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Making Uncertainty in Sub-seasonal Weather Forecasts Intelligible

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Sub-seasonal weather forecasting is notoriously difficult, particularly for the extra-tropics. Predictions must be probabilistic, and from weeks 3 or 4 onwards forecast distributions are often very close to model-climate distributions. Together, these facts make conveying a meaningful forecast to customers extremely difficult, and those forecasts are then very vulnerable to misinterpretation. Standard map-based graphical output can show little more than whether the forecast mean is for average, or above average or below average conditions – ostensibly a 3-category classification. And indeed "average" in this scheme can be interpreted variously as a genuine forecast of average, or a "no-signal" prediction, which cannot both be right.

So ECMWF is working towards a new two-layer brand of map-based sub-seasonal forecast products, that succinctly represent both the mean anomaly and the forecast uncertainty. We plan to call these "quantile-based weekly guidance maps". The overarching aim has been to exploit much better than hitherto the information content of the sub-seasonal forecast system in a compact format. Once these first go public they will be classed as an "experimental product". We hope for wide-ranging uptake, providing greater outreach for our forecasts than hitherto, to benefit multiple sectors of society.

The new graphical output can be summarised in a 3-by-3 matrix form where one dimension represents the mean anomaly and the other relative spread. So for example a mean anomaly around zero can either represent a high confidence, narrow distribution forecast of average conditions (a true forecast of "average"), or more commonly a no-signal forecast where forecast and climate distributions are much the same (= "we don't know"), or less often an odd scenario in which forecast spread exceeds climate spread (= "very uncertain indeed"). The graphical versions of the new system, and the 9 classes, will be demonstrated using real ECMWF forecast examples. These will highlight how translating appropriately chosen mathematical metrics into suitable graphics, and on into plain language text, can lie at the heart of successful uncertainty communication. Clear documentation for users is another key requirement.