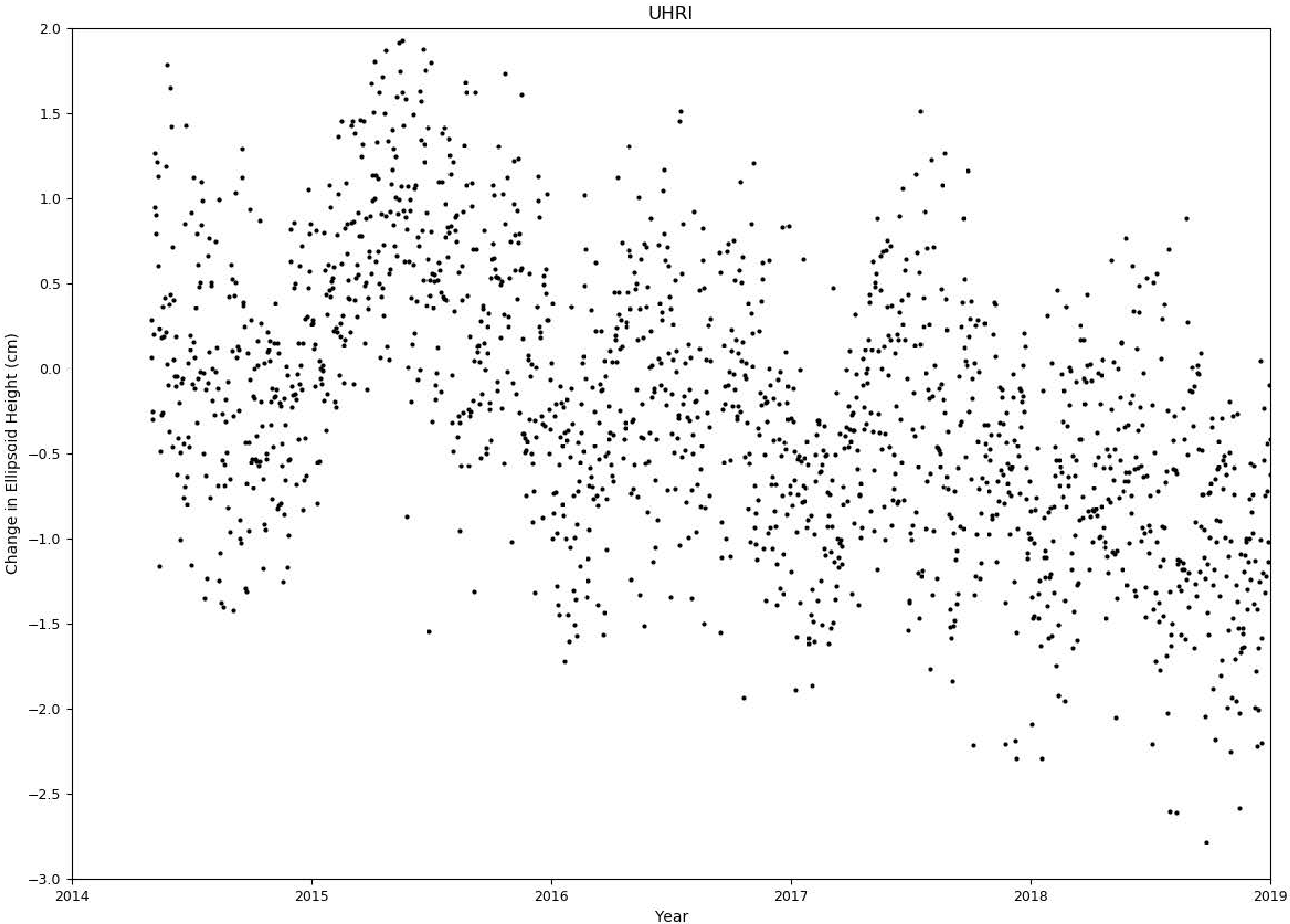
2014
2015
2016
2017
2018
2019


UHRI
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
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−1.0
−1.5
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−2.5
−3.0
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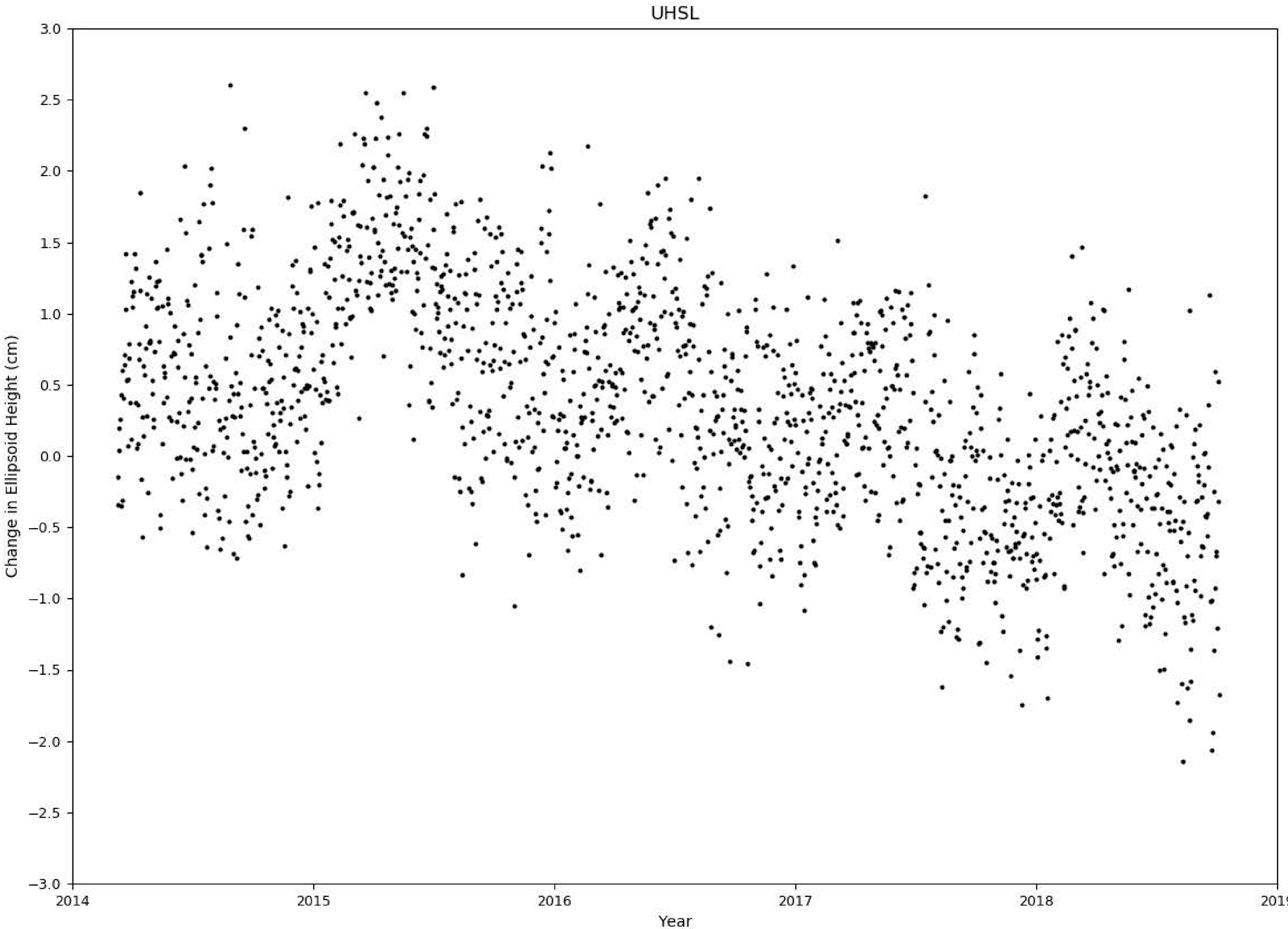
UHSL
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
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−1.5
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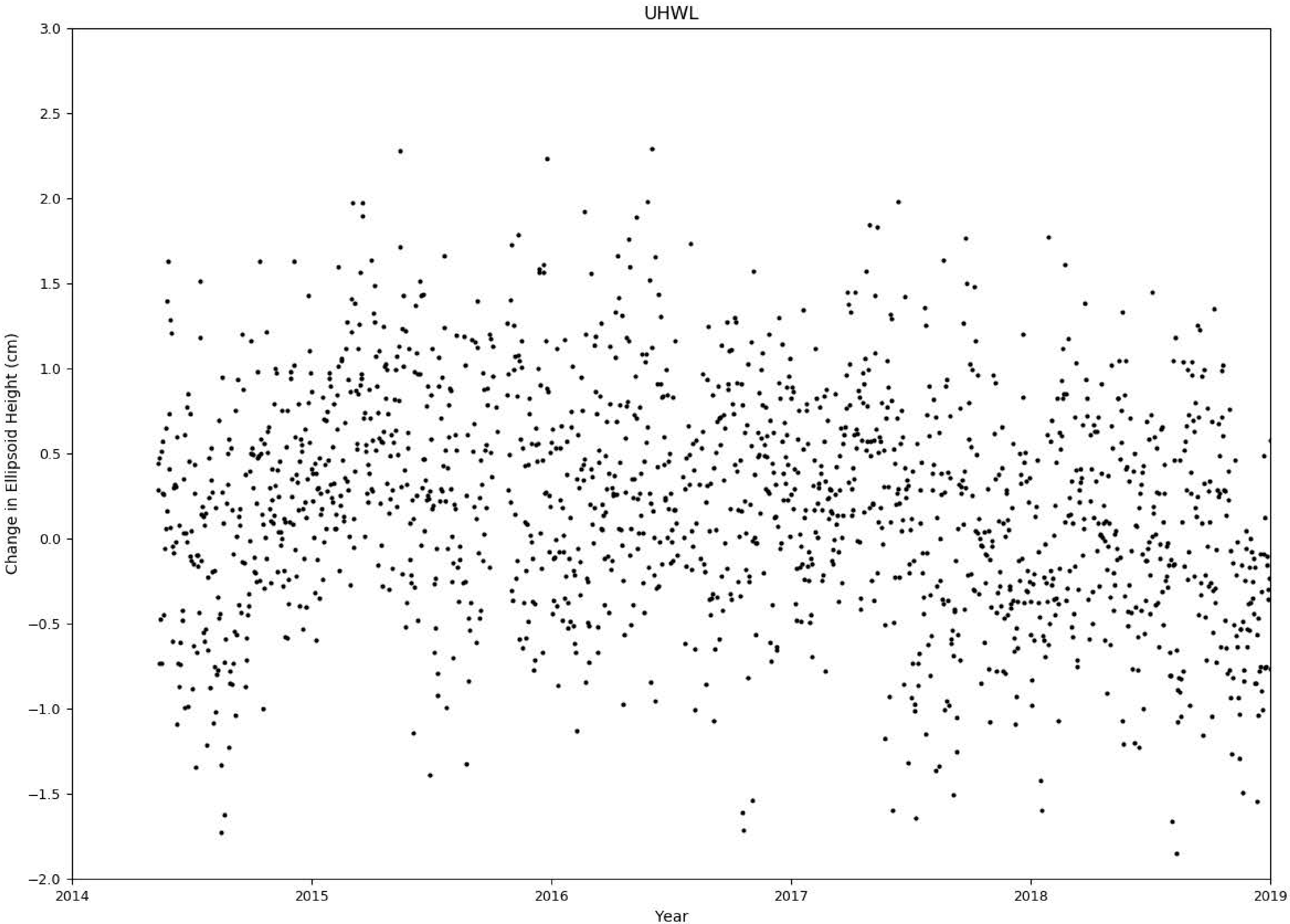
−2.5
−3.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UHWL
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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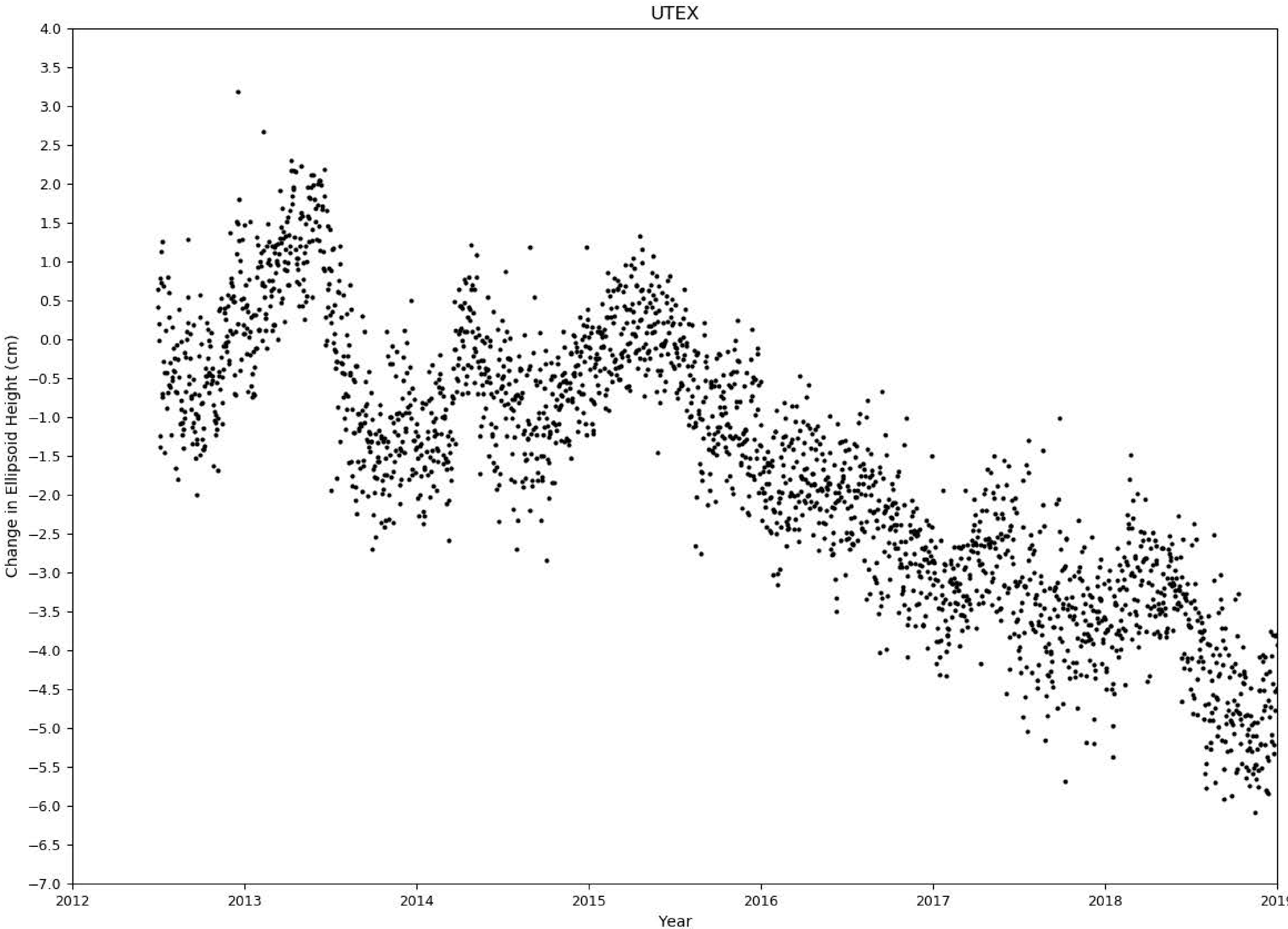
−1.5
−2.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


UTEX
Change in Ellipsoid Height (cm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
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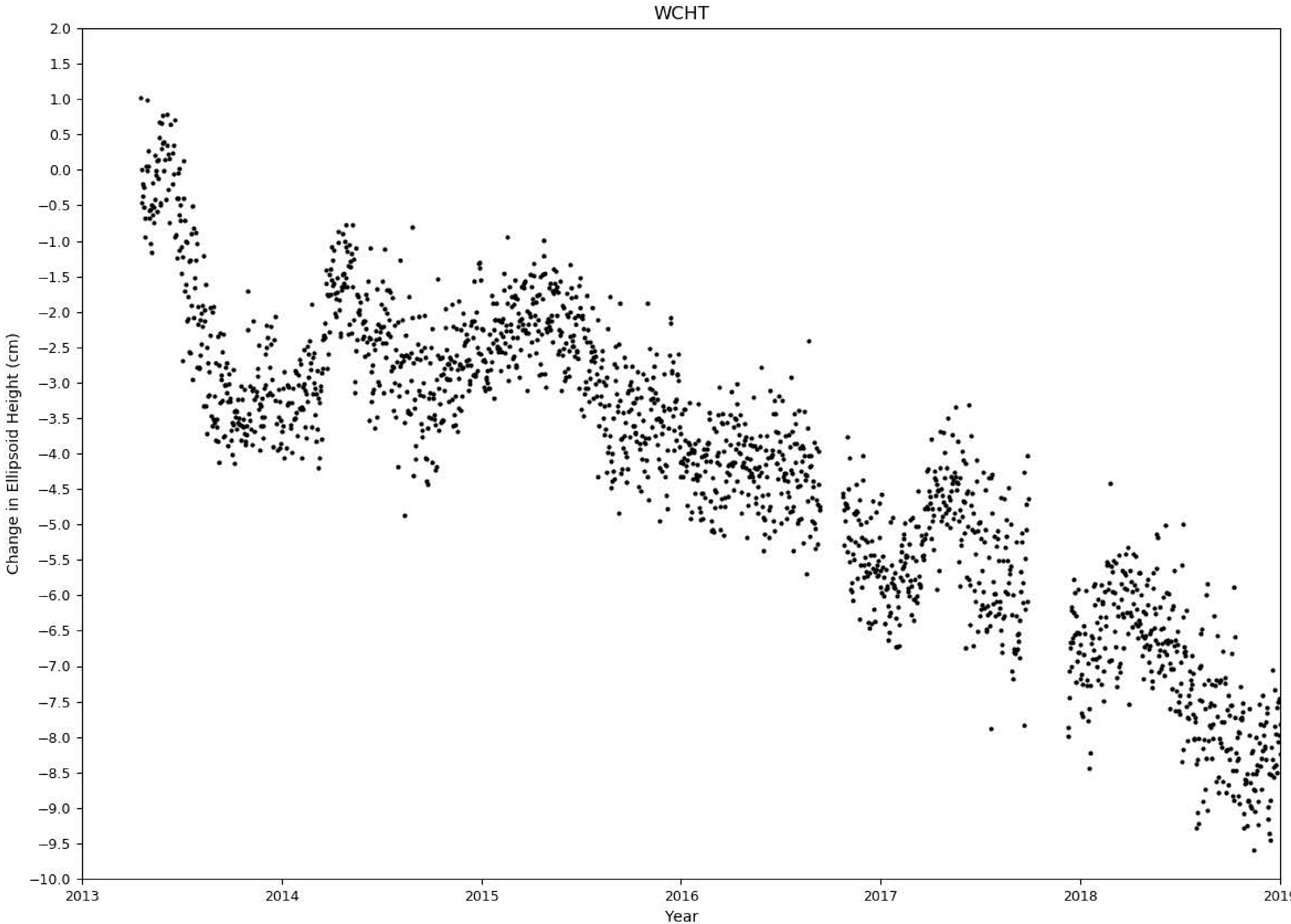
Year


WCHT
Change in Ellipsoid Height (cm)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
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−6.0
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−8.5
−9.0
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−10.0
2013
2014
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2016
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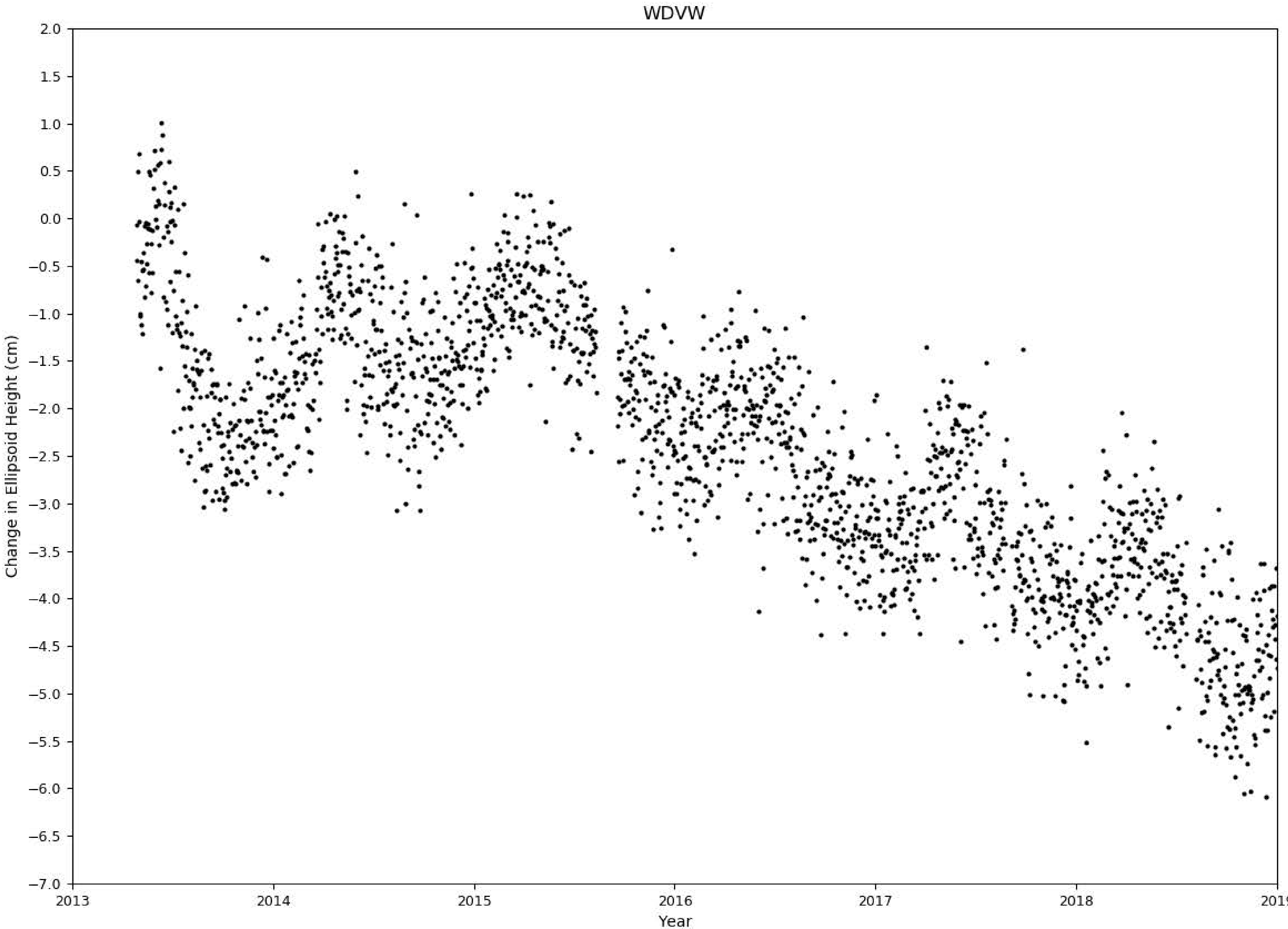
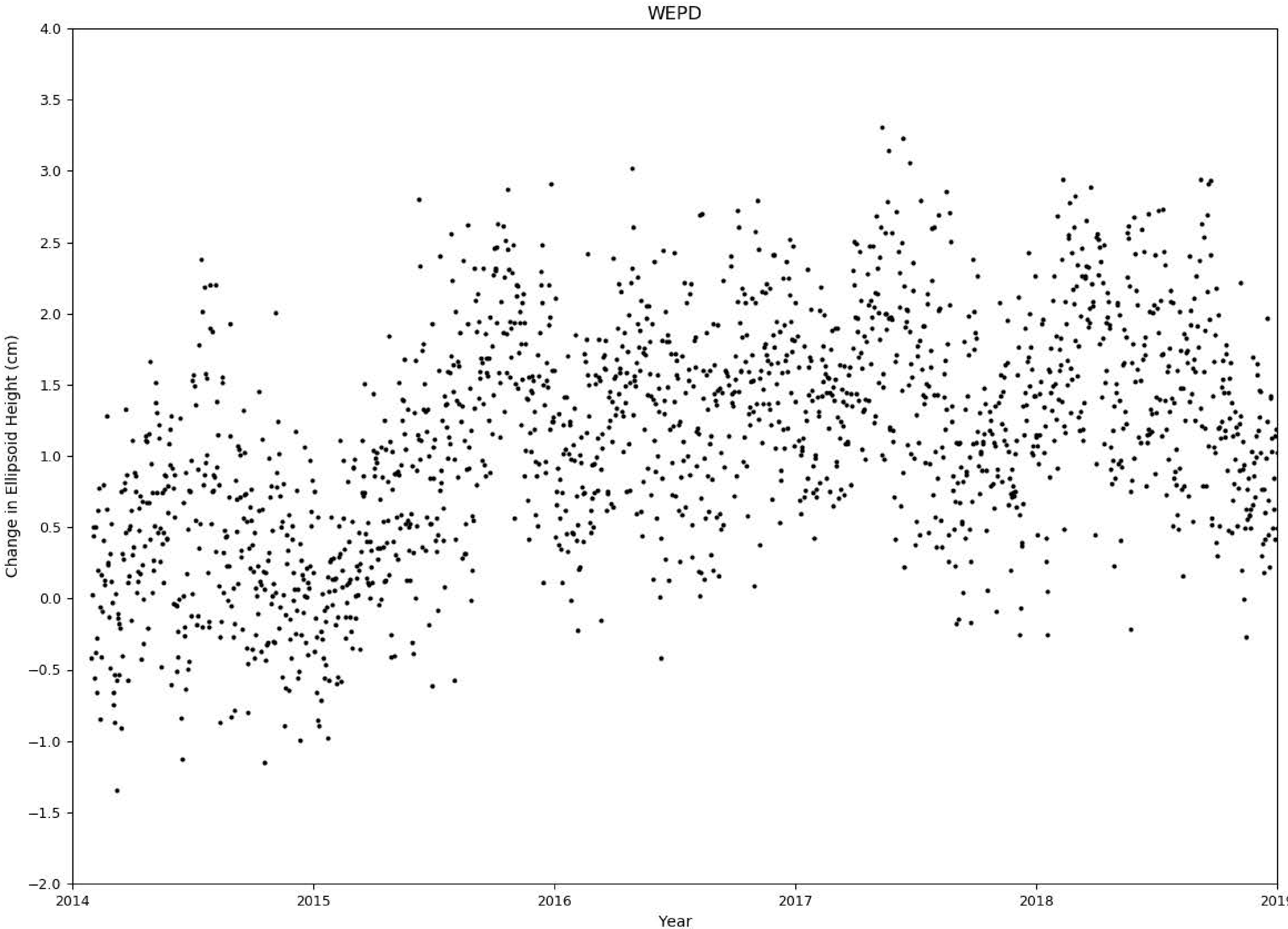
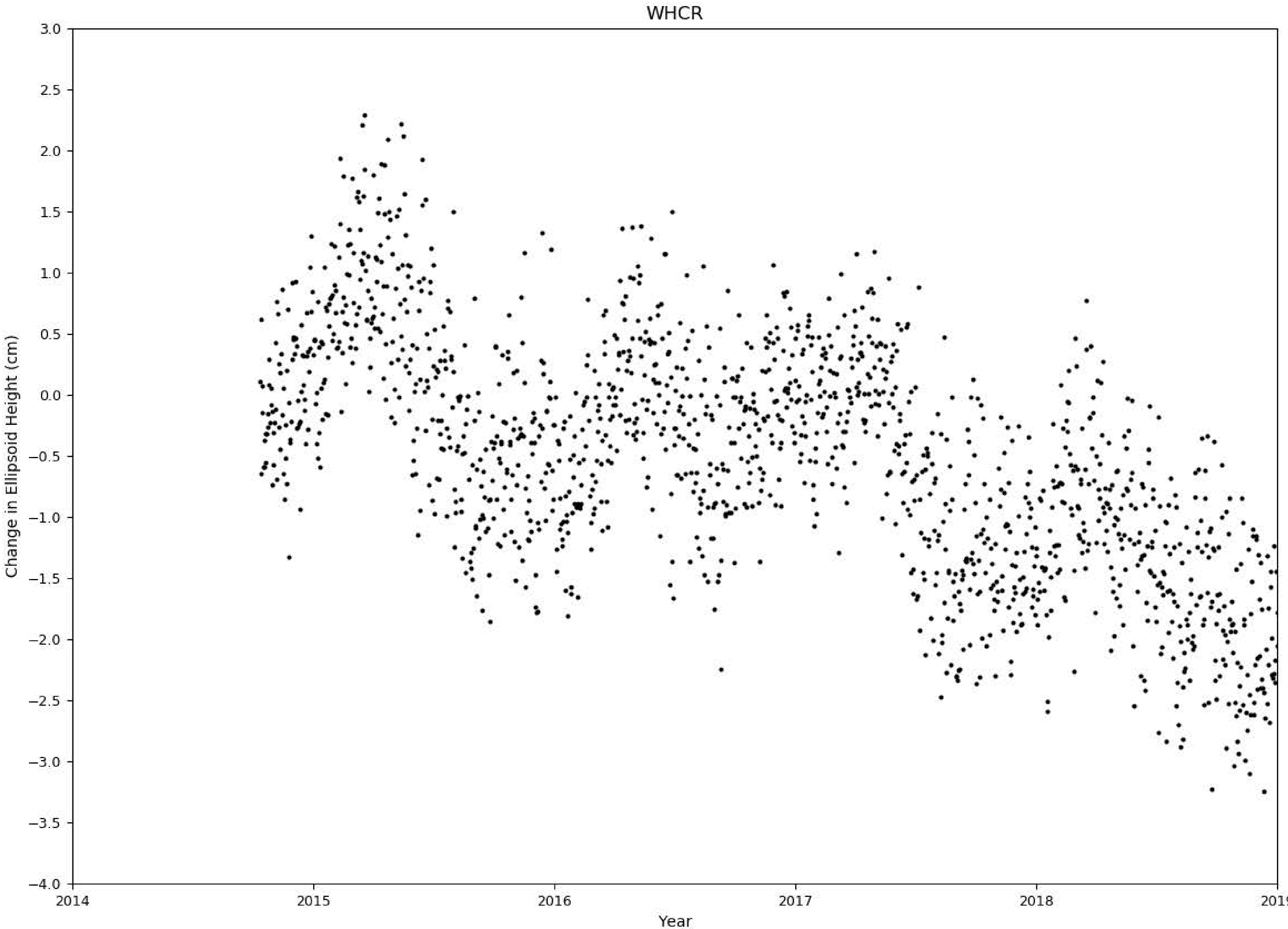
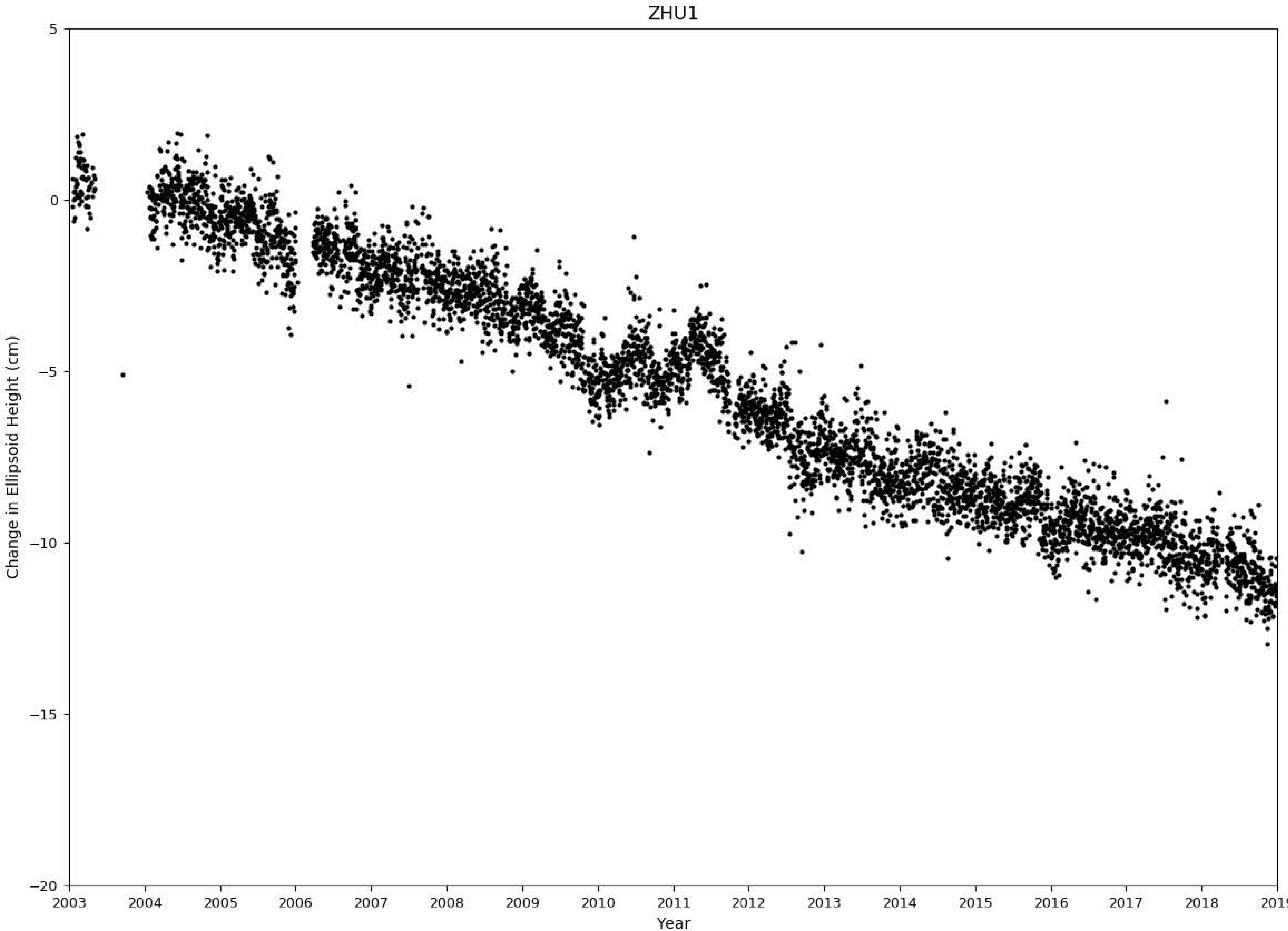
2019
Year


WDVW
Change in Ellipsoid Height (cm)
Year
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
2013
2014
2015
2016
2017
2018
2019


WEPD
Change in Ellipsoid Height (cm)
Year
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2014
2015
2016
2017
2018
2019


WHCR
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
Change in Ellipsoid Height (cm)
2014
2015
2016
2017
2018
2019
Year


ZHU1
5
0
−5
−10
−15
−20
Change in Ellipsoid Height (cm)
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year