Omnipresent Waves in the Thermosphere?

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Spatially coherent waves with quasi-periods of ~1-hour were found to be continuously and ubiquitously present in incoherent scatter radar (ISR) observations over Arecibo Observatory in Puerto Rico [*Livneh, et al*., 2007]. Further investigation has led to the discovery of the same phenomenon over the ISRs at Millstone Hill, Massachusetts, and Poker Flat AK, as well as in ion drift measurements taken by the Defense Meteorological Satellites Program (DMSP) F13 and F15 satellites. For the radars, the waves were observed to be nearly continuously present over four multi-day geomagnetically quiet observation periods at Arecibo, several multi-day periods at Poker Flat and a full month period of varying geomagnetic activity at Millstone Hill. The radar data sets were filtered to highlight the waves; the processing techniques will be discussed. The radar results show the waves strongly throughout the F-region, often spanning 140 km to above 500 km in altitude, and they are detected day and night in the F2-layer. In fact, the waves are seen at every time and altitude that there is sufficient plasma to detect them. DMSP ion drift measurements consistently show evidence of these waves at the height of the satellites (~840 km), implying that their vertical extent may be the entire thermosphere above ~140 km. The consistent detection of the waves, along with the longitudinal alignment and large latitudinal spread of the observation sites suggests that these waves are always present over eastern North America. Airglow imager results at Arecibo indicate a southwestern direction of travel for the waves. These waves may be linked to high-latitude Medium-Scale Traveling Ionospheric Disturbances (MSTIDs) observed with the superDARN radar network and associated with E-region auroral electrojet source(s) that are quasi-coherent under geomagnetic quiet conditions, suggesting that the waves have auroral origins. As auroral-zone MSTIDs are believed to dissipate before reaching Arecibo latitudes [*Vadas*, 2007] various alternative scenarios are explored.

Livneh, D. J., et al. (2007), Continuous quasi-qeriodic waves over Arecibo, *Journal of Geophysical Research*, *112*, DOI: 10.1029/2006JA012225.

Vadas, S. L. (2007), Horizontal and Vertical Propagation, and Dissipation of Gravity Waves in the Thermosphere from Lower Atmospheric and Thermospheric Sources *Journal of Geophysical Research*, *112*, DOI: 10.1029/2006JA011845.