



Swift Reboost: Planning & Progress

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Swift's Altitude Problems

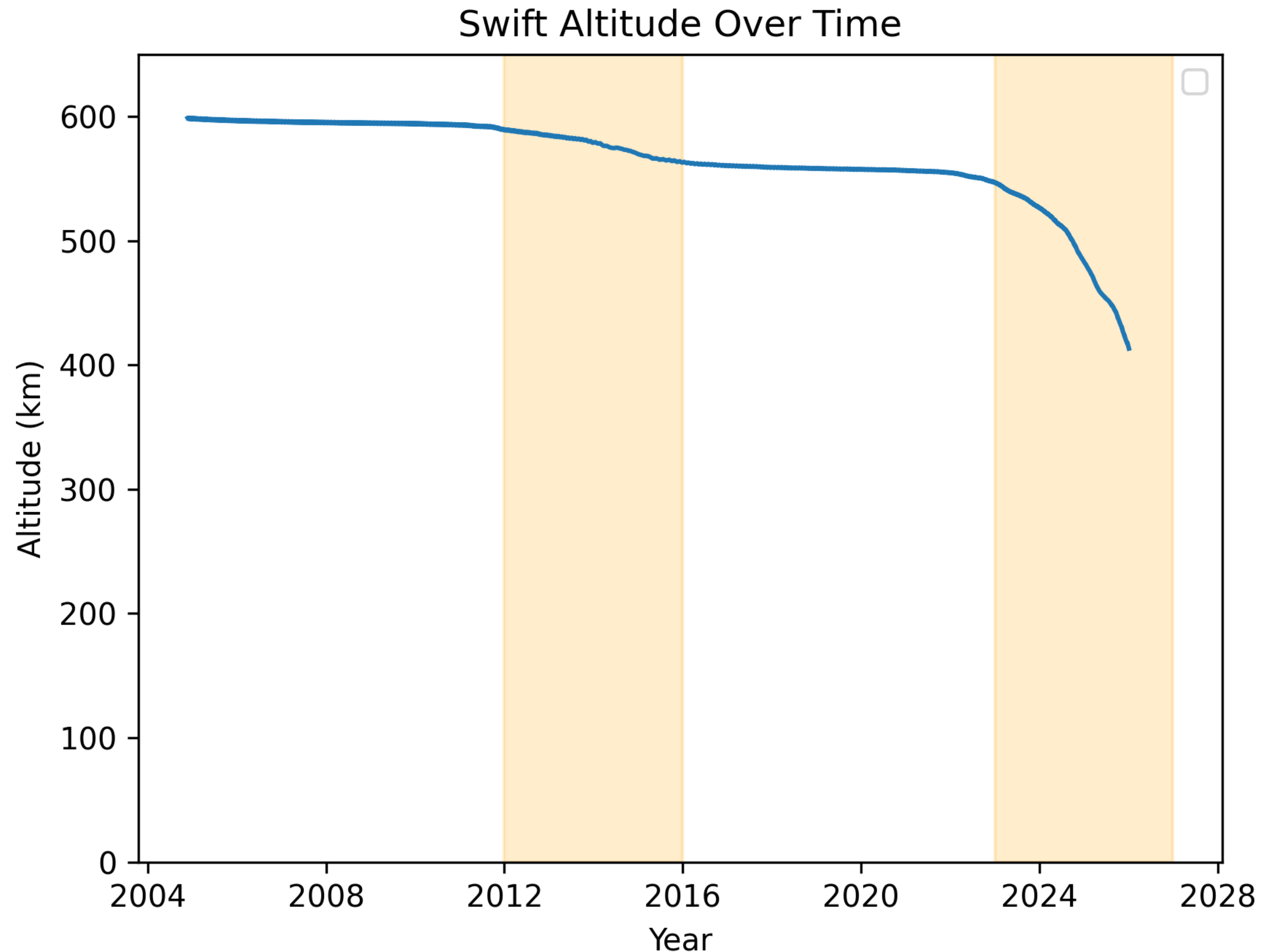
- Swift launched into a altitude of ~600km in 2004.
- High solar activity causes the atmosphere of the Earth to expand. This creates drag on Swift which leads to loss of altitude over time.
- Swift has gone through 2 solar cycles (one on-going).
- Current solar activity has been very high! There have been many occurrences of aurora borealis events at low latitudes in the last 2 years.
- Without mitigation, Swift will likely decay to re-entry sometime in the next 6 months.



Photo taken from my back yard in State College, PA October 2024.

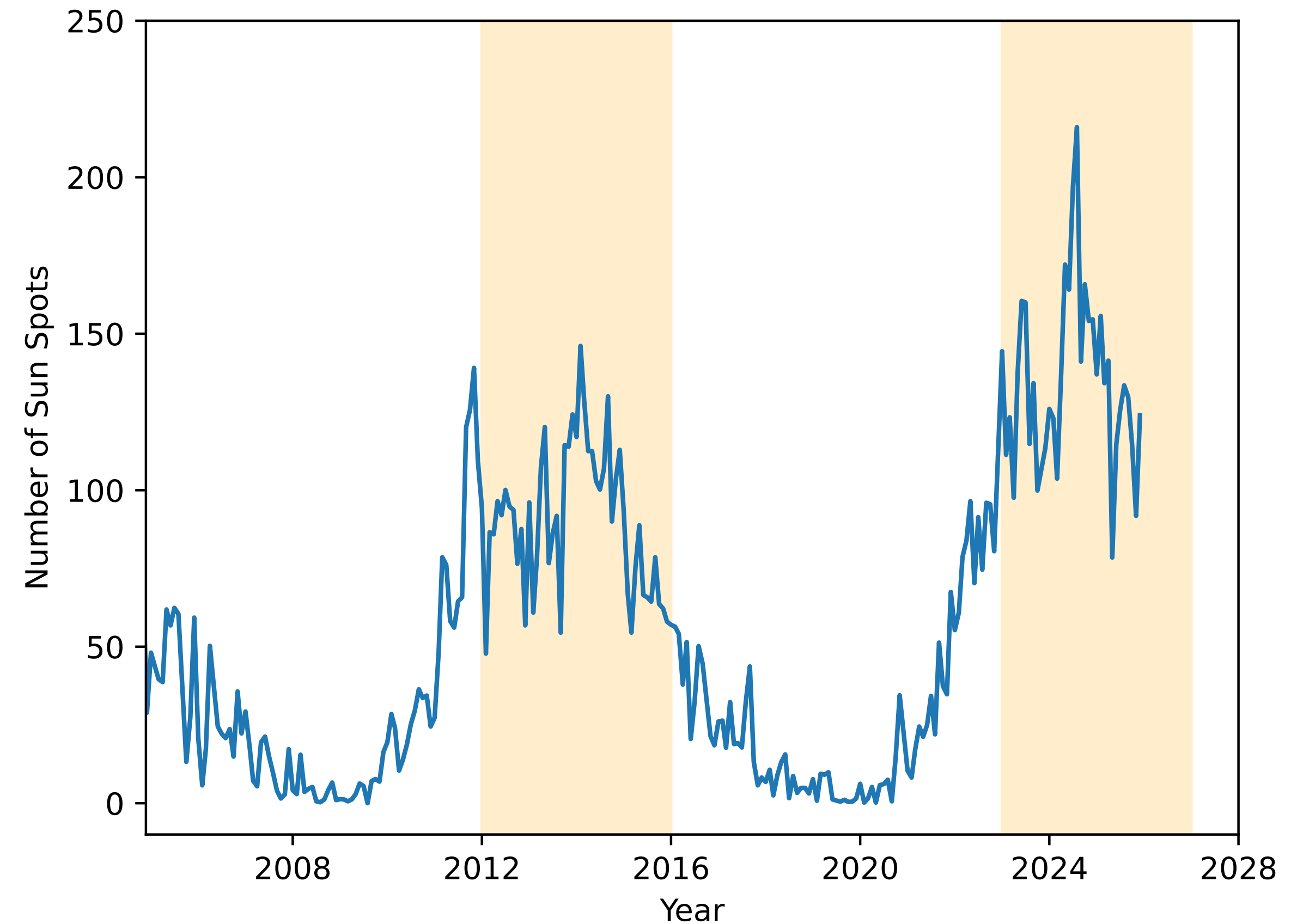
Swift's Altitude over time

- On the right I show Swift's altitude over time.
- Marked in yellow are the periods of high solar activity.
- Around the first Solar Maximum, Swift's altitude dropped approximately 32km.
- The second Solar Maximum period, has been much more dramatic, with Swift dropping around 140km (so far).



Why has Swift's orbit started dropping so fast?

- The most obvious explanation is that this current solar cycle has been stronger and longer lasting than the previous event.
- Despite the fact that Solar Max was officially **October 2024***, the sunspot activity is still close to the 2013 Solar Max.
- As Swift drops, the atmospheric drag goes up as the atmosphere gets denser, so it amplifies the effect of drag.
- **Can Swift be saved?**



* <https://science.nasa.gov/science-research/heliophysics/nasa-noaa-sun-reaches-maximum-phase-in-11-year-solar-cycle/>

Extending Swift's Life

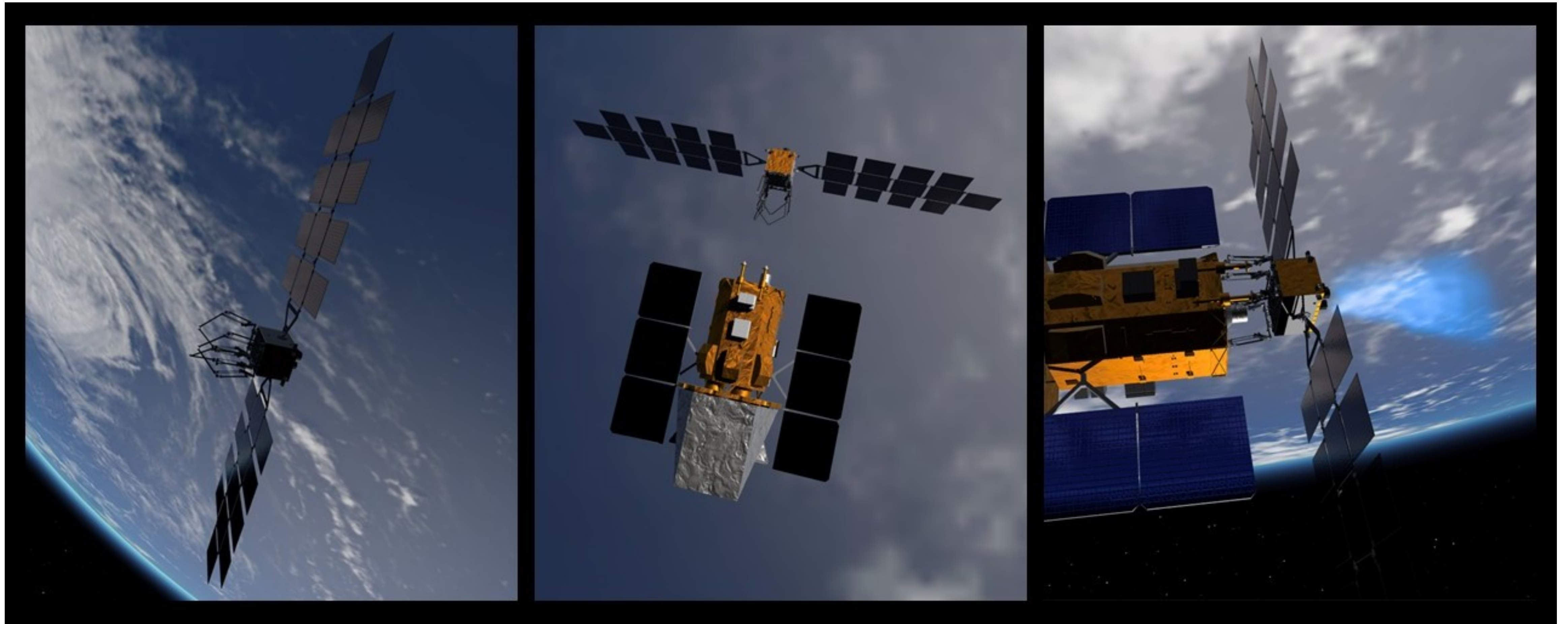
- NASA is leading an effort to reboost Swift to a higher orbit (requirement of 550km, goal 600km).
- NASA has selected Katalyst Space to perform the boost.
- The timeframe for boost mission launch is June 2026. This is an extraordinarily fast turn around time. Katalyst are meeting this goal by refactoring an existing platform to provide the boost.
- One of the primary issue is securing a launch this fast. Swift's 21 degree inclined orbit does not make this a good match for ride shares which typically launch into Sun-Sync orbits. Swift Rescue Mission will launch on a dedicated Pegasus XL rocket.

NASA Awards Company to Attempt Swift Spacecraft Orbit Boost



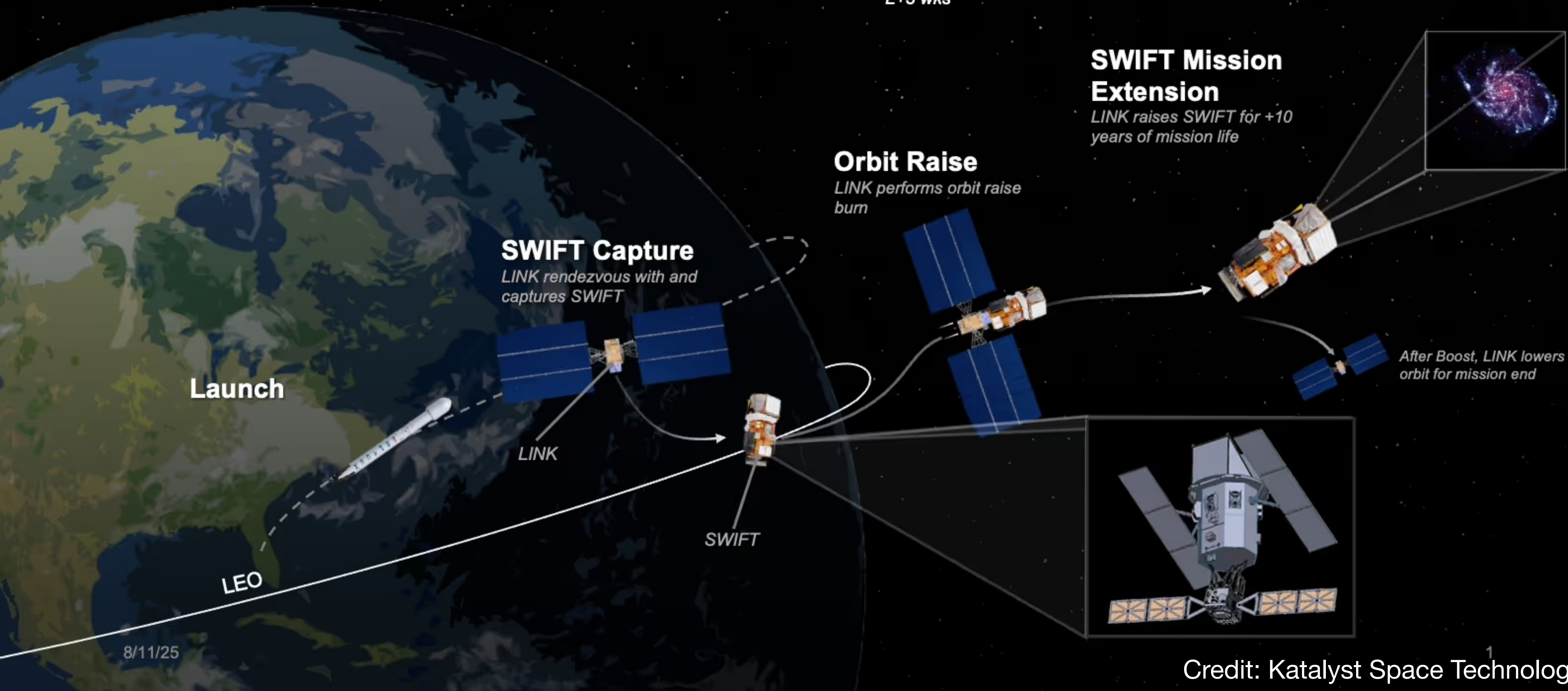
NASA's Neil Gehrels Swift Observatory, shown in this artist's concept, orbits Earth as it studies the ever-changing universe.

Katalyst Space Boost Mission



Credit: Katalyst Space <https://www.katalystspace.com/post/nasa-telescope-is-about-to-fall-out-of-the-sky>

LEO LINK Servicing Mission for SWIFT (June 2026)

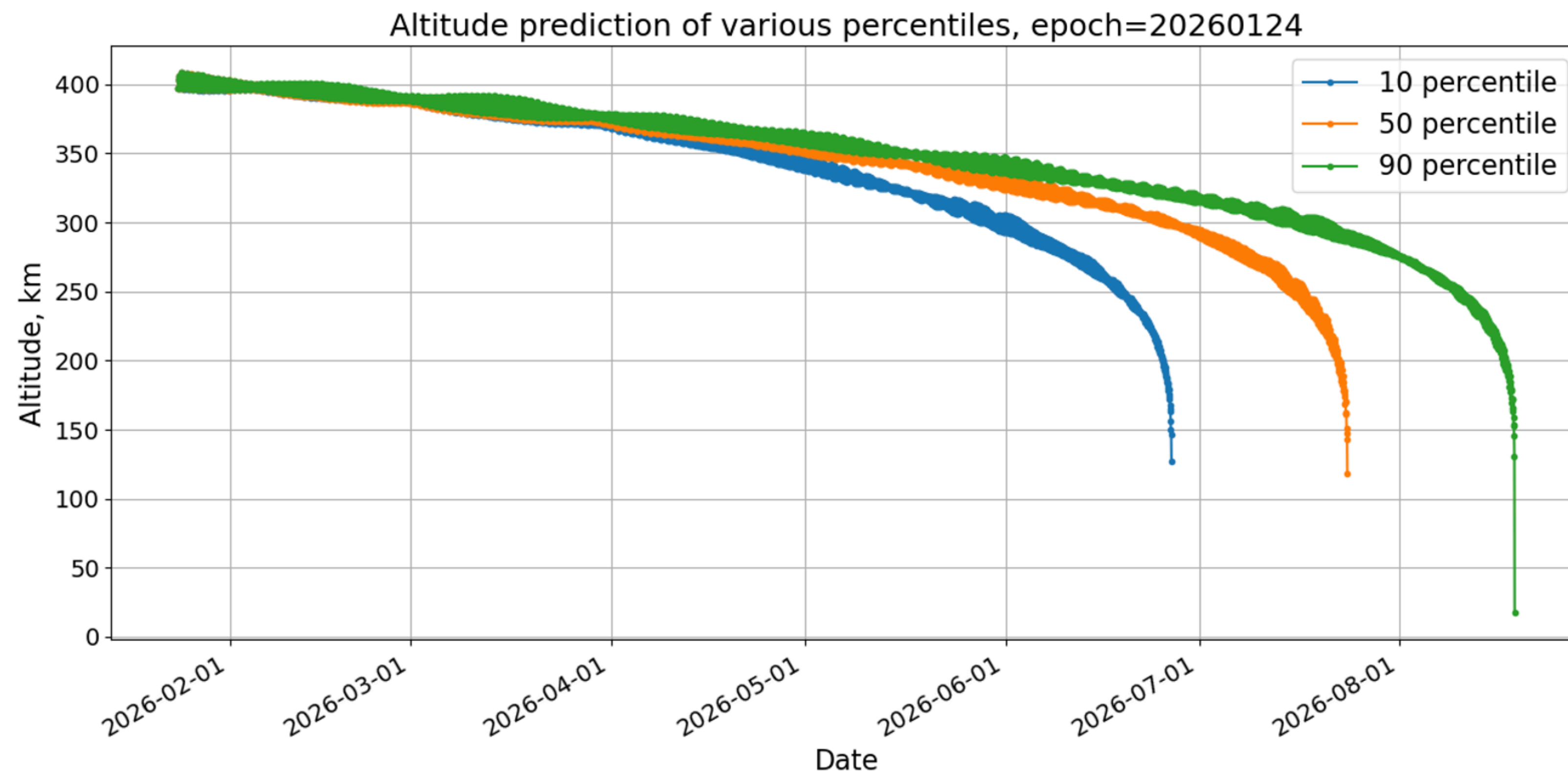


Notes on the Swift Boost Mission

- The boost mission will be an extremely complex process requiring collaborations of Swift Operations Teams, NASA and Katalyst Space.
- We have been meeting regularly to finalize the design of the mission, this is going well.
- The boost itself will likely take several months to complete. This means that Swift will be taking no science during this period.
- Post boost, we will perform a detailed series of calibrations and check-outs, to ensure that Swift was not compromised in any way.
- Please note that I am not able to speak on behalf of Katalyst Space, so am limited on the technical details I can give on that side.

Early January Orbital Decay Predictions Updates

24 Jan 2026 Altitude Profiles Corrected



300-km alt crossing:
10% = 2026/05/29
50% = 2026/06/24
90% = 2026/07/13

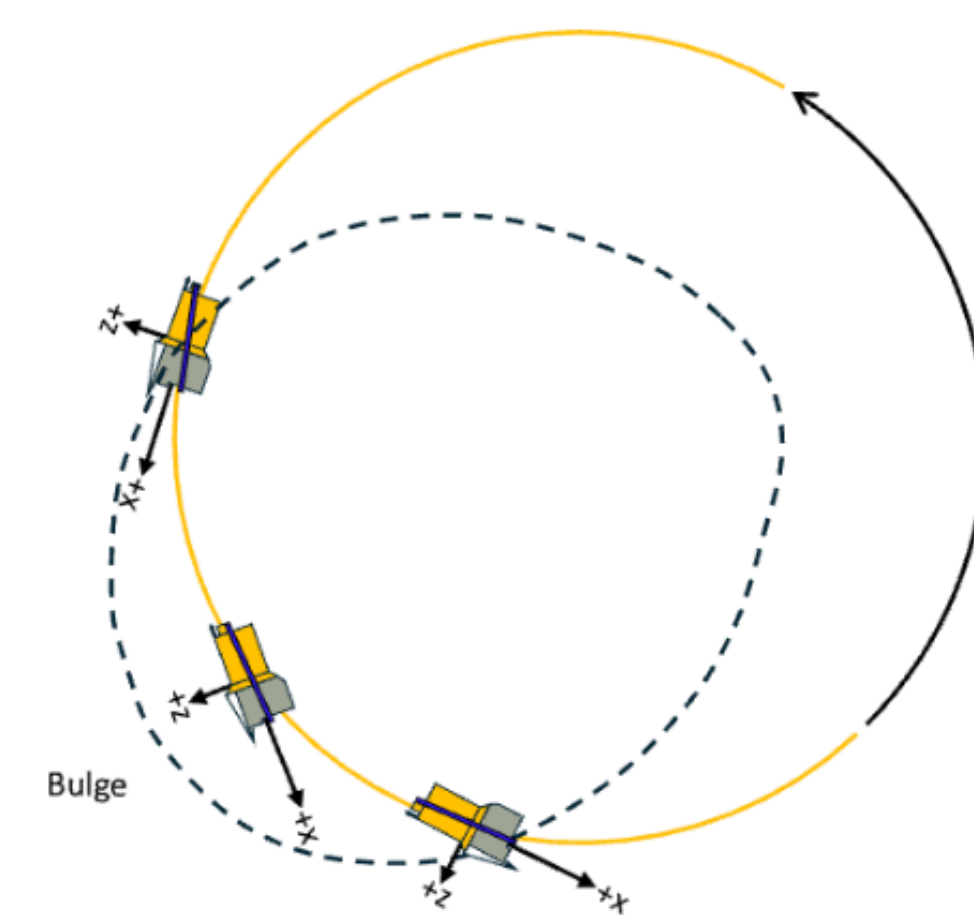
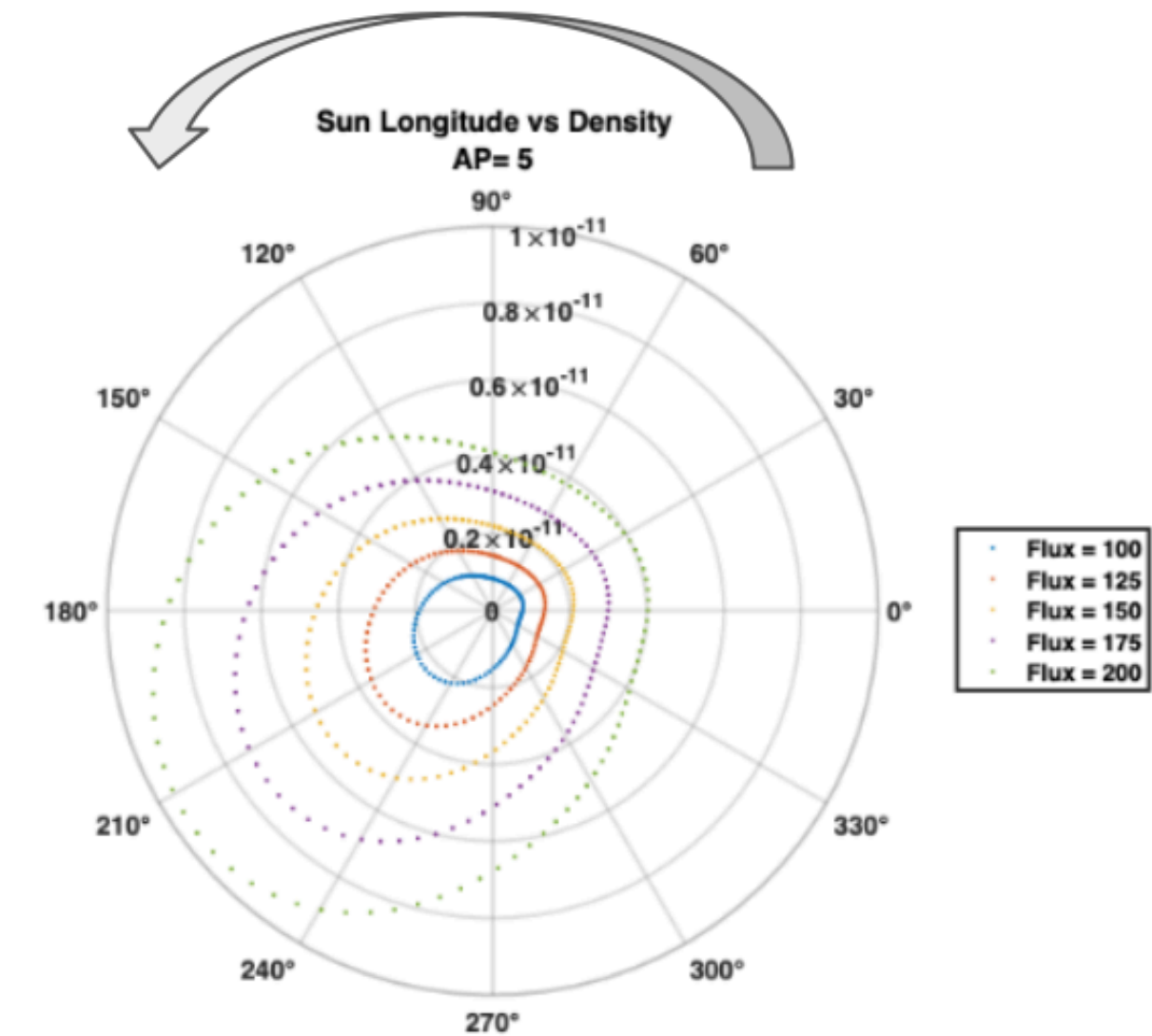
100-km alt crossing:
10% = 2026/06/26
50% = 2026/07/23
90% = 2026/08/18

Ensuring the Success of the Swift Boost

- In late January revised orbit decay predictions suggested that there was a 10% chance that Swift could go below 300km altitude in the May/June timeframe.
- 300km represents the minimum altitude for the rendezvous, so it was imperative that we attempt to preserve Swift's orbit altitude to ensure the boost mission is successful.
- On February 10th, 2026, Swift ceased Science Operations, and transitioned into a mode where we attempt to reduce the drag on the spacecraft by as much as possible.
- We have been operating in this mode ever since.

Efforts to reduce drag

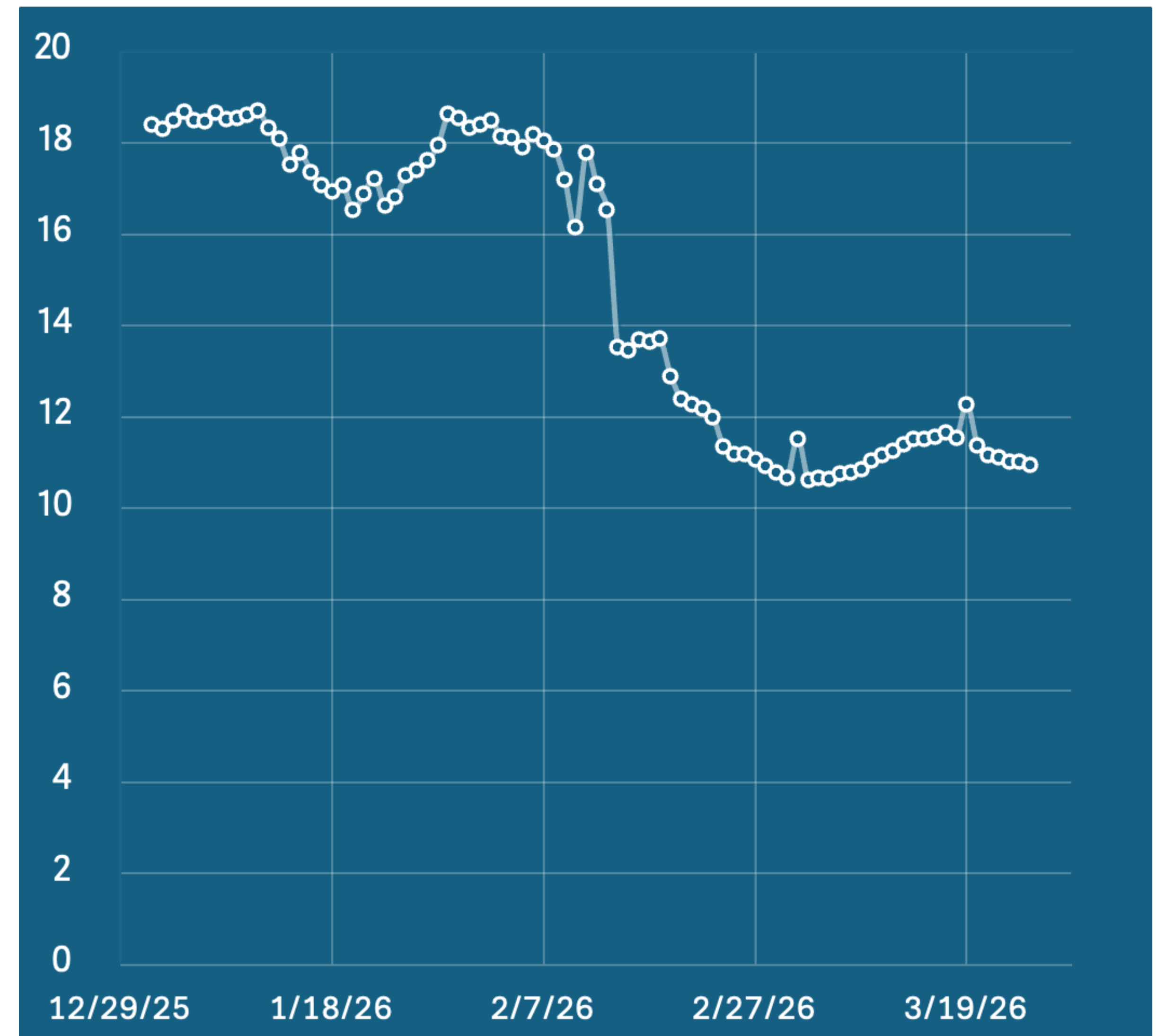
- In order to extend Swift's lifespan, efforts are underway to reduce the drag on Swift itself. How do we do this?
- Drag on Swift can be reduced by minimizing its cross sectional area in "v-bar" (the direction of motion).
- Cross sectional area is dominated by the solar panels (~11.5m²) and the body of the spacecraft itself (6.6 - 8.1 m²).
- The Earth's atmosphere has a "bulge" towards the Sun, which allows us to define a period of time when the drag is highest on Swift.
- However, given the urgency of the need to reduce drag, we decided to point in a reduced drag orientation for the entire orbit.



Drag reduction efforts.

- We've developed a plan to reduce Swift's drag cross-section. We were told to aim for a 30% average reduction to maintain Swift's orbit.
- We model Swift's cross-sectional area and determine the optimal RA/Dec/Roll combination for each minute of the day to minimize drag.
- We've also relaxed Swift's requirement to keep its solar panels within 10 degrees of the Sun, allowing greater freedom in orientation.
- In Daylight a 40-degree maximum off-sun angle and 75 degrees in night ensures Swift maintains adequate power, while allowing maximum flexibility to point.
- **It is clear that we are meeting our 30% reduction goal!**

Evolution of Average Drag Cross Section (m²)



SWIFT ORBIT

Alt 387.7 km
Lat 7.06°
Lon 9.14°
Beta -0.37°
Light ECLIPSE

ATTITUDE (PPST)

RA 128.0000°
Dec 15.2895°
Roll 340.00°
Panel4Sun45.81°

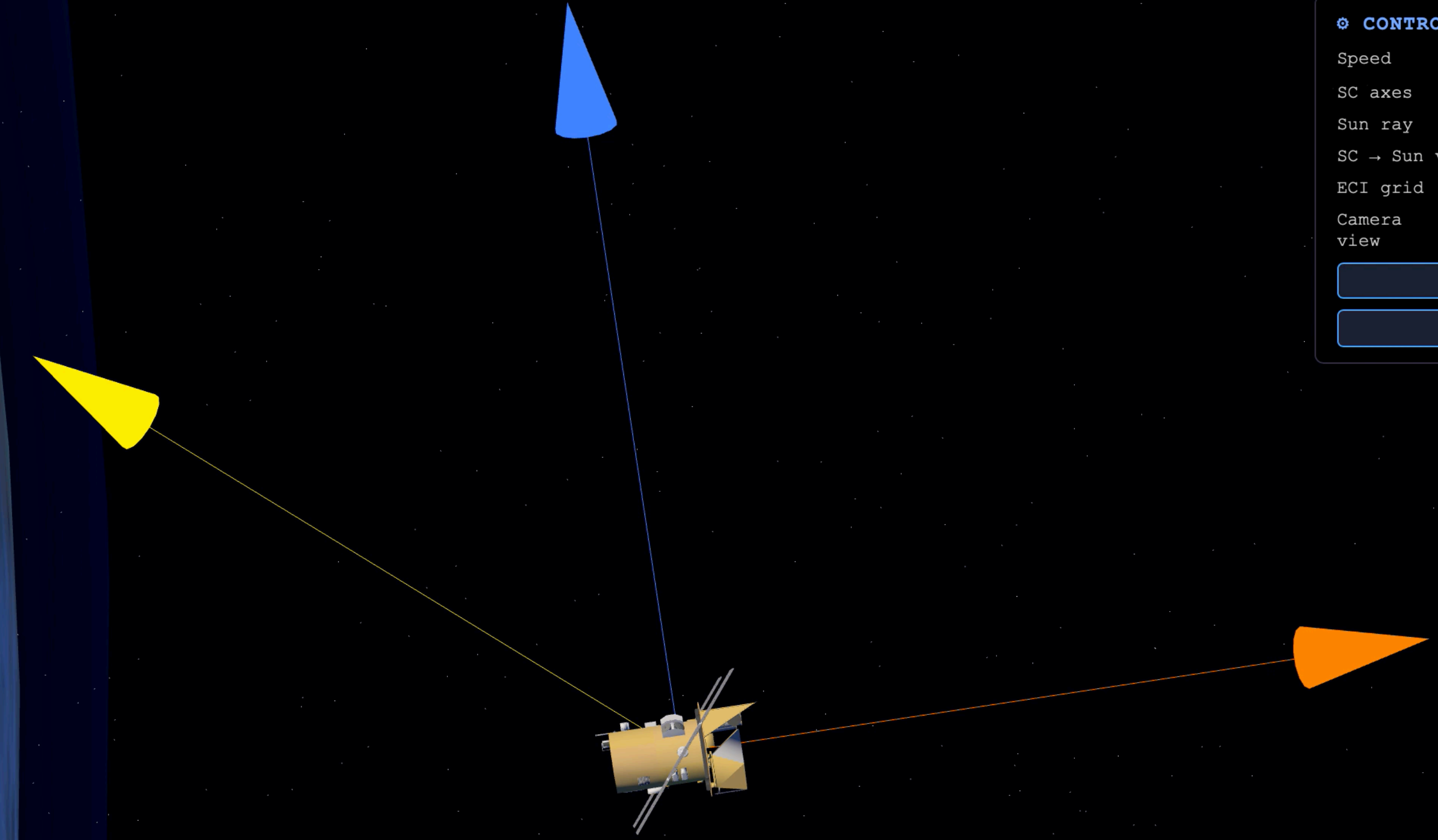
TARGET

Mode PPT
DragPointing 15907

CONTROLS

Speed ×60
SC axes
Sun ray
SC → Sun vec
ECI grid

Camera view



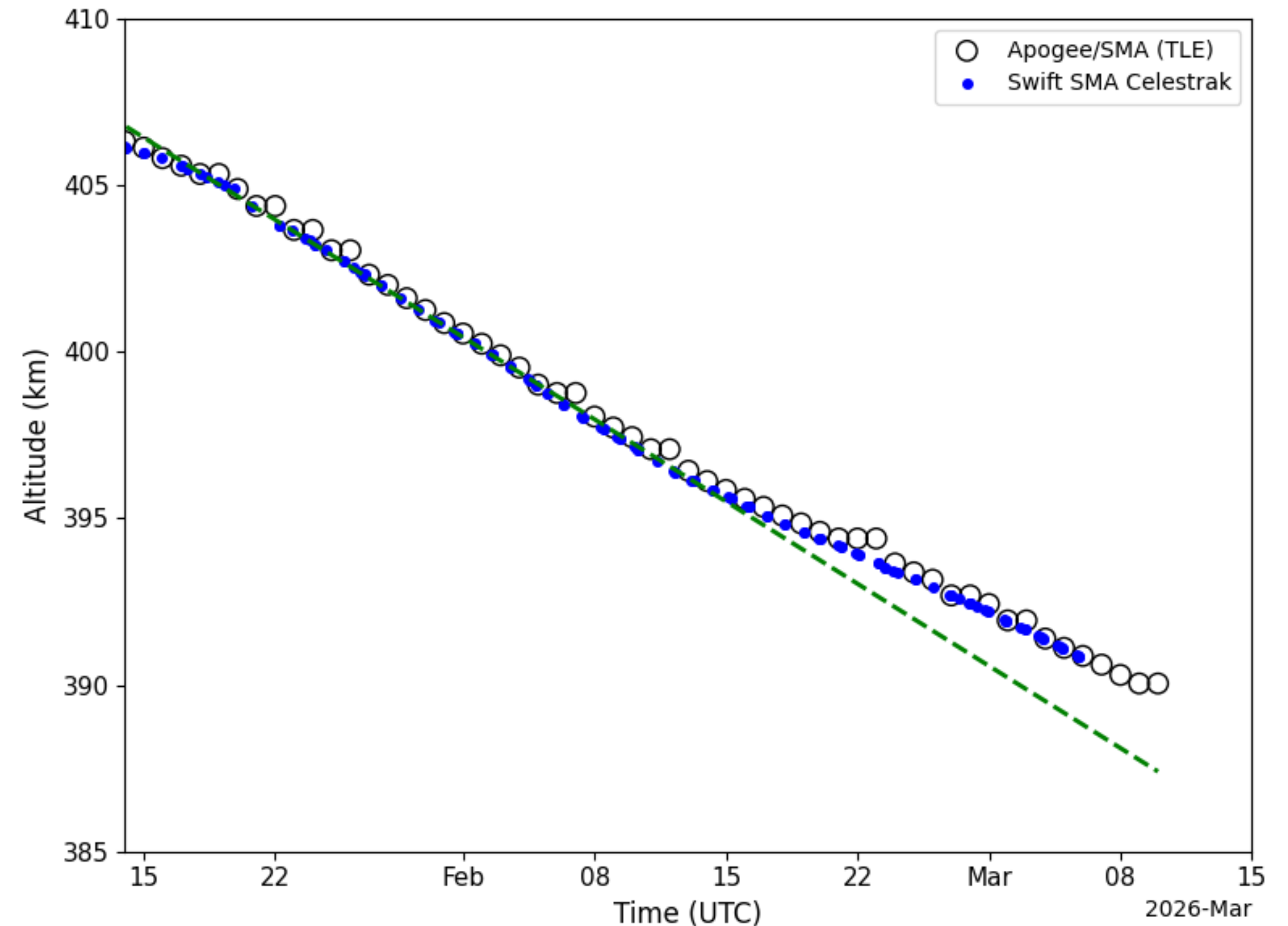
- Velocity (RAM)
- +X SC boresight (XRT)
- +Y SC panel drive axis
- Panel normal → *
- +Z SC up
- Sun direction
- SC → Sun vector

Swift Orbit Visualizer: <http://www.swift.psu.edu/viz>



Is this actually working?

- Although we have shown we are able to reduce the drag cross section of Swift, is this actually working.
- Analysis of TLE data shows a clear drop in the rate of descent of Swift.
- The time at which the trend changes is clearly around mid-February, when drag reduction started in earnest.



Credit: Phil Evans / University of Leicester

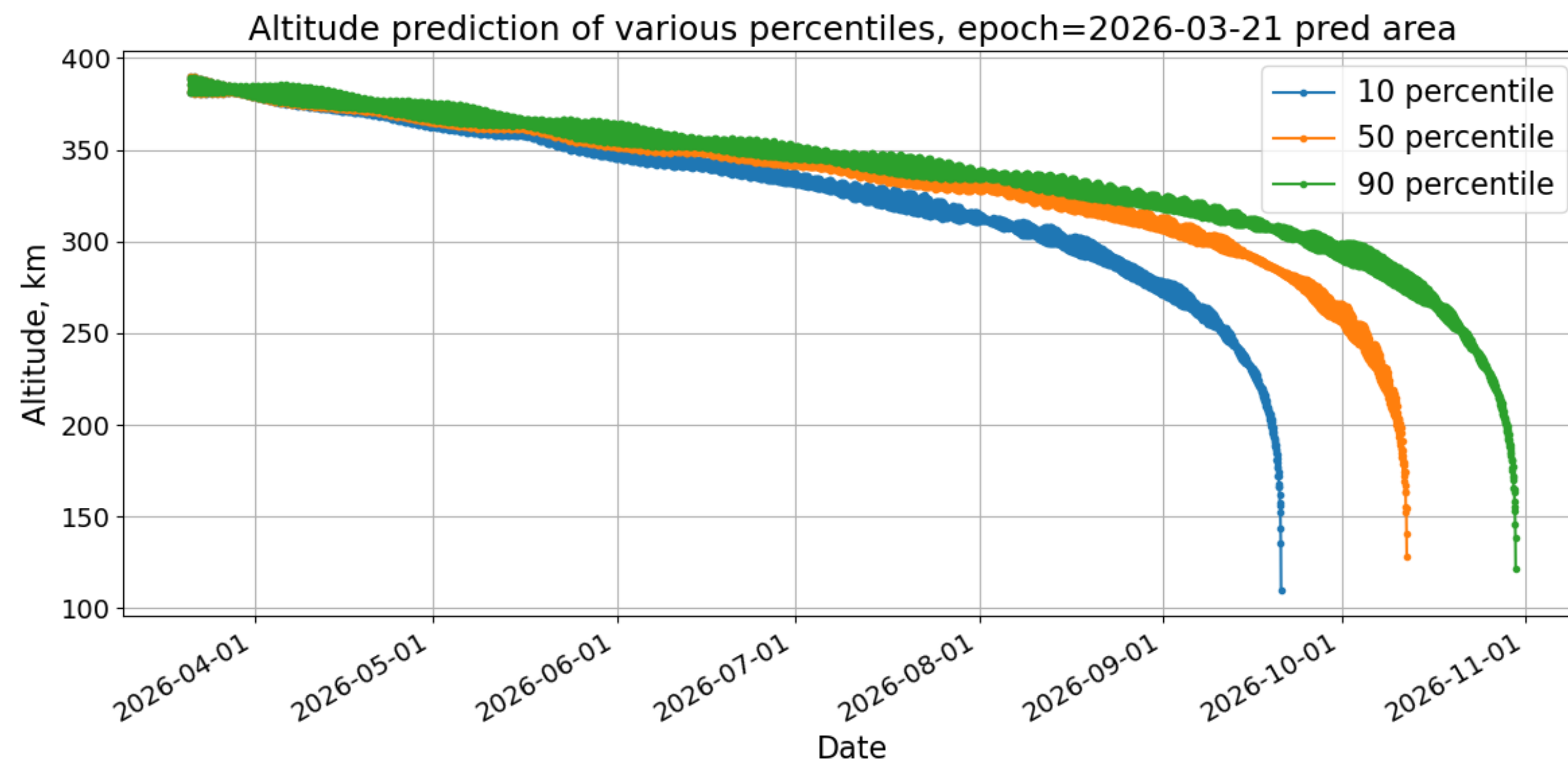
B.L.U.F. for 2026/03/21 epoch

- Trending using existing methodology continues to show dates moving later by a few days each weekly update.
- 300-km altitude crossings:

	10%	50%	90%	Notes
Nominal Area	2026/06/25	2026/07/20	2026/08/04	Likely overconservative, no explicit drag reduction modeled
30% Reduced Area	2026/08/26	2026/09/23	2026/10/10	Likely overpredicts the drag reduction (no beta effect)
40% Reduced Area	2026/09/27	2026/10/24	2026/11/12	Likely overpredicts the drag reduction (no beta effect)
Beta-dependent Area	2026/08/11	2026/09/06	2026/09/24	Likely the highest fidelity drag reduction (includes beta)

Latest Predictions - 300km crossing pushed out!

21 Mar 2026 Altitude Profiles (predicted beta-dependent area)



350-km alt crossing:
10% = 2026/05/24
50% = 2026/06/04
90% = 2026/06/18

300-km alt crossing:
10% = 2026/08/11
50% = 2026/09/06
90% = 2026/09/24

100-km alt crossing:
10% = 2026/09/20
50% = 2026/10/11
90% = 2026/10/30

Round Up

- NASA is planning to launch a mission to boost Swift, launch date is June 1st, 2026. This program is lead by Katalyst Space.
- In order to maintain Swift's orbital altitude, we transitioned to non-science mode in February, attempting to reduce spacecraft drag, and maintain orbit.
- This appears to be working! Predictions suggest that we have extended Swift's time above 300km by 1.5 - 2.5 months at least.
- This effort maximizes the chance of success of the LINK mission.
- Swift and Katalyst teams are working hard to prepare for the boost mission!