GHJ - Novel ground-based radio techniques for studying the sun-earth plasma environment

## Mesospheric Measurements from Dynasonde Ionograms

J. W. Wright, N. A. Zabotin (CIRES, U. of Colorado at Boulder) M. T. Rietveld (EISCAT Scientific Association, Tromso Norway) M. L. V. Pitteway (Brunel University, Uxbridge UK)

Ionosondes by definition are multi-frequency radar systems, while mesospheric radars ... whether named as "partial reflection", "Imaging Doppler Interferometer" or "MF radar" systems ... are almost invariably designed for single-frequency operation. A potential exception is the 'IDI' implementation for the Dynasonde, but in practice it also uses a single frequency. All of these examples integrate their observations in time series, to improve signal vs. noise performance. Early mesospheric emphasis aimed at D-region electron density profiles by Faraday rotation or magnetoionic (O, X) mode amplitude measurements. Today, this objective is neglected in favor of spaced-antenna observations from which winds and tides can be obtained. The Dynasonde is also a spaced antenna system, and its high-resolution I & Q range sampling (e.g., at 10µs, 1.5 km intervals) can easily be initiated at, say, 50 km altitude rather than at 90 km as is sufficient for the E and F-regions of the ionosphere. What can be learned from multi-frequency measurements in the mesosphere? We show that wind and tide results do not require fixed-frequency soundings; that information to obtain the mesospheric ionization density is present in these measurements; that some of the data-analysis steps applied to ionospheric I & Q are equally applicable to mesospheric scatter; that no dedicated observing mode is required; and that standard Dynasonde ionograms are sufficient for atmospheric observations in the mesosphere and ionosphere.