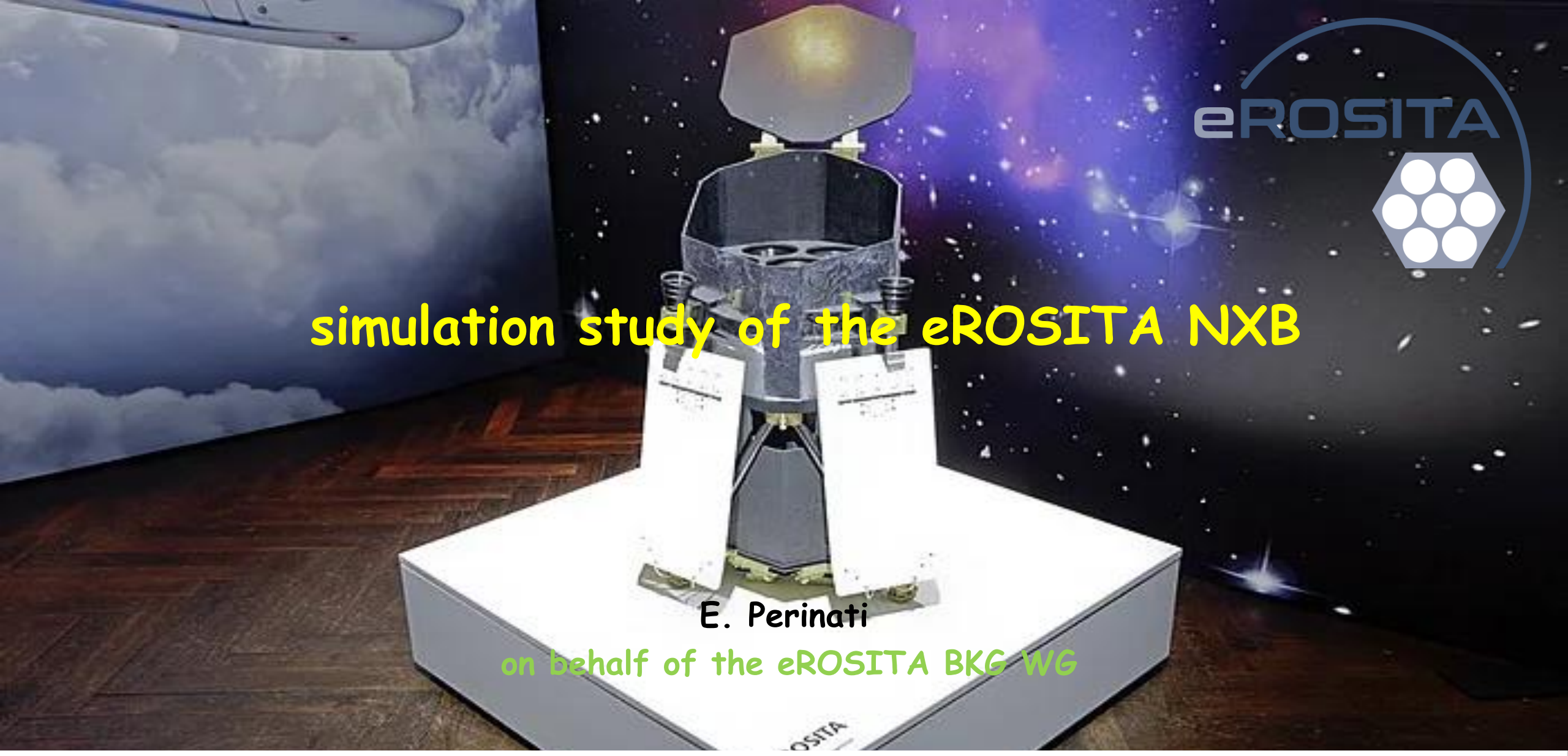


simulation study of the eROSITA NXB

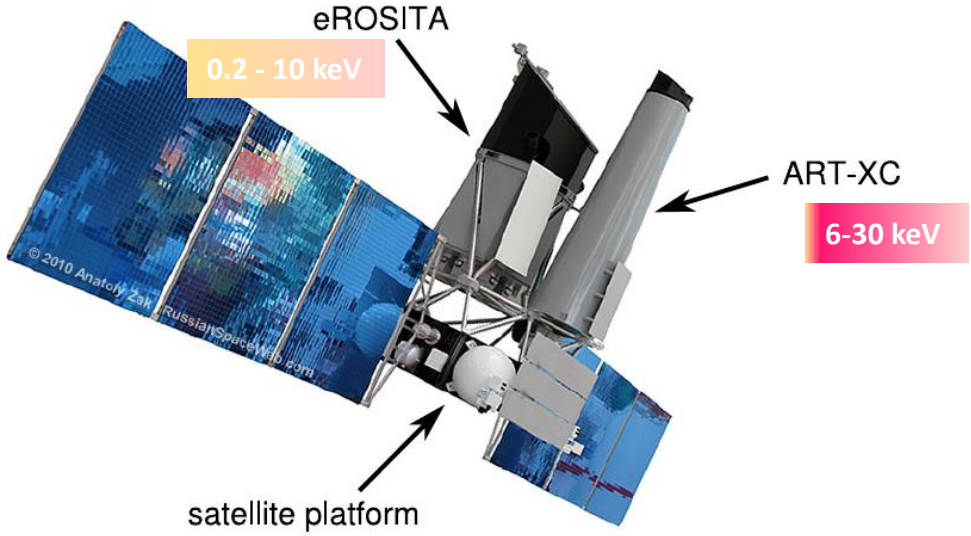
E. Perinati

on behalf of the eROSITA BKG WG

eROSITA on-board SRG

4ys survey + 3ys pointed observations

- launched on 13 July 2019
- L2 reached in October 2019
- PV phase until December 2019
- eRASS-1 started in December 2019



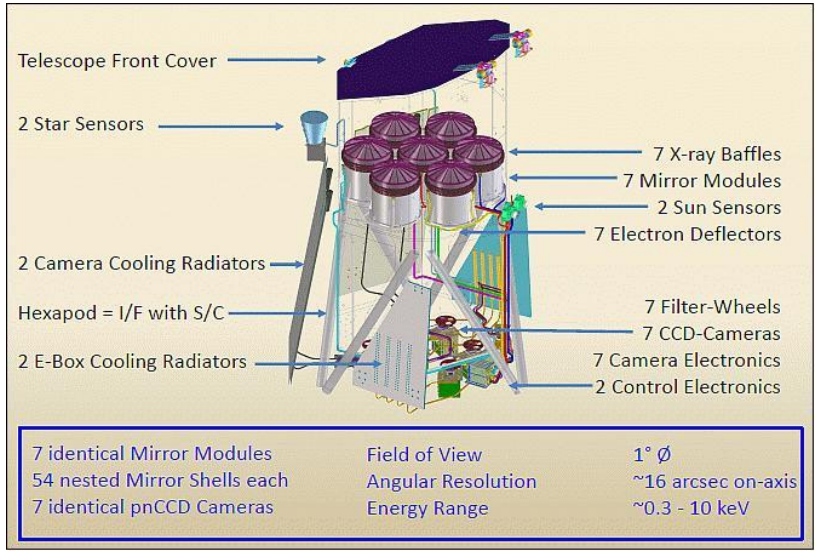
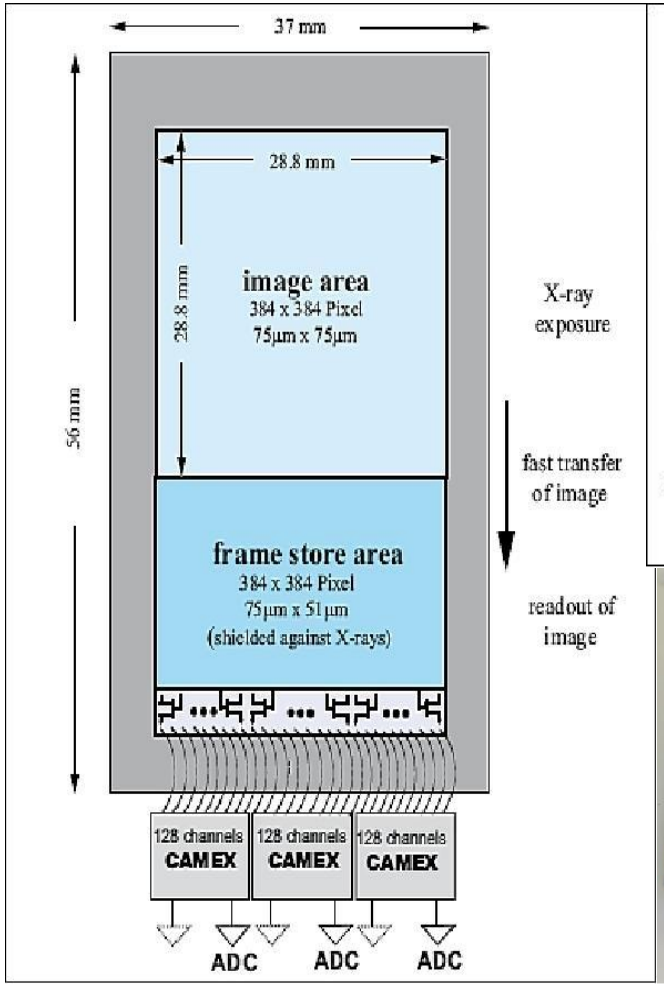
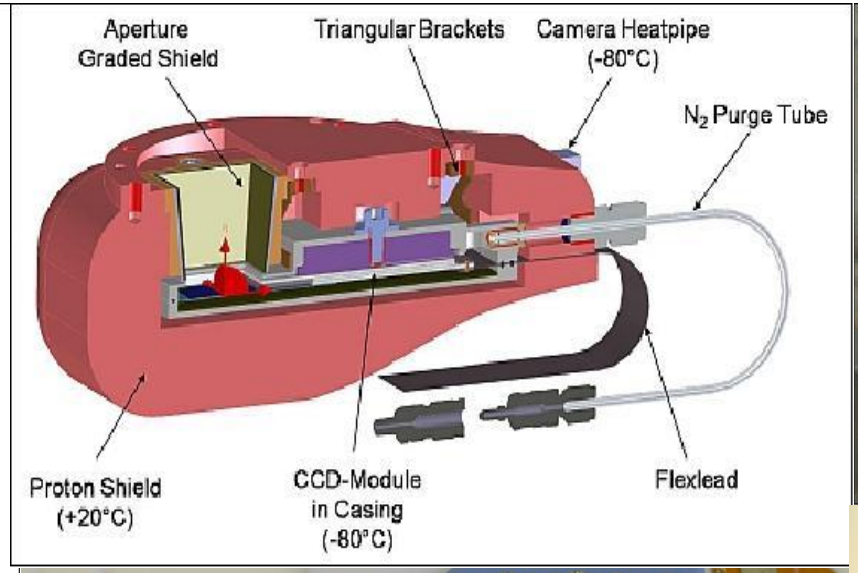
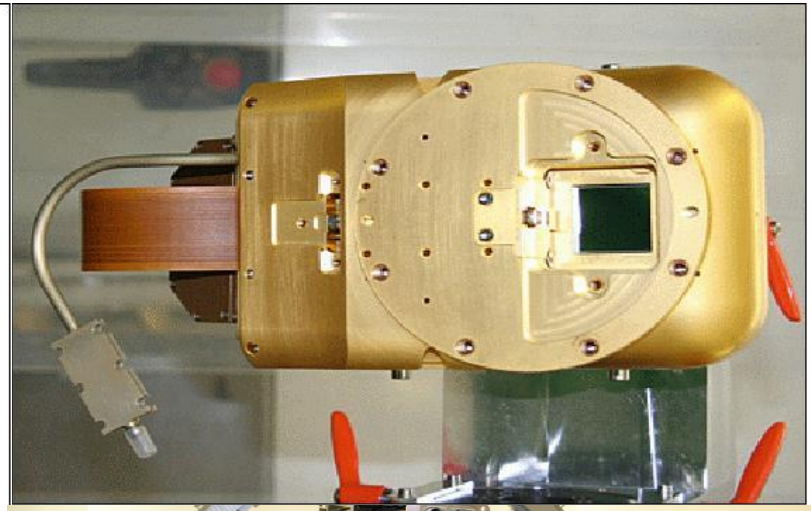
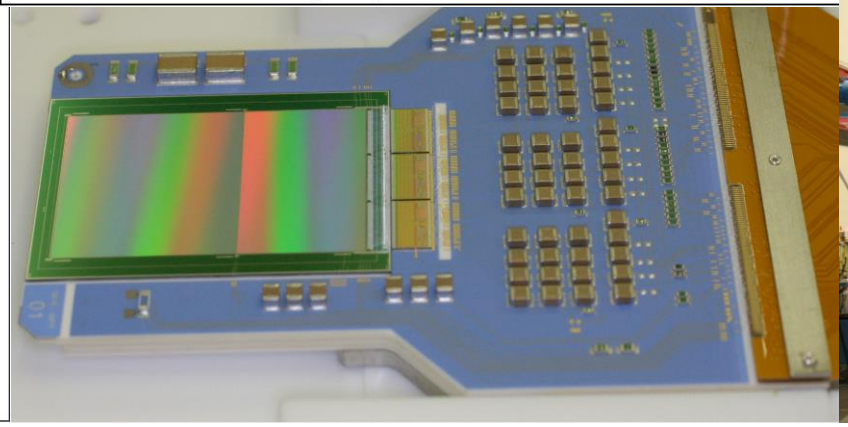


image credits:MPE









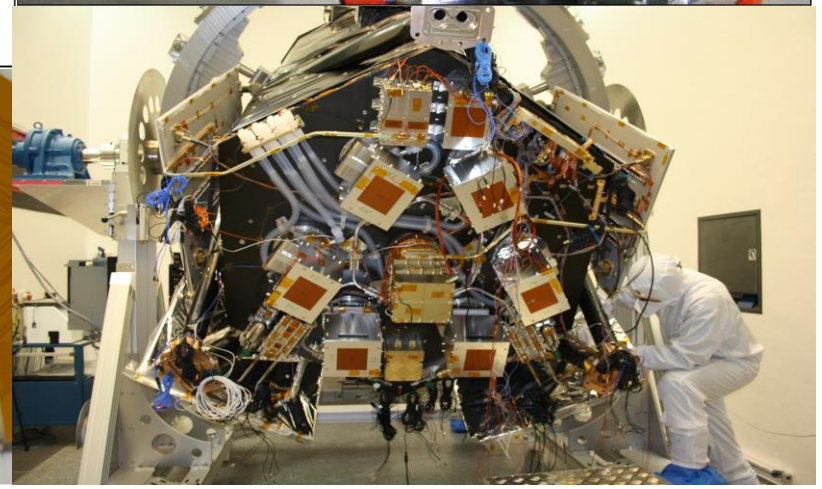


image credits:MPE

exposure ~50 msec, readout ~9 msec

ΔE(FWHM) ~80 eV @1.5 keV , ~140 eV @6.5 keV

eROSITA pnCCDs are the first X-ray detectors around L2

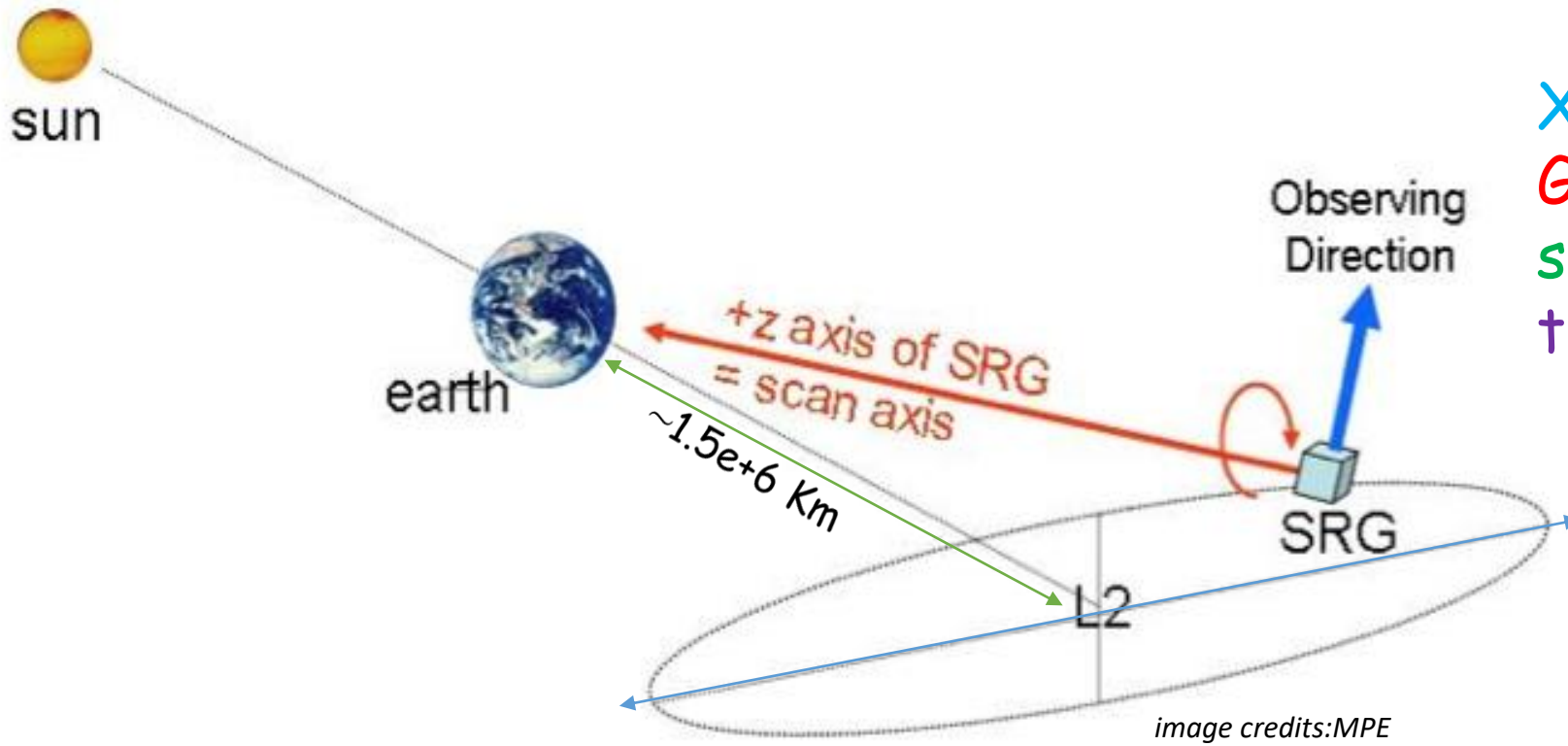
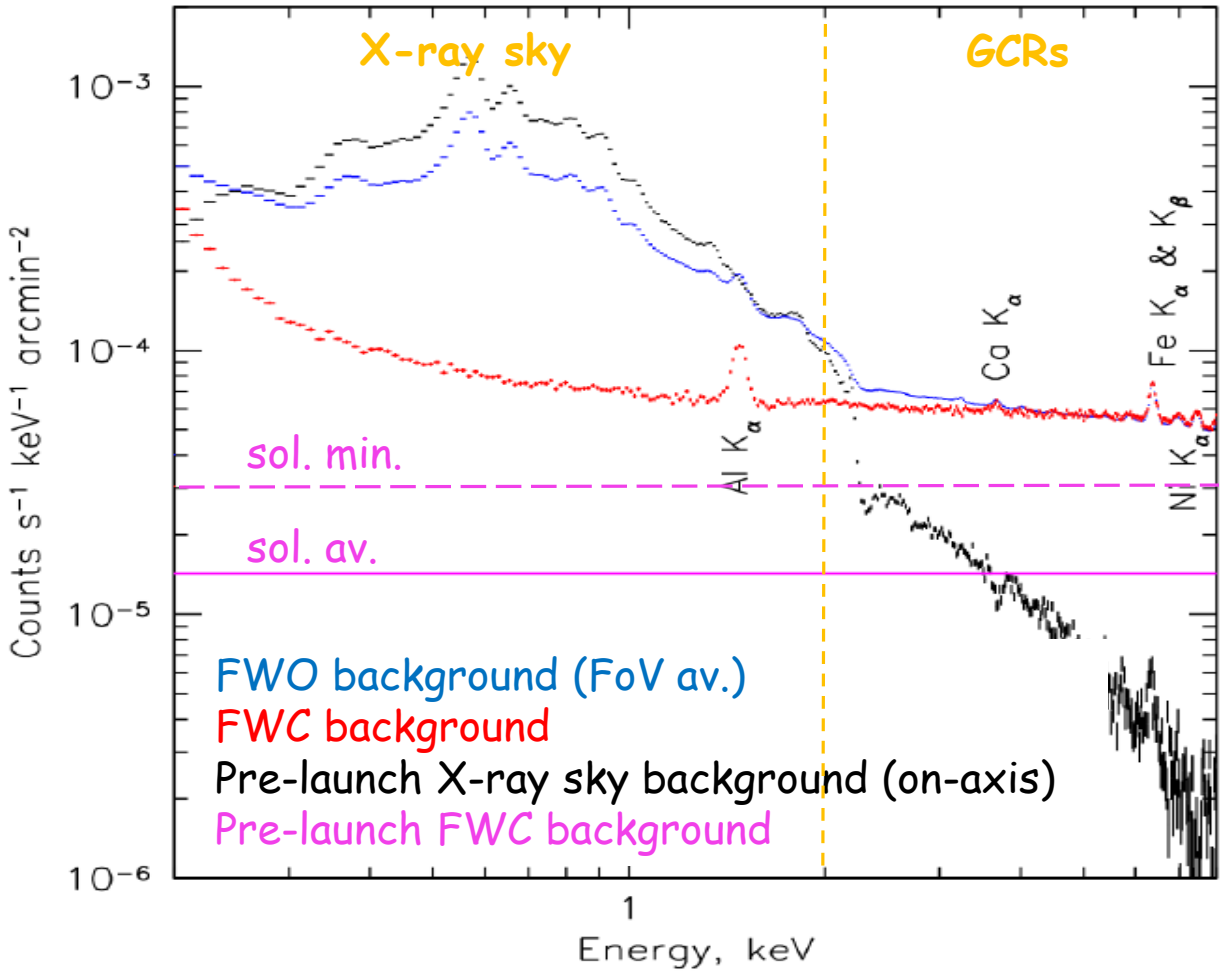


image credits:MPE

X-ray sky
GCRs
solar wind/flares/CME
trapped protons?

eROSITA in-flight background (eRASS-1)



from Predehl et al., 2020

post-launch analysis clarified that the main causes of discrepancy between pre-launch expectations and initially measured NXB are:

1) invalid/corrupted events in the initial FWC dataset (+30% NXB)
2) simplifications in the used mass model and input to simulations (-40% NXB)

combining 1) and 2) explain the factor of ~2 discrepancy initially seen

NXB enhancement after FW rotations

- likely induced by contact between metal and plastic parts of the FW (triboelectric charging)
- transient spikes decay with a time-scale of 10-20 min
- fake counts peak at lower energies (<1 keV)
- seen also in lab but on a way shorter time-scale
- affected time intervals have been removed from the FWC dataset

(see M. Yeung talk)

post-launch NXB simulations using:

- same G4 architecture/input adopted for ATHENA (AREMBES project)
- detailed mass model derived from the most up-to-date CAD drawing (C. Pommranz+,2022)
  - based on G4 CSG
  - comprises camera and FW
  - material composition w/ impurities

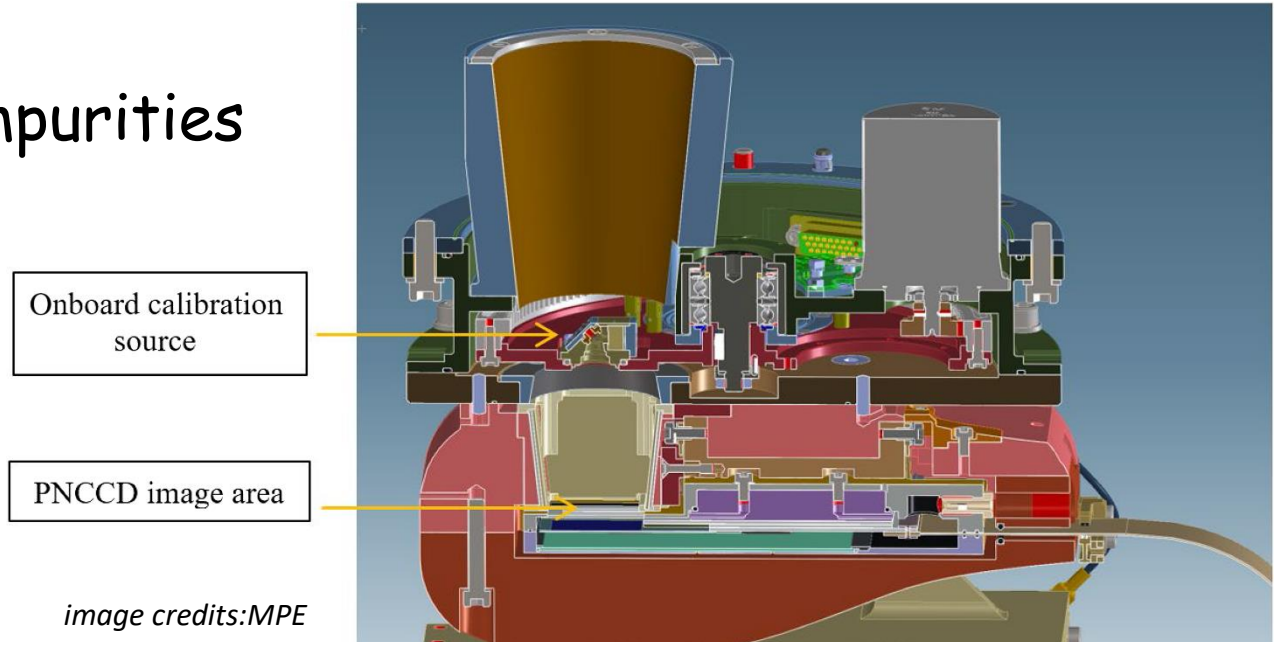
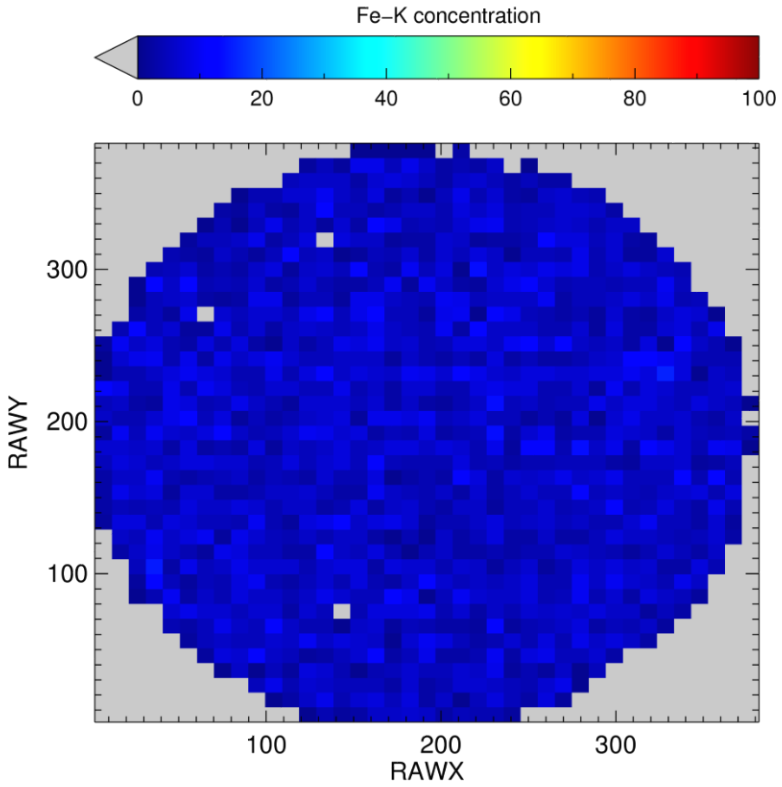


image credits:MPE

origin of fluorescences in the eROSITA NXB spectrum



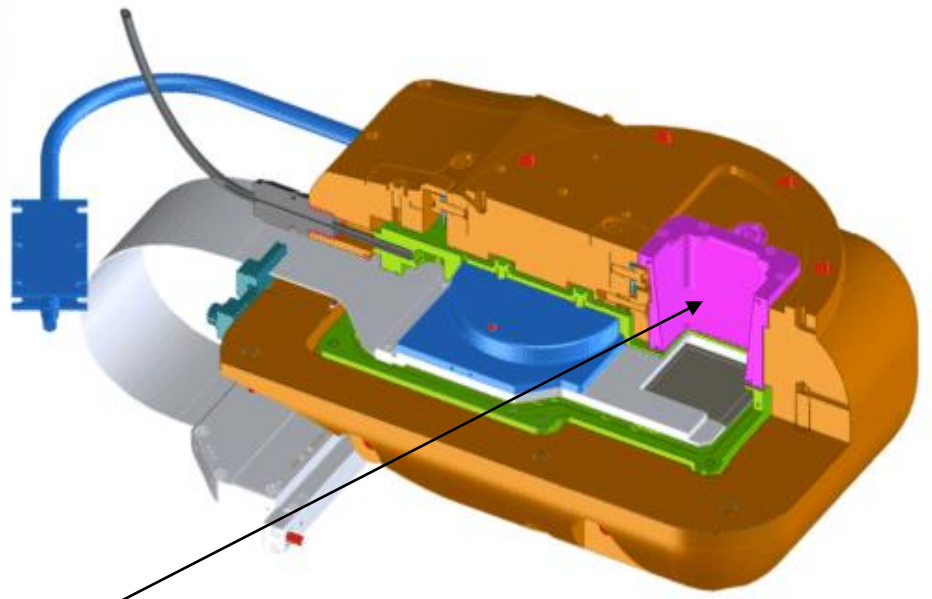
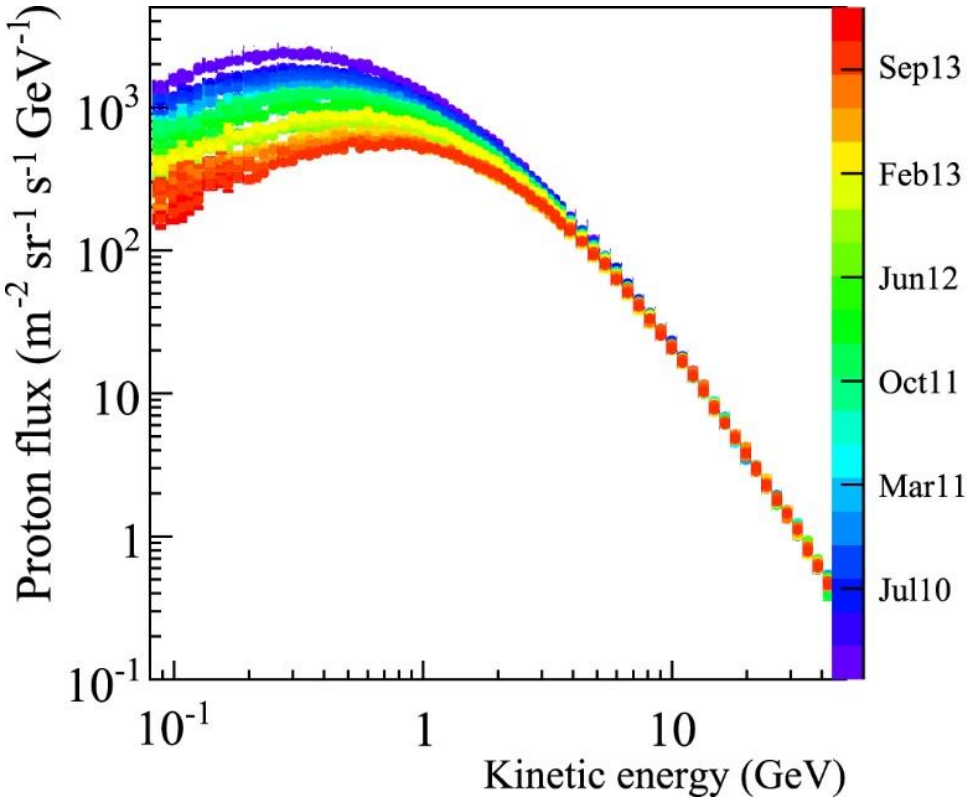
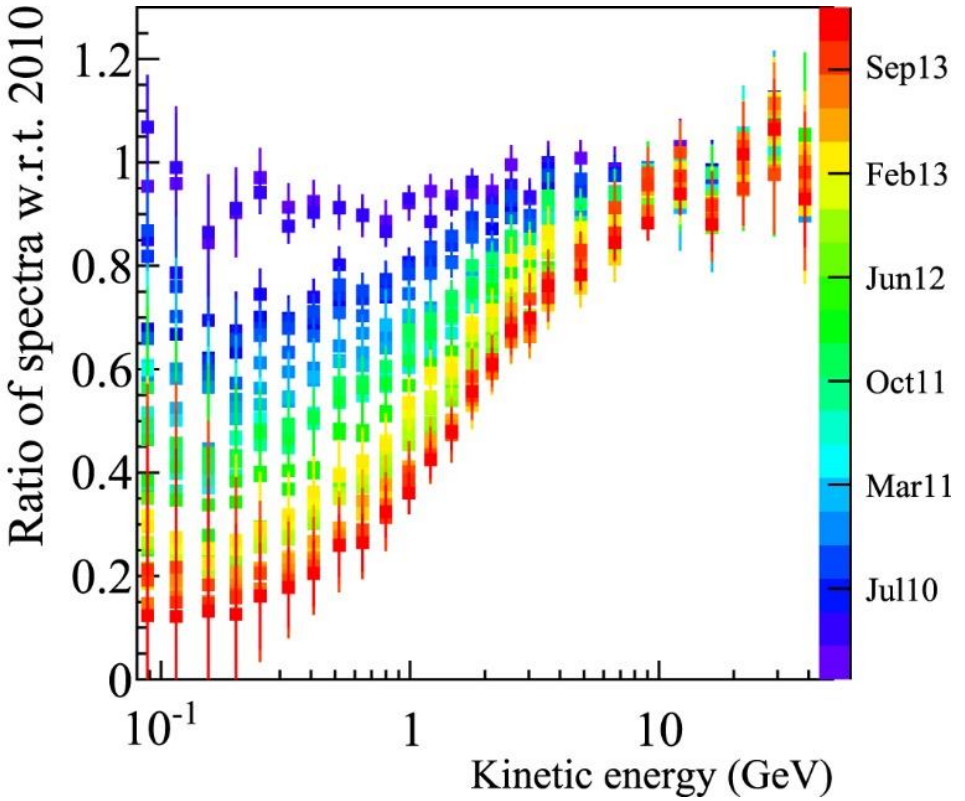


image credits:MPE

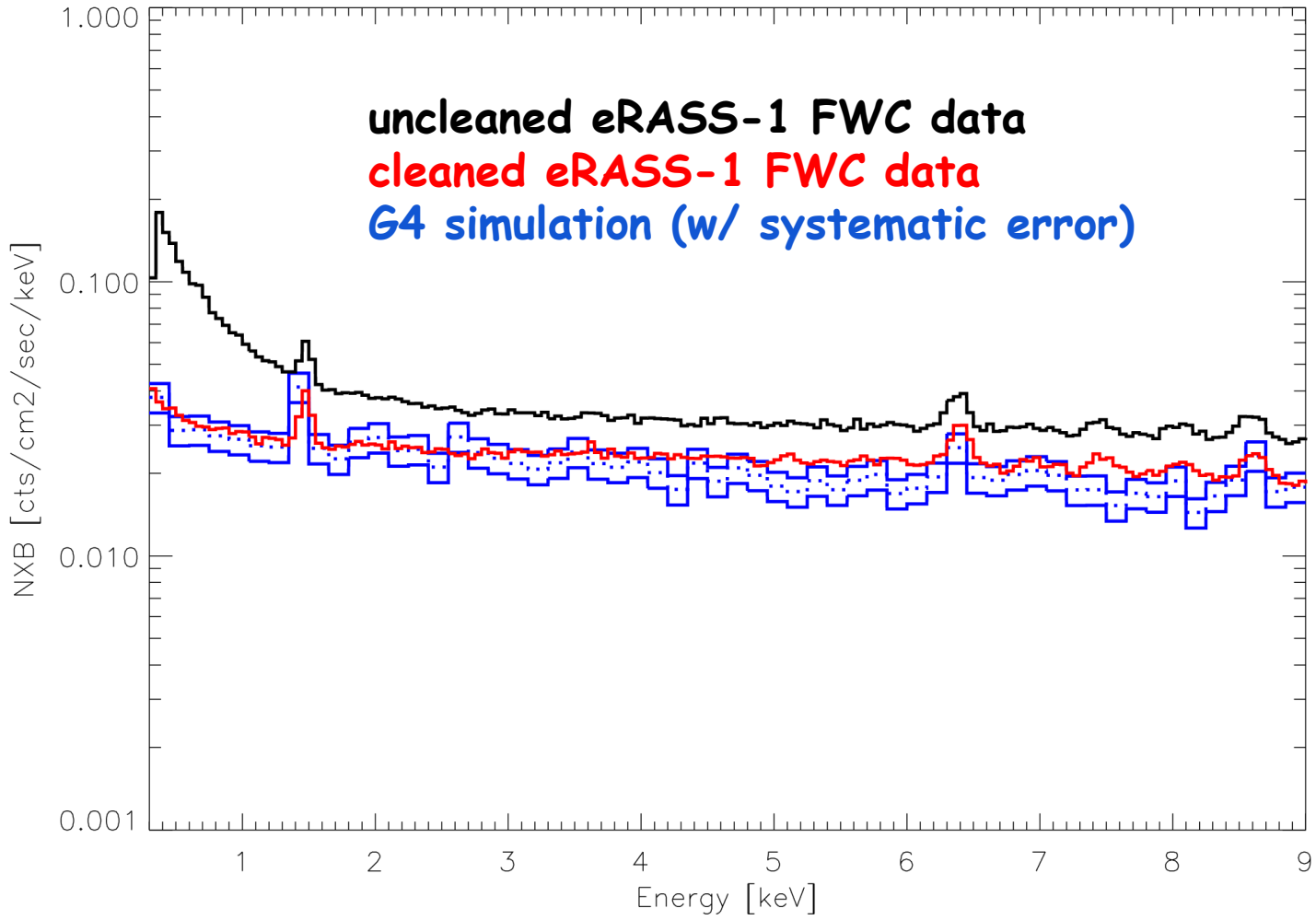
Be inner layers contain impurities (e.g. Fe)

input spectrum: GCR protons in sol. min. of SC #24 (measured by PAMELA)





from Martucci et al., 2018



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Summary

- eROSITA NXB in eRASS-1 is very stable (low solar activity)
- post-launch simulations reproduce quite well eROSITA (cleaned) NXB
- reproducibility of eROSITA NXB is crucial to validate predictions for WFI