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Influence of the disturbed solar wind on atmospheric processes in Antarctica

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Fluxes of galactic cosmic rays altered by solar wind and spikes of solar cosmic rays are usually examined as the most likely mechanism of the solar activity influencing the Earth's atmosphere. Analysis of wide set of the ground-based meteorological data and aerological measurements from the Antarctic plateau stations Vostok and Dome C has shown that atmospheric perturbations in the Southern winter polar region are better related to fluctuations in the interplanetary magnetic and electric fields: the large increases of the geo-effective dawn-dusk component of the interplanetary electric field give rise to warming on the ground level in the Central Antarctica. The interplanetary electric field can influence the temperature regime by means the global electric circuit affecting clouds and, hence, the radiation dynamics of the troposphere. We suggest that the winter atmosphere on the Antarctic ridge is usually in state of the thermal quasi-equilibrium due to superposition of the constant radiation cooling of air placed at the ice sheet and adiabatic warming of air masses, which income from above. This equilibrium would be violated if the radiation cooling sharply decays owing to appearance of a cloud layer in the upper troposphere. The warming in the central Antarctica would crucially disturb the wind regime at the whole of Antarctica. The severe deviations of the ground level atmospheric winds from the regular pattern (i.e. anomalous winds) have been examined in relation to strong disturbances in the interplanetary magnetic field (IMF). The statistically significant relationships between anomalous winds in Antarctica and the southward IMF have been found.