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Statistical evidence for the generation and role of EMIC waves

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We use several satellites' data, such as Van Allen Probes, POES, and GOES, to study EMIC waves in the Earth's magnetosphere. Based on the VAP observations, we find there are two main source regions of EMIC waves: one is at noon sector, and the other is at dust sector. Then we use modified AE index (AE^+) and solar wind dynamic pressure (P_d^+) to present two drivers of EMIC waves: substorm injection and solar wind compression. It is shown that during low AE^+, the strong P_d^+ can drive the generation of EMIC waves at the noon sector and high-latitude regions. While, the EMIC waves at the dusk sector and magnetic equator are mainly caused by strong AE^+. Besides, we also utilize long-term POES and GOES relativistic electron data to study the dropout events. The results reveal that during negative IMF Bz, the flux dropout of relativistic electrons should be mainly caused by the enhanced electron precipitation in the dust sector, which supports the key role of EMIC waves in scattering relativistic electrons into the Earth's upper atmosphere.

References

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