Hierarchical Relationship of pure DH, m-DH and DH-km type II bursts using the kinematic properties of the associated CMEs

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Abstract

Using type II radio bursts from Wind/WAVES and the associated coronal mass ejections (CMEs) from SOHO/LASCO, Gopalswamy et al., (2005) found a hierarchical relationship between the wavelength range of the type II bursts and CME kinetic energy. Under 'DH Type II bursts' they had included mDH, pure DH and DH-km bursts. In this paper, we consider the pure DH, m-DH and DH-km subsets separately. We find that DH-km type II burst associated CMEs have the largest average speed, non-halo width and halo fraction. The m-DH type II burst associated CMEs have slightly larger values than the pure DH type II burst associated CMEs. The DH-km type II burst associated CMEs have the largest mass. mDH type II burst associated CMEs have slightly larger mass than pure DH associated type II burst associated CMEs. Our m-DH and pure DH CMEs type II burst associated CMEs have slightly lower speed and fraction of halos compared to DH type II burst associated CMEs in Gopalswamy et al. (2005). However, the DH-km type II burst associated CMEs have larger values than Gopalswamy et al. (2005). So the kinetic energy of CMEs organizes the hierarchal relationship of type II bursts. DH-km type II burst associated CMEs have the largest SEP association compared to m-DH and pure DH type II burst associated CMEs. The DH-km type II burst associated CMEs SEP association is slightly smaller than that of Gopalswamy et al. (2005) m-km type II burst type II burst associated CMEs. The SEP sources are generally located in the western hemisphere because of magnetic connectivity requirement. The CMEs associated with major SEP associated have larger average speed than the pure DH and m-DH CMEs but smaller than the DH-km CMEs.