MAIN ION COMPONENTS OF AIR PLASMA IN THE LOWER TROPOSHERE [[1]](#footnote-1)\*)

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Interest in the composition of the plasma of the ionosphere at altitudes of 0-40 km has increased recently in connection with the problems of the chemistry of the atmosphere and the study of ion-formation processes near thunderclouds. The issue of the distribution of the concentration of ions in the lower ionosphere over height is of important applied interest, since the concentration of ions with their participation in chemical and physical processes determines their effect on the charging of the ionosphere and clouds and the electrical conductivity of the lower ionosphere.

The knowledge of ion concentrations allows one to judge the processes in the ionosphere in the state before earthquakes, since during earthquakes there is a rapid increase in the concentration of particles. Knowledge of the ion composition of the atmosphere is necessary when simulating plasma aerodynamics devices, when it is necessary to create a plasma region at altitudes, where the ionization processes due to radon in the surface layer of the atmosphere do not work.

An important issue is the distribution of ions over the height of a thunderstorm cloud, which is charged inhomogeneously due to the production of ions when cosmic ray particles collide with air molecules near the cloud. For the calculations, we used the dependence of the ionization of the atmosphere by cosmic rays over the height above sea level, measured at different points of the globe, that is, at different values ​​of the magnetic hardness.

When determining the main processes leading to the establishment of the type of charged particles, we used the analysis of elementary processes in the lower ionosphere, which shows that after the production of electrons and ions, the processes of electron attachment to oxygen molecules and the conversion of positive ions effectively occur. Taking these processes into account, it was found that at the altitudes considered, the relation is fulfilled, where *Q* is the ionization rate,  is the ion-ion recombination coefficient depending on the temperature (altitude) of the atmosphere, is the concentration of negative oxygen ions, is the concentration of positive ions, at  (at atmospheric pressure, at the level of the Earth, when *Q* = 4 cm-3∙s-1, and cm-3 / s, the concentration of ions turns out to be of the order of the experimental cm-3). The main ions are . The concentration of electrons is determined on the basis of the ratio, where is the constant of electron detachment from oxygen molecules, - frequency of three body attachment of electrons oxygen molecules *N* is the concentration of neutrals. Taking into account detachment, the concentration of electrons at the ground level turns out to be of the order of 1 cm-3.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/GE-Bychkov.docx) [↑](#footnote-ref-1)