Magnetized Rossby waves in mid-latitude ionosphere F-layer

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From the analysis of the critical F2 frequency variations in the ionosphere the waves with temporal scales about 7 days and relative amplitude to 40% were observed. From the temporal scale, position and wave maximum changes it is assumed that the critical F2 frequency variations are caused by Rossby wave-like disturbances. The spatial and temporal planetary scale wave parameters on F-layer hights were obtained based on of mid-latitude ionosonde network measurements and TEC data for Millstone Hill, Dyess, and Point Arguelo (www.ngdc.noaa.gov/stp/IONO/). The long-term existence of 5-7 days period waves are confirmed from critical F2 frequency and TEC variations data. The numerical model based on conservation laws is proposed and some special nonlinear cases are considered to study the wave dynamics on the ionosphere F-layer heights. The model test runs show good correspondence with the simulations according to Hasegawa-Mima and Charney-Obukhov equations (Horton W., Hasegawa A. Chaos. 1996. V. 4(2). P. 227). In linear case the proposed model gives results, which reproduce the dispersion equation for the slow planetary scale waves. The dynamics of separate initial disturbances is considered taking into account the nonlinear term of the generalized Charney-Obukhov equation.