Storm Time EMIC Waves Observed by Swarm and Van Allen Probe Satellites

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The temporal and spatial evolution of electromagnetic ion cyclotron (EMIC) waves during the magnetic storm of 21–29 June 2015 was investigated using high-resolution magnetic field observations from Swarm constellation in the ionosphere and Van Allen Probes in the magnetosphere. Magnetospheric EMIC waves had a maximum occurrence frequency in the afternoon sector and shifted equatorward during the expansion phase and poleward during the recovery phase. However, ionospheric waves in subauroral regions occurred more frequently in the nighttime than during the day and exhibited less obvious latitudinal movements. During the main phase, dayside EMIC waves occurred in both the ionosphere and magnetosphere in response to the dramatic increase in the solar wind dynamic pressure. Waves were absent in the magnetosphere and ionosphere around the minimum SYM-H. During the early recovery phase, He⁺ band EMIC waves were observed in the ionosphere and magnetosphere. During the late recovery phase, H⁺ band EMIC waves emerged in response to enhanced earthward convection during substorms in the premidnight sector. The occurrence of EMIC waves in the noon sector was affected by the intensity of substorm activity. Both ionospheric wave frequency and power were higher in the summer hemisphere than in the winter hemisphere. Waves were confined to an MLT interval of less than 5 hr with a duration of less than 186 min from coordinated observations. The results could provide additional insights into the spatial characteristics and propagation features of EMIC waves during storm periods.