

Abstract Submitted
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Nonlinear Interaction of Naturally and Artificially Excited VLF and ELF Waves in the Ionosphere¹ VLADIMIR SOTNIKOV, JAMES CAPLINGER, TONY KIM, Air Force Research Laboratory, WPAFB, OH, EVGENY MISHIN, Air Force Research Laboratory, Kirtland AFB, NM — We report on analysis of nonlinear parametric coupling between quasi-electrostatic whistler waves (also known as Lower Oblique Resonance (LOR) waves) and of Extremely Low Frequency (ELF) fast magnetosonic waves to generate electromagnetic whistler waves. Natural and artificial VLF and ELF sources are analyzed. In the case of naturally excited VLF/ELF waves we show that nonlinear parametric coupling between the LOR and ELF waves suffices to explain the observed electromagnetic whistler waves in the plasmasphere boundary layer. In the case of artificial sources such as a loop antenna a great deal of the source power is radiated not as an electromagnetic whistler wave, but as a quasi-electrostatic LOR mode. Only a small percentage of the power is radiated as the electromagnetic whistler wave. We present new results on parametric interaction of LOR waves with ELF waves to demonstrate the possibility to overcome this difficulty. It will be shown that interaction of LOR waves gives rise to excitation of electromagnetic whistler waves. Additionally, particle-in-cell (PIC) simulations, which demonstrate the excitation and spatial structure of VLF waves excited by conventional and parametric sources will be presented.

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