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Impact of Nesting Techniques Over Short-Term WRF Forecast Accuracy

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Weather Research and Forecasting (WRF) plays a crucial role in studying atmospheric dynamics and investigating the mesoscale weather prediction phenomena. However, WRF model offers lots of different configurations for physics, dynamics, and domain options that need to be investigated. From these configurations, domain options offer nesting techniques which may affect the fundamental structure and the performance of the simulations. Nesting options may impact the representation of fine-scale processes by increasing the resolution for the desired domain, compared to single-domain simulations. Existing studies on comparison of different nesting configurations in mesoscale domains are limited. This study presents a comparative analysis of three different nesting configurations in the WRF model over Türkiye. Accuracy of WRF-based short-term (24 to 48 hourly) temperature, wind, and precipitation forecasts over a 30-day period in November 2021 is investigated utilizing ground-station based observations. Three different model configurations are investigated: single domain, one-way feedback nested, and two-way feedback nested runs for the same time period and region. Root mean square error (RMSE), error standard deviation, and correlation coefficient were calculated for all three configurations. This study contributes to the optimization of nesting configurations in WRF mesoscale weather predictions, aiding decision-making processes reliant on accurate short-term forecasts in Türkiye.