THE CLIMATE OF MID-LATITUDE IONOSPHERIC IRREGULARITIES ACCORDING TO DYNASONDE OBSERVATIONS AT BEAR LAKE, UTAH

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A time series (11 Feb. 2003 to present) of mid-latitude dynasonde observations supports a climatological study of small-scale (0.1-10 km) irregularity parameters by the "Phase Structure Function" and "Anomalous Attenuation" methods. The Phase Structure function method is based on precision measurements of short-period phase variations in totally-reflected radio echoes, as statistically summarized in the temporal structure function, SFp. We relate parameters of the SFp to the irregularity spectrum parameters (ΔN/N(1000m), and spectral index ν) by means of diffraction theory. The ionospheric E and F regions are treated separately. Another diagnostic approach, based on the theory of multiple scattering, predicts a significant level of anomalous attenuation (tens of decibels) of totally-reflected echoes arising from a specific mode of radiowave interaction with ionospheric irregularities. This is, we believe, the first synoptic study of small-scale ionospheric irregularities.

Study of about one years data yields the following results:

a) Characteristic (and different) average diurnal variations are found for E and F regions, and for the seasons. There is an evident cause and effect relation between, for example, the sunrise/sunset processes in the ionosphere and irregularity amplitude.

b) There is evidence that the electron density irregularity absolute amplitude, ΔN, is of more fundamental significance than the relative amplitude ΔN/N for small scales. Clearly, ΔN should be less dependent on diurnal variations of average electron density, and we find that it has a distinct tendency to preserve its value (on the average) along a magnetic tube, between E and F regions.

c) There is an evident correlation between irregularity amplitude and plasma gradient, in both E and F regions.

d) Irregularity amplitude is correlated with the local magnetic K index at higher latitudes, but not at Bear Lake.

e) On the other hand, we observed indications of a significant increase of the anomalous attenuation during some stages of the record Halloween 2003 magnetic storm days, probably signifying an increase in the relative importance of the small-scale (sub-kilometer) end of the irregularity spectrum compared to quiet days.

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2. G - Ionospheric Radio and Propagation

3. (a) G/H Impacts of the Ionosphere on Terrestrial Systems

4. C - Contributed Paper, Program chair: Anthea Coster

5. No special instructions