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Generation of Whistler Waves by Continuous HF Heating of the Upper Ionosphere

Abstract:

Broadband whistler waves in the frequency range 7-10 kHz and 15-19 kHz, generated by F-region CW HF ionospheric heating in the absence of electrojet currents, were detected by the DEMETER satellite overflying the HAARP transmitter during HAARP/BRIOCHE campaigns. The whistler waves are in a frequency range corresponding to the F-region Lower-Hybrid (LH) frequency and its harmonic - generated by mode conversion of LH waves that were parametrically excited by HF-pump-plasma interaction at the upper hybrid layer. The letter discusses the basic physics and presents a model that conjectures: (i) The whistler wave observed at the LH frequency is due to the interaction of the LH waves with meter-scale field aligned striations; (ii) The whistler wave at twice the LH frequency is due to the interaction of two counter-propagating LH waves. The model is supported by numerical simulations that show good agreement with the observations.