



NASA GPM Status and Future Activities

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The GPM Core Observatory

Joint NASA-JAXA
project

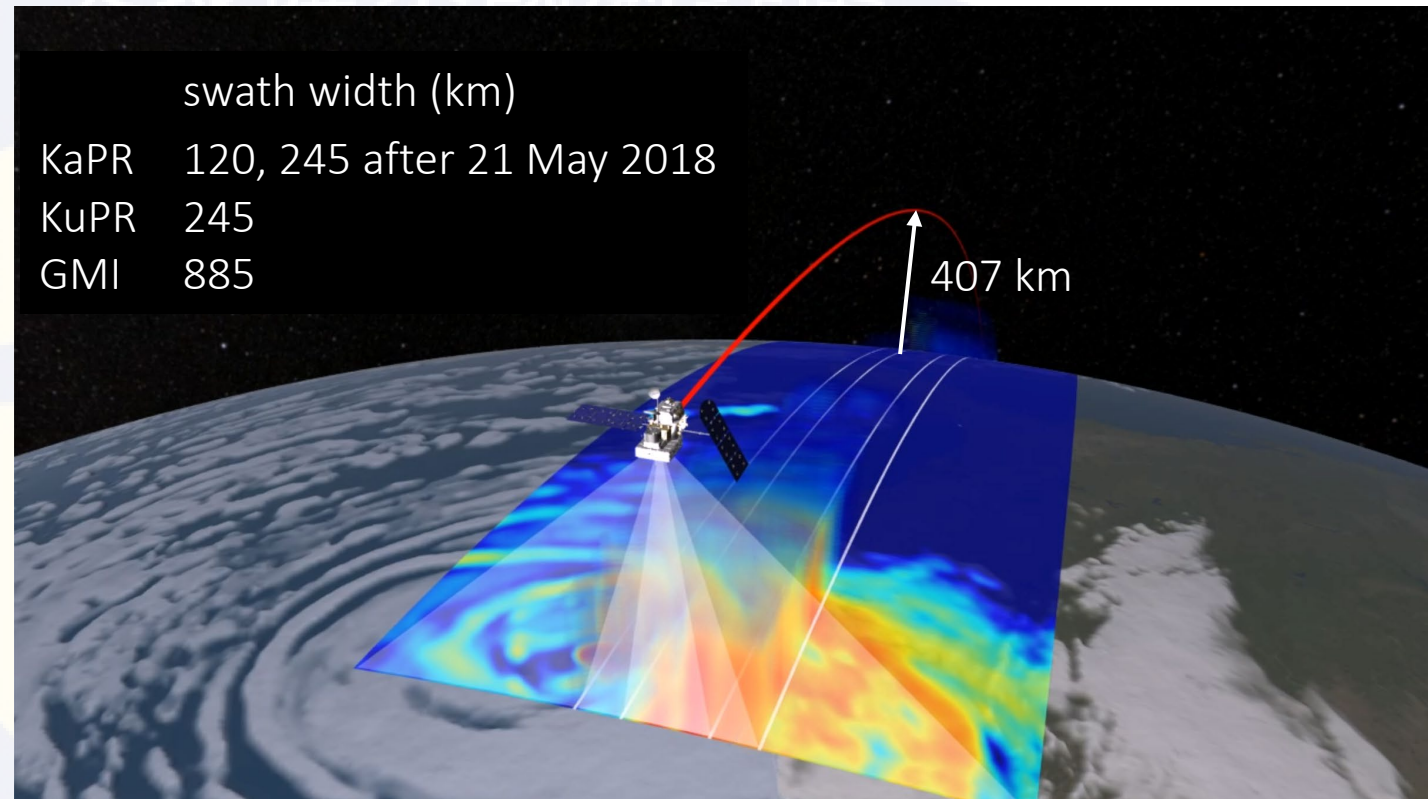
Launched in 2014

65° inclined orbit

- 83 day precession

Carries 2 sensors

- Dual-frequency
Precipitation Radar
(DPR)
 - 3-D
 - narrow swath
- GPM Microwave
Imager (GMI)
 - 2-D
 - wider swath

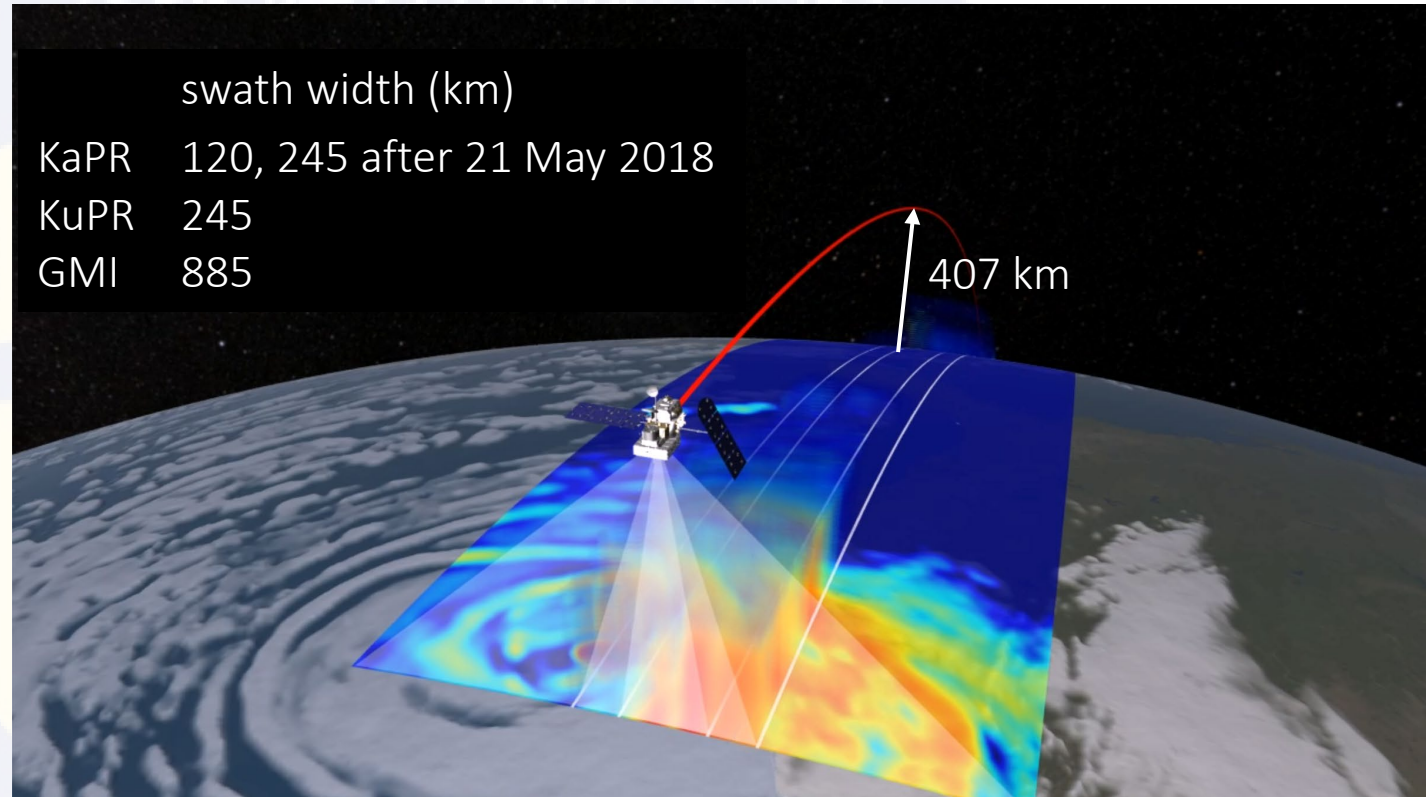


The GPM Core Observatory

Mission Operations

Center is very busy

- collision avoidance
- GPM has 5 reaction wheels that help control spacecraft attitude
 - 4 of 5 functioning, 1 has shown problems, rest are solid
- all other subsystems and the instruments are all fully functional



The GPM Constellation

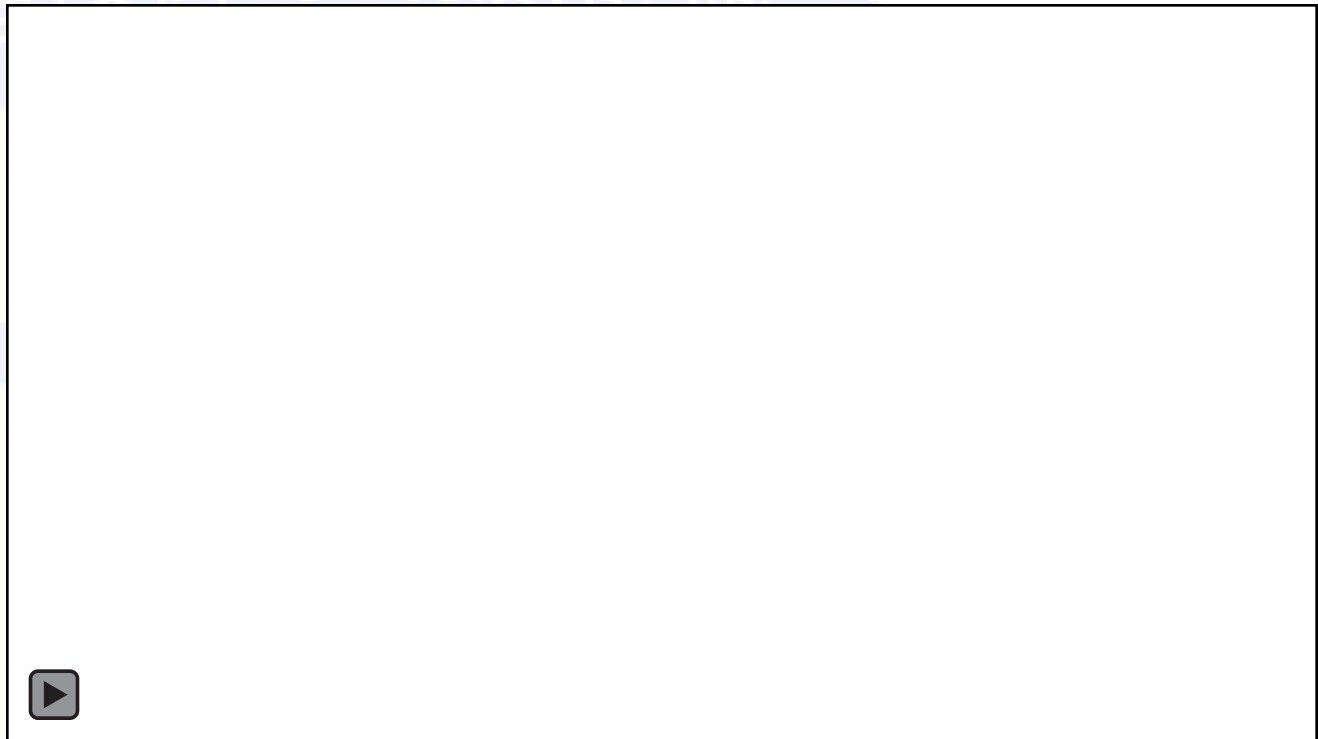
The Core Observatory by itself gives really sparse coverage

- DPR gives 1 snapshot every 3 days
- GMI gives 1 snapshot per day

So, we asked other agencies to contribute data

- currently 11 passive microwave sensors
- ~3-hourly observations
- also geosynchronous infrared observations as a last-ditch fill-in

And then we do interpolation to fill in the gaps



U.S. Science Team 2022-2024

36 PI projects, 8 PI "work packages", 20 "International Collaborators" from 17 countries

8 Working groups

- Applications
- Ground Validation (GV)
- Land Surface
- Multi-Satellite
- Cross-calibration (XCAL)
- Hydrology
- Latent Heating
- Particle Size Distribution (PSD)

Annual U.S. Science Team meeting, 3-7 October 2022, Denver, Colorado (hybrid)



Algorithms

Version 07 core products are released

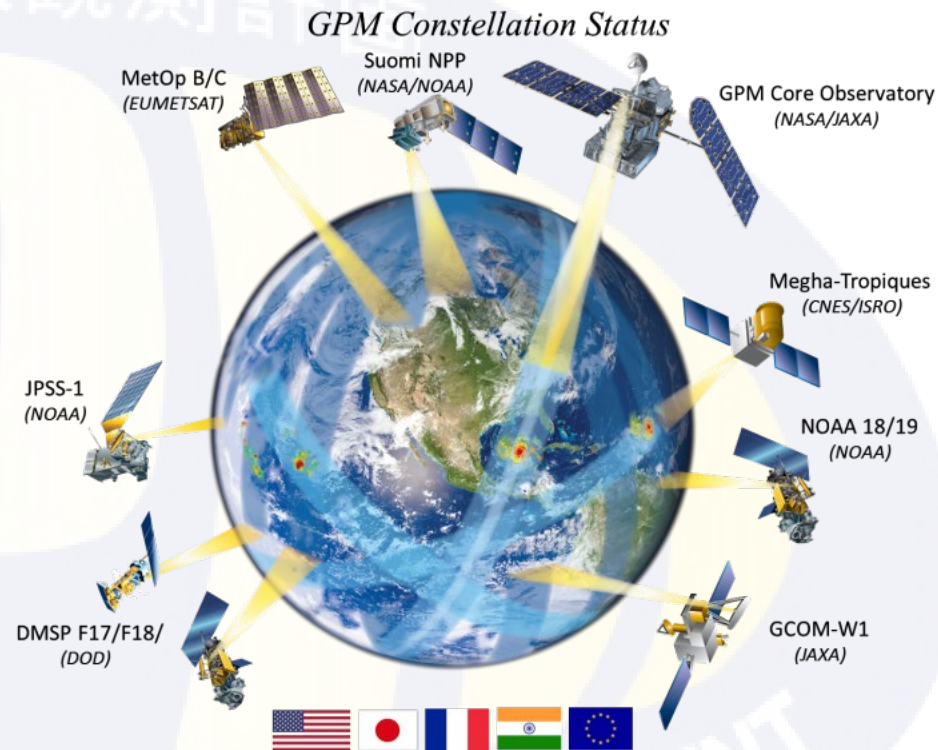
- improved [mountains, polar regions](#)
- improved [continuity from TRMM to GPM](#)

IMERG V07 multi-satellite products are being computed now

- Final Run retrospective processing should be done in early September
- near-real-time Early and Late Runs will go live in November
- Jackson Tan will give some early results

Version 08 is planned for early 2026

- V08 can introduce innovations, but Phase F should just be corrections for errors
- it is planned to make a final recomputation at the end of mission (Phase F)



Data Systems

Precipitation Processing System (PPS) does the heavy lifting for project computing

- core products (except Level 1 DPR), IMERG, U.S. latent heating product
 - run Integration and Test Experiments to check out developers' code and concepts
 - access, store, and organize required input data
 - compute products
 - create “value-added” products
 - make data available in multiple formats

Goddard Earth Science Data and Information Services Center (GES DISC) has long-term responsibility for archiving GPM products

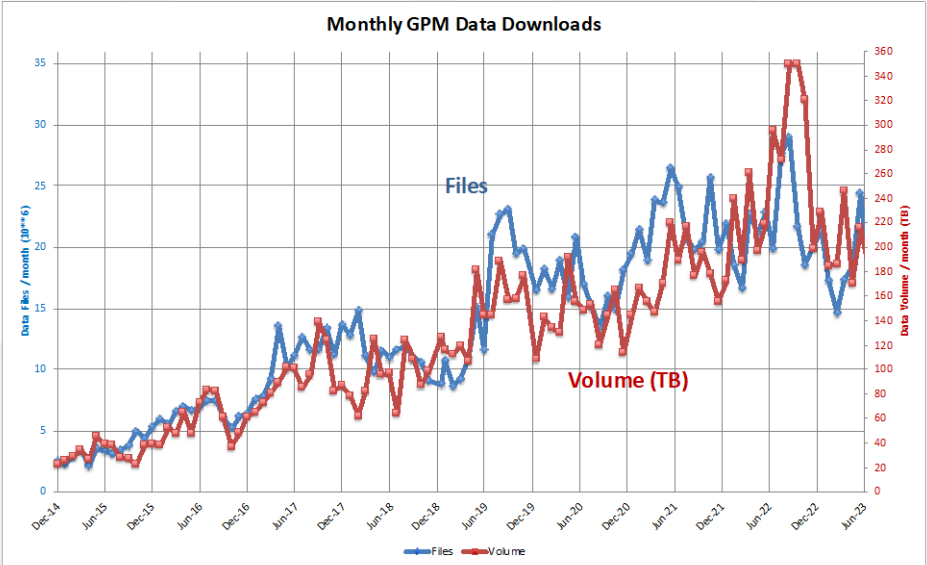
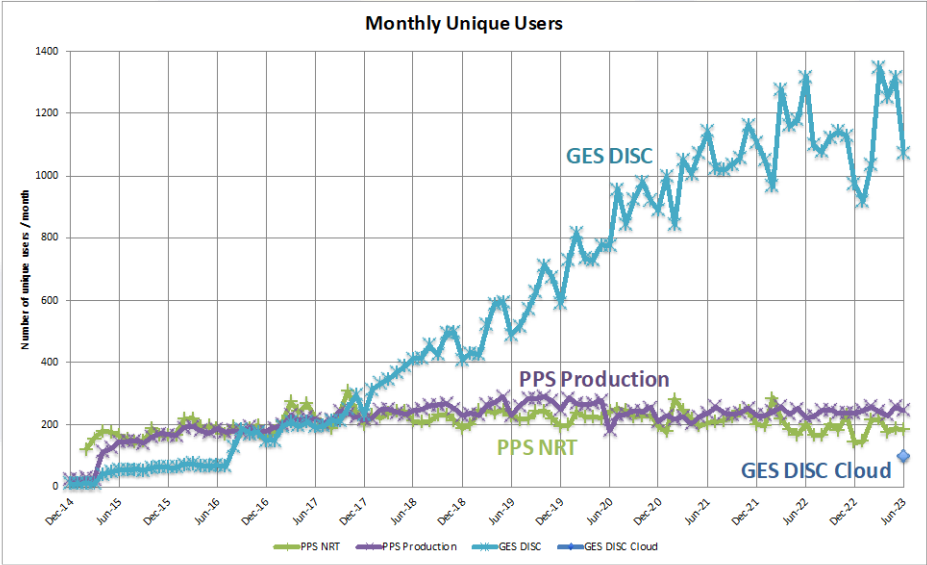
- provides multiple schemes for accessing data
- hosts Giovanni on-line analysis and display web tool
- working toward Cloud-based operations
 - IMERG was a pathfinder for Cloud testing

<https://gpm.nasa.gov/data/directory> catalogues all datasets in the Goddard archives

Data Systems

GPM product distribution by NASA continues to grow

- PPS and GES DISC file numbers and data volume can be combined
 - they track together, but not closely – ratio is affected by sizes of products downloaded
- “unique” user counts can’t be combined, since there might be overlap



The total count of GPM-related papers over 800

Science studies

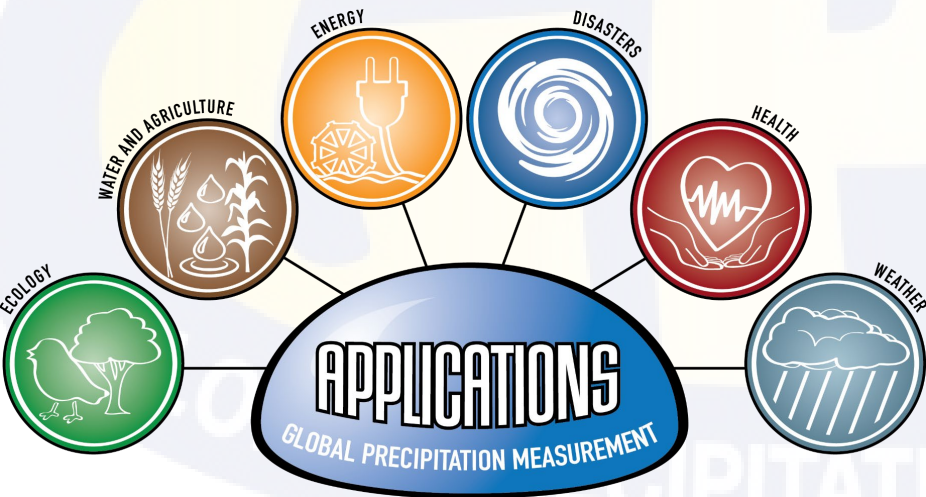
The lengthening TRMM/GPM record enables studies of intermittent or seasonal events

- [Bai and Schumacher \(2022\) doi:10.1029/2021JD035905](#)
 - break out diurnal cycle rainfall patterns by location in the Maritime Continent by phase of Madden-Julian Oscillation (MJO)
 - 89 MJO events during 2001-2019 using IMERG data
- [Li et al. \(2023\) doi:10.1016/j.jhydrol.2023.129563](#)
 - evaluate precipitation events in IMERG product against GV-MRMS in the Continental United States
 - develop statistics on difference in start, stop, duration, and detection by season
- [Li et al. \(2022\) doi:10.1175/BAMS-D-22-0127.1](#)
 - survey reflectivity differences for 136 WSR-88D radar sites and the GPM DPR by season
- [Liu et al. \(2022\) doi:10.1029/2021JD035785](#)
 - compute the total and directional momentum flux at 100 hPa for individual convective gridboxes
 - TRMM Spectrum Latent Heating product and large-scale wind profiles from ERA-Interim
 - geographical distribution of momentum flux at 100 hPa in the tropics and subtropics
 - diurnal, seasonal, and interannual variations of the momentum flux

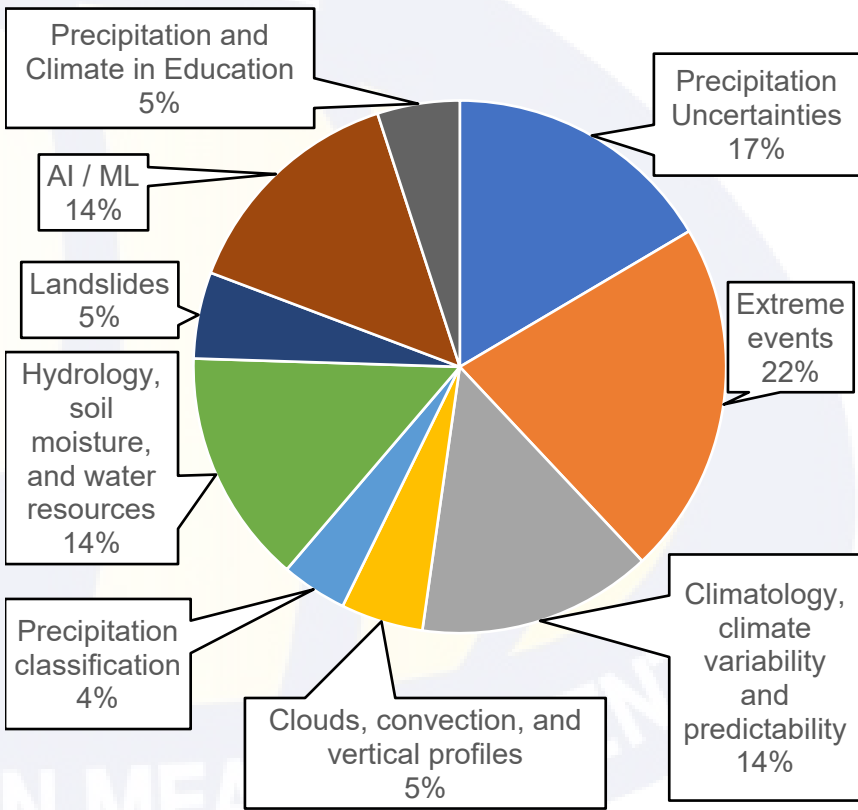
Applications

Engage user communities

- increase awareness of TRMM/GPM applications
- improve data/documentation access and user-friendliness
- capacity building
 - training sessions
 - mentor program



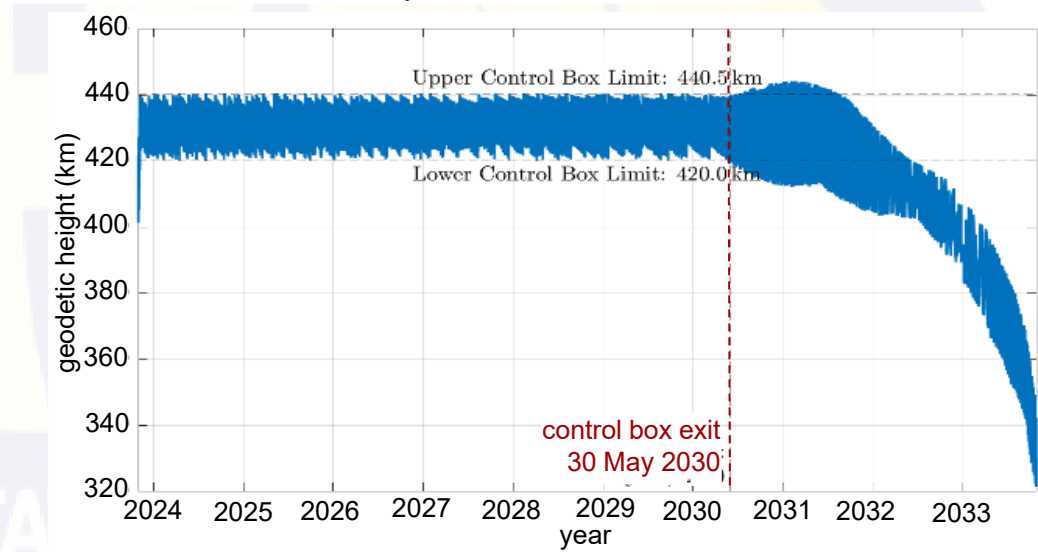
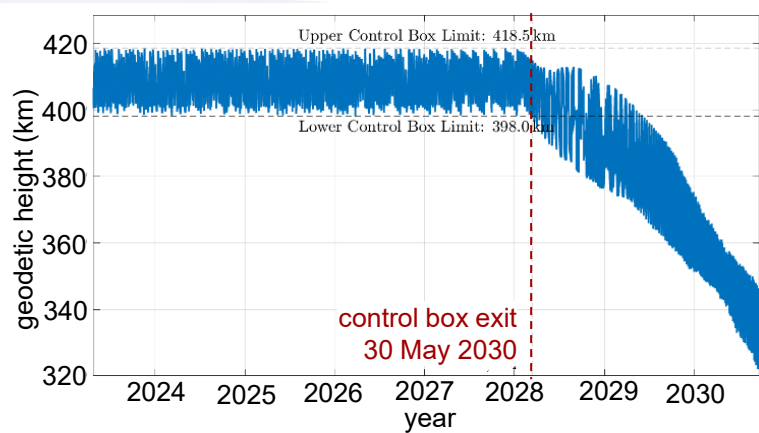
2023 applications summary



Core Observatory Lifetime

Forecasts of fuel use have trended faster than expected

- even at 400 km altitude there is atmospheric drag
 - strongly affected by Solar activity
 - current Solar activity is higher than expected
 - lower-than-expected Solar activity would extend lifetime
- we will not get a TRMM-style pass on the re-entry requirement
- planning and approval for the orbit boost are proceeding
- 432 km forecast to take us into 2034
 - but, drift-down forecast to start late in 2030



Closing Remarks

The Core Observatory is functioning well

The JAXA-NASA partnership is working well

GPM is contributing significantly to the precipitation community

- we still have more years for doing good research

I look forward to seeing how the legacy of TRMM and GPM continues into the AOS era

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