8th International Conference on Fog, Fog Collection and Dew
Taipei, Taiwan, 14–19 July 2019
IFDA2019-107

Visibility in the ACCESS NWP model

Belinda Roux, Richard Dare, and Rodney Potts
Bureau of Meteorology, Science to Services, Australia (belinda.roux@bom.gov.au)

Low visibility associated with fog at the aerodrome remains one of the major forecast challenges for aviation. Despite major improvements in Numerical Weather Prediction (NWP) models over the past decades, the local nature and complex interactions of fog continue to make it a challenging phenomenon to predict. The Bureau of Meteorology uses the Australian Community Climate and Earth-System Simulator (ACCESS) model to provide operational numerical weather prediction (NWP) guidance for fog forecasting. Visibility is a standard diagnostic output from the model, but the performance in Australia has been quite poor and the guidance has had limited value for forecast operations. The shortcomings in the predicted visibility are due to both the functioning of the diagnostic visibility scheme and to inaccuracies in the meteorological fields predicted by the NWP model. In this work, we isolate the visibility scheme from the model and perform a variety of sensitivity, tuning and trial experiments to better understand it's performance. Based on results from the experiments, values of configuration parameters that yield improved diagnoses of visibility within the scheme are suggested for implementation in Australia. Case studies are used to test the effects of these changes in the ACCESS NWP model, and to investigate other factors affecting the model performance such as the land surface scheme. Even though the ACCESS model generally simulates meteorological variables such as temperature, dewpoint temperature and wind quite well, high urban fractions in the land surface ancillaries can lead to an over forecast of afternoon and evening screen temperatures and the method used to estimate visibility is very sensitive to small variations in the temperature and moisture fields. Trial experiments of the visibility scheme have shown that it is difficult to produce consistently accurate predictions of visibility even when observations are used in place of NWP data. With the improvements, the performance of the visibility scheme can be maximised in terms of the equitable threat score for a specific threshold visibility distance and should provide useful forecast guidance for fog even with the noted limitations.