

Convective-scale models in Improver

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Improver is the Bureau's new post-processing system. At the Met Office, the operational Improver configuration includes convective-scale ensemble and deterministic forecast. Model blending with time-varying weights is straightforward in Improver, allowing the output to rely more heavily on convective-scale forecasts early in the forecast period. It is also possible to aggregate ensemble or deterministic forecasts in space (over local areas of the grid) and time (over different basetimes), in order to better estimate forecast uncertainty. Improver's reliability calibration method allows each model to be calibrated separately, so that all models have similar distributions after calibration. This makes for smooth transitions between models over the forecast period.

The Bureau's operational Improver configuration currently includes four NWP models, ECMWF-ens, ECMWF-HRES, ACCESS-GE, and ACCESS-G. It is planned to add more models, including the convective-scale ACCESS-C and ACCESS-CE, in future.

Improver's rainfall model Rainforests was recently deployed in operational forecasting. It uses a machine learning method to produce calibrated probabilistic forecasts from ensemble and deterministic NWP output. Although Rainforests does not currently use convective-scale NWP for input, it is able to downscale larger-scale gridded forecasts to account for sub-grid variability. This allows it to correct for errors caused by the parametrisation of convection in NWP forecasts. Rainforests learns the relationship between the predicted rainfall at the grid-cell scale in the NWP model, and the actual probability of rain at the point scale, as measured by observations. Additionally, Rainforests incorporates NWP predictions of related variables, including convective precipitation, CAPE (convective available potential energy), and windspeed, which help in accurately estimating the uncertainty of the NWP forecast. Rainforests has approximately one additional day of skill for the 3H forecast, compared to GOCF, and improved consistency between the 3H and 24H forecasts. We anticipate that including convective-scale models will further improve the accuracy.