Kaladze, T. D.; **Özcan, O.**; **Yeşil, A.**; **Tsamalashvili, L. V.**; **Kaladze, D. T.**; **Inc, M.**; **Sağir, S.**; **Kurt, K.**

Shear flow-driven magnetized Rossby wave dynamics in the Earth's ionosphere. (English)

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Summary: Taking into account the action of inhomogeneous zonal wind (shear flow), nonlinear dynamic equations describing the propagation of planetary ULF magnetized Rossby waves in the ionospheric D-, E-, and F-layers are obtained and investigated. The influence of existence of charged particles through Hall and Pedersen conductivities on such dynamic equations is studied in detail. It is shown that the existence of shear flow and Pedersen conductivity can be considered as the presence of an external energy source. The possibility of a barotropic instability of the magnetized Rossby waves is shown. Based on the Rayleigh's theorem, the appropriate stability conditions are defined in case of the ionospheric D- and E-layers. It is indicated that magnetized Rossby waves under the action of shear zonal flow correspond to states with negative energy. Some exponentially localized vortical solutions are found for the ionospheric D- and E-layers.

MSC:

76U65 Rossby waves
76X05 Ionized gas flow in electromagnetic fields; plasmic flow
76U60 Geophysical flows
76E20 Stability and instability of geophysical and astrophysical flows
86A10 Meteorology and atmospheric physics

Keywords:

shear zonal planetary wind; Pedersen conductivity; charged particle; Rayleigh theorem; stability condition

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