



Grand Limited Area Model Ensemble Prediction System



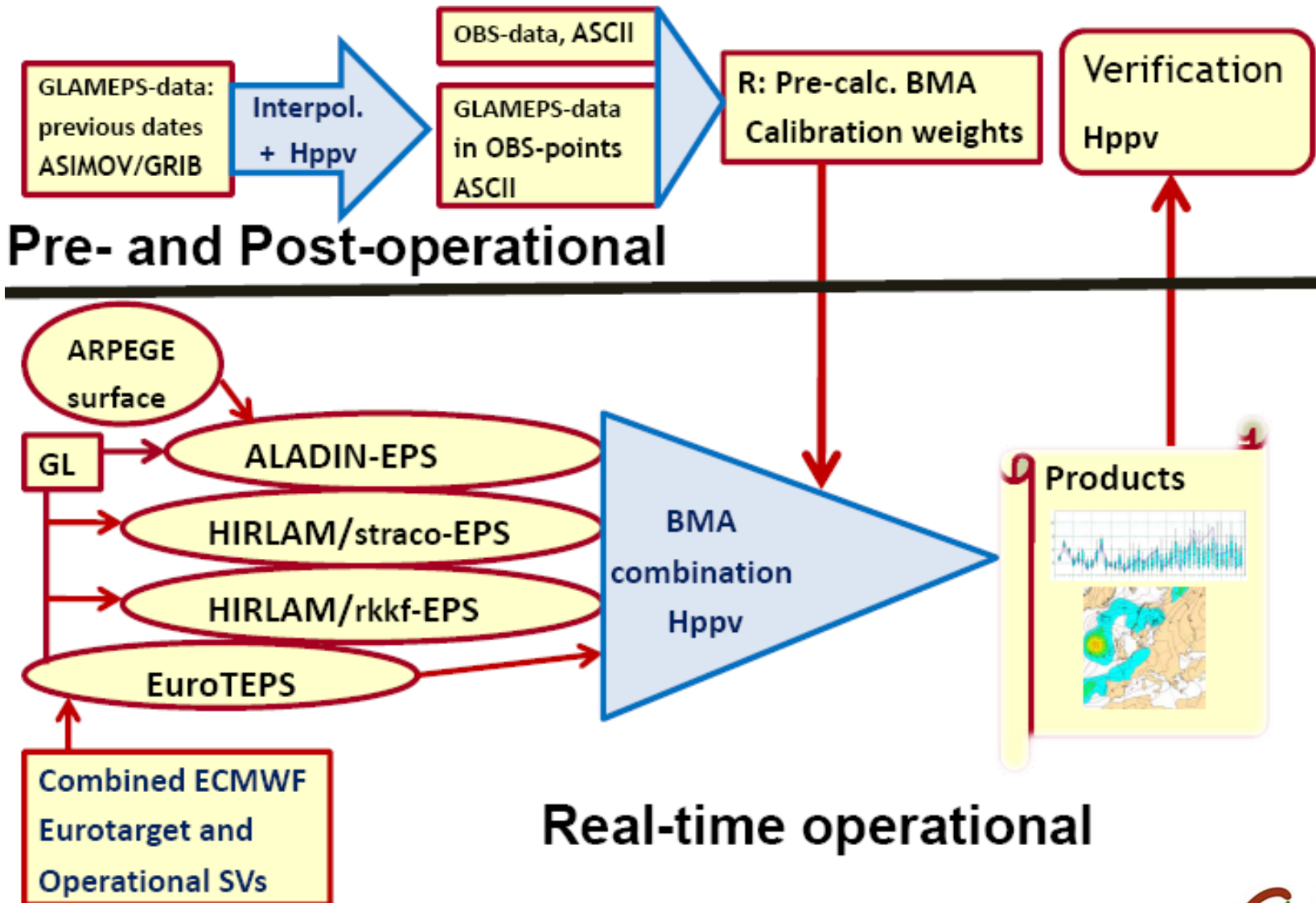
**and possible further LAM-EPS developments in HIRLAM
which requires high-quality ensembles of lateral boundary data**

Trond Iversen

Norwegian Meteorological Institute (met.no)

GLAMEPS production – flow chart

Launching and monitoring by SMS (Kai Sattler)

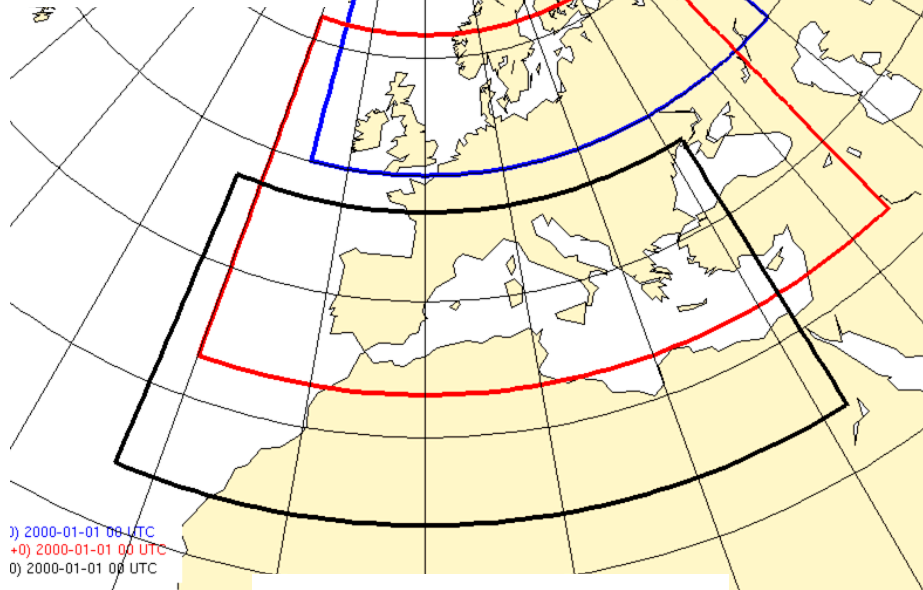


EuroTEPS: (Frogner; Leutbecher)

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



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

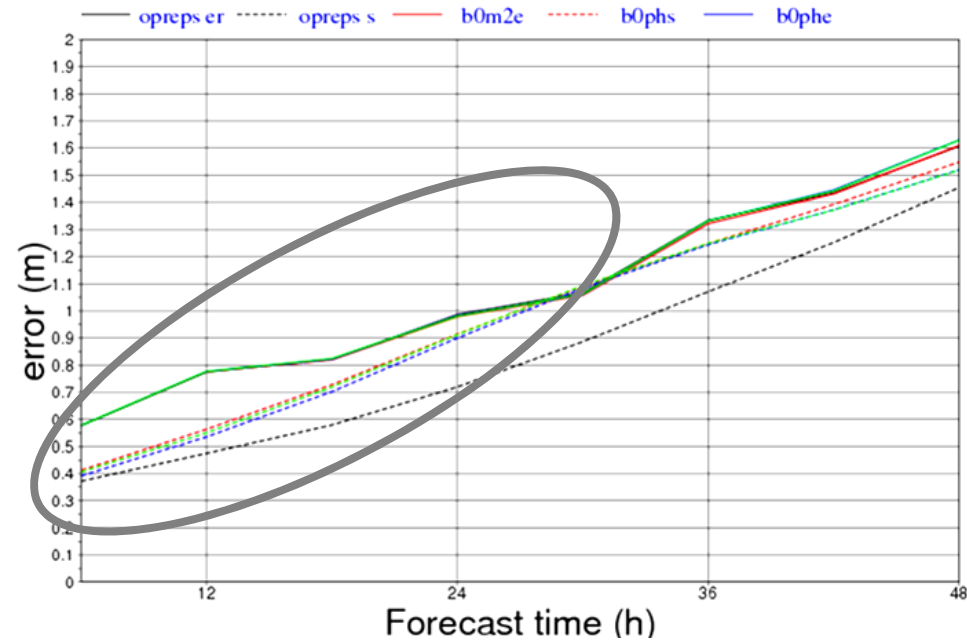


Target area south
(47N, 23W, 24N, 32E)

10 TSVs per target area:

- T159 (T42 for oper. SVs)
- 24h opt. time (48h for oper. SVs)
- Targeted to the troposphere
- based on total energy norm
- orthogonal to the oper. SVs
- also mutually orthogonal
- New version: combined with EDA

Spread-Skill MSLP 21 cases winter 2008

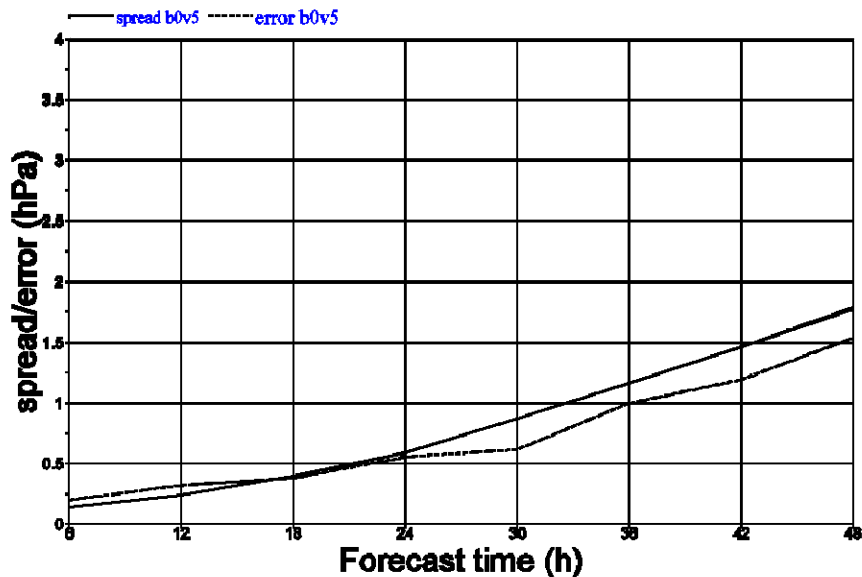


Solid lines: error of mean
Dashed lines: spread

Old EuroTEPS

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

Spread-Skill MSLP 7 cases in 2009



New EuroTEPS (cy36r2)

— 11 members.

No under-spread in the first 24h.

Present main candidate for operational GLAMEPS:

52 ensemble members; 13 per model

EuroTEPS (12 + 1) + HirEPS_K (12+1)
+ HirEPS_S (12+1) + AladEPS (13) = 52

In reality 51 unique members;

AladEPS_00 is EuroTEPS_00 downscaled

- **13km grid resolution**

(Aladin 509x416, 12.9km,L37);

(Hirlam 486x378, 0.115deg,L40)

- **Forecast range: 42h**

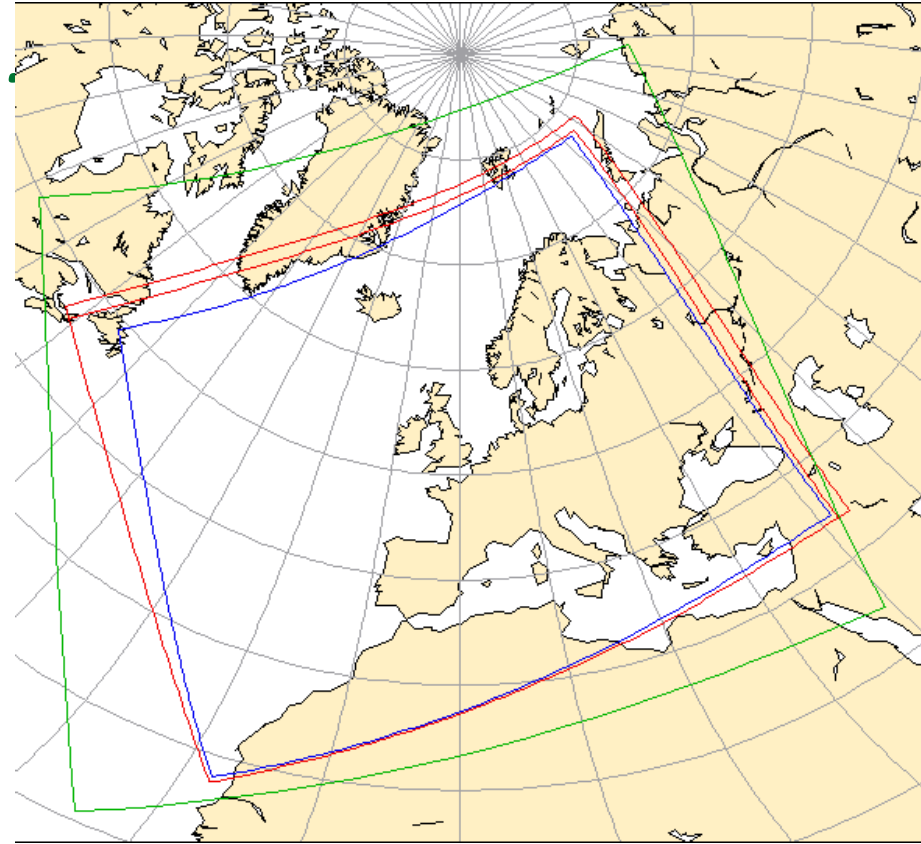
- **Required computer resources at ECMWF:**

EuroTEPS with 12+1 members run to + 48h, with resolution T639L62,

EDA (Cy36r2), and 30 diabatic TSVs,: ~4.5 Msbu/year (6.6 with L92)

LAMEPS (24+2 HirEPS and 13 AladEPS): ~5.7 Msbu/yr

In total: ~ 10.2 Msbu /yr. (12.3 with L92 in EuroTEPS)



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 (numbers may change)

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

Overall production time per cycle, ca. **2h 30min**;

obtained by allowing 36 parallel jobs at c1a.

With new EuroTEPS: ca. 25 min longer ~ **3h** (needs to be confirmed)

NB: When run on main obs-hours (00 and 12),

Glameps needs to wait 7h50min before EuroTEPS is started.

Are 06 and 18 utc better?

Suppose may take care of the synoptic scale for some time: what's the next?

Short-range prediction of high-impact weather, require resolution of deep convective systems and sufficient geographical detail to indicate gust fronts, wind channeling, breaking mountain waves etc.

--→ i.e. **meso-eps – cloud-resolving eps.**

Model tool:

in Hirlam/Aladin: Harmonie (non-hydrostatic)

Physics for the "grey zone": Alaro (~4km)

Full meso-scale physics: Arome (~1km)

Next steps

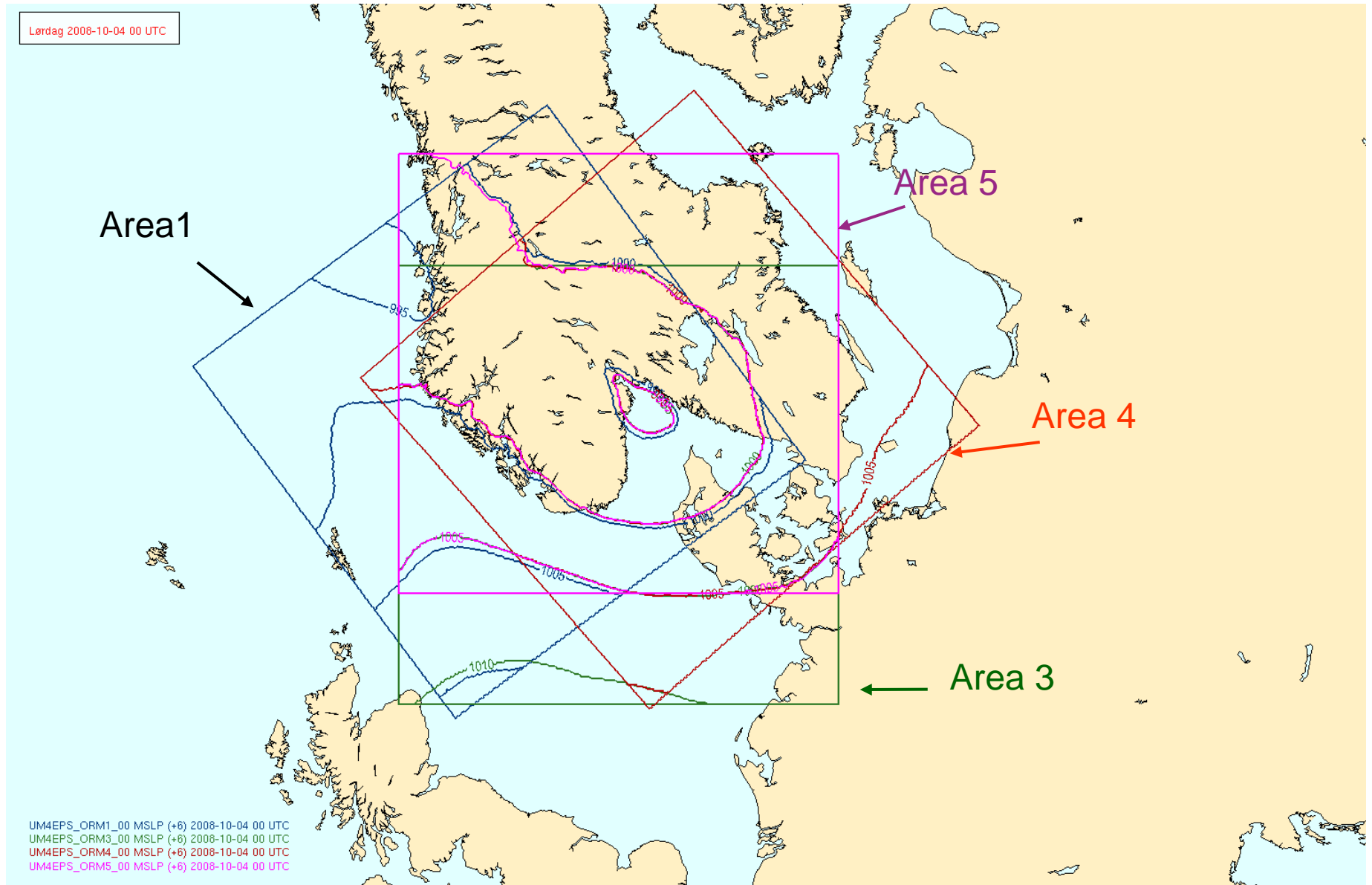
Pan-European meso-eps is presently unrealistic.

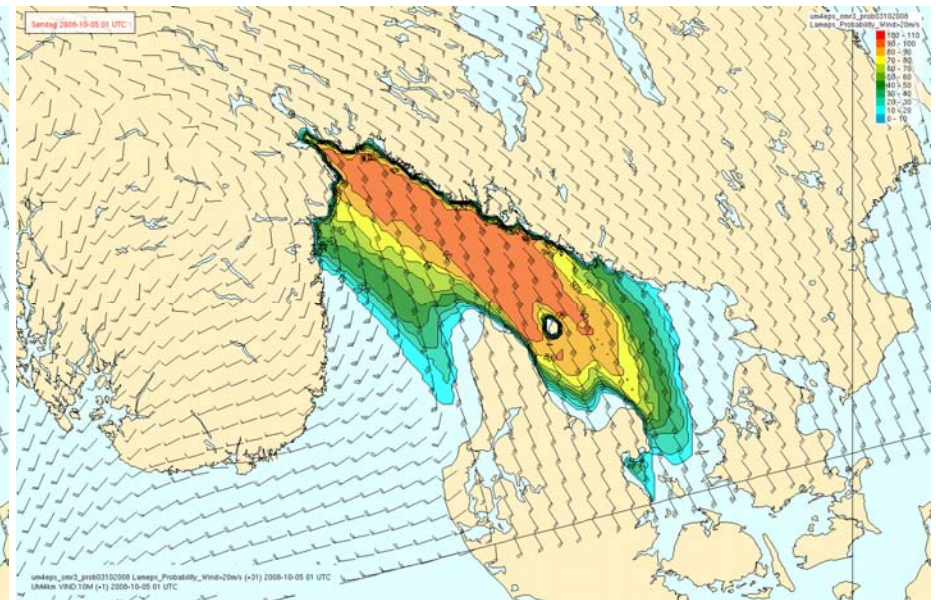
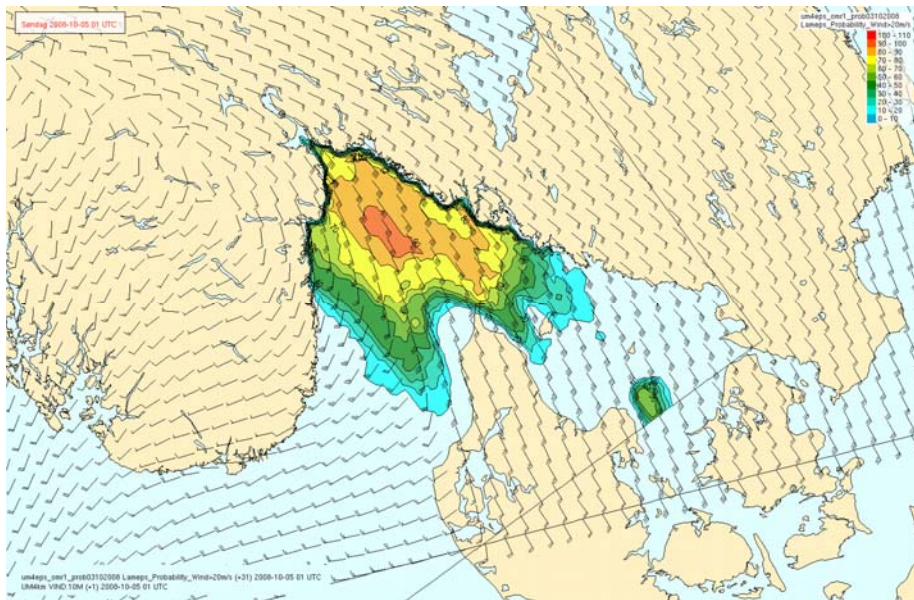
In stead: Small domains with high resolution.

Perhaps OK for pure downscaling to local forcing, but there may be strong dependence to chosen model domain.

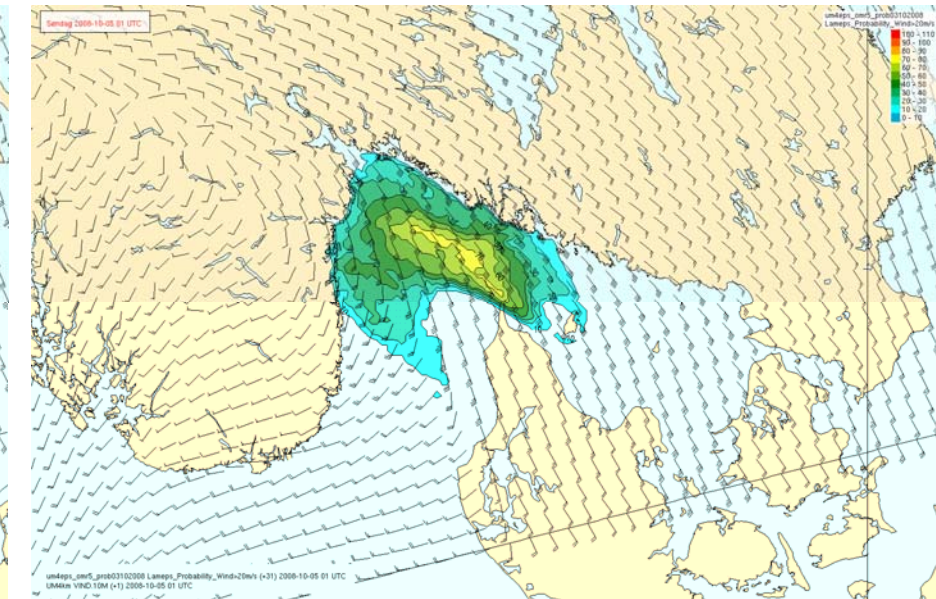
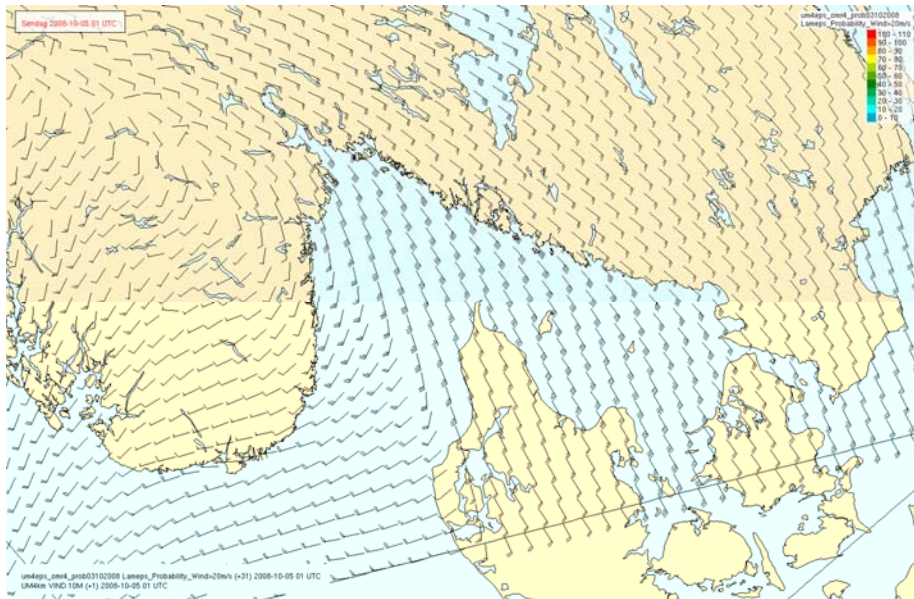
The quality of LB-data is crucial for small domains

UMEPS 4km downscaling 5/10-2008 (Storm case)





Wind-arrows: UM4km +1h; UMEPS Probabilities ff10m>20m/s, +31h



Next steps

For a decent nowcasting – short range meso-eps, rapid update data-assimilation is needed.

Time-dependent "balances" must be estimated:

DA – EPS coupling is probably needed, and even a "deterministic" prediction system would need eps.

LBC-data for meso-eps?

- GLAMEPS (or similar systems)
- "EuroTEPS_super", run at ECMWF:
 - diabatic, high res. TSVs, + EDA
 - T1279 (16 km);
 - up to 72h, hourly output from 06 and 18 utc (+ 00 and 12 ?)

Some aspects to consider for a system producing LBC-data

- Resolution (16km for 4km meso-eps)
- Frequency of production (2/day; 4/day; 8/day)
- Frequency of data (20min; 1h; 3h)
- Timing of production
 - In order to be useful for forecast-range 6-24h, the LBC-production should be run with short cut-off and before the medium-range.

Thank You!

