EuroTEPS – Targeted EPS for Europe

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EuroTEPS

- Results from recent experiments with targeted EPS for Europe 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 also itself a part of the multi-model GLAMEPS ensemble
- 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
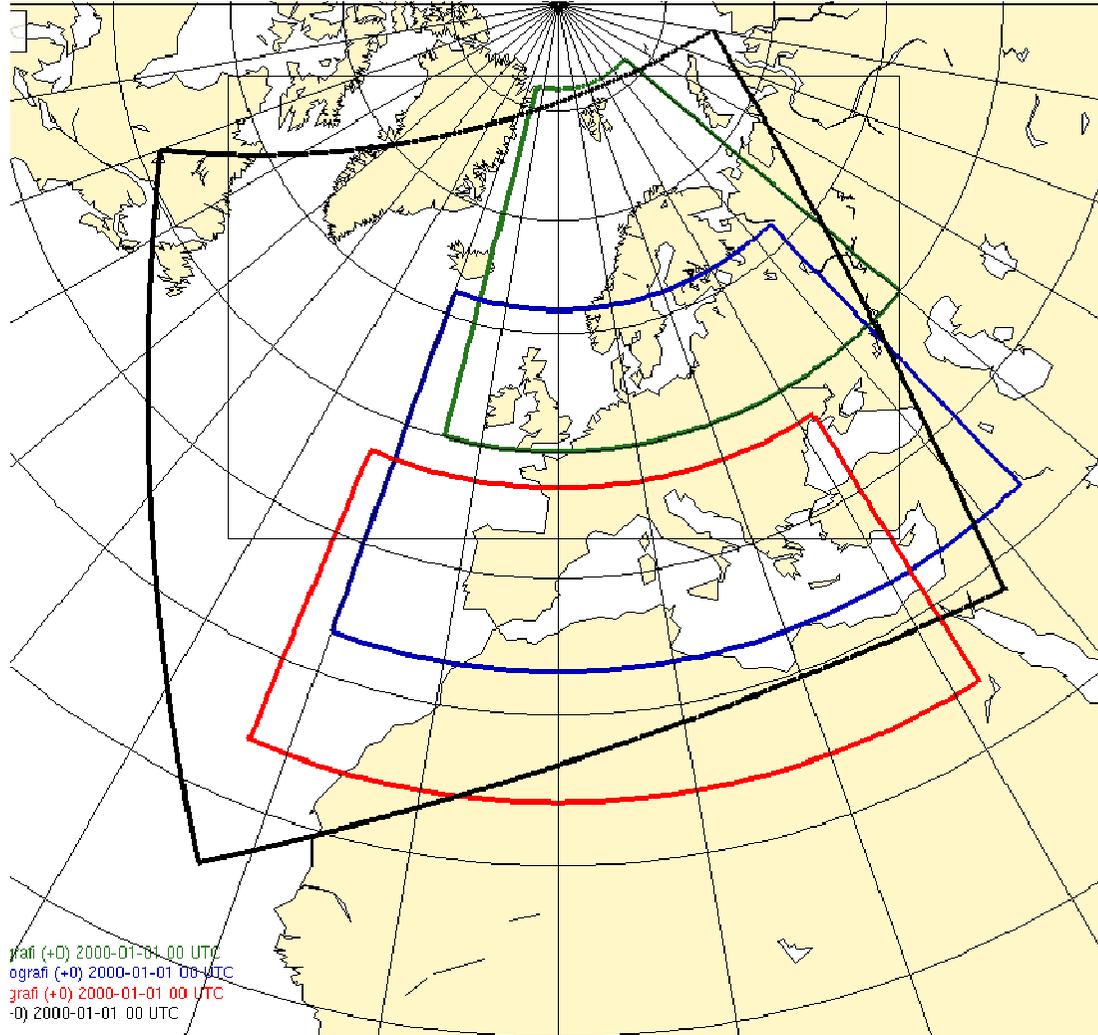
GLAMEPS integration domain
(HIRLAM version)

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

- First experiments was performed with CY32R2 of the IFS-code, newest with the cycle: CY32R3
- Singular vectors are computed with:
  - 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
- The perturbations from which EuroTEPS 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 are assigned to the different sets of SVs, to give the desirable spread/skill relation

EXPERIMENTS with cycle 32R3

- The perturbation amplitudes were reduced by 30% in the operational setup for EPS, this was due to the more active model in CY32R3. Operational amplitude in cy32R3: 0.014
- SV amplitude reduced by 25% to 0.0105
- TSV amplitude set to 0.0105
- Ratio = 1

EuroTEPS: production (cy32R3)

- The LAM models need input on model levels

- Too much data and too slow to use MARS

- In agreement with ECMWF the model level data needed for HIRLAM and ALADIN are stored on:
  - hpce: hpce/tmp/ms/no/fai/hirlam/bnd/teps_eur
  - ecfs: ec:/hirlam/bnd/teps_eur/

- Two periods are available:
  - Summer 2007: 20070812 – 20070825 (00 UTC and 12 UTC) = 2 weeks
  - Winter 2008: 20080117 – 20080305 (00 UTC and 12 UTC) = 7 weeks

COST

- TSVs for all three target areas: ca 600 SBUs
- EuroTEPS: ca 3000 SBUs

A total cost of ~3600 SBUs per run

This makes a total of: 3600 * 2 times a day * 9 weeks * 7 days a week ≈

450 000 SBU (+ all the test with different amplitudes + +)

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

mean NHSV. Temp. Lev 35 20070626
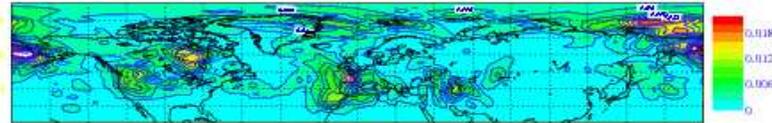
mean NHSVEVO. Temp. Lev 35 20070626
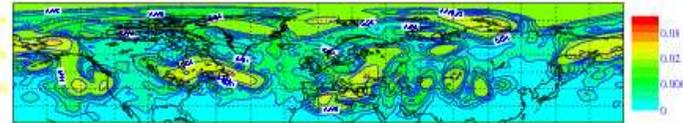
mean TSV north. Temp. Lev 35 20070627
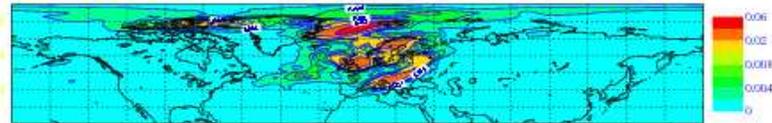
mean TSVEVO north. Temp. Lev 35 20070627
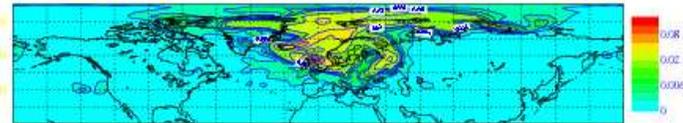
mean TSV central. Temp. Lev 35 20070627
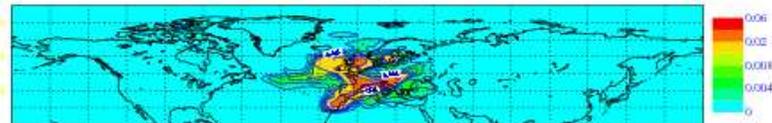
mean TSVEVO central. Temp. Lev 35 20070627
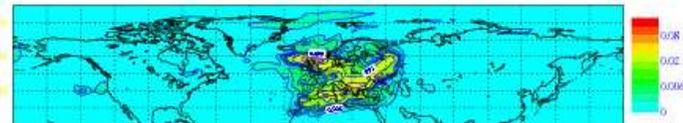
mean TSV south. Temp. Lev 35 20070627
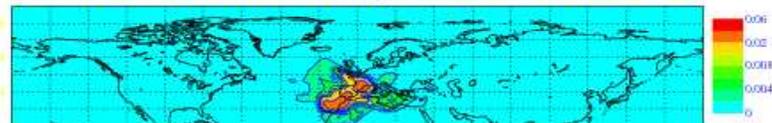
mean TSVEVO south. Temp. Lev 35 20070627
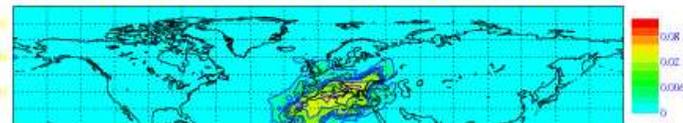
Difference in spread between EuroTEPS and EPS (7 winter weeks in 2008)

SPREAD MSLP 7 WINTER WEEKS: euroTEPS-EPS

+24h
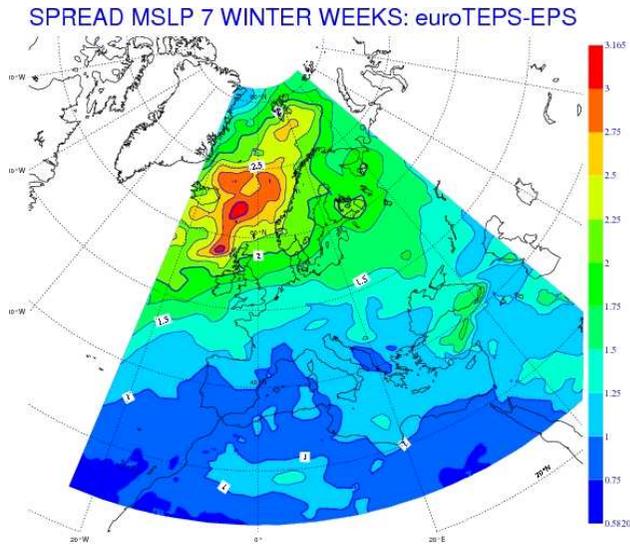
+36h
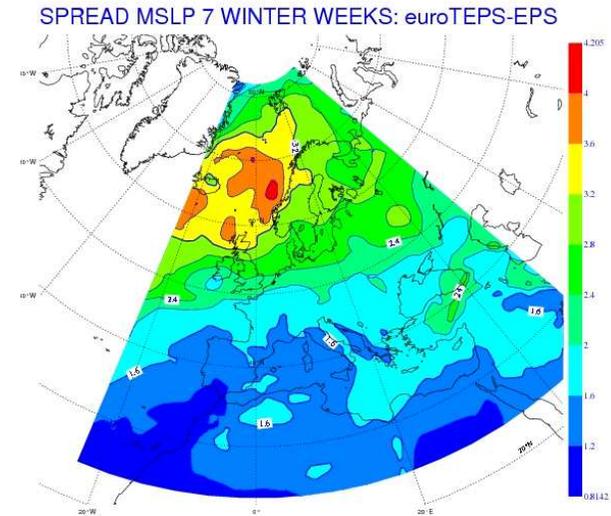
+48h
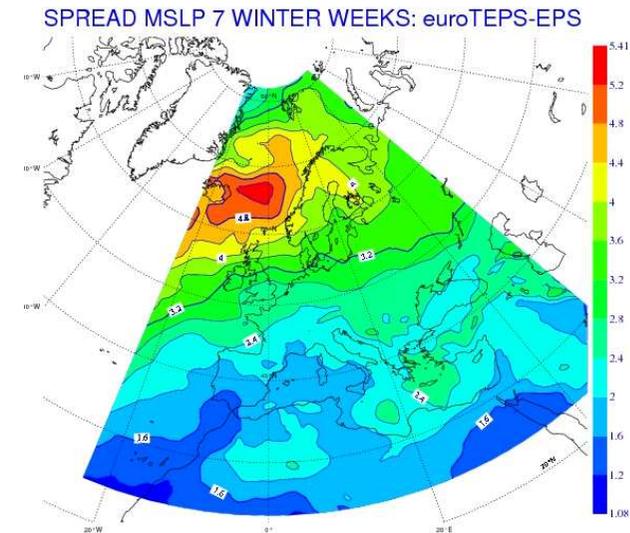
+60h
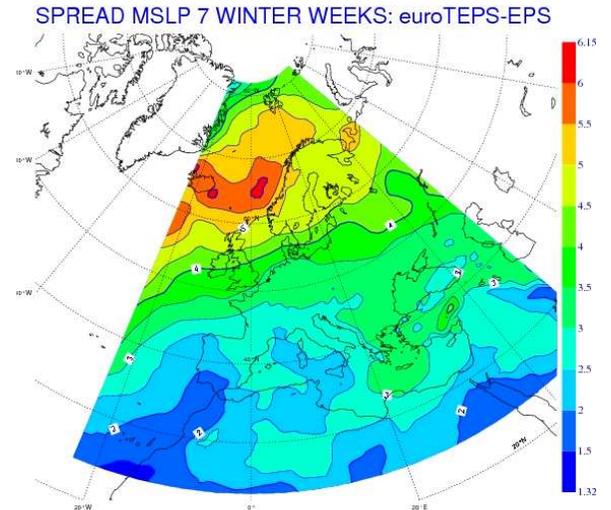
Spread/skill 7 winter weeks 2008

20080117 - 20080305
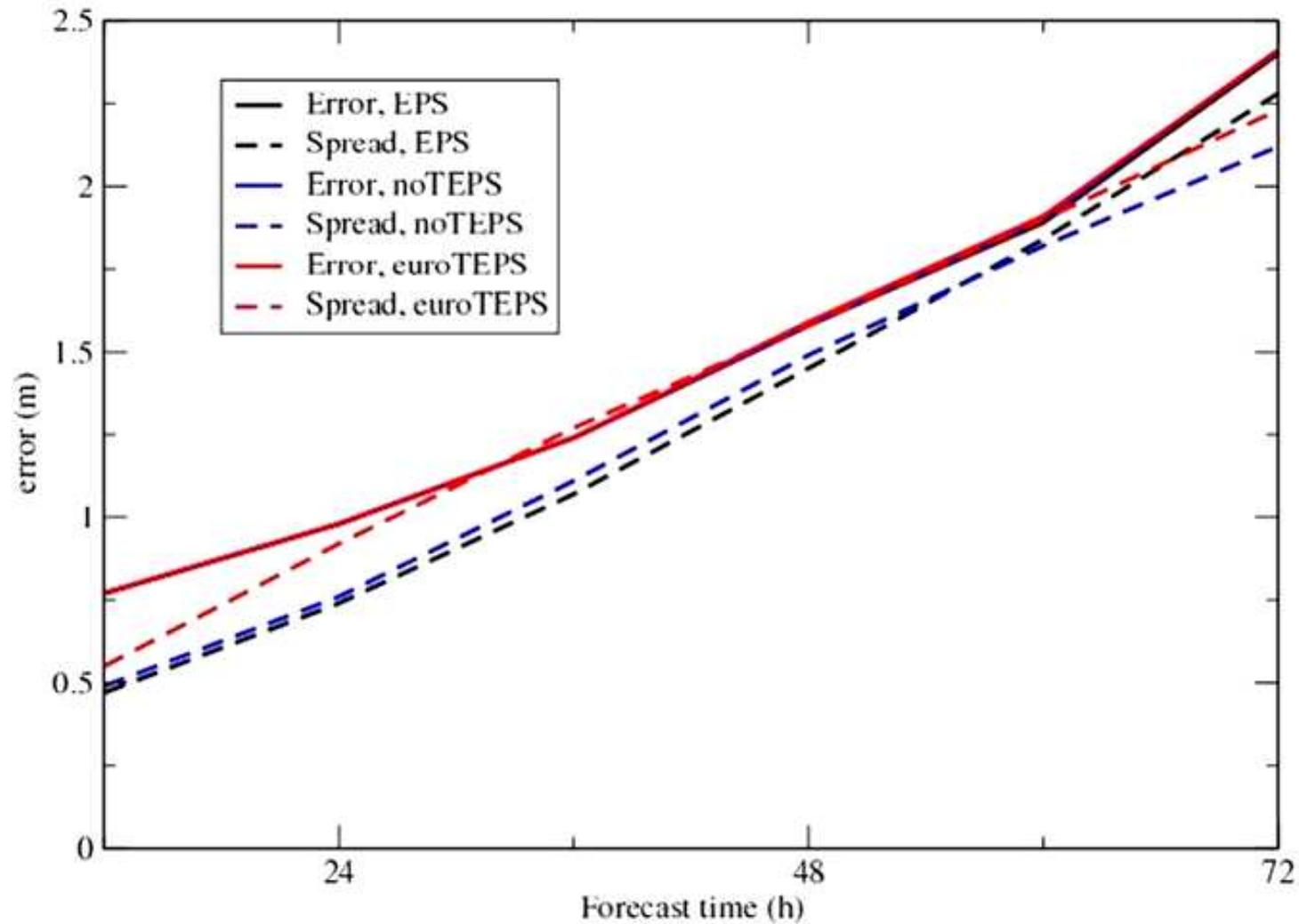
MSLP

MSLP, Area ROC and BSS
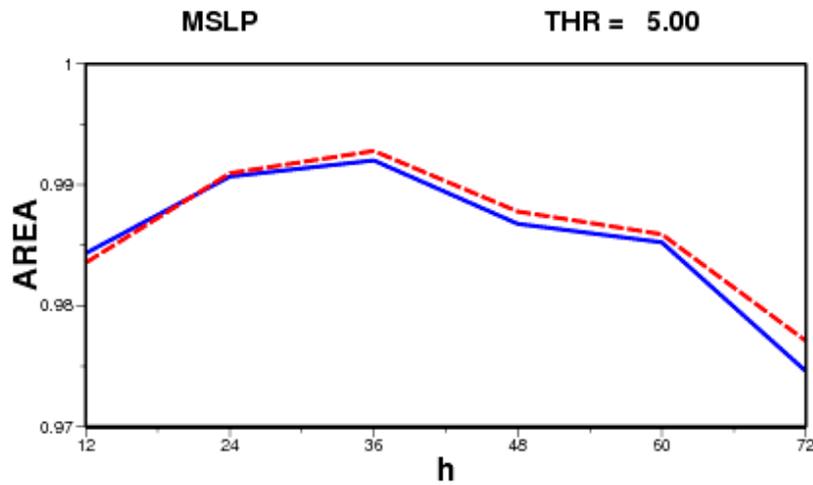
EuroTEPS

EPS20 "clean" run
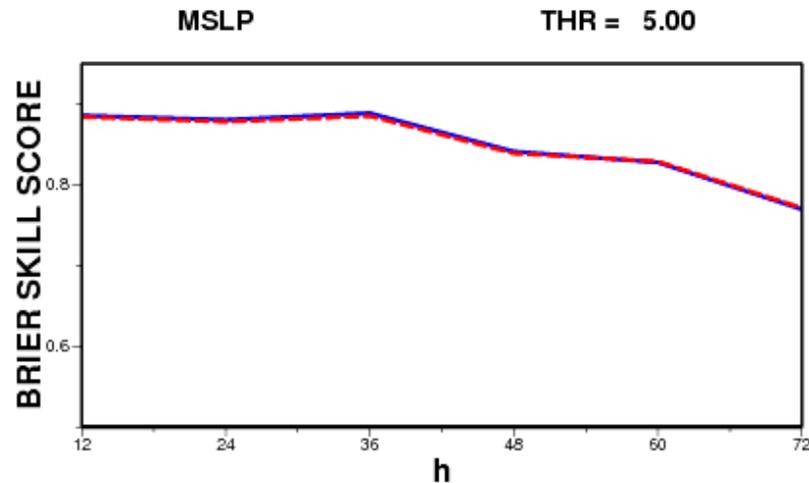
MSLP, ROC and COST/LOSS
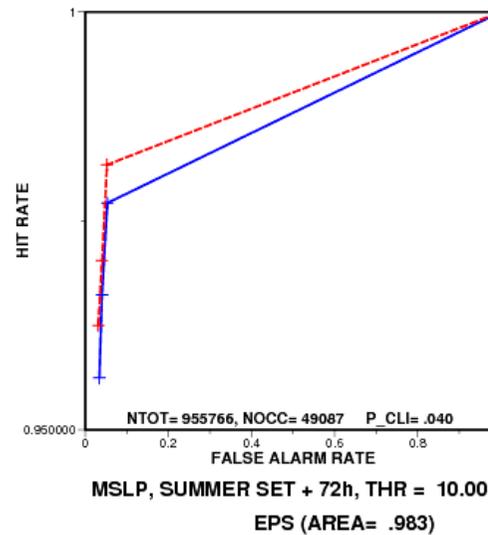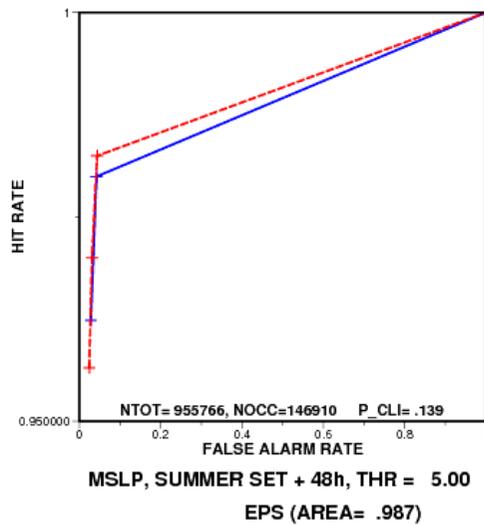
EuroTEPS

EPS20, "clean" run
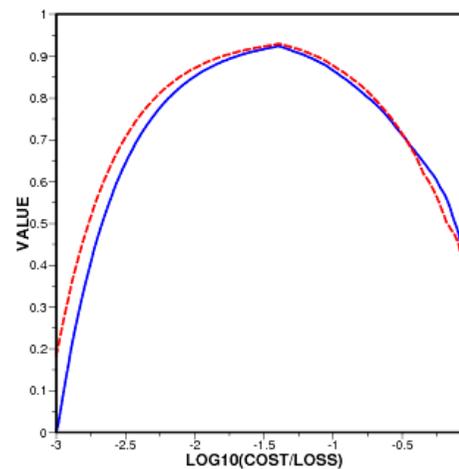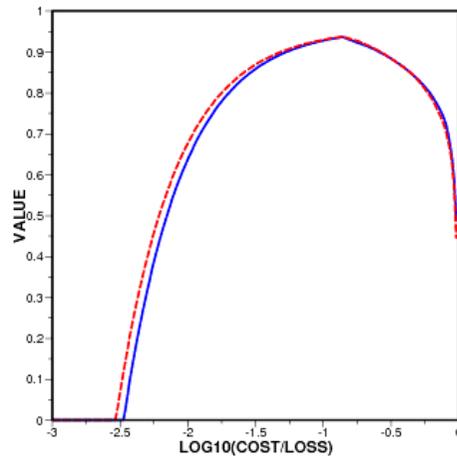
MSLP, RELIABILITY DIAGRAM

20070812 20070825 + 36h, THR = 10.00
EPS (AREA= .990)
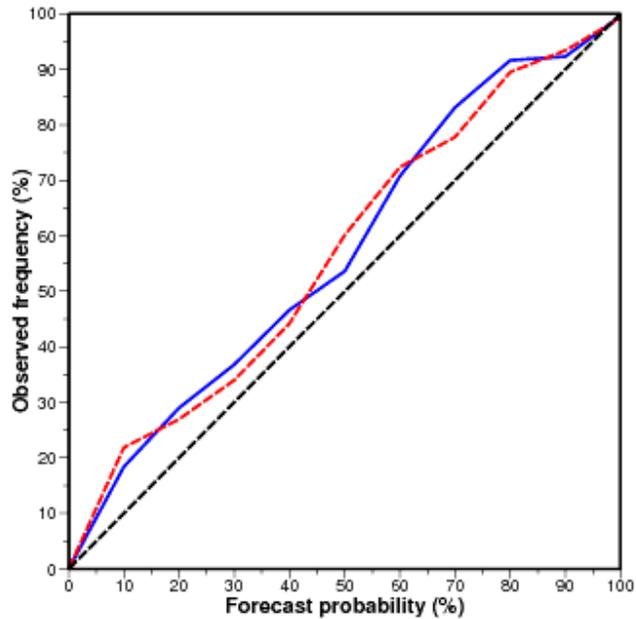
20070812 20070825 + 72h, THR = 10.00
EPS (AREA= .990)
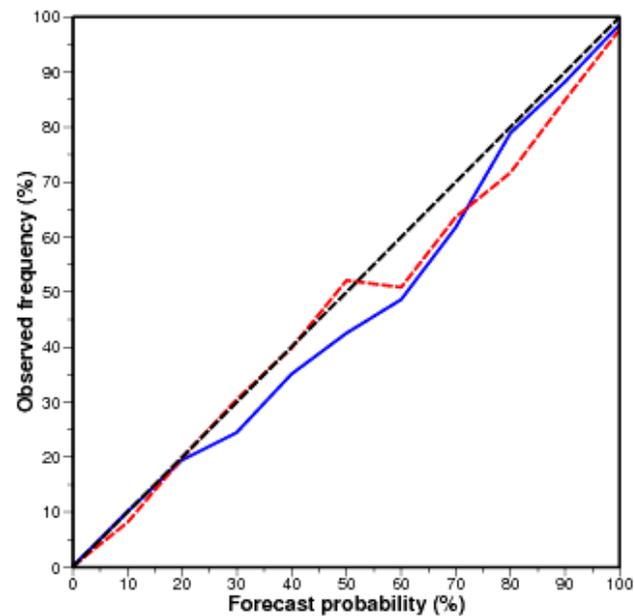
EuroTEPS

EPS20, "clean" run
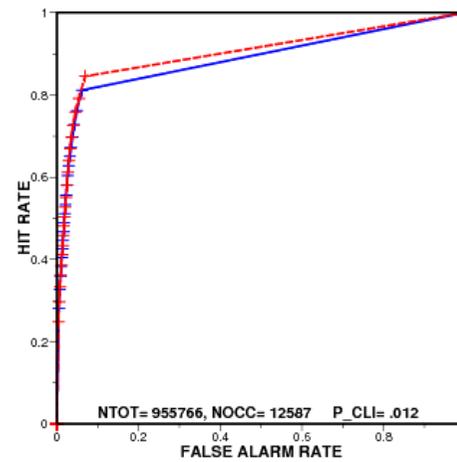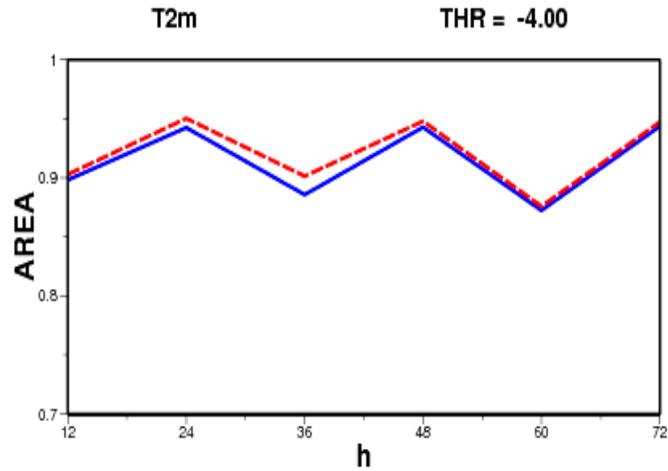
T2m

EuroTEPS

EPS20, ”clean” run
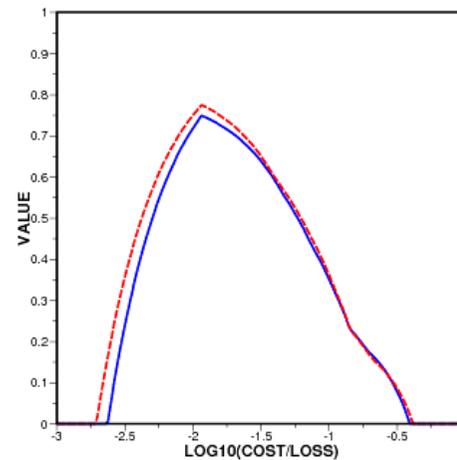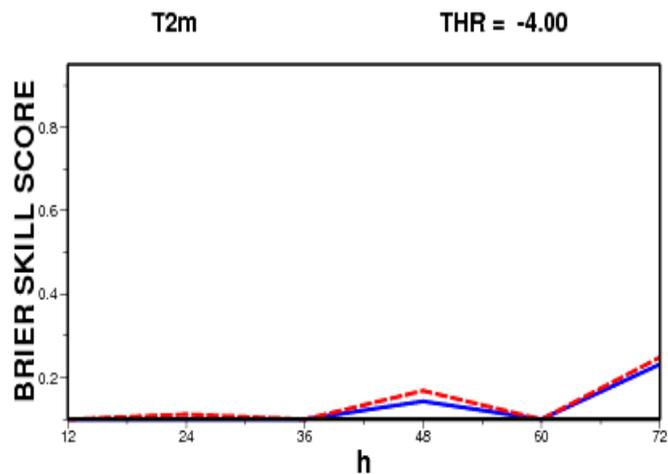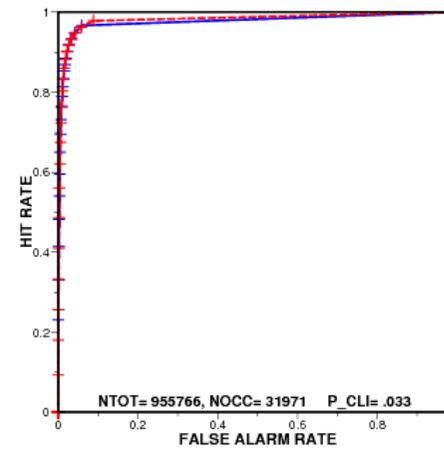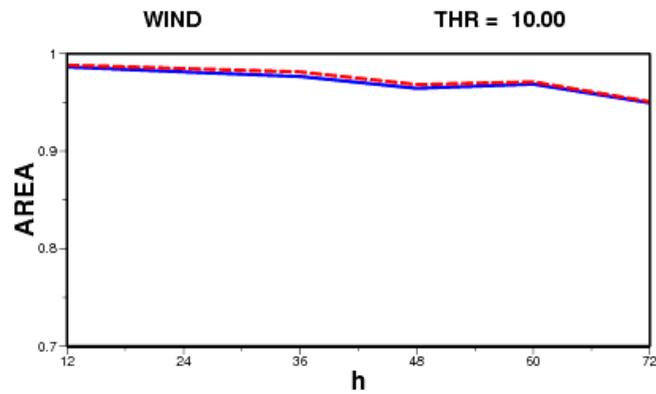
T2m, Reliability diagram
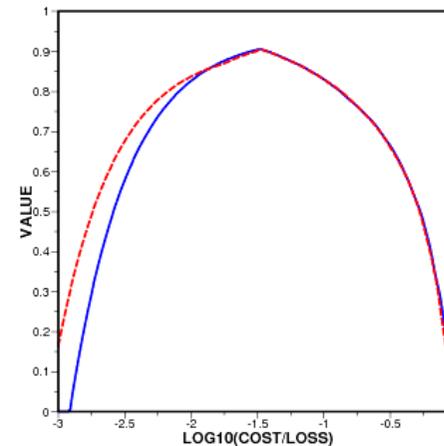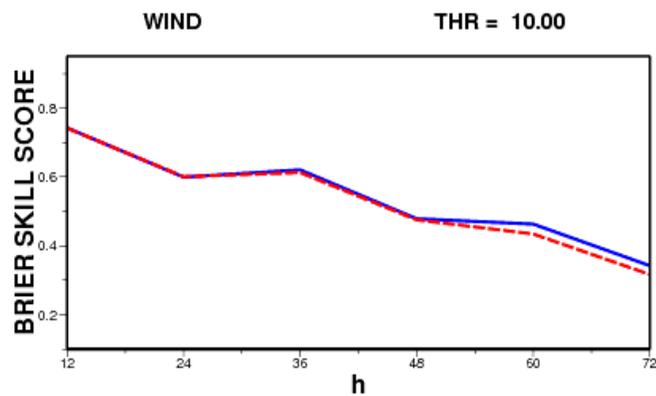
10 meter wind speed

10 meter wind speed, Reliability diagram

20070812 20070825 + 36h, THR = 10.00
EPS (AREA= .000)
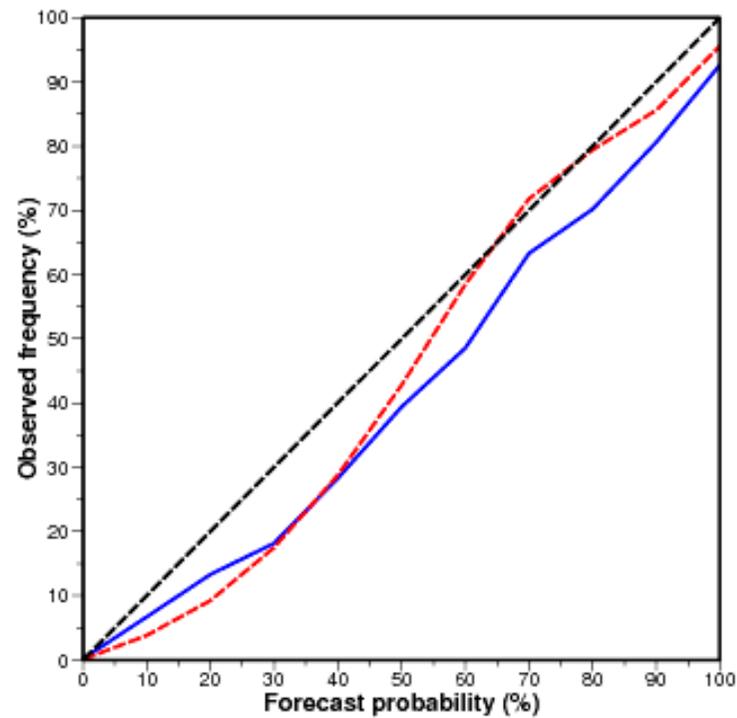
Conclusions TEPS for Europe

- The experiments are now running without any technical problems, including saving of model levels for LAMs.
- Two test periods are finished: 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 too small for the first hours of the forecasts, but the spread/skill relationship is very good from about 24 h (CY32R3)
- TEPS for Europe is capable of giving spread in the whole area of interest, that is in all parts of Europe for all forecast lengths.
- TEPS for Europe scores better or equal to EPS20 (only summer weeks verified so far)
- More experimentation is needed to find the optimal set up for TEPS for Europe

Outlook

- Type 1 experiments: establish first operational prototype
    - check the effect w.r.t. quality and computer costs of:
        - using one or two target areas in stead of three
        - reducing the ensemble size (e.g. 13 in stead of 21)
        - reducing the forecast length (e.g. 48h in stead of 72)
- Type 2 experiments: test further improvements of EuroTEPS:
    - fit EuroTEPS to the EPS structure planned at ECMWF
    - experiment with diabatic TSVs
    - Investigate possibilities for Hessian TSVs, or combining with other methods that use information about actual analysis error structures
    - Furthermore, we should prepare for an operational, time-critical facility at ECMWF.

Thank you for your attention