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Title: *High Latitude Ionospheric Irregularities*

Cluster: *Cross-Theme Theory and Data Analysis/SECTP*

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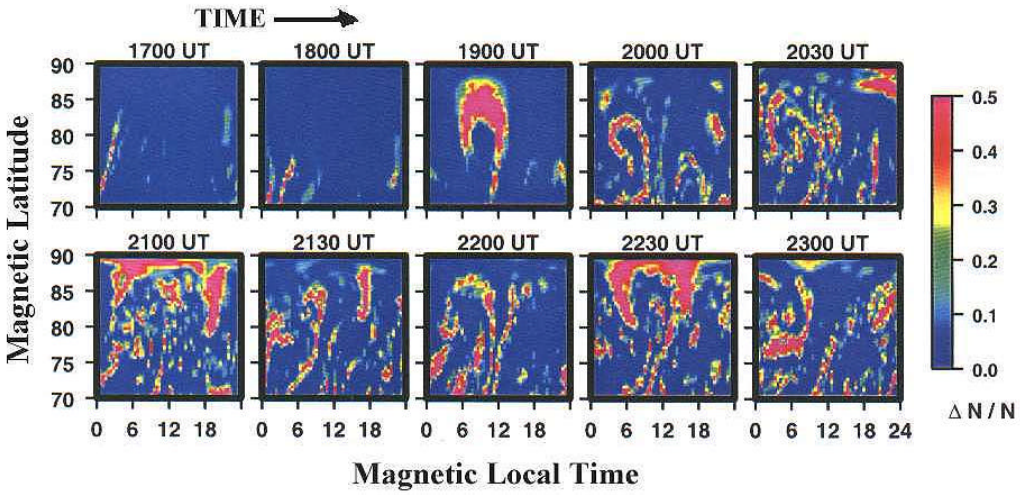
- **Plasma Density Irregularities Grow as They Move Thousands of Kilometers**

The Earth's ionosphere drifts horizontally across the polar region due to magnetospheric electric fields. This motion, in combination with ionization produced by auroral energetic particle precipitation, leads to large-spatial scale electron density structures whose sharp boundaries can be unstable. leading to small-scale density irregularities. Global ionospheric models have successfully reproduced the observed large-scale structures, but not the density irregularities. A first step has been taken to incorporate the instabilities in a global model. A simulation of the irregularity growth rate and time-integrated irregularity development as the plasma drifted across the polar region has now been incorporated in the USU ionosphere model. The simulation showed that local instability calculations are not appropriate — it is necessary to model the time evolution of the plasma density irregularities while following the plasma motion.

These irregularities contribute to the fading of high frequency trans-ionospheric radio signals and to the degradation of ground-satellite communication. Forecasting and specification of the irregularities is a major component of space weather programs.

Time-sequenced snapshots of simulated electron density irregularities, $\Delta N/N$, at 300 km altitude in the northern polar region. (a simulation for 13 November 1996).



Sojka, J. J., L. Zhu, M. David, and R. W. Schunk, Modeling the Evolution of Meso-Scale Ionospheric Irregularities at High Latitudes, *Geophysical Research Letters*, 3595-3598, November, 2000; and work in progress.