

VLF Conjugate events between Arase (ERG) and Kannuslehto: differences between cases on the noon and midnight sides.

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Quasi-periodic (QP) emissions, are naturally occurring magnetospheric plasma waves ($3 \text{ Hz} < f < 30 \text{ kHz}$) propagating in the whistler-mode with a fairly regular periodic modulation of their wave intensity. Through wave-particle interactions, whistler-mode waves play an important role in the regulation of radiation belt dynamics. Understanding the processes behind their generation and propagation, including their spatial extent, can help us quantify their part in the acceleration and scattering of electrons in the radiation belts. This study presents two rare QP conjugate events between the ground station of Kannuslehto [MLAT=64.4N, L=5.3], Finland, and the Arase (ERG) satellite. Case 1 on March 28, 2017 from ~22:30 to 23:00 UT, happened on the post-midnight side and during the recovery phase of a storm with a period of sustained high solar-wind speed and high AE ($400 < \text{AE} < 800 \text{ nT}$). Case 2 on November 30, 2017 from ~09:30 to 10:20 UT was observed on the noon side, during a geomagnetic quiet time with a Dst $> 10 \text{ nT}$ and AE $< 100 \text{ nT}$. Using these events, we estimated the size and characteristics of the active wave source for each event, the region where the waves are generated with the same frequency and spectral features. We discuss the coherence and spatial extent of the waves, and their local source size. We also investigate the role that density plays in the variations in the spectral features of the observed waves. We use correlation and wave analysis to compare wave propagation between the two cases. Finally, we discuss electron pitch angle distributions. This study presents the first opportunity to compare two conjugate events between the same ground-station and satellite, at different geomagnetic conditions and on almost opposite sides of the magnetosphere.

Keywords: VLF, Arase , Conjugate event, ERG, QP, whistler-mode