

Excitation of Rossby-Khantadze Solitary Waves in the Earth's Ionospheric E-layer

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Nonlinear vortex propagation of electromagnetic coupled Rossby and Khantadze planetary waves in the weakly ionized ionospheric E-layer is investigated by both analytically and numerically.

Simplified 2D system of nonlinear partial differential equations is obtained owing to physical and mathematical model testing. Corresponding nonlinear solitary dipole vortical structures are constructed theoretically. Conditions for such self-organization are given. It is shown that nonlinear large-scale dipole vortices generate strong pulses of the geomagnetic field.

Large scale, finite amplitude vortex structures are launched as initial conditions at low, mid, and high latitudes under the numerical simulations. We show that for finite amplitude there are dipole solitary structures emitted from the initial conditions.

We note that obtained theoretical results satisfy experimental observations.