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Studying the Dynamics of Non-stationary Jet Streams Formation in the Northern Hemisphere Troposphere

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In the present study, we investigate dynamics of non-stationary jets formation in troposphere by means of mesoscale simulations in the Weather Research & Forecasting (WRF) modeling system, analyzing jet streams that affected the territory of Belarus over the time period of 2010-2012. For that purpose, we perform modeling on domains with 5 km, 3 km and 1 km grid steps and 35 vertical coordinate levels with an upper boundary of 10 hPa.

We focus our attention to identification of basic regularities in formation, movements and transformations of jet streams, as well as to analysis of their characteristic features, geographical position and underlying atmospheric processes and their classification. On the basis of these regularities, we define basic meteorological parameters that can be used to directly or indirectly (as well as qualitatively and quantitatively) identify the presence of jet streams in the specific region of troposphere, and also to determine their localization, stage of development and other characteristics. Furthermore, we estimate energetic parameters of the identified jet streams and their impact on synoptic situation in the surrounding region.

Analyzing meteorological fields obtained from satellite observations, we elaborate a methodology of operational detection and localization of non-stationary jet streams from satellite data. Validation of WRF modeling results with these data proves that mesoscale simulations with WRF are able to provide quite successful forecasts of non-stationary tropospheric jet streams occurrence and also determination of their localization and main characteristics up to 3 days in advance.