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The use of complex method of storm detection and forecasting of severe convective structures based on modelling and satellite data for the territory of the Republic of Belarus

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The most important objective of the forecast is the prognosis of severe weather conditions in time. In summer period these are convection clouds, having rain, thunderstorms. These processes have nonlinear dynamic character and fast development that makes it difficult to forecast. Forecasting methods of these events include such characteristics as moisture, instability and convergence.
The satellite data, and different techniques of analysis applied IR 10.8 μm and WV 6.2 μm channels of satellites, are used for diagnostics of deep moist convection features from the high level troposphere to the low level stratosphere. Meteosat-11 is equipped with a high-resolution imaging radiometer in the visible and infrared channels and consists of 11 channels with 4 km special resolution and 15 minutes temporal resolution. The method used is based on IR 10.8 μm channel that observes cloud-top temperature, shape and phase and WV 6.2μm channel that observes contents of water vapor and cloud-top temperature. The important step of algorithm is comparison between cloud-top temperature and temperature tropopause. To identify the temperature of tropopause there are used the data of numerical model GFS with good spacial and temporary resolutions.
The algorithm includes parameters that produced from analyses IR 10.8 μm and WV 6.2 μm channels and numerical weather prediction fields, divided into two levels, for better interpretation of the regions with deep convection. The first step is to analysis of parameters on possibilities convection. The next step is calculating of the intensity of possible convection.
The study period covered the time interval from March to September 2018. The results demonstration a good special and temporal frequency for the territory of Belarus. For the verification of the results there were applied radar and satellite data. The results showed that the method has more accuracy for complex convective structures, such as the mesoconvective complex. Sometimes, in zones of active cyclones, along fronts, presumably in areas of large-scale removal of water vapor to the upper layers of the troposphere, there may be cases of false detection of areas of powerful convection. In this regard, to mask these false zones, an additional parameter was introduced into the methodology - the convective instability index.
The approach described can be advantageous for specialists to diagnose severe convective storm. The results of research showed that the method can be quite satisfying when applied to large-scale systems that generate several convective storms with different intensities. The best results of method are produced for summer period. The method can be used as the first step of diagnostics for nowcasting system.