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Modelling of observed fog development over flat terrain

A. Porson (1), J. Price (2), and A. Lock (1)
(1) Met Office, Exeter, U.K., (2) Met Office Research Unit, Cardington Airfield, U.K.

In this work, we model case studies of observed fog over Cardington, UK. These case studies are presented in a companion paper.

Radiation fog occurs in stable conditions and its properties highly depend upon the interaction between radiation fluxes and turbulence. In stable conditions, turbulence is intermittent and the eddies become critically small. These conditions present a challenge to any numerical modelling tool.

First, we use LES modelling. We compare LES model outputs to radiosonde data as well as to time series of air temperature and radiation fluxes from mast measurements. We focus the analysis on the capacity of the LES model to capture the fog development stages as formation, maturity and dissipation.
The sensitivity of the fog development stages to model configuration is assessed: the case study is run for different times of initialization, with an interactive surface or with prescribed surface conditions, with different upper air profiles resulting in different radiation fields and with different initial profiles in order to take into account uncertainties in radiosondes.

Finally, in order to improve regional fog forecasts, a preliminary intercomparison between the LES model outputs and the MetUM model outputs is presented.