



The use of the MM5 and WRF models for climate downscaling: An Eastern Mediterranean example

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The Penn State/National Center for Atmospheric Research (NCAR) mesoscale model version 5 (MM5), and the newer Weather Research and Forecast (WRF) mesoscale model, have been adapted for climate downscaling, such that, given lateral-boundary conditions from a large-scale analysis or forecast model, the model dynamics and local forcing will define the regional climate. This system, called the Global Climatological Analysis Tool, GCAT, may be used to define the current regional climate for various purposes including wind-energy “prospecting”, optimally locating new airports, and assessing the vulnerability of populations to hazardous material accidentally or intentionally released into the atmosphere. Alternatively, GCAT can be used for downscaling large-scale-model climate forecasts.

As an example, we describe a downscaling study of precipitation, cyclones, and other components of the water cycle in the eastern Mediterranean and the adjacent countries of the Middle East. The first step in this study is the use of the model to replicate the present-day hydro-climate of the area. To accomplish this, the model was run for a number of winter seasons using the NCAR-NCEP (National Centers for Environmental Prediction) Reanalysis Project archived global analyses for lateral-boundary conditions. The comparison of the simulated and observed precipitation establishes the veracity of the modeling system for replicating the water cycle in this complex geographic area. The next step in this Eastern-Mediterranean study will be to downscale from a double-CO₂ experiment of the coupled ocean-land-atmosphere Community Climate System Model, CCSM.