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New developments in the Australian Bureau of Meteorology's thunderstorm prediction system - Calibrated Thunder

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There is clearly an increasing need by many users of weather information to extract thunderstorm information from the output of numerical weather prediction models (NWP), but 'raw' NWP output fields are difficult to interpret in view of estimating the likelihood of thunderstorms. Late in 2016 a post-processing package, Calibrated Thunder (CT), went operational at the Australian Bureau of Meteorology. It produces uncalibrated and calibrated probabilities of cloud-to-ground lightning strikes in 3-hourly intervals on a 40 km x 40 km grid over Australia out to 2 days. NWP inputs are sourced from a 5-member lag ensemble of the ACCESS-R model which produces output on a ∼12.5 km grid over Australia.

Operational demands have led to the development of two significant extensions to the original CT system. First, the Graphical Forecast Editor, the Bureau's primary forecast production system, requires thunder probabilities up to eight days in advance. To achieve such a lead time, CT has been duplicated to run off input from the second release of the global ACCESS model (ACCESS-G2) with model fields written to a grid with ∼24 km spacing. We will describe the adapted CT system setup and show how the CT reliability, accuracy and ability to distinguish between thunder events and non-events evolves with increasing lead time. Early validation over the 5-month 2016/2017 summer period indicate that CT remains sufficiently skillful for useful operational use out to 8 days, but only for afternoon and evening convection. Nocturnal convection is handled less skillfully by the system, and the system loses significant skill by day 4.

Second, the Bureau's Extreme Weather Desk drafts daily national convective outlooks on a 20 km x 20 km grid. The CT system has also been adapted to produce 24-hour thunder probabilities on this finer grid. The novel derivation of the 24-hour calibrated probabilities and other new system features will be outlined, and verification results presented.