



## **Vortex motions and nanoscale particles in the ionosphere**

Yu.N. Besedina (1), S.I. Popel (1), and P.K. Shukla (2)

(1) Institute for Dynamics of Geospheres, Moscow, Russian Federation (besedina\_yn@mail.ru / Fax: +7-499-1376511), (2) Ruhr University Bochum, Germany

Redistribution of dust particles in the ionosphere as a result of vortical motions is discussed. The following possibilities are studied: capture and evolution of dust particles in acoustic-gravity (AG) vortices, formation of dust vortices as a result of involving a great number of dust particles into vortex motions, and formation of vertical dust flows (streamers). It is shown that excitation of AG vortices at altitudes of 110–130 km as a result of development of AG wave instability, associated with nonzero balance of heat fluxes, owing to solar radiation, water vapors condensation, infrared emission of the atmosphere, and thermal conductivity, leads to a substantial transport of dust particles and their mixing at altitudes of 110–120 km. Layers of dust particles in the ionosphere with a thickness of about a kilometer, forming at altitudes less than 120 km, distribute within the region of existence of AG vortical structures. As a result, at altitudes of 110–120 km, dust vortices can appear, and transport of particles up to altitudes of 130 km becomes possible. One of the ways of transport of dust particles in the ionosphere is vertical flows (streamers), which are generated by dust vortices as a result of development of parametric instability. This study was supported by the Division of Earth Sciences, Russian Academy of Sciences (the basic research program “Nanoscale particles in nature and technogenic products: conditions of existence, physical and chemical properties, and mechanisms of formation”) and by the Division of Physical Sciences, the Russian Academy of Sciences (the basic research program “Plasma physics in the solar system”). S.I.P. is also supported by the Dynasty Foundation.