

Verification of Mesoscale NWP Forecasts of Abrupt Wind Changes

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Predicting the timing of wind changes is a vital aspect of fire weather forecasts (Fig. 1), and mesoscale numerical model forecasts are an integral guidance for these forecasts. While subjective forecasts of wind change times are subjectively verified, there is a need to objectively verify mesoscale NWP forecasts of wind changes. Previous studies have demonstrated fuzzy-logic methods that diagnose the timing and the strength of the wind changes from time series of wind direction, speed, gust, and of surface temperature, dewpoint and pressure observations. Applying these methods to NWP model time series (Fig. 1, right) allows the NWP model wind change timings to be verified against the objective timings from observations.

Based on a five-year fire season data-set over selected stations in Victoria, it is found that:

70 % of model forecast wind changes are within 2.5 hours of independent subjective wind change estimations (Fig. 2,3)

93 % of the subjective wind changes fall within the objective wind change periods

for 87 % of major pressure trough passages, wind change are identified from both observations and the model forecasts.

For the first time an objective verification of numerical model wind change timings has been made.

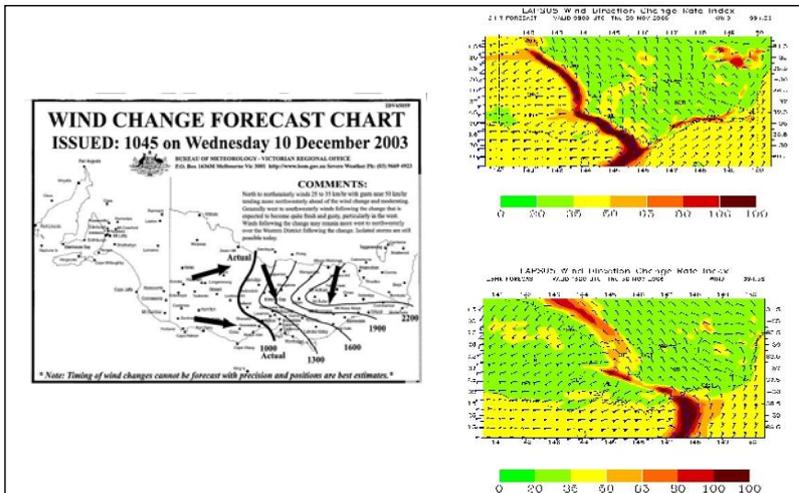


Fig. 1: Examples of VRFC subjective wind change chart (left) and objective WCRI forecast (right)

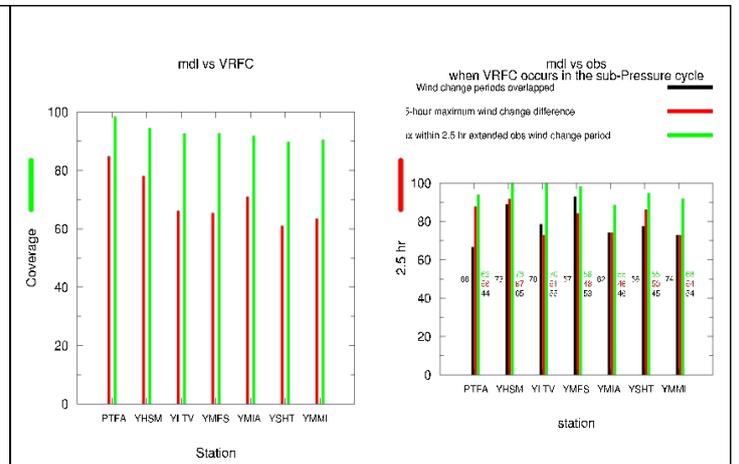


Fig. 2: Verification statistics for comparisons between the objective forecast and VRFC subjective wind change (left), and between the observations and forecasts (right)

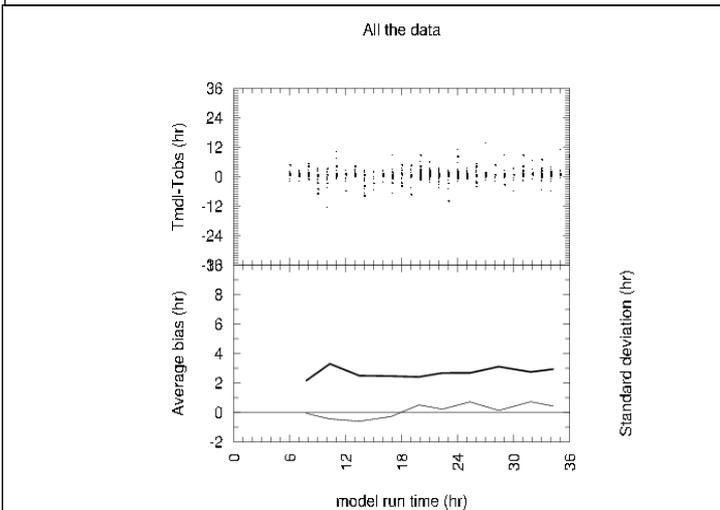


Fig. 3: Scatterplot of wind change timing error versus forecast lead time (upper) and the smoothed mean and standard deviation of error (lower)

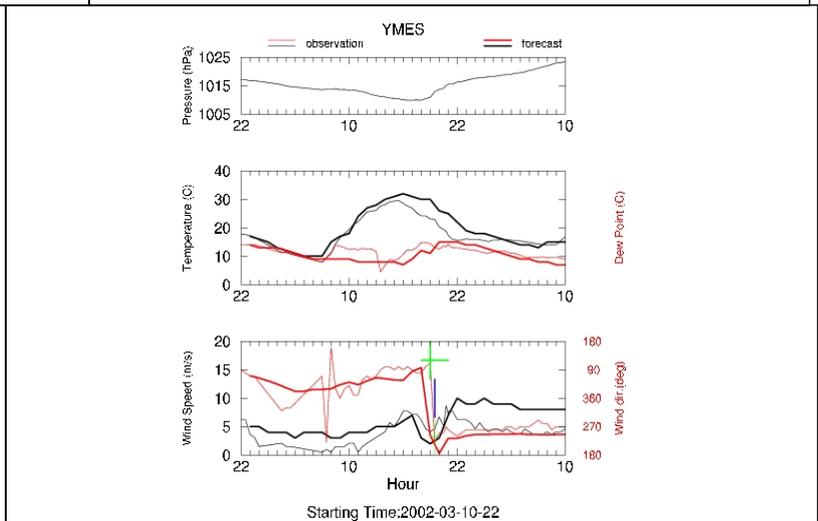


Fig. 4: Example of time series of forecast (thick) and observed (thin) meteorological variables at East Sale AWS. Vertical bars indicate the wind change identified from the observation (thin green bar), the forecast (thick green bar) and the VRFC (blue bar). The corresponding horizontal bars indicate the time spans of the Wind change period from the observations and forecast.

Reference : Huang Xin-Mei, Ma Yimin, and G.A. Mills 2008. Objective verification of operational mesoscale NWP model wind change forecasts. CAWCR Research Report