DATA ANALYSIS AND SIMULATION OF PLASMA FLOW VORTICES IN THE MAGNETOTAIL. Kh. Chargazia[1], O. Kharshiladze[2], G. Zimbardo[3], J, Rogava[4], [1]Iv. Javakhishvili Tbilisi State University, Chavchavadze ave 2., 0128 Tbilisi, Georgia, [2]Iv. Javakhishvili Tbilisi State University, Chavchavadze ave 2., 0128 Tbilisi, Georgia, [3]Universita' della Calabria, 87036 Rende (CS), Italy, [4]Iv. Javakhishvili Tbilisi State University, Chavchavadze ave 2., 0128 Tbilisi, Georgia,

Introduction: Ulf electromagnetic planetary waves can self-organize into vortex structures (monopole, dipole or into vortex chains). They are often detected in the plasma media, for instance in the magnetosheath, in the magnetotail and in the ionosphere. 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 (Keiling et al., J. Geophys. Res., 114, A00C22 (2009), doi:10.1029/2009JA014114), which have conjugate vortices in the ionosphere. By analyzing the THEMIS data for that event, we find that several vortices can be detected together with the main one, and that the vortices indeed constitute a vortex chain. The study is carried out by analyzing both the velocity and the magnetic field measurements for spacecraft C and D, and by obtaining the corresponding hodograms. It is found that both monopolar and bipolar vortices may be present in the magnetotail. The comparison of observations with numerical simulations of vortex formation in sheared flows is also discussed.

References:

[1] Keiling, A., Angelopoulos, V., Runov, A., Weygand, J., Apatenkov, S. V., Mende, S., McFadden, J., Larson, D., Amm, O., Glassmeier, K.-H., and Auster, H. U.: Substorm current wedge driven by plasma flow vortices: THEMIS observations, J. Geophys. Res., 114, A00C22, doi:10.1029/2009JA014114, 2009.

[2] Baumjohann, W., M. Hesse, S. Kokubun, T. Mukai, T. Nagai, and A. A. Petrukovich. Substorm dipolarization and recovery, *J. Geophys. Res.*, *104*, 24,995–25,000, doi:10.1029/1999JA900282. 1991

[3] Birn, J., J. Raeder, Y. Wang, R. Wolf, and M. Hesse. On the propagation of bubbles in the geomagnetic tail, *Ann. Geophys.*, *22*, 1773–1786, doi:10.5194/angeo-22-1773-2004. 2004

[4] Aburjania G. ,Chargazia Kh. Self-organization of ULF large-scale electromagnetic wave structures in E region of the ionopshere at interaction with inhomogeneous zonal winds. Plasma Phys. Rep., V. 37, N 2, P. 199-213. 2011.

[5] Aburjania G., Khantadze A., Kharshiladze O. Nonlinear planetary electromagnetic vortex structures in F region of the ionosphere. Plasma Phys. Rep. V. 28, N 7, P. 633-638. 2002.