A Statistical Study of Prominence Eruptions and their Relationship with CMEs

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We present a statistical study about the solar prominence eruptions (PEs) and their associated coronal mass ejections (CMEs) during May 2010 - December 2019, which covers the solar cycle 24. The data of PEs is taken from the Atmospheric Imaging Assembly (AIA) on Solar Dynamics Observatory (SDO) and CMEs from the Large Angle and Spectrometric Coronagraph (LASCO) on Solar and Heliospheric Observatory (SOHO). We found a total of 1225 PEs for our study, which are categorized as 67% radial, 32% transverse, and 1% failed eruptions. The average speeds of all, radial, and transverse PEs are found to be 38, 53, and 9 km s^{-1} respectively. Next, we check the association of these PEs with CME by setting a confidence level (CL) from 0 to 3: 0 for no association and 3 for clear association, and found that 662 (54 %) PEs are associated with CMEs. Out of all these CMEs, 78 % shows a clear bright core stucture for the cases with CL3. The computed average speeds of the PEs associated with CMEs, associated CME cores, and CME leading edges are 62, 390, and 525 km s^{-1}, respectively. The morphological and height-time analysis of PEs and CME cores reveals that the prominence and CME core are the same material at different heights. Further, we study the temporal and spatial relationship between these prominences and CMEs. The temporal offset (difference between the initiation time of PE and CME) is large during solar maxima and small during minima. For the spatial relationship, it is found that the central position angle (CPA) of CMEs is closer to the equator than that of the PEs, during solar minima. This could be due to a strong polar field during solar minima.