Geophysical Research Abstracts
Vol. 13, EGU2011-67, 2011
EGU General Assembly 2011

Interaction between frontal cloud system and dangerous events in Crimea

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The three-dimension diagnostic and prognostic models of frontal cloud systems have been adapted and used for investigation and theoretical interpretation of atmospheric phenomena that accompanied the damage events in Ukraine: heavy rainfalls, flash floods, storms, spouts, earthquakes etc. Cloud systems passing over the Crimea during August – September of 2002 have been considered for the numerical study of the mutual response between these phenomena. Conditions of formation and development of the deep convective cells and heavy precipitation, strong updrafts and downdrafts, strong rotation were modeled and investigated. Cases of heavy rainfall and flash floods that place in Crimea region on August 4-9 and September 16-20 of 2002 will be presented in detail.
Numerical experiments are carried out with main goal to determine the role of various dynamics and microphysics parameters in formation of strong and catastrophic precipitation. Series of numerical experiments have been carried out with aim to research the temporal and spatial distribution of entropy and its production. Interaction between entropy and cloud and precipitation had been estimated. Spatial investigations have been fulfilled with aim to study response on seismic activity of cloud and precipitation.
Some key parameters, meteorological conditions and predictors caused the occurrence of dangerous phenomena were defined:
1. interaction between flows of different physical nature coming from opposite directions;
2. strong vortex motions in air mass advanced to study region;
3. presence of ice supersaturation layers;
4. special distribution of heat flows and entropy;
5. chimney clouds with ice tops and cirrus clouds above;
6. high tropopause achieved 10 km and more, very strong ascending and compensative descending motions;
7. necessary combinations of precipitation-forming mechanisms.
Key words: numerical study, frontal cloud systems, damage events, heavy rainfalls.