THE DYNASONDE THREE-DIMENSIONAL PROFILE INVERSION ALGORITHM NEXTYZ: AN INSTRUMENT TO INVESTIGATE MID-SCALE MORPHOLOGICAL FEATURES OF THE IONOSPHERE (SPORADIC LAYERS, PRECIPITATION, GRAVITY WAVES ETC.)

N.A. Zabotin[1], J.W. Wright[1], G.A. Zhbankov[2] , L.Ye. Zabotina[1]

[1]CIRES, University of Colorado at Boulder, Box 216, Boulder, CO, 80309 USA
[2]Institute of Physics, Rostov State University, Stachki Ave., 192, Rostov-on-Don, 344091 Russia

Electron density profile inversion from digital ionogram data has been reconsidered in our previous publications from the viewpoints of new possibilities and of modern requirements. The Dynasonde data processing system (DSND) provides accurate information for every echo, of not only group range but also about its direction of arrival (among other physical parameters), thus yielding three-dimensional distributions of apparent echolocations. A contemporary PC processes this information quickly enough using a multiple ray tracing technique, to obtain parameters of a quite sophisticated three-dimensional model of the local electron density distribution (the so-called Wedge-Stratified Ionosphere). The WSI model characterizes the vertical N(h) profile together with its horizontal gradients and general tilts. This approach has been implemented in the NeXtYZ ("Next Wise") algorithm that inaugurates a new generation of ionospheric electron density inversion procedures.

Ionogram traces can often be characterized as belonging in one or the other of two broad groups: those that describe an essentially continuous (not necessarily vertical) structure, and "fragments" that describe parts of sufficiently intense lateral structures. The first group yields the natural product of NeXtYZ, the WSI parameters and calculated 3-D positions of reflection points for each of the echoes used in that part of the inversion process. In addition, when traces of the second type are present, and provided that WSI parameters from the first group are fully available, ray tracing is performed for echoes in traces of the second type. In this way, NeXtYZ represents accurately all significant ionospheric structures in the local three-dimensional space. It is a useful instrument in research aimed at studies of auroral precipitation, gravity waves and the notoriously intense equatorial structures.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: zabotin4003

Date Received: September 19, 2005

1. (a)
Nikolay Zabotin
University of Colorado at Bould
CIRES
Campus Box 216
Boulder, CO
80309 USA
nikolay.zabotin@colora
(b) (303) 497-5095
(c) (303) 497-6513

2. G - Ionospheric Radio and Propagation

3. (a) S-G4

4. C - Contributed Paper

5. No special instructions