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Poster
Radiation belt particles are a major component of space weather and can significantly impact satellites and space-based technologies. These electrons are strongly influenced by wave-particle interactions with whistler-mode waves, which regulate their acceleration, transport, and precipitation. Consequently, radiation belt diffusion processes depend critically on the spatial distribution and intensity of whistler-mode wave power in the magnetosphere. Lightning-generated whistler-mode waves are an important natural source of such waves and can propagate along geomagnetic field lines, interacting with radiation belt electrons during their propagation. This study investigates the propagation characteristics of lightning-generated whistler-mode waves in the inner magnetosphere in the presence of cold plasma density irregularities using a numerical ray-tracing model. The simulations incorporate a dipole geomagnetic field and magnetospheric ducts represented as latitude-limited Gaussian density enhancements centered near the magnetic equator with different latitudinal spans. The study focuses on latitudes of Palmer Station (??2.58) and Dunedin (??2.72) where extensive whistler observations datasets have been previously analyzed.
Backward ray tracing is used to determine the possible magnetospheric propagation paths of waves observed at the ground stations and to identify the conditions under which one-hop propagation and potential ground observation of lightning whistlers. The results indicate that both duct span and wave frequency influence successful ducted one hop propagation. Furthermore, the inferred source regions may extend to latitudes both higher and lower than the magnetic conjugate points. These findings provide insight into how magnetospheric density structures control whistler-mode wave propagation and influence the distribution of wave power relevant to radiation belt dynamics.
Poster session day
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12
Meeting homepage
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