ENSEMBLE PREDICTION OF THE EAST COAST LOW OF APRIL 2015

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BETWEEN 20-23 APRIL 2015 THE EASTERN COAST OF AUSTRALIA WAS AFFECTED BY A LOW-PRESSURE SYSTEM, KNOWN AS AN EAST-COAST LOW, WHICH BROUGHT FLOODING, DAMAGING WINDS AND COASTAL EROSION. THIS STUDY UTILISES ENSEMBLE SIMULATIONS TO GET A BETTER UNDERSTANDING OF THE DYNAMICS OF THIS EVENT, AS WELL AS ITS PREDICTABILITY. THIS IS IMPORTANT TO BOTH FORECASTERS AND EMERGENCY SERVICES.

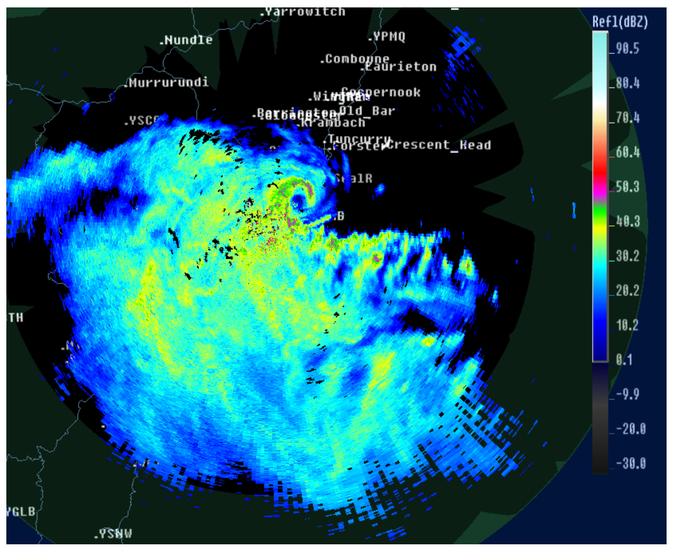

Figure 1: Radar reflectivity (dBZ) for 1336 UTC 20 April 2015 (+ 10 hours for local time). Cyclonic rotation of the precipitation band associated with the East Coast Low (ECL) is evident, as well as the area of intense convection.

MOTIVATION AND RESEARCH AIMS

- The April 2015 ECL was a devastating event for Dungog and Maitland area.
- There are many forecasting challenges associated with ECLs due to their rapid development (e.g., location along the coast, the intensity and location of maximum winds and highest rainfall).
- Main aim is to study processes associated with the development of this ECL event and learn about its predictability and dynamics.

MODELLING SET UP

- A high-resolution ensemble of 24 simulations has been run.
- Simulations initialised from the 24 members of the Bureau of Meteorology prototype global ensemble prediction system (ACCESS-GE).
- Global model run nested down to 4 km and 1.3 km runs.

END USER STATEMENT

The use of ensembles in studying the April 2015 east coast low is a novel approach and provides valuable insight into the meteorology of the event, as well as its predictability. The results of this research project have important implications, as ensembles will be implemented operationally in the Bureau of Meteorology very shortly and better understanding of the potential of ensemble modelling is essential.
Dr. Paul Fox-Hughes, Tasmanian Regional Office, Bureau of Meteorology.

a) LOW-LEVEL WIND AND HOURLY RAINFALL

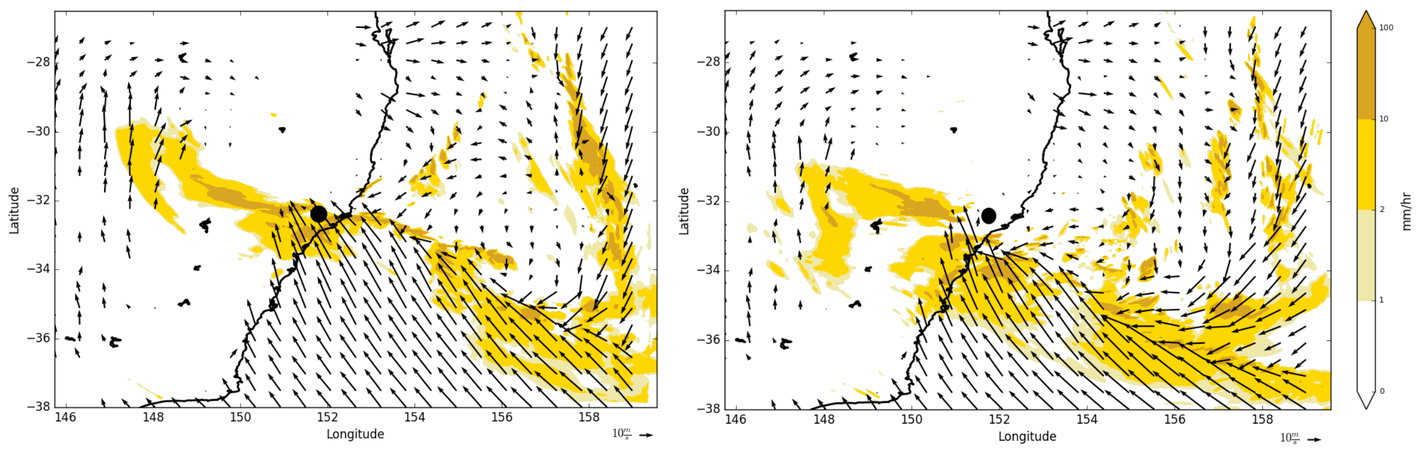

Figure 2: Surface winds (vectors) and hourly rainfall (mm, shaded) for ensemble member 22 (left) and ensemble member 11 (right) at 2000 UTC 20 April 2015. Black dot shows the location of Dungog.

b) STRIATED DELTA CLOUDS

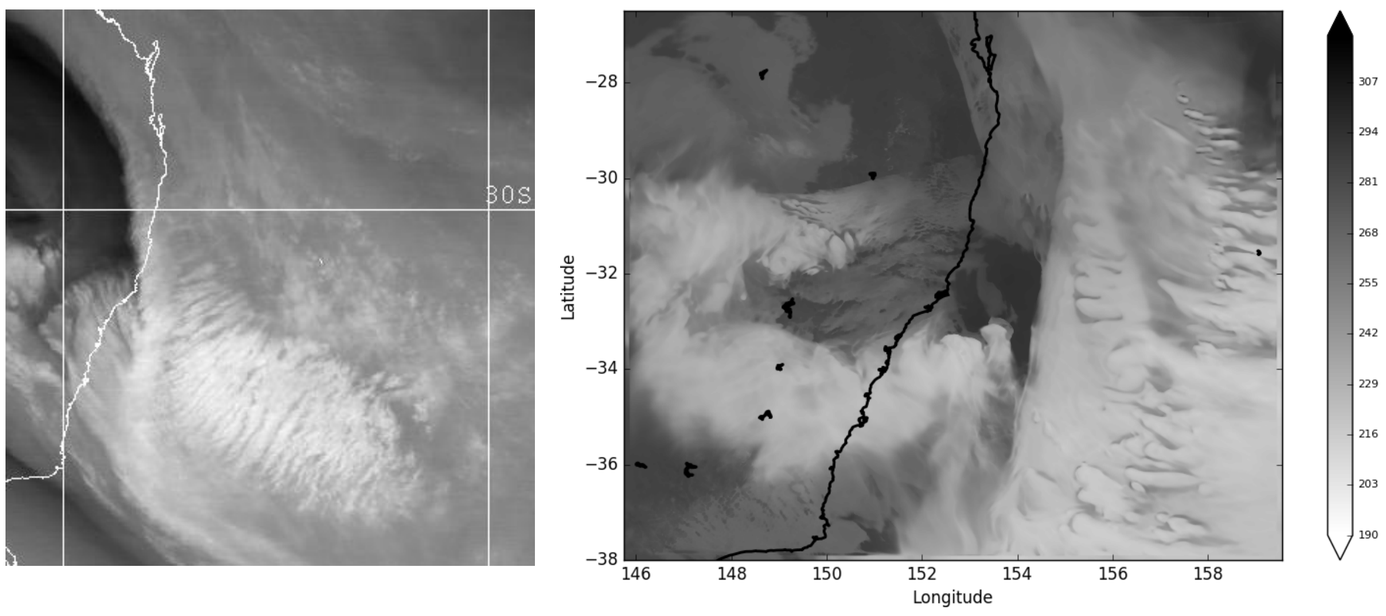

Figure 3: (Left) Water vapour satellite imagery at 1232 UTC 20 April 2015. (Right) Synthetic satellite image for ensemble member 08 at 1600 UTC 20 April 2015. Both figures show a distinctive banded cloud system associated with the main east coast low, known as a "striated delta" (Feren 1995).

CONCLUSIONS

- Subtle differences in ECL location and structure between ensemble members result in important differences in the predicted location of highest rainfall and strongest winds. Figure 2 shows that in ensemble member 22 Dungog is impacted by the rain and south-easterly jet, whereas in ensemble member 11 these features are located further south, and Dungog is spared. It also shows that for both members the strongest winds and rain occur to the south of the main low.
- Figure 3 shows that striated delta clouds observed in satellite imagery are simulated in at least one ensemble member. The simulated striations occurred several hours later than the observed ones. Their location and orientation varied considerably amongst ensemble members and compared to the observed striations. Feren (1995) showed that striated deltas are important due to their link to intense surface cyclogenesis and we are using these simulations to better understand this relationship.

References: Feren, G., 1995: The "Striated Delta" Cloud System–A Satellite Imagery Precursor to Major Cyclogenesis in the Eastern Australian-Western Tasman Sea Region. Wea. Forecasting, 10, 286–309

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