Correlation between Coronal Mass Ejections and Type II Radio Bursts

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Coronal mass ejections (CMEs) are solar eruptions, which usually drive shocks ahead of them. These shocks result in radio burst emission, known as Type II radio bursts. The Type II radio bursts have slow drift rate, compared to Type III bursts, which have comparatively faster drift rate. Studying the correlation between different properties of CMEs and Type II bursts would be useful to predict the CME arrivals near Earth as CMEs play a major role in space weather disturbances near Earth-space leading to severe geomagnetic activity. In the present study, we have carried out an extensive statistical data analysis between solar Type II radio burst and CMEs. The CME data were mostly used from SOHO/LASCO, while we have used radio data for Type II radio bursts spanning different frequency ranges from Wind/Waves, Gauribidanaur, Artemis catalog and Culgoora Solar Radio Spectrograph. Using these data sets, we have revisited the correlation study, as carried by others earlier, between different properties of CMEs and Type II radio bursts such as, 1) CME start time and Type II burst start time, 2) CME speed and time difference between CME start time and Type II burst start time, 3) CME width and Frequency bandwidth, 4) Frequency drift rate and start frequency of radio Burst, 4) Frequency drift rate and CME speed. We have carried out these correlations first, taking into account all classes of solar flares and then separately for different classes such as B-, C-, M-, X-solar flares. Our correlation analysis shows a strong correlation CME start time and Type II burst start time for all data sets, and for all classes of flares and when analyzed separately for different classes of flares. However, we find a poor correlation between CME speed and time difference of CME and burst start times. Similarly, in opposite to a recent report, we find a very poor correlation between CME angular width and frequency bandwidth. In addition, we find a good correlation between frequency drift rate and start frequency of the burst, where as a poor correlation is obtained between frequency drift rate and CME speed. I would present the importance of these results and their implications in predicting the CME arrival and for space weather.