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Evaluation of NOTHAS performance in assessing initiation and evolution of a various scale convective systems

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The predictability of mesoscale convective phenomena is limited by the rapid transfer of energy between the large-scale and microscale as the result of the initial conditions, the natural constraints imposed by synoptic-scale forcing, and physical processes. Uncertainties are the greatest challenge when predicting the initiation of convection as the most difficult aspects of convection, due to the complexity of small-scale atmospheric processes. To reduce and minimize the possible errors and forecast uncertainties, the NOvel THunderstorm Alert System (NOTHAS) is developed as a dynamic and diagnostic tool for predicting local-scale phenomena across the specified region up to 72 hours in advance such that it combines various microphysical parametrizations, schemes, and convective parameters by taking the maximum hourly-based local scale signal driven from the NCEP-GFS (or ECMWF) forecasting model and utilizing the WRF model configuration to produce the model hourly outputs. It is adapted to the algorithm based on the probability concepts of the multivariate distribution to estimate the uncertainties under the sharpest threshold criteria and afterward integrated into the main function to obtain the expected output. The flexibility of applying different schemes, and parametrizations, and adapting them to the WRF system implies the NOTHAS capability to run different domains under a single or nested domain under the different horizontal grid lengths. The NOTHAS has been heavily tested over the last three years with the several severe mid-latitude and tropical storm case scenarios, producing a high level of accuracy and being in alignment with the observed thunderstorm activity hours ahead. The excellent model performance of the model is verified under the statistical and scientific guidelines of the World Meteorological Organization.

Primary authors: SPIRIDONOV, Vlado (Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, North Macedonia); ĆURIĆ, Mlađen (Faculty of Physics, University of Belgrade, Department of Meteorology, Belgrade Serbia); SLADIĆ, Nedim (International University of Sarajevo, Sarajevo, Bosnia and Herzegovina); JAKIMOVSKI, Boro (Faculty of Computer Science and Engineering-FINKI, Ss. Cyril and Methodius University in Skopje, North Macedonia)

Presenter: SPIRIDONOV, Vlado (Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, North Macedonia)

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