



The geomagnetic activity influence on climatic characteristics of the troposphere and climate changes in the last century

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Mechanisms of solar activity effects on weather and climate have been discussed. Authors proposed a physical mechanism of solar activity effects on climatic characteristics and the atmospheric circulation through the atmospheric electricity. A model of the solar activity effect on climatic characteristics of the Earth's troposphere was elaborated on the basis of the mechanism under consideration. The model key concept is the heliogeophysical disturbance effect on the Earth climatic system's parameters, which influence energy flux going from the Earth to space in high-latitude areas. In accordance with this model, the atmospheric electricity parameters in the high latitudes depend on the solar activity; at the same time, they influence the altitude distribution of charged condensation nuclei in the troposphere, as well as the cloudiness formation and radiation balance and atmospheric circulation. When the solar activity increases, radiation cooling of high-latitude regions decreases, thermobaric field restructures, average meridian gradient of temperature between polar and equatorial regions decreases, defining the atmospheric circulation.

Precipitation is a sensitive indicator of the atmospheric circulation change. NCEP/NCAR Reanalysis and CMAP data were used to analyze particularities and regularities of long-term variations in amount of precipitation in 1950-2007. Global decrease in amount of precipitation was found to dominate till late 1990s. It started increasing only 10 years ago. Peculiarities of distribution and long-term variations in amount of precipitation in different latitudes and longitudes were also considered.

In the framework of the model considered, the analysis results are presented and discussed of regularities of variations in geomagnetic activity and troposphere thermobaric characteristics for 1900–2007. It is showed that a continuous increase of the Earth climatic system heat content has been observed from 1910 till now. Under the model, we made analysis of regularities, which underlie variations of geomagnetic activity and troposphere thermobaric characteristics. These results and changes of the global circulation in the atmosphere and ocean allow the conclusion that the warming observed in the 20th century can be mostly explained by variations of the solar activity level. The surface temperature anomalies in 1940-1975 and the World Ocean heat content changes result from a response peculiarity of thermal and dynamic regimes of the World Ocean and atmosphere to changes of processes in the atmosphere, ocean and cryosphere. These changes are associated with the warming in polar areas in the early 20th century. The main determining factors of the process are changes in the Arctic Ocean's frost mass and north rivers' outflows, which regulate the North Atlantic salinity, thermohaline circulation characteristics and atmosphere-ocean energy exchange.

Scenario for changes of physical processes in the Earth atmosphere, cryosphere and ocean is presented on the basis of the model of the solar activity effect on the troposphere circulation and thermobaric characteristics. Necessity was shown to consider changes in the atmosphere and ocean circulation (including El Niño – La Niña), cryosphere, thermohaline circulation and volcanic effects to determine quantitative contribution of the solar activity and anthropogenic factors to changes of the global surface temperature, heat content of the atmosphere and ocean.