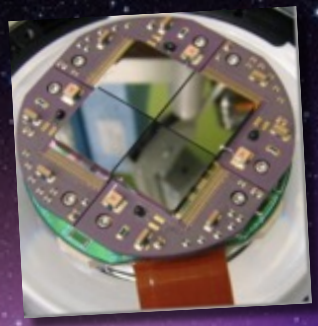
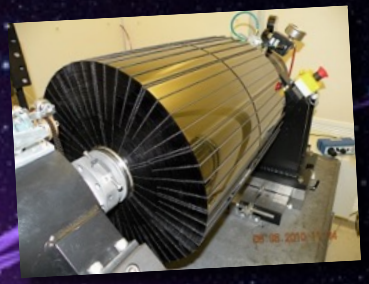
18th IACHEC meeting

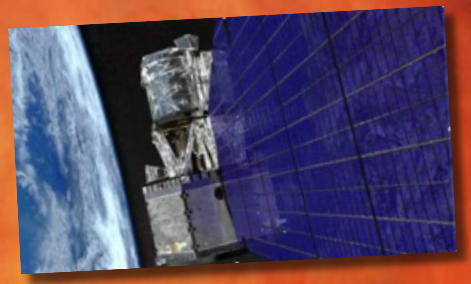
Pelham, Germany

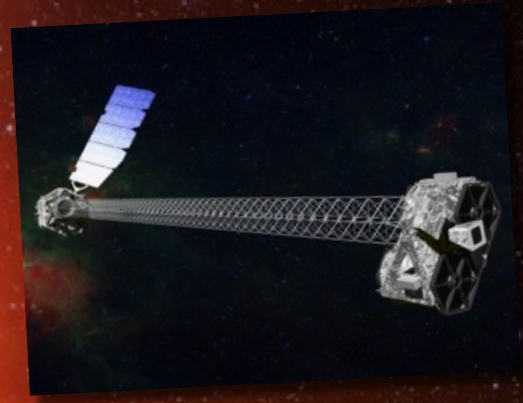
April 20 – 23, 2026

NuSTAR Operations Status





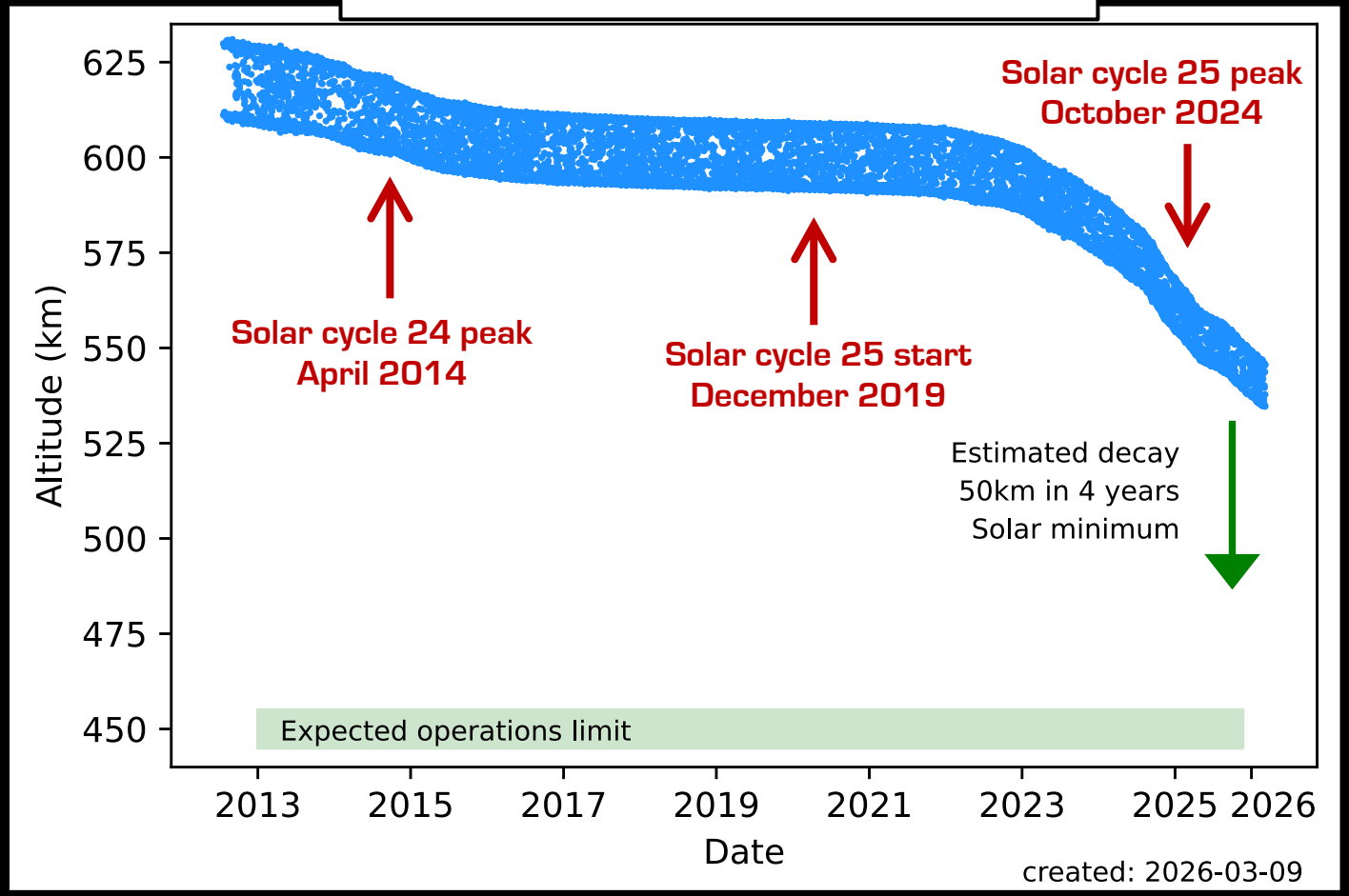




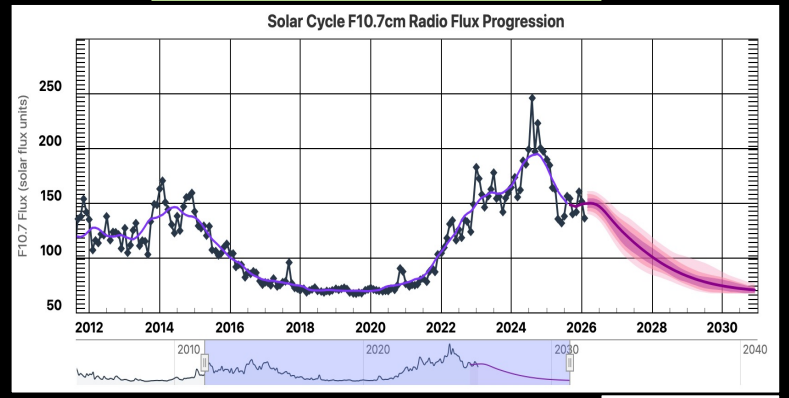
Hannah Earnshaw, for the NuSTAR SOC

NuSTAR Observatory

NuSTAR Orbit Altitude

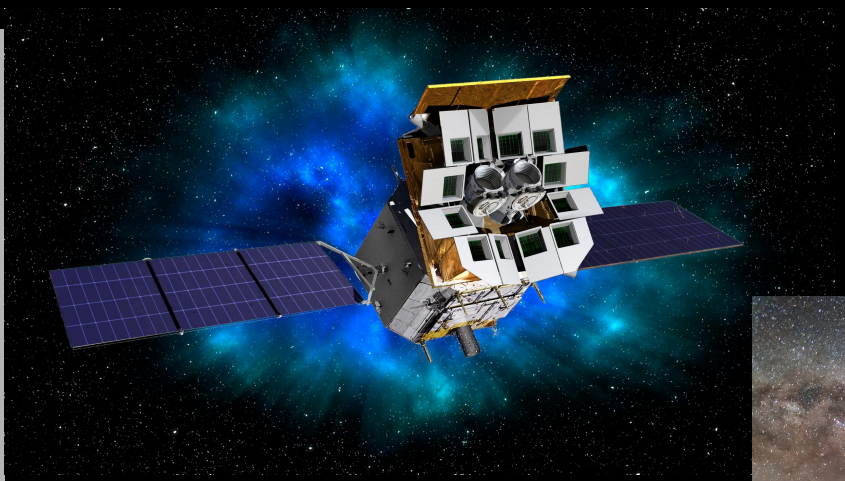


Expect nominal operations through Solar minimum



NuSTAR Time Domain Response

- NuSTAR was originally designed with the expectation of performing 1–2 ToO observations every year
- Today, NuSTAR averages around one ToO observation a week
- >25% of NuSTAR observations are ToOs
  - Mix of GO programs and Director's Discretionary Time
- ToO time is over-subscribed by a factor of 6 in GO program
- Typical ToO response time is around 1 week
  - <48-hour turnaround reserved for GO programs
- Senior Review in 2022 identified need for enhanced time-domain capabilities as a primary objective



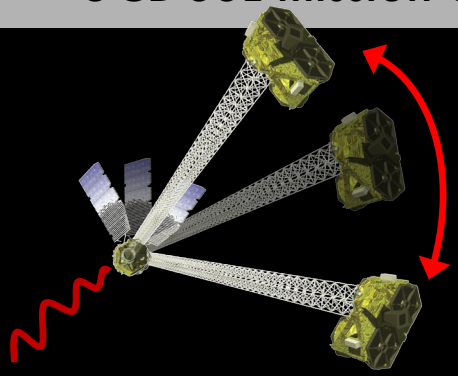
The X-ray time-domain landscape is changing – possible impending loss of time-domain workhorses Swift and NICER; increasing number of transients for follow-up from Einstein Probe, LSST, etc.

Automated Rapid Response Follow-up

Goal: reduce Guest Observer ToO response times to <24 hours

Previous ToO scheduling process:

- <48-hour response time on a best-effort basis
- PI makes request using ToO web form
- Manual scheduling and command sequence upload
- Operators required to drive into the UCB-SSL mission operations center

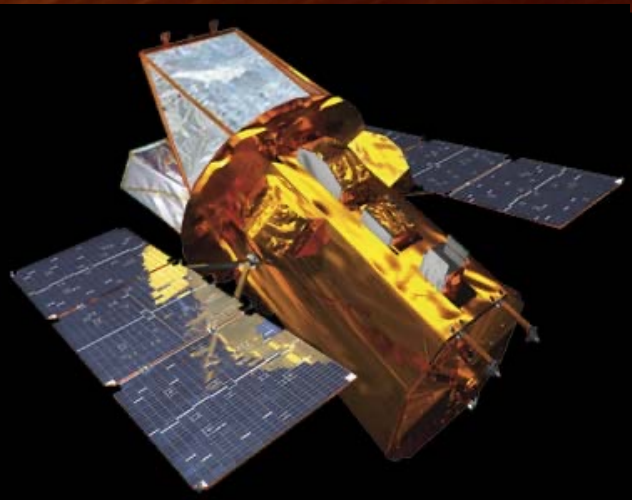


New process:

- <24-hour response time for pre-approved GO programs
- PI makes request using ToO web form with a pre-provided authorization code, automatically ingested into the NuSTAR scheduling system
- Automated: scheduling, command sequence generation, delivery and validation at MOC, and upload to spacecraft on next contact
- Messaging system alerts SOC and MOC team to new ToO
  - Minimum exposure time is ~12 hours, giving time for team to create follow-up schedule to return to regular programming
- System went live in November 2025 – no triggers yet…

Removal of minimum ToO observing time

Goal: support time-domain science during Swift's reboost mission



- Usual minimum exposure time is 20ks
  - The reason for this has been observing efficiency given NuSTAR's slew time
  - Bright targets don't need this length of observation to get a good spectrum
  - Higher demand for bright target monitoring with absence of NICER and Swift
  - ➢ Therefore, we are removing the minimum exposure time for well-motivated ToO observations
- Highlights so far:
  - Her X-1 monitoring with 10 ks exposures, tied to orbital phase
  - DDT monitoring of GS 1354–64 between Chandra observations
- May allow short exposures in next year's GO program
- Impacts:
  - Level of effort is tied to number of observations
  - Affects scheduling effort and QA after observations

Impact of new scheduling constraints

- Increased optics temperatures due to MLI tears have led to us imposing new observing constraints, suspending all observations with SAA < 60 and SAA > 130
  - Previously we were limiting observations at these SAA ranges to <24 hours
  - Heating effect is cumulative and increases exponentially with temperature, so we have decided to suspend high/low SAA observations altogether for optics safety

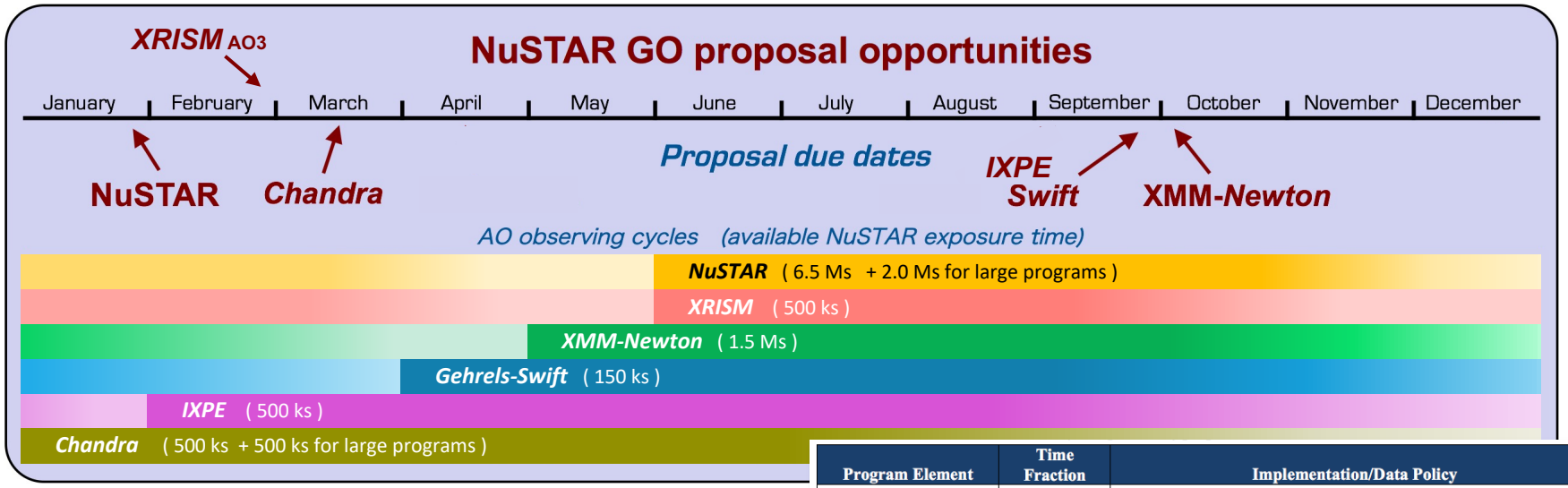
- Impacts:
  - >90% of GO observations are still possible as proposed
  - Joint observations with Chandra and ground-based observatories are now more challenging (e.g. cancellation of recent coordinated M87 observations)
  - No impact on coordinations with XMM, IXPE, XRISM (40% of all NuSTAR observations)
  - ToO impact uncertain (can't respond faster than anyone else at low SAA anymore)
  - Kepler observations will need to be performed slightly earlier, with ~5° difference in roll angle

- These constraints can be waived for very high priority science events (e.g. T CrB, Galactic SN, aliens etc.)

GO Program

Proposals requesting NuSTAR observing time may be submitted to six GO programs

- NuSTAR GO: 212 proposals received in Jan 2026; 101 accepted including coordinations with XMM, XRISM, and Swift (fingers crossed!)



Executing about 100 proposals / year
= 70% of observing time

- >50% observations coordinated with other observatories
- >75% observations have time constraints

Program Element	Time Fraction	Implementation/Data Policy
Guest Observer Program	70%	Annual open call for proposals with time offered through *XMM-Newton, Chandra, Gehrels-Swift, IXPE,* and *XRISM* TACs for joint observations. 6-month limited-use period.
Legacy Surveys	3%	*Swift-BAT* AGN survey (20 ks exposures). No exclusive-use period.
PI Discretionary Time	17%	Unanticipated ToOs open to community. No exclusive-use period.
Program Reserve	10%	Reserve for calibration, engineering and unanticipated operational issues. Calibration data has no limited-use period.