Geophysical Research Abstracts
Vol. 20, EGU2018-19014, 2018
EGU General Assembly 2018

Incoherent scatter radar observations of thermal plasma oscillations in the ionosphere

Juha Vierinen (1), Björn Gustavsson (1), David Hysell (2), Michael Sulzer (3), Phil Perillat (3), and Erhan Kudeki (4)

(1) University of Tromso, Tromso, Norway, (2) Cornell University, New York, USA, (3) Arecibo Observatory, Puerto Rico, USA, (4) University of Illinois Urbana-Champaign, Illinois, USA

Incoherent scatter radar observations of ionospheric plasmas rely on echoes from electron density fluctuations with properties governed by the dispersion relations for ion acoustic and Langmuir waves. Radar observations of echoes associated with Langmuir waves (plasma lines) from thermal plasma are extremely weak. Plasma line echoes are typically only observed with radars only when the Langmuir waves are enhanced by suprathermal electrons via wave-particle interaction. A new observation technique has been developed which is sensitive enough to allow observations of these echoes when the Langmuir waves are not enhanced by suprathermal electrons. We present recent observations from the Arecibo Observatory 430 MHz incoherent scatter radar which show plasma line echoes during the night when nearly no suprathermal enhancement is expected to be present. The observations are compared with theory, and the results are found to be in agreement with classical incoherent scatter theory for thermal plasmas. The theoretical ratio of the ion line and plasma line power spectral density is within approximately 3 dB of the predicted value. The finding adds a new observational capability, allowing electron density to also be observed at night using the plasma line well into the top side of the ionosphere, increasing the accuracy of the electron density measurement.