Hydrological Ensemble Forecasting at the Met Office

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Acknowledgements

- Richard Graham: Seasonal ensemble results
- Ken Mylne: Previn & LAMEPS
- Clive Pierce & Neil Bowler: STEPS

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Outline

- Seasonal Forecasts
  - Anomalies from coupled ocean-atmosphere ensemble
- Medium Range Forecasts
  - Previn/FGEW: Post-processing of ECMWF ensembles
- Short Range Forecasts
  - LAMEPS plans
- Nowcasts
  - STEPS: an ensemble precipitation nowcasting scheme
- Hydrology
  - MOSES-PDM: a land surface hydrology and river routing scheme used in the Unified Model and in nowcasting

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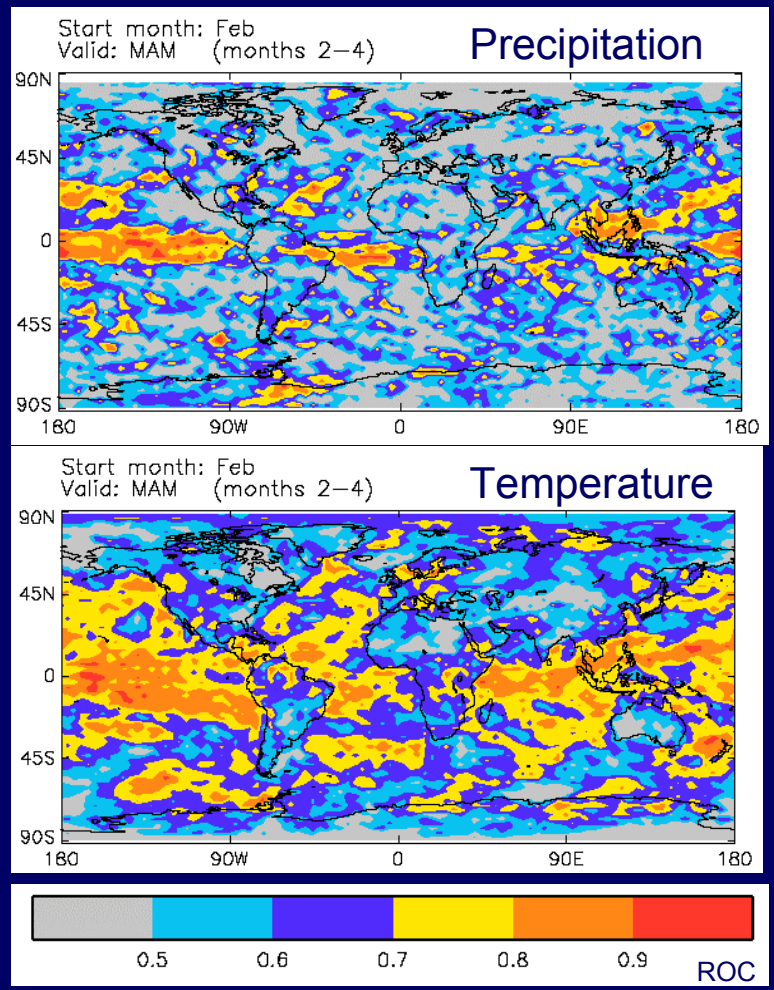
Seasonal ensemble

- 9 member ensemble using climate version of UM with coupled ocean and using lagged initial states
- Limited predictability, focussed on specific regions



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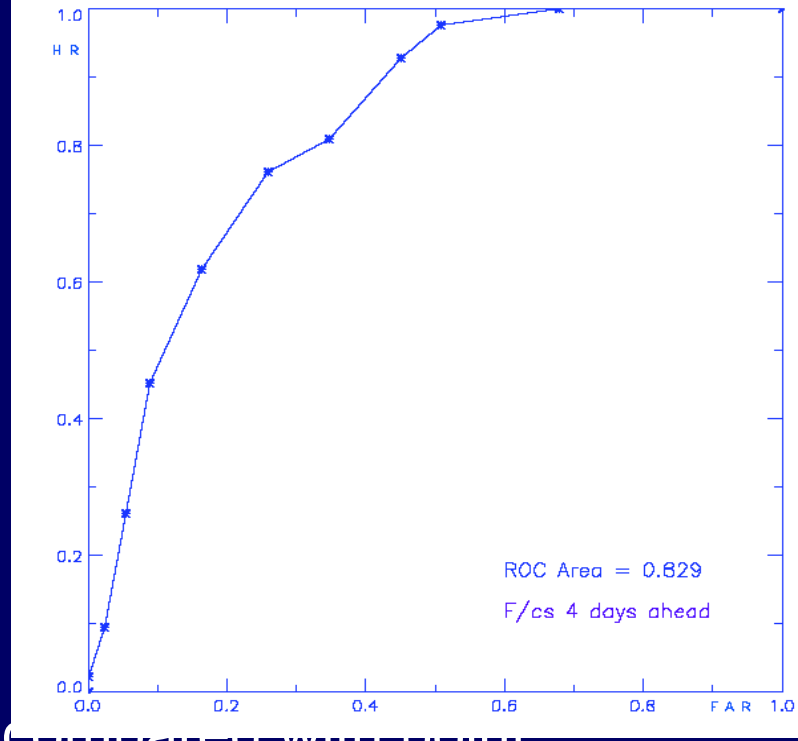
Previn/FGEW



- ECMWF ensemble
- Previn:
  - Rank histogram calibration
  - Weibull calibration of tails
  - Verification indicates limited skill compared with point rain gauge 12hr accumulations
- FGEW
  - Threshold exceedance calibration
  - Verification against nowcast warnings indicates significant skill

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LAMEPS

- Planned 24km grid Limited Area Ensemble for Europe/N. Atlantic, nested in Global
- ETKF initial perturbations + model physics perturbations + boundary perturbations
- Fine grid needed to resolve frontal rain bands (& ultimately convective storms) in short range forecasts

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STEPS

- Advection of existing rain areas deduced from radar on 2km grid with perturbed advection velocity – represents uncertainty in large scale
- Scale dependent decay to autocorrelated random noise – dominates error in advection forecast

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MOSES-PDM

- Unified Model SVAT with sub-grid run-off parametrization (PDM / Topmodel) is competitive as hydrological run-off model
- 1km grid routing scheme using kinematic wave equation for surface & sub-surface flow over land and in rivers

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Summary

- Seasonal predictability is very limited except in favoured regions
- Scaling is critical, both for predictability and for verification – finer scales can dominate, and are ultimately unpredictable – yet the relevant scales must be resolved for useful predictions
- Skill is focussed at low probability thresholds
- Macroscopic hydrological models are available, but are they useful?

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