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Understanding the connection between chorus and microbursts through multipoint observations: 2017-12-05 event study

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There are many competing processes that contribute to the dynamic formation and depletion of the Earth's radiation belts and the relative importance of each process is the most fundamental, unanswered question in radiation belt physics. The loss of electrons from the radiation belts occurs mainly by either precipitation into the atmosphere or by escape through the magnetopause boundary. Electron microbursts are impulsive (<1s) scatterings of electrons (few keV to MeV) from the outer radiation belt into the atmosphere that may represent a major loss source from the radiation belt during storm main phase and recovery. The inherently bursty nature of whistler-mode chorus waves, and their ability to resonate with a wide range of electron energies, makes them the primary candidate for generation of electron microbursts. Surveys have shown similarities in occurrence of microbursts and chorus waves, including distributions in L and MLT, attempting to quantify the contribution of microbursts on outer belt electron loss. However, the uncertainty in the overall size and duration of the microburst region is typically large, meaning that estimates for the time for microbursts to deplete the outer belt of electrons range from significant (few hours) to not very important (many days). One way to address these questions is with high altitude chorus observations made simultaneously with low altitude microburst observations during magnetic conjunctions. We combine a number of datasets directly or indirectly measuring chorus waves (RBSP, Arase, ground-based VLF stations) and microburst precipitation (FIREBIRD II and Ac6 CubeSats, POES/MetOp) to determine the size of microburst-producing chorus source region on 2017-12-05.