Coronal Mass Ejections' Kinematics in 3D using observations from STEREO

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We have implemented a method to track coronal mass ejections (CME) events in three dimensions by combining triangulation and tie-pointing analysis with a supervised computer vision algorithm. This novel approach does not rely on any geometric constraint, and eliminates the need for visual identification of the CME boundaries. We applied our method to CME events observed simultaneously by the twin Solar Terrestrial Relations Observatory (STEREO) COR2 coronagraph imagers from 2008 to 2011 in order to obtain their 3D kinematical characterization (i.e., the velocity vector) along with their morphological properties. Some of these events have already been analyzed using other methodologies. In these cases, a comparison of results was carried out. We found that, in spite of both the different nature of the methodologies, and the different spatial coverage of the other studies with respect to ours, the majority of the results agree. On the other had, some events exhibited discrepancies in the magnitude of the velocity vector, in the longitudinal direction of propagation, and in latitude. The discrepancies appeared mainly in those cases where quasi-simultaneous, quasi-co-located events were observed in the coronagraphs' fields of view. (G.S. gratefully acknowledges the support of NASA.)

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