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# Study of plasma heating processes in a CME-driven shock-sheath region observed with Metis coronagraph

On 2021 September 28, a C1.6 class flare occurred in active region NOAA 12871, located approximately at 27° S and 51° W on the solar disk.
This event was followed by a partial halo coronal mass ejection (CME) that caused the deflection of pre-existing coronal streamer structures, as observed in visible-light coronagraphic images.
An associated type II radio burst was also detected by both space- and ground-based instruments, indicating the presence of a coronal shock propagating into interplanetary space.
By using H I Lyman-alpha (121.6 nm) observations from the Metis coronagraph on-board the Solar Orbiter mission, we demonstrate for the first time the capability of UV imaging to provide, via a Doppler dimming technique, an upper limit estimate of the 2D distribution of the proton kinetic temperature in the CME-driven shock sheath as it passes through the field of view of the instrument.
Our results suggest that over the 22 minutes of observations the shock propagated with a speed decreasing from about 740 km/s to 400 km/s.
At the same time, the post-shock proton temperatures maximized at latitudes around the shock nose and decreased with time from about 5.5 MK to 3.3 MK.
The application of the Rankine-Hugoniot jump conditions demonstrates that these temperatures are larger than those expected by simple adiabatic compression, implying that significant shock heating is still going on at these distances.

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