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A new strategy for integrated Post-Processing and Verification for the Convective Scale age

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The advent of convective scale NWP models with horizontal grid-lengths of order 1-4km has introduced huge potential for detailed local forecasting not previously possible, in particular much better representation of convective precipitation and of orographically forced local detail such as valley fog. However much of this detail is not deterministically predictable, for example the timing and location of convection or patchy low visibility, so that these models are best run in ensembles and require a probabilistic approach to post-processing systems to aid in their interpretation and generate automated forecast outputs. Met Office post-processing systems have evolved over many generations of lower resolution models, with separate systems for ensembles and deterministic models. While there has been some integration for the convective scale 1.5km UKV model and 2.2km MOGREPS-UK ensemble including use of neighbourhood processing to address spatial uncertainty, a recent review of post-processing science recommended a new approach to provide a fully integrated probabilistic system for the convective-scale age. Key features of this system will include:
- A modular software architecture allowing plug-in components to be included as required;
- Verification at every stage so that the benefit of each component can be better understood;
- A probabilistic approach including neighbourhood processing to consistently compare and combine ensemble and deterministic model outputs;
- A blending approach to provide optimal forecasts combining data from multiple models and ensembles;
- All processing conducted on standard grids, with extraction of site forecasts and any optimisation using site observations occurring at the end of the chain, to improve consistency between site and gridded forecasts.
Implementation of the new strategy started in 2016 with the implementation of a “decoupler” which presents all model outputs on standard grids in CF-compliant netCDF format. As well as aiding the blending of different models in the post-processing system, these formats are also used for all model output distribution through the Met Office’s new “Service Hub” which will allow downstream applications such as forecast product generation to be decoupled from changes to individual NWP models.
One of the key challenges for a post-processing system today is condensing and summarising the key messages from the vast quantities of data available from ensembles and rapid update cycles such as the Met Office’s planned hourly-cycling UK model runs. A key output of the new system will therefore be a set of forecaster “dashboard” products to provide headline alerts and messages to operational forecasters on high-impact weather risks.
Software development for the new systems is being implemented in Python making extensive use of the open-source Iris libraries , and new code is mostly open-source making it ideal for collaboration which is strongly encouraged. This presentation will present an overview of the strategy and progress with implementation, including the first end-to-end demonstration of the data-flow completed in March 2017. Further details of some of the science modules are offered by Roberts (2017).

Ref: Roberts, N. (2017): Generating probabilistic forecasts from convection-permitting ensembles, EMS Conference, Dublin 2017.