

An operational forecasting system of radiation fog in an arid region using the WRF model

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We run an operational setup of the WRF model as part of a research project in order to forecast next day fog events over the United Arab Emirates. Fog is a winter time phenomenon in the region that causes a decrease in visibility and has major adverse effects on road transport networks and aviation operations. We use a threshold method with modifications to create a fog probability field from model results. Here, we describe our system and how the thresholds are calculated from observations. We include a probability function which indicates proximity of forecast to the threshold values. The final “fog” product is then verified against a satellite product to assess its performance on fog days. Bias in the model is identified and shown to be linked to the land surface parametrisation schemes and the characterisation of the desert land surface.

Results show that the fog probability performs well on fog days with a POD of 0.7 to 1. However it also highlights some deficiencies within the model that include the following. 1.) Sensitivity to cooling rate, which is an important factor to consider when simulating radiation fog. A sensitivity test to the cooling rate is assessed and presented. This is achieved by modifying the land surface parametrization within WRF. 2.) The treatment of the desert as a uniform land use land cover type. The desert surface is diverse and oversimplified within WRF. Sensitivity to surface characteristics such as soil texture and surface roughness are explored and presented. Lastly we present some ongoing and future investigations.