Norwegian Meteorological Institute
met.no

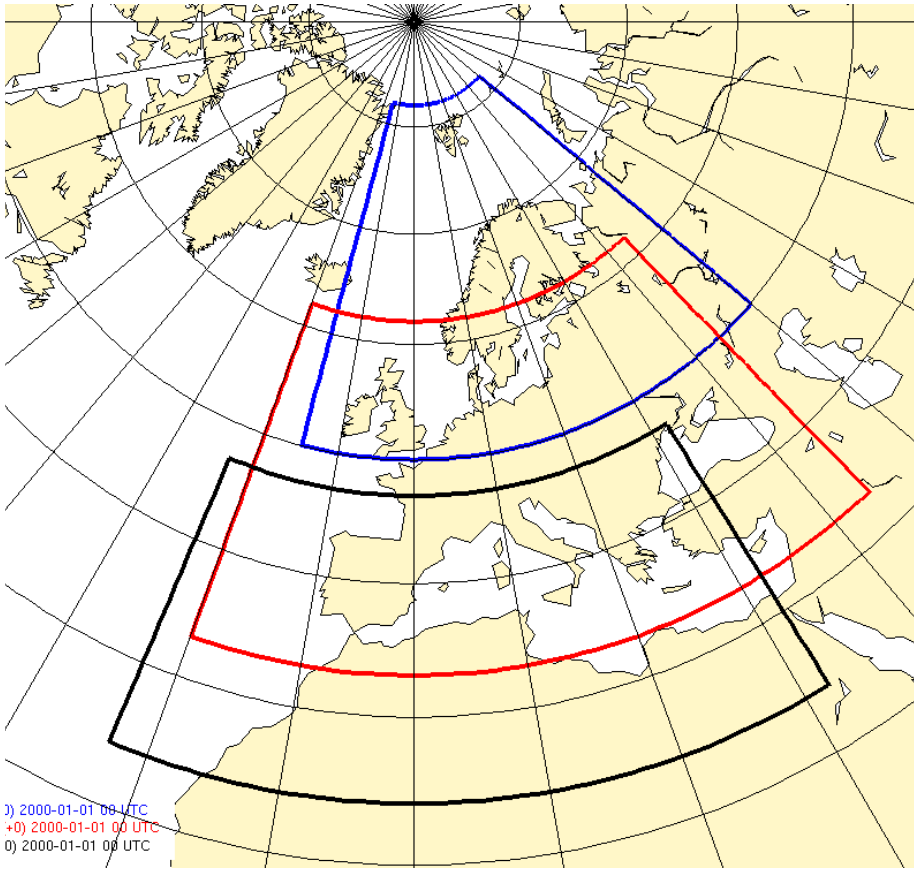
EuroTEPS contribution to GLAMEPS

Inger-Lise Frogner

EuroTEPS

- EuroTEPS is as a version of EPS with targeted SVs
  - Target area: Europe
  - The SVs are calculated with higher resolution than in EPS
  - Several sets of SVs are combined to create the perturbations
- Results from experiments with different EuroTEPS configurations will be shown
- EuroTEPS is a part of the GLAMEPS-project
- EuroTEPS will provide initial and lateral boundary perturbations for multi-model limited area EPS for the short range for the HIRLAM and ALADIN countries
- It is a special version of ECMWF IFS EPS that is designed to be optimal for Europe in the short range (day 1-3)

TARGET AREAS



Target area north
(82N,15W,50N,50E)

Target area central
(62N,20W,33N,44E)

Target area south
(47N,23W,24N,32E)

Details of the experimental setup for EuroTEPS (1)

- The Singular vectors:
  - T159 (as opposed to T42 for operational SVs at ECMWF)
  - 24h optimization time (as opposed to 48h for operational SVs at ECMWF)
  - Targeted in the vertical to the troposphere
  - Targeted SVs (TSVs) based on total energy norm
  - The TSVs are selected to be orthogonal to the operational SVs and also mutually orthogonal

Details of the experimental setup for EuroTEPS (2)

- The perturbations:
  - The perturbations from which TEPS runs is made from a combination of the following SVs using Gaussian sampling:
    - 10 TSVs from each of the three European target areas
    - 10 evolved TSVs from each of the three European target areas
    - 50 SVs from the operational EPS (NHSVs)
    - 50 evolved SVs from the operational EPS
- Different amplitudes can be assigned to the different sets of SVs, to give the desirable spread/skill relation
- Ratio SV/TSV=1 gave the best spread/skill relationship:
  - SV amplitude reduced by 25% to 0.015
  - TSV amplitude set to 0.015

EXPERIMENTS

- 14 days in summer 2007:
  - 20070812 – 20070825 (both 00UTC and 12UTC)
- 49 days in winter 2008:
  - 20080117 – 20080305 (both 00UTC and 12UTC)

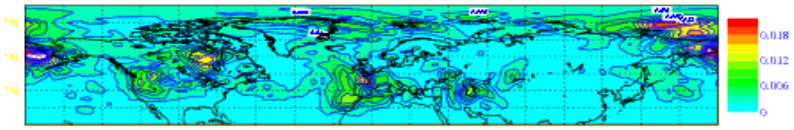
- EXP_0:
  - 20 + 1 members, +72h

- EXP_0.1:
  - 10 + 1 members, +48h

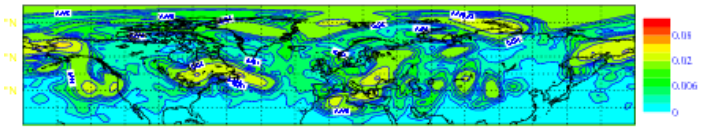
- EXP_0.2:
  - 12 + 1 members, +48h

Example of SVs. Mean of absolute value of the SVs/SVEVOs

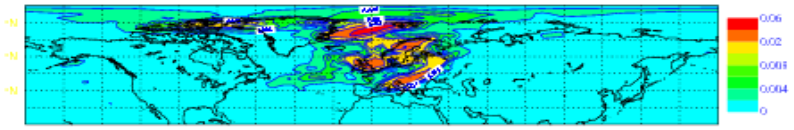
mean NHSV. Temp. Lev 35 20070626



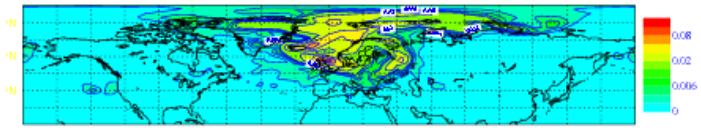
mean NHSVEVO. Temp. Lev 35 20070626



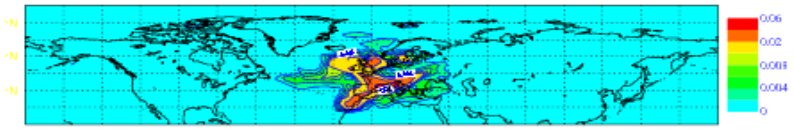
mean TSV north. Temp. Lev 35 20070627



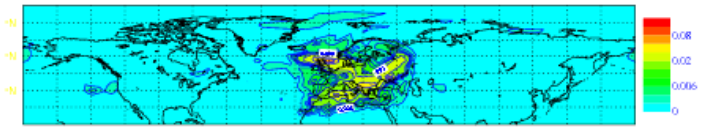
mean TSVEVO north. Temp. Lev 35 20070627



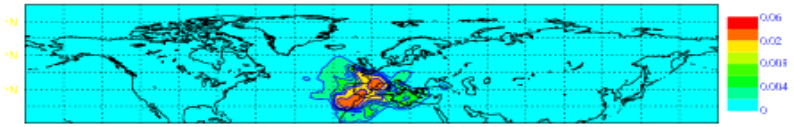
mean TSV central. Temp. Lev 35 20070627



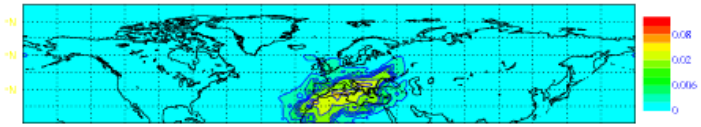
mean TSVEVO central. Temp. Lev 35 20070627



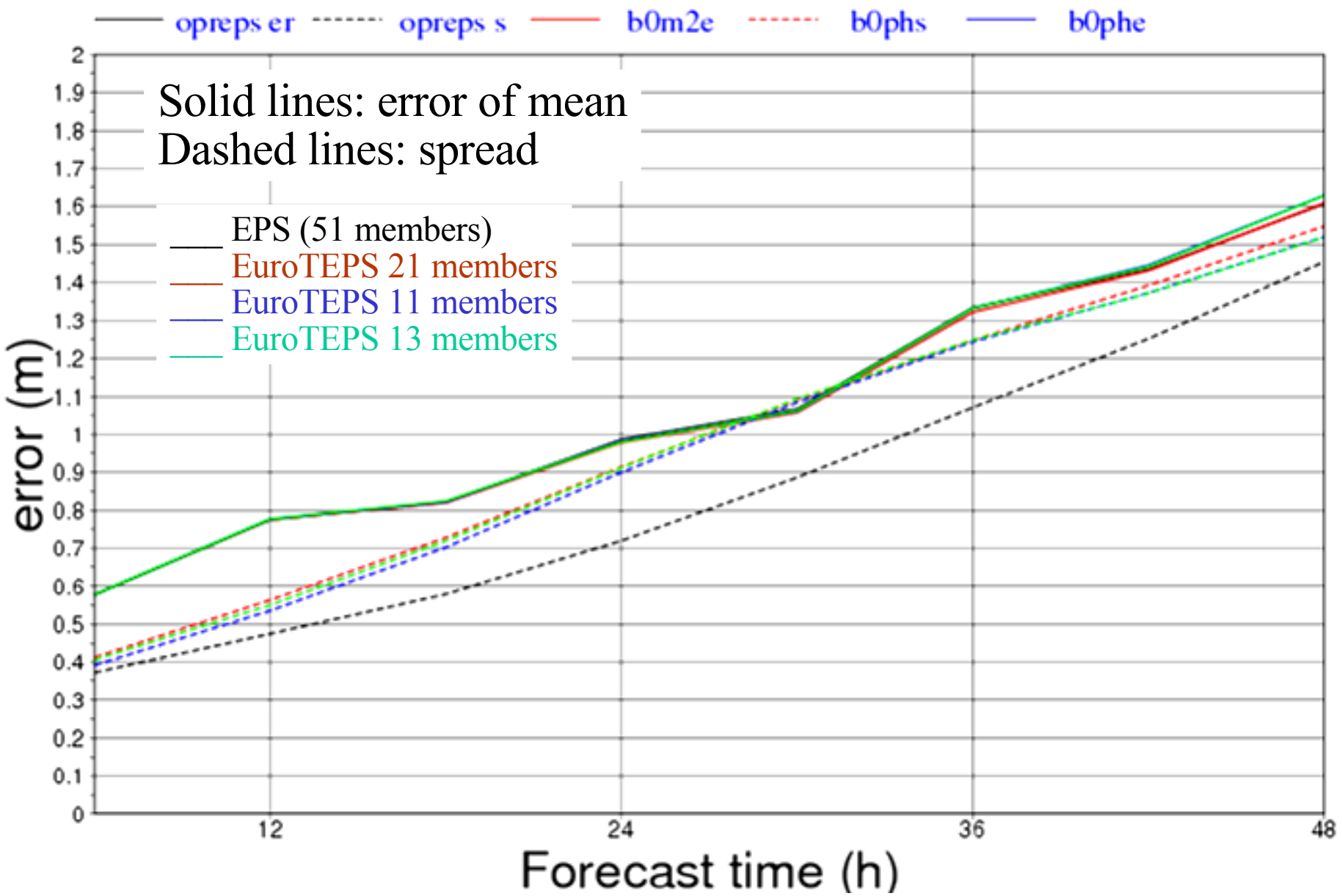
mean TSV south. Temp. Lev 35 20070627



mean TSVEVO south. Temp. Lev 35 20070627

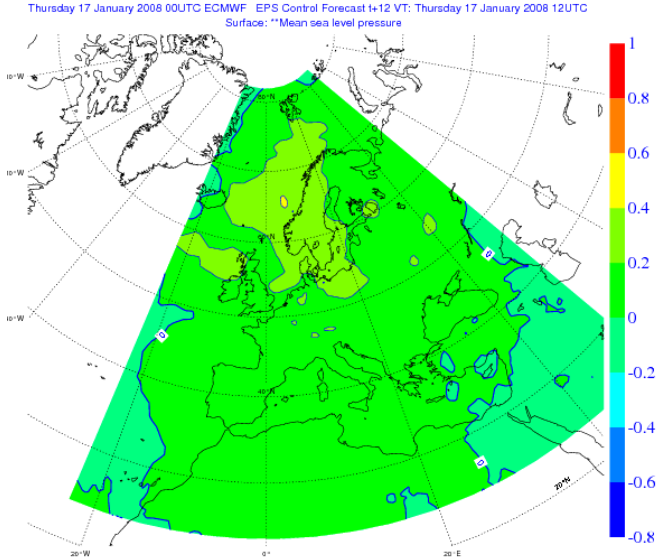


Spread-Skill MSLP 21 cases winter 2008

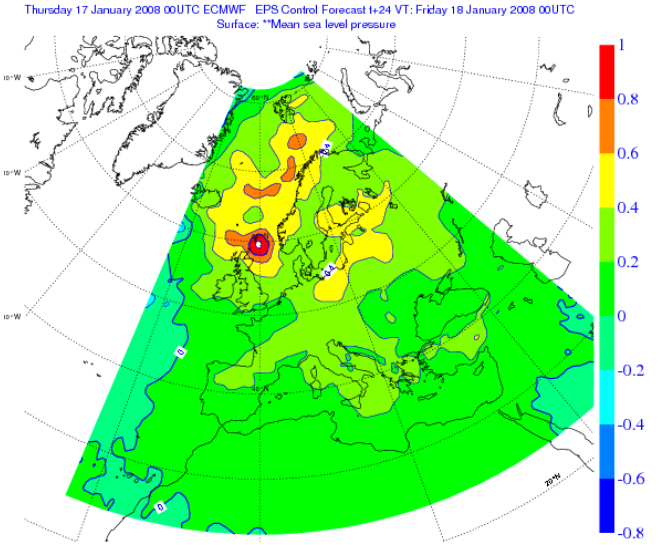


Difference in spread between EuroTEPS and EPS (21 winter cases)

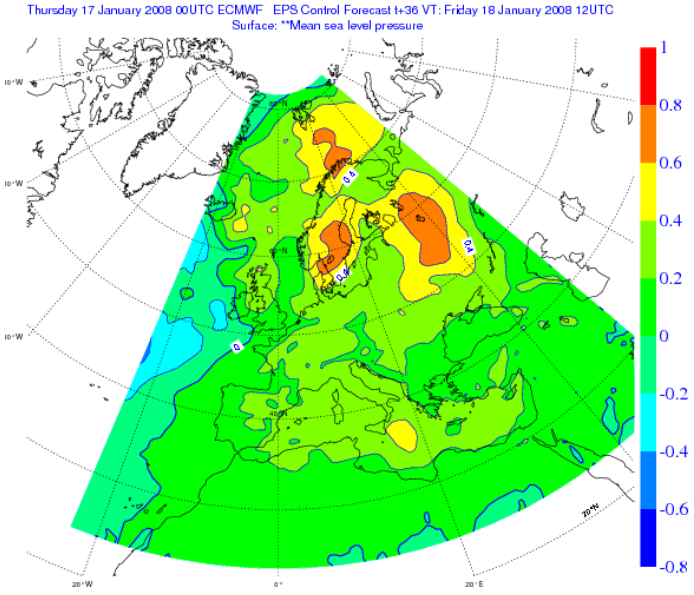
+12



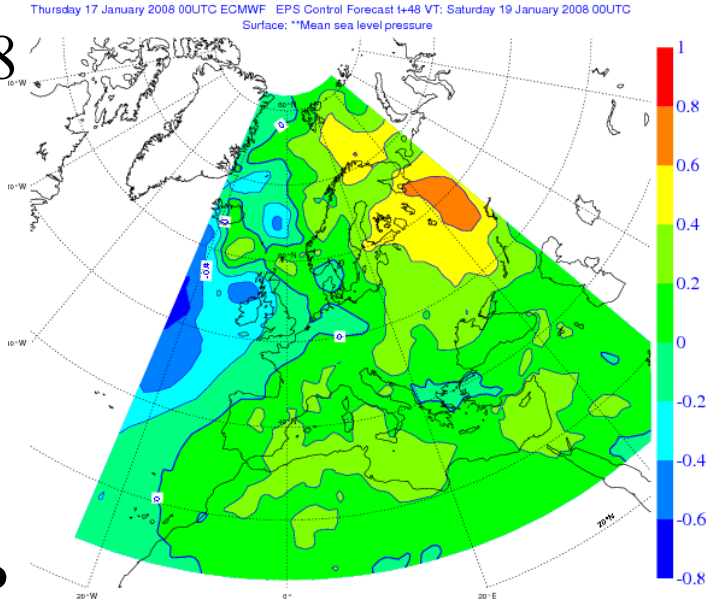
+24



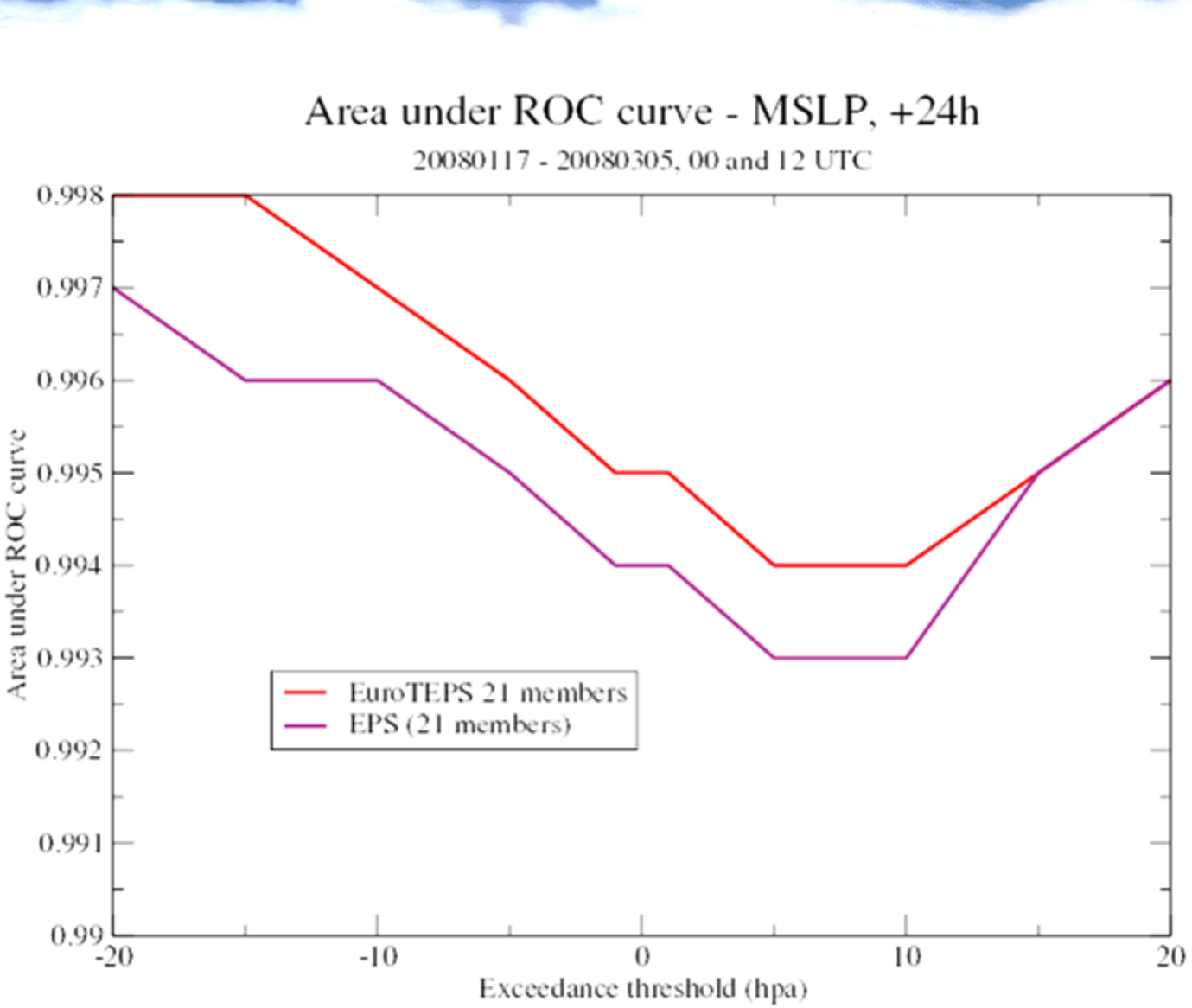
+36

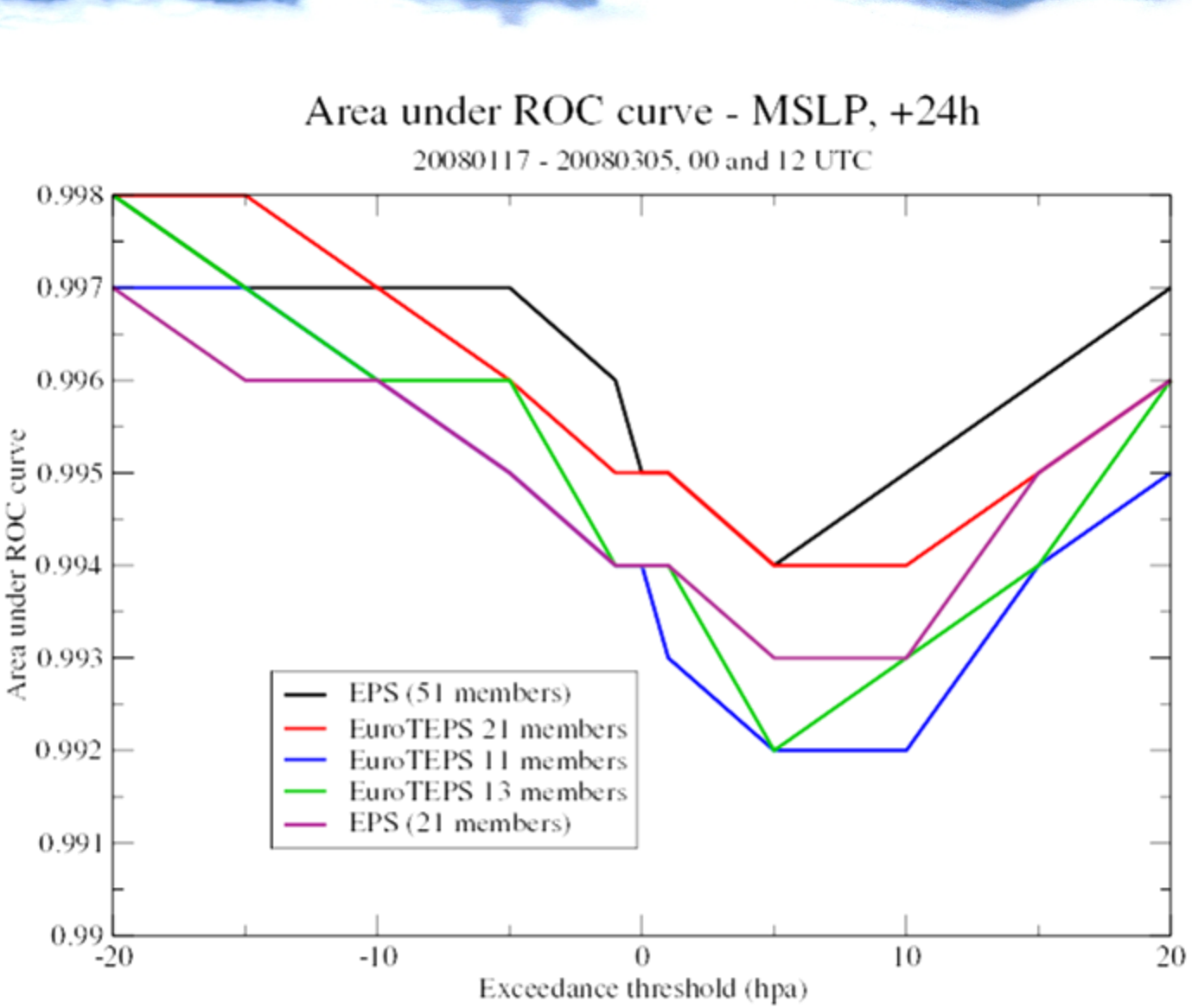


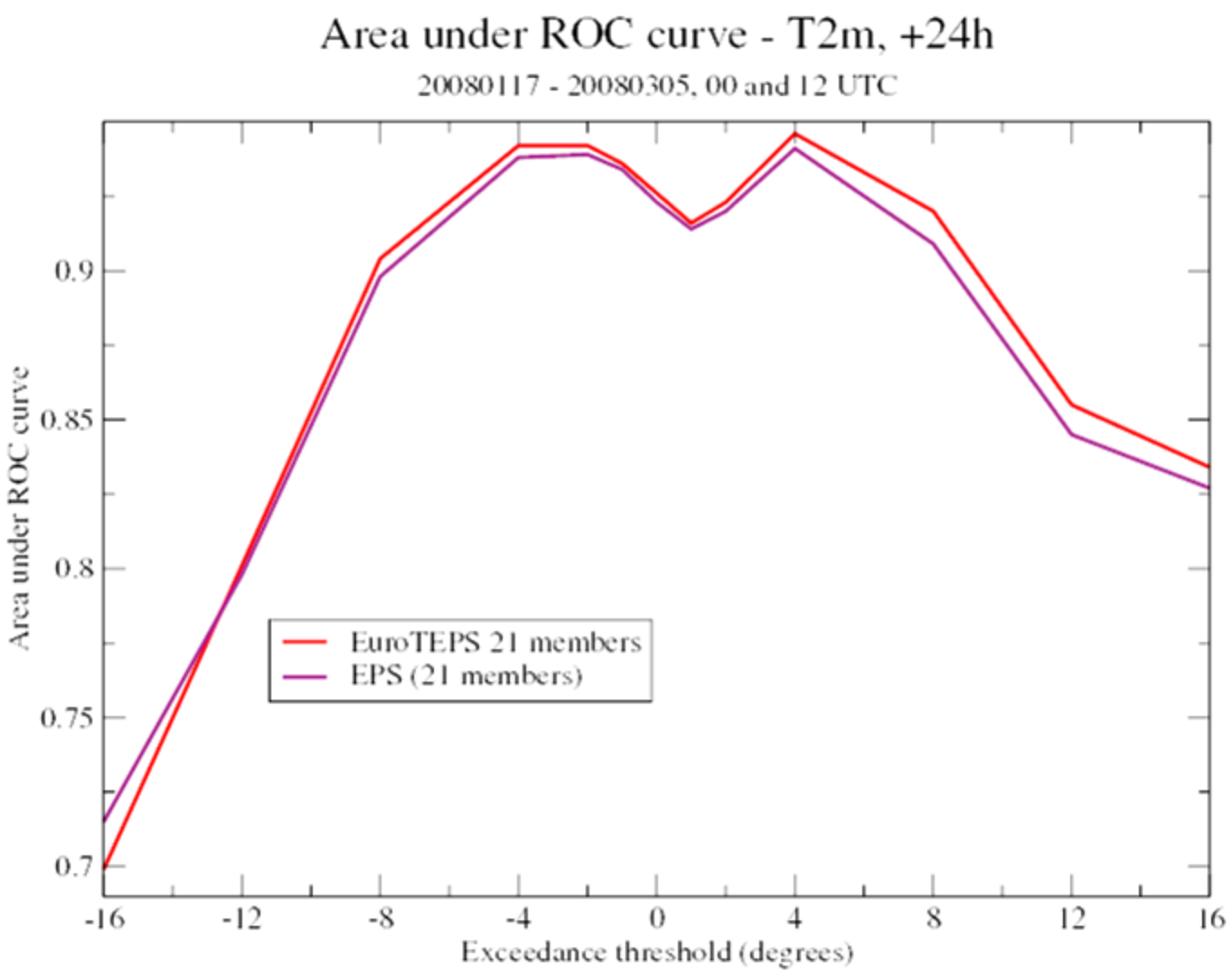
+48

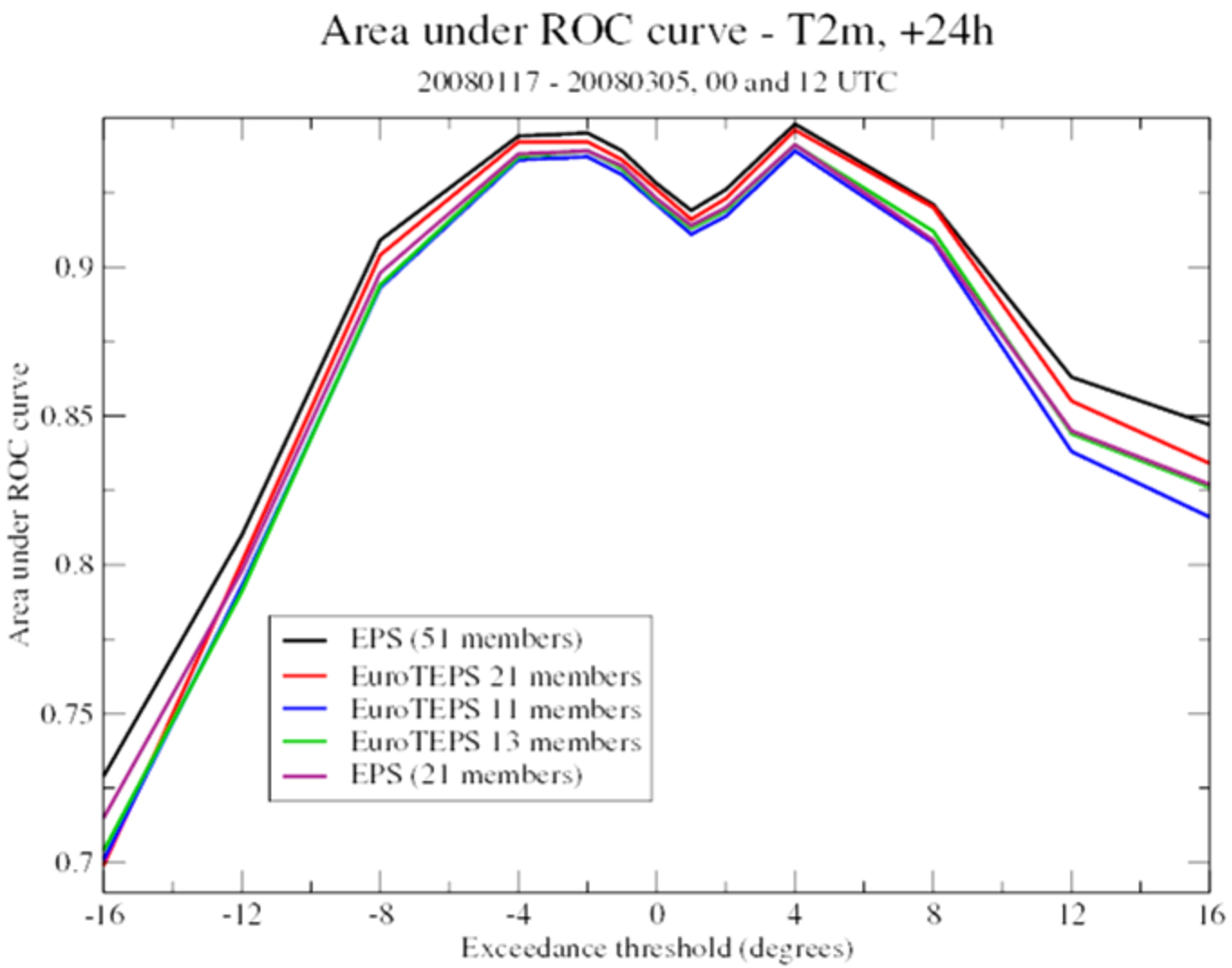


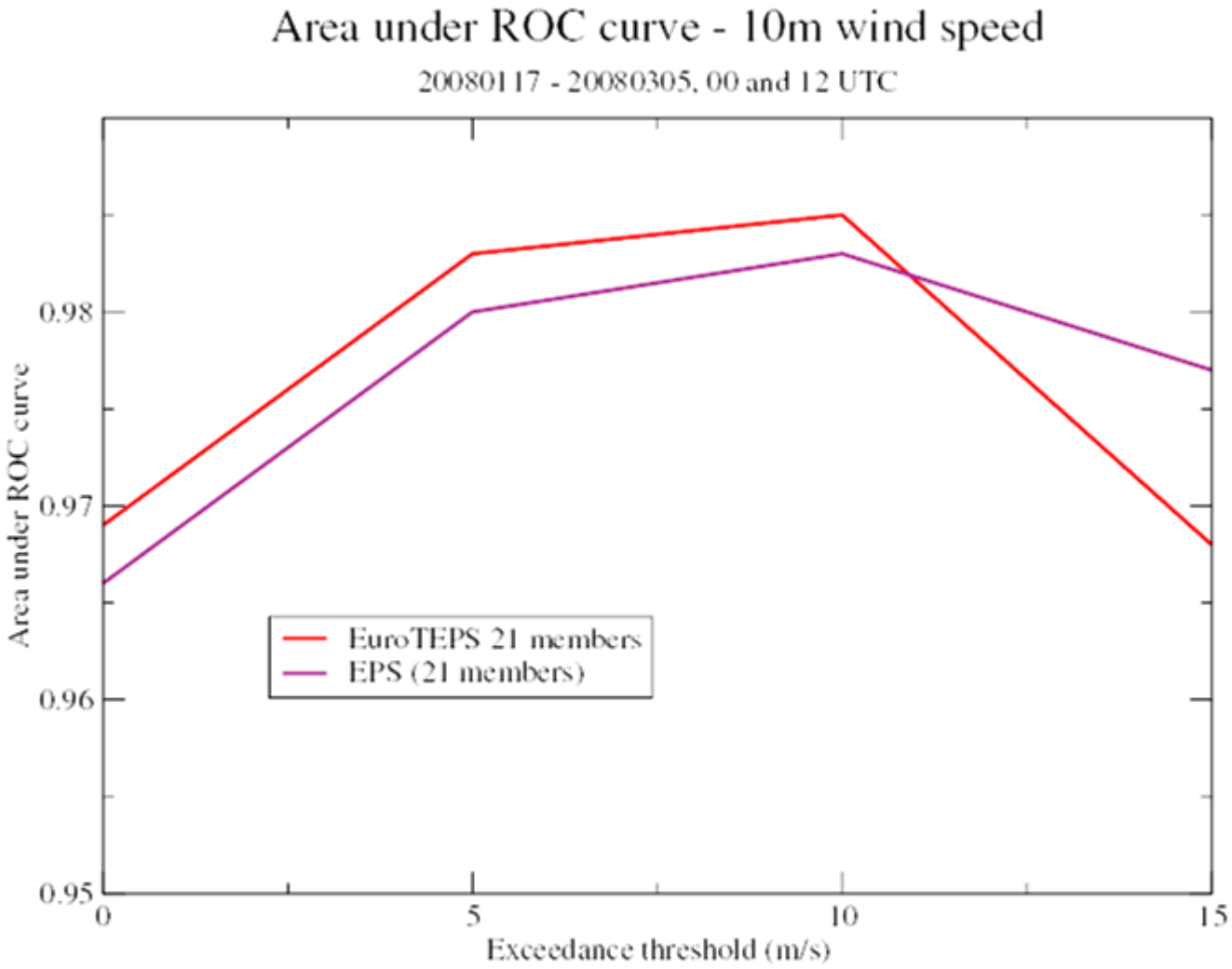
MSLP

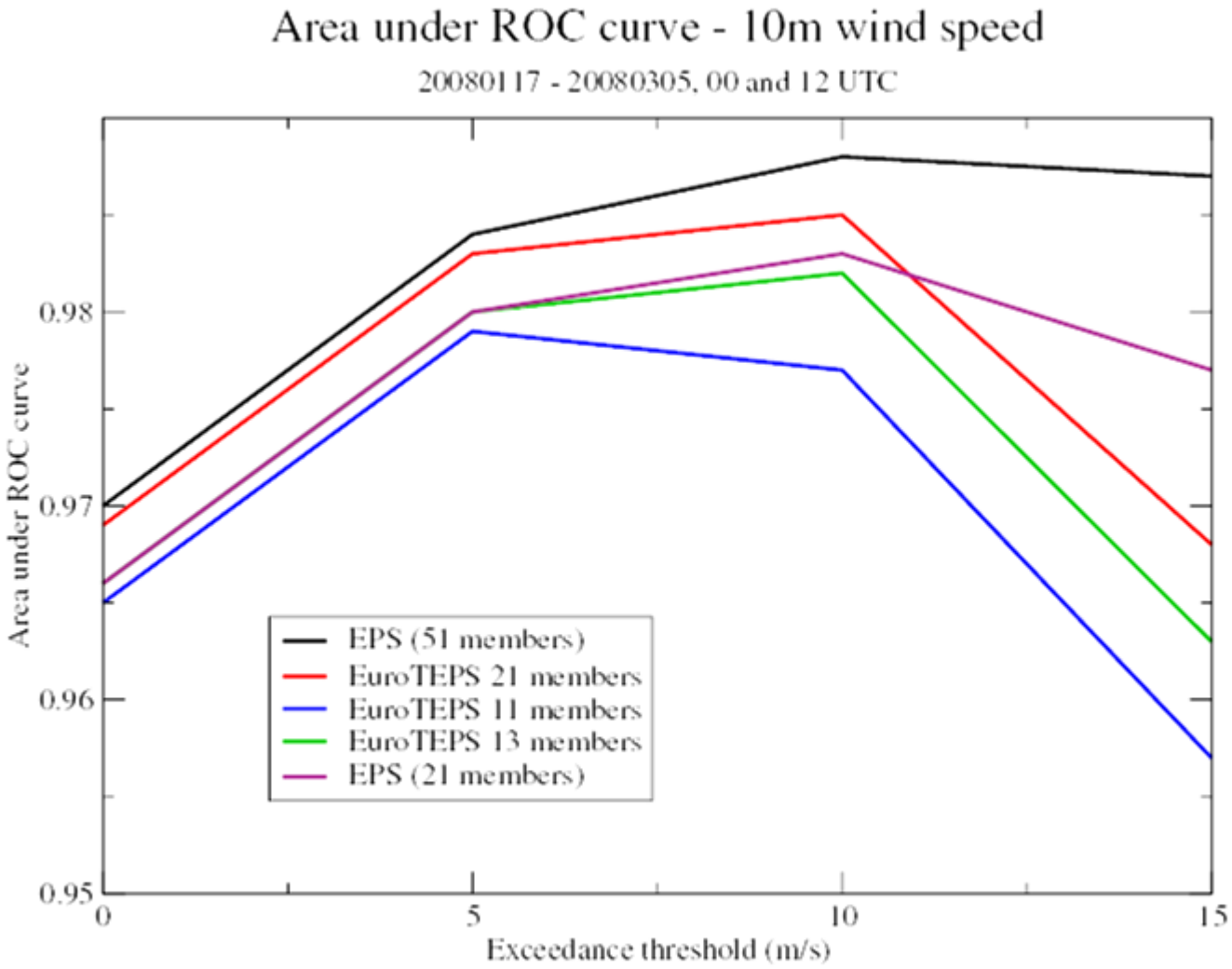

Area under ROC curve - MSLP, +24h
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.998
0.997
0.996
0.995
0.994
0.993
0.992
0.991
0.99
-20
-10
0
10
20
Exceedance threshold (hpa)
EuroTEPS 21 members
EPS (21 members)


Area under ROC curve - MSLP, +24h
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.998
0.997
0.996
0.995
0.994
0.993
0.992
0.991
0.99
-20
-10
0
10
20
Exceedance threshold (hpa)
EPS (51 members)
EuroTEPS 21 members
EuroTEPS 11 members
EuroTEPS 13 members
EPS (21 members)

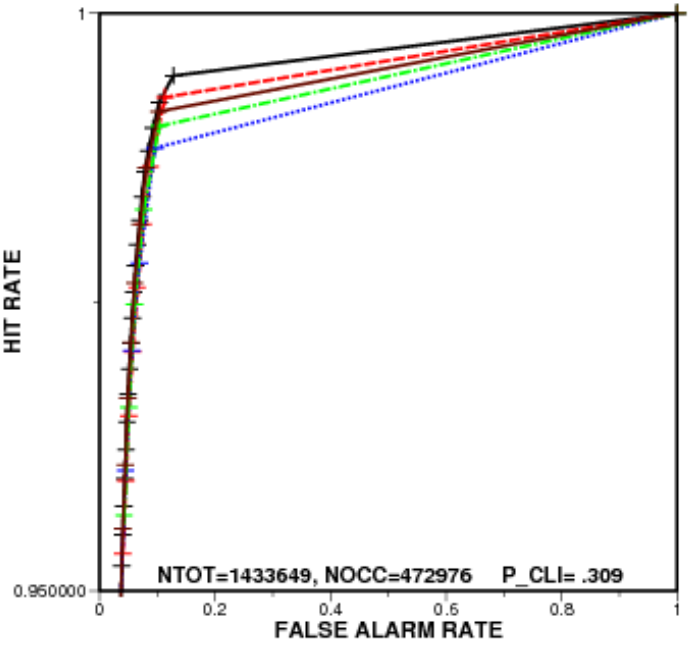

Area under ROC curve - T2m, +24h
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.9
0.85
0.8
0.75
0.7
-16
-12
-8
-4
0
4
8
12
16
Exceedance threshold (degrees)
EuroTEPS 21 members
EPS (21 members)


Area under ROC curve - T2m, +24h
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.9
0.85
0.8
0.75
0.7
-16
-12
-8
-4
0
4
8
12
16
Exceedance threshold (degrees)
EPS (51 members)
EuroTEPS 21 members
EuroTEPS 11 members
EuroTEPS 13 members
EPS (21 members)


Area under ROC curve - 10m wind speed
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.98
0.97
0.96
0.95
0
5
10
15
Exceedance threshold (m/s)
EuroTEPS 21 members
EPS (21 members)

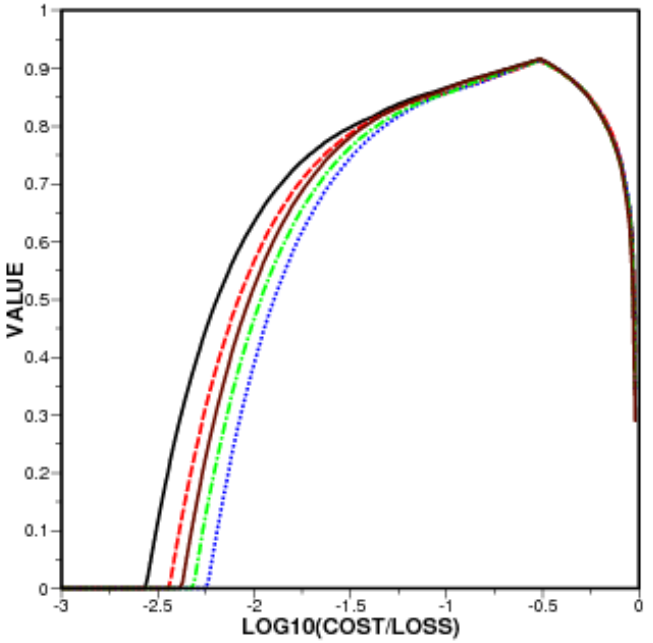

Area under ROC curve - 10m wind speed
20080117 - 20080305, 00 and 12 UTC
Area under ROC curve
0.98
0.97
0.96
0.95
0
5
10
15
Exceedance threshold (m/s)
EPS (51 members)
EuroTEPS 21 members
EuroTEPS 11 members
EuroTEPS 13 members
EPS (21 members)

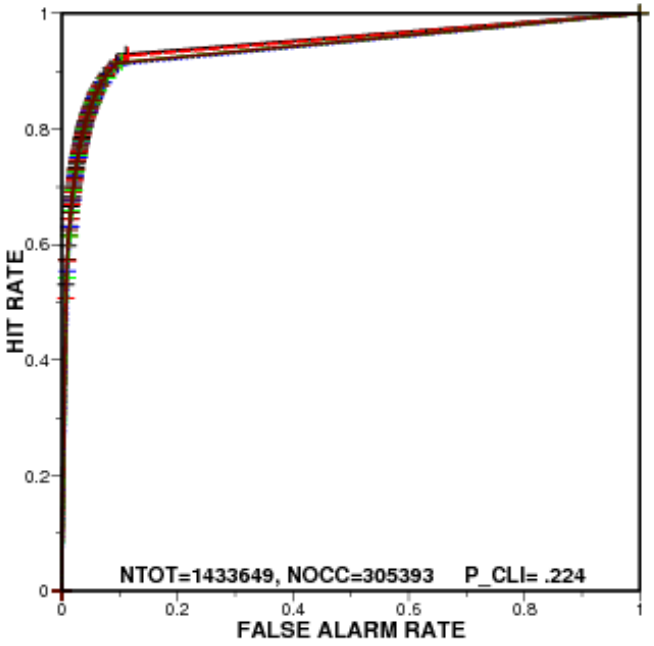
MSLP T2m



MSLP 20080117 20080206 + 36h, THR = 5.00

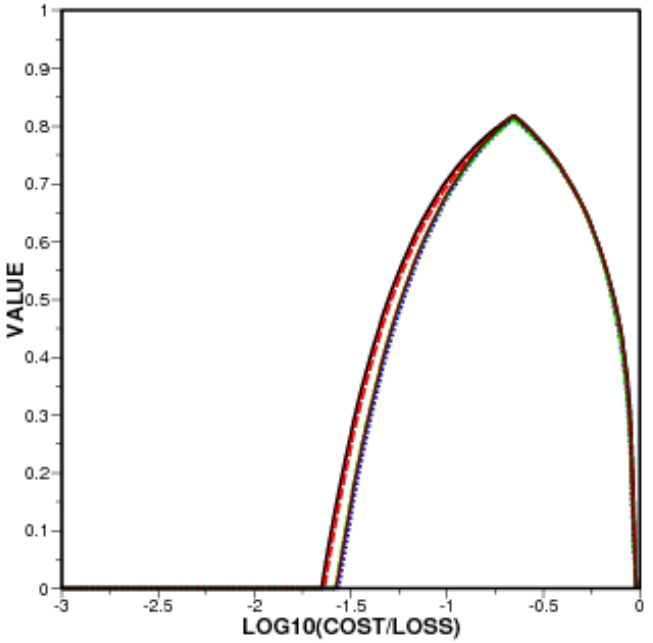
EPS (AREA= .990)





T2m 20080117 20080206 + 36h, THR = 4.00

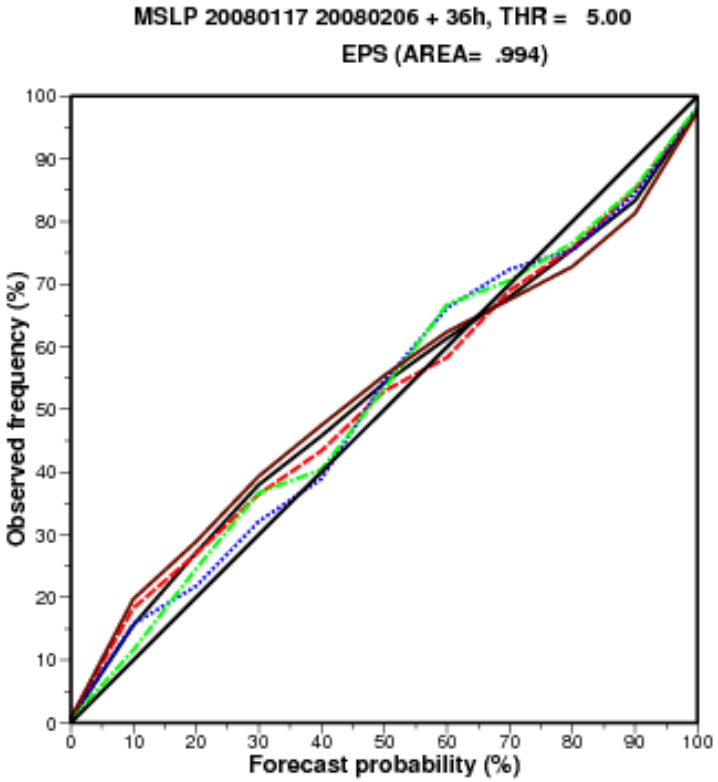
EPS (AREA= .945)



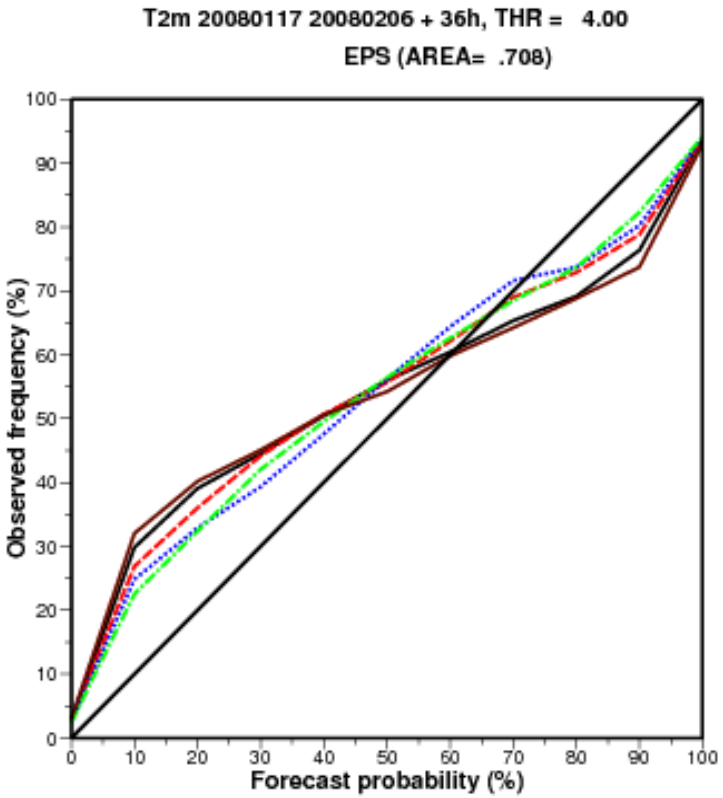
EPS (51 members)
EuroTEPS 21 members
EuroTEPS 11 members
EuroTEPS 13 members
EPS (21 members)

Reliability diagram

MSLP



T2m



EPS (51 members)
EuroTEPS 21 members
EuroTEPS 11 members
EuroTEPS 13 members
EPS (21 members)

Conclusions

- Three EuroTEPS data sets are finished, a total of 2 summer weeks in 2007 and 7 winter weeks in 2008
- The TSVs targeted to the three European areas are behaving as expected, i.e. the structures are reasonable, both horizontally and vertically, and they are located in the right places.
- The spread is slightly too small, mainly for the first hours of the forecast. The spread/skill relationship is better for EuroTEPS than for EPS
- EuroTEPS is capable of giving spread in the whole area of interest, that is in all parts of Europe for all forecast lengths.
- ROC and cost/loss analysis: EuroTEPS with 20 members scores better than EPS with 20 members. EPS with all 50 members is mainly the best system
- Reliability: EuroTEPS is better than EPS20 and EPS50

- Keep in mind that the results shown here for the comparison with EPS is only for one part of the GLAMEPS system!

Further work

- Adapt EuroTEPS to the coming changes in EPS
- Try diabatic singular vectors (the increased resolution implies that diabatic processes increase in importance)

Thank you for your attention