

# XMM-Newton Overall Mission Status



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XUG Meeting #23  
16 May 2022

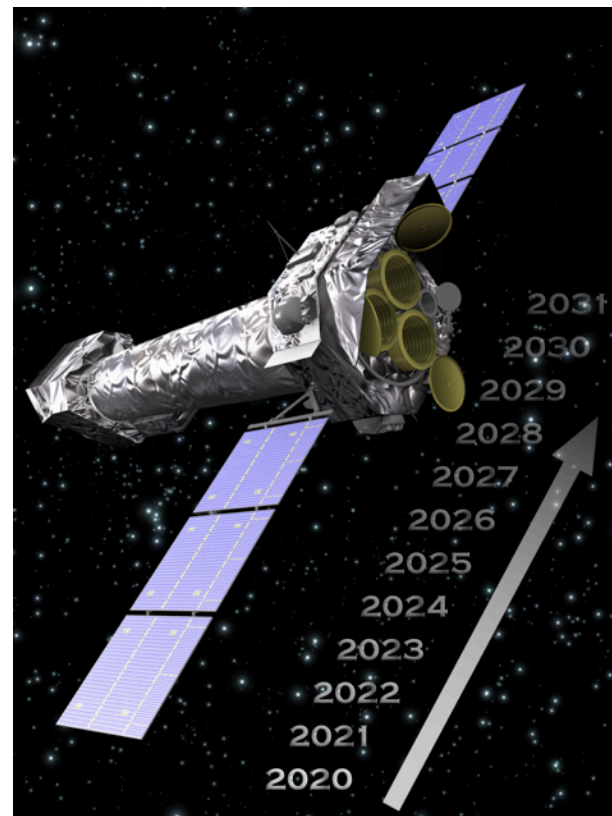
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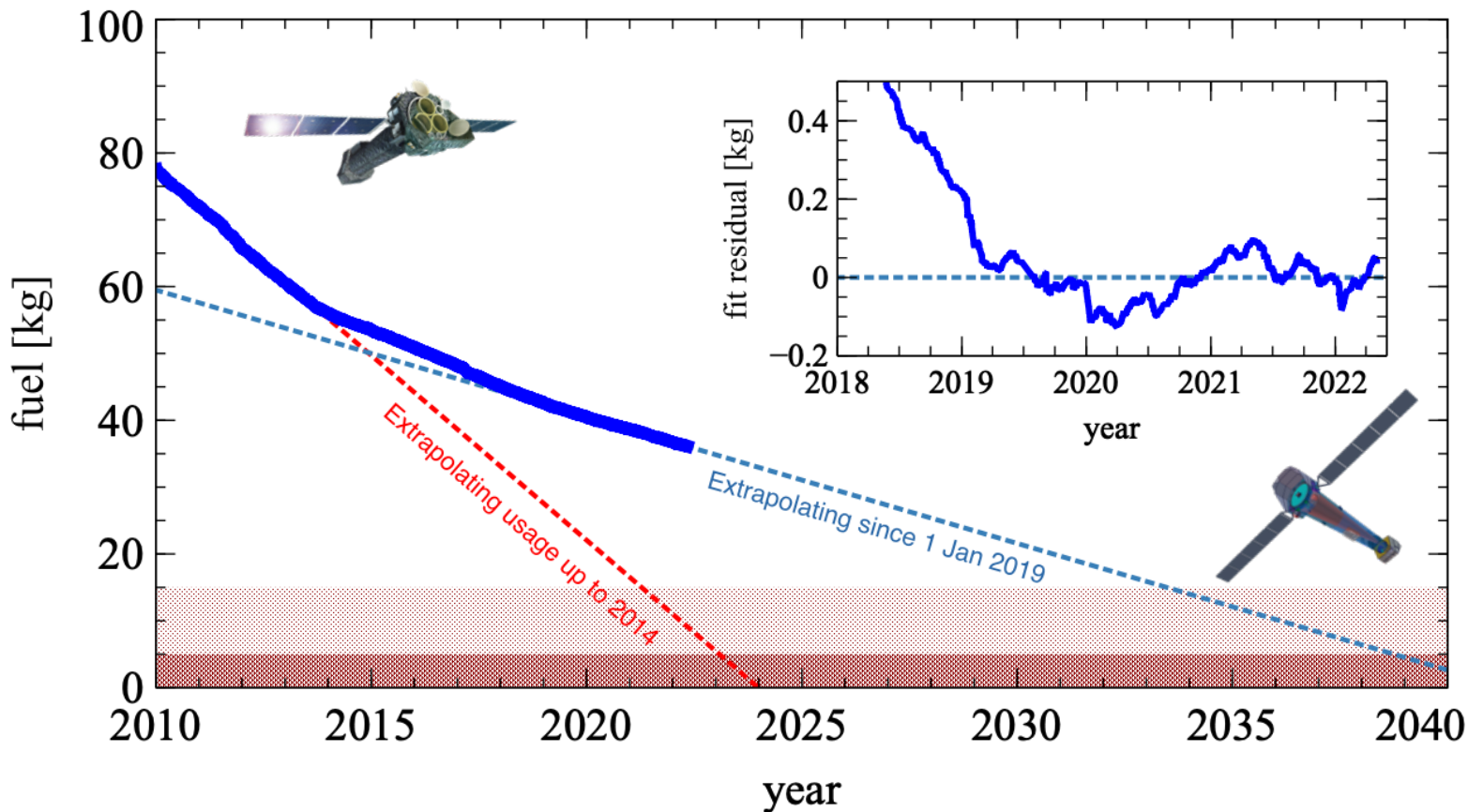
European Space Agency

# The spacecraft continues in great shape

- ✓ All instruments in same general shape as last year. No major incidents.
- ✓ Successful fuel replenishment in 2020. **2022 fuel replenishment going on now: 16–20 May.**
- ⚠ Need to follow crossings of geo-stationary orbit zone.
- ⚠ Keep an eye on degradation of components like Coarse Attitude Anomaly Detector (see 2021 presentation).
- ➡ Continuing to look ahead to more than another decade of science operations, but need to keep an eye on long-term issues.

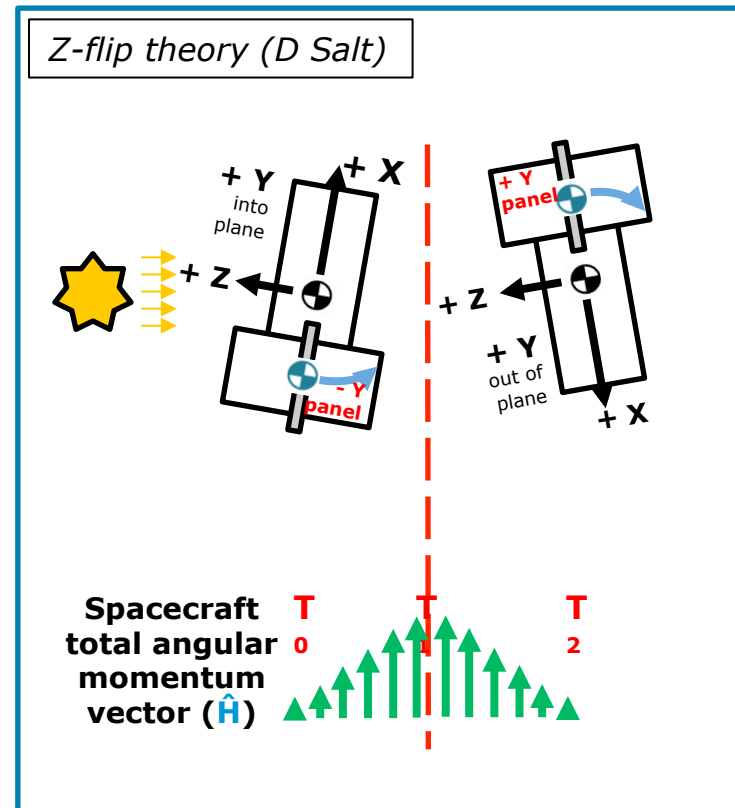


# Fuel usage would allow for life time clearly >2030



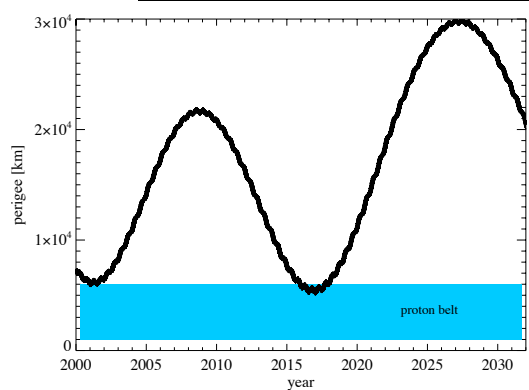
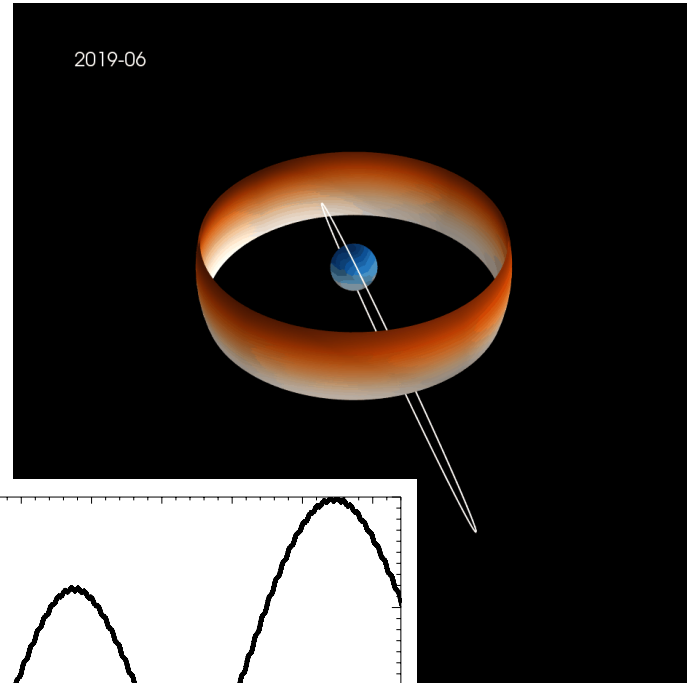
# Adopting the “Z-flip” could extend life further

- Developed for INTEGRAL after reaction control system (RCS) failure: rotate about sun line over planning period to control solar radiation pressure  $\Rightarrow$  **zero fuel consumption**.
- Initial study with industry shows that also for XMM-Newton very long periods without RCS use would be possible.
- Would have impact on planning flexibility and require software updates for mission planning and flight dynamics.



# Keeping a safe distance – update

- Healthy perigee height for extended operations.
  - But over the next 200 years XMM-Newton will spend approximately half the time on an orbit which crosses the GEO protected zone.
  - There are no manoeuvre strategies available which could avoid GEO crossings.
  - Even large manoeuvres ( $\sim 15$  kg of fuel,  $\sim 8$  years of current normal use!) would change dwell time only by about 10%
- ➔ Operational collision avoidance 2021-2023 and 2027-2028.



# Evolving Mission Operations and Ground Stations

- Telemetry drops resolved end Sep 2021
- Testing additional external station in Tolhuin, Argentina from new provider (KSAT) to diversify GS scheduling options and providers. Expected to be ready for operations by Q3 2022.
- Automation allows to support 3 missions with one team. Ongoing work to refine and improve. Starting to include AI tools in operations for predictions and decision support.

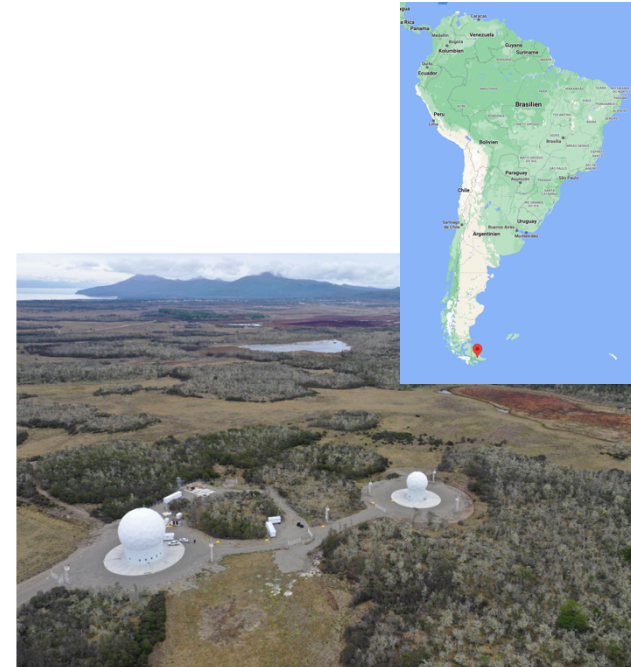


Figure 2-2: Tolhuin, antenna to the left is the 13.5 meter for XMM

# MOC system evolution for coming years



- Mission Control System migrated to same baseline as for other missions (Solaris 10 and 11).
- Migrate MOIS automation platform to newer OS on virtual machines.
- Move of Operational Database to ESOC standard DABYS (→ long effort with significant impact on SOC).
- Migrate MUST parameter archive to ARES (on-going).
- Upgrade radiation monitoring system Lela (solution by SOC in principle ready).
- New webserver infrastructure, including near-realtime system.
- Aiming to reach stable state by ~2025, maintainable to 2030+.



- Slowly settling into working within new contractual framework. Still more overheads for team than previously, due to management and reporting duties or coordination between work areas.
- Rejuvenation of systems moving forward at good pace, despite all troubles. Various significant improvements to, e.g., proposal handling, SAS, calibration, pipelines, archive, ... using new methods and technologies  
⇒ see individual presentations.
- Further rejuvenation activities ongoing 2022/23, on-top of 'normal' improvements ⇒ next slide.
- And for good measure: major renovation of B building in 2022, leading to temporary migration of operational machines to interim location and back and complete rework of control room at ESAC.



# Specific SOC rejuvenation activities for 2022/23



- AO Phase II software (XRPS) to modern software base.
- ARES system for parameter monitoring, triggered by MOC evolution and in-line with usage by other missions (cross-mission approach for technical base). Migration of monitoring tool to ARES supported by Young Graduate Trainee from Sep 2022 onward.
- Automated ODF generation.
- Virtualization of RGS on-board software server (used operationally).
- Migrate operational servers to Solaris 10 and databases to Oracle 12.
- Long-term migration of Archive web interface to new standard (Angular).
- ➔ Goal before 2025: “worry-free”, maintainable system for rest of decade.

# Storm warning!



- War in Ukraine and other problems affect ESA and ESA science programme.
- Tight financial situation predicted before already, now even more problematic.
- Impact on missions in operation still to be determined, but problems to be expected, especially beyond 2024.
- ➔ Strong push from management to prepare options for reduced operational cost. On-going work for Mission Manager and others.



# In summary: light and shadow



- ✓ Great team efforts and teamwork also across sites ensured operations and improvements, despite another turbulent year – **thanks!**
- ✓ Telemetry drop issues resolved. Spacecraft and ground segment in general working very well. Outlook encouraging for many more years to come.
- ✓ Ground systems being modernized at both SOC and MOC, preparing for many more years of science operations.
- ? Still significant work ahead in various areas to achieve rejuvenated systems.
- ? Environment, at least at ESAC, seems to be in constant flux.
- ? Community expectations and demands rather increasing.
- ⚠ Overwork leading to team fatigue in face of unrelenting stream of challenges.
- ⚠ Possible impacts of fallout from current crisis situation.