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Study of transient events in the solar corona through combined analysis of images acquired by the Metis multi-channel coronagraph on board the ESA Solar Orbiter mission

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On November 09-11 2021 the Metis coronagraph on-board ESA Solar Orbiter mission observed a sequence of interesting transient events in the solar corona. First, starting from 18:00 UT on November 09 the instrument observed over the West limb the reconfiguration phases immediately after a major Coronal Mass Ejection (CME), also observed by the LASCO coronagraphs on-board SOHO. The VL images show the propagation of multiple plasma blobs around the main CME propagation latitude, likely related with magnetic reconnections going on after the transit of the eruption. The same blobs were not observed in the UV Lyman- α channel and this information provided us constraints on the blob plasma temperature. We identified and tracked 5 blobs, measuring their propagation speed and for the brightest among them we measured radius, and volume, as well as their average electron density and thus total mass. The corresponding estimates of kinetic, thermal and potential energies dragged by the blobs have been used to infer both the heliocentric distances and times where these blobs were formed by magnetic reconnection. It turns out that all the blobs were formed between 2.7 and 5.3 R_{sun} , hence below the inner edge of the Metis field-of-view (located around 5 R_{sun}), and inside the LASCO/C2 field-of-view. The images acquired by LASCO/C2 show a morphology supporting these results. Moreover, in the same dataset, a second slow eruption was observed by Metis above the East limb. This weak event showed interestingly only an expanding bubble-like feature darker than the surrounding corona both in the VL and UV Lyman-alpha channels, without any clear core or front, suggesting that what we observed was a slowly expanding hollow flux-rope. The LASCO/C2 images confirm that this feature formed in the inner corona and thus entered in the Metis field-of-view. After a determination of its kinematical properties (hence an estimate of the UV Doppler dimming coefficient), the VL and UV Lyman- α images have been analysed with the direct ratio “Doppler dimming” technique to obtain 2D maps of electron temperature inside the expanding flux-rope and derive information on the thermal evolution of the embedded plasma.

First results are presented here.

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