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# An Investigation of coronal mass ejections and EUV waves for space weather forecasting

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    Coronal mass ejections (CMEs) affect the terrestrial environments and technological infrastructures because they cause solar energetic particle events and geomagnetic storms. Extreme Ultraviolet (EUV) waves are large scale disturbances propagating over a significant fraction of the solar surface and are closely related to CMEs. Therefore, the EUV waves have the potential to be used for space weather forecasting. We examined CMEs and EUV waves using SOHO, STEREO and SDO associated with 176 major flares (M class and above) that occurred from 12 June 2010 to 14 June 2012. We found that 75 of the 176 flares were associated with both CMEs and EUV waves, while 83 lacked both. Although we could not determine the associations of the remaining 18 flares, there is a clear one-to-one correspondence between CMEs and EUV waves. Since approximately half of the major flares are not associated with the CMEs, space weather alerts issued by only the flare information will be false half the time. Therefore, the EUV waves are useful tool to improve the space weather forecasting. We will discuss how to estimate the CME speeds from the observation of flares and EUV waves.

Keywords: flare, CME, EUV wave