## Ideas for ensemble tropical cyclone prediction

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Tropical cyclones (TCs) are high impact weather events for which uncertainty information for both track and intensity can be critically important for emergency management decision-making. Even the best deterministic Numerical Weather Prediction models are prone to some degree of forecast error arising from both uncertainty in the initial analysis and growth of model error. The pragmatic forecasting approach is to utilise a range of track and intensity forecasts from a variety of sources, including the local and overseas deterministic forecast models, as well as overseas ensemble products.

The resulting track forecasts are generally reasonable but cyclone intensity can be more difficult to forecast. The Bureau of Meteorology has an operational bias correction system which substantially improves the intensity and R34 wind radii predictions from global NWP models which are then used as input to the JIP-TC ensemble wave model. The bias corrections improve the ocean response, duration of gales, and width of damage swath. The bias correction system also provides a range of intensities, which is seen as a critical information for user decision making. However, in the longer term, a preferable solution is an ensemble of higher resolution models which are necessary to resolve the scales needed to capture both the intensities and the rapid change in intensity often found in real tropical cyclones.

The Bureau currently runs two high-resolution TC-specific deterministic Numerical Weather Prediction systems: ACCESS-TC (12km resolution, 3-day forecasts for up to 3 concurrent TCs on relocatable 33°x33° domains within the Greater Asian tropics covering the Western Pacific and Eastern Indian Oceans); and ACCESS-TCX (4km resolution, 5-day forecasts on a fixed 25°x40° domain over the NW coast of Australia). At present though, the Bureau does not run any operational ensemble NWP systems of its own. This talk will discuss the pros and cons of some approaches for ensemble tropical cyclone NWP within the Bureau.