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High cadence and high resolution observation of a CME observed by Solar Orbiter Metis Coronagraph in October 2022

During the October 2022 perihelion, the Metis coronagraph on-board Solar Orbiter captured an exceptionally large coronal mass ejection (CME) during a dedicated observation program. This event was recorded with high temporal (cadence 20 s) and spatial (4.5×10^3 km/px) resolution, within a field of view extending from 2 to 3.1 solar radii at a distance of 0.3 AU from the Sun. Detailed investigation from time-averaged running difference imaging reveals detailed structural features of these eruptions with unprecedented resolution. These observations include upward and downward flows of material as well as the presence of coronal wavefronts that appear not to interact with the CME itself, prompting speculation about their origin and nature. The investigation of these wavefronts is particularly significant, as it offers new insights into the dynamic processes within the solar corona, potentially shedding light on previously unknown mechanisms of energy transfer and wave propagation in the Sun's atmosphere. In this study, we present a comprehensive analysis of the eruptive event, providing significant findings regarding its kinematic properties, temporal evolution and the outflow velocity within the expanding solar corona. Additionally, the observations are complemented by data from radio instruments and other space-based coronagraphs and disk imagers, enabling the complete tracking of the event from its initiation in the low corona to its expansion up to higher layers of the solar atmosphere.

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