

Estimation of the solar wind speed near the Sun on the basis of speed measurement of limb CMEs

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To obtain solar wind speed in the region within 20 solar radii from the Sun is important for the understanding of the acceleration of solar wind plasma, but direct access has been difficult. Measurement of the speeds of coronal mass ejections (CMEs) is one of the limited methods to obtain the solar wind speed in the vicinity of the Sun. Gopalswamy et al. (2000, 2001) presented a linear relationship between initial speeds of limb CMEs and their average acceleration during their travel time in interplanetary space, which suggests that a dragging force is acting on the CMEs, depending on the speed difference between the CMEs and the ambient plasma.

The linear relationship was found between the initial acceleration and the speed of the limb CMEs measured within the field of view of the SOHO/LASO telescopes as well. Using the relationship, we can estimate the solar wind speed in the vicinity of the Sun. The ambient solar wind speed within 20 solar radii estimated from low-latitude CMEs during 1998-2003 ranged from 100 to 700 km/s, while the solar wind speed measured at 1AU ranged from 300 to 700 km/s. The estimated solar wind speeds in the vicinity of the Sun sometimes agreed with the simultaneous in situ measurements at 1AU, but in other periods, they were slower than the speeds measured at 1AU. It is suggested that most of the time the low-latitude solar wind completes accelerating within 20 solar radii, but occasionally additional acceleration is present beyond 20 solar radii.