Geophysical Research Abstracts
Vol. 20, EGU2018-17167, 2018
EGU General Assembly 2018

Recent advances in CME research using the heliophysics observatory

Alexis Rouillard
CNRS - IRAP, University of Toulouse III, Toulouse, France (arouillard@irap.omp.eu)

For many decades, the study of the Sun and its influence on our local space environment had been impaired by the large distances separating the inner corona, observed through electromagnetic radiations (e.g. radio, ultraviolet, X-rays, white light), and the distant solar wind typically measured in situ. This observational gap was filled when a new generation of space-borne instrumentation, launched during the last two decades, began recording the white light scattered by solar wind electrons from the Sun out to 1AU and beyond in the form of 'heliospheric images'. Numerical studies of Coronal Mass Ejections (CMEs) combined with these new multipoint observations and in situ measurements has spurred a wealth of research on their dynamic evolution from the Sun to 1AU. The flux-rope structure in the form of a toroid with variable cross section has been validated for a subset of CMEs through multi-point 3-D reconstructions. While the physical processes and instabilities that produce these flux ropes are still debated, the toroïdicity of magnetic flux ropes suggested by these reconstructions implies that the hoop force must play an important role to accelerate CMEs. I will review recent research that has revealed how CMEs interact with the ambient coronal medium forcing their rotation, deflection and some topological changes. The continuous tracking of CMEs from the Sun to probes taking in situ measurements has provided new insights on how CMEs interact with the solar wind and with other CMEs. Finally I will discuss the latest work on CME shock waves and their relation to energetic particles on a wide range of spatial and temporal scales.