2nd International Conference and Exhibition on Mechanical & Aerospace Engineering

September 08-10, 2014 Hilton Philadelphia Airport, USA

Theoretical and experimental detection of nonlinear electromagnetic waves as the elements of turbulence in the geospace environment

Khatuna Chargazia and **Oleg Kharshiladze** Tbilisi State University, Georgia

The physical and mathematical model of generation and further linear and nonlinear evolution of ultra low frequency (ULF) electromagnetic waves is investigated in the ionosphere at interaction with inhomogeneous winds (shear flows), which represents itself a new mechanism of energy redistribution in the medium. Self organization of the considered waves into nonlinear strongly localized vortex structures (monopole and dipole vortices, vortex chains, vortex streets) is studied theoretically in the different regions of the ionosphere and magnetosphere. Plasma vortices are often detected by spacecraft in the geospace (atmosphere, ionosphere, magnetosphere) environment, for instance in the magnetosheath and in the magnetotail region. Large scale vortices may correspond to the injection scale of turbulence, so that understanding their origin is important for understanding the energy transfer processes in the geospace environment. In a recent work, the THEMIS mission has detected vortices in the magnetotail in association with the strong velocity shear of a substorm plasma flow, which have conjugate vortices in the ionosphere. By analyzing the THEMIS data for that event, we find that several vortices in the magnetotail can be detected together with the main one, and that the vortices indeed constitute a vortex chain. Such vortices can cause the strong turbulent state in the different media. The strong magnetic turbulence is investigated in the ionsophere as an ensemble of such strongly localized (weakly interacting) vortices.

Biography

Khatuna Chargazia graduated the Faculty of Physics and Mathematics of Tbilisi State University in 1994. In 2006, she defended the dissertation on theme "The Features of the Dynamics of Ultra-Low Frequency Electromagnetic Wave Structures in the lonosphere" at M. Nodia Institute of Geophysics, Tbilisi, Georgia. Her research interest are: Theoretical studies of linear and nonlinear dynamic processes in space and laboratory plasma, strong turbulence theory on the bases of nonlinear solitary vortex structures in the dispersive media, physics of atmosphere, ionosphere, magnetosphere, physical, mathematical and computer modeling.

khatuna.chargazia@gmail.com