



## Integrating Ensembles into Operational Forecast Production

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Forecasters have used ensemble forecasts for many years now to help inform their assessment of likely outcomes and risks of high impact events. Since the introduction of the ECMWF and NCEP medium-range ensemble systems in 1992, access to ensemble forecasts has grown steadily and forecasters at the Met Office now have access to a wide range of forecast products from the Met Office's MOGREPS short and medium-range ensembles as well as the ECMWF ensemble prediction system. A number of specialised ensemble products and services are generated automatically, but despite these developments the majority of operational forecast production has continued to be based on deterministic models, with the ensembles providing peripheral and supplementary information. Much of the reason for this has been that ensemble post-processing has developed in parallel with deterministic post-processing, rather than being fully integrated, as forecaster workstations have been unable to support the ensemble forecast data other than via web browsers. Recent work, however, has started to integrate ensemble data more fully. Site-specific temperature forecasts for 10000 locations worldwide now combine a central best-estimate temperature with an uncertainty range based on the ensemble, and at lead-times above 5 days the central estimate is based on the ensemble mean, all bias-corrected using a Kalman filter for sites where observations are available. These forecasts are being further upgraded to provide a full set of percentile values allowing generation of full probabilistic forecasts for a large set of weather variables. Gridded fields of ensemble forecast data are also now being generated on the same high resolution grids as deterministic forecasts, and these will soon be ingested into the new SWIFT forecaster workstations, allowing forecasters to overlay ensemble fields with observations and other models in forecast production tools. These capabilities will allow the new convective-scale ensemble planned for introduction in 2012 to be immediately integrated and assessed on an equal basis with other NWP data.