Environmental Controls on Convective-Scale Error Growth

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References

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Project Aims
1. Explore the different definitions and of frequency of regime placement rainfall events, and use these to determine the predictability of the events and look at Convective Available Potential Energy (CAPE) as a physically sensible timescale.
2. Assess hypothesis: ‘A predicted convective timescale (and as such different convective regimes) can distinguish qualitatively-different convective-scale error growth.’

Work on the first aim is presented here.

Methods for Aim 1
1. Calculate grid-point \( \tau_c \), then average over points where \( \tau_c \) is not infinite (following Molina et al., 2011).
2. Calculate a spatial average of CAPE predictions, then calculate \( \tau_c \) (following Done et al., 2006).
3. Use a Gaussian kernel to average CAPE prediction, then calculate \( \tau_c \) (based on Keil and Craig, 2011, etc.).

For these methods, an area of \( 132 \times 132 \) km² has been used for the averaging and a half-width of 60 km has been used for the Gaussian kernel (Fig. 2).

The data is from the NAE domain of the MetUM (Met Office Unified Model), interpolated onto pressure levels and model levels. The last row (Fig. 2) uses data from the UKV domain.

The Sensitivity of the Convective Adjustment Timescale

Using case studies from the Convective Precipitation Experiment (COPE) and Dynamical and Microphysical Evolution of Convective Storms (DYMECS) projects the timescale has been calculated using the methods described above (Fig. 2). The events show that the timescale does distinguish between different dynamical cases, however care needs to be taken when drawing comparisons with previously published results. However this could be dependent upon whether the timescale was calculated on a model using a convective scheme.

Discussion and Future Work

Although the timescale is sensitive to its calculation, it still gives useful results. The COPE IOP 10 case is a triggered event, 1400 UTC. The timescale is sensitive to its calculation, it still gives useful results.

For future work:
• Calculate the timescale for the UKV resolution.
• Use ensembles to determine the predictability of the events and look at the convective-scale error growth.

Acknowledgements

This work was funded by the NERC grant NE/K008900/1, as part of the Floods from Intense Rainfall (FFIR) project, and the Met Office’s Rapidly-Exploiting New Data Assimilation (REND) project.