



## **Identification of ring current proton precipitation driven by electromagnetic ion cyclotron waves**

Binbin Ni (bbni@whu.edu.cn), Yang Zhang, and Xudong Gu  
Department of Space Physics, School of Electronic Information, Wuhan University,  
Wuhan, Hubei 430072, China

### **Abstract**

Among the most intense emissions in the Earth's magnetosphere, electromagnetic ion cyclotron (EMIC) waves are regarded as a critical candidate contributing to the precipitation losses of ring current protons, which however lacks direct multi-point observations to establish the underlying physical connection. Based upon a robust conjunction between the satellite pair of Van Allen Probe B and NOAA-19, we perform a detailed analysis to capture simultaneous enhancements of EMIC waves and ring current proton precipitation. By assuming that the ring current proton precipitation is mainly caused by EMIC wave scattering, we establish a physical model between the wave-driven proton diffusion and the ratio of precipitated-to-trapped proton fluxes, which is subsequently applied to infer the intensity of EMIC waves required to cause the observed proton precipitation. Our simulations indicate that the model results of EMIC wave intensity, obtained using either the observed or empirical Gaussian wave frequency spectrum, are consistent with the wave observations, within a factor of 1.5. Our study therefore strongly supports the dominant contribution of EMIC waves to the ring current proton precipitation, and offers a valuable means to construct the global profile of EMIC wave intensity using low-altitude NOAA POES proton measurements, which generally have a broad L-shell coverage and high time resolution in favor of near-real-time conversion of the global EMIC wave distribution.