

# DOSTEL REM LIDAL intercomparison

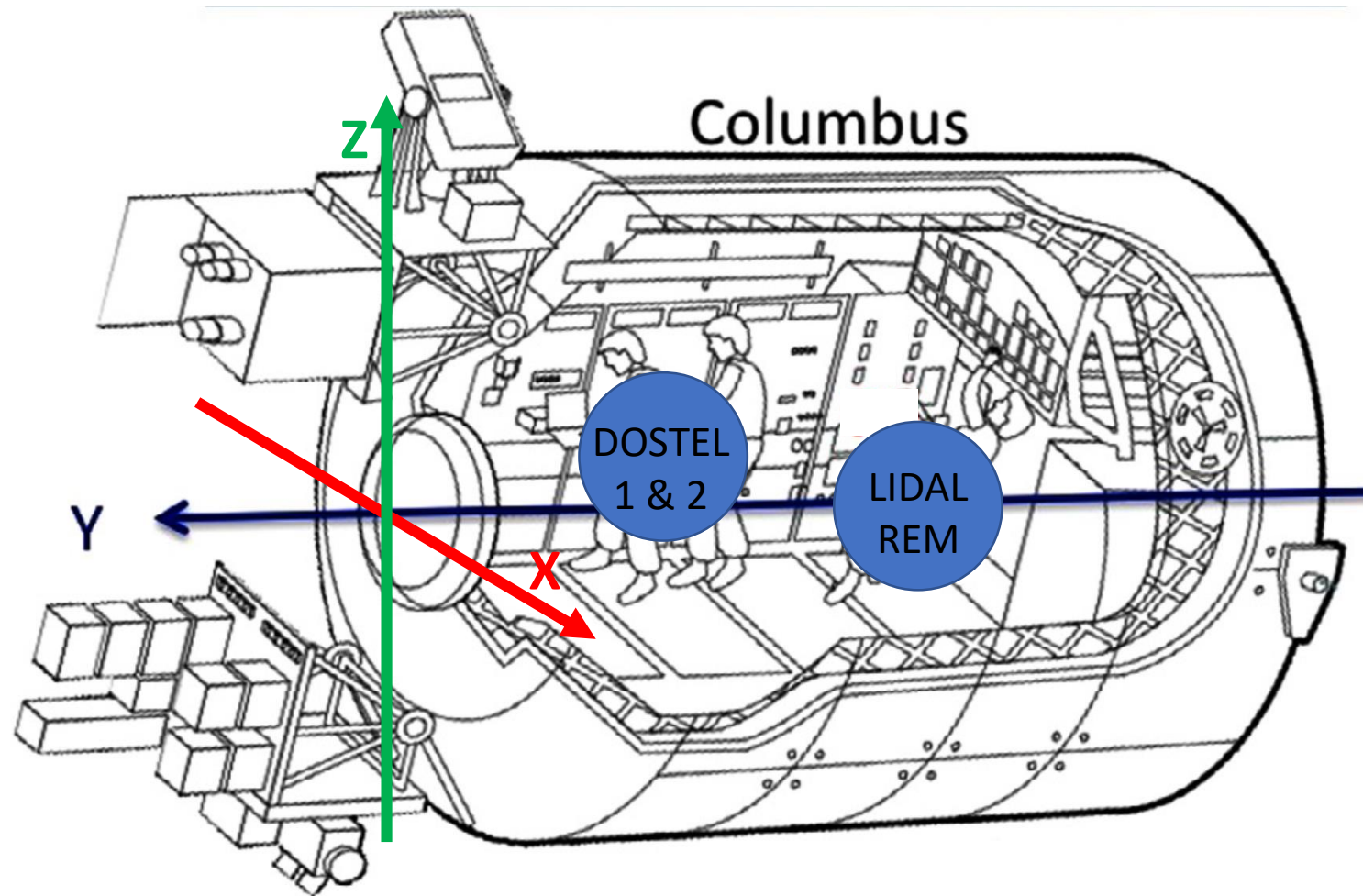
Livio Narici *on behalf of the DORELI collaboration*

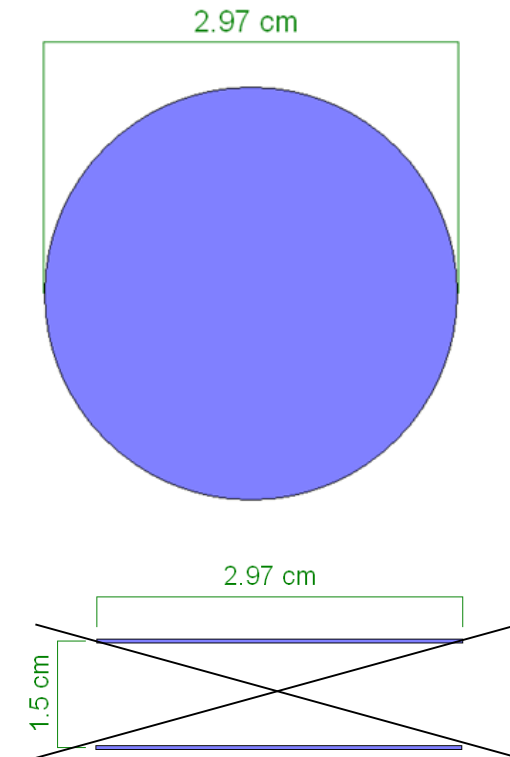
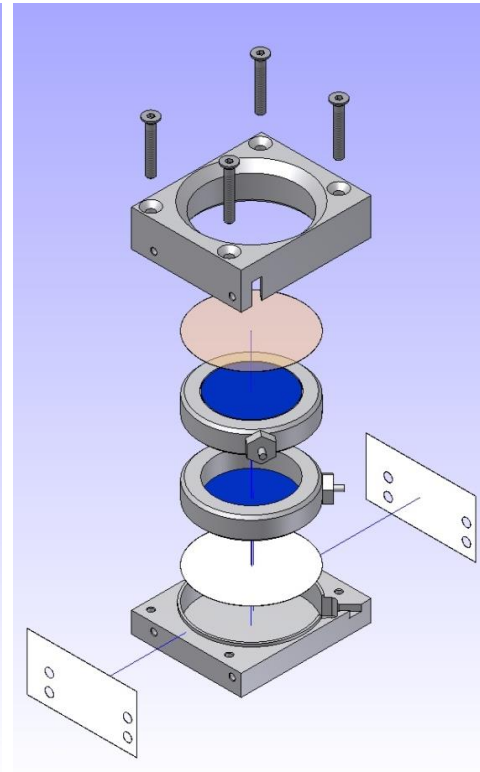
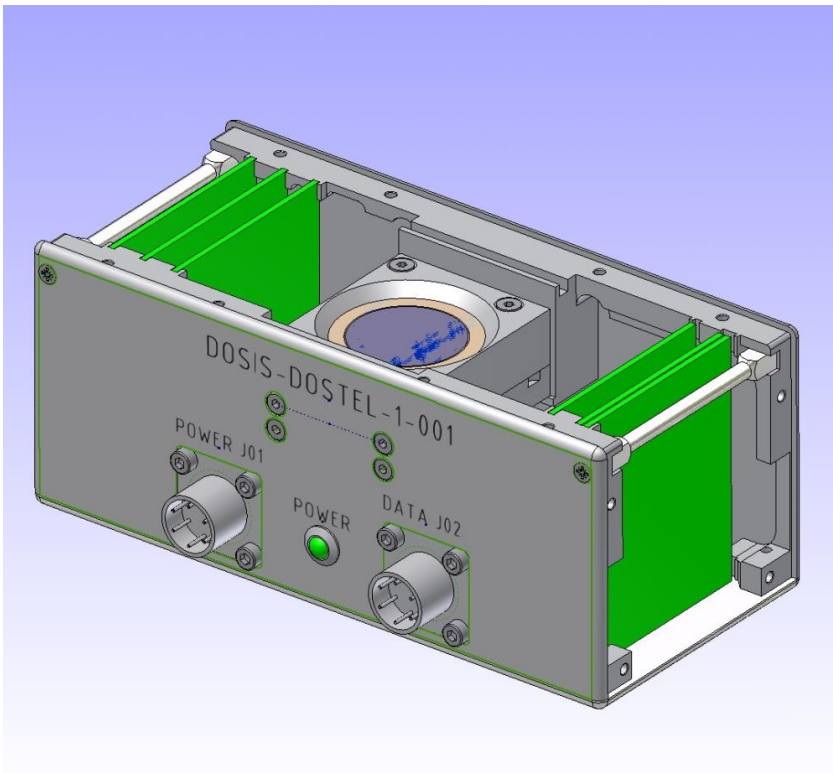


UNIVERSITÀ  
DI PAVIA

Comparative studies of the measurements from four silicon detectors in Columbus:

DOSTEL 1 & 2  
REM  
LIDAL





Each DOSTEL consists of two Canberra PIPS (Passivated Implanted Planar Silicon) sensors forming a telescope.

Each sensor has a thickness of  $315 \mu\text{m}$  and an active area of  $6.93 \text{ cm}^2$ .

The distance between the two detectors of  $1.5 \text{ cm}$  defines an field of view of  $120^\circ$ .

Dose is measured by a single detector (opening angle  $4\pi$ )

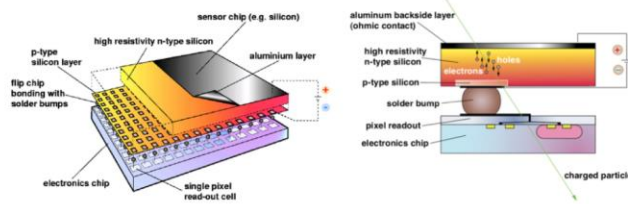
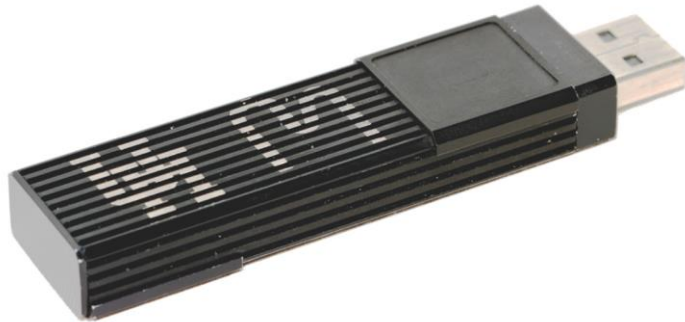
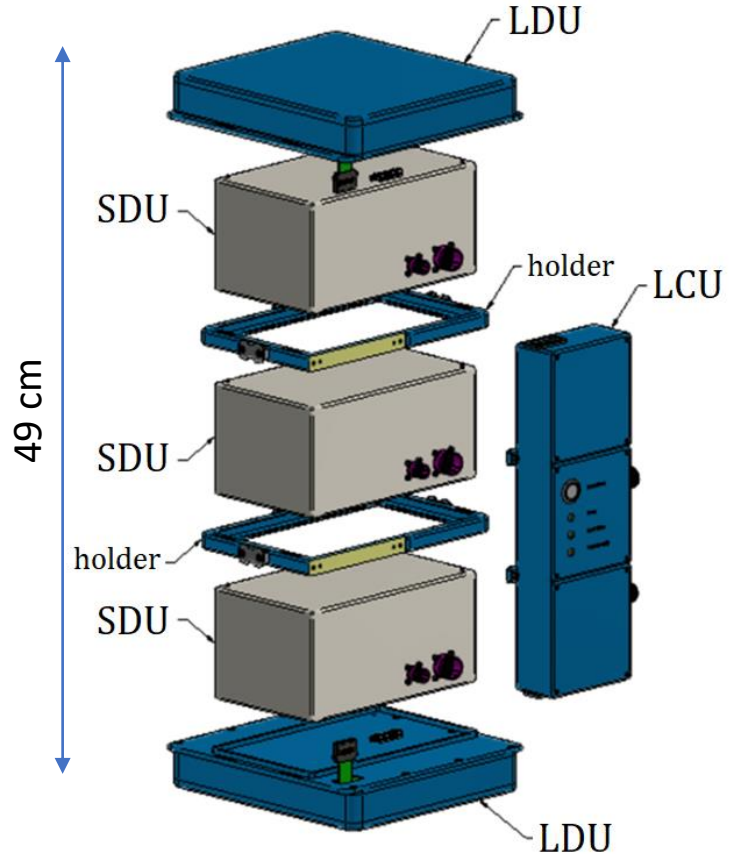


Figure 1: Medipix2 chip and Timepix assembly.  
(Source: CERN/Medipix.)



- Hybrid silicon pixel detector utilizing Medipix2/Timepix technology from CERN ([medipix.cern.ch](http://medipix.cern.ch)).
  - $256 \times 256$  pixels, each with a  $55 \mu\text{m}$  pitch ( $1.982 \text{cm}^2$ ).
  - Opening angle:  $4\pi$ .
- Low mass/power/cost make it an ideal technology for space applications.

FoV 9° - 20°

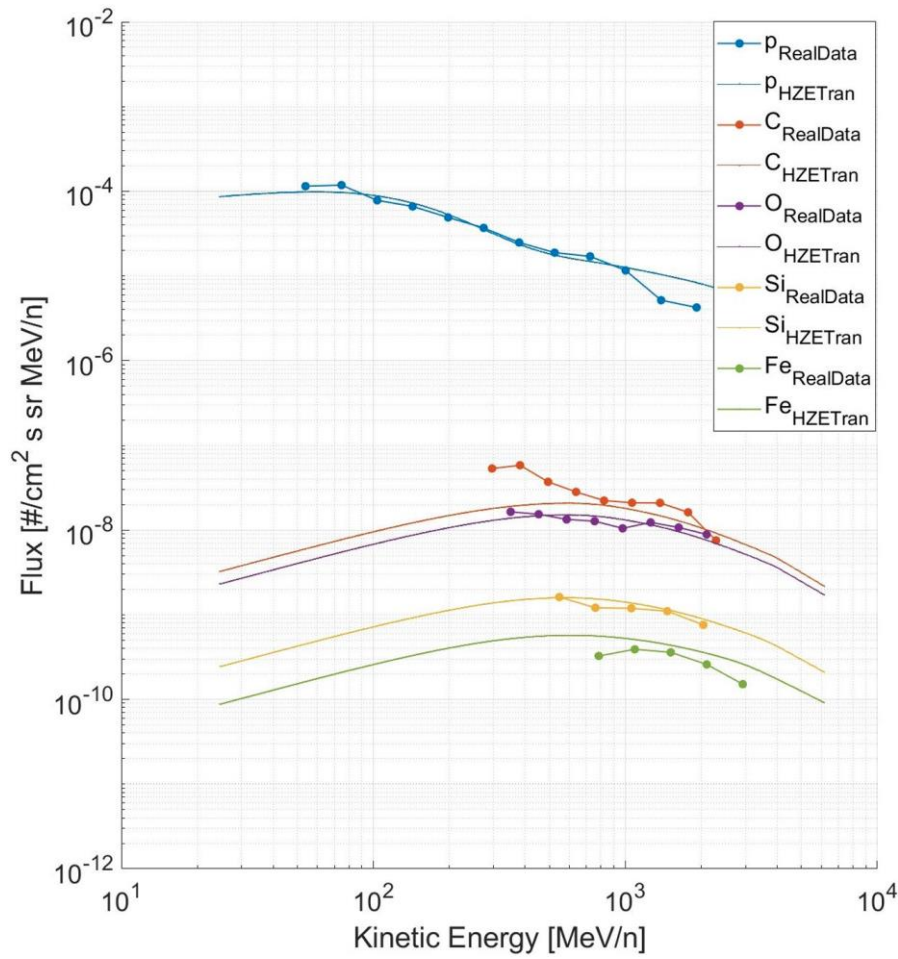


GF: 15.32  $cm^2 sr$  (bi-directional)

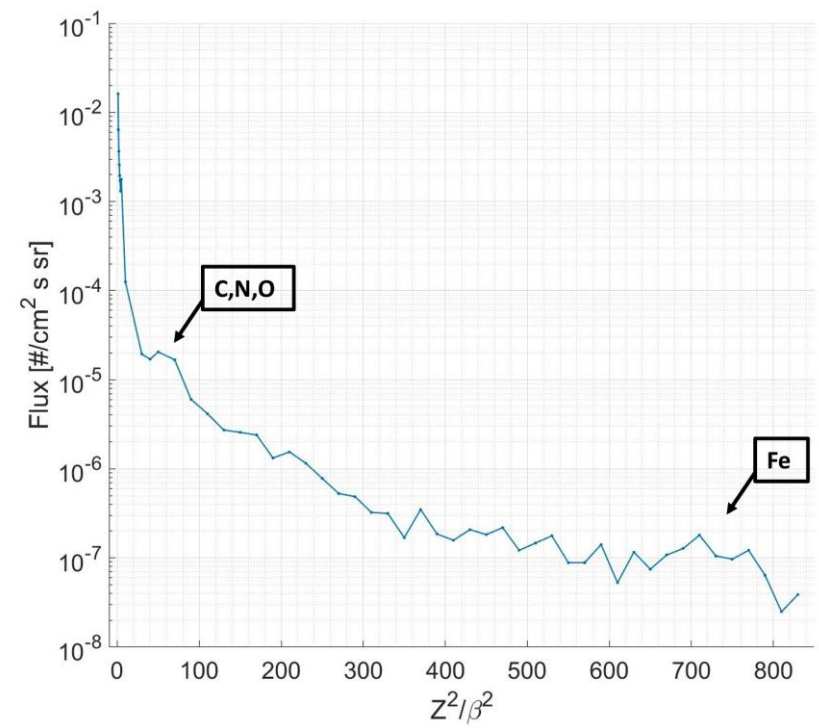
18 Si planes: [0.038 x (2 x 8) x 8]  $cm^3$

2 Scint. planes.: [0.4 x (8 x 2) x 8]  $cm^3$

## First detector measuring ToF in a space habitat

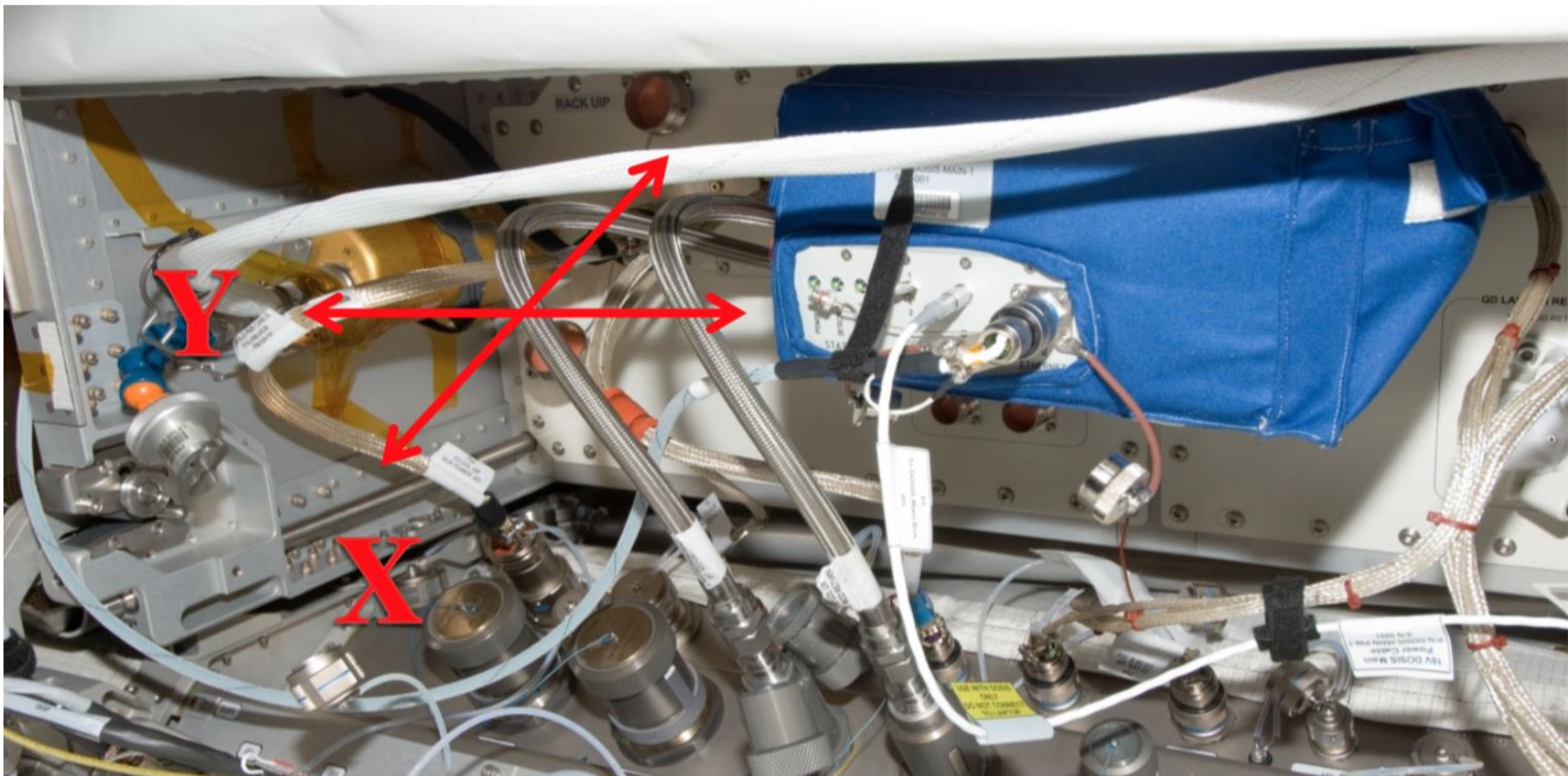


↑  
First Kinetic energy spectra

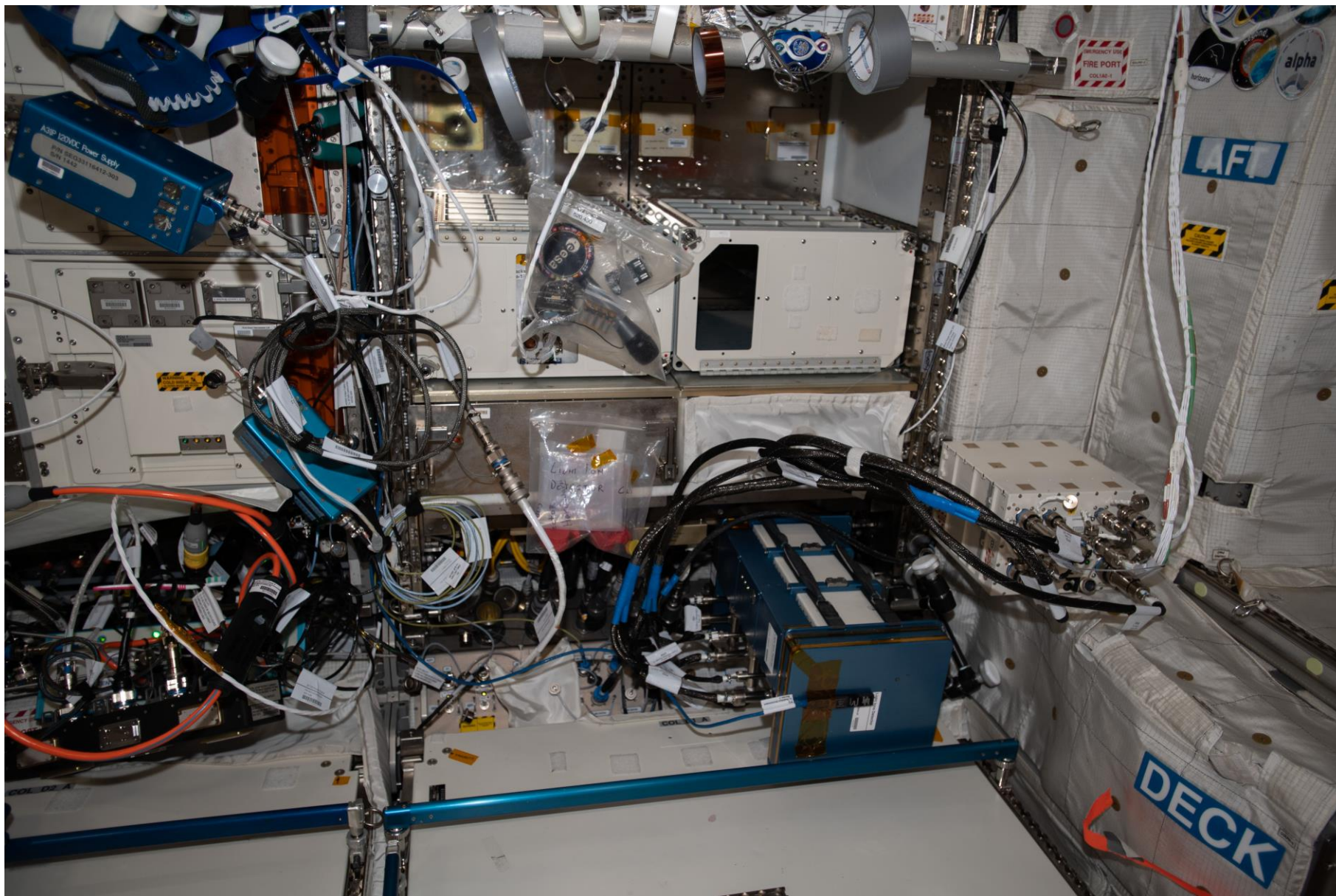


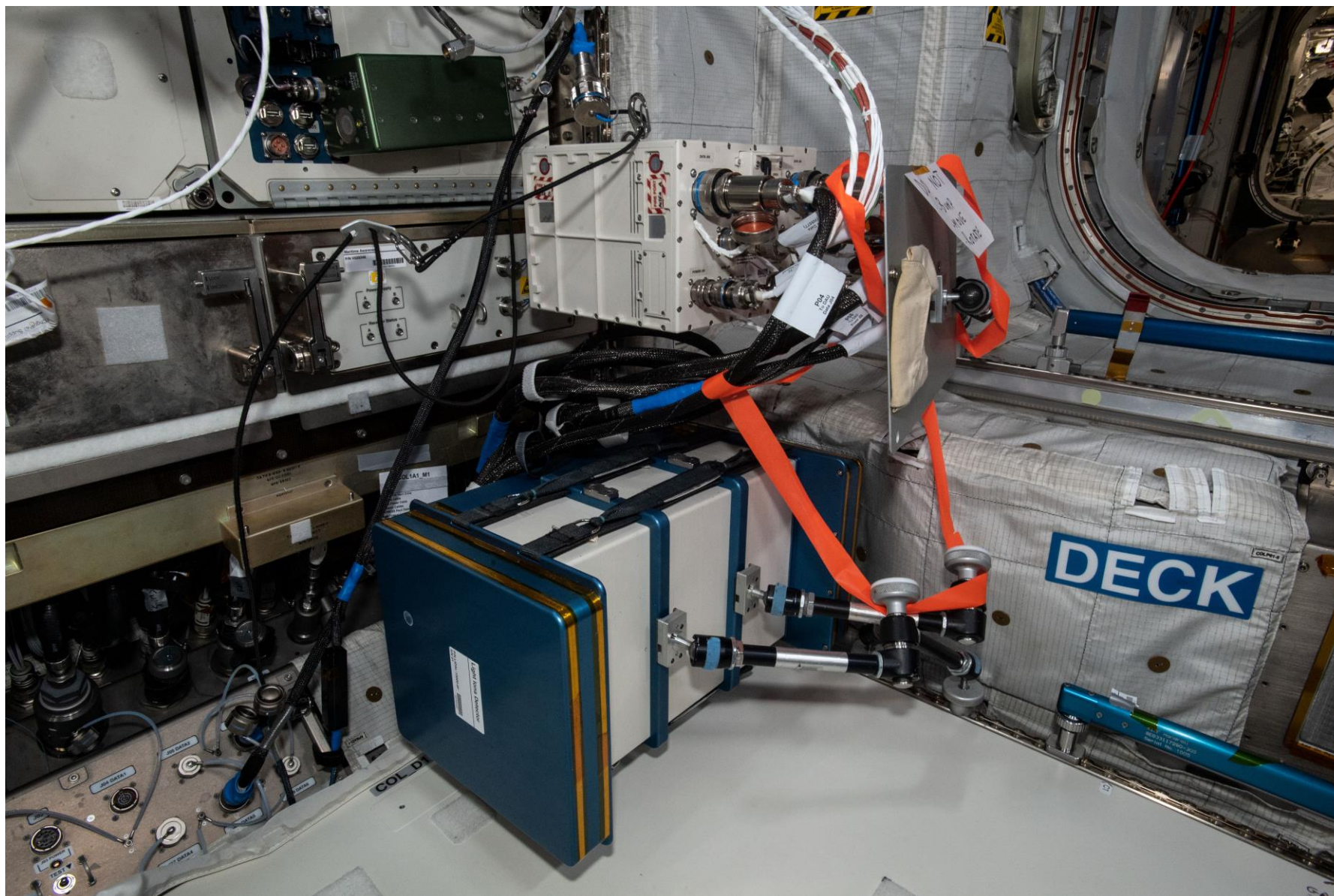
↑  
First  $Z^2/\beta^2$  spectra  
→ measurement of NASA Q

# Where: DOSTEL site (fixed)



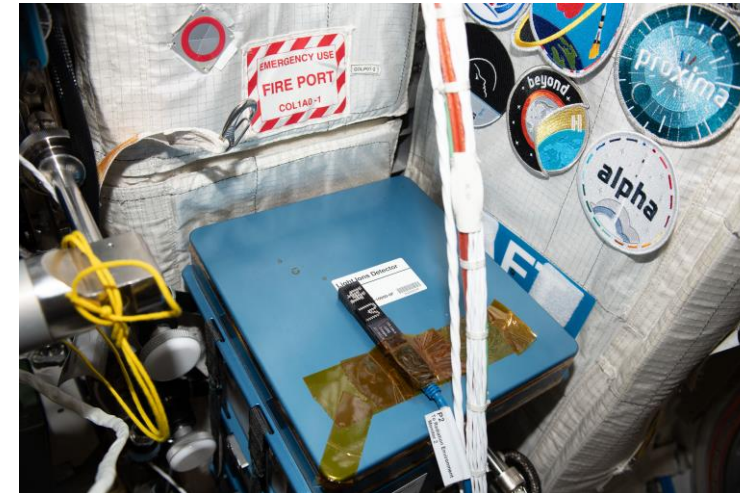
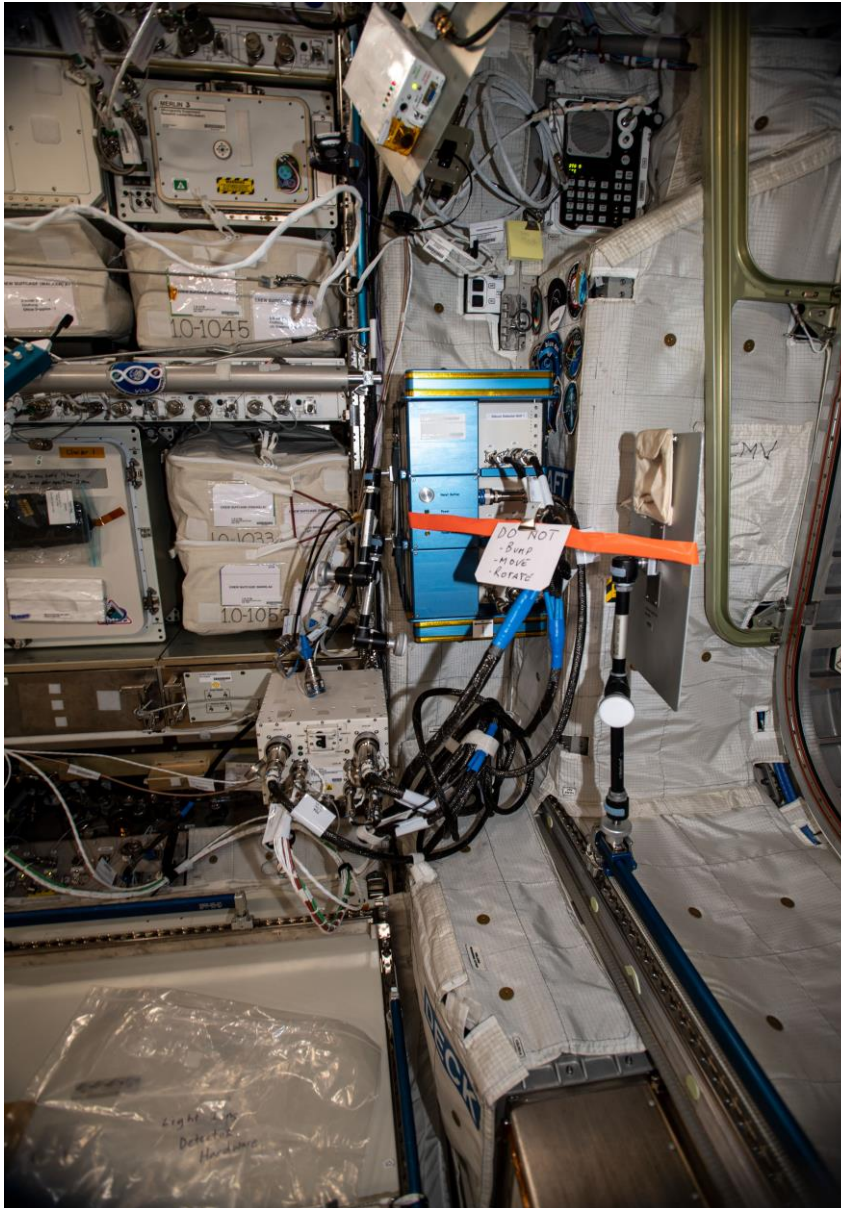
# Where: LIDAL X / REM







# Where: LIDAL Z/REM

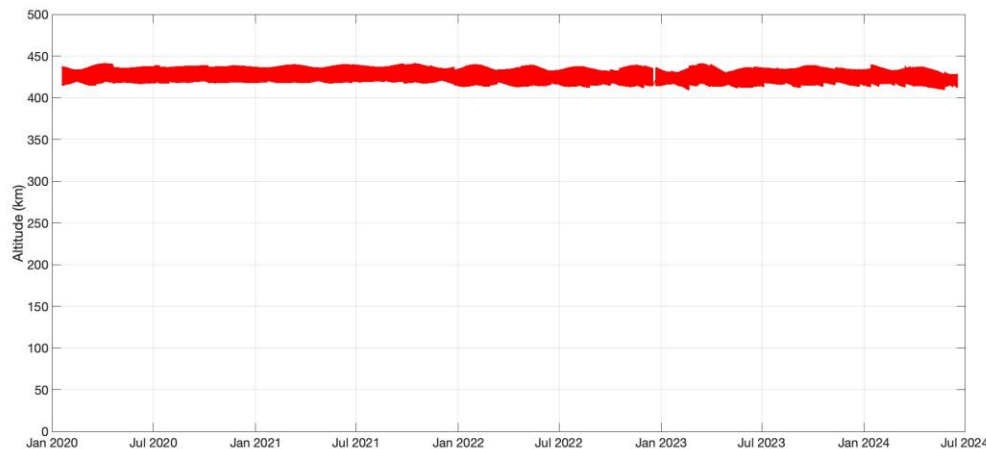


## Measurement times

Detector	from	to*
LIDAL	2020 Jan 19 <sup>th</sup>	2024 Jun 10 <sup>th</sup>
DOSTEL1	2021 Mar 4 <sup>th</sup>	2024 Jun 16 <sup>th</sup>
DOSTEL2	2020 Jan 1 <sup>st</sup>	2024 Jun 24 <sup>th</sup>
REM	2021 Sep 17 <sup>th</sup>	2024 Jun 1 <sup>st</sup>

\* All four detectors are still running and acquiring data. The 'to' date refers to the data shown here

Altitude would not be an issue during the considered period:



- RadLab**
- Overview
- LEO
- ISS
- BLEO
- Time series plots
- Data comparison
- Geospatial plots
- Knowledgebase
- Data API
- Settings

**The RadLab portal and the RadLab data API**

RadLab is a portal that aims to provide a single point of access to radiation telemetry data from multiple databases maintained by multiple space agencies. The Web interface provides the ability to query, visualize, inspect, and download data; for example, [time series plots](#) of readings from multiple instruments, [pairwise comparisons](#) of instrument readings, and [geospatial visualizations](#) of absorbed radiation dose rate and flux registered by the instruments. The underlying [API](#) enables data selection and retrieval at a programmatic level.

[Read about the data and features in the current release](#)

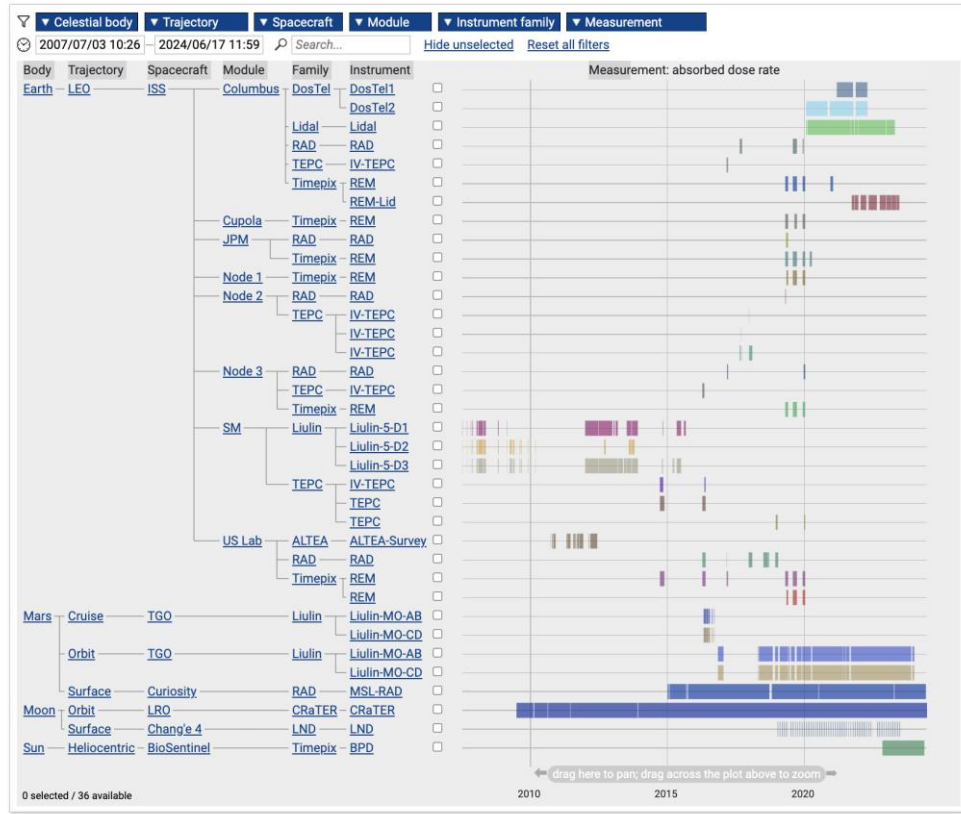
[Read about interactive plots](#)

**Overview of available instrument readings**

Explore [the data available from the ISS](#) or from [instruments in BLEO](#), or directly explore the overview table below to filter for instruments (using the dropdowns above the table) and time spans of interest (by panning and zooming the interactive plot).

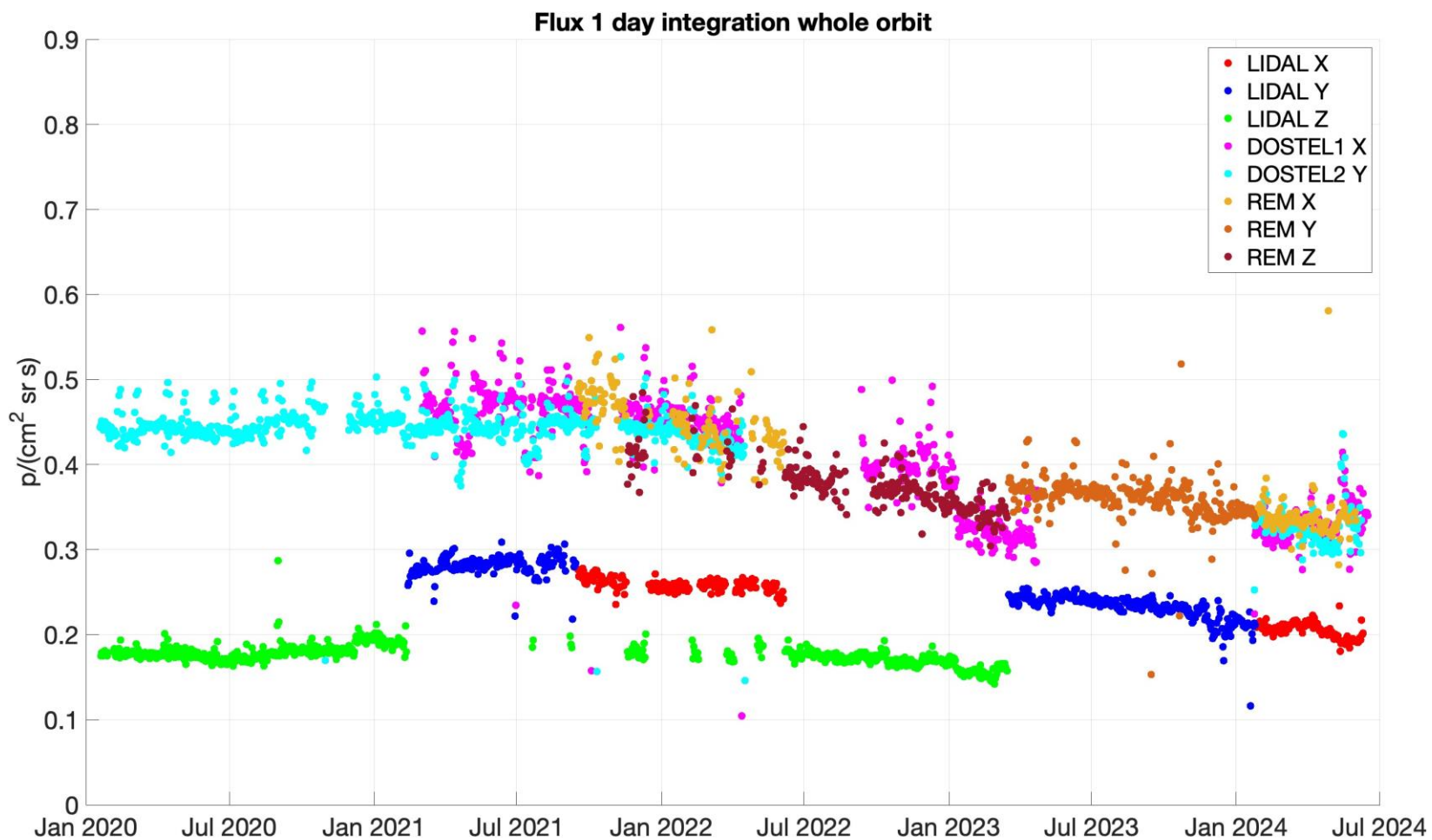
Tick the checkboxes next to the instruments of interest to proceed with more in-depth visualizations.

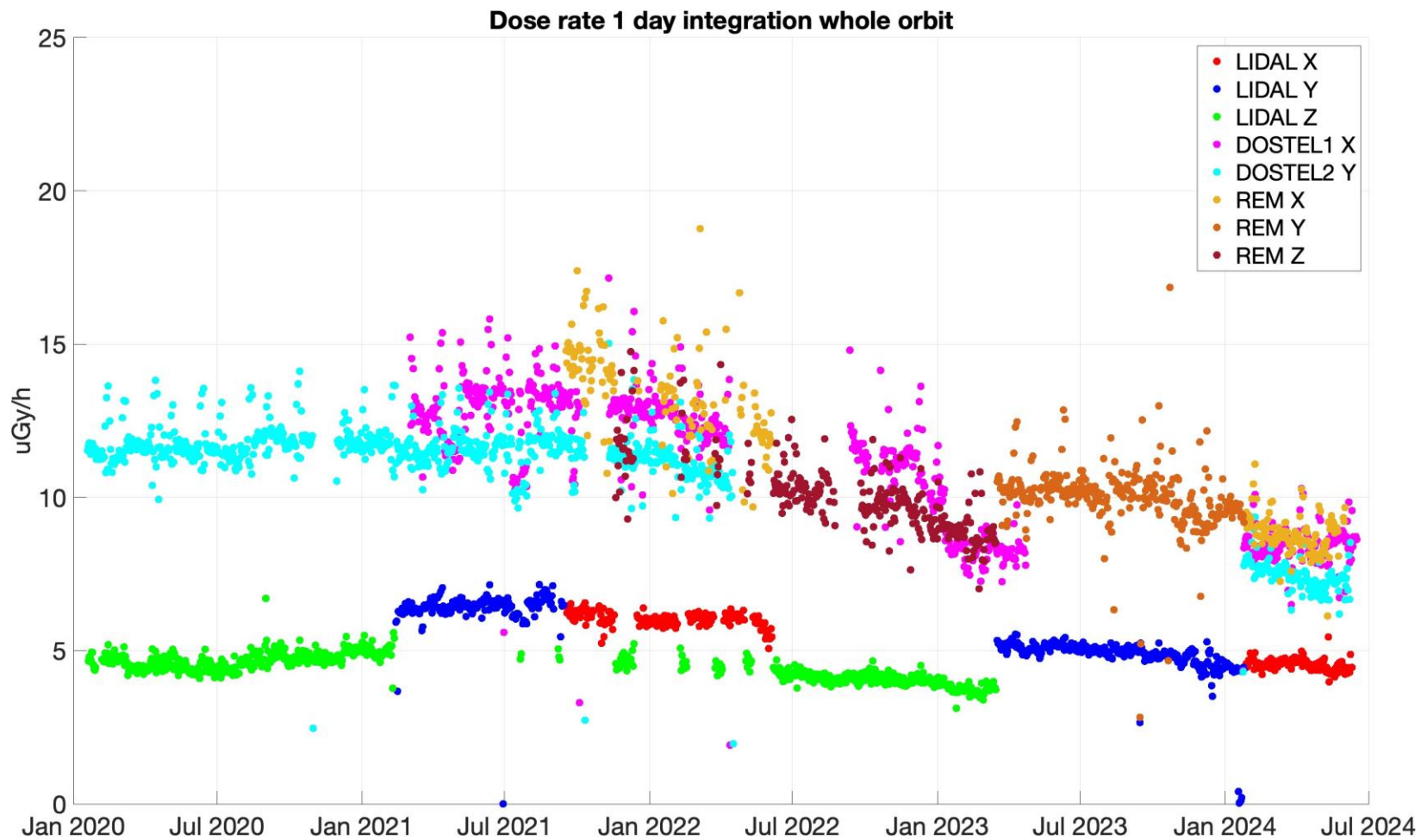
**DORELI** can be seen as a use-case of **RadLab**

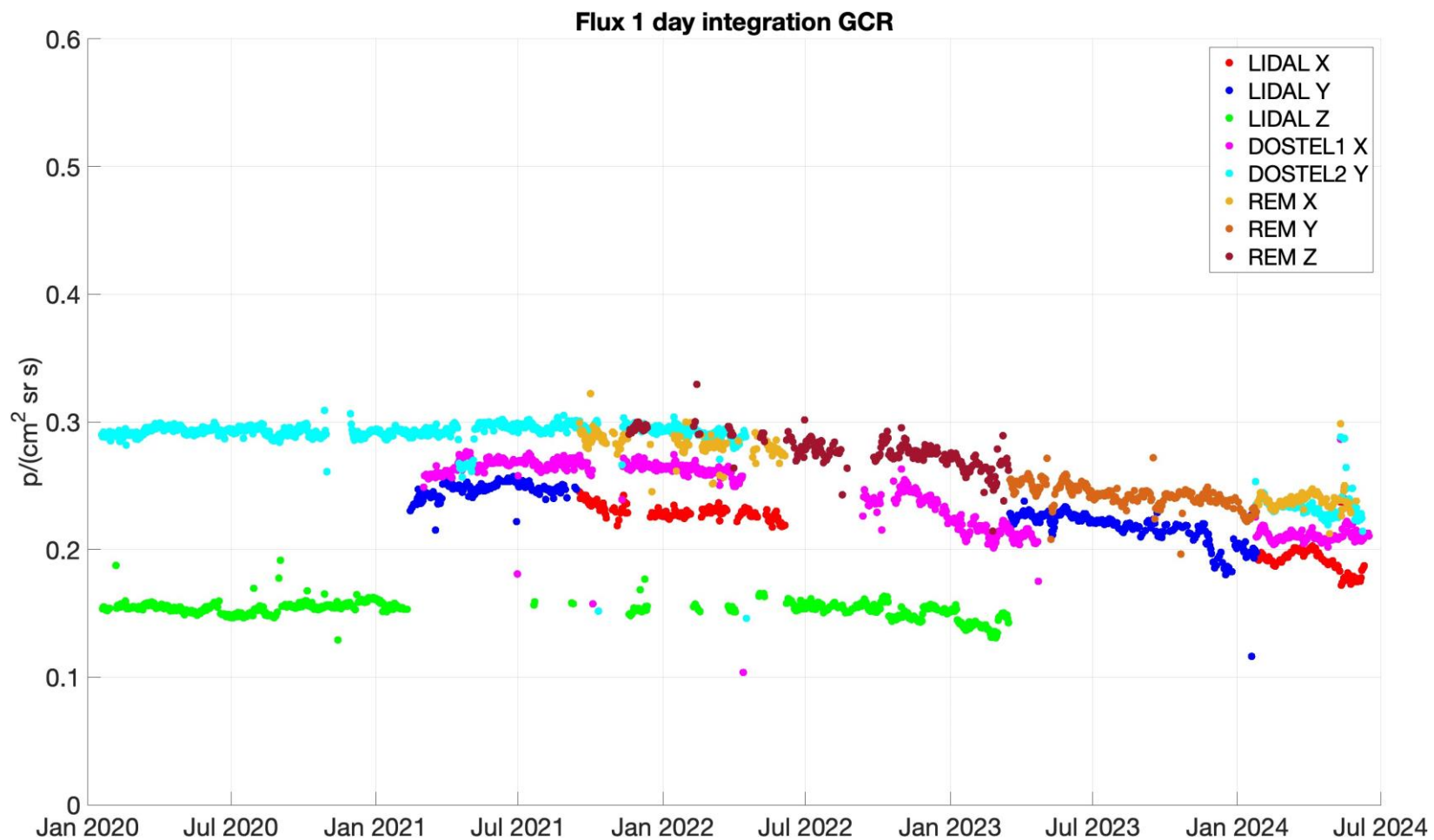


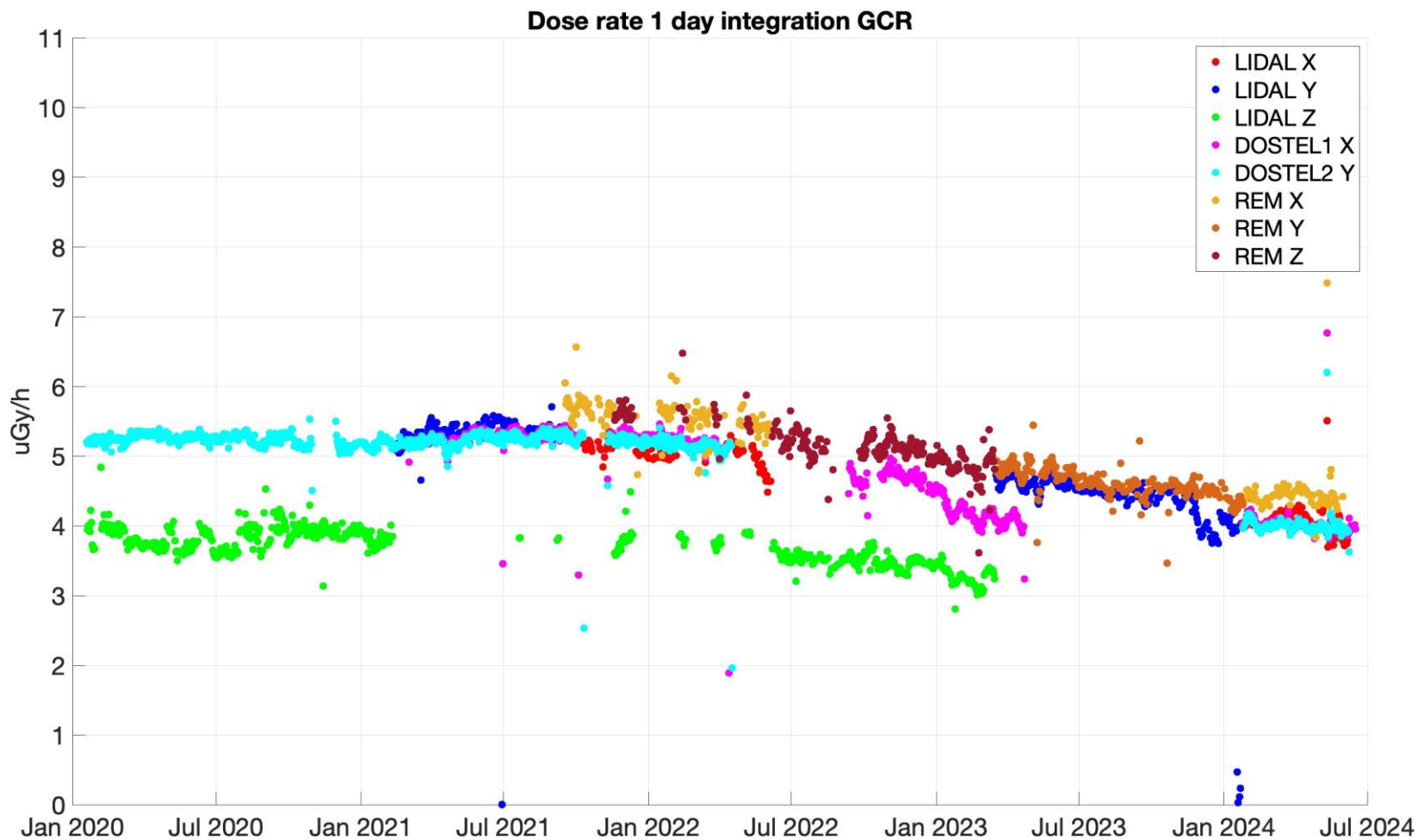
← DO  
← LI  
← RE

<https://visualization.osdr.nasa.gov/radlab/gui/overview/>

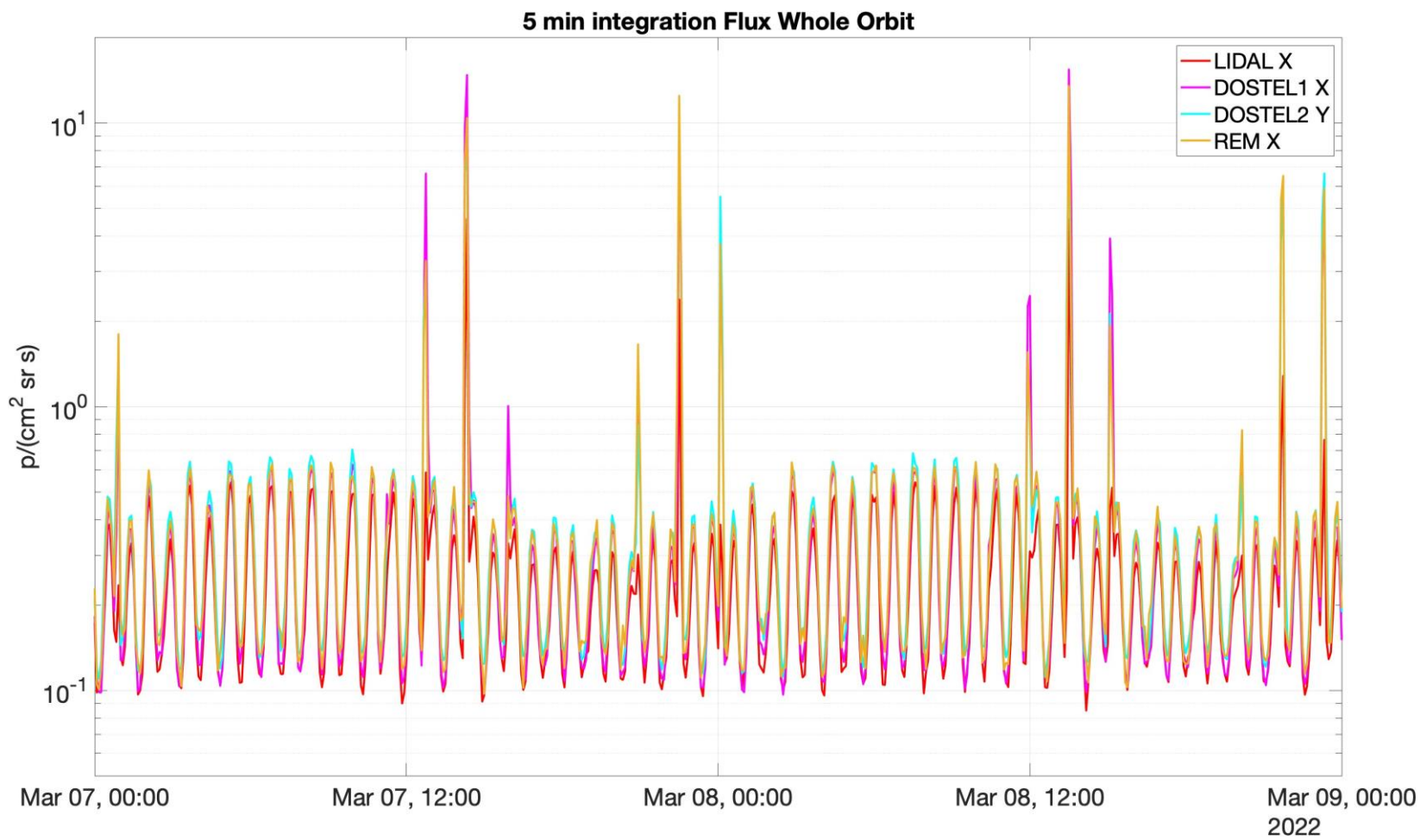






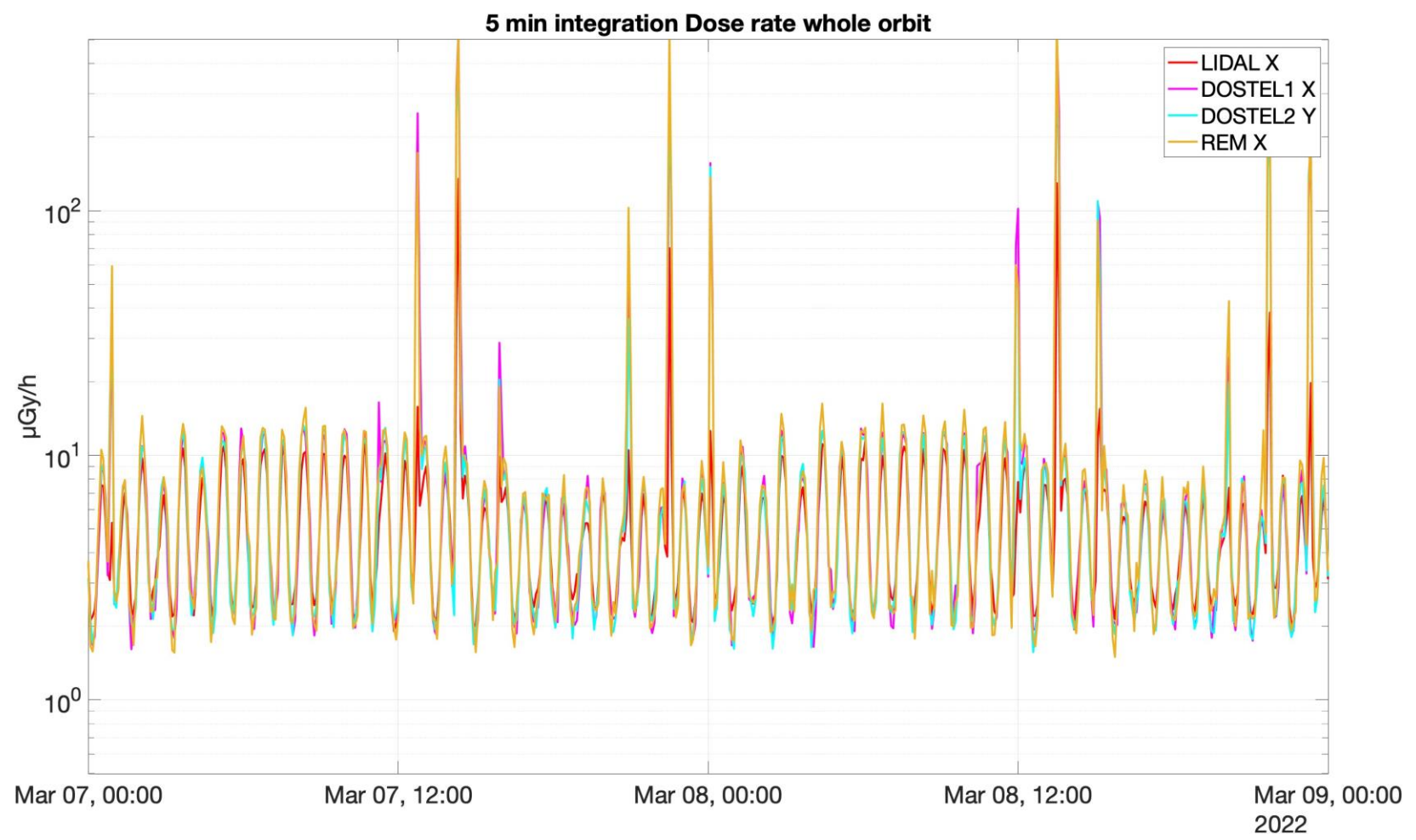


# Two 'normal' days flux

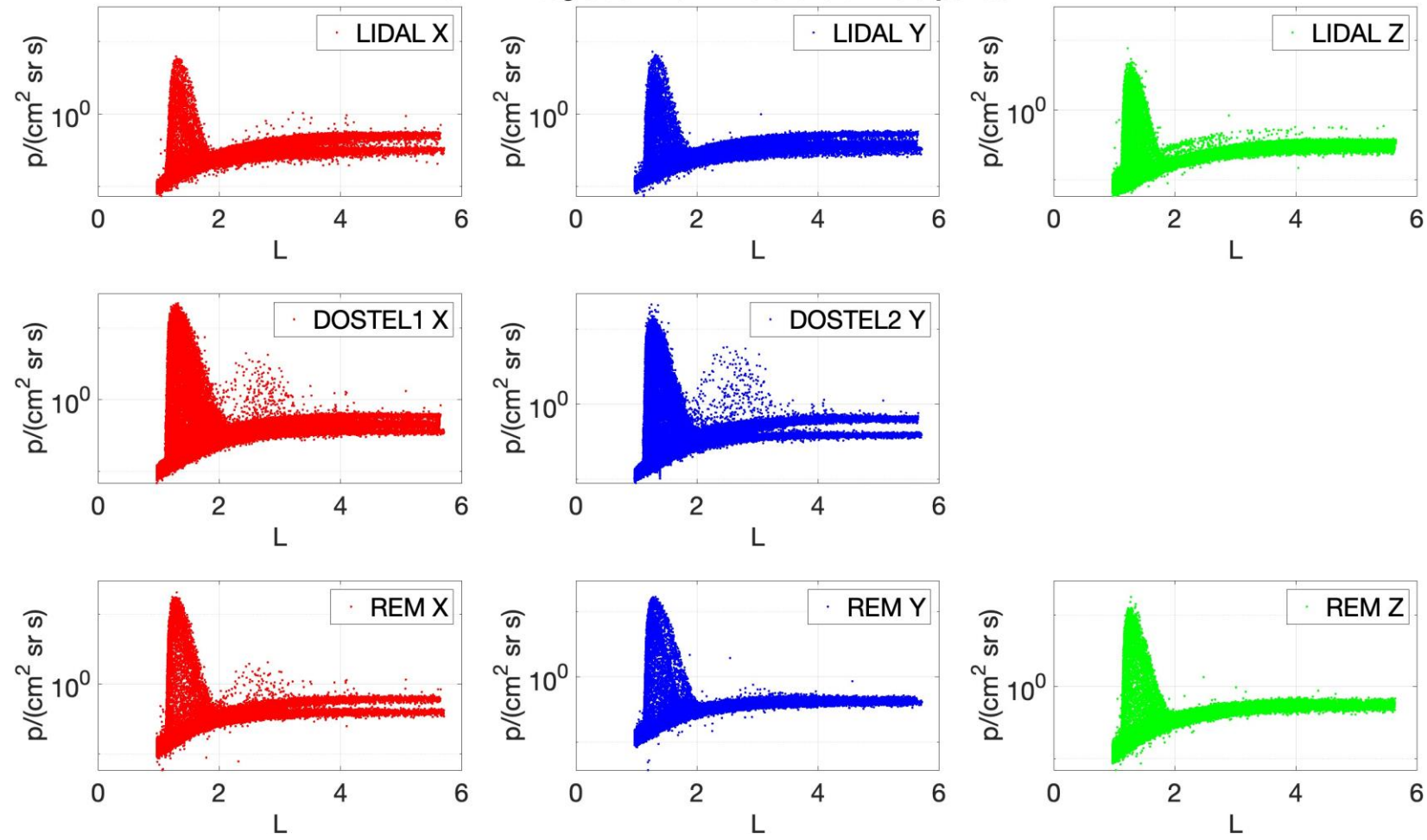




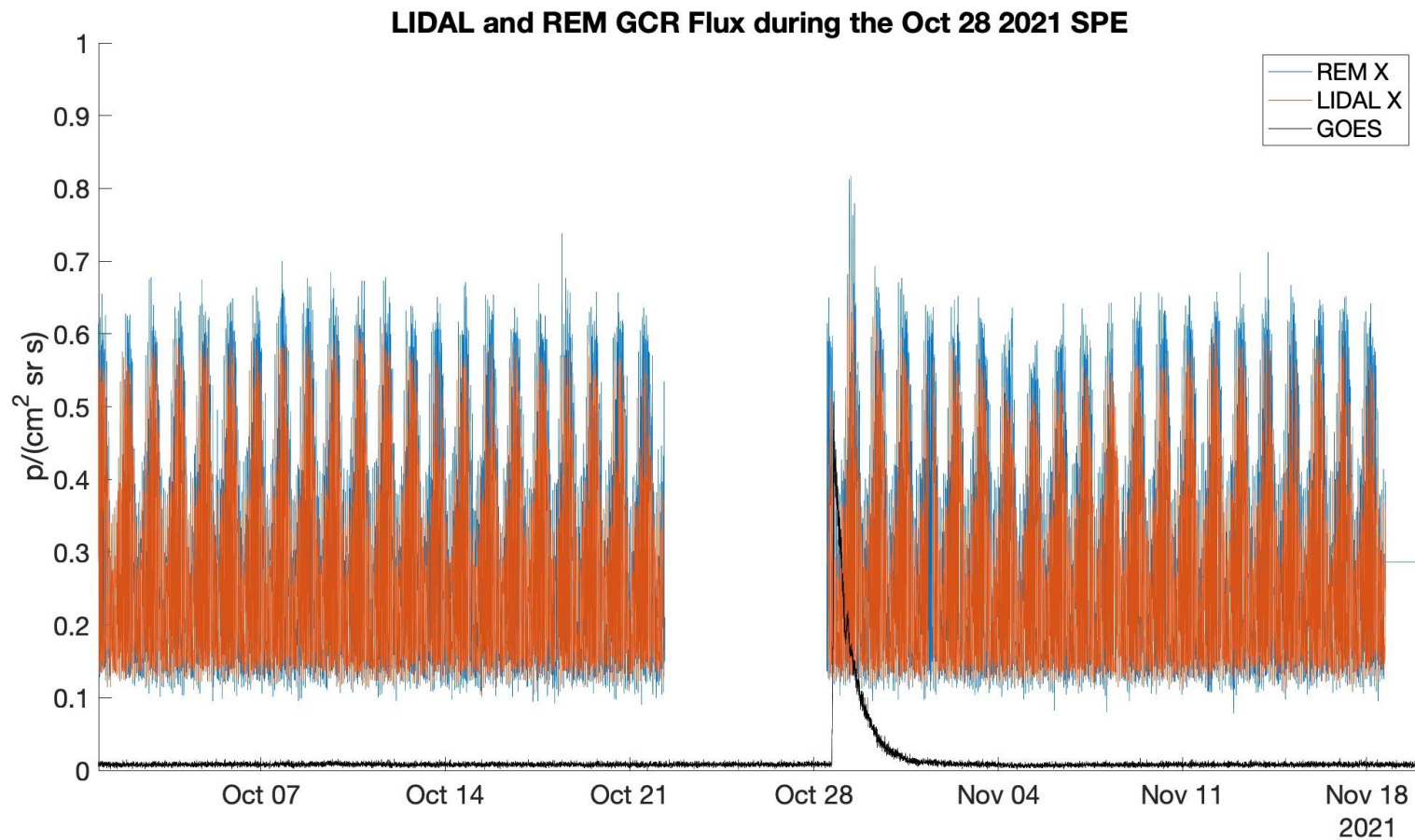
# Two 'normal' days dose rate

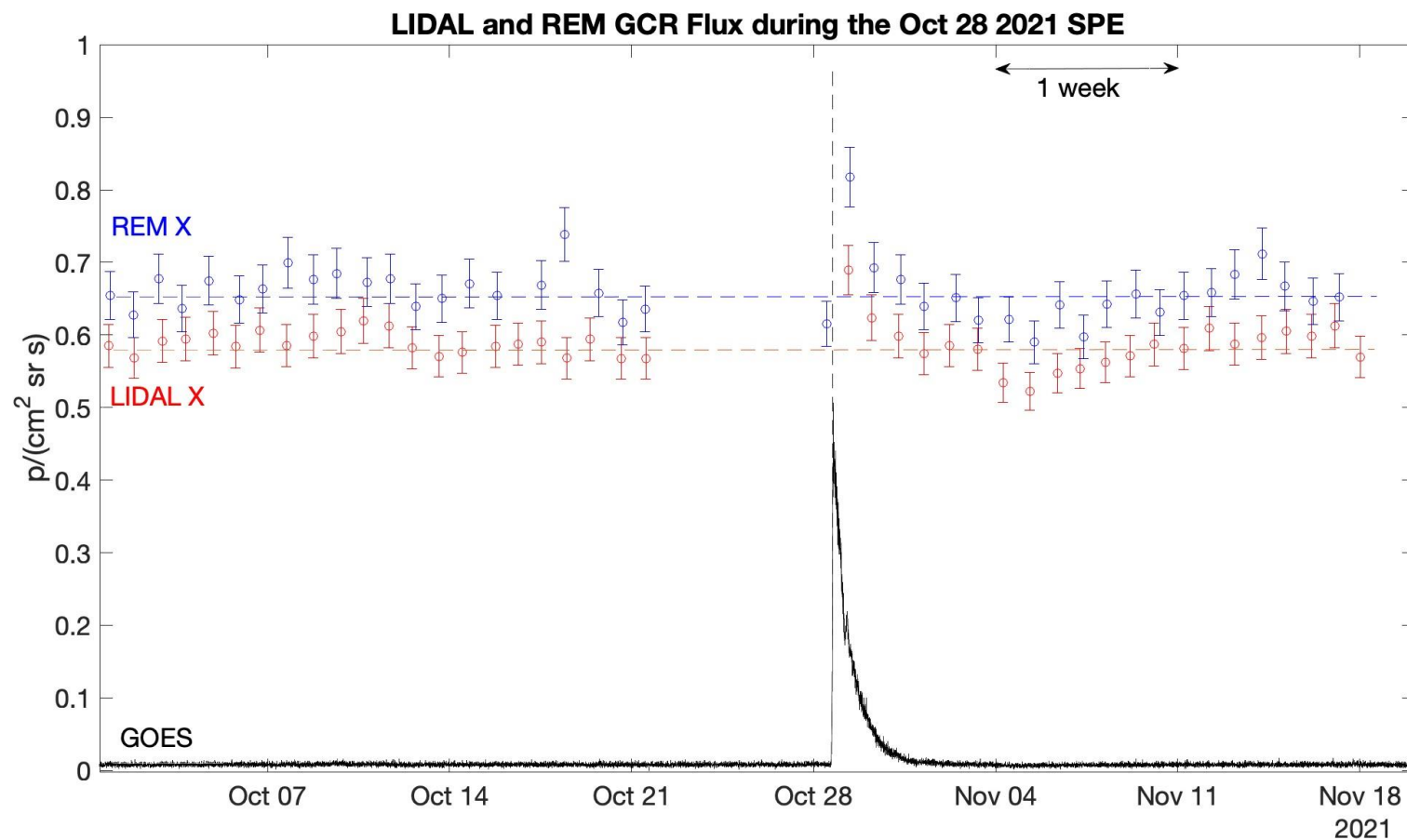


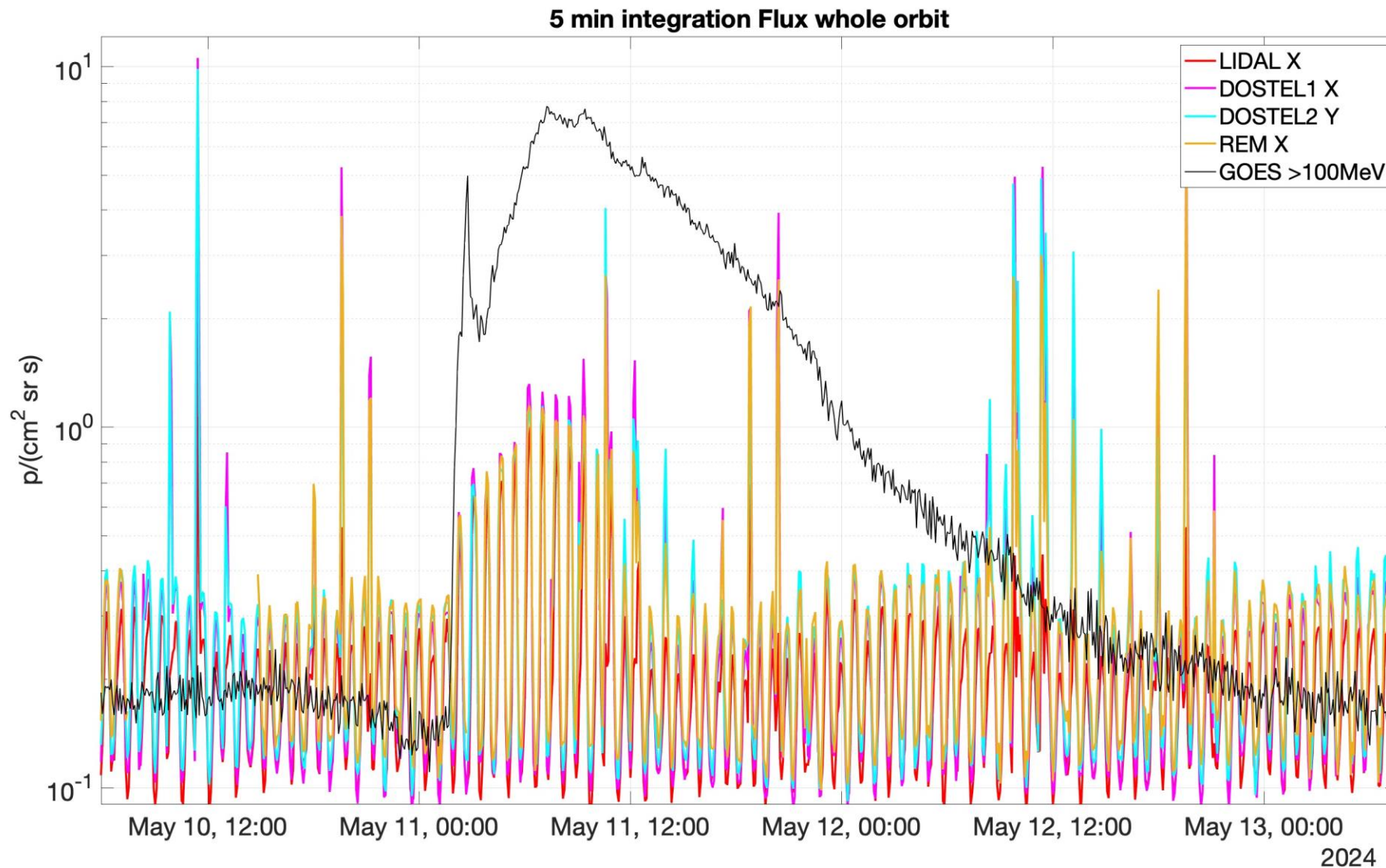
5 min integration Flux whole orbit whole period

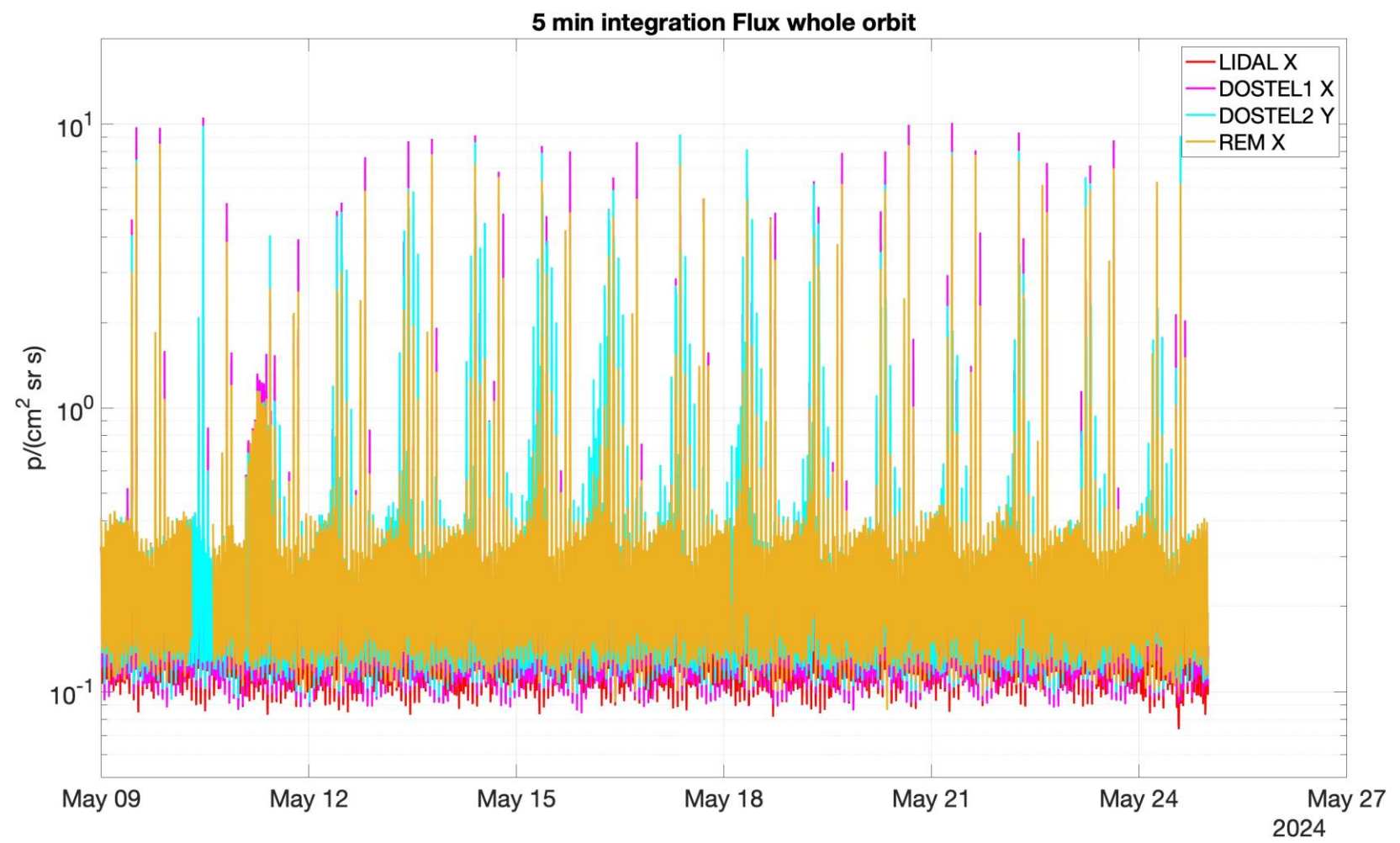


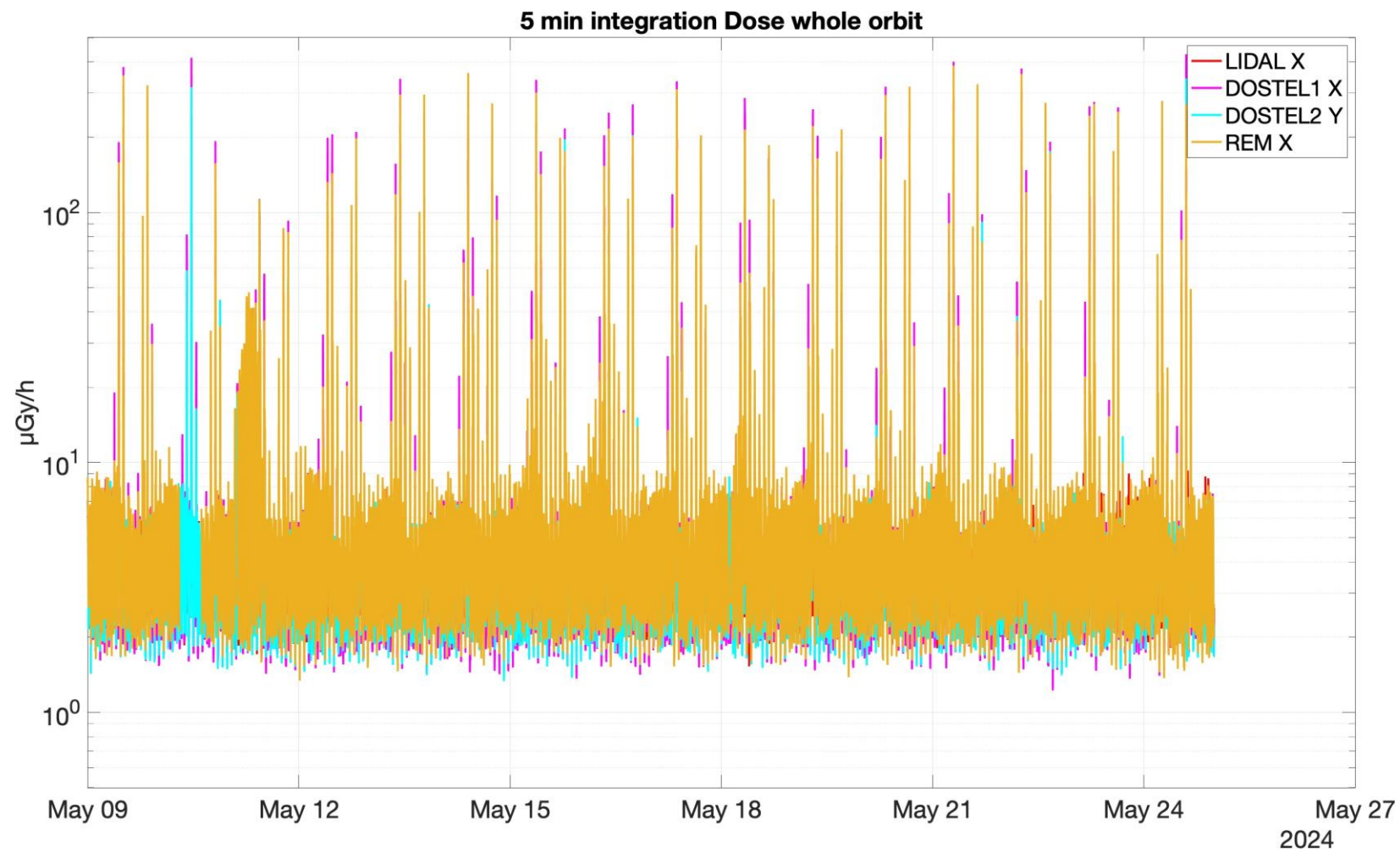
Let us look at SPEs measured by the different detectors



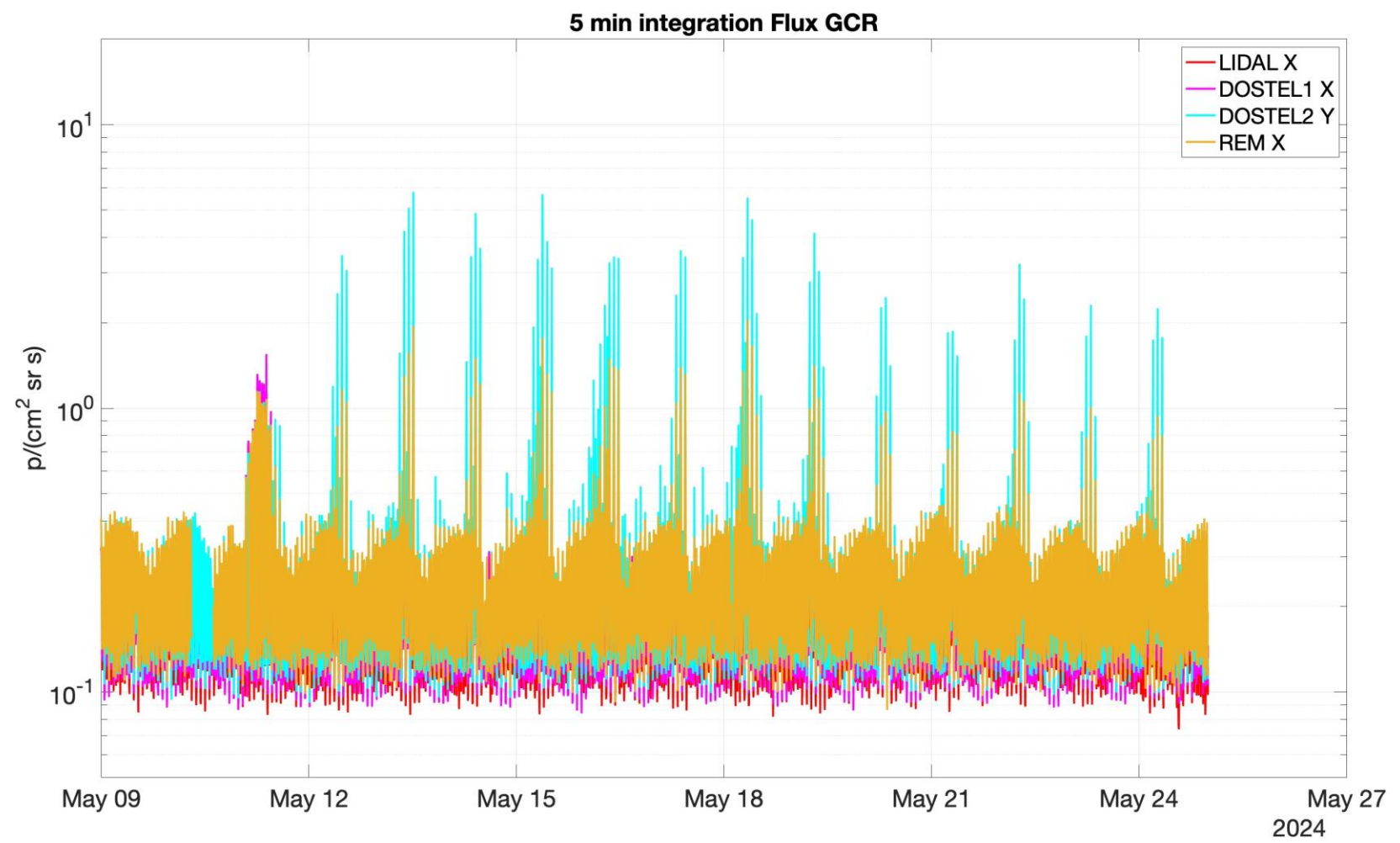


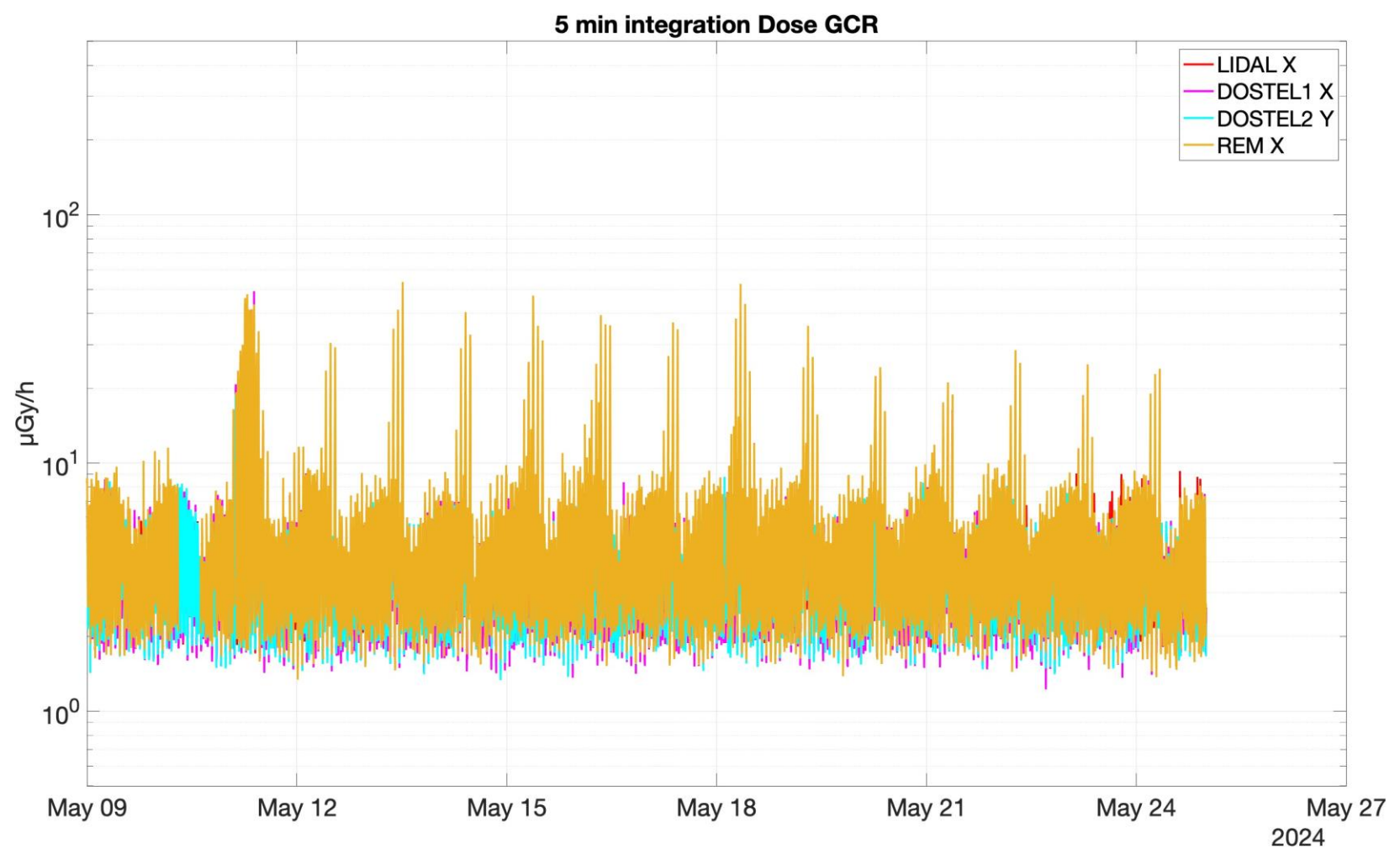




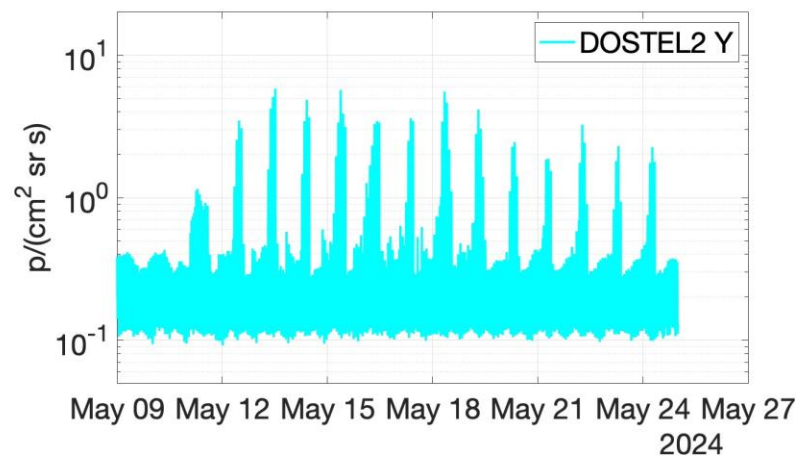
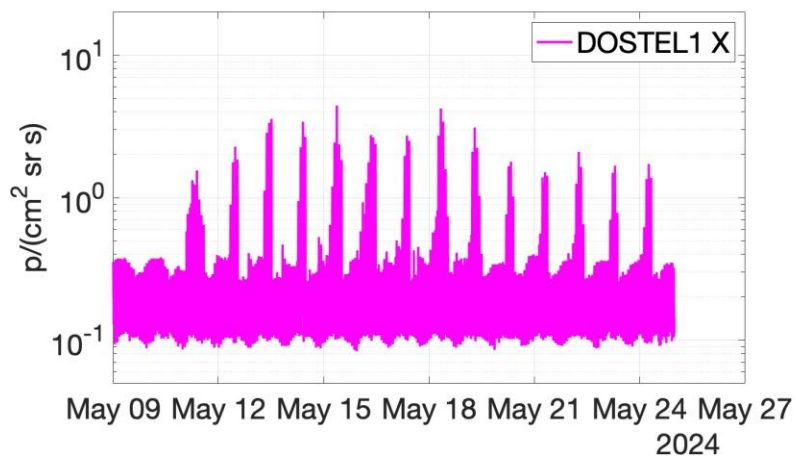
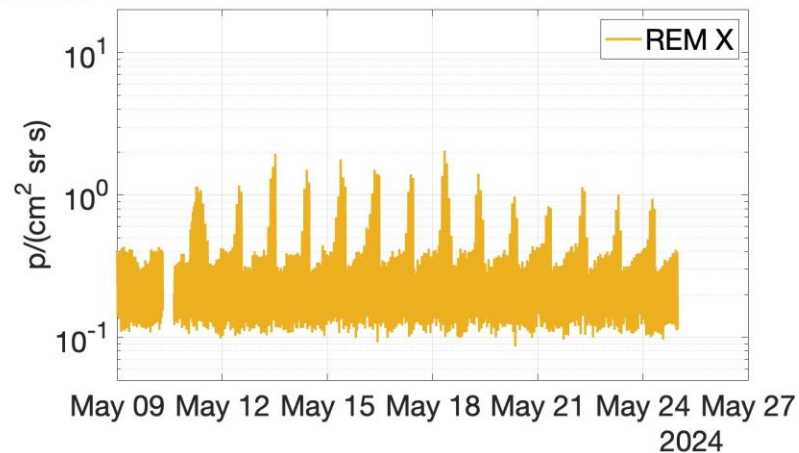
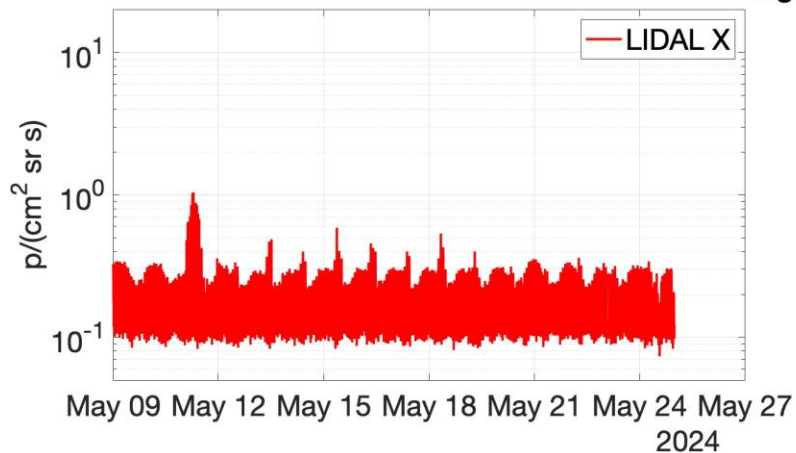




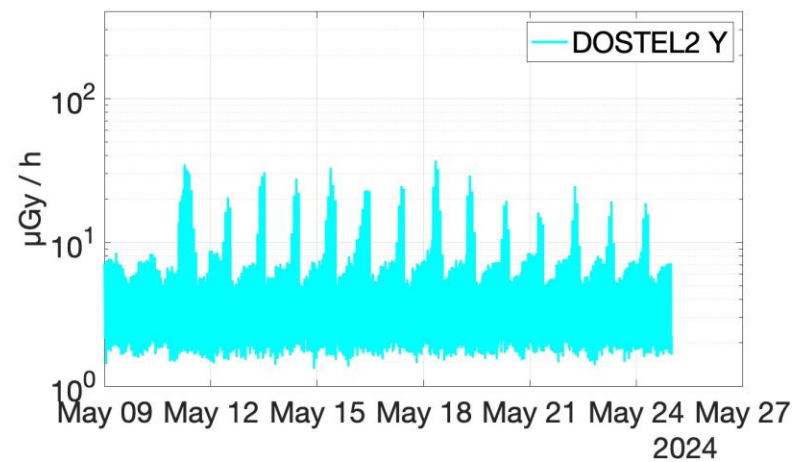
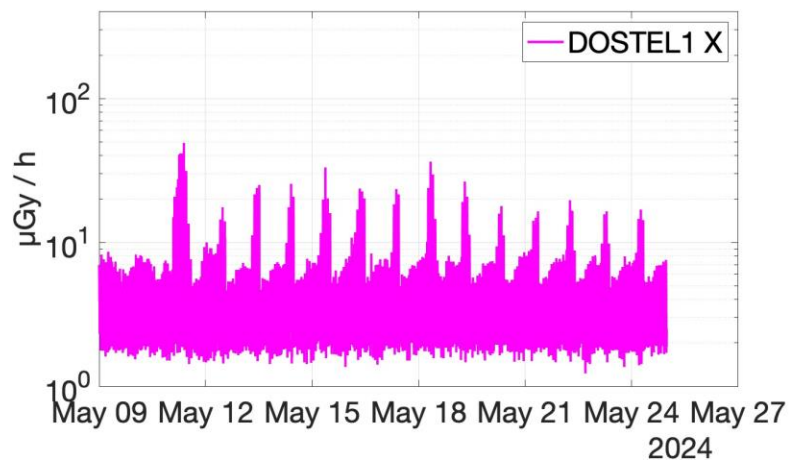
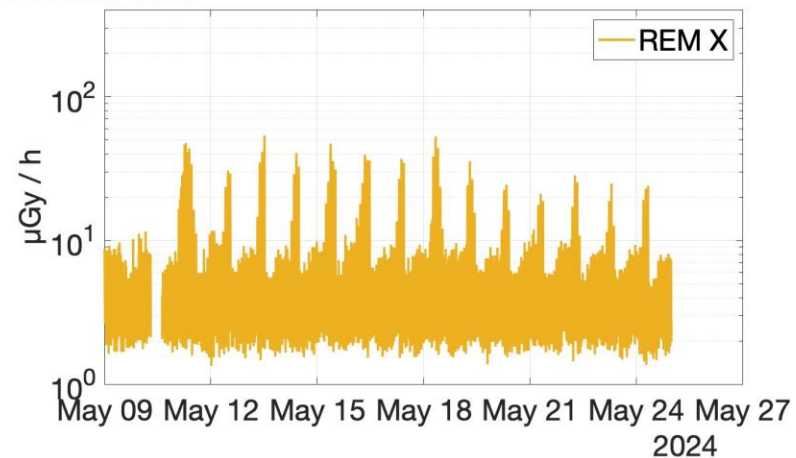
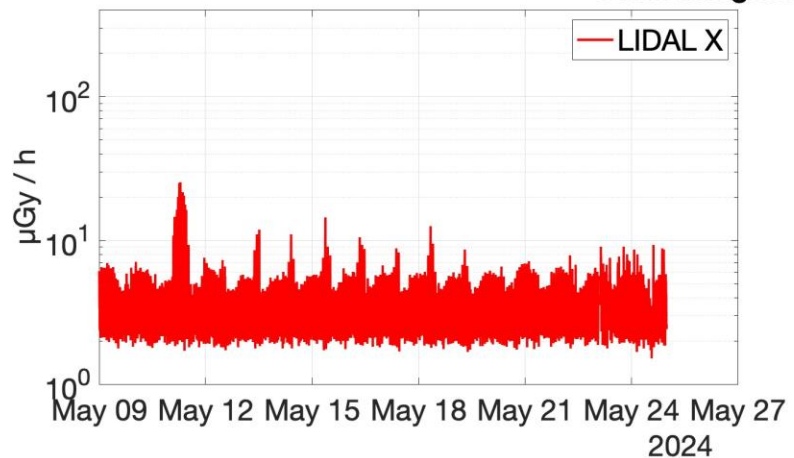




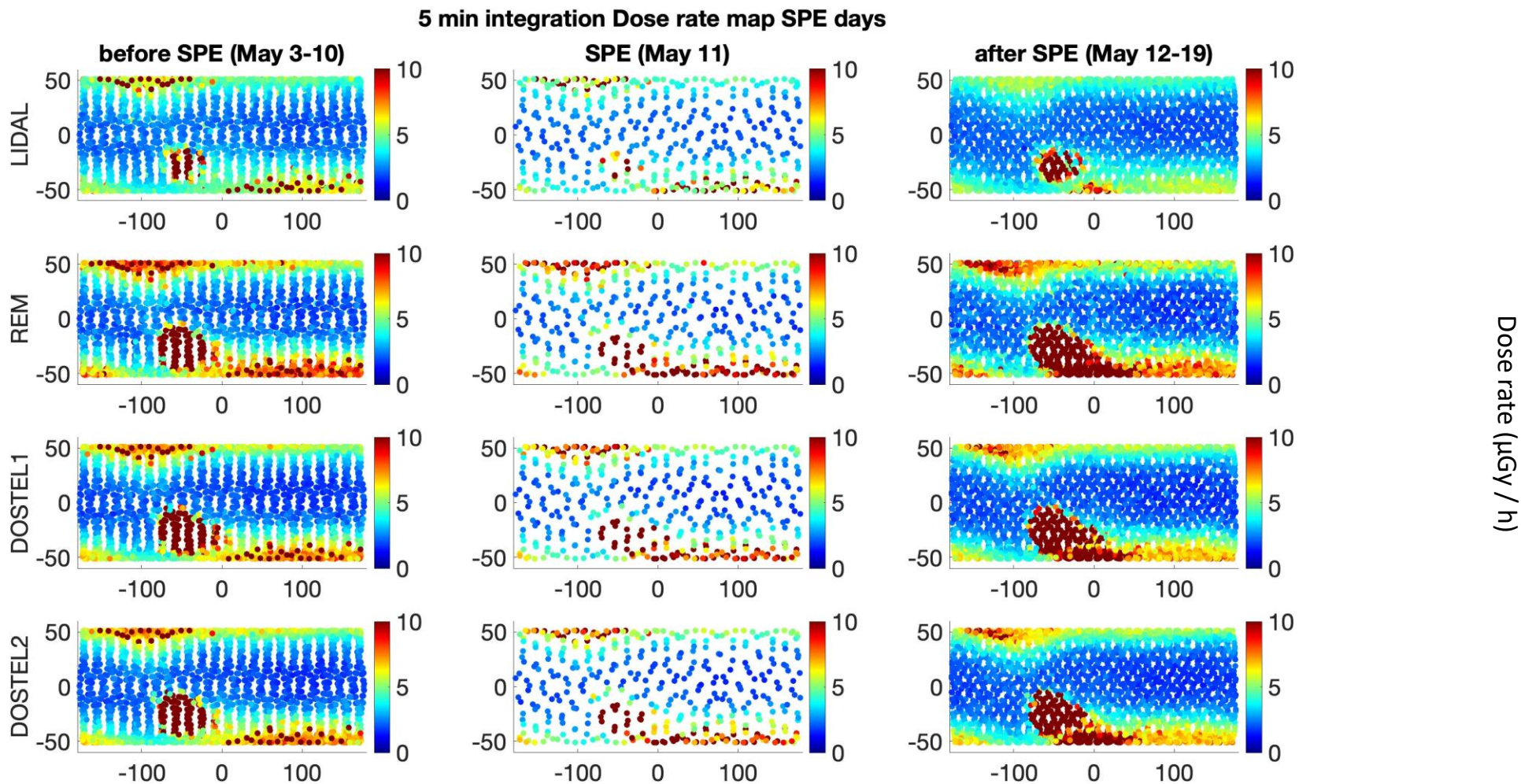
5 min integration Flux GCR



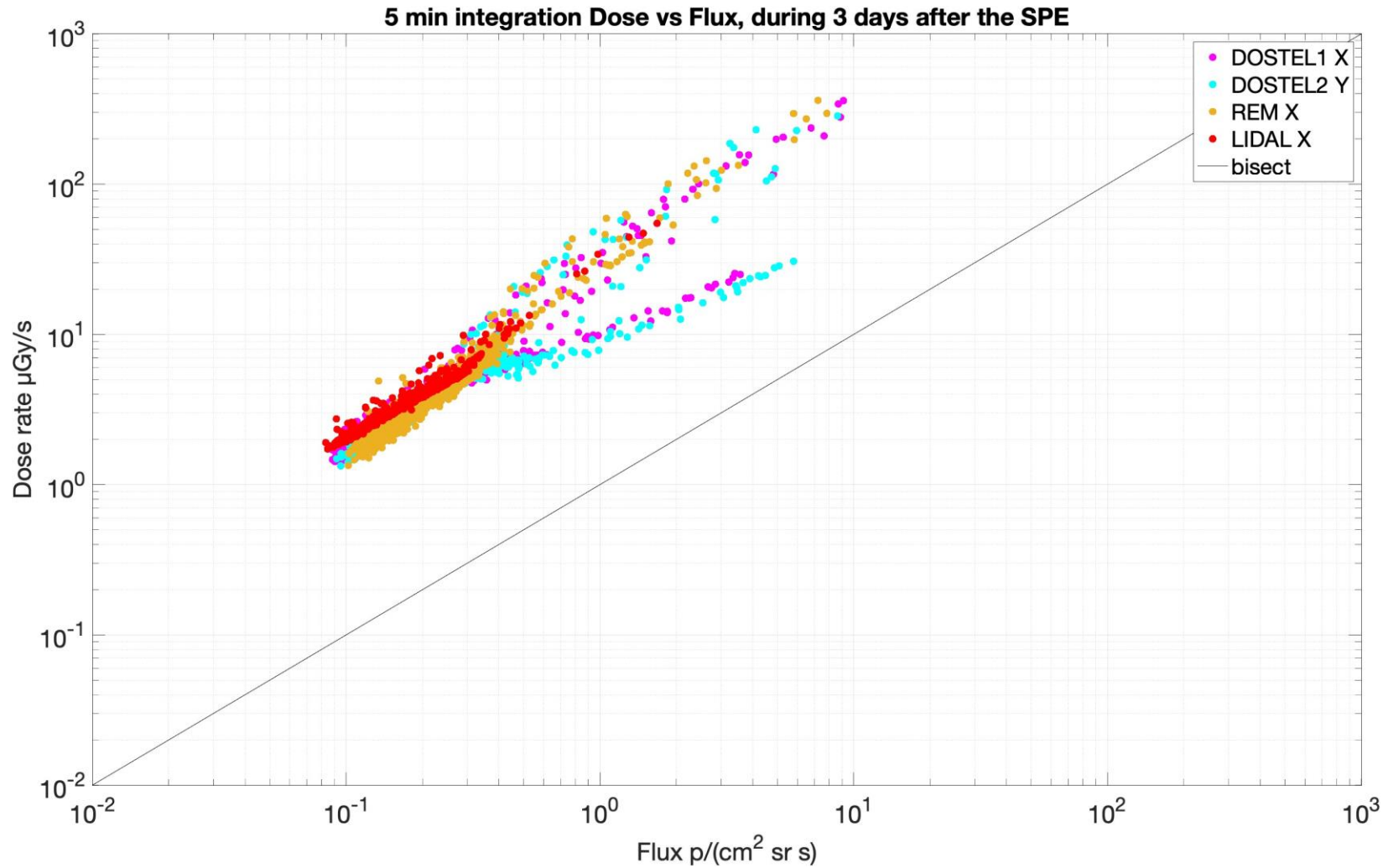
5 min integration Dose rate GCR



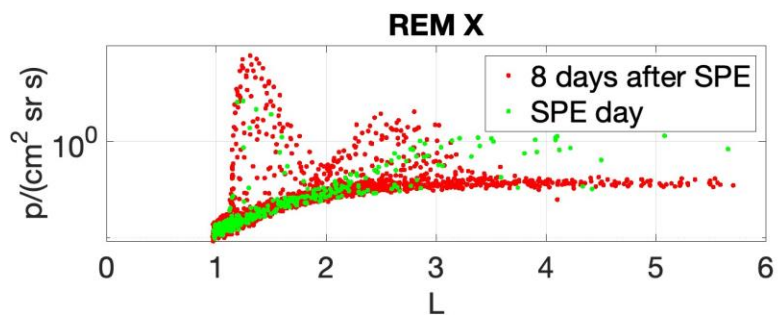
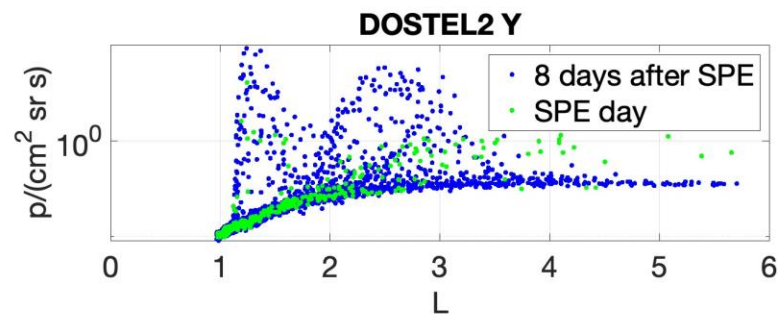
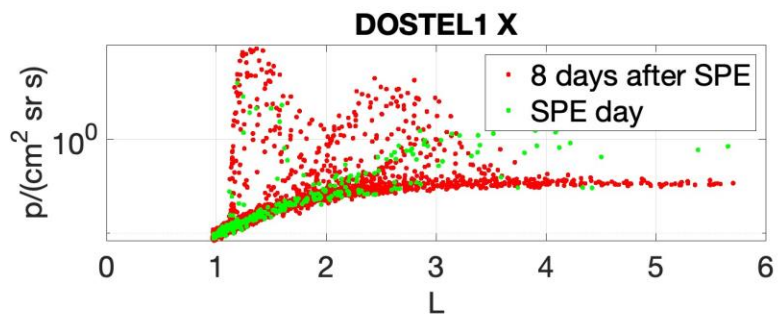
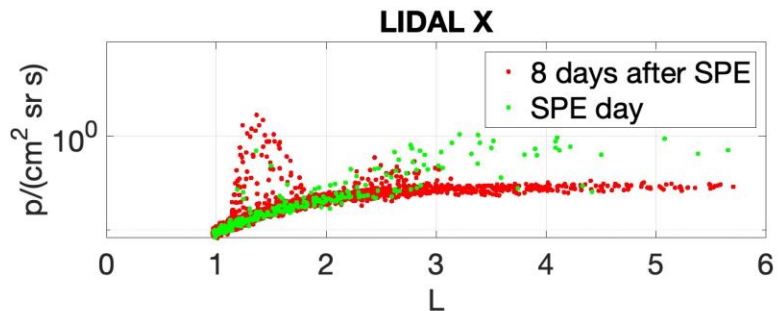
# World maps May 11<sup>th</sup> SPE



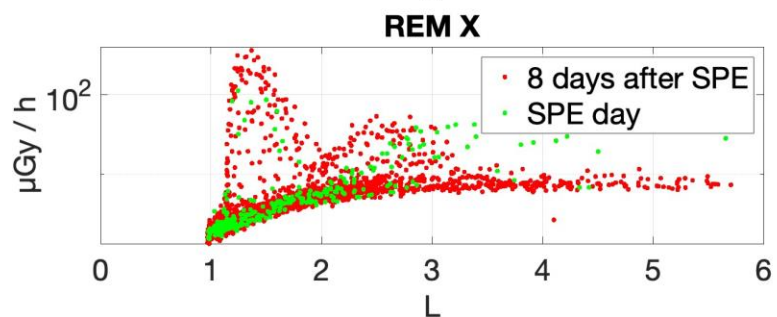
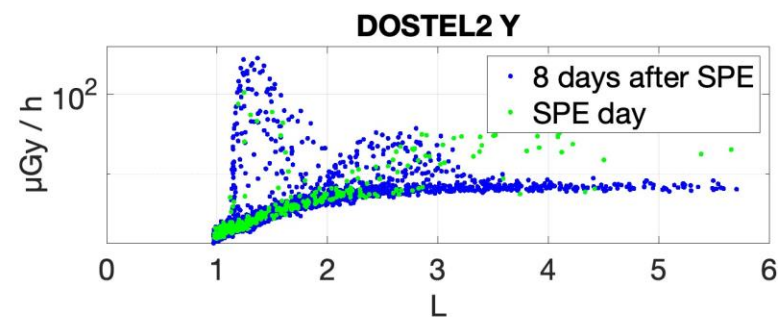
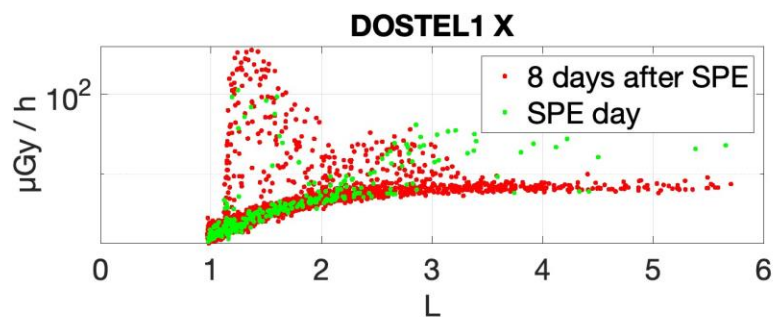
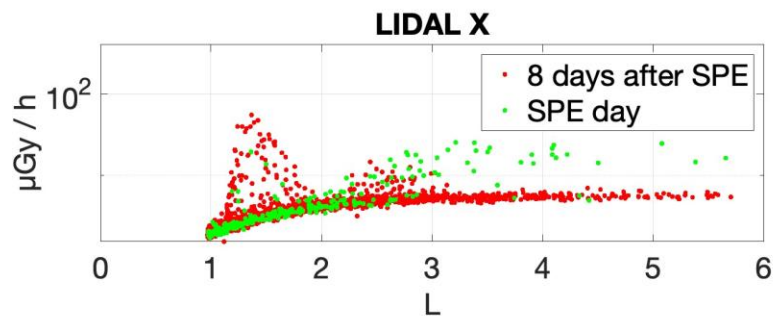
# Dose vs Flux after SPE



5 min integration Flux whole orbit SPE/after SPE days



5 min integration Dose rate whole orbit SPE/after SPE days





## LIDAL team

Livio Narici  
Virginia Boretti\*  
Luca Lunati •  
Giulia Romoli\*  
Giorgia Santi Amantini  
Luca Di Fino •  
Giorgio Baiocco  
Alice Mentana

## REM team

Kerry Lee\*  
Nic Stoffle\*  
George Stuart  
Tom Campbell-Ricketts  
Andy Castro

## DOSTEL team

Thomas Berger  
Daniel Matthiae  
Bartos Przybyla  
Sönke Burmeister\*  
Maximilian Brüdern

- \* Not anymore in the collaboration
- Not anymore in the LIDAL team, still partially collaborating

Thank you for your attention