Grand Limited Area Model Ensemble Prediction System

The prospects of GLAMEPS

Trond Iversen

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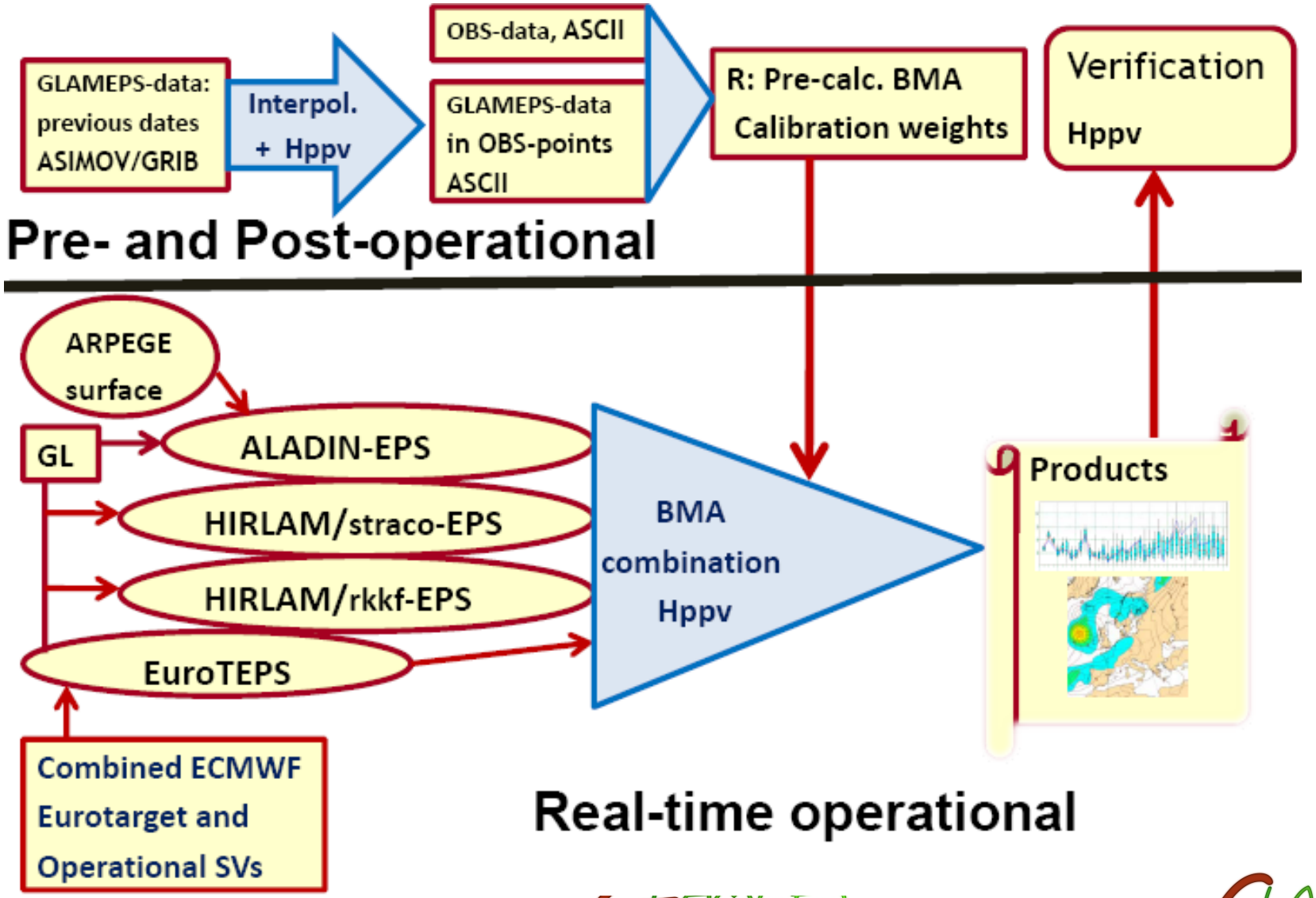
SLAF: J. A. Garcia-Moya

Physics perturbations: H. Feddersen, J. Kristiansen

Thanks to ECMWF: Martin Leutbecher & Dominique Lucas

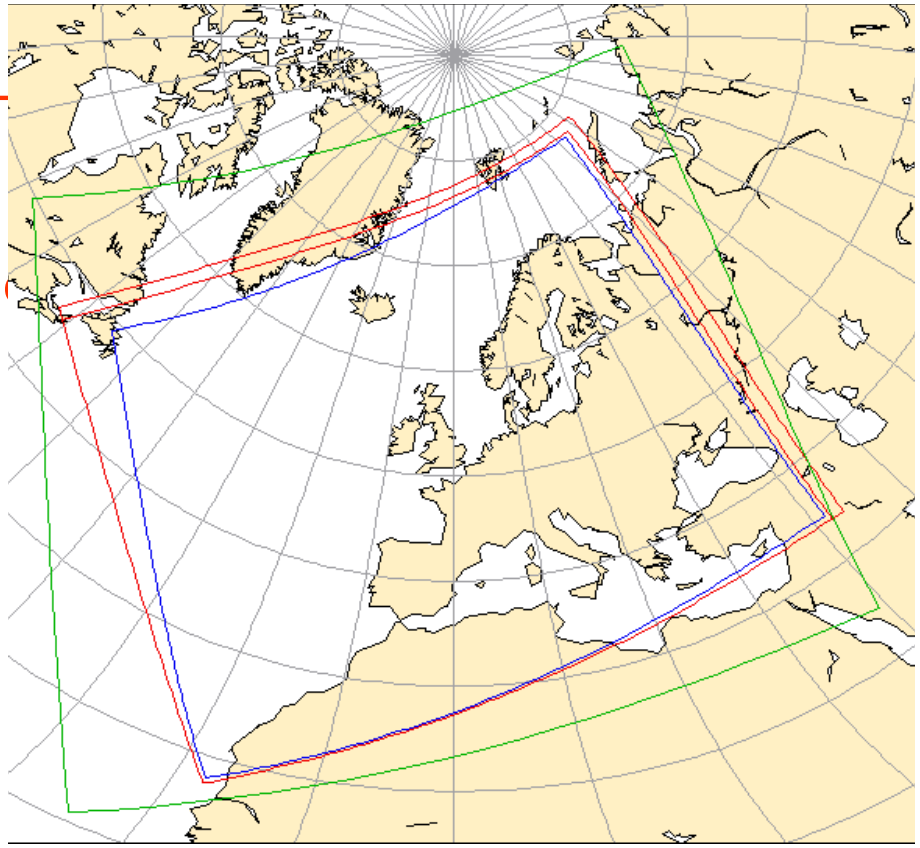
GLAMEPS production – flow chart

Launching and monitoring by SMS (Kai Sattler)



Present main candidate for operational GLAMEPS:

52 ensemble members; 13 per
EuroTEPS (12 + 1) + HirEPS_K (12-
+ HirEPS_S (12+1) + AladEPS (13)
In reality 51 unique members;
AladEPS_00 is EuroTEPS_00 downs



- ***13km grid resolution***

(Aladin 509x416, 12.9km,L37);
(Hirlam 486x378, 0.115deg,L40)

- ***Forecast range: 42h***

- *preliminary estimate ~8 Msbu/yr, before EPS upgrade.*
- *LAMEPS: ~5.5 Msbu/yr*

Experimental operational prod EuroTEPS_13 Cy35r3 replaced by EC EPS _00-12 Cy36r1

Operational EuroTEPS postponed because of upgrades at ECMWF:

- *T399L62 →T639L62 (36r1, implemented)*
- *SVevo→EDA-perturbations (36r2, June2010)*
- *T639L92 + new EuroTEPS (incl diabatic SVs), (36r3, fall 2010)*

Pre-operational test runs since

Timing results of pre-operational version

- 35 Min EC EPS data extraction
- 75 min LAM EPS (serially: AladEPS 40; HirEPS_S 55; HirEPS_K 60)
- 12 min postPP preparation (Hppv)
- 60 Min postPP production (Hppv)

Overall production time per cycle, ca. **2h 45min**;
(smaller than the sum, because of overlapping)

Pre-Operational GLAMEPS
EuroTEPS_13 replaced by EC EPS _00-12

Twice daily GLAMEPS runs since 11th Feb 2010

- *Preliminary product plots available from 11th Feb to 4th March*
  - ***Hppv-failure*** *occurred 5. March (metview error),* ***Still not solved***

- ***glameps.org:***
  400 plots per cycle to become available – in the meantime, check:

https://hirlam.org/portal/GLAMEPS/Products/Gl.PROD.m52/index.html

Back to main page

Info

forecasted

AccPcp3h

valid

AccPcp3h

GLAMEPS production

DISCLAIMER: Use of data is The User's own full responsibility.

On this web-page it is intended to show operational glameps-results as they become available. The data you will find here for the moment are Preliminary test data for experimental use only.
Most of the data are historical, but from time to time real-time results will be possible to see. The use of these data should only be used for internal information, and no weather forecasts must at any time rely on the quality or availability of these data.
While we welcome experimental test use of the results with feed-back reported back, we strongly emphasize that any use of the data remains the full responsibility of the user, and the user only.

GLAMEPS - Grand Limited Area Model Ensemble Prediction System

HIRLAM and ALADIN countries are in the process of developing a short-range limited-area ensemble forecasting in Europe.
This co-ordinated activity, which aims at incorporating a range of approaches to account for known uncertainties into an operational system for probabilistic forecasts, is in short named GLAMEPS. At present the aim is to provide member countries with skilful and reliable probabilistic forecasts up to 42h ahead, with 13km grid resolution twice per day (00 and 12 UTC).

The operational idea behind GLAMEPS is to establish a multi-model, limited-area EPS by sharing computer resources amongst selected member countries in real time. GLAMEPS is at present fully run at ECMWF high performance computers with a SBUs from a special project and SBUs added from some of the member countries. It is anticipated that GLAMEPS also will use ECMWF as the data centre to facilitate real-time GLAMEPS production in the future, but this will depend on an agreement with ECMWF and with sufficient SBUs made available from members of HIRLAM and ALADIN.

The system is set up with two HIRLAM versions, which respectively use the Rasch-Kristiansson/Kain-Fritsch (RKKF) and the Straco parameterization schemes for clouds, and one ALADIN version. The two HIRLAM-versions are run with independent 3d-Var data-assimilation, whilst ALADIN presently downscale the EuroTEPS control. Each LAM version produces ensemble member perturbations of initial and lateral boundary data employing a pan-European version of the Targeted EPS called EuroTEPS. Together with the EuroTEPS itself, the system yield products from 4 independent models and three different control analyses, in addition to initial and lateral boundary data perturbations constructed from singular vectors. The number of ensemble members is 52.

Preliminary products

The data shown are examples of products from GLAMEPS. If you miss results, the reason is that the operational production is not in place yet and we still struggle with failures. mslp, 2m temperature, 10m mean wind, 10m wind gust, 3h accumulated precipitation, 850hPa Temperature, 925hPa mean wind, 500hPa Z. maps include ensemble mean (lines) imposed with ensemble standard deviation (shading), and a range of maps of probabilities for parameters exceeding some pre-selected thresholds (shadings).

31.03.2010, Trond Iversen

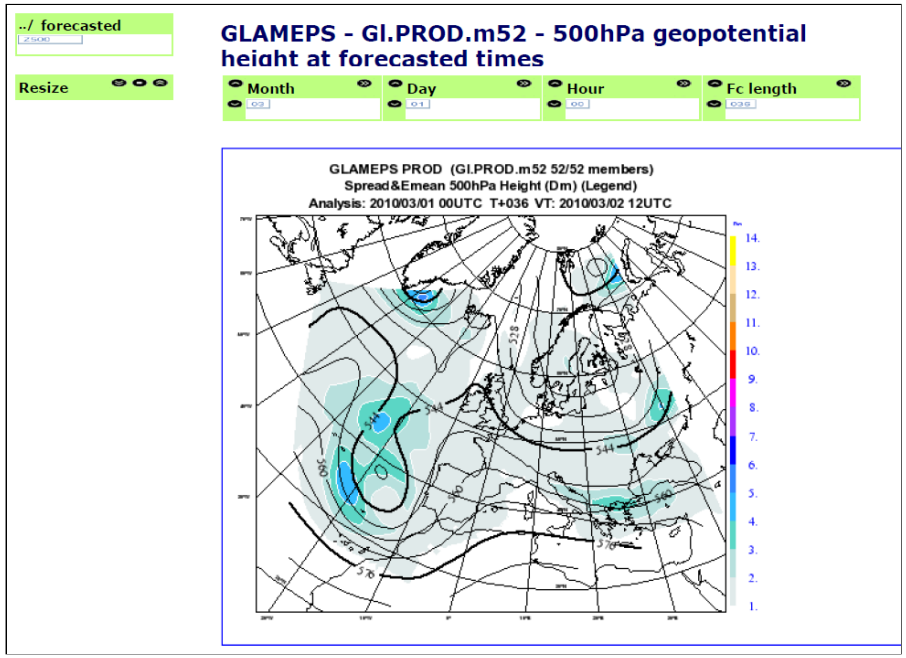
Pre-Operational GLAMEPS

EuroTEPS_13 replaced by EC EPS _00-12

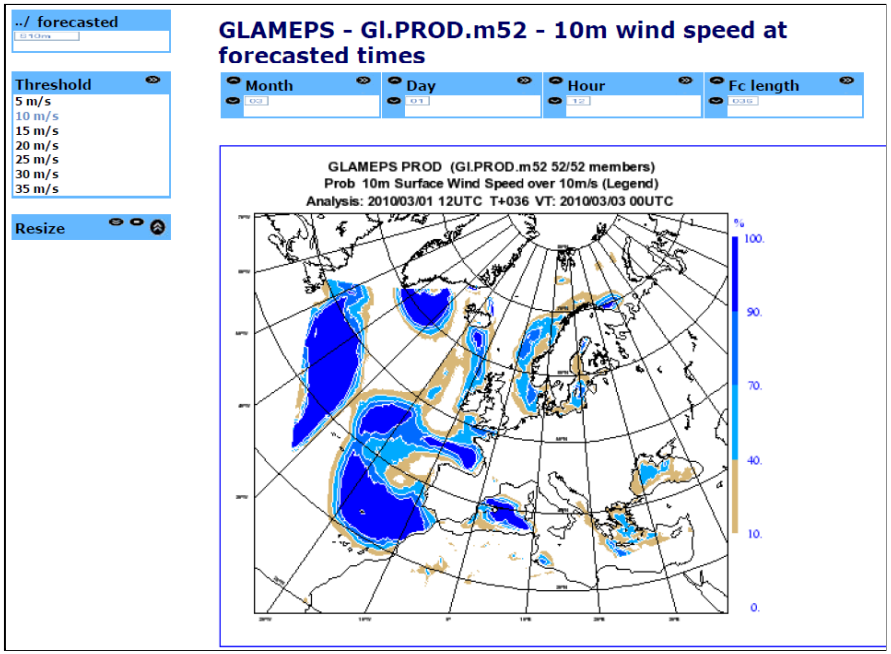
https://hirlam.org/portal/GLAMEPS/Products/Gl.PROD.m52/index.html

For Example:

Z_{500} ensemble mean + RMS spread



Prob [ff10m > 10m/s]

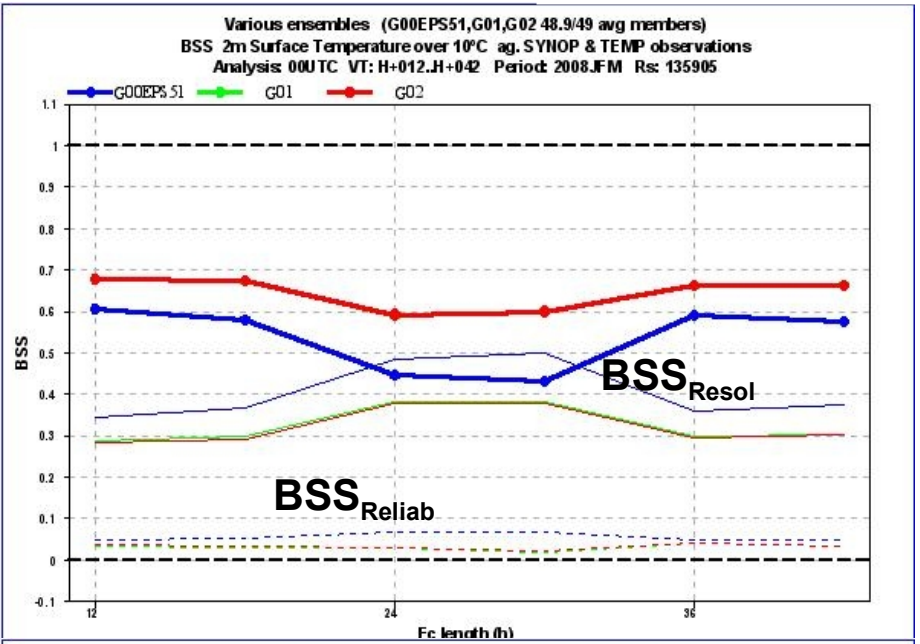


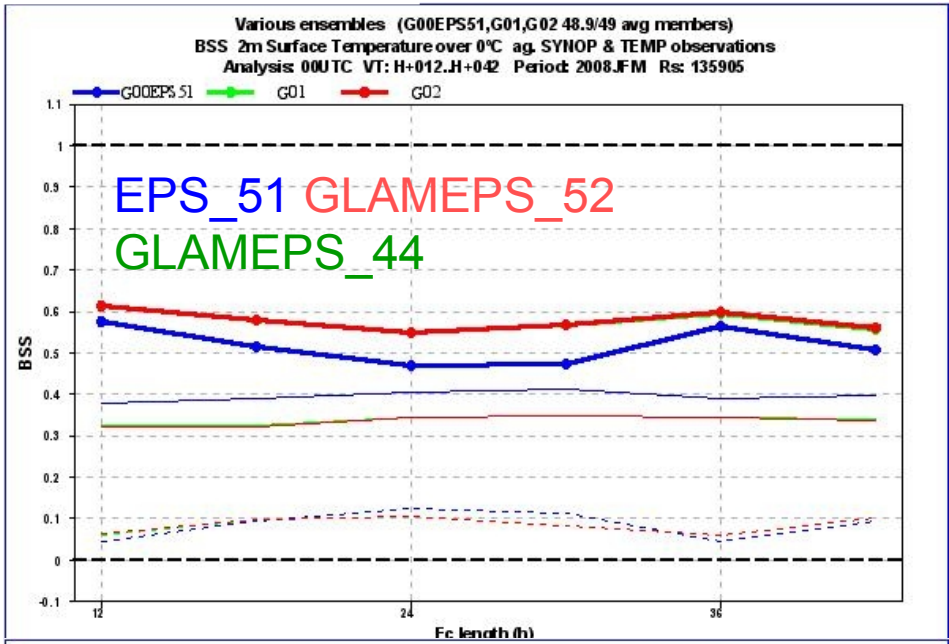
Brier Skill Score 2008/0117 - 0308 (00, 12 +24h)

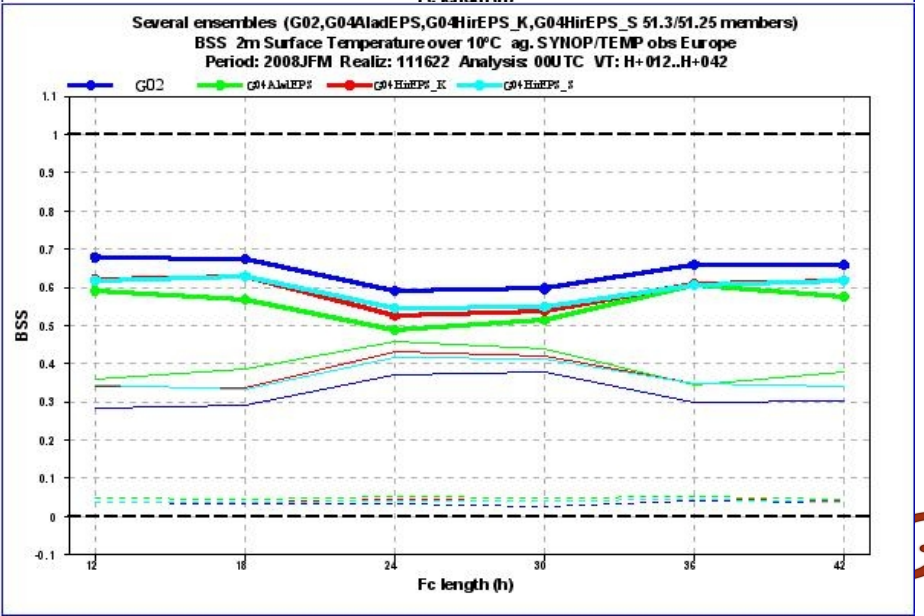
T2m > +10 C

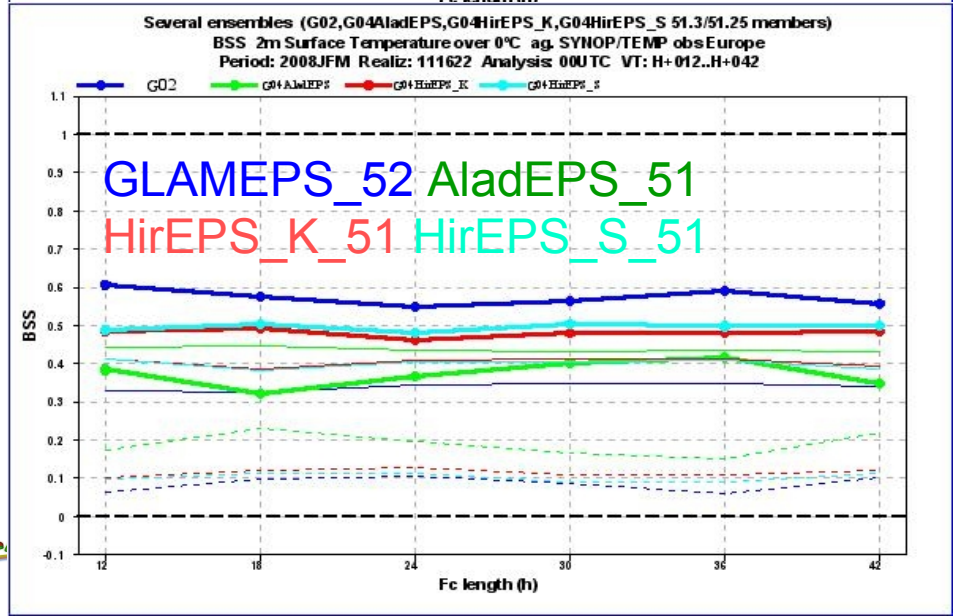
$$[\ BSS = 1 - BSS_{Reliab} - BSS_{Resol}\ ]$$

T2m > 0 C







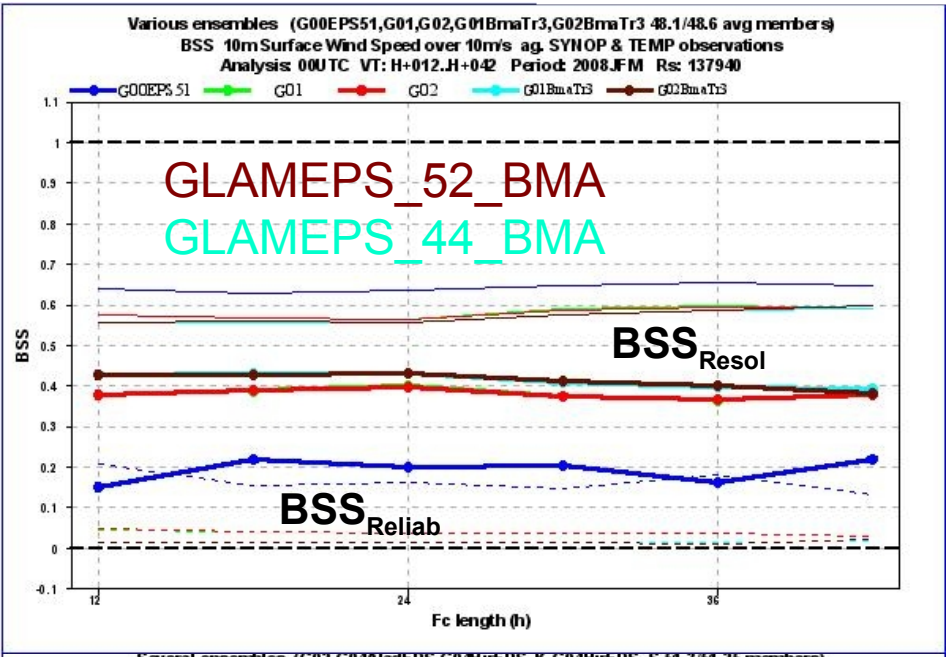


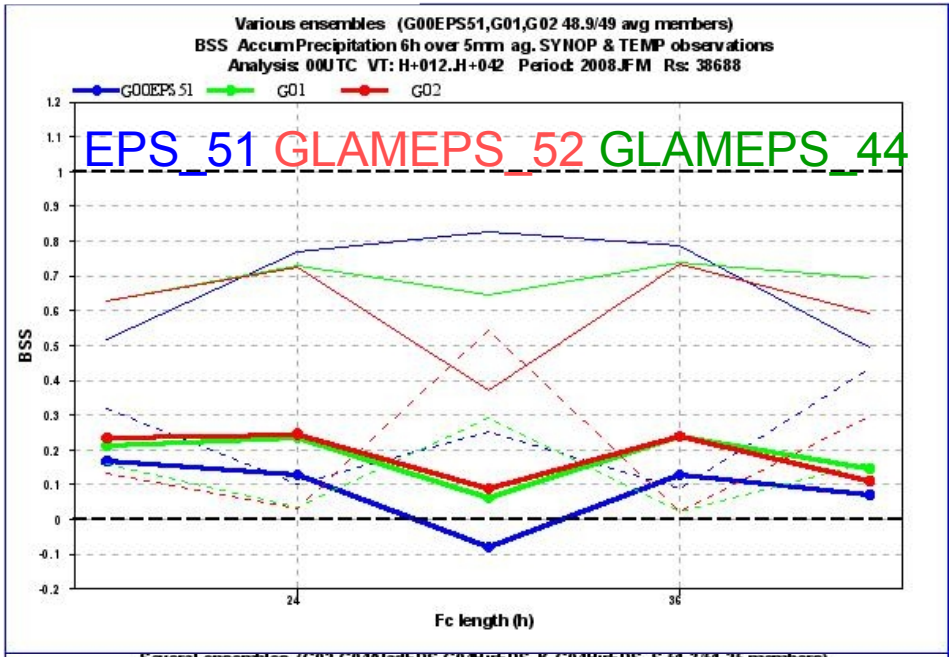
Brier Skill Score 2008/0117 - 0308 (00, 12 +24h)

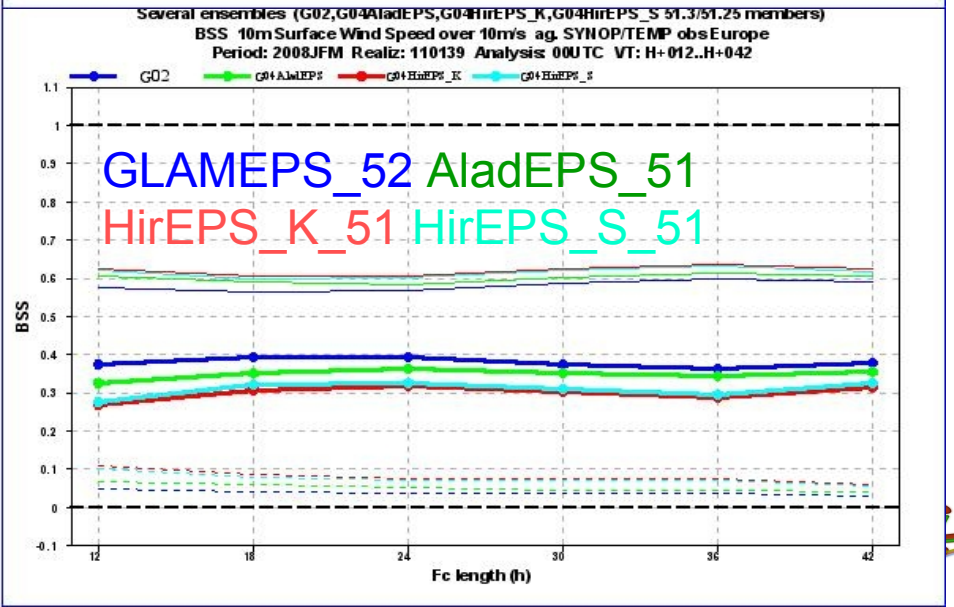
ff10m > 10m/s

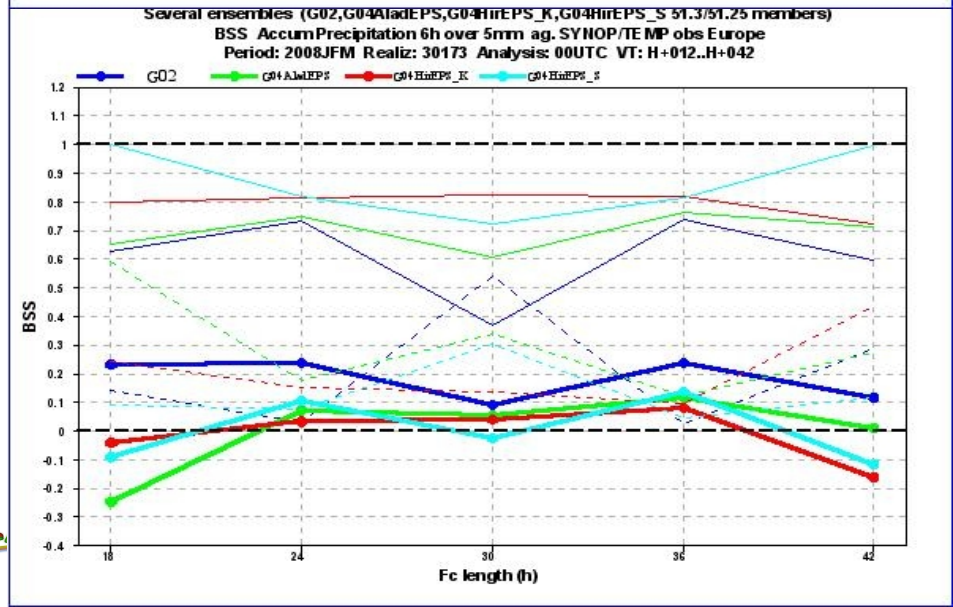
$$[\ BSS = 1 - BSS_{Reliab} - BSS_{Resol}\ ]$$

Pr6h > 5mm/6h



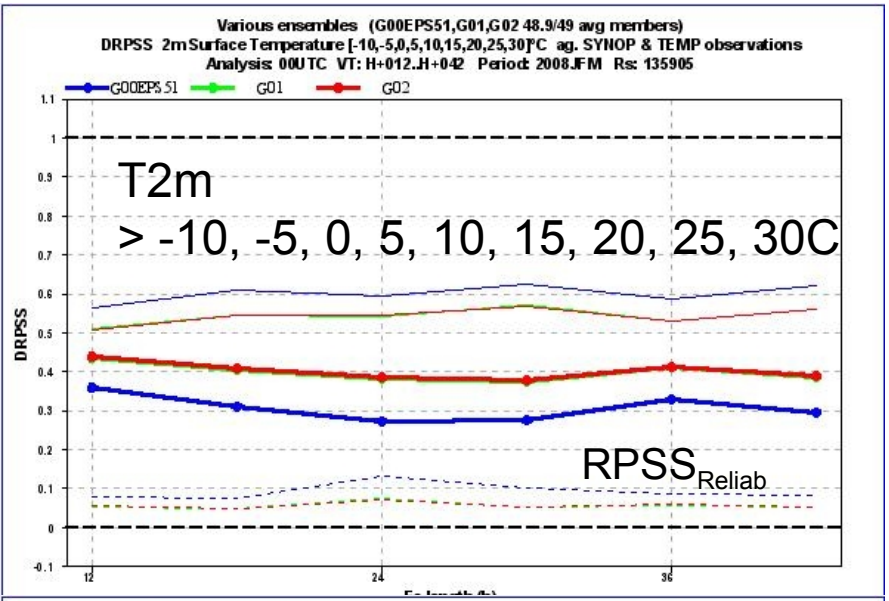


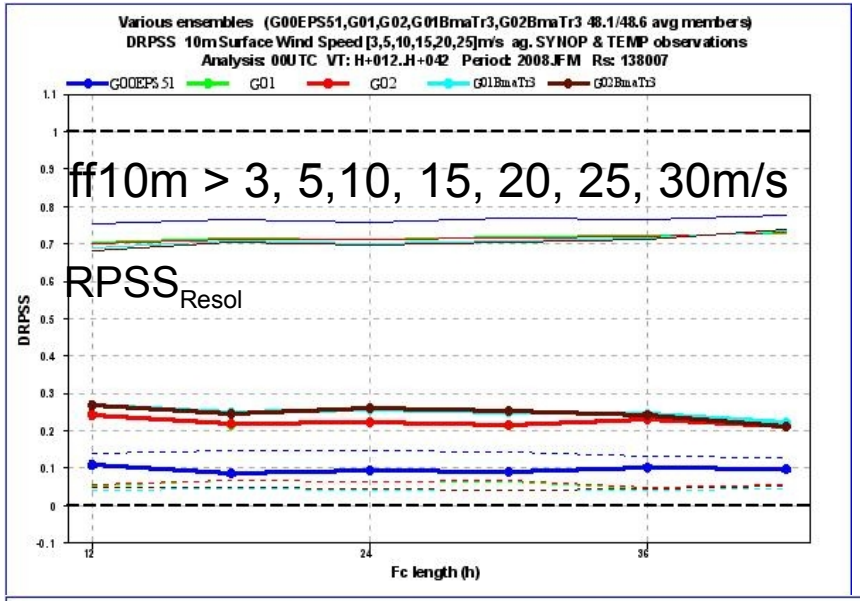


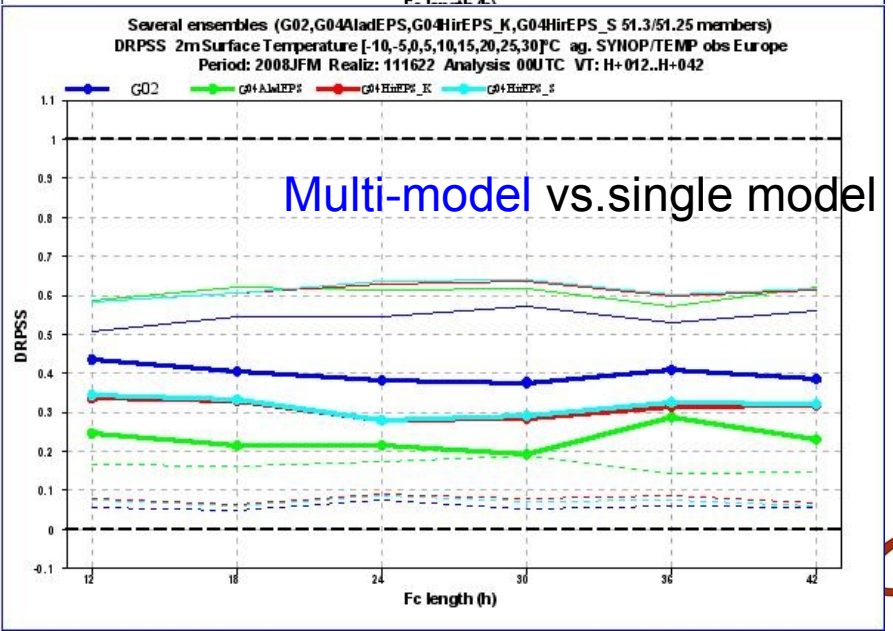


Ranked probability skill score – DRPSS 2008/0117 - 0308 (00, 12)

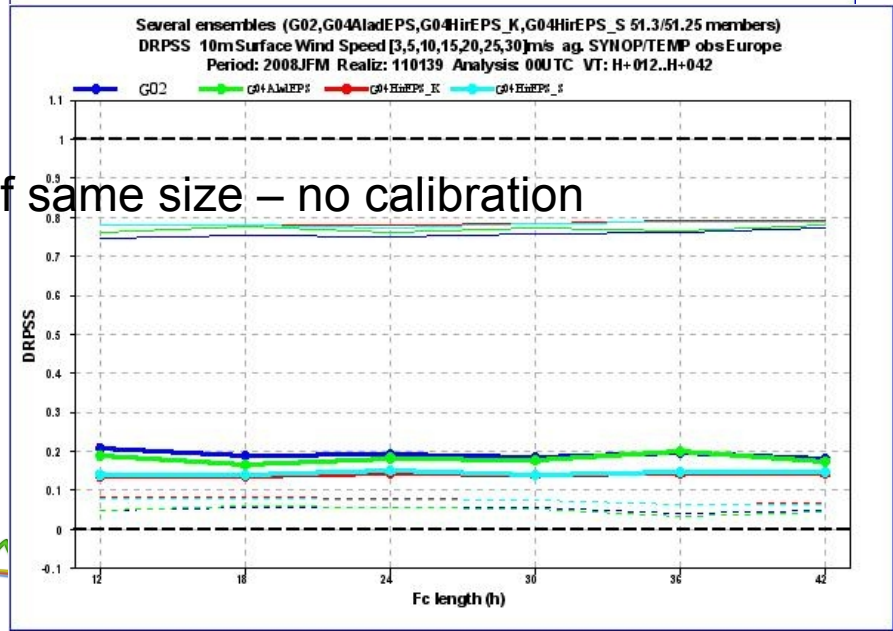
[DRPSS = 1 - $DRPSS_{Reliab}$ - $DRPSS_{Resol}$]







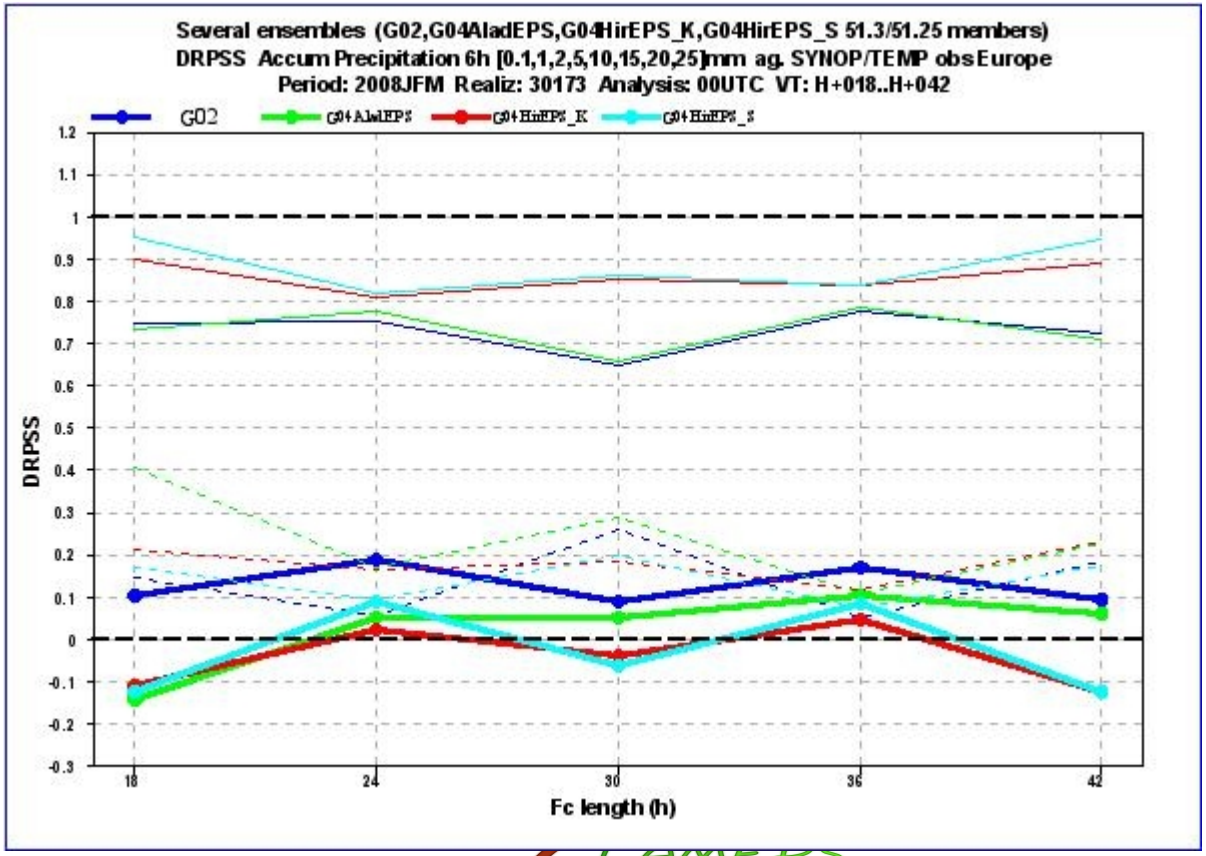
Multi-model vs.single model EPS of same size – no calibration



DRPSS 12-42h, 6h Precip

Multi-model vs.single model EPS of same size – no calibration

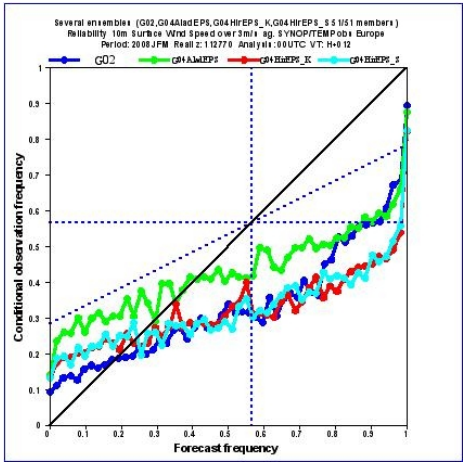
Pr6h > 0.1, 2, 5, 10, 15, 20, 25, mm/6h

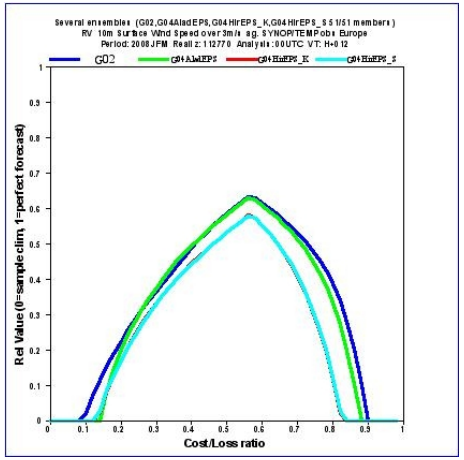


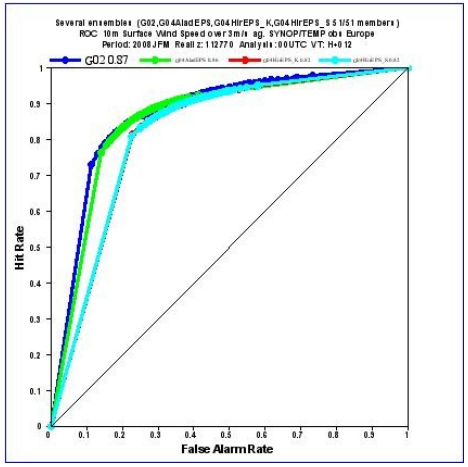
Multi-model vs single-model EPS: exception

Reliability, Value, ROC, ff10m > 3m/s 2008/0117 - 0308 (00, 12)

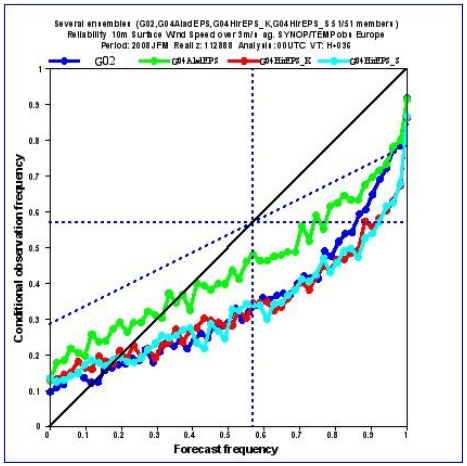
+12h

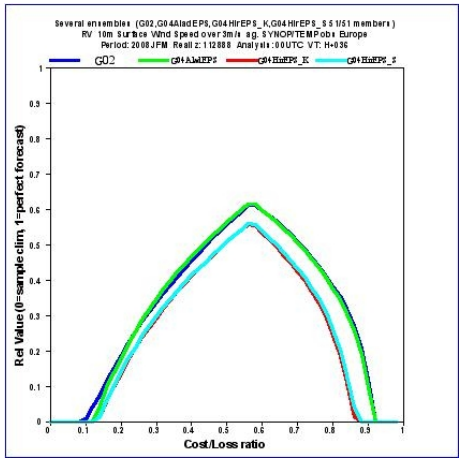


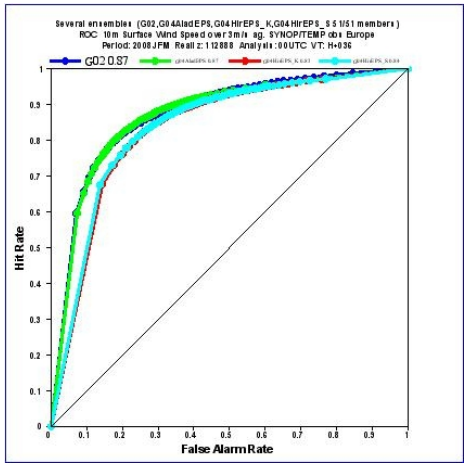




+36h

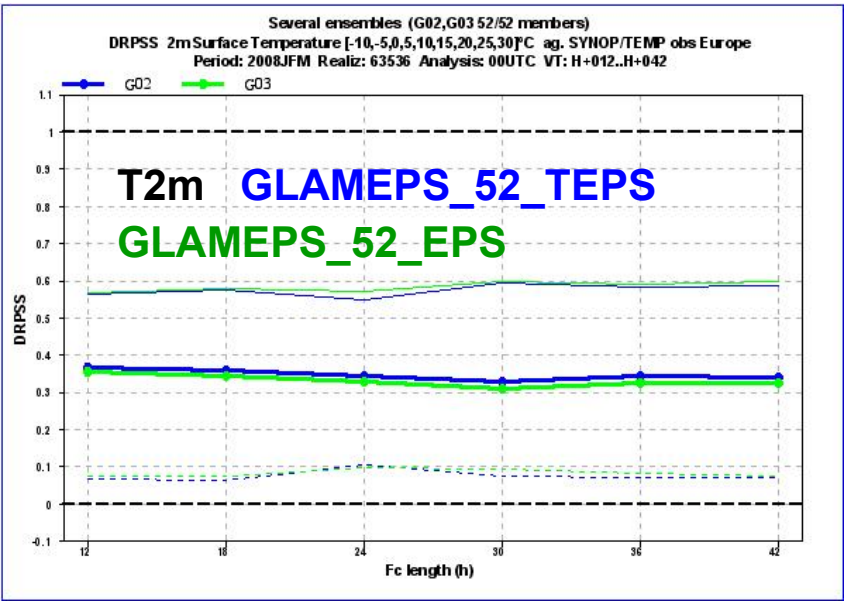


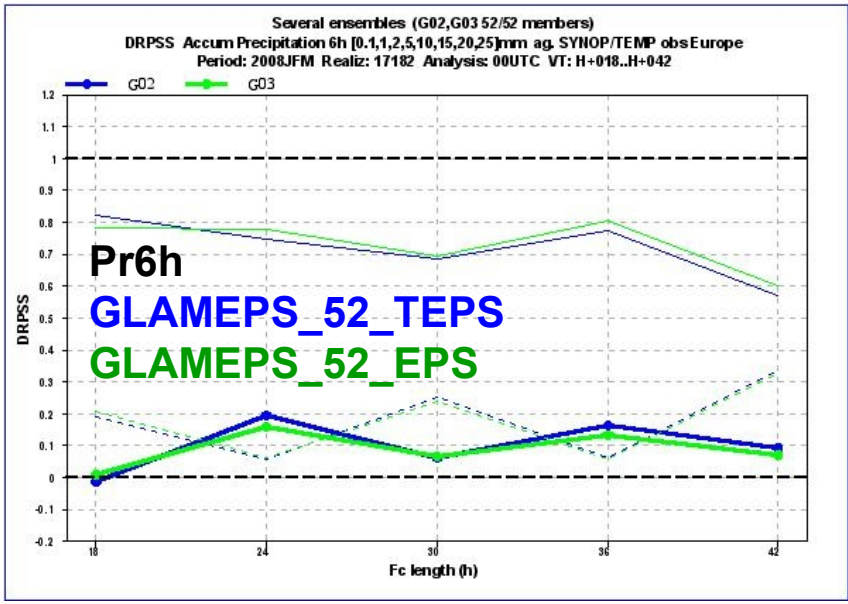


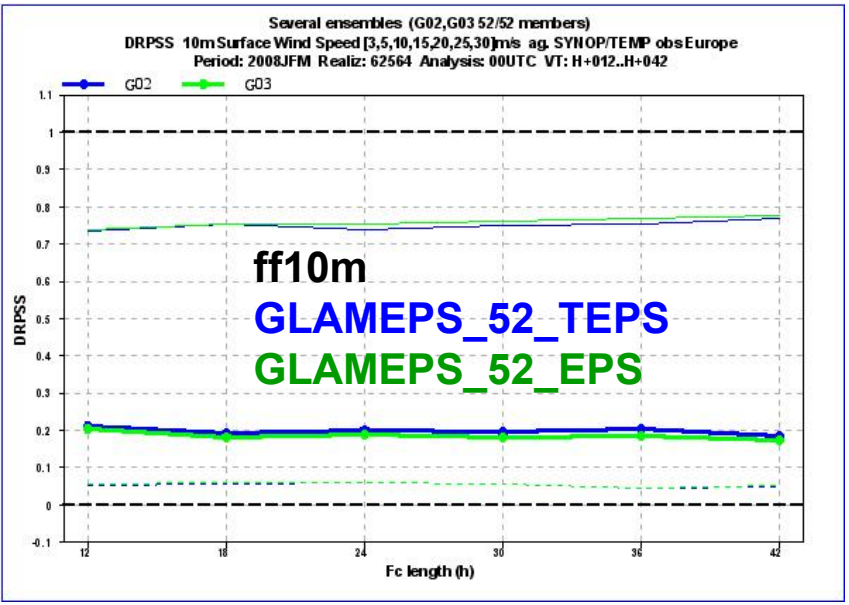


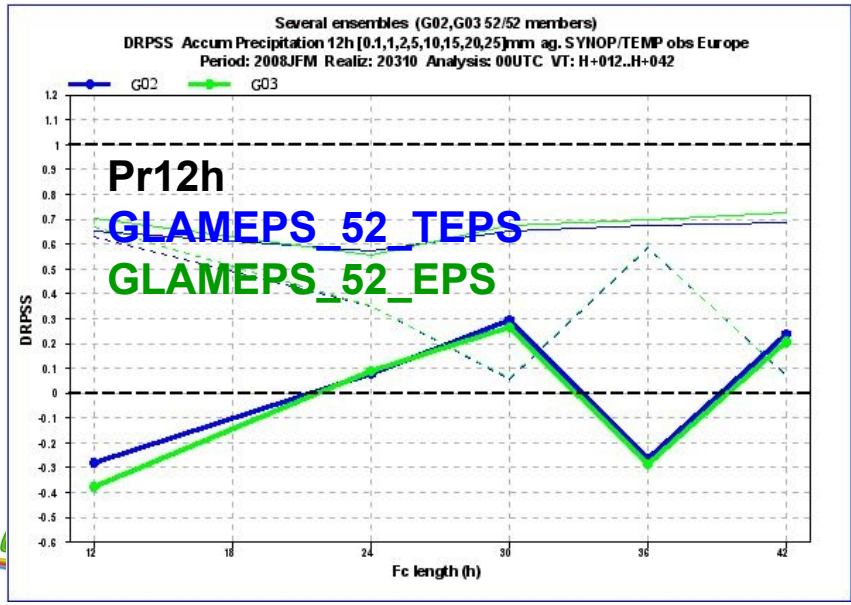
EPS51 vs EuroTEPS

DRPSS



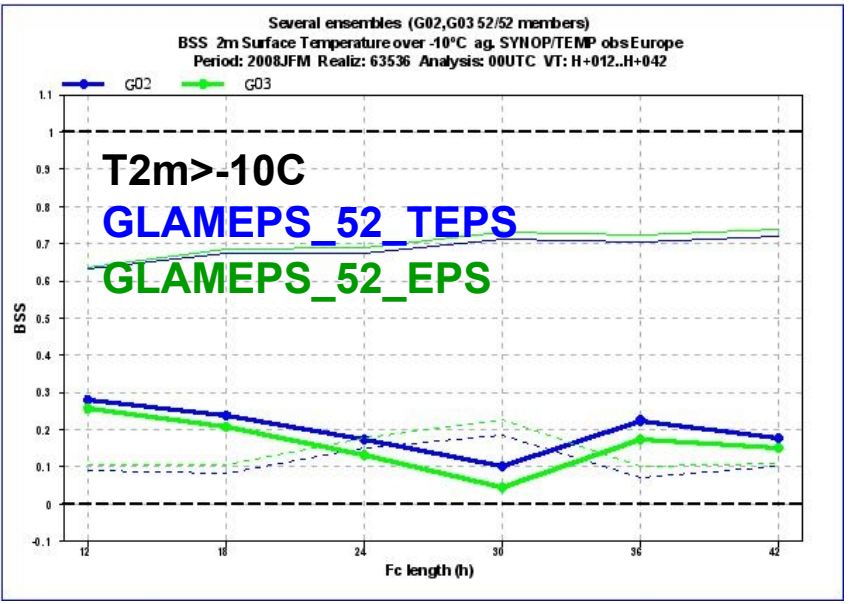


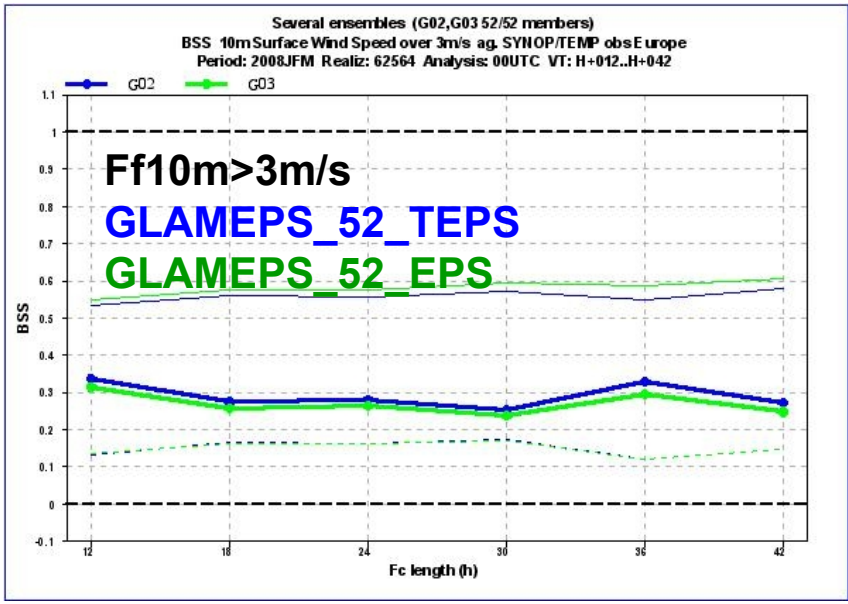


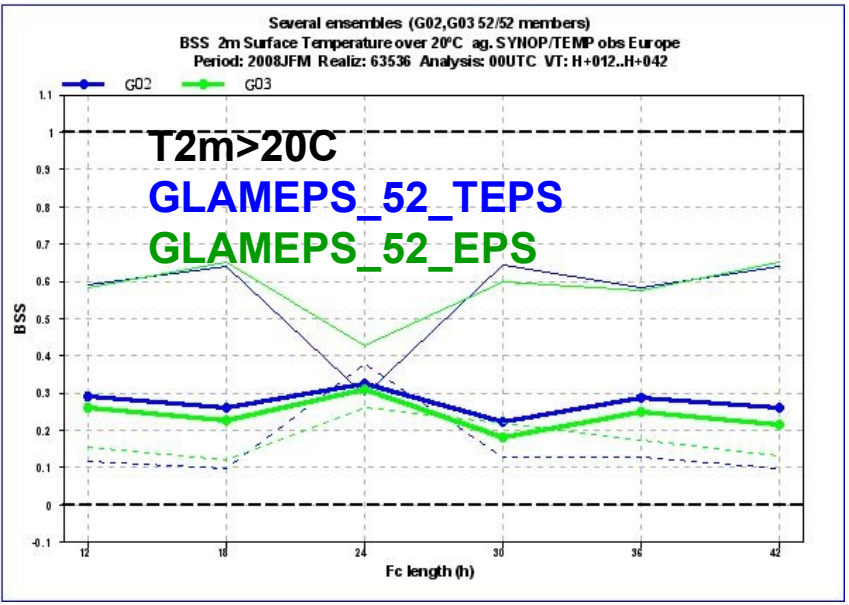


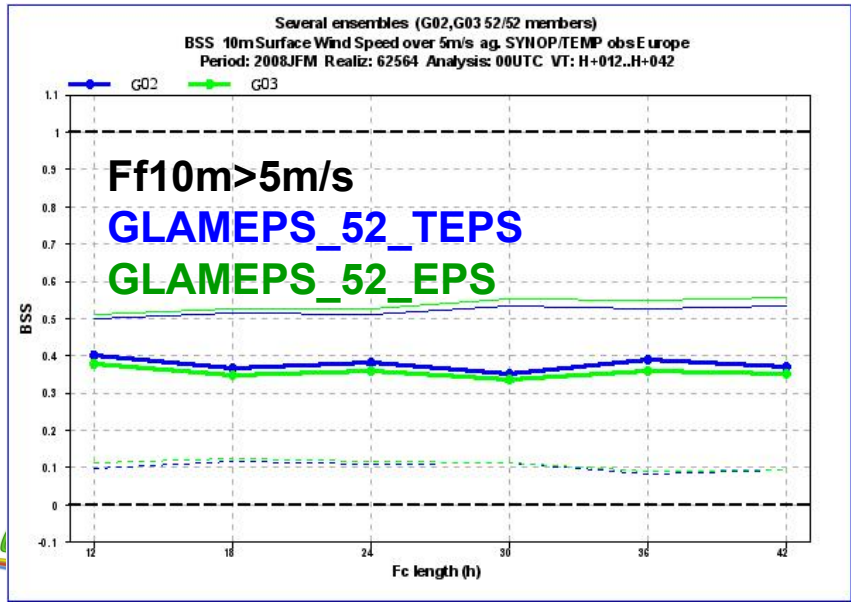
EPS51 vs EuroTEPS

BSS



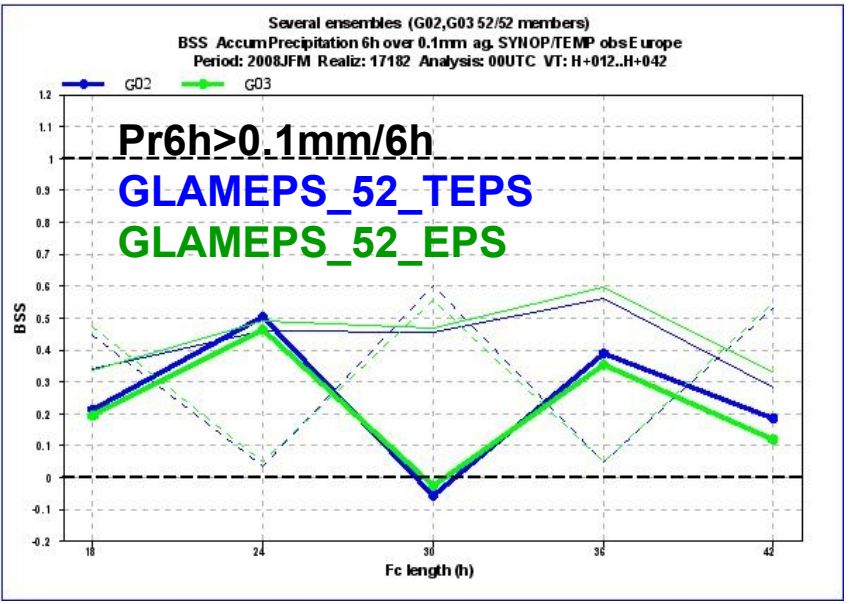


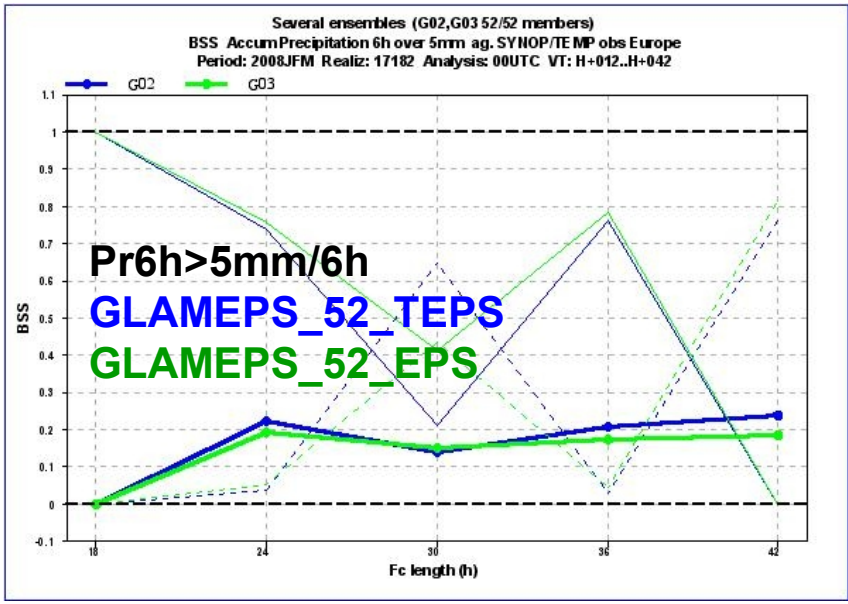


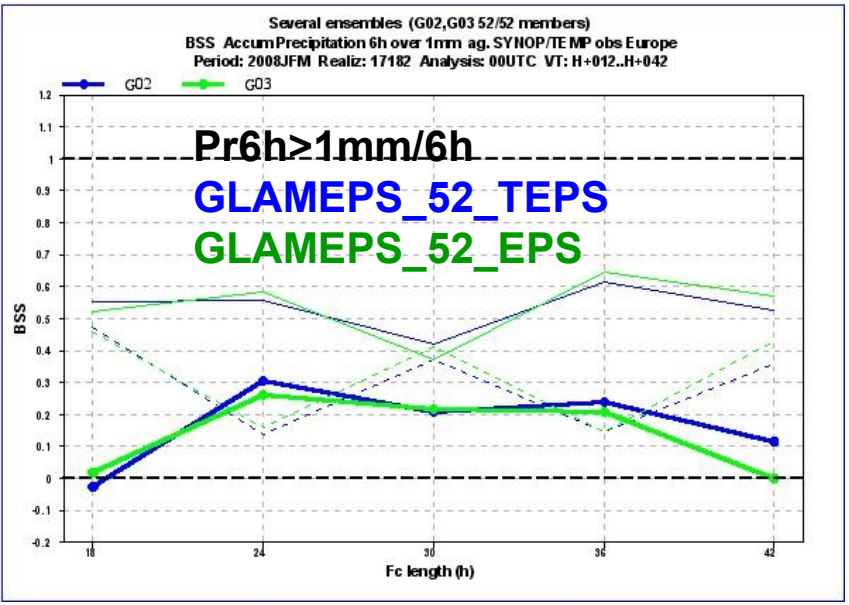


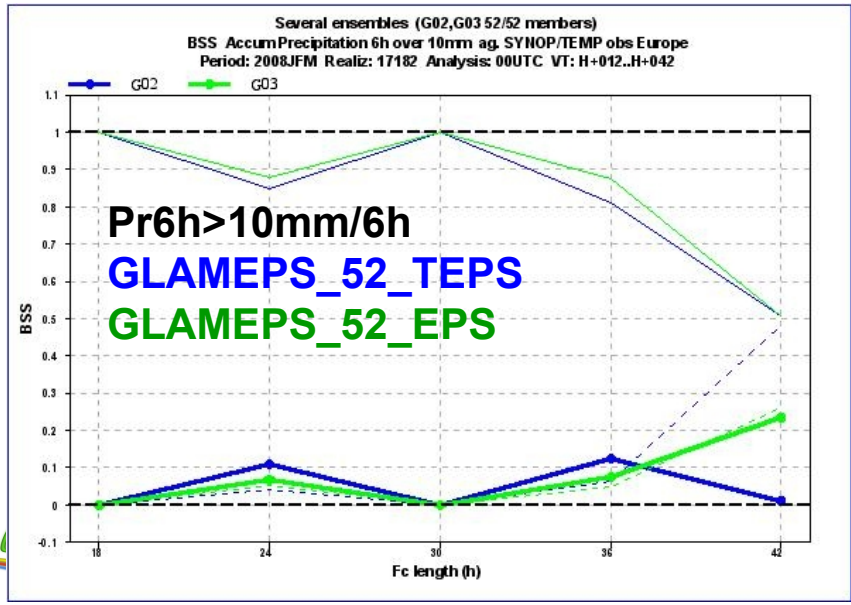
EPS51 vs EuroTEPS

BSS









Summary

- GLAMEPS_v1 is running operationally at ECMWF
  - at present: error in result production, need back-up solution
- Multi-model better than single model EPS
  - Exceptions exist (smaller weak-wind biases in Aladin?)
- Replacing EuroTEPS with EPS-selection consistently degrades – but only slightly
  - However, EuroTEPS is not fully exploited so far
- Ongoing development:
  - Surface analysis in ALADIN (remove Arpege-dep.)
  - ETKF in HIRLAM
  - HIRLAM SVs (CAPE)

So where could GLAMEPS go?

1. No EuroTEPS (use selected EPS members)
   - More resources can be spent on AladEPS & HirEPS
2. EuroTEPS_13 (+ pan-European AladEPS & HirEPS)
   - 10.7 Msbu/year (+72h) [8.9 Msbu/year (+60h)]
   - EuroTEPS can be TCF Option 3 fully supervised at ECMWF
   - LAMEPScanbe TCF Option 2: supervised by HIRLAM&ALADIN
3. EuroTEPS_13_super (+pan-European AladEPS_10 & HirEPS_10) (?)
4. EuroTEPS_51_super, no AladEPS & HirEPS (?)
   - downscale w/ HARMONIE (4km/8km, sub-European)

So where could GLAMEPS go? (II)

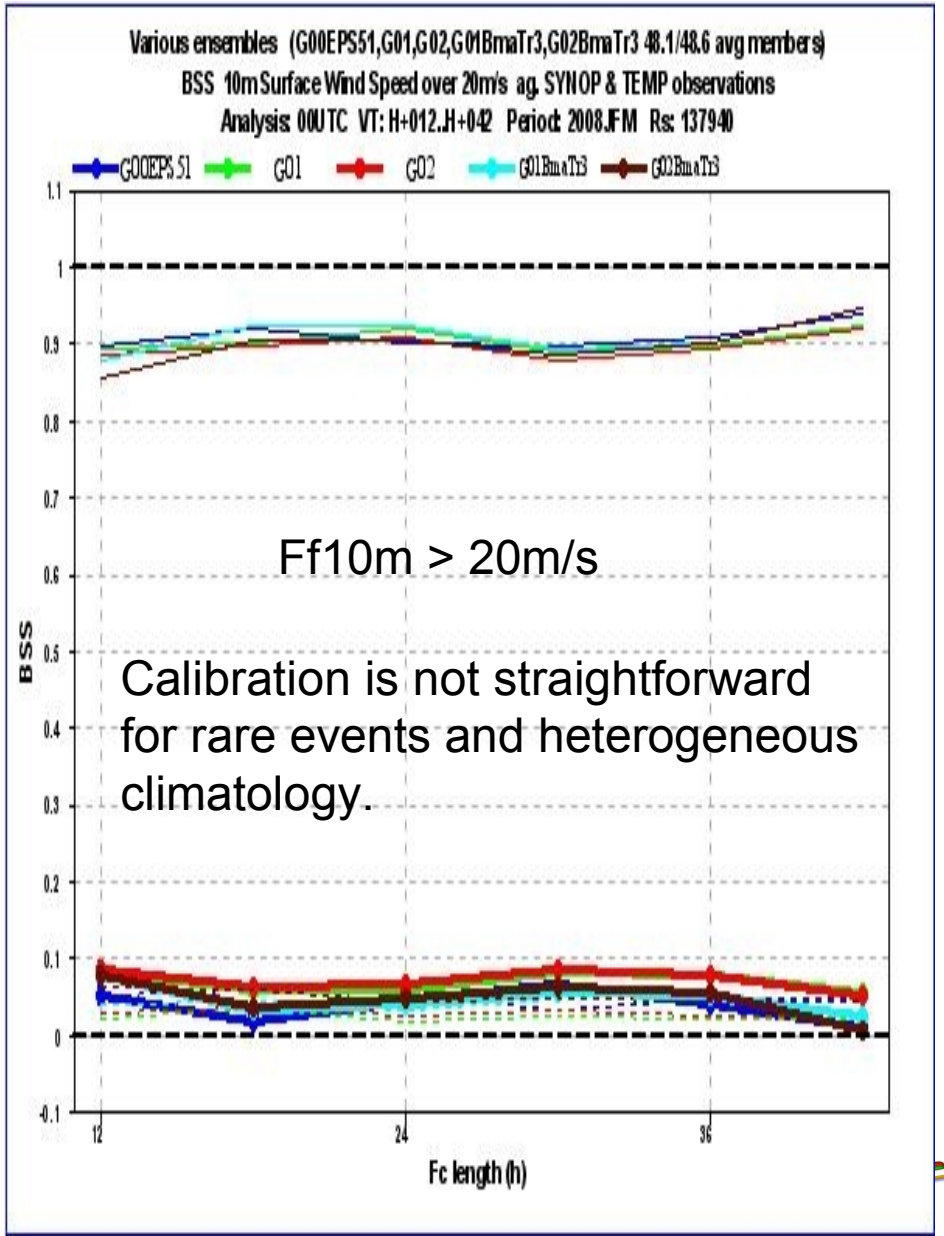
- EuroTEPS_super(?):
  - diabatic, high res. TSVs, OT24 + NHSVs, OT48 + EDA
  - T1279 (16 km);
  - up to 72h, hourly output from 06 and 18 utc
  - Could be extended with Forcing SVs

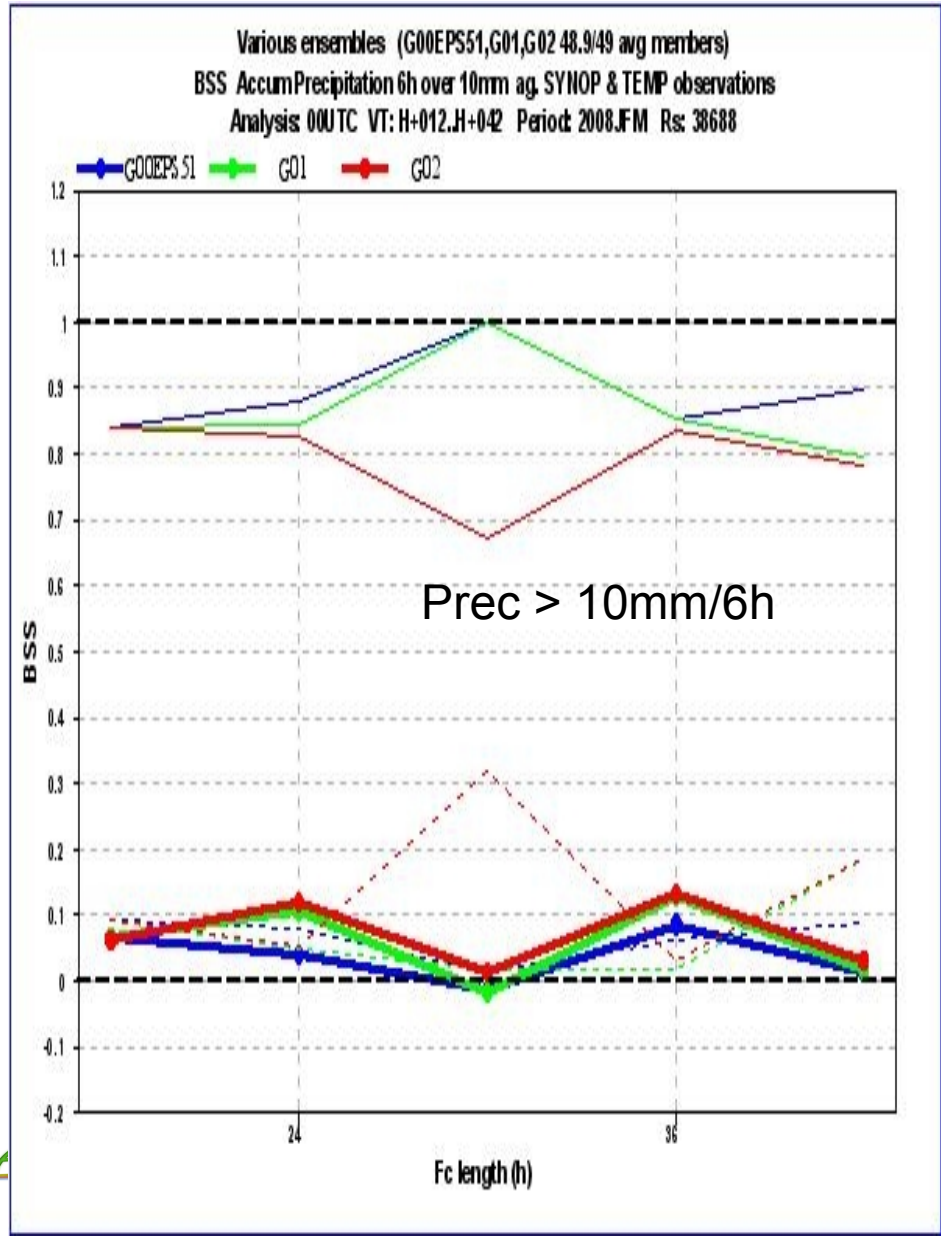
- Initial LAMEPS perturbations replaced/complemented by
  - meso-scale relevant LAM SVs (e.g. CAPE inner product)
  - perturbations reflecting actual analysis errors (ETKF)

- **Challenge:** Stable and robust systems on
  - Calibration (BMA with regional variation)
  - Product generation (back-up to / replacements of Hppv)
  - Regular probabilistic verification

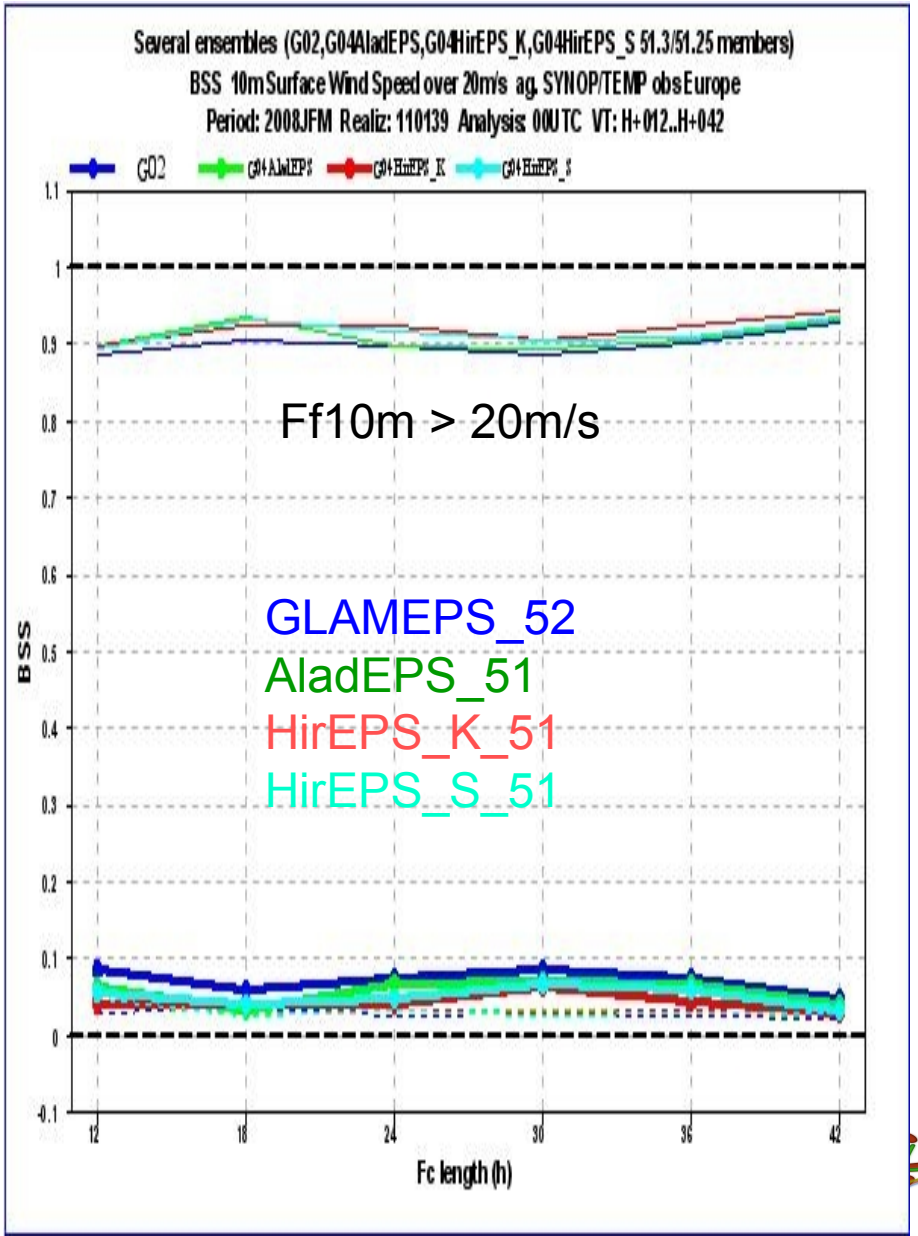
Thank You!

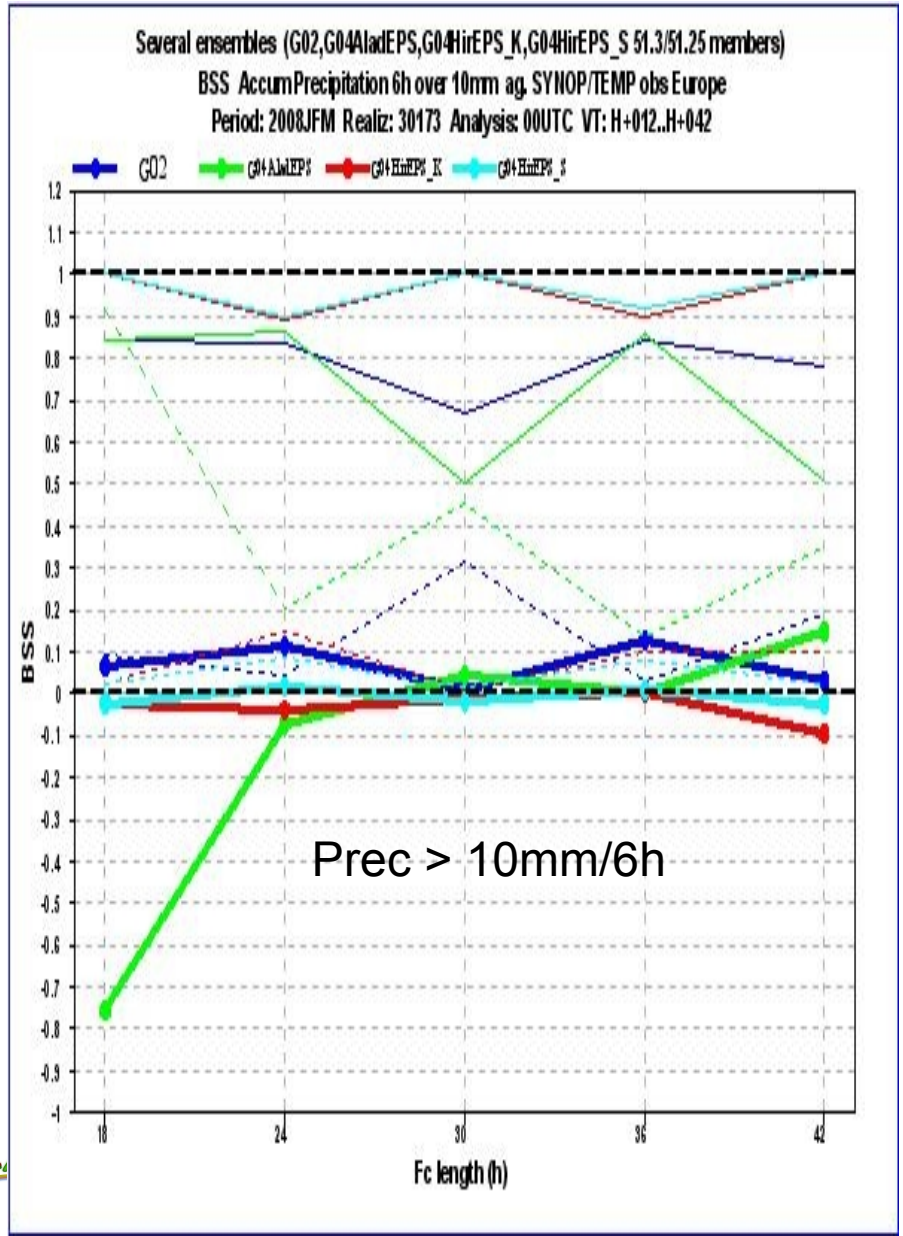
BSS, Rare events – *BMA calibration for ff10m*



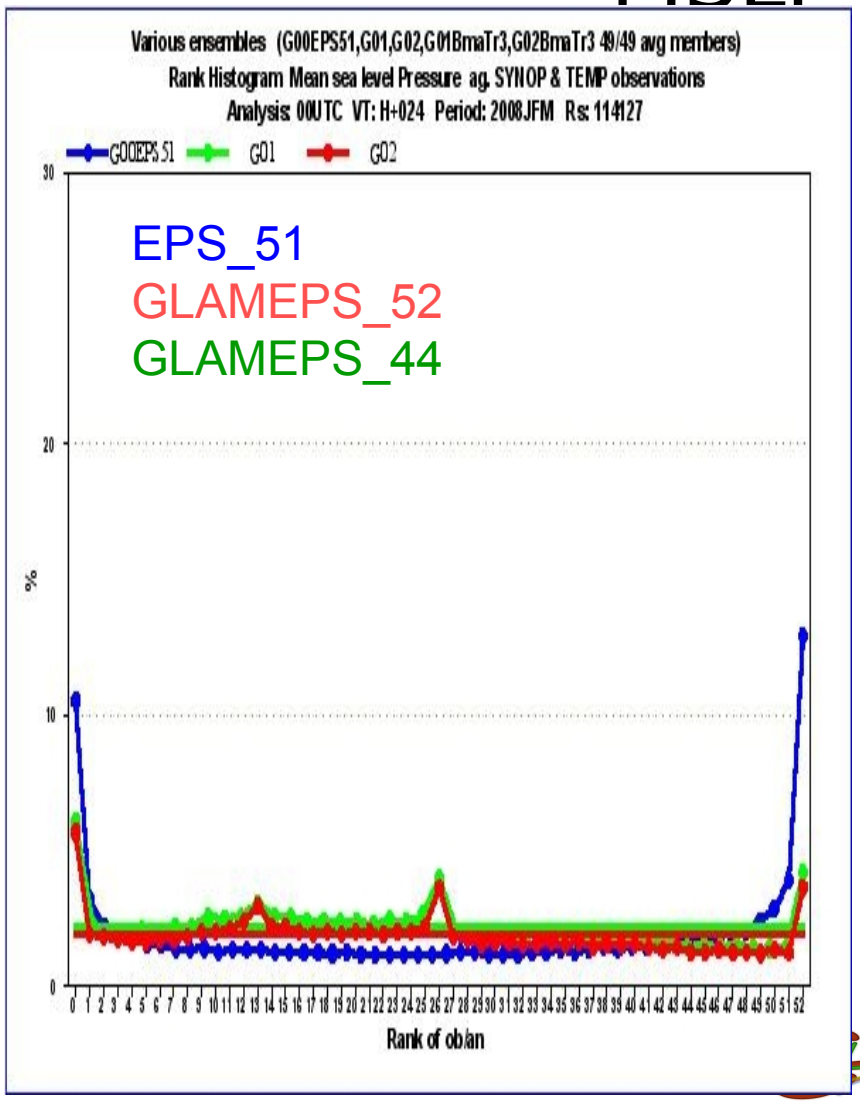


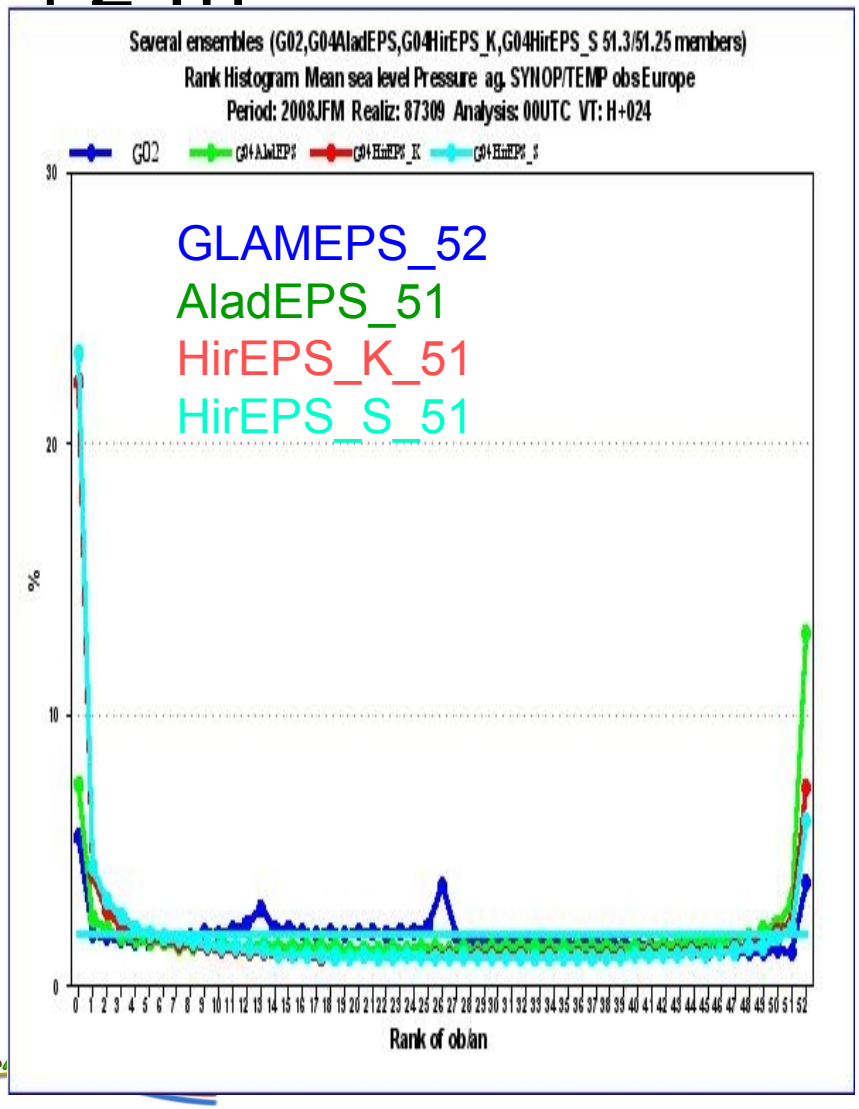
BSS, Rare events



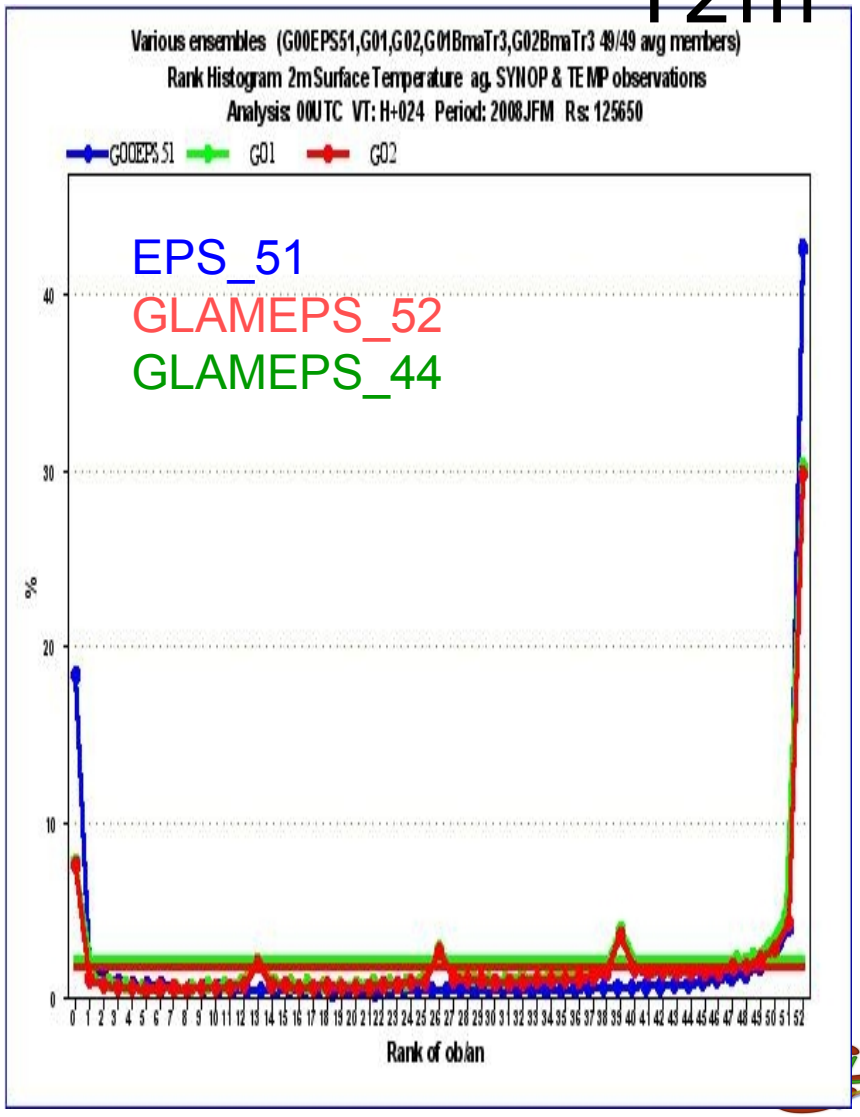


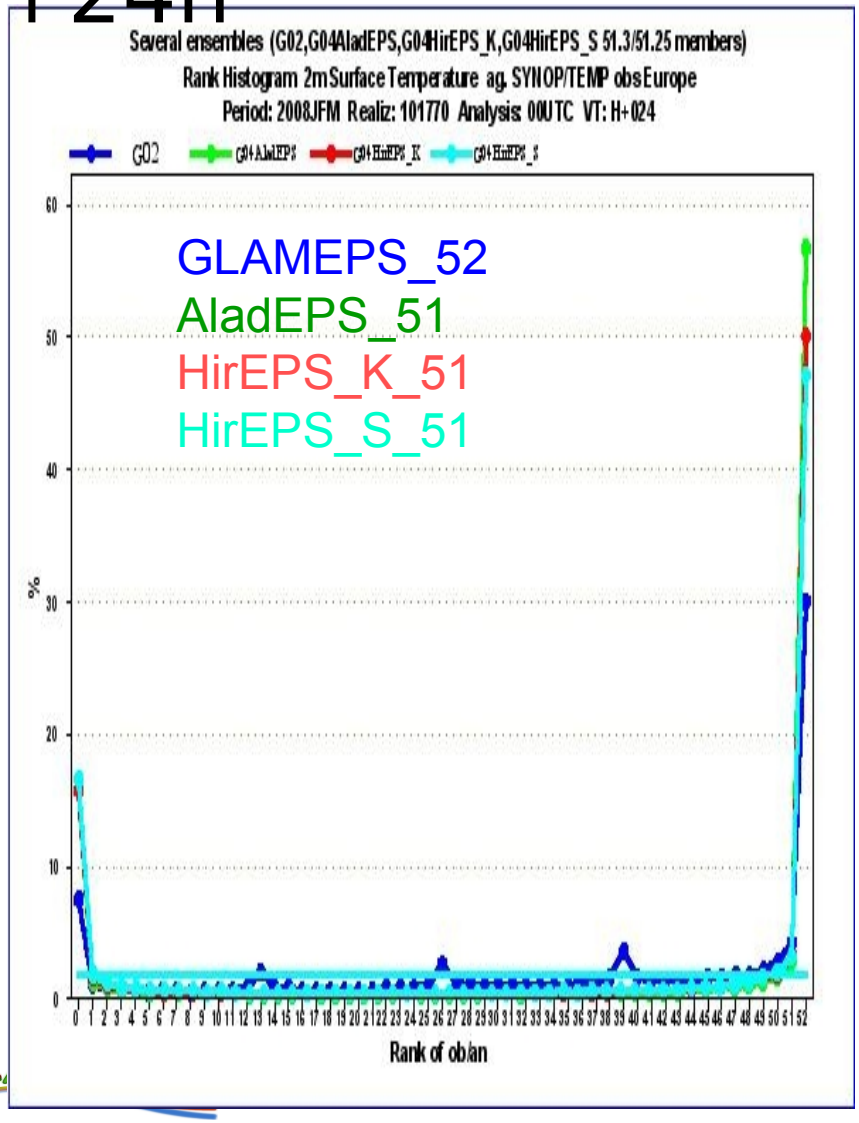
Talagrand diagrams, 2008/0117 - 0308 (00,12) MSLP +24h



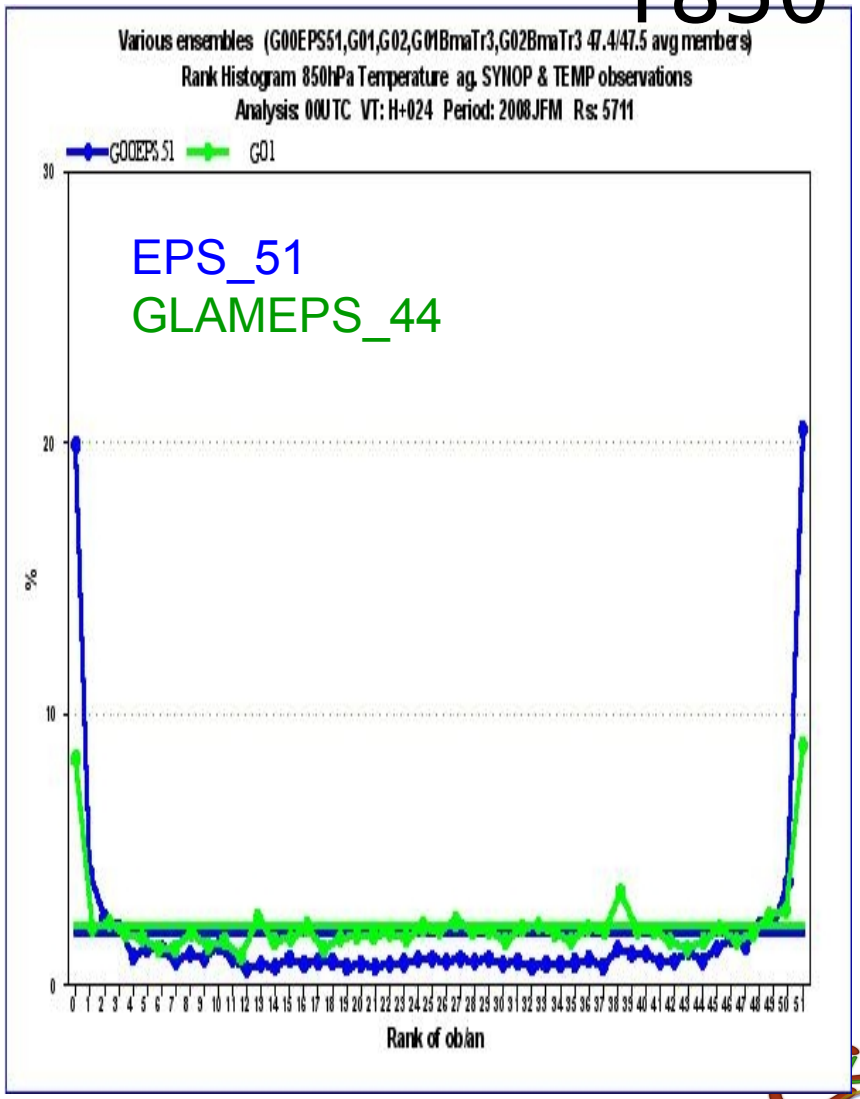


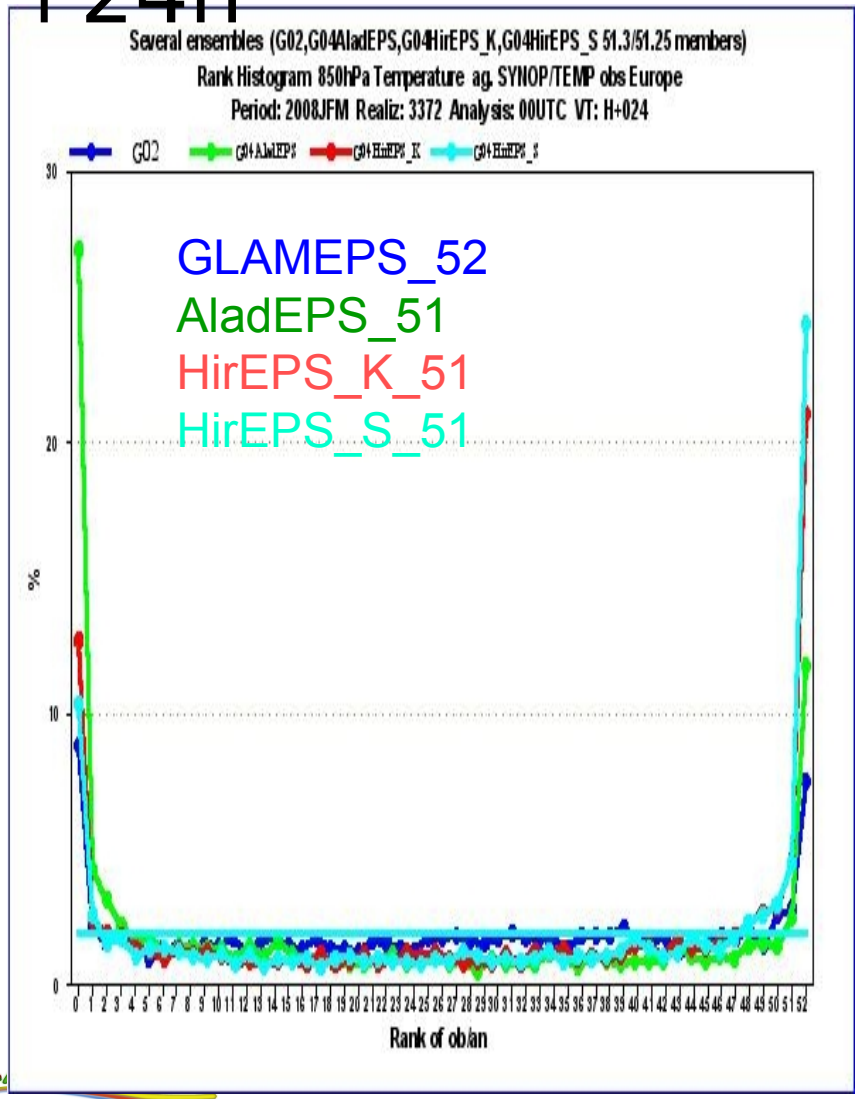
Talagrand diagrams, 2008/0117 - 0308 (00,12) T2m +24h



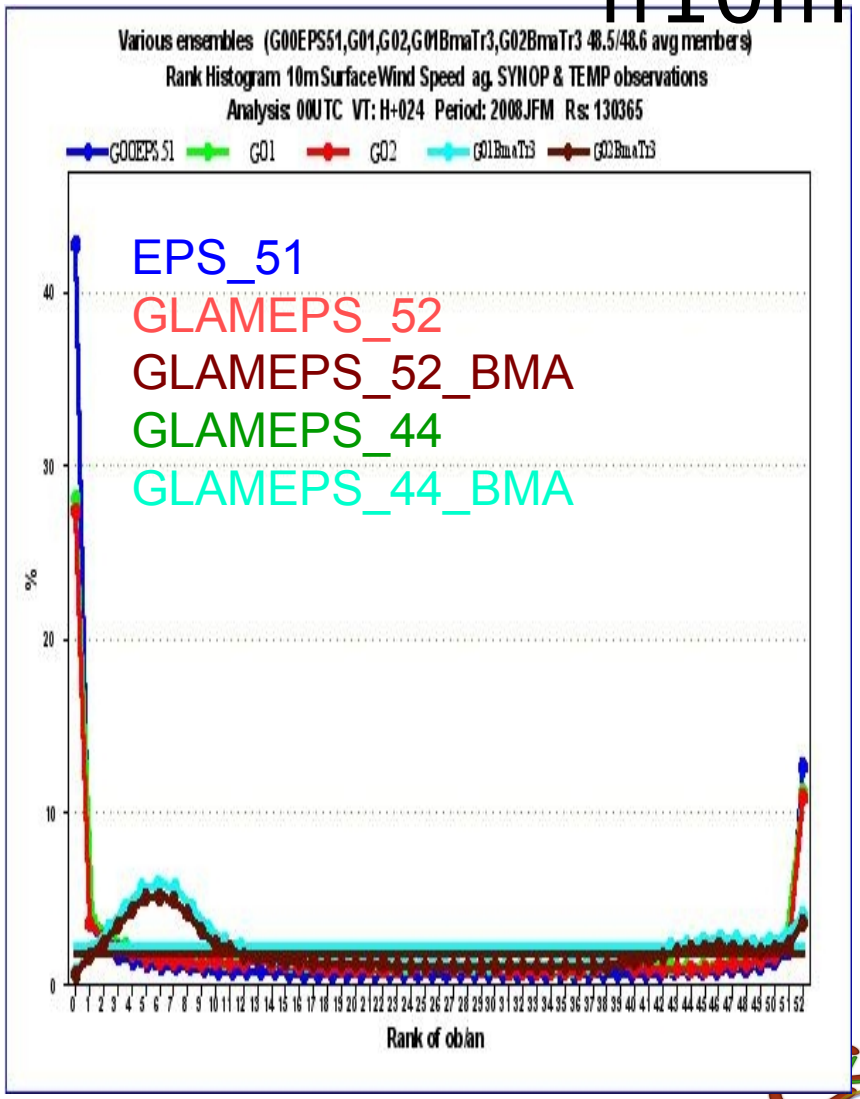


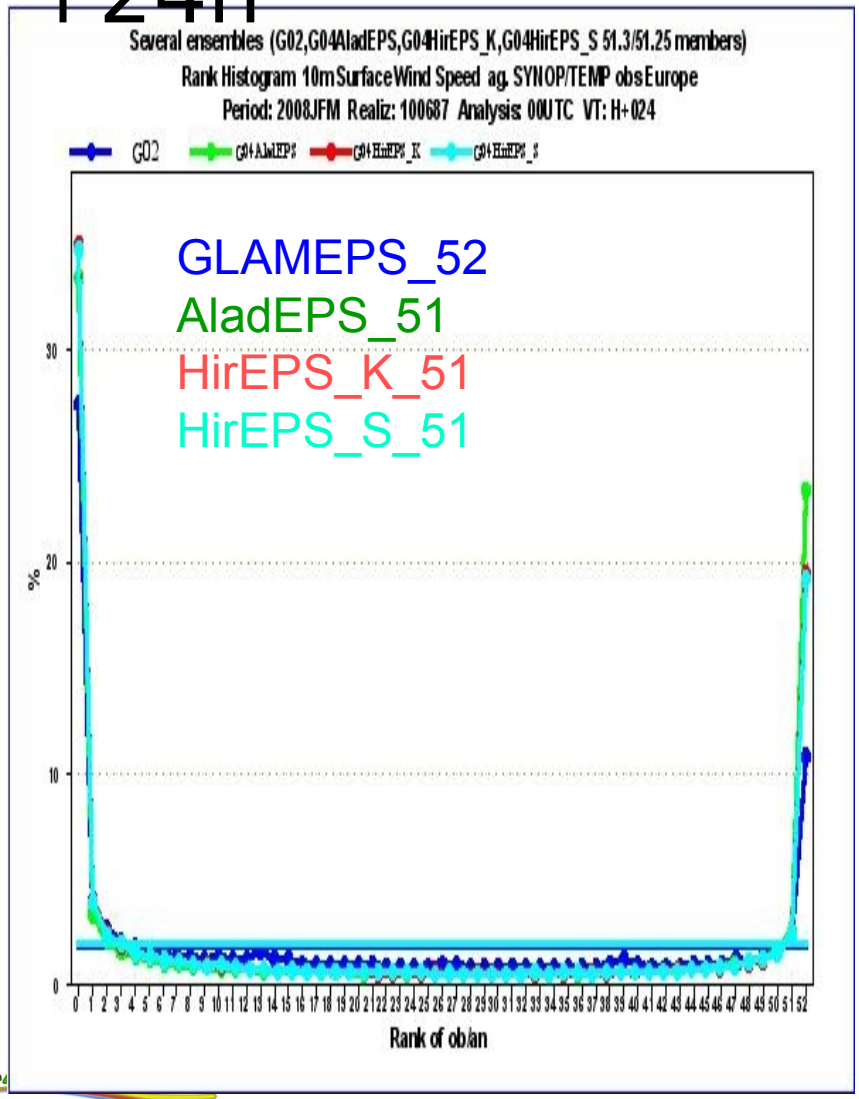
Talagrand diagrams, 2008/0117 - 0308 (00,12) T850 +24h



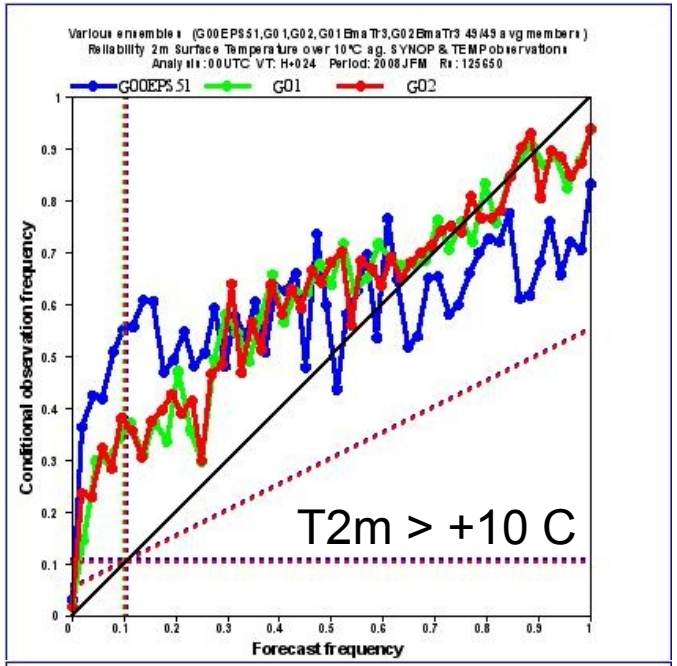


Talagrand diagrams, 2008/0117 - 0308 (00,12) ff10m +24h

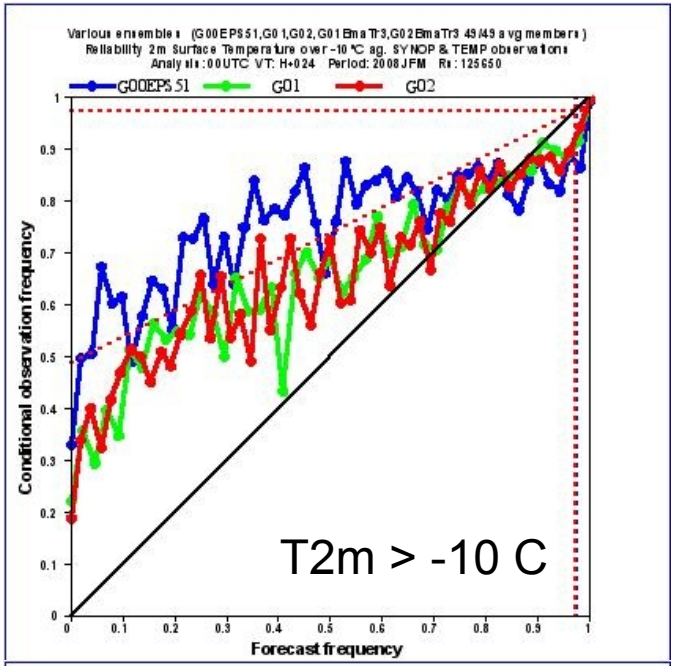


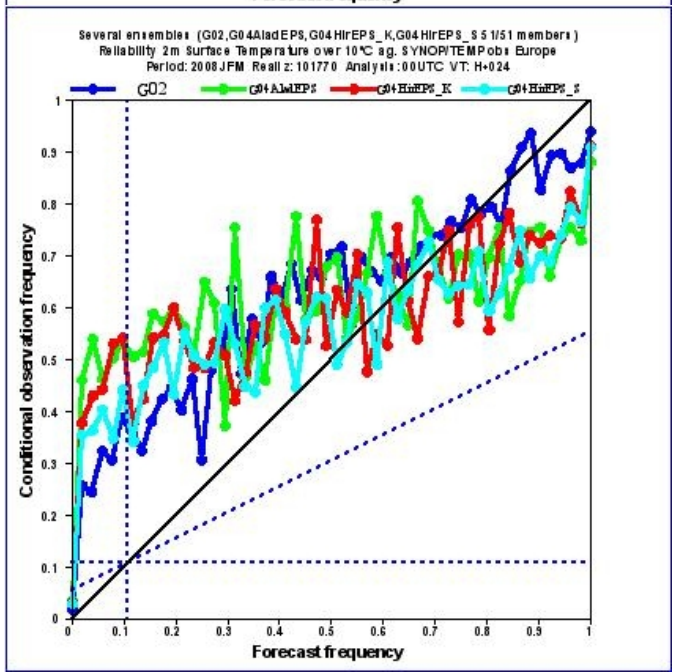


Reliability 2008/0117 - 0308 (00, 12) + 24h

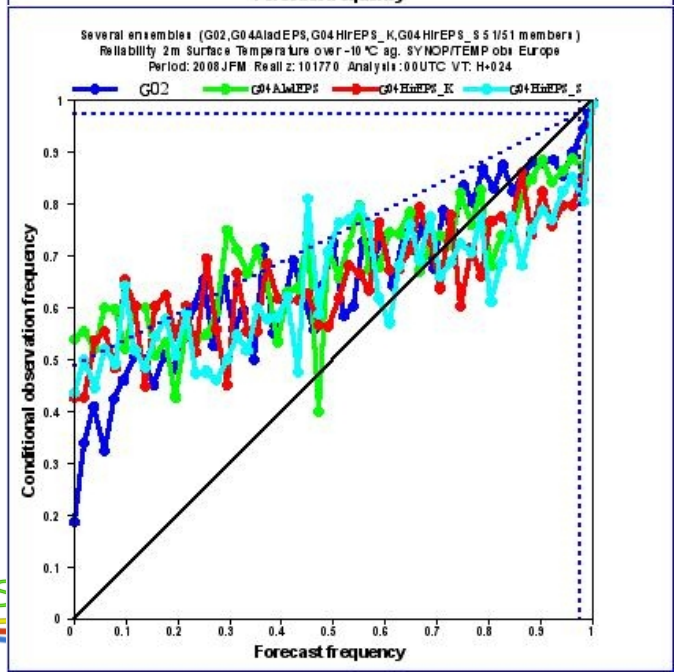


EPS_51
GLAMEPS_52
GLAMEPS_44



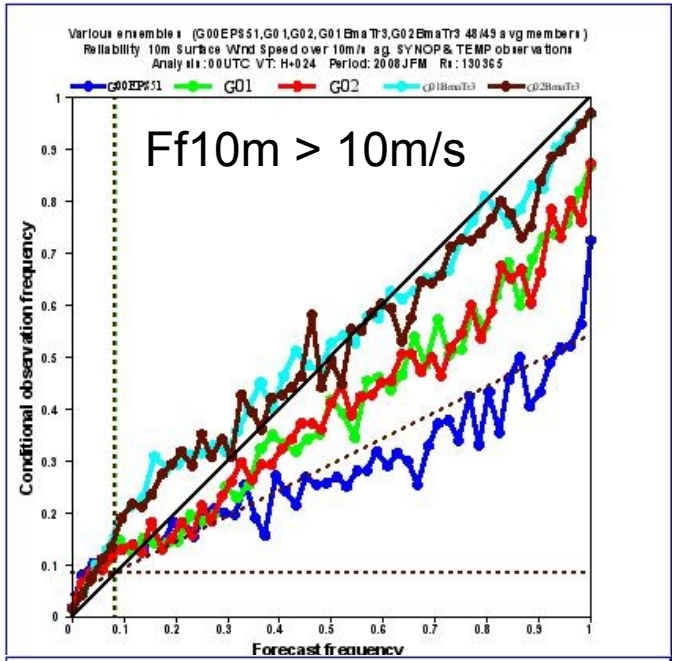


GLAMEPS_52
AladEPS_51
HirEPS_K_51
HirEPS_S_51

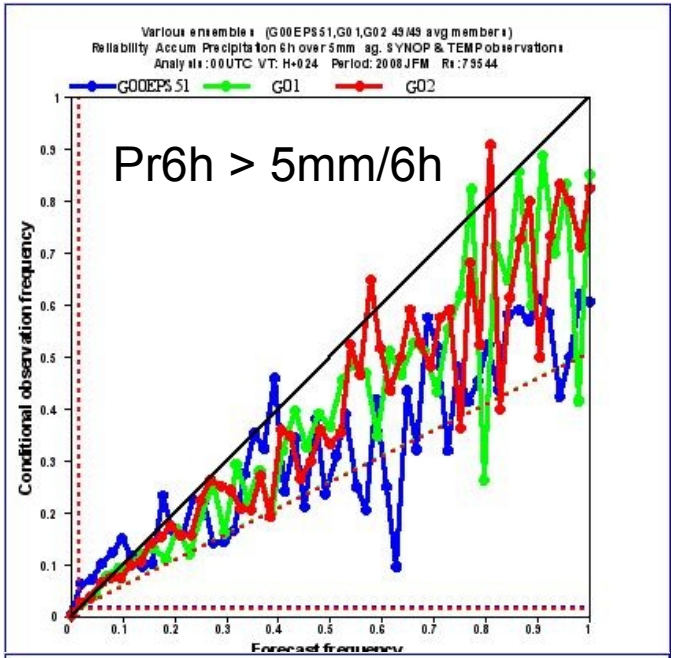


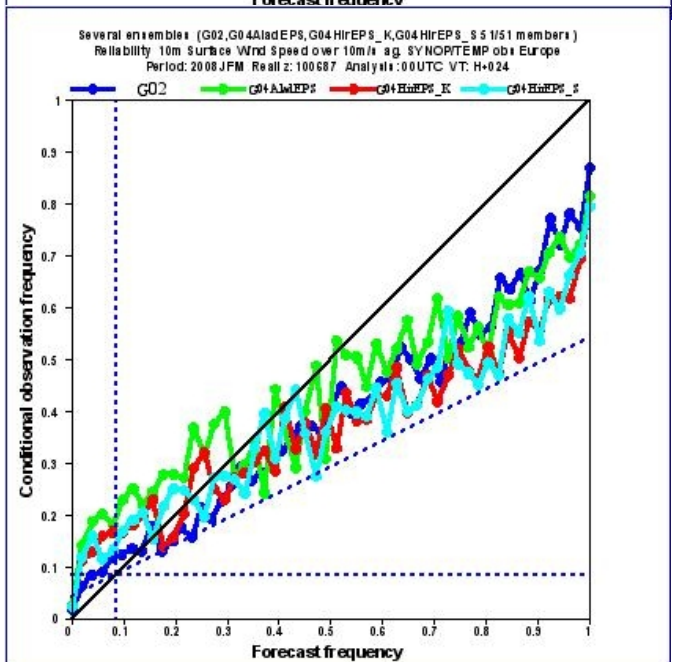
Reliability 2008/0117 - 0308 (00, 12) + 24h

BMA calibration for ff10m

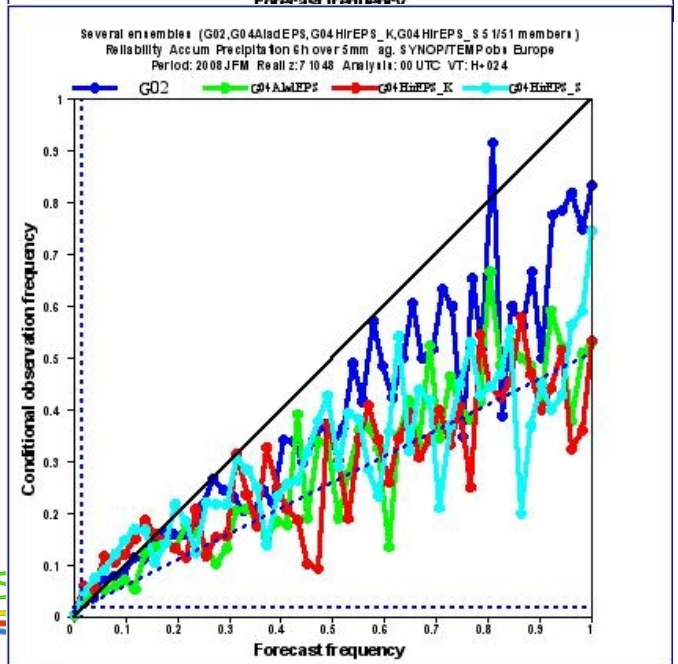


EPS_51
GLAMEPS_52
GLAMEPS_44





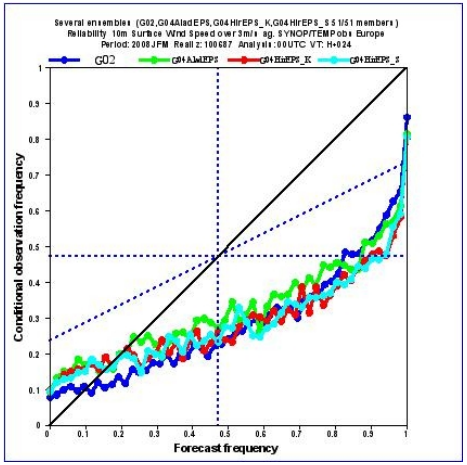
GLAMEPS_52
AladEPS_51
HirEPS_K_51
HirEPS_S_51

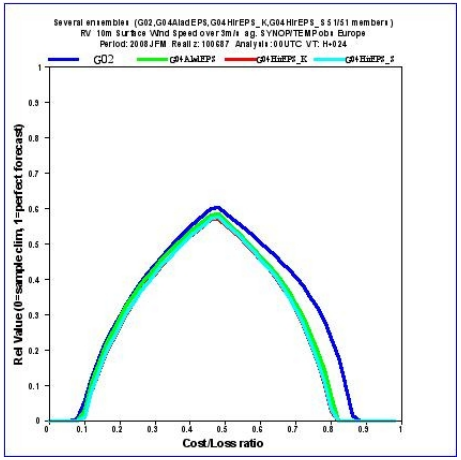


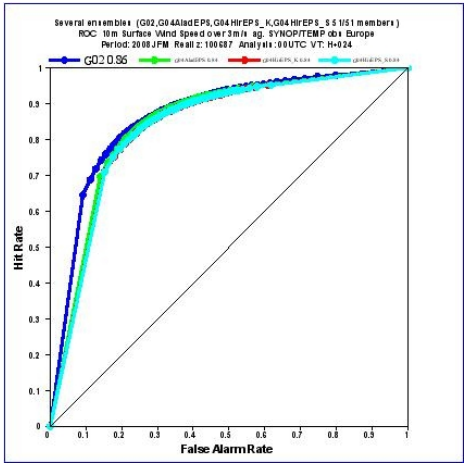
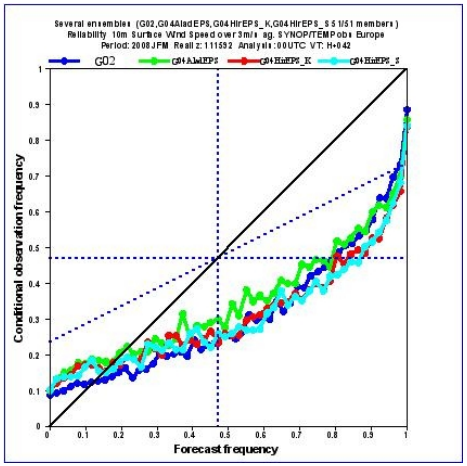
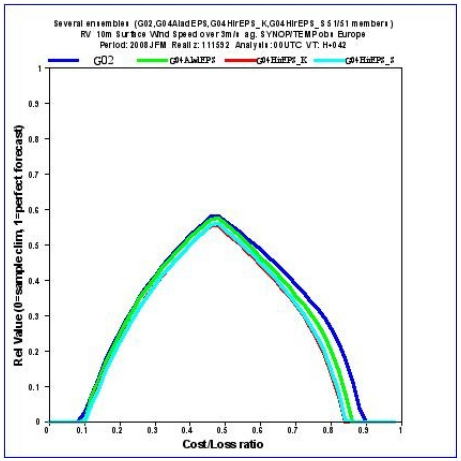
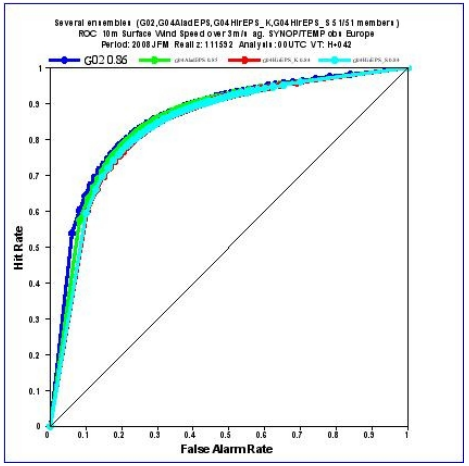
Multi-model vs single-model EPS: exception

Reliability, Value, ROC, ff10m > 3m/s 2008/0117 - 0308 (00, 12)

+24h







+42h