

55th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE
ACTIVITIES (D5)

Prediction, Testing, Measurement and Effects of space environment on space missions (3)

Author: Dr. Ryun Young Kwon
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FORECASTING CAPABILITIES**Abstract**

Since the early 1980s, halo coronal mass ejections (CMEs) have been believed to be evidence for Earth-directed expanding magnetized plasma clouds. However, we present that halo CMEs are in fact the observations of spherical, circumsolar coronal shocks, rather than a matter of the projection of expanding magnetic structures propagating along the Sun-Earth line. The significant findings are as follows: (1) Halo CMEs are the manifestation of spherically shaped fast-mode waves/shocks, having their footprints on the coronal base, the so-called EIT/EUV waves. (2) These spherical fronts arise from a driven shock (bow- or piston-type) close to the CME nose, and it is gradually becoming a freely propagating (decaying) fast-mode shock wave at the flank. (3) Such large longitudinal extents of these shock waves in the corona agree with those of the solar energetic particles (SEPs) in the heliosphere. (4) The shock density compressions peak around the CME nose and decrease at larger position angles. (5) The supercritical region extends over a large area of the shock and lasts longer than past reports. Such up-to-date knowledge offers a promising way to reduce the false alarm rate of geomagnetic storms and better predict SEP events.