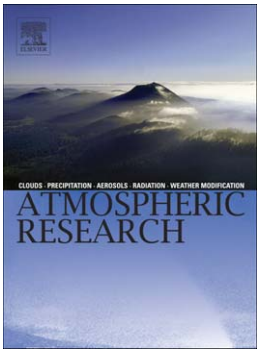

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Land Use and Topography Influence in a Complex Terrain Area: A High Resolution Mesoscale Modelling Study over the Eastern Pyrenees using the WRF Model

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Abstract

Different types of land use (LU) have different physical properties which can change local energy balance and hence vertical fluxes of moisture, heat and momentum. This in turn leads to changes in near-surface temperature and moisture fields. Simulating atmospheric flow over complex terrain requires accurate local-scale energy balance and therefore model grid spacing must be sufficient to represent both topography and land-use. In this study we use both the Corine Land Cover (CLC) and United States Geological Survey (USGS) land use databases for use with the Weather Research and Forecasting (WRF) model and evaluate the importance of both land-use classification and horizontal resolution in contributing to successful modelling of surface temperatures and humidities observed from a network of 39 sensors over a 9 day period in summer 2013. We examine case studies of the effects of thermal inertia and soil moisture availability at individual locations. The scale at which the LU classification is observed influences the success of the model in reproducing observed patterns of temperature and moisture. Statistical validation of model output demonstrates model sensitivity to both the choice of LU database used and the horizontal resolution. In general, results show that on average, by a) using CLC instead of USGS and/or b) increasing horizontal resolution, model performance is improved. We also show that the sensitivity to these changes in the model performance shows a daily cycle.

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