Spatial-temporary variations of atmospheric-electrical and meteorological sizes during shkval's passage

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The aim of the work was to analyze the atmospheric conditions that caused the emergence of a squall in the autumn season of the year, as well as a detailed assessment of dynamic processes in the surface layer of the atmosphere, which led to the emergence and development of this dangerous natural phenomenon.

The weakening of the western transference in the Northern Hemisphere, observed at the beginning of the XXI century [1], contributes to the increase in "breakthroughs"of air masses from the north or south, which are associated with large temperature gradients that catalyze convective processes. From October 28 to October 29, 2018 squally wind amplifications up to 25 m / s and more were registered over the city of Tomsk. The registration used data from multipoint measurements of meteorological, electrical, and turbulent quantities in the surface layer. The measuring network is equipped with automatic weather stations TAA-01, as well as sensors of electric field strength EFS-2/50.

The air temperature in the period preceding the HE reached anomalously high values. Relative humidity has dropped to an abnormal low value of $\sim 20\%$. In the dynamics of the components of wind, turbulent flows, and electric field strength E, waves with a period of ~ 12 h were recorded. Before the passage of the cold front, slow variations in the intensity characteristic of cumulonimbus clouds were observed [2].

The conditions for the formation of the "Squall" nuclear weapons, registered late in autumn in the city of Tomsk, are considered. The specific features of the dynamics of atmospheric-electrical quantities before and during RH are noted. The results can be used to predict the autumn squalls, the frequency of which in Siberia and the Arctic in a changing climate increases.

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1. Loginov S.V., Moraru E.I., Kharyutkina E.V. Connection of tropospheric circulation cells with variability of meridional heat fluxes over the territory of Siberia // Atmospheric and Oceanic Optics. 2016. V. 29, No. 08. p. 640-646.

2. Pustovalov K.N., Nagorskiy P.M. Cumulonimbus clouds / Journal of Atmospheric and Solar-Terrestrial Physics, 2018. V. 172. P. 33-39.