MetCoOp
One year with operational experiences

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With colleagues from SMHI & MET-Norway
Outline

- What is MetCoOp?
- AROME-MetCoOp Configuration
- Examples of added value compared to ECMWF
- Examples of model deficiencies & ongoing development
- 2015/2016 - plans
What is MetCoOp?

- SMHI and MET-Norway
- Joint NWP production
- AROME-MetCoOp & C11
- Operational since March 2014
- RCR (Cycle38)

Organization

- Operations
  - 1.line, 2.line & 3.line
- Development
- Frequent meetings (rotate on leaders)

Use at MET-Norway

- AROME-MetCoOp basis for official forecasts
- Post-processing of T2m, precipitation, wind, clouds, lightning

Use at SMHI

- AROME-MetCoOp part of forecast database and frequently used as «model of the day» by duty-forecasters
- Post-processing of T2m, clouds and precipitation
AROME-MetCoOp Configuration

- **Cycle 38h1.2** (8. December 2014)
- **3D-Var + surface analysis**
- **2.5 km hor. res. / 65 vertical layers**

**Cycles, lead times and cut-off**
- +66 hours at 00, 06, 12, 18 UTC, cut-off 1hr 15min, delivery ~2hr
- +3 hours at 03, 09, 15 and 21UTC (cut off ~3hr 40min)

**Pre-operational AROME-MetCoOp suite**
- +48hr at 00 & 12UTC
- +3hr at 03, 06, 09, 15, 18 and 21UTC
Data assimilation and observation usage in MetCoOP

Upper-Air 3D-Var DA  
(LSM of ECMWF at large scales)

- Conventional types of observations
- Satellite radiances from AMSU-A, AMSU-B/MHS (VarBC)
- GNSS ZTD from METO and ROBH processing sites (VarBC)

**Pre-operational run**

- Satellite radiances from IASI (passive)
- Radar reflectivity soon to be included

Surface DA based on CANARI

- RH2m and T2m from SYNOP stations
- Snow depth from SYNOP and climate stations
- SST and SIT from ECMWF
Some examples of added value compared to ECMWF
Severe wind

3 most windy days in Norway
April 2014 – March 2015
“max wind per station”
Severe precipitation

3 wettest days in Norway
April 2014 – March 2015
“24hr acc precipitation”
Some examples of model deficiencies & ongoing development
Intense summer convection
12hr acc precipitation – daytime summer

See also HIRLAM-discussion forum:
http://hirlam.org/index.php/forum/6-operational-monitoring/1146-summer-precipitation-arome-cy38h1-1
Development: Precipitation from (very) shallow convection under Arctic conditions.
Precipitation from (very) shallow convection under Arctic conditions.

In vdfhghtnhl.F90, replace ZCLDDEPTHDP=4000 m with:

Depth = 4000 \quad T_{LCL} > 20 \, ^\circ C

Depth = 1200 \quad T_{LCL} < 0 \, ^\circ C

Depth = 1200 + 140T_{LCL} \quad 0 \, ^\circ C \leq T_{LCL} \leq 20 \, ^\circ C

Where $T_{LCL}$ is the temperature at Lifting Condensation Level
Positive impact on case of April 22\textsuperscript{nd}, more precipitation along the coast, and out over sea. Note if ZCLDDEPTHDP=1500 was not enough to generate precipitation, so the clouds in this case were very shallow and still generated precipitation. (see also Poster by Lisa B.)
Cy38h1.2
HIROMB SST (from 06UTC)

Cy38h1.2
EC - SST

Cy38h1.1
EC-SST

Cy37h1.2
EC - SST

Baltic Sea coastal stations

Norwegian Meteorological Institute
2015/16 – plans

New Swedish HPC («Frost»)

MetCoOp-EPS

✓ Cycle 40
✓ AROME-MetCoOp domain
✓ Control run ~ AROME-MetCoOp

✓ Lead times?
✓ 2,5km or 3,1km?
✓ Perturbations?
✓ Multi-physics?
✓ Cut-off?
✓ ..
✓ ..
Summary

- The co-operation increase our HPC-capacity, and give us a broader knowledge of the model system.

- In general we are satisfied with model quality and the model output is widely in use at SMHI and MET-Norway.

- The update from Cy38h1.1 to Cy38h1.2 was very beneficial for temperature (still a small cold bias) and cloud cover (not shown).

- Compared to ECMWF, AROME-MetCoOp add value in forecasting temperature, wind, and precipitation.

- AROME-MetCoOp has deficiencies w.r.p.t shallow convection in polar regions, too intense summer convection (Cy38h1.1) and the use of ECMWF SST is not optimal in certain regions/seasons. There are also issues connected to fog/low stratus and lower tropospheric temperature gradients (not shown).

- The pre-operational suite use IASI (passive mode) and soon radar reflectivity.

- Next step is new Swedish HPC and MetCoOp-EPS.
Thank you for your attention!