

Verification of a set of GLAMEPS ensemble experiments

- A comparison with ECMWF EPS

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HirEPS vs ECMWF EPS

- HirEPS

- HIRLAM version 7.2 (changeset 6110)
- 0.115° horizontal resolution, 40 vertical levels
- EuroTEPS boundaries
- HIRVDA (3D-Var) analysis for control member; perturbations from EuroTEPS for perturbed members
- 26 members (13 STRACO + 13 KF/RK)

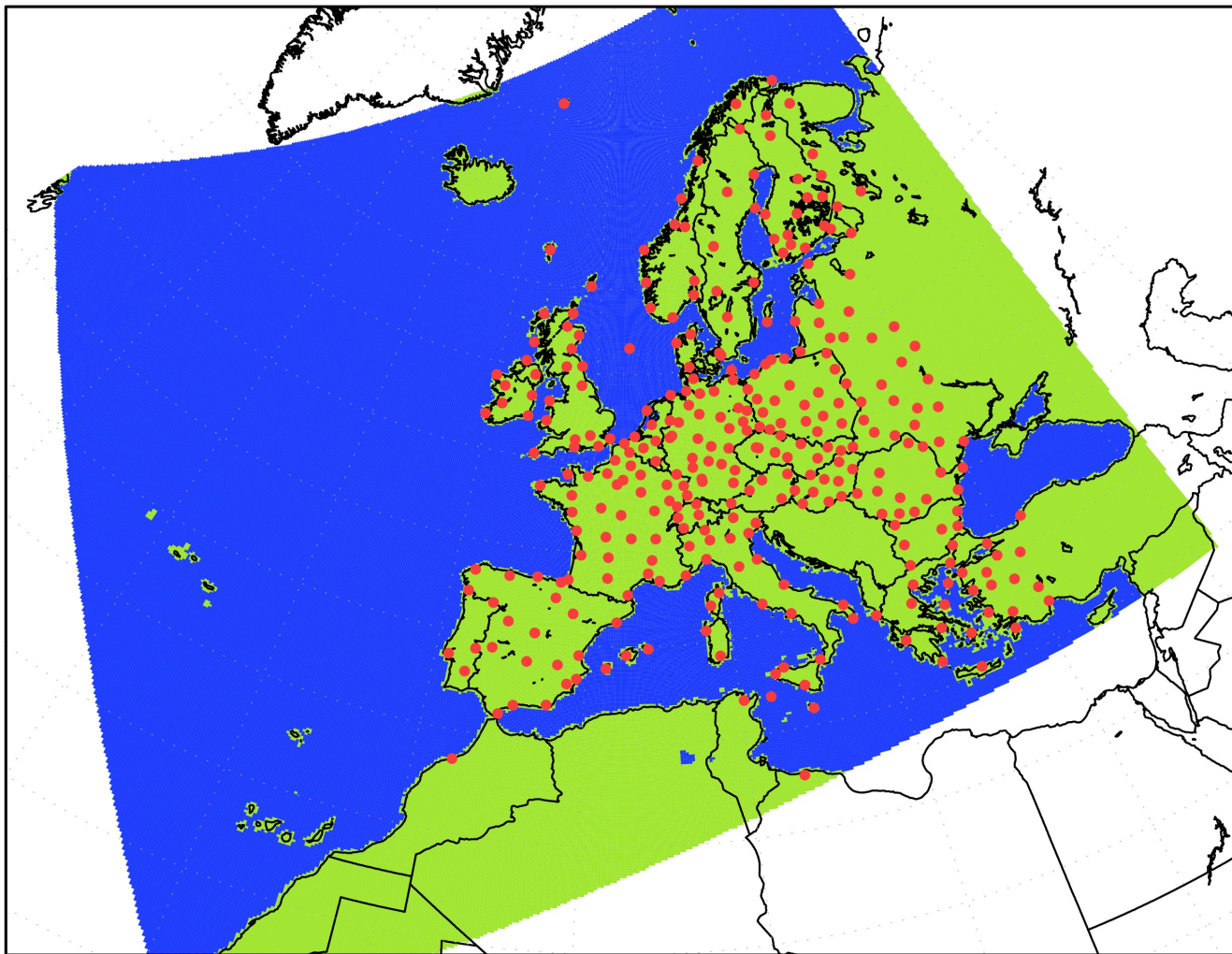
- ECMWF EPS

- TL399L62 (~50km horizontal resolution)
- 51 members



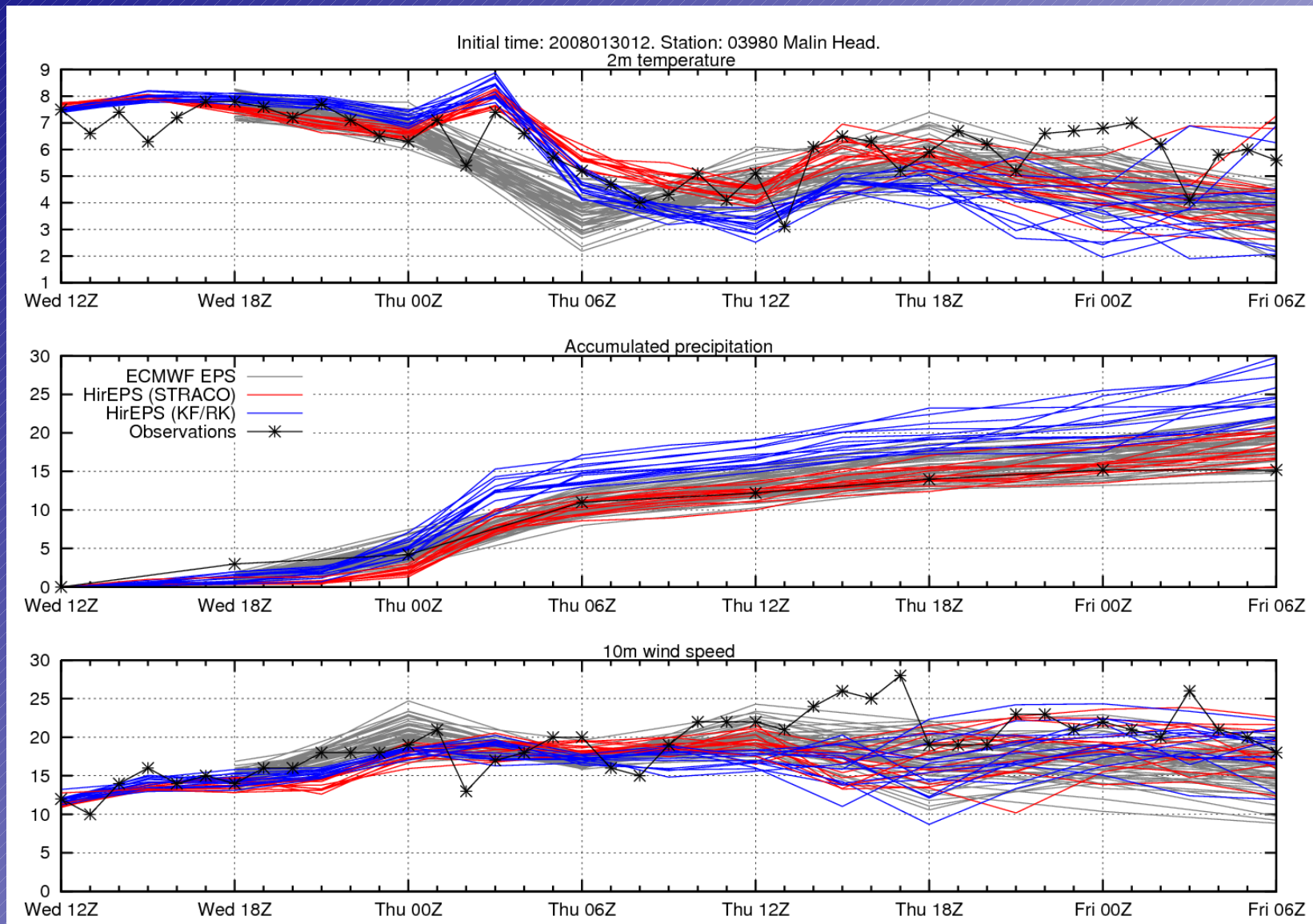
Verification

GLAMEPS domain and stations for verification

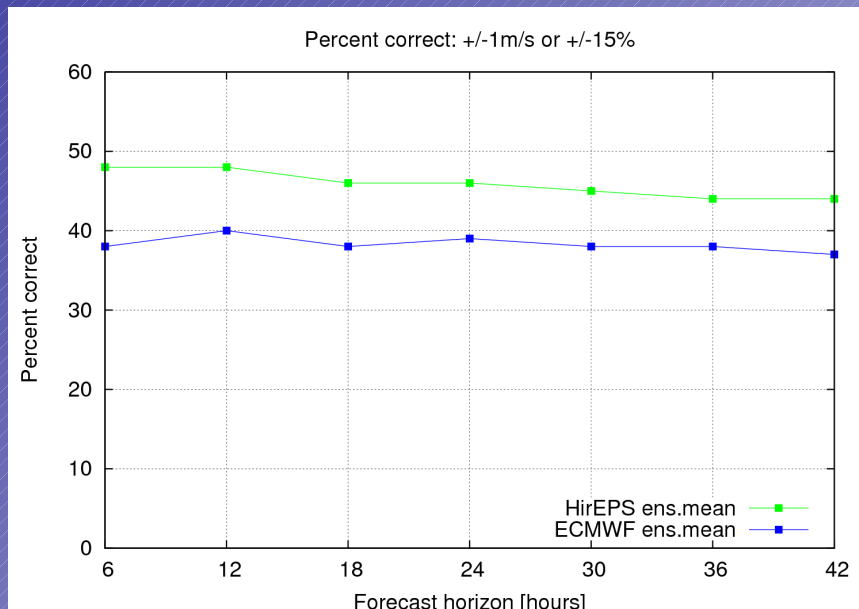
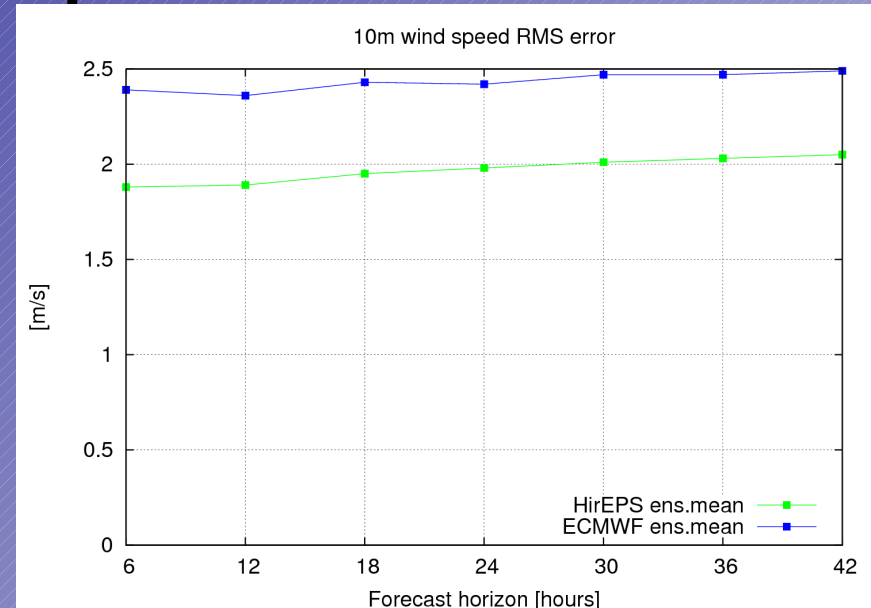
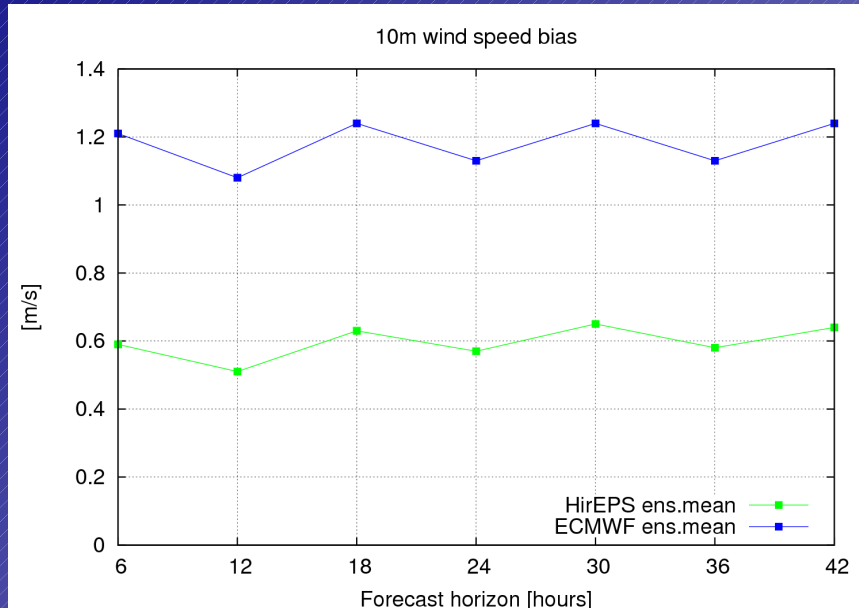


- 88 forecasts from 2008011700-2008022912
- 315 stations
- Forecast lengths: 6h, 12h, 18h, 24h, 30h, 36h, 42h

Ensemble meteogram example



Ensemble mean verification, 10m wind speed



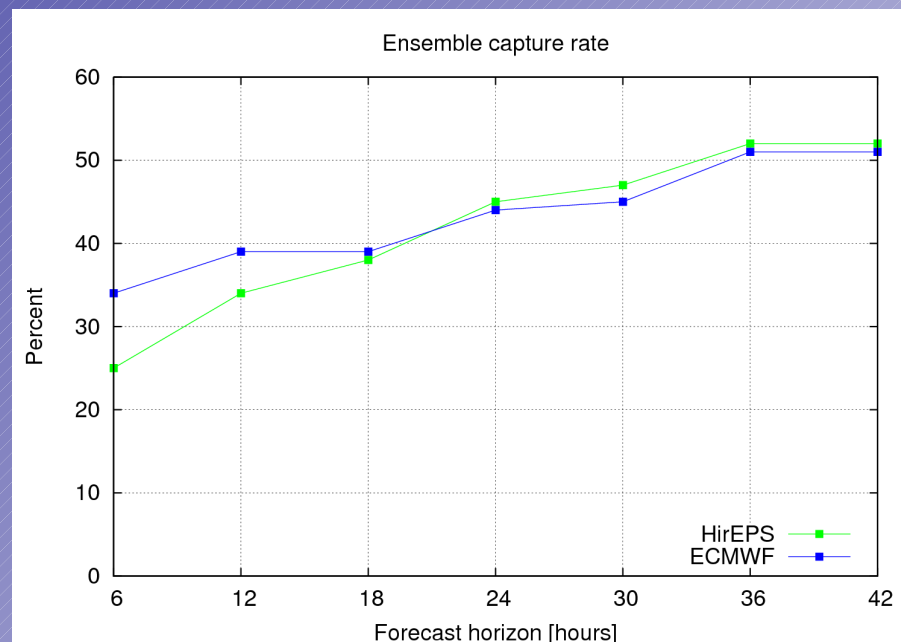
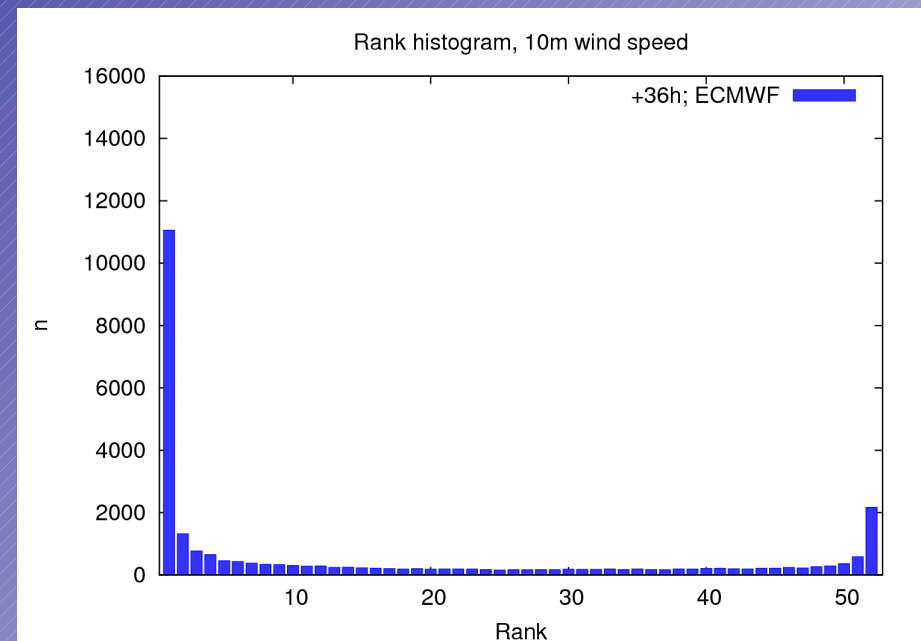
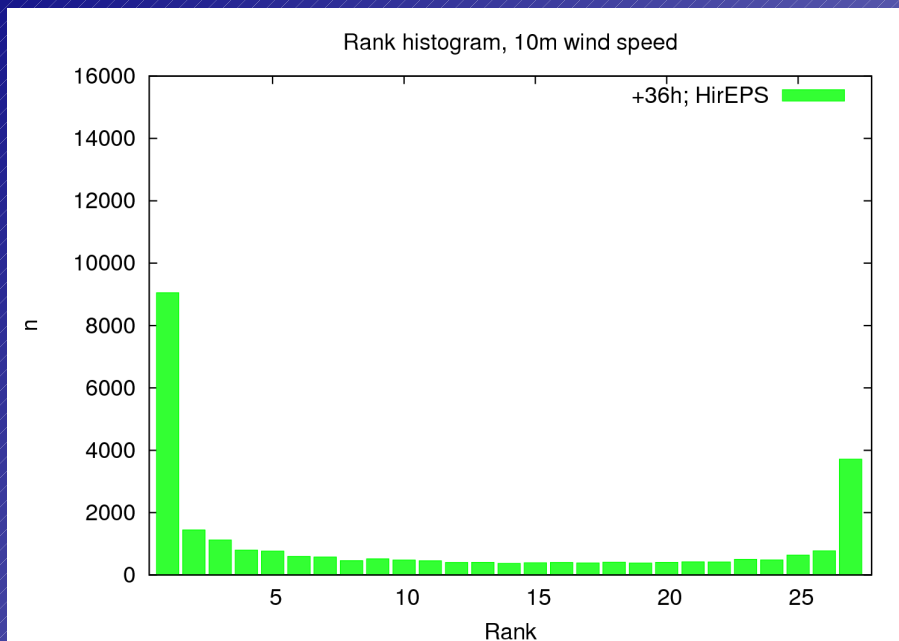
HirEPS ensemble mean has

- less bias
- less RMS error
- more correct forecasts

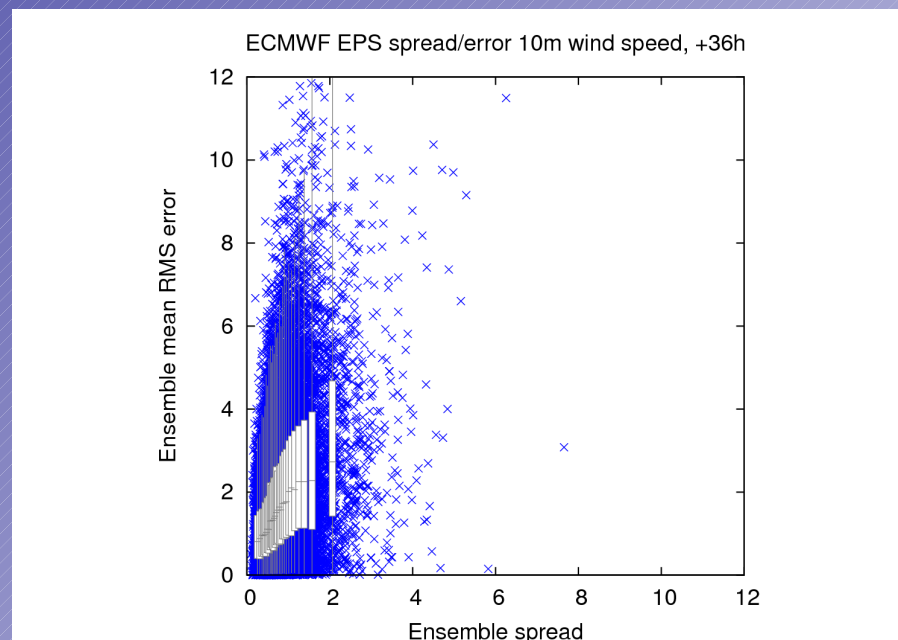
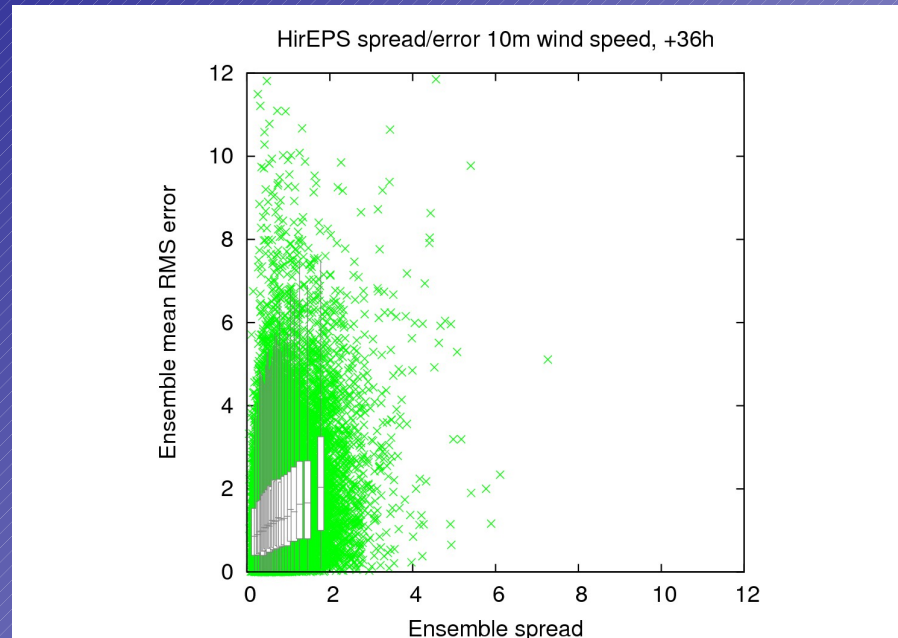
then ECMWF ensemble mean



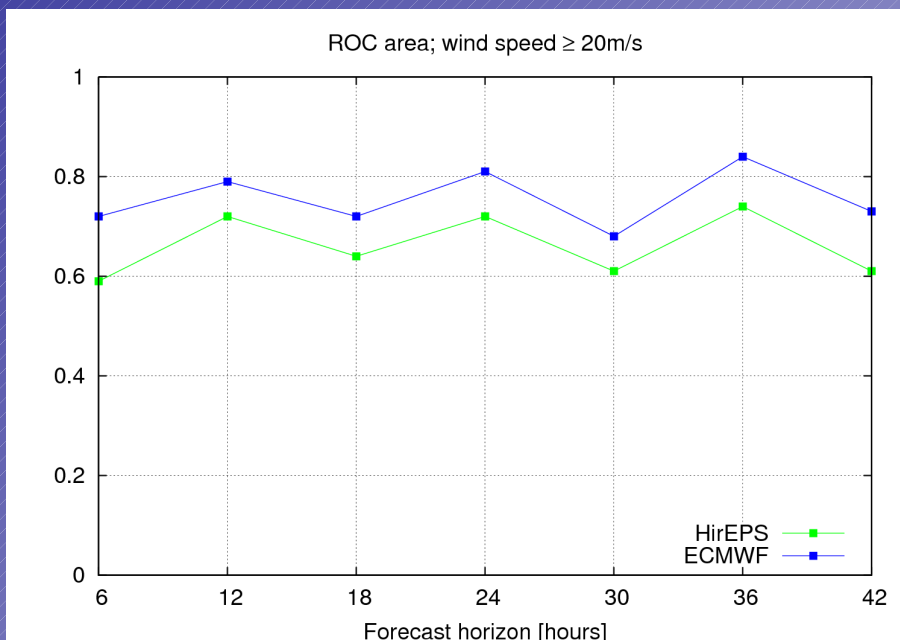
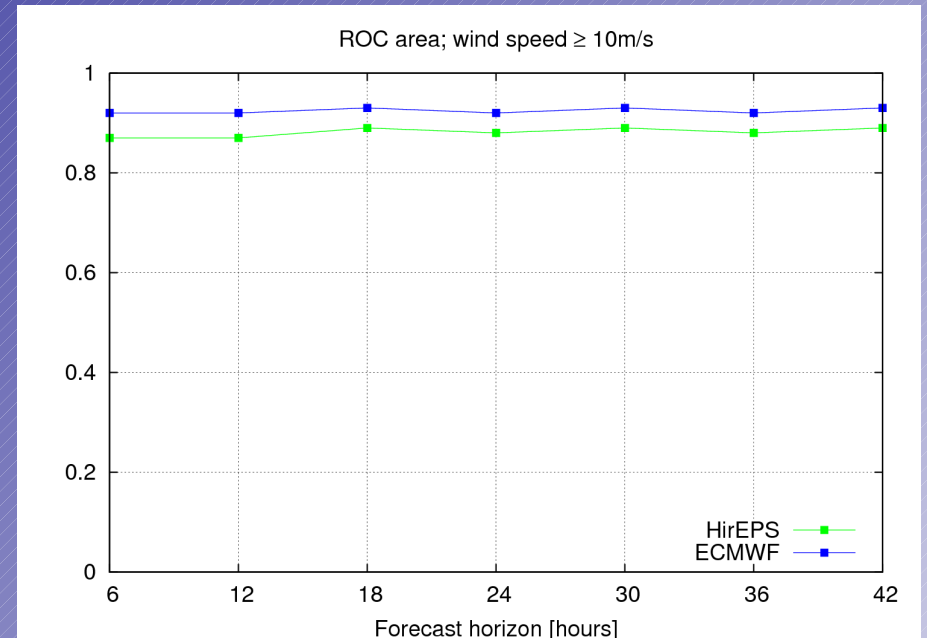
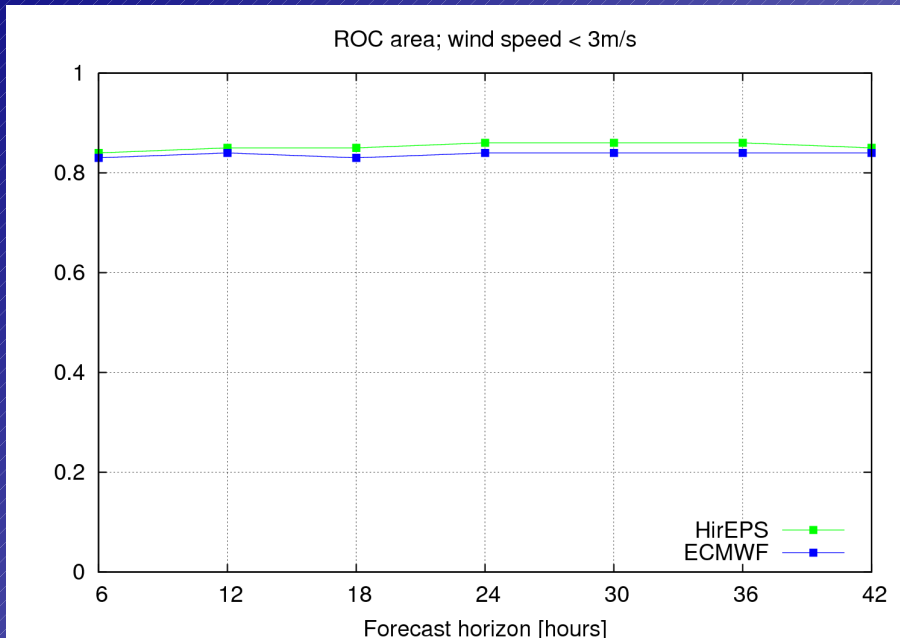
Rank histograms, 10m wind speed



Spread/error relation



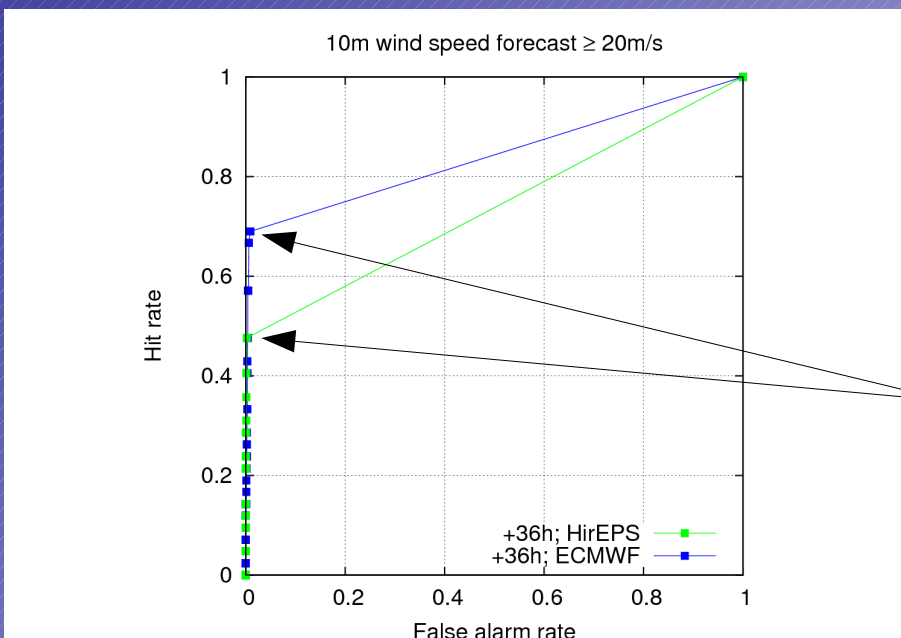
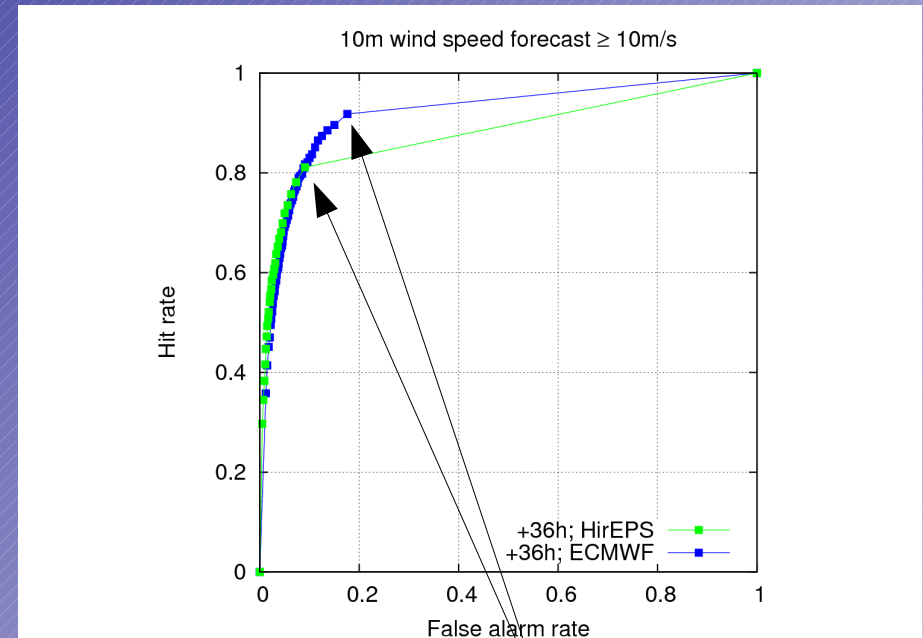
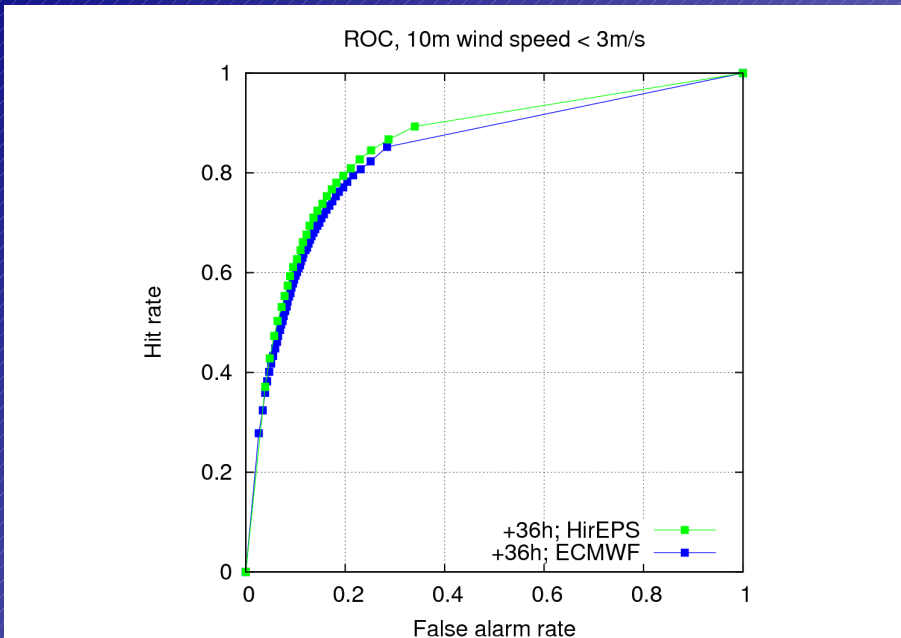
Relative operating characteristic



- HirEPS scores better for small wind speeds
- ECMWF EPS scores better for larger wind speeds, but...



Relative operating characteristic

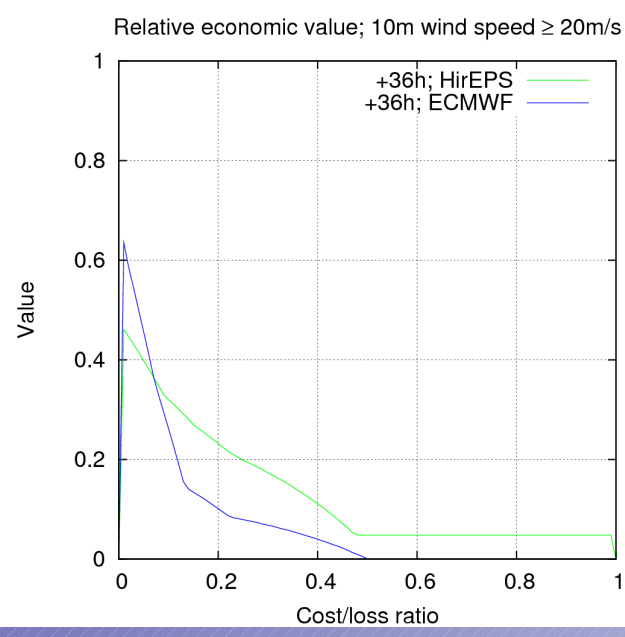
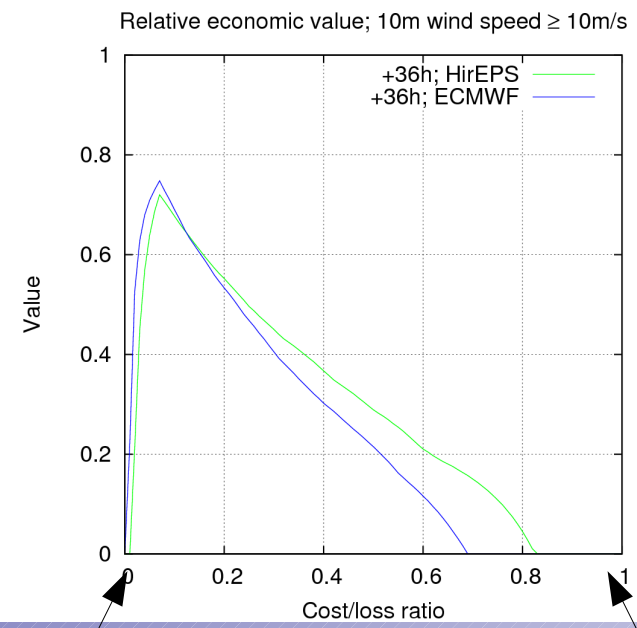
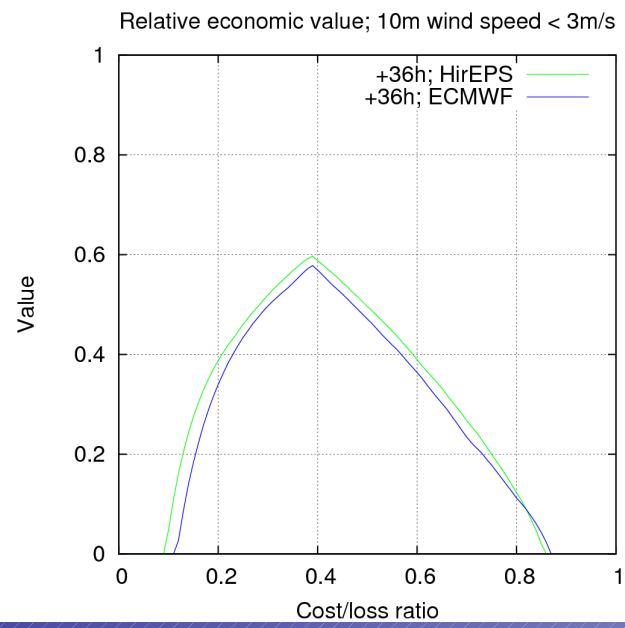


ECMWF 13% higher hit rate than HirEPS, and 93% higher false alarm rate

ECMWF 45% higher hit rate than HirEPS, and 267% higher false alarm rate



Economic value



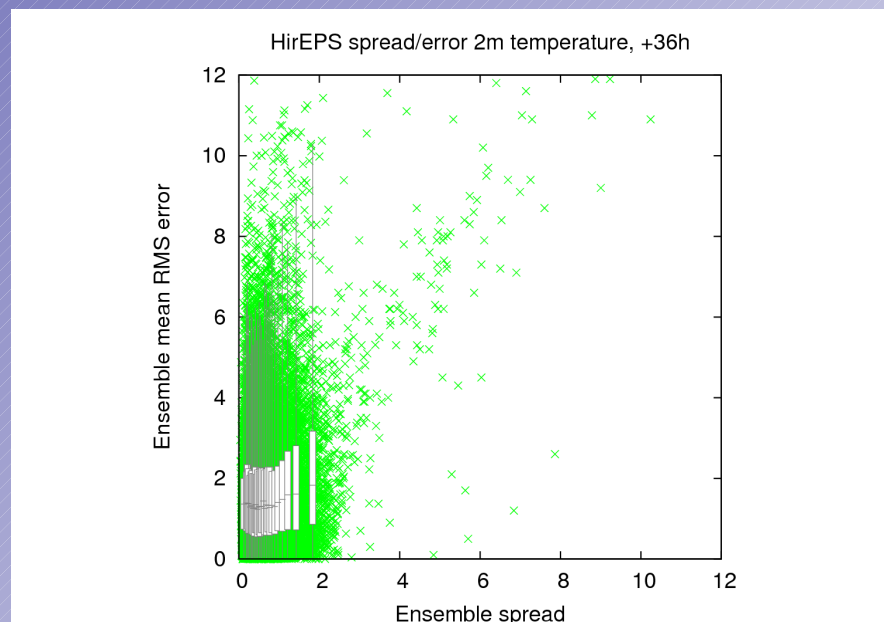
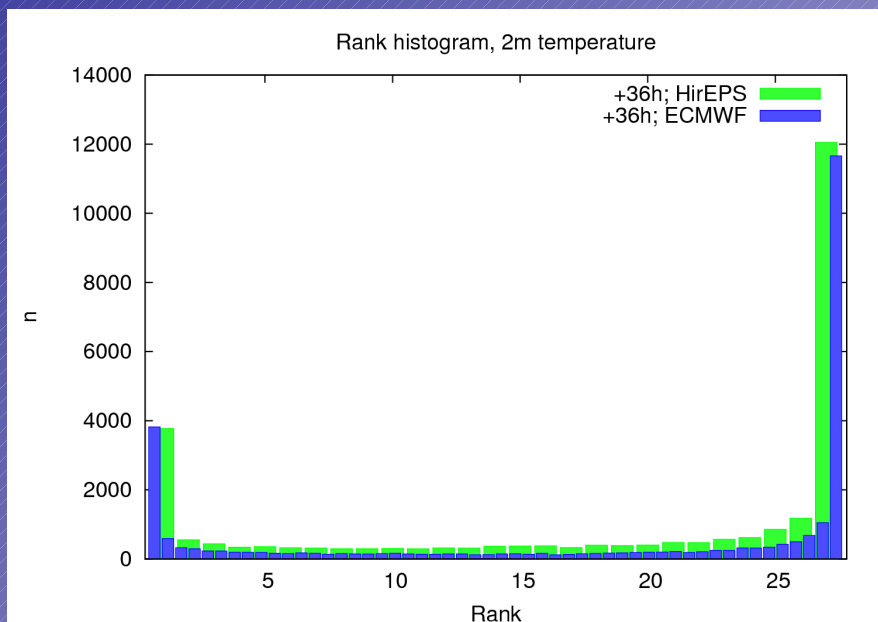
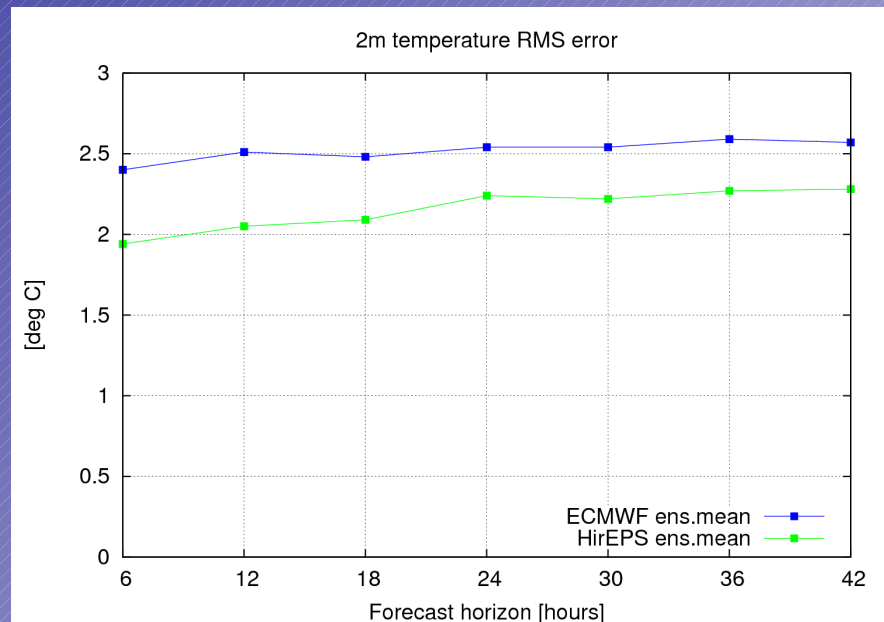
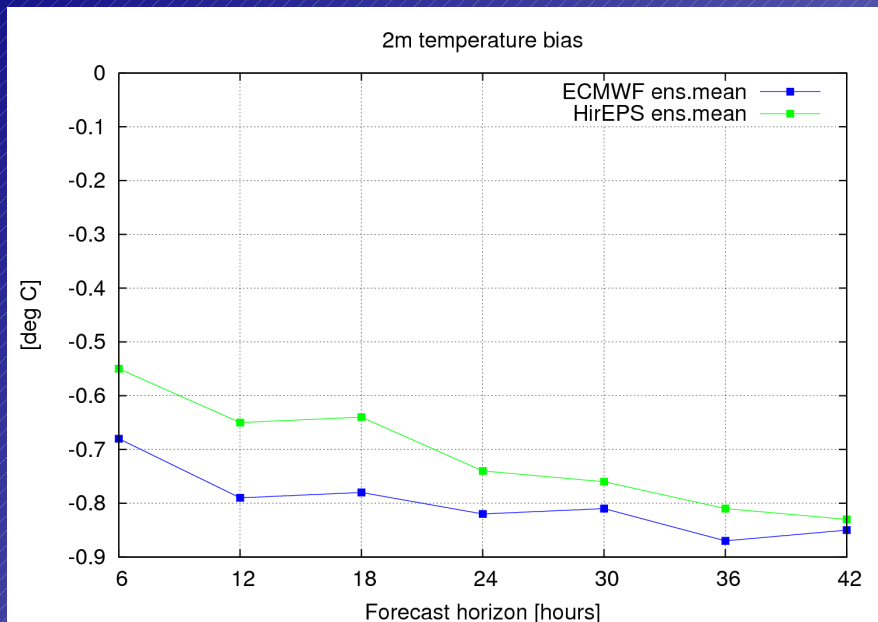
Many false alarms acceptable

Many false alarms *not* acceptable

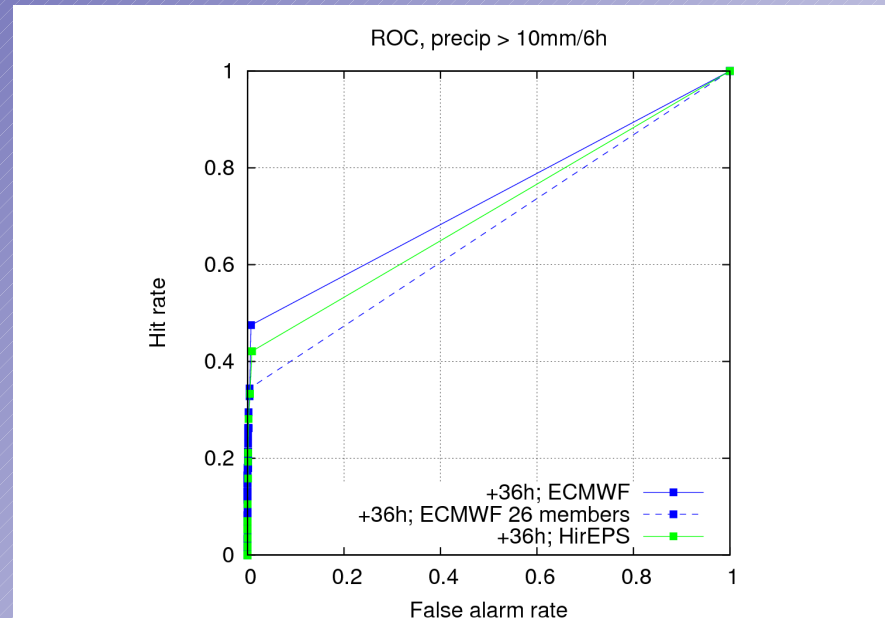
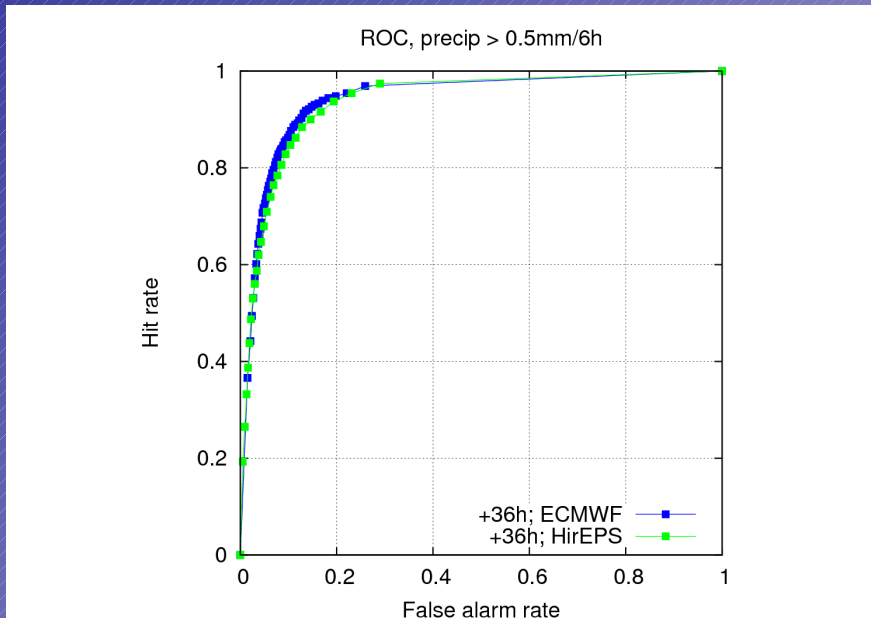
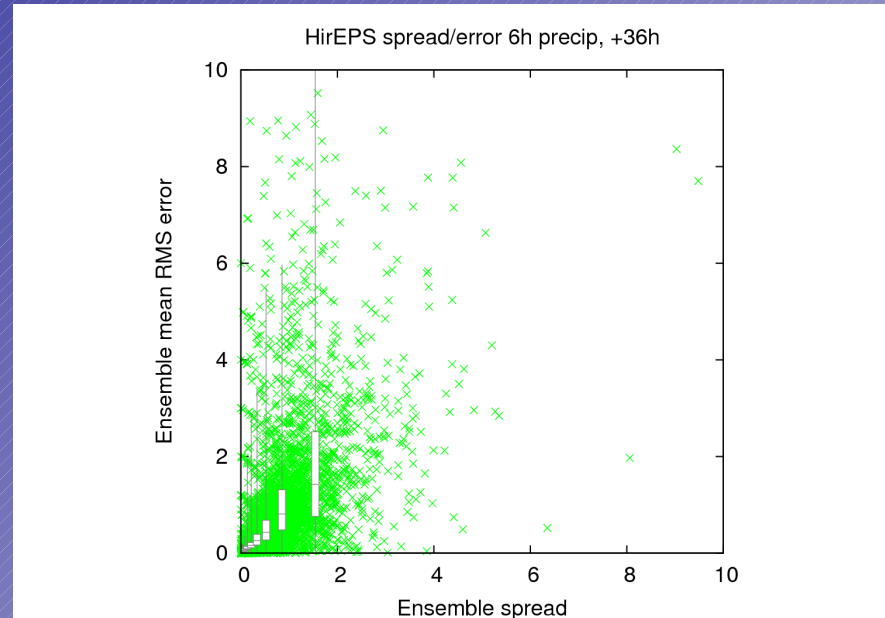
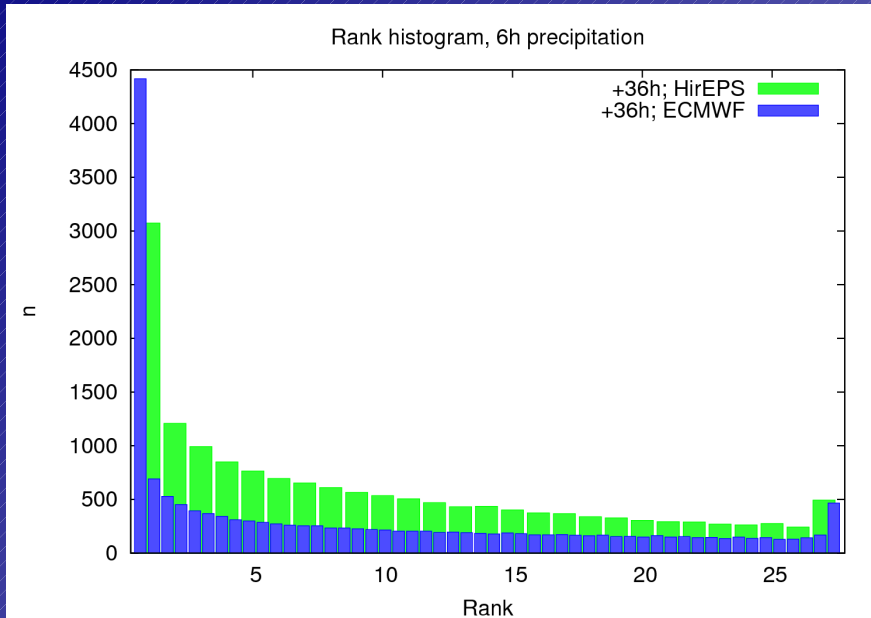
HirEPS better than ECMWF for high cost/loss ratios



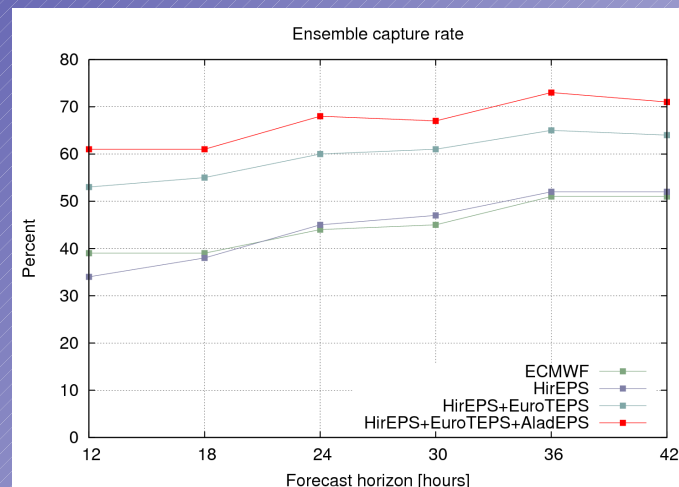
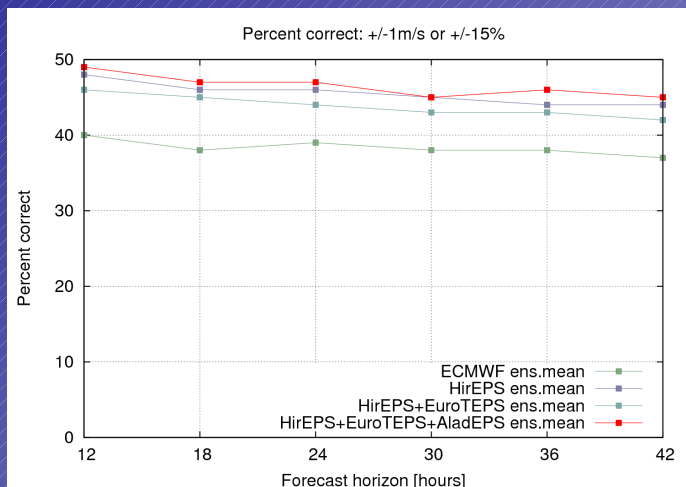
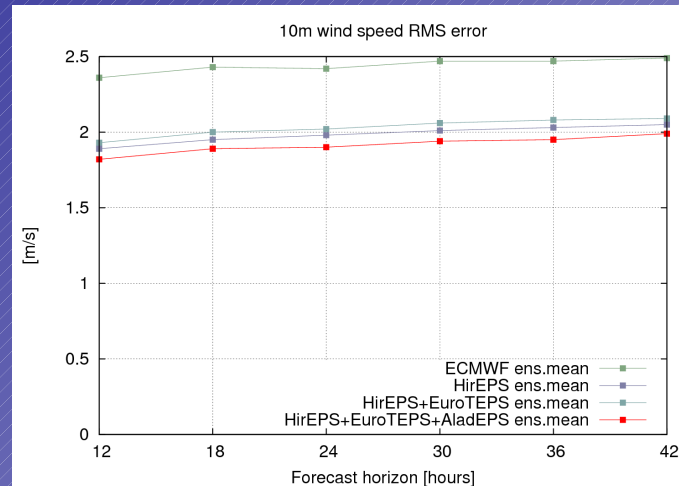
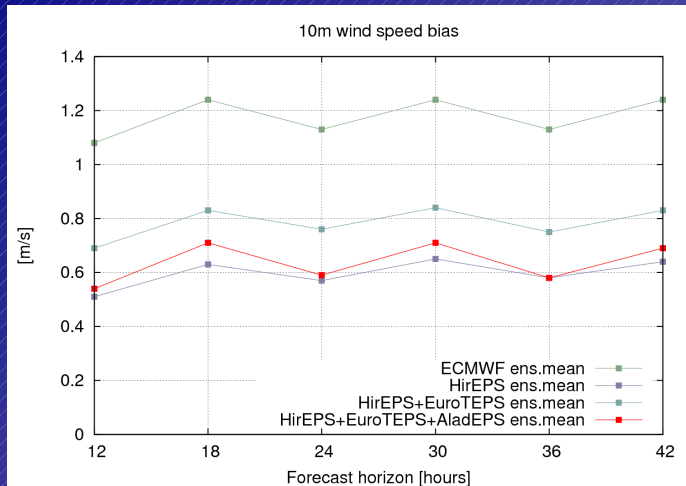
2m temperature



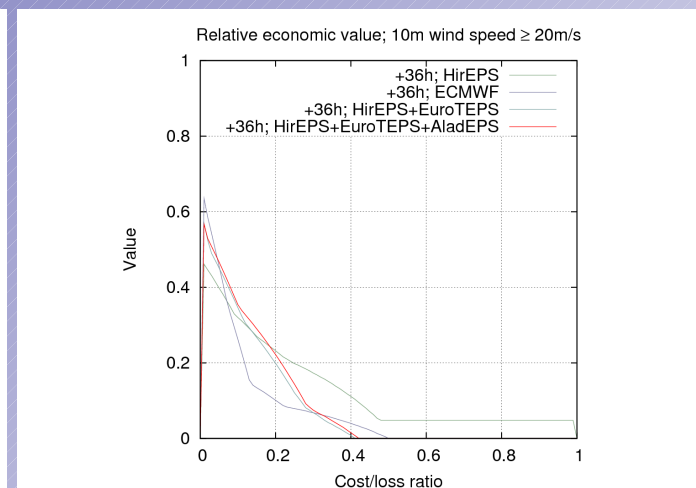
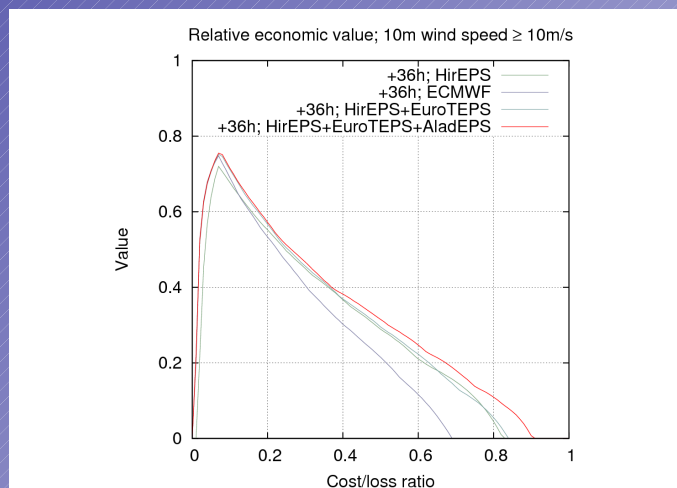
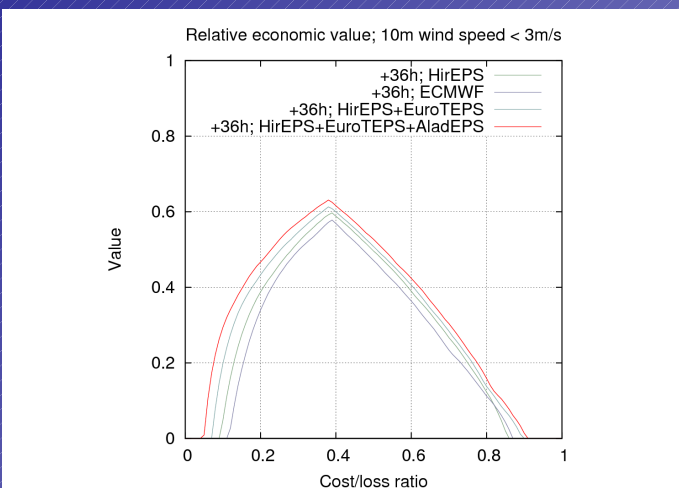
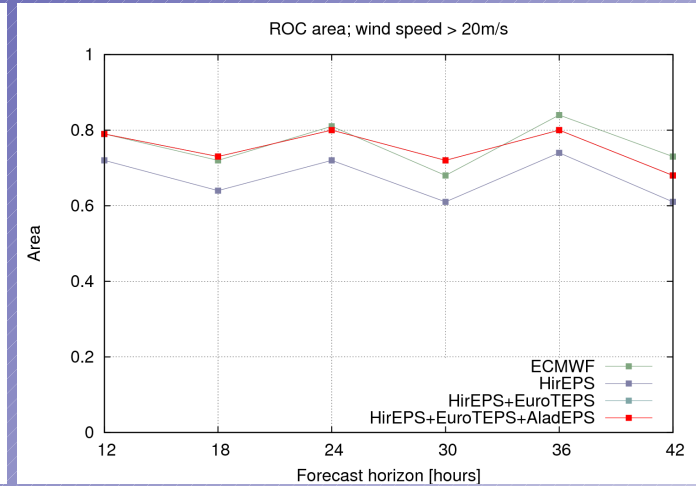
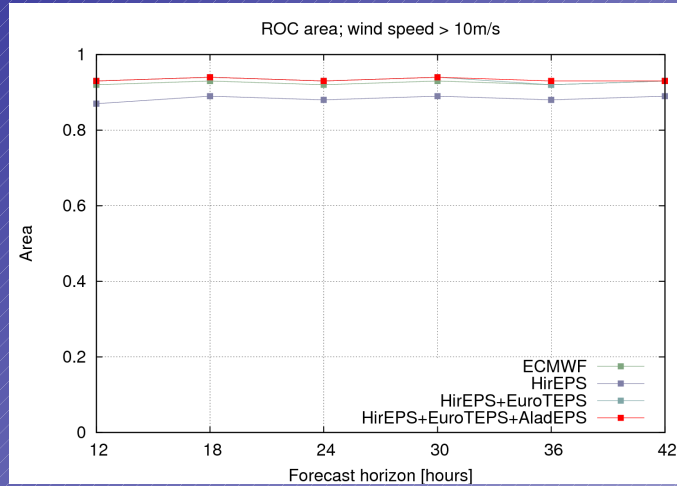
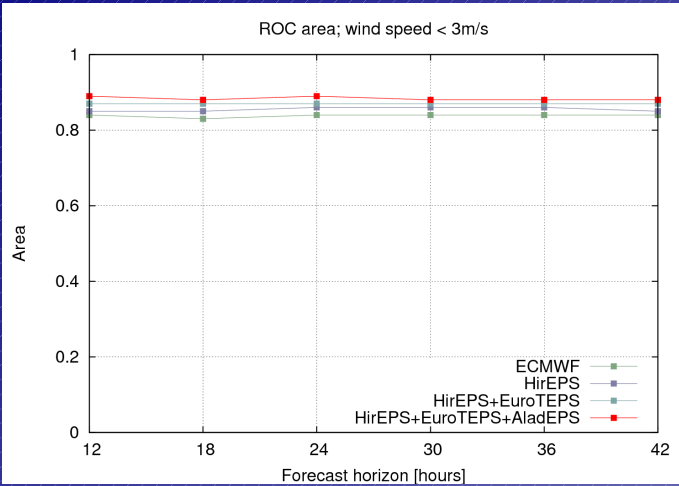
Precipitation



Adding EuroTEPS and AladEPS members

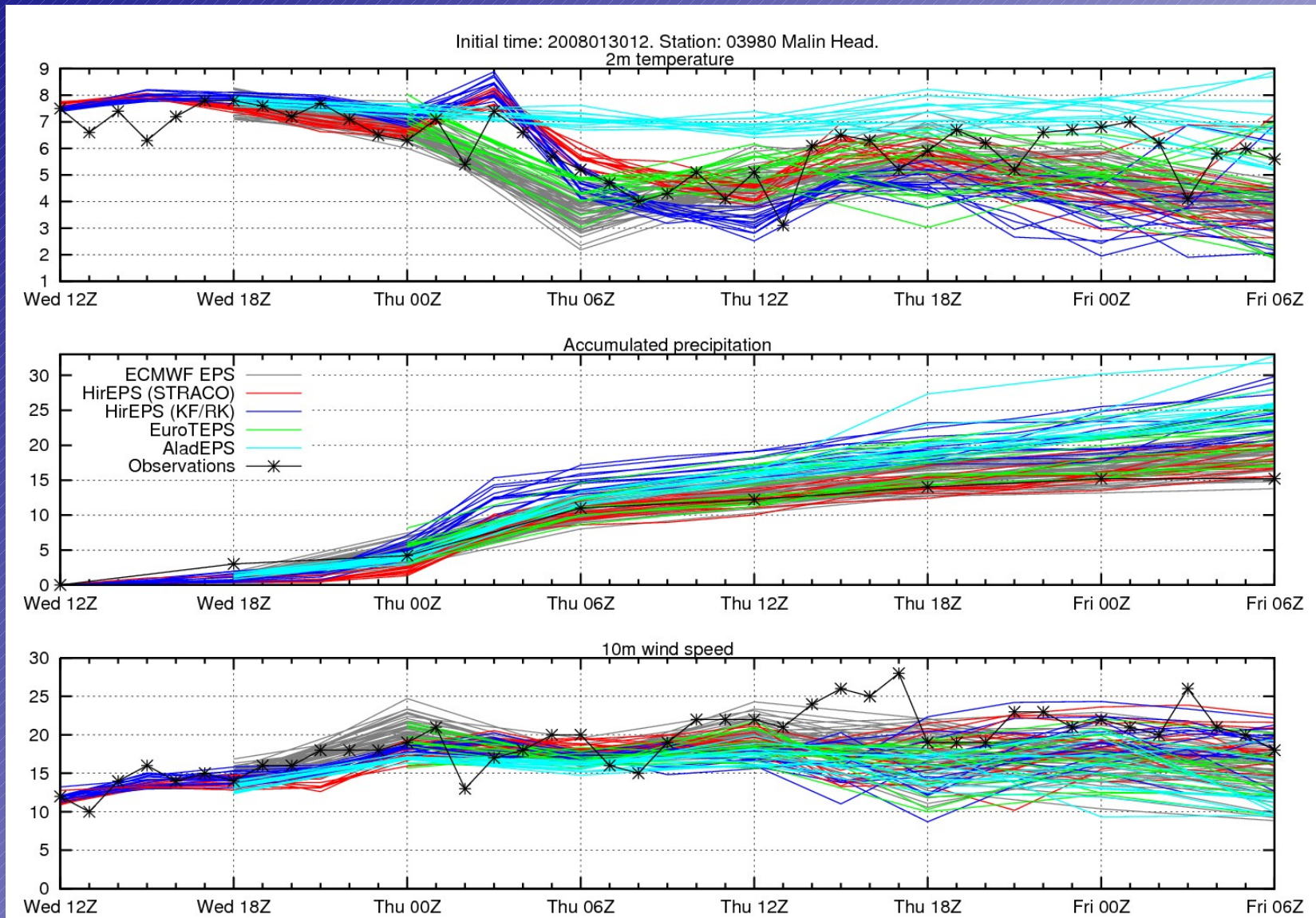


Adding EuroTEPS and AladEPS members



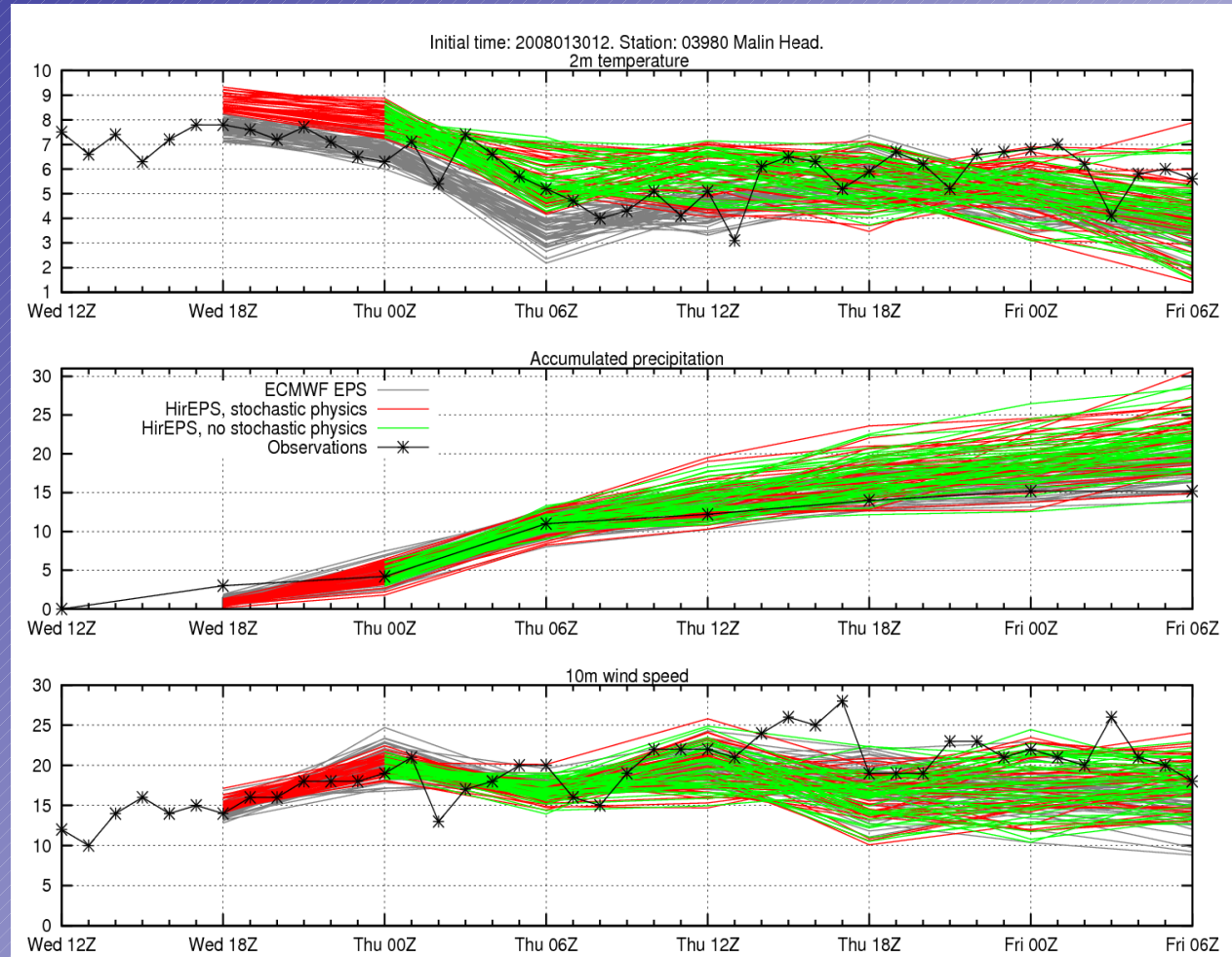
Adding members from different models
improves the ensemble forecasts

Ensemble meteogram revisited

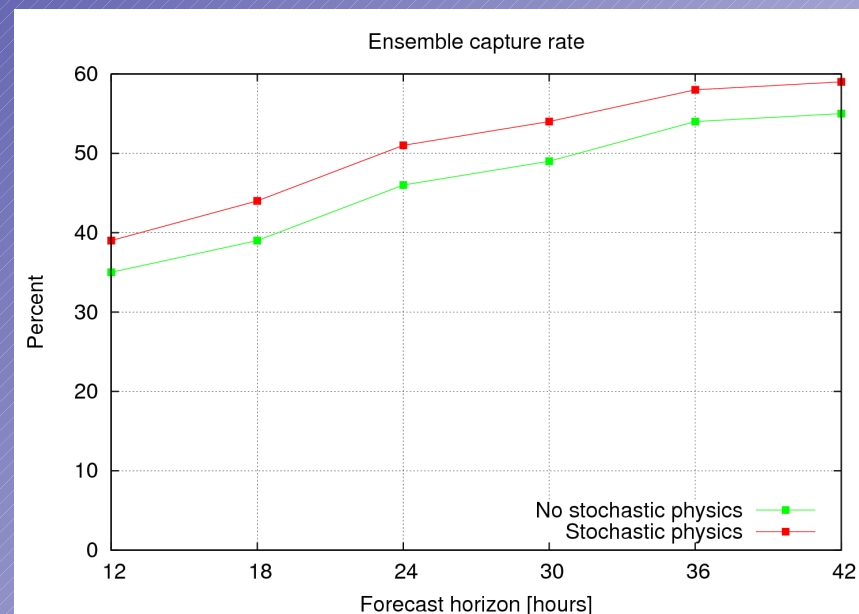
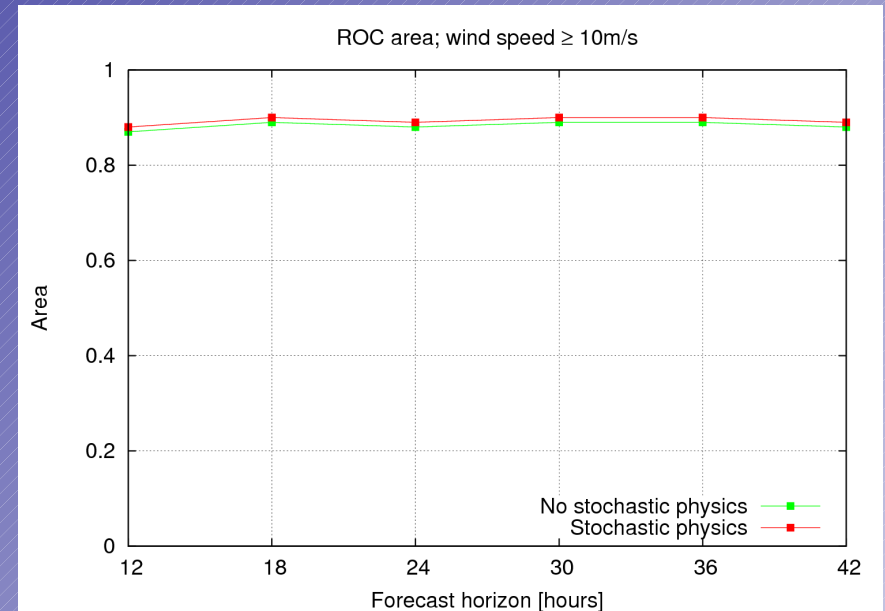
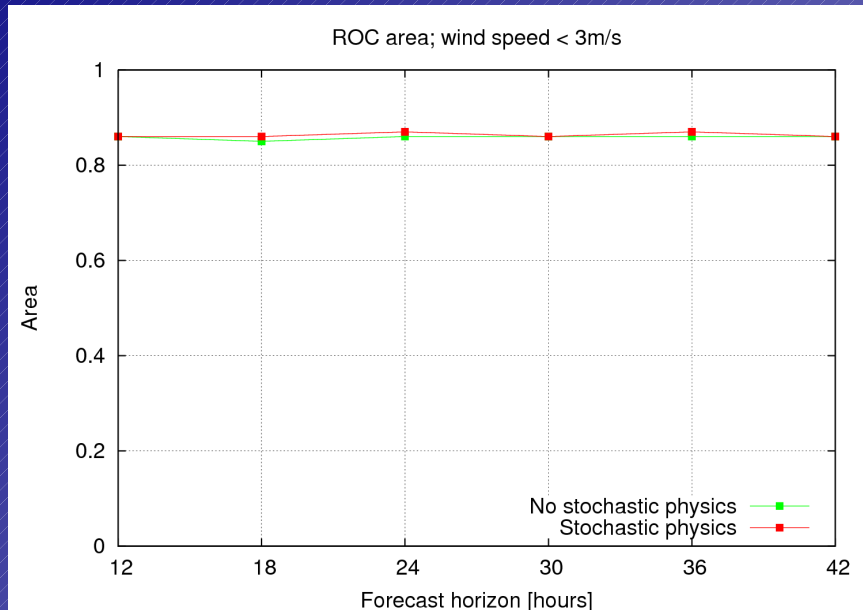


Impact of stochastic physics

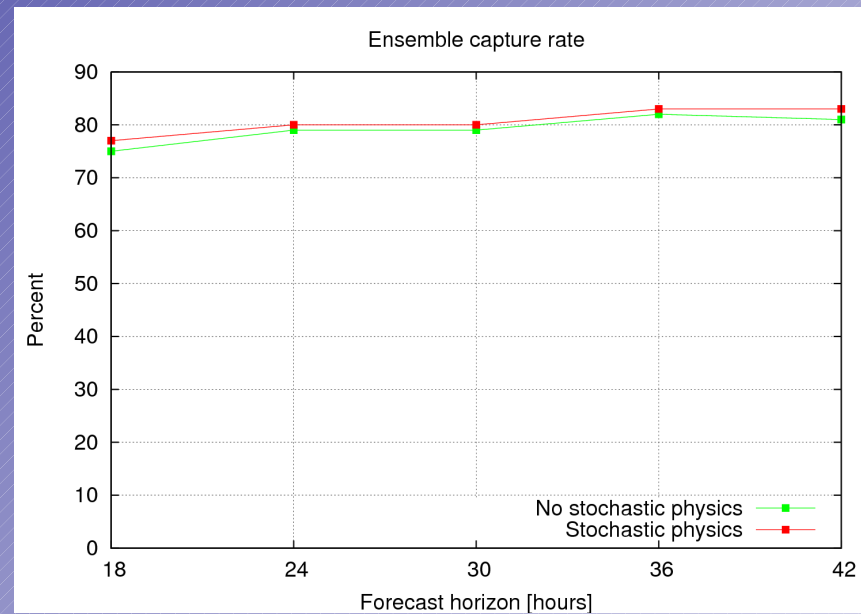
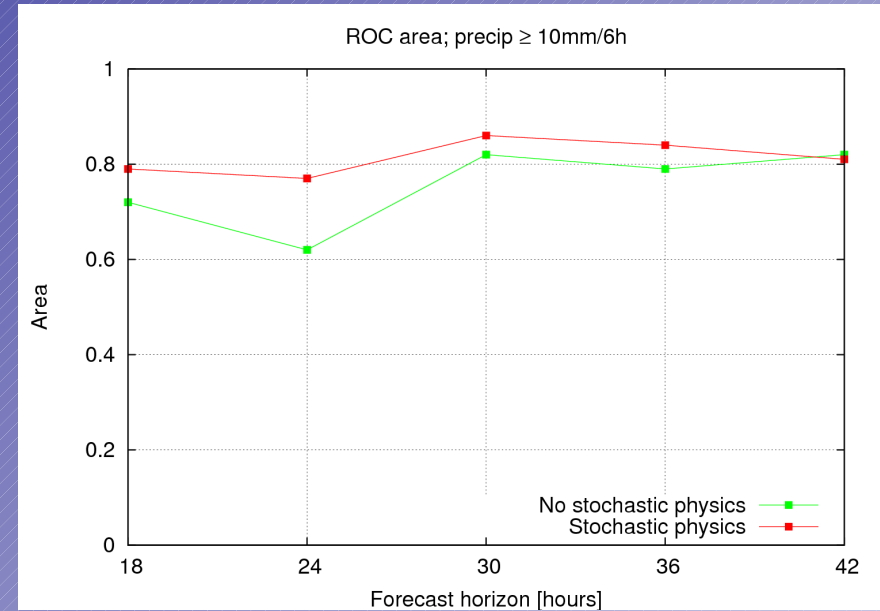
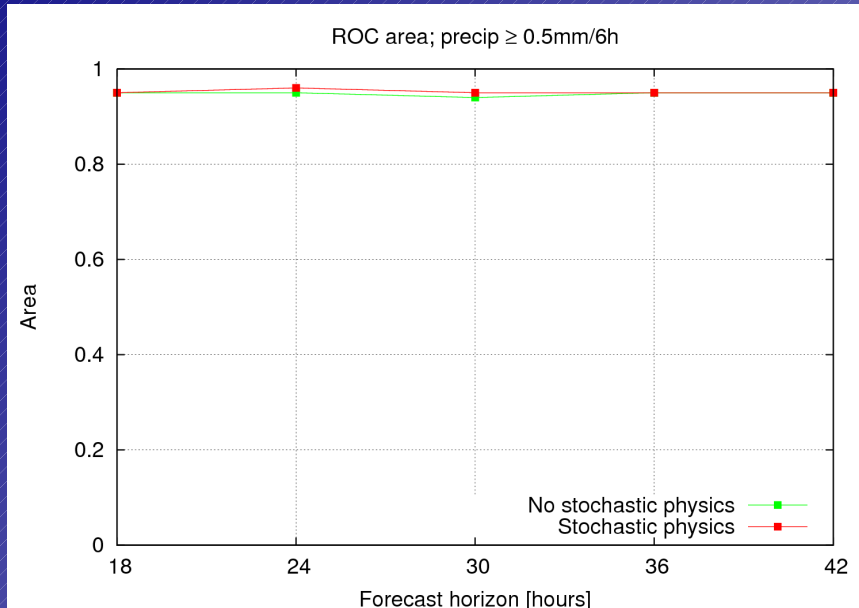
- GLAMEPS exp. 0 (0.2° horizontal resolution)
- HirEPS, 42 members
- Random perturbation of physics tendencies
- Verification period: 20080117-20080131



Impact of stochastic physics (10m wind speed)



Impact of stochastic physics (precipitation)



Conclusions

- The GLAMEPS ensemble compares favourably to the ECMWF ensemble for short-range forecasts
- Ensemble spread is generally too small to capture expected number of observations
- There is evidence for the benefit of using
 - multiple schemes (STRACO, KF/RK)
 - multiple models (Hirlam, Aladin, EuroTEPS)
 - stochastic physics
- Statistical postprocessing is needed to build a reliable probabilistic forecasting system



DMI