Space Weather detections with housekeeping sensors onboard Mars Express, Rosetta, BepiColombo and Solar Orbiter
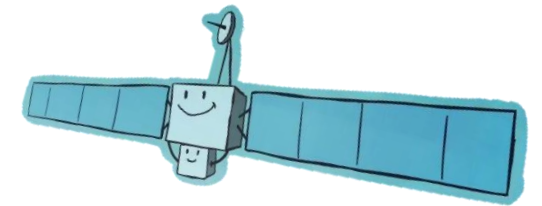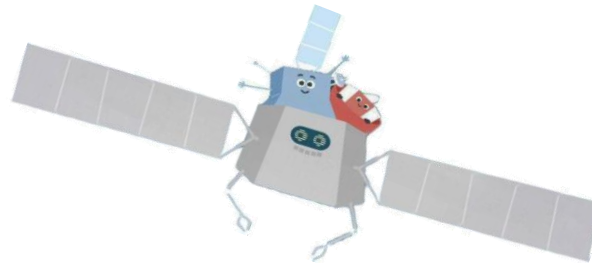
Beatriz Sánchez-Cano,   Olivier Witasse, Elise W. Knutsen, Dikshita Meggi, Mark Lester,   Robert F. Wimmer-Schweingruber, Hermann Opgenoorth and the ESA mission teams (ESOC, ESTEC & ESAC).

What is an EDAC housekeeping parameter?

- EDAC is an algorithm present **on all spacecraft computers**, and stands for Error Detection And Correction.

- When an energetic particle hits an on-board computer it can cause memory errors due to the charge deposited in the physical memory cells. Such errors are caught and corrected by the EDAC algorithm.

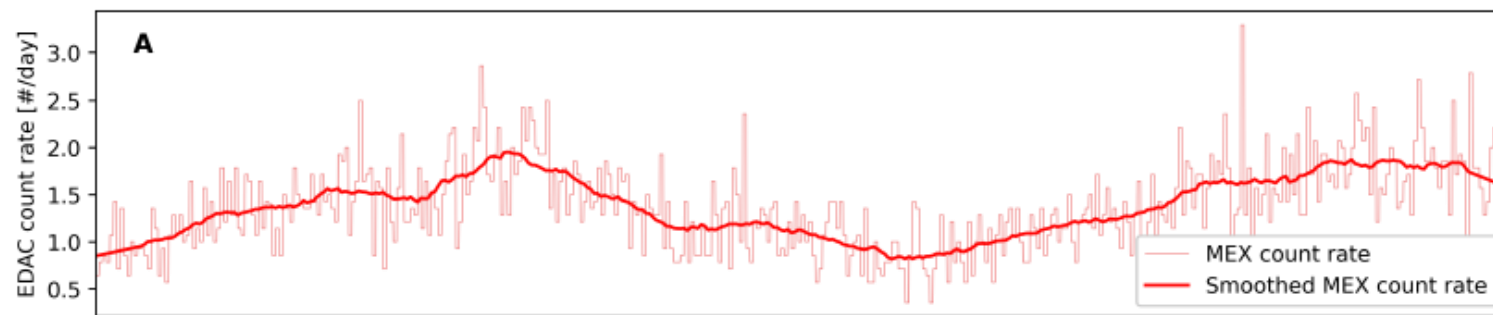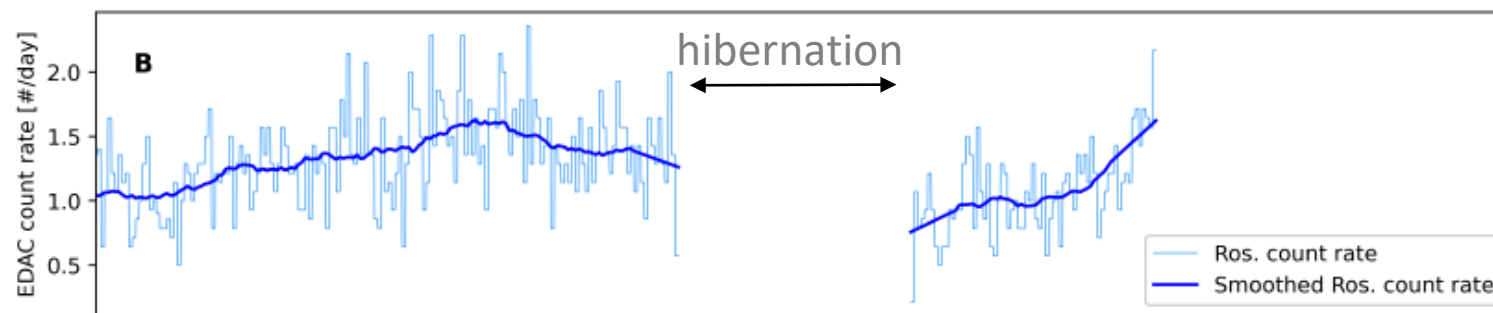- Once a correction is done, the relevant EDAC counter is incremented by 1.
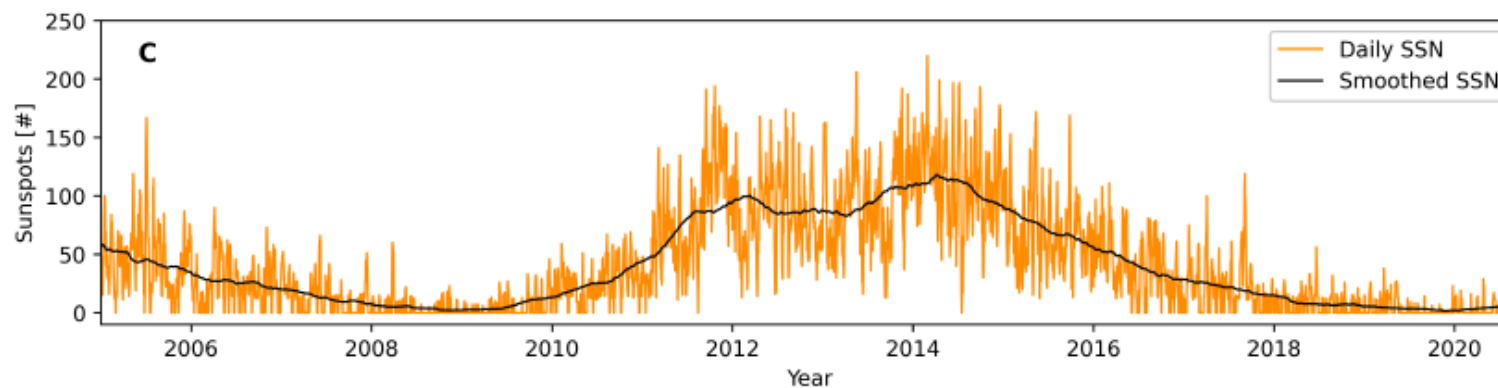
Rosetta EDAC

bscmdr1@leicester.ac.uk

Knutsen et al., A&A, 2021

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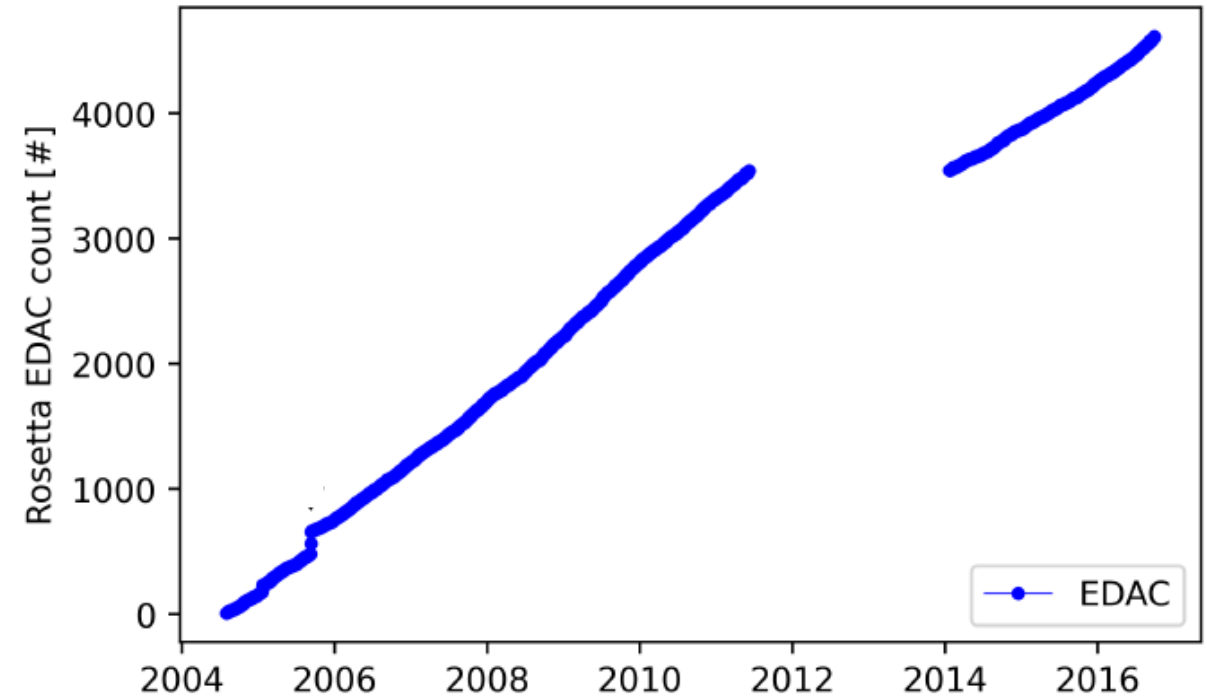
Galactic Cosmic Rays

Mars Express EDAC

Rosetta EDAC

Sunspot Number
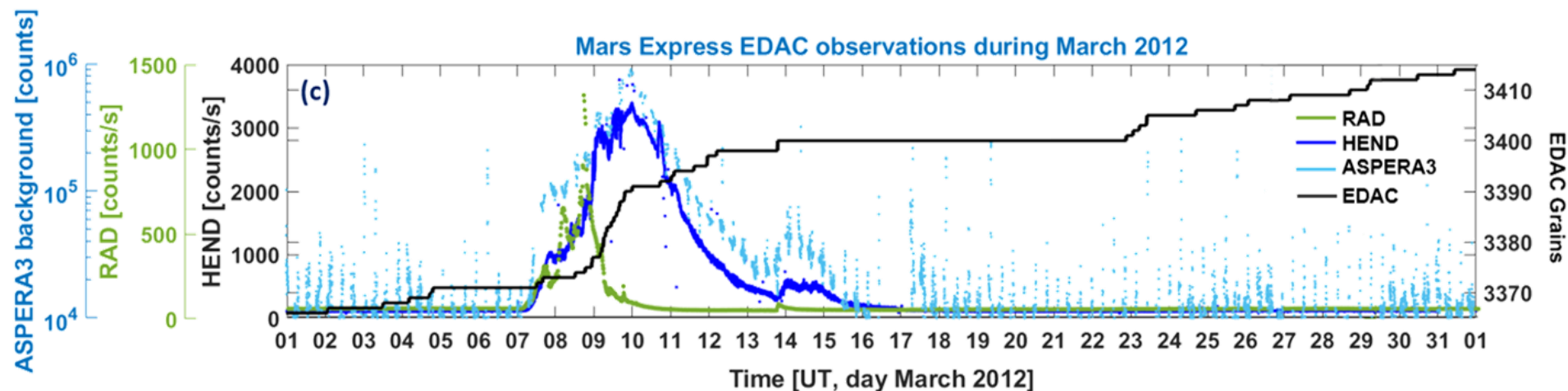
Knutsen et al., A&A, 2021

Space Weather detections??

Rosetta

January 2005
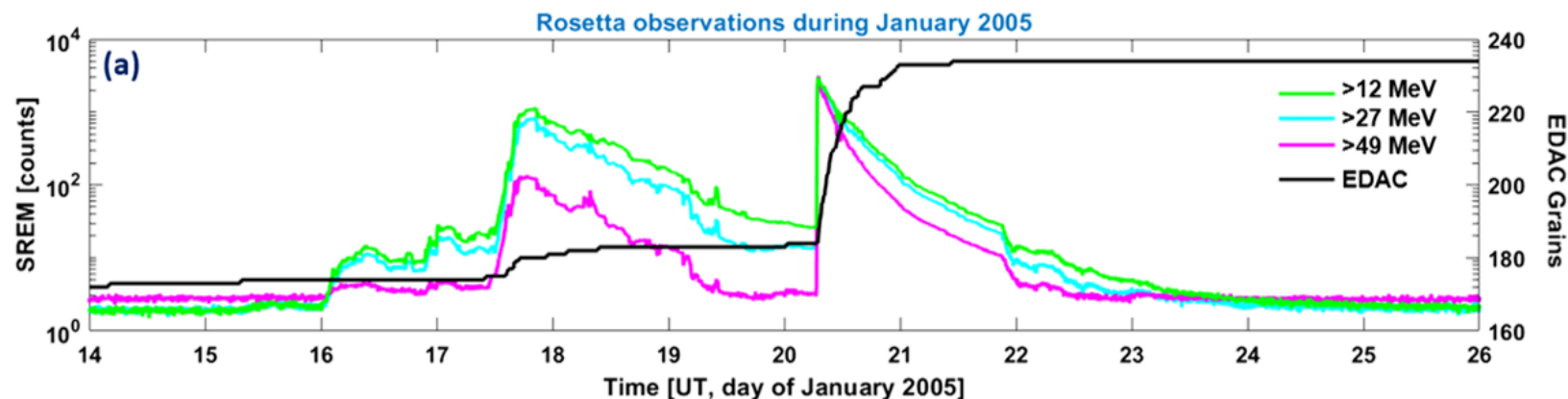
Rosetta observations during January 2005

Mars Express

March 2012
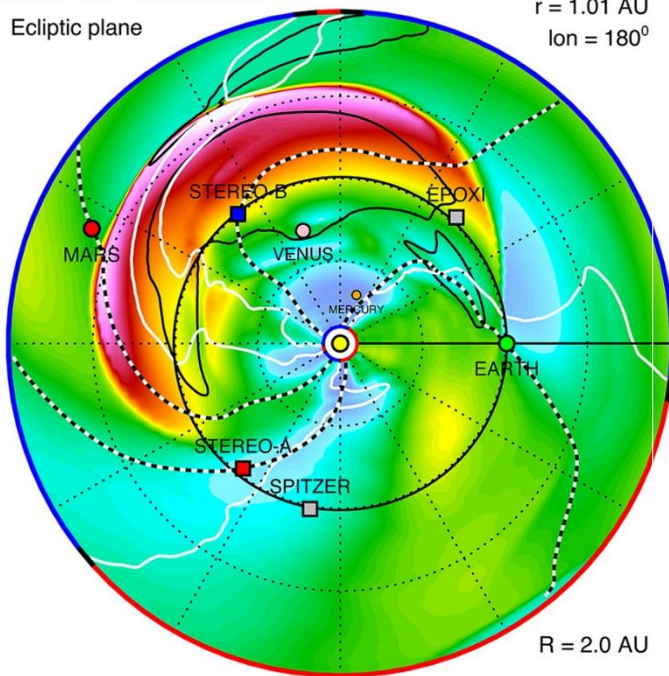
Mars Express EDAC observations during March 2012

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Sanchez-Cano et al., in prep

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MARS EXPRESS

2017-09-12T23:00
Ecliptic plane

Mars Express EDAC observations during September 2017
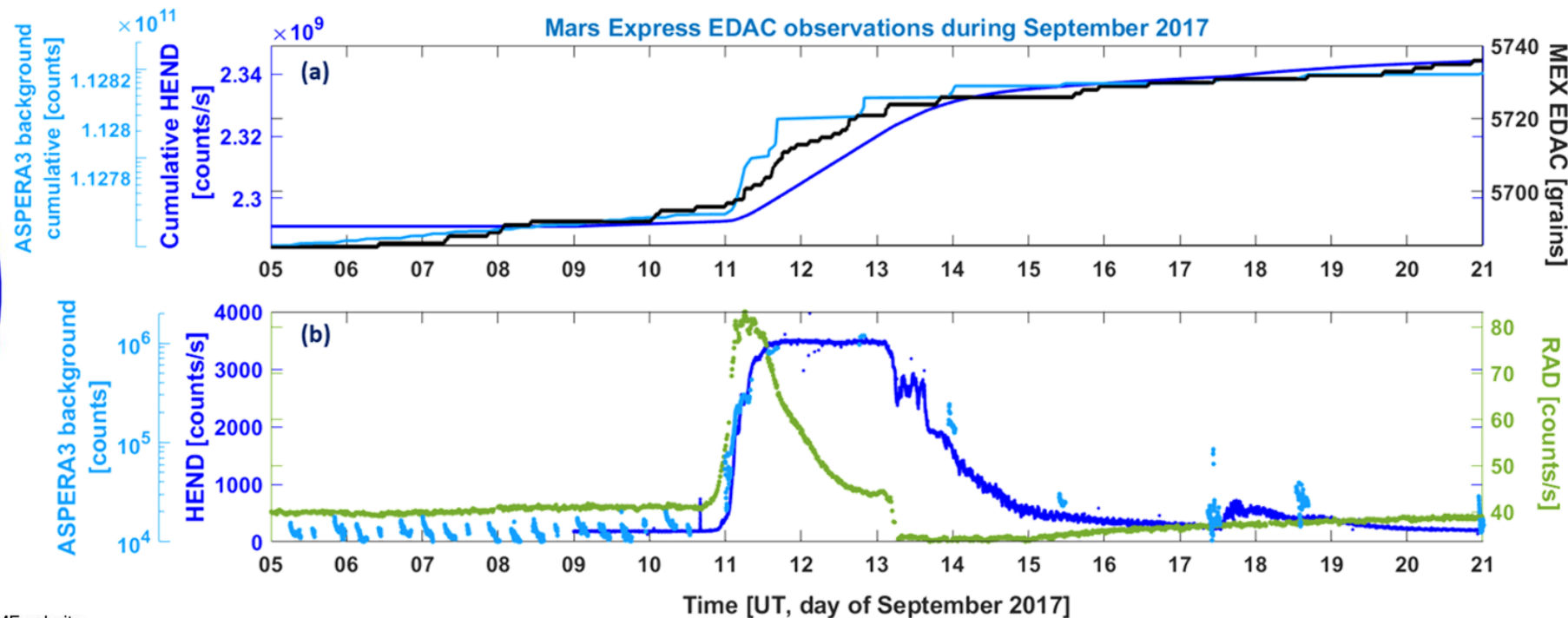
Jiggens et al., 2018; Sanchez-Cano et al., in prep

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BepiColombo

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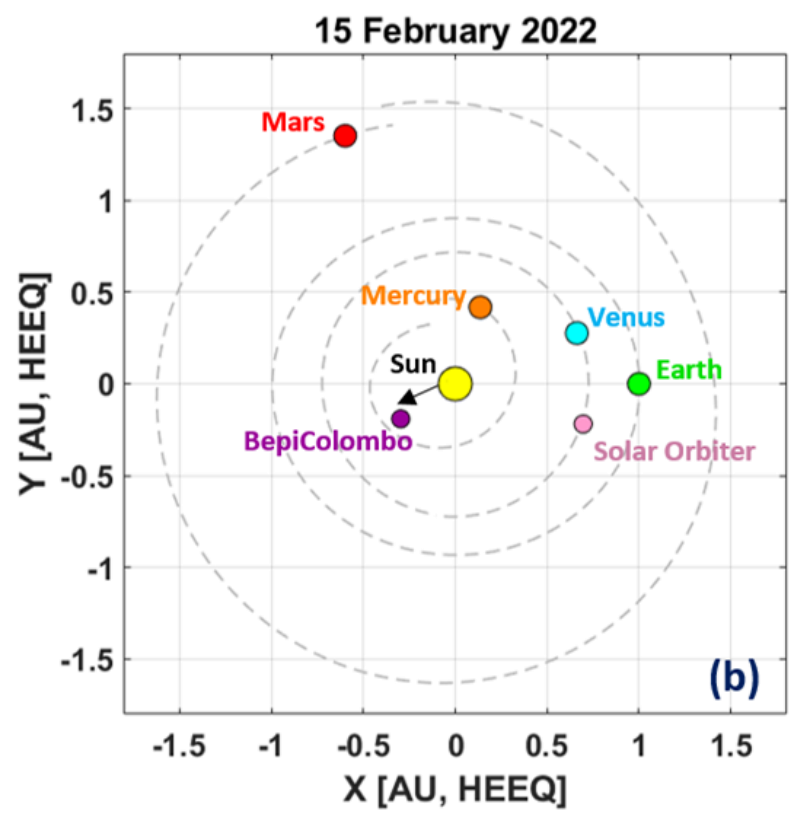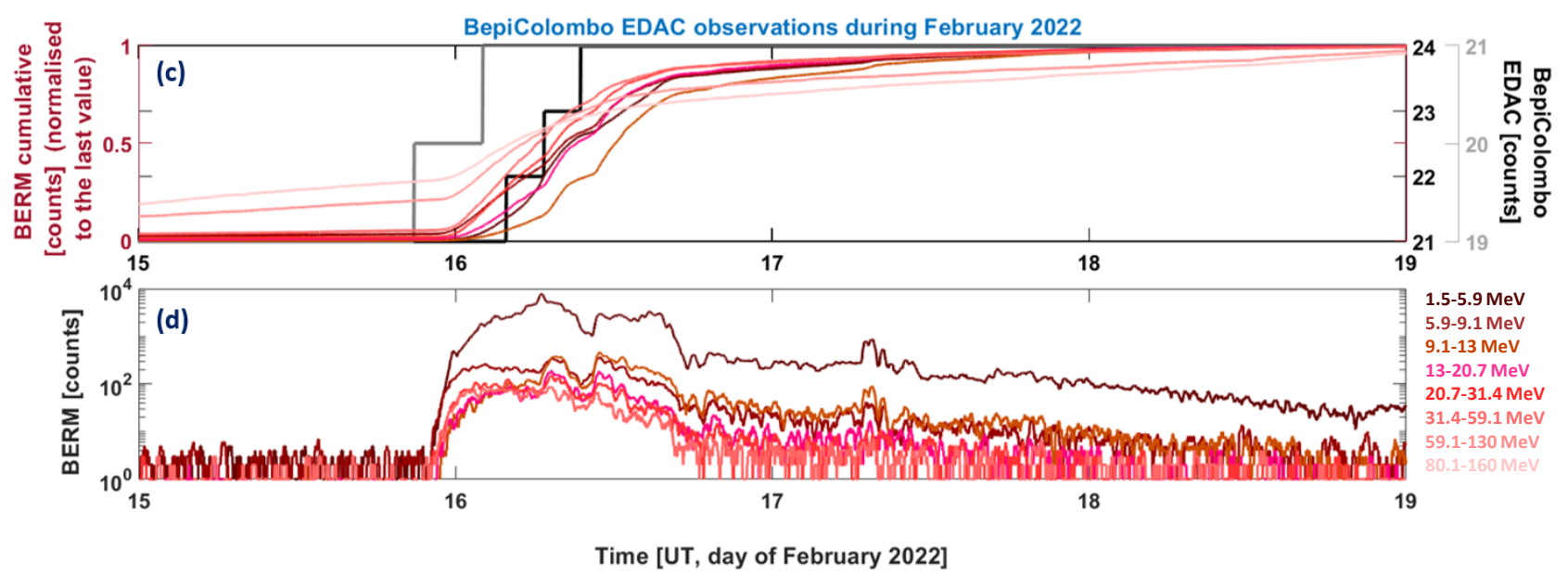
Solar Orbiter

28 October 2021

Solar Orbiter EDAC observations during October 2021
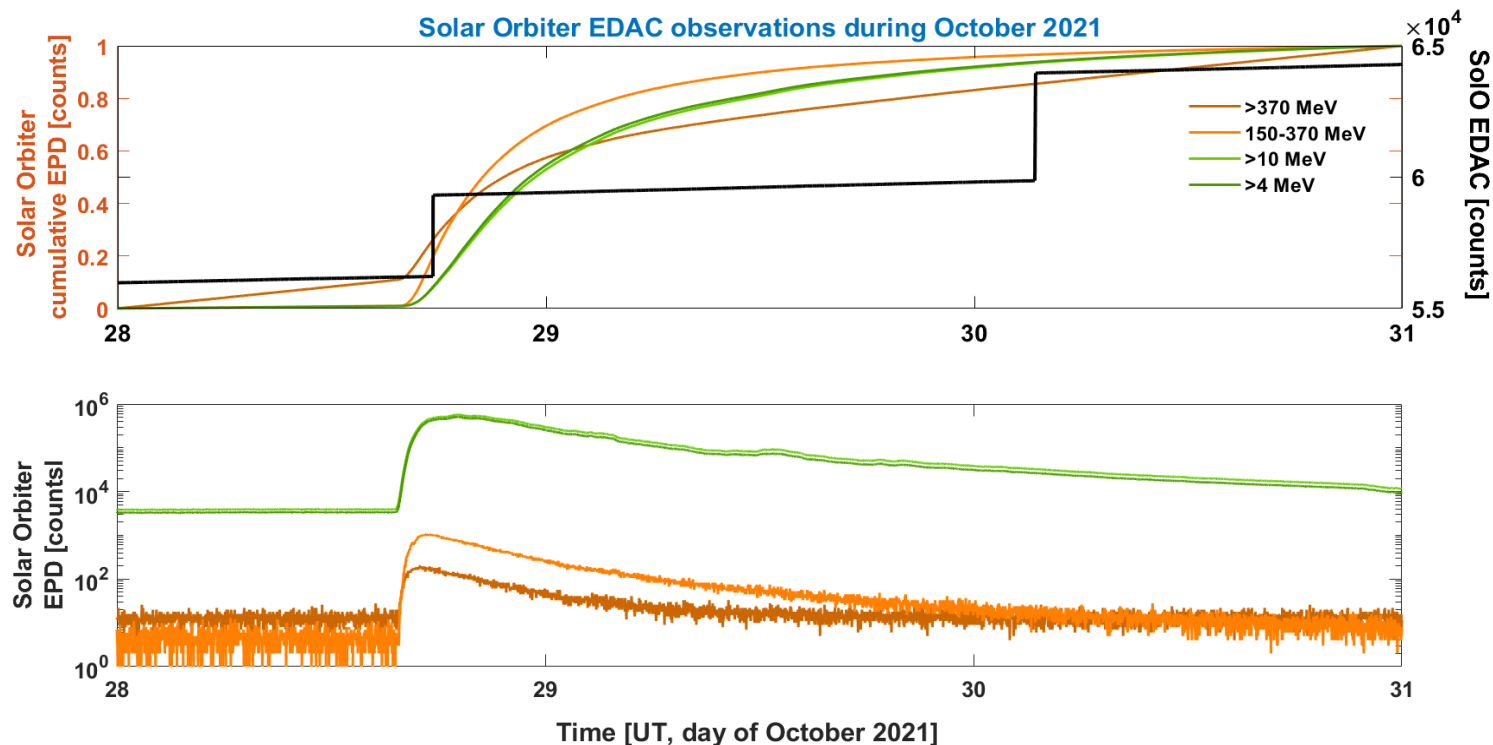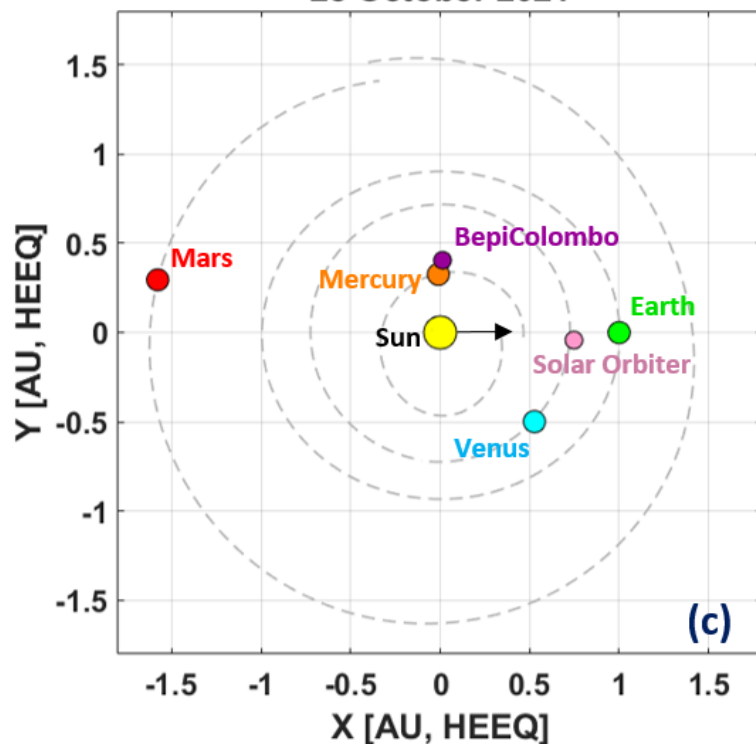
Take home message

- EDAC-housekeeping spacecraft data can be very useful for space weather detections when no other plasma instruments are available.

  - Example: to have a measurement of particles entering in Mars' atmosphere before MSL and MAVEN missions.

- We have identified the right EDAC parameters that are sensitive to Space Weather activity, such as to Solar Energetic Particle events.

- Ongoing work is being done to understand the response of EDACs in Solar Orbiter and BepiColombo.

- Paper coming soon. STAY TUNED! ☺

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