R006-19
B 会場 ： 11/27　AM1（9:15-10:45）
10:30～10:45:00

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Lightning-Generated Whistler wave coupling and its effects on electrons in the inner magnetosphere using ERG and WWLLN

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Lightning discharges in the Earth's atmosphere emit electromagnetic waves over a broad frequency spectrum. In the Very Low Frequency (VLF) range, energy can penetrate upwards into the ionosphere, propagating as whistler-mode waves into the inner magnetosphere. These waves are known to cause pitch-angle scattering of radiation belt electrons, leading to their precipitation into the atmosphere. While one-to-one correlations between single lightning events and subsequent electron precipitation have been established, the long-term impact of global lightning activity on the total trapped electron population remains an open question. Martinez-Calderon et al. (2020) conducted a year-long comparison of global lightning activity, measured by the World Wide Lightning Location Network (WWLLN), with trapped electron fluxes observed by the Van Allen Probes. They did not find the expected clear long-term connection between increased lightning activity and decreased radiation belt fluxes. A more recent analysis incorporating WWLLN, Van Allen Probes, and Arase data for 2018 yielded similar results (manuscript in preparation).

To explain the above, we assumed that the propagation efficiency of whistler waves from the atmosphere to the magnetosphere is highly variable and potentially low. This study statistically quantifies this efficiency using data from Arase (PWE, MEP-e, HEP) and WWLLN. Focusing on the 30 days of peak global lightning activity in 2018, we applied the methodology of Zheng et al. (2016) to determine the correspondence rate between whistlers and lightning strokes. For exceptionally large-amplitude whistler events, we also conducted targeted case studies on concurrent electron data to identify direct signatures of pitch-angle scattering. Our approach provides key observational data on lightning-whistler coupling efficiency, addressing the inconsistencies between models and long-term observations.