

Coordinated Interplanetary Scintillation Observations at Japan and Russia for Halo Coronal Mass Ejection Events in September 2017

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The solar activity was raised significantly during early September 2017 owing to emergence of the eruptive active region AR 12673. In association with two halo coronal mass ejections (CMEs) which occurred on September 4 and 6, 2017, solar wind disturbances travelling between the Sun and the Earth orbit were detected clearly from interplanetary scintillation (IPS) observations made at ISEE (Japan) and Pushchino (Russia). These IPS observations are taken at the time of the meridian transit for a given source, and the observation times differ by about 6-hour depending on the site longitude. Therefore, a combined analysis of the IPS data at ISEE and Pushchino enables high cadence tracking of solar wind disturbances. The solar elongations where the solar wind disturbances were observed at ISEE are generally consistent with those at Pushchino, if the time difference is considered. The propagation speeds inferred from the IPS observations are higher than the average speeds derived from the occurrence time of IP shocks at the Earth. This fact is ascribed to either the deceleration of the CME-driven disturbances during the propagation or the azimuthal dependence of the disturbance speed. Another interesting point to note is that solar wind disturbances moving at a speed significantly slower than the average speed of the IP shock were identified from the IPS observations for the September 6, 2017 halo CME event. This slow disturbances, which may correspond to a flank portion of the CME, were observed at the east to the Sun, i.e. the other side of the flare/CME site, and much less prominently at the west. The results obtained here demonstrates the utility of world-wide network of IPS observations for space weather predictions.

Keywords: interplanetary scintillation, solar wind, coronal mass ejection