

SOLITONS IN THE IONOSPHERE – ADVANTAGES AND PERSPECTIVES

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Solitary vortex structures in the atmosphere of the Earth, as well as of other planets, have been investigated in last decades. Rossby solitons have been derived under different approximations, usually investigating nonlinear effects associated with large amplitude acoustic-gravity perturbations in the Earth's atmosphere, using approximation of incompressible fluid with stream function with no rotational effects, or equivalently, in the plasma environment with temperature gradient for the ion-acoustic perturbations.

However, so-called magnetized Rossby waves have been investigated recently, in the Earth's ionosphere, in order to explain rotational and magnetic field effects. In our research, we have included for the first time compressible fluid and horizontal effects of self-organized conductive fluid accompanied with Poisson's equation, instead of stream function approach. The existence conditions for these nonlinear structures are discussed with respect to the presence of inhomogeneities of the layer thickness in the equilibrium.

Advantages of the soliton structure are numerous. First, these structures are stable in time and space and it is much easier to deal with them, instead of number of linear waves existing in the ionosphere. They are, at the same time, more accurate since they involve nonlinearities balancing dispersion effects. Neglecting of nonlinearity could lead to catastrophic conclusion of often break down of linear waves due to dispersion.

References

- van Hejst, G. J. F., Kloosterziel, R. C.: 1989, *Nature*, **338**, 569.
Forbes, J.M., Leveroni, S.: 1992, *Geophys. Res. Lett.*, **19**, 981.