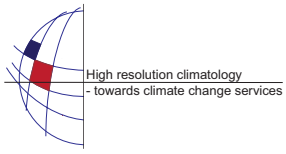
EMS Annual Meeting Abstracts
Vol. 7, EMS2010-467, 2010
10th EMS / 8th ECAC



Preliminary results of a four-dimensional data assimilation technique at a Mediterranean coastal area, Southern Italy

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A four-dimensional data assimilation (FDDA) scheme based on a Newtonian relaxation (or “nudging”) was tested using observational asynoptic data available at a coastal site in the Central Mediterranean peninsula of Calabria, in South Italy. Since nudging is performed toward observations, the technique is referred to as “observational data assimilation (ODA)” and it was incorporated into a tailored version of the Regional Atmospheric Modeling System (RAMS). This version of RAMS was run at high spatial horizontal resolution (1km), with the purpose of investigating the improvements of the model performance obtained by the assimilation.
Wind profiler, sodar and surface meteorological station measurements were considered. In particular, we assimilated vertical wind profiles from the sodar and wind profiler, and wind, temperature and specific humidity from the surface meteorological station. All instruments are installed and operated routinely at the experimental field of the ISAC/CNR-CRATI located at 600 m from the Tyrrhenian coastline. A second station, located few kilometres to the NE of the experimental field, is considered as independent verification.
The RAMS meteorological fields, simulated with and without data assimilation, were evaluated and compared for selected case studies in the summer 2008; several experiments were performed for each case (assimilation for the entire simulation time, and for different time windows).
The results show that the assimilation of wind and/or temperature data, both throughout the simulation time (continuous FDDA) and for a 12h time window (forecasting configuration), produces improvements of the model performance. Improvements are substantial (50% error reduction) in the case of continuous FDDA, while they are reduced in the case of forecasting configuration (5% to 20% error reduction, depending on cases).
The obtained meteorological fields are finalised as input into air quality and agro-meteorological models, and also for atmospheric model initialization.