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# The effect of WRF nudging techniques on fine-scale variability of a Mediterranean cyclone event

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The challenge that WRF is facing is undoubtedly the accuracy of the simulations. On the one hand, to improve the skill of the model, dynamical and physical parameters should be adjusted and configured. On the other hand, nudging is alternative approach to optimize the model's simulations. The present study compares the model's skill using grid (analysis-AN) and spectral nudging (SN) (Von Storch et al., 2000) in contradistinction with the model's spread between different parameterization schemes for a Mediterranean tropical-like cyclone.

In the frame of the project "Modelling the Vertical Structure of Tropical-like Mediterranean Cyclones using WRF Ensemble Forecasting and the impact of Climate Change (MEDICANE)" (MIS 5007046), it is necessary to find the optimal physical configuration for Mediterranean cyclone cases. Therefore, it is important to maintain the variability of physical parameterizations by improving the accuracy of the simulations.

Studies for regional climate modelling have shown that AN is less efficient for sensitivity analyses in high resolution as it results in extinguishing fine-scale variability (Bowden et al., 2012, Spero et al., 2014). Additionally, SN can fade out extreme events as it drives the model toward a smoother, larger-scale state (Glisan et al., 2012). The aim of our research is to find the optimal methodology and parameters in order to successfully produce fine-scale simulations with distinctive parameterization characteristics and good model skill at the same time.

In agreement with the literature the key point is to nudge the coarse-scale components of the atmospheric fields toward the IC, whilst the fine-scale components remain open to be implicitly or explicitly resolved. First, we exhibit that the optimal configuration for both AN and SN analyses includes assimilating u and v velocity components along with air temperature for above the 850 hPa layer. Spectral nudging has proven to be dampening physical parameterizations variability less than nudging analysis. Finally, surface validation results in lower errors for the SN than AN simulations.

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