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Formation and dynamics of hazardous convective weather events in Ukraine

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Atmospheric circulation change observed from the middle of the 70s of the twentieth century in the Northern Hemisphere resulted in changes of weather events formation conditions in different regions. The degree of influence of various factors on the formation of weather events also has changed. This eventually led to an increase in number and intensity of weather events and their variations in time and space. Destructions and damages associated with these events have increased recently and the biggest damages are mainly results of complex convective weather events: showers, hail, squall. Therefore, one of the main tasks of climatology is to study the mechanisms of change repeatability and intensity of these events.
The paper considers the conditions of formation of hazardous convective weather phenomena (strong showers, hail, squalls, tornadoes) in Ukraine and their spatial and temporal variability during 1981 – 2010.
Research of convection processes was based on daily radiosonde data for the warm season (May-September 1981 - 2010s), reanalysis ERA-Interim ECMWF data for 1989 - 2010 years , daily observations at 187 meteorological stations in Ukraine, as well as observations of the natural phenomena in other regions (different from the meteorological stations). Indices of atmospheric instability, the magnitude of the Convective Available Potential Energy (CAPE), the moisture, the height of the condensation and equilibrium level was used to quantify the intensity of convection.
The criteria for the intensity of convection for Ukrainian territory were refined on the basis of these data. Features of the development of convection for various hazardous convective weather events were investigated and identified the necessary conditions for the occurrence of showers, hail, tornadoes and squall in Ukraine.
Spatio-temporal variability of convection intensity in Ukraine, its regional characteristics and dynamics for the past 30 year was analyzed. Significant tendency to an increase the average temperature and moisture of the troposphere is observed during 90s of the twentieth century in Ukraine in the warm season that led to the growth of CAPE of the atmosphere, the speed of updrafts, raising the level of condensation and convection, and have increased the instability of the atmosphere. The number and intensity of strong showers, hail, squalls, tornadoes and the number of days with thunderstorms have increased due to such changes in Ukraine.
The obtained quantitative criteria of convection will clarify their forecasting methodology, increase forecast accuracy and reduce the amount of uncertainty in predicting type of phenomena for various dangerous convective events.