Local time and longitudinal differences in the occurrence frequency of ionospheric EMIC waves during magnetic storm periods

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The spatial and temporal distributions of ionospheric electromagnetic ion cyclotron (EMIC) waves during magnetic storms from 2014 to 2018 were studied using Swarm observations. Ionospheric EMIC waves preferably occurred during storms and their recovery phases at subauroral regions within an average magnetic latitude of 40°-55°. There were more wave events during more intense and longer period storms. However, the correlation between event number and storm duration was not good. This might be due to the effect of heavy oxygen ions on EMIC wave generation and the loss of ring current high-energy ions by the EMIC waves. There are obvious magnetic local time (MLT) differences in the peak occurrence frequency of EMIC waves during storm phases. The enhanced solar wind dynamic pressure was favorable for duskside EMIC waves. With an increased substorm activity the wave occurrence rate peak shifted from the morning side to the dusk-premidnight sector. During the recovery phase of a storm, EMIC waves in the 12-24 MLT sector appeared preferably in the earlier part than those in the 00-12 MLT sector. This shift in local time is related to the eastward rotation of the plasmaspheric plume towards morning during the late storm recovery phase and its overlap with the ring current. Highest occurrence frequency of the storm time EMIC waves could be found in the South Atlantic Anomaly region, which might be related to the drift shell splitting and the wave propagation effect in the weak magnetic field region.