VERIFICATION OF HIGH-RESOLUTION FORECASTS FROM ACCESS

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Introduction

Verification is a crucial component of the development and maintenance of numerical weather prediction (NWP) systems. It provides the tools needed to determine whether a prototype new system is better than its predecessor, and also ensures that our forecast performance is on a par with international best practice. Accurate weather prediction supports effective, efficient and safe management of fires.

A NWP system aims to predict the full dynamics of the atmosphere. As the temperatures, pressures, wind changes, rainfall, clouds and so on all depend on each other, it is necessary to verify all aspects of the system.

Verification of particular cases is important, but it is not the whole answer since an inferior system may "get lucky" and produce a good forecast of a particular event. Verification scores over a large number of cases ensures that the improvements in the new system are statistically significant and not just a fluke.

This poster presents a taste of current verification efforts at CAWCR. Future work will focus directly on fire weather parameters.

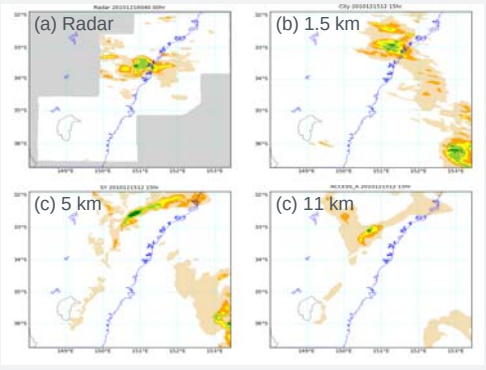

Fig 1: (a) Radar-observed rainfall for a heavy rain event near Sydney. (b) ACCESS forecast at 1.5-km resolution of rainfall amount for a simulation starting 15 hours prior to the event. (c) As for b, but at 5-km resolution. (d) As for b, but at 11-km resolution.

Rainfall verification

Figure 1 shows the rainfall prediction from the ACCESS systems at three different resolutions for a storm system over the NSW coast, together with a radar-derived rainfall field. It is clear that the structure of the rain area is quite accurate in the 1.5-km simulation, while the coarser-resolution forecasts are much less successful. This difference is partly because the higher-resolution simulation can better represent the atmospheric processes, and partly because it can use a more accurate representation of the mountain range.

However, none of the simulations have the rainfall maximum in exactly the right location. So while none are perfect, the finer-resolution one in particular is good enough to be useful for many purposes.

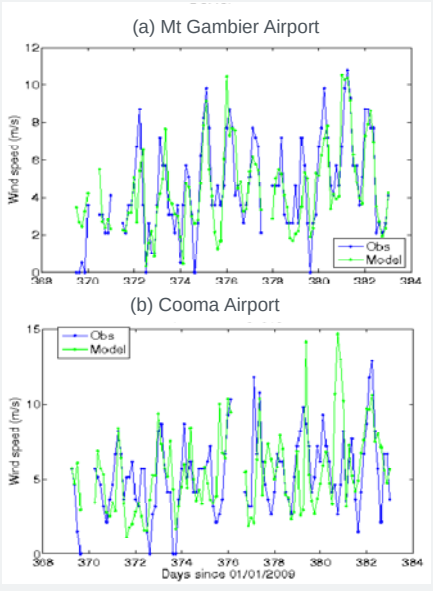

Fig 2: Comparison of ACCESS 11-km resolution forecasts of wind speed at (a) Mt Gambier and (b) Cooma airports. The forecasts are in green and the observations in blue. The forecasts have been statistically downscaled to account for some of the effects of unresolved topography, but are still more accurate at the coastal site.

Wind verification

Forecasts of wind energy production, like fire weather forecasts, are sensitive to the accuracy of wind forecasts. Fig 2 compares forecasts of wind speed at a coastal (Mt Gambier) and inland (Cooma) site to observations. The coastal site has good forecasts, indicating the high quality of the NWP system, but the inland site is much less successful since this 11-km resolution forecast does not adequately represent the complex topography of the area. Finer resolution should substantially improve matters.

Fig 3 compares forecast RMS wind speed errors between the Bureau of Meteorology's current (ACCESS) and previous (LAPS) high-resolution operational NWP systems, using data from a number of wind farm and automatic weather stations in SE Australia. The new system outperforms the old on average and at most sites.

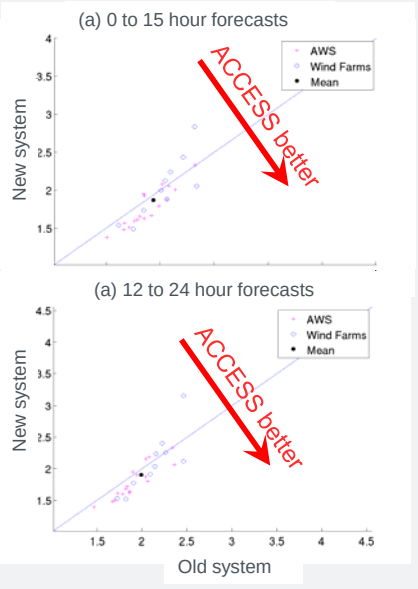

Fig 3: A comparison of wind forecast accuracy between the old and new NWP systems at the Bureau of Meteorology. The scores are RMS wind speed errors at individual wind farms and automatic weather stations. The new system is consistently, but not universally, better. Some of the scatter is due to statistical sampling, and shows the need for large verification datasets.