

# **Heavy ion layer in the Earth's stratosphere and its influence on the middle atmosphere processes**

L. N. Makarova and A. V. Shirochkov

Arctic and Antarctic Research Institute Saint-Petersburg 199397 Russia

(shirmak@aari.nw.ru/Phone:+7-812-3520601)

Various experimental data prove existence of a layer of charged particles (preferably ions of both polarities) in the Earth's stratosphere (altitudes 15-30 km). Data of atmospheric balloon, lidar and rocket measurements performed at different latitudes of the both hemispheres during various seasons are considered. Results of the mass-spectrometer rocket measurements show that this layer consists mostly of complex ion-clusters whose mass numbers exceed  $\sim 200$  units and rates of formation are comparatively slow. Origin of this layer is thought to be energetic particles capable to penetrate to stratospheric heights. The most probable candidate is the galactic cosmic rays – a permanent source of the middle atmosphere ionization. Sometimes solar protons and relativistic electrons of very high energy contribute to a level of ionization of this layer. In this paper the main photo-chemical processes determining long-live existence of the stratospheric layer of charged particles are considered in details. Interactions of these processes with dynamics of the main ozone layer and formation of aerosol concentration in the middle atmosphere are analyzed also. A direct connection of stratospheric ion layer with such atmospheric processes like heating of the stratosphere by electric currents induced by the solar wind disturbances, formation of the stratospheric clouds etc is demonstrated also. A suggestion is made that under definite circumstances the stratospheric ion layer could be a conducting parameter of the global electric circuit playing important role in various middle atmosphere processes.