



Preliminary results from Solar Orbiter "Eruption Watch" campaigns



C. Sasso¹, F. Landini², G. Russano¹, F. Auchère³, D. Berghmans⁴, É. Buchlin³, J. Hirzberger⁵, P. Hess⁶, S. Kruger⁷, D. Orozco Suárez⁸, S. Parenti³, L. Rodriguez⁴, H. Strecker⁸, G. Valori⁵, A. Vourlidis⁹, A. De Groof¹⁰, D. Williams¹⁰

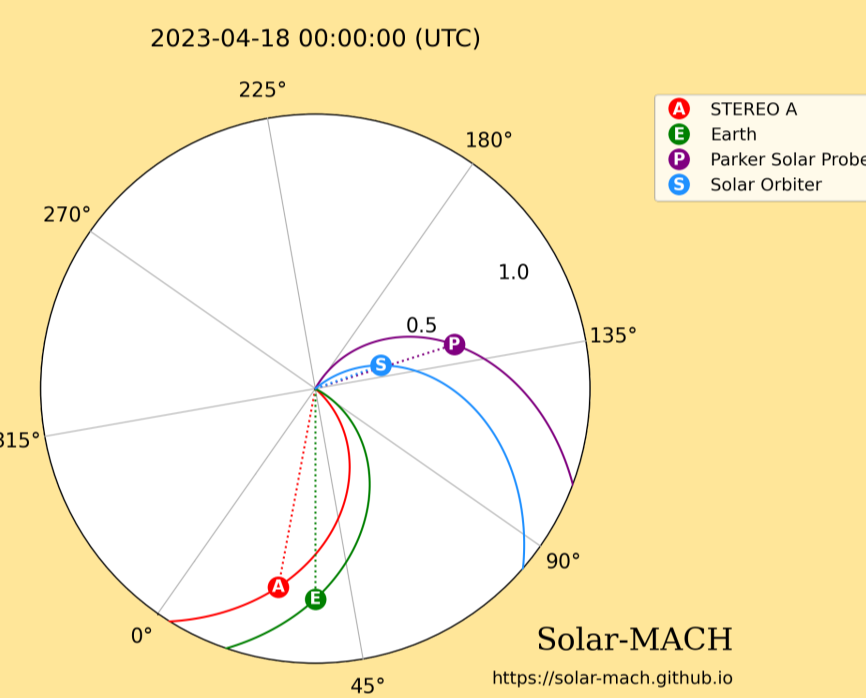
¹INAF-Capodimonte Astronomical Observatory, Italy; ²INAF-Turin Astrophysical Observatory, Italy; ³Université Paris-Saclay, CNRS, Institut d'Astrophysique Spatiale, France; ⁴Solar-Terrestrial Centre of Excellence - SIDC, Royal Observatory of Belgium, Belgium; ⁵Max Planck for Solar System Research, Göttingen, Germany; ⁶U.S. Naval Research Laboratory (NRL), Washington D.C., USA; ⁷University of Applied Sciences and Arts Northwestern Switzerland (FHNW); ⁸Instituto de Astrofísica de Andalucía (IAA-CSIC), Granada, Spain; ⁹The Johns Hopkins University Applied Physics Laboratory, Laurel, USA; ¹⁰European Space Agency, ESAC, Spain

Introduction

During Remote Science Windows, Solar Orbiter (SoIo) observations are organized into Solar Orbiter Observing Plans (SOOPs), where a SOOP is a set of common operations from multiple instruments addressing several mission sub-objectives. The **Eruption Watch** (EW) SOOP is a full-disk, high resolution plan, designed to catch eruptive events. All remote sensing instruments are involved while in-situ payload provides continuous observations.

Up to now, we have had nine Eruption Watch campaigns. In this poster we are analyzing some eruptions we observed in two of them, in particular, during the period 17-19 April 2023 (EW1) and 22-24 October 2023 (EW2).

Eruption Watch Campaign April 2023



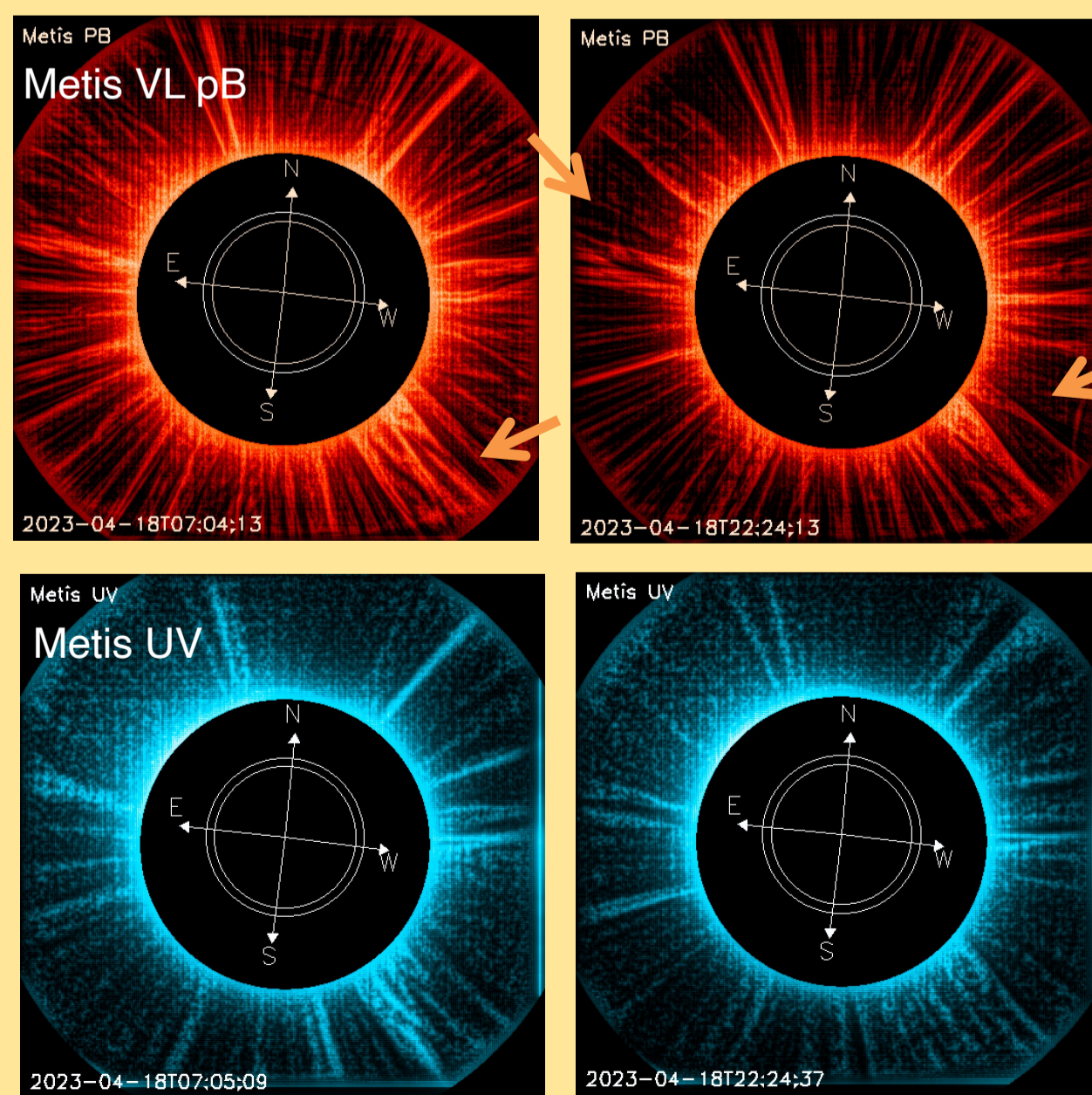
The EW1 campaign was led from the 17th 21:30 UTC to the 19th of April 2023 15:10 UTC. During the campaign we could recognize 6 erupting events in the Metis coronagraph images that was observing in both the VL and UV channels, with a cadence of 10 minutes.

Three of these eruptions are shown in this poster. They were all seen in both Metis channels thus meaning that some cold plasma is present (visible in the UV images), most probably belonging to the erupting prominence, the core of the coronal mass ejection (CME).

Regarding the third eruption, we were also able to recognize in the Extreme Ultraviolet Imager (EUI) images, the flare from where it was probably originated and, in the Solar Orbiter Heliospheric Imager (SolOHI) the expansion of the following CME.

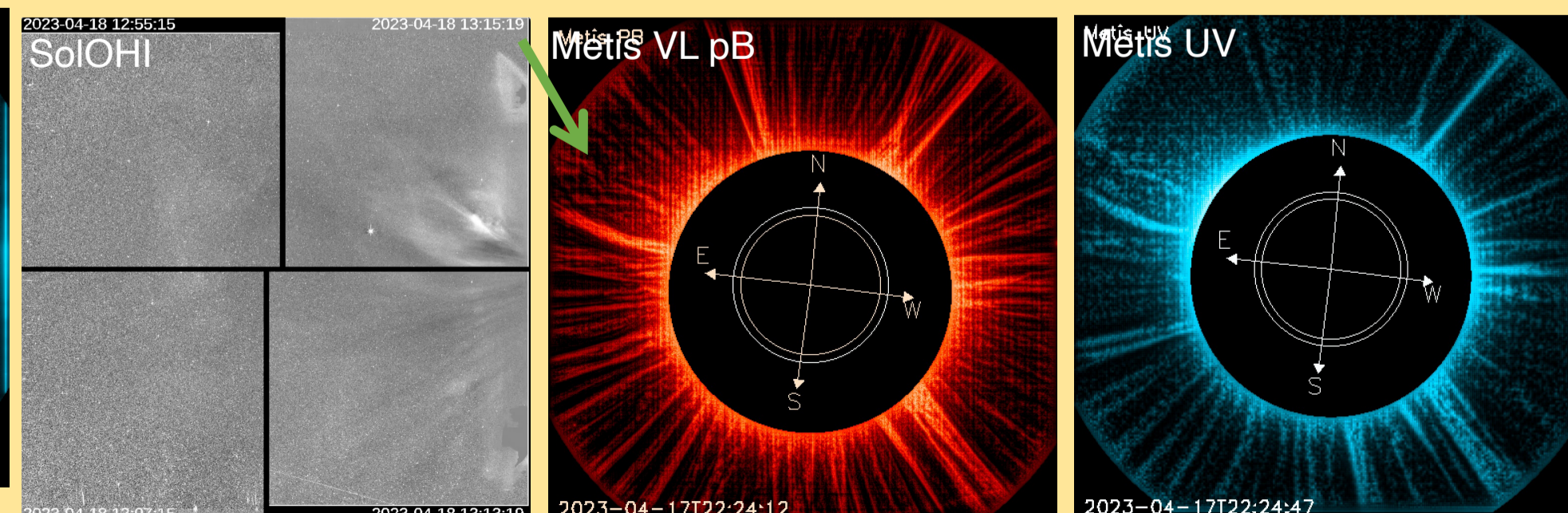
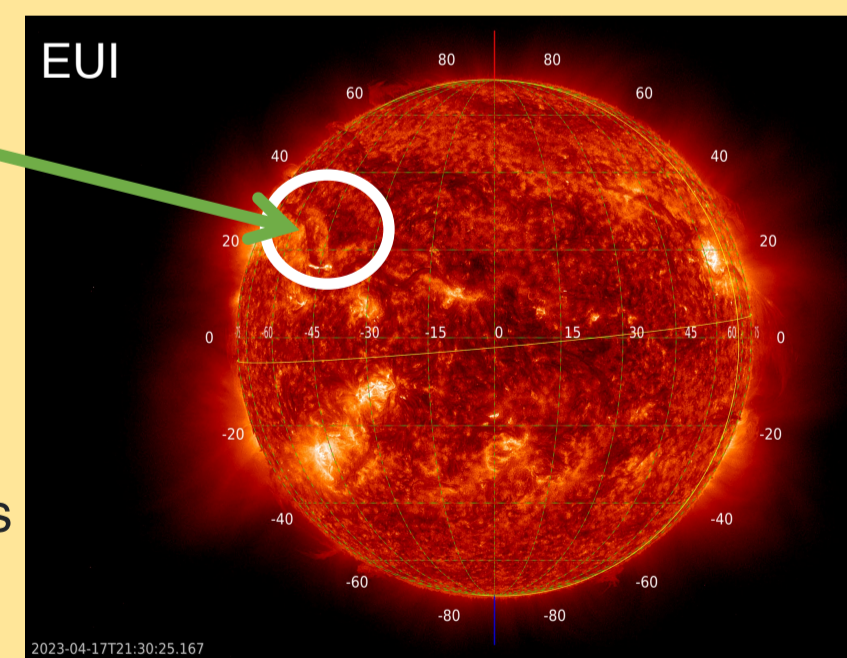
Position of different spacecraft, SoIo, STEREO-A, and PSP, and the Earth during the EW1.

First two eruptions



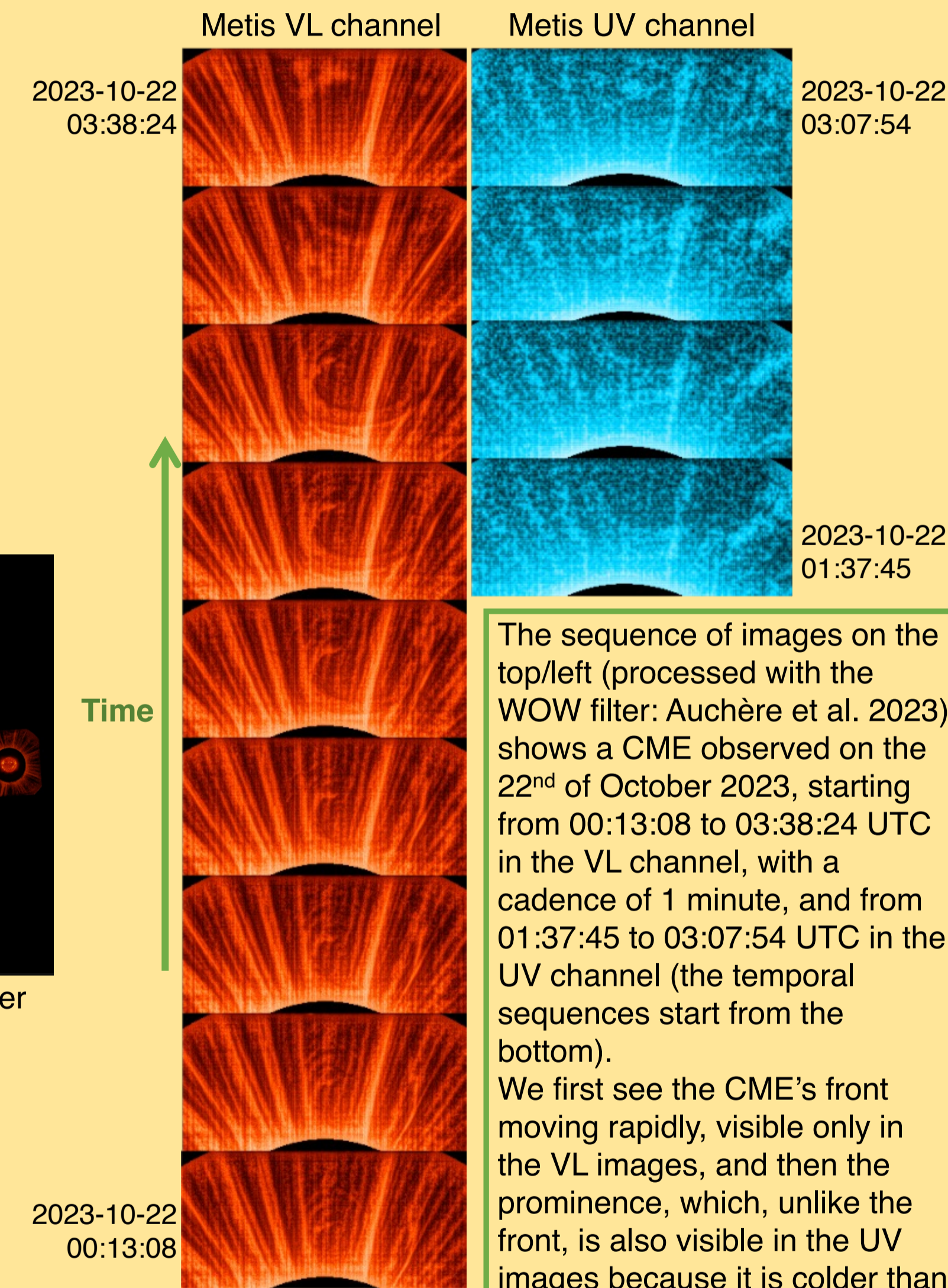
Third eruption

Flare
This event is identified in the Spectrometer Telescope for Imaging X-rays (STIX) Flare List as a C1.4 flare.



Eruption Watch Campaign October 2023

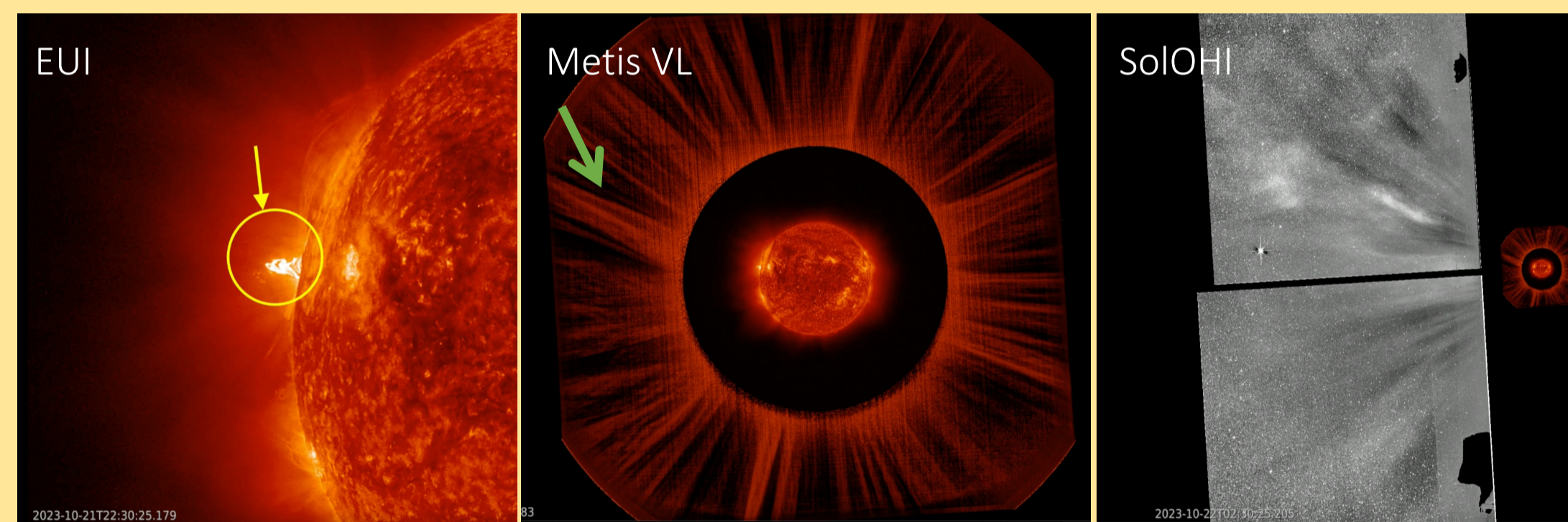
Second eruption



The EW2 campaign was led from the 22nd to the 24th of October 2023. During the campaign we could recognize three erupting events in the Metis instrument images. Two of these eruptions are shown below.

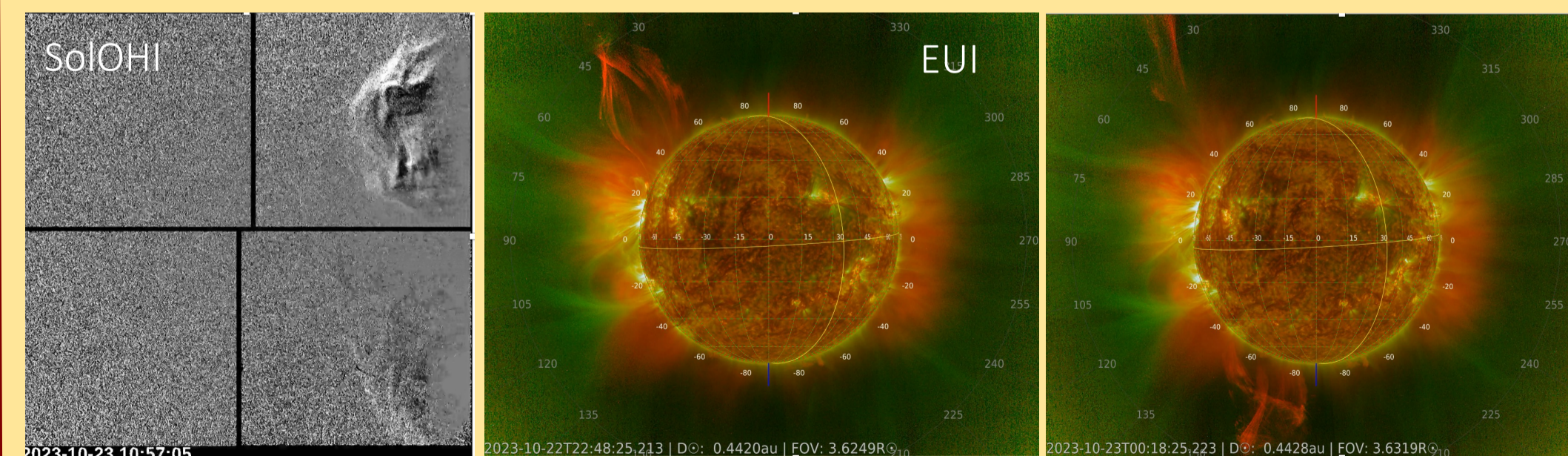
The instrument was observing in both the VL and UV channels with a cadence of 30 minutes, except in the case of the second event where the observations were performed at high temporal cadence of 1 minute for one hour.

First eruption



The first event we are showing was first seen first in the EUI images, on the 21st of October 2023 at around 22:30 UTC. Then, started to appear in the Metis instrument images and then it was finally visible in the SolOHI ones.

Third eruption



The last eruptive event we show was a huge filament eruption seen by Solar Orbiter's EUI and SolOHI instruments on the 22nd of October 2023. The event was first seen first in the EUI images, at around 22:30 UTC, and then in the SolOHI ones.

The sequence of images on the top/left (processed with the WOW filter: Auchère et al. 2023) shows a CME observed on the 22nd of October 2023, starting from 00:13:08 to 03:38:24 UTC in the VL channel, with a cadence of 1 minute, and from 01:37:45 to 03:07:54 UTC in the UV channel (the temporal sequences start from the bottom). We first see the CME's front moving rapidly, visible only in the VL images, and then the prominence, which, unlike the front, is also visible in the UV images because it is colder than the front. At a first analysis, the speed of the prominence is around 180 km/s. This event was probably initiated by a flare occurring behind the north limb of the Sun since we did not recognize any flare or eruption in the EUI images.