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Global distribution of Jovian ionospheric holes estimated from Jupiter dispersed pulses

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Abstract

The polar perijove passes of Juno provide a unique opportunity to monitor Jovian lightning [1, 2, 3]. Previously, Voyager radio observations in a frequency range of 20 kHz to 41 MHz showed no detections of radio pulses in the Jovian inner magnetosphere [4]. One of the surprising results from Juno is the first detections of dispersed millisecond pulses called Jupiter dispersed pulses (JDPs) at frequencies below 150 kHz. JDPs with lower frequency cutoffs between 20 kHz and 150 kHz were recorded by the Juno radio and plasma wave (Waves) instrument [5]. JDPs propagate in the free left-hand ordinary (L-O) mode with typical durations of 3 ms. In accounting for the spectral shapes of these pulses, we proposed an O mode propagation model in which low plasma irregularities are located between Juno and lightning strokes. These irregularities directly connect to ionospheric holes with densities below 250 cm^{-3}. Hence, observing JDPs gives a useful tool to identify low density holes in the Jovian ionosphere [6]. By the mid-point of the Juno mission we have made over two thousand JDP detections. Sometimes, pairs of JDPs and lightning-induced whistlers are captured in same 16 ms electric field waveforms. In this presentation, we show the global distribution of ionospheric holes estimated from JDPs and demonstrate their association with Jovian whistlers.

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