

## Diagnosis of coronal shock strength using the activation of large amplitude prominence oscillation

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X5.4 class solar flare occurred on March 7, 2012 which was the second largest flare in this solar cycle. The flare was associated with very fast coronal mass ejection (CME) with the velocity of over 2500 km/s. Associated with this flare, a wave-like coronal disturbance (known as EUV wave) was observed to propagate along the solar surface. The observed EUV wave propagated with the average speed of about 670 km/s towards the north and 'hit' a polar prominence leading to its large amplitude oscillation. The activated prominence strongly brightened when EUV wave 'pushed' it.

Because of the difficulty in direct observation of physical quantities in the corona, the physical nature of the EUV waves is still under discussion. Two main interpretations of EUV waves are the 'fast mode MHD wave/shock' interpretation, and 'non-wave' interpretations.

In the images taken with Inner coronagraph (COR1) of the Sun Earth Connection Corona and Heliospheric Investigation (SECCHI) on board *Solar Terrestrial Relations Observatory (STEREO)-Behind*, we could see a coronal disturbance detached from expanding CME plasma. The time evolution of the disturbance seen in COR1 images was consistent with that of observed EUV wave. Also, Type II radio burst which is thought to be evidence of coronal shock wave was observed simultaneously. Because of that observational evidence, we regard the observed EUV wave as MHD fast mode shock front. Assuming the shock nature of the observed EUV wave, we could also explain prominence acceleration and brightening consistently.

Using the initial velocity of activated prominence, we could estimate the coronal shock strength of the EUV wave with the help of linear wave theory. We also check the applicability of linear theory to the shock problem with one dimensional numerical model and ascertained that it is applicable when the shock strength is not strong. Estimated fast mode mach number of the EUV wave was between 1.20 and 1.42, and we could say that the EUV wave was a weak shock front in the corona.

Keywords: solar flare, coronal mass ejection (CME), shock waves, solar prominence, magnetohydrodynamics (MHD)

