Hirlam physics developments

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with contributions from many others

Overview

- ## Mesoscale physics
  - ### Experience with Aladin/AROME (talks of Andersen and Niemela)
  - ### EDMF
  - ### HIRALD (Andersen)

- ## Synoptic scale
  - ### Surface scheme (snow scheme, lake scheme)
  - ### Convection/Condensation (STRACO & KF-RK)
  - ### Tuning of model for stable PBL
  - ### Problem solving (soil ice, fog over sea)
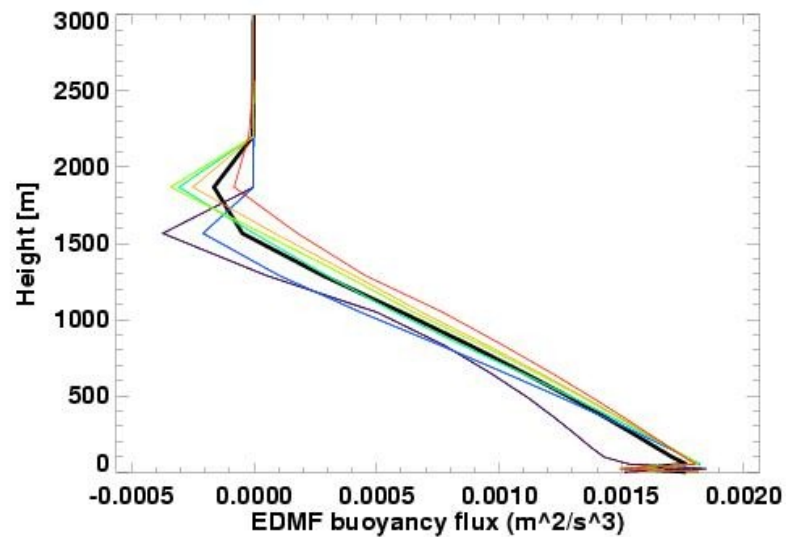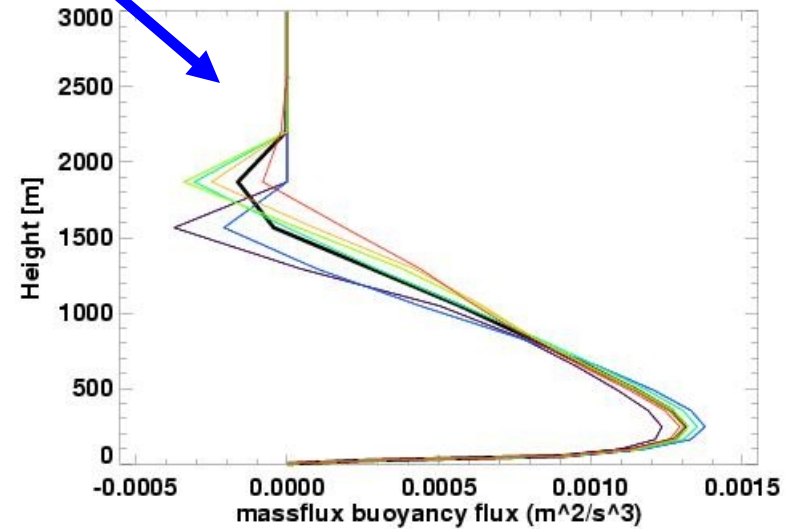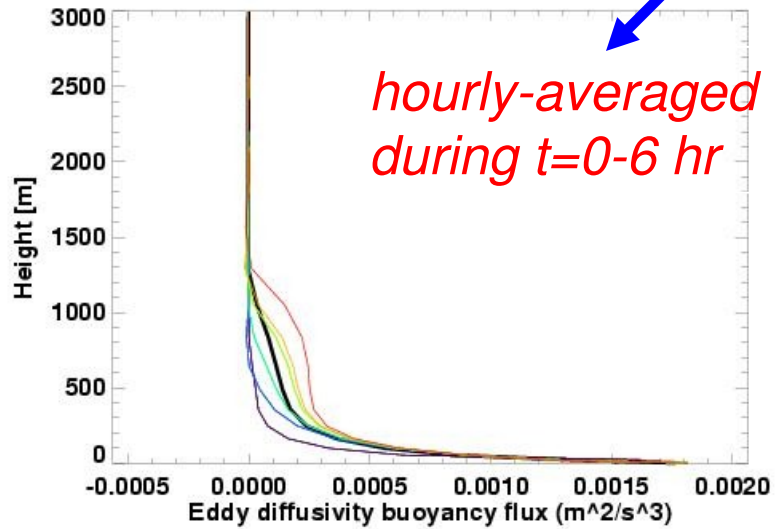
- Aladin run for coupling of HIRLAM to AROME in FMI/SMHI/DMI

- AROME run in FMI, SMHI (2) and DMI

- Already quite some experience with AROME in conditions not regular in Aladin countries (winter, less importance of orography)

- Communication of experiences with AAA can improve, through mailinglists (mesoscale@hirlam.org or other?) and/or web-pages on Hirlam.org-server, newsletter articles

- More in talks of Andersen and Niemela

EDMF

- Good cooperation between AROME developers and HIRLAM (and ECMWF)
- Turbulent fluxes determined by local eddy diffusion combined with mass flux scheme for strongest eddies and moist shallow convection
- Problems with decoupling in stratocumulus
- Scheme must prove itself in NWP-setting, now being developed in academic 1D cases
- Example: clear boundary layer

EDMF

hourly-averaged values during t=0-6 hr

Total buoyancy flux dominated by mass flux contribution

HIRALD

- Complete set of HIRLAM upper air physics in Aladin system

- TKE-turbulence scheme with some options (dry/moist, with/without cloud ice), fast radiation scheme, STRACO convection and condensation scheme

- Works OK now without systematic internal problems

- Code in Aladin very close to HIRLAM code, so development can be done in both frameworks

- Agreement on interface

- Mast-verification of RCR & ARPEGE agains mast-observations (Sodankyla and Cabauw)

- Extension with more models (other HIRLAM versions, AROME-N of SMHI)

- Validation of surface fluxes, radiation, boundary layer mixing
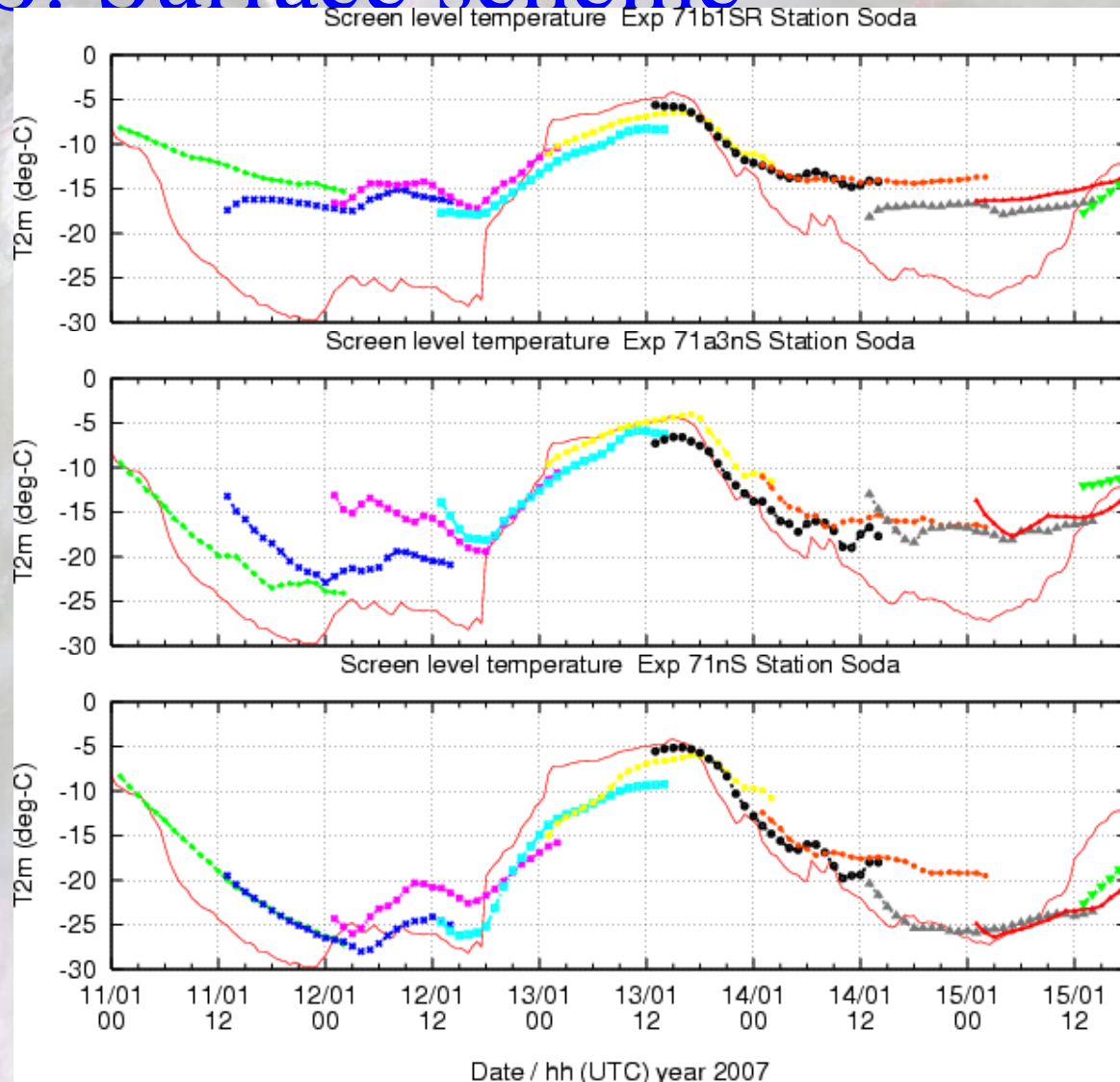
- Visible via hirlam.org

S: Surface scheme

- Prior problems with snow scheme:
  - Too quick cooling in clear conditions with snow cover (T2m translation, too quick snow?)
  - No impact of surface analysis (bug)
  - Too low temperatures in forest in warm summer conditions (climate)
- Most problems now reduced or solved in Hirlam 7.0, 7.1?
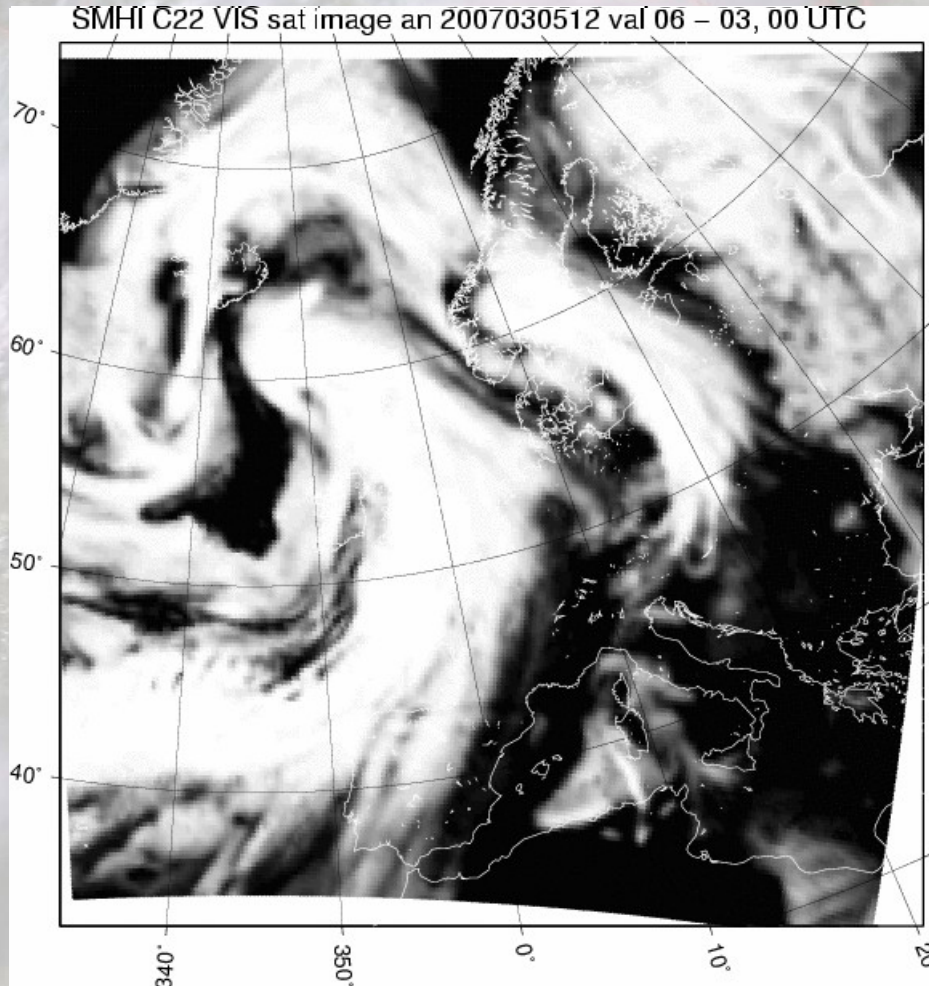- Lake scheme included in new surface scheme, can now be ported to SURFEX

S: Surface scheme

Screen level temperature Exp 71b1SR Station Soda

Screen level temperature Exp 71a3nS Station Soda

Screen level temperature Exp 71nS Station Soda

Date / hh (UTC) year 2007

S: Convection/condensation

- https://www.hirlam.org/~tijm/satcomp.html

SMHI C22 VIS sat image an 2007030512 val 06 – 03, 00 UTC

S: Convection/condensation

- Intercomparison between STRACO and KF-RK
- Many changes in both schemes due to 'competition' and comparison with other scheme
- Find best scheme, next reference. Inter-comparison in May-June, results before end of summer
- Stop development (except for SREF plus obvious bug fixe
- Aim free resources at mesoscale convection and condensation schemes
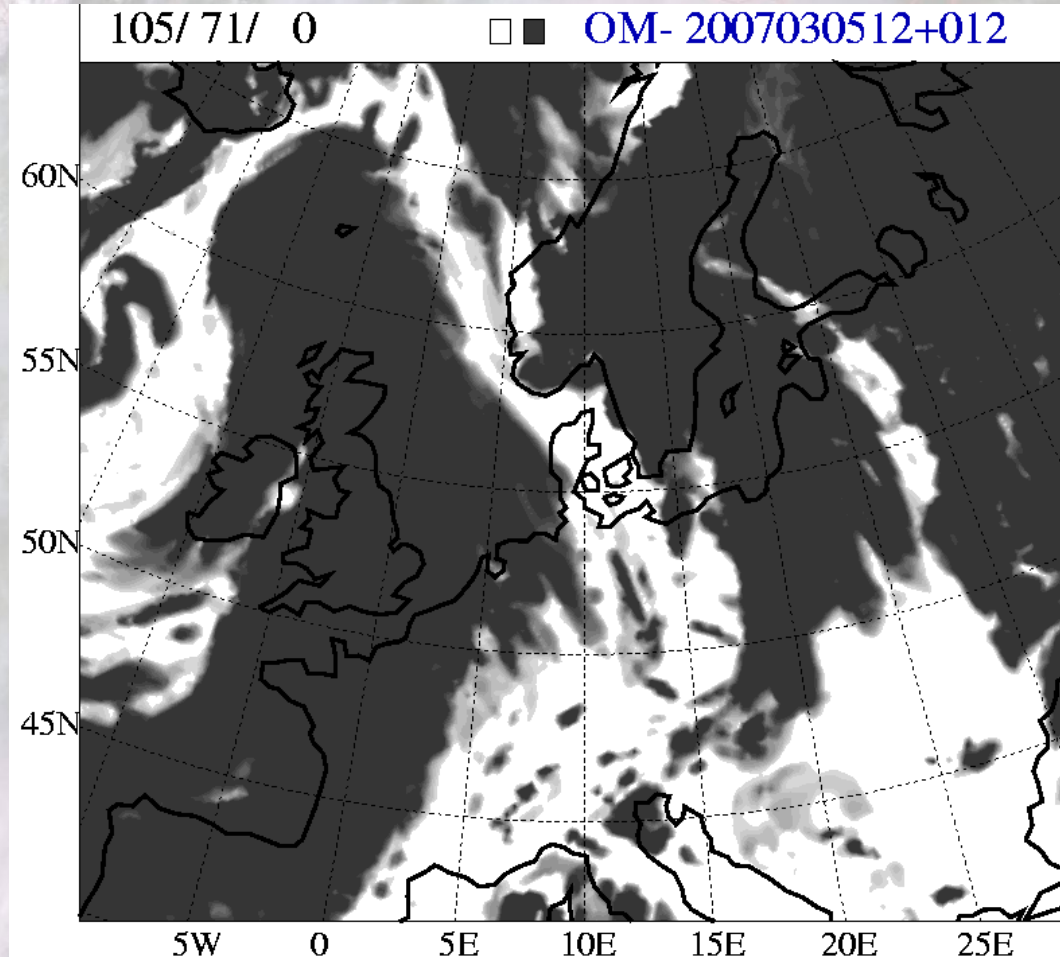- Workshop on working with mesoscale model in September for physics developers

- Intercomparison good for finding deficiencies

M:
HIRALD-
ALARO-
AROME-

Comparison?

S: Tuning

- Surface stress turning still in model
- Positive bias in wind speed for weak wind
- Maximum low level jet too high above surface (Cabauw)
- Too much mixing in stable conditions
- Remove extra mixing, remove surface stress turning, adjust something else (surface fluxes of heat, moisture and momentum, displacement height in stable conditions)?

- Reported problem with surface temp. in AROME/Aladin due to soil ice from Hirlam input (DMI, FMI & SMHI)

- Also with surface temperature in Hirlam in small areas (KI Ivarsson)

- Caused by error in more rapid soil ice thawing

- Important remaining problem: Fog over sea in spring and summer (too much)

S: Problem solving

[Run from Mon at 06Z par typ lev 11 105 954][438x284]
48H fct valid Wed 14-Feb-2007 at 06Z : 954 105Temperature   fc2007021206+048exp08

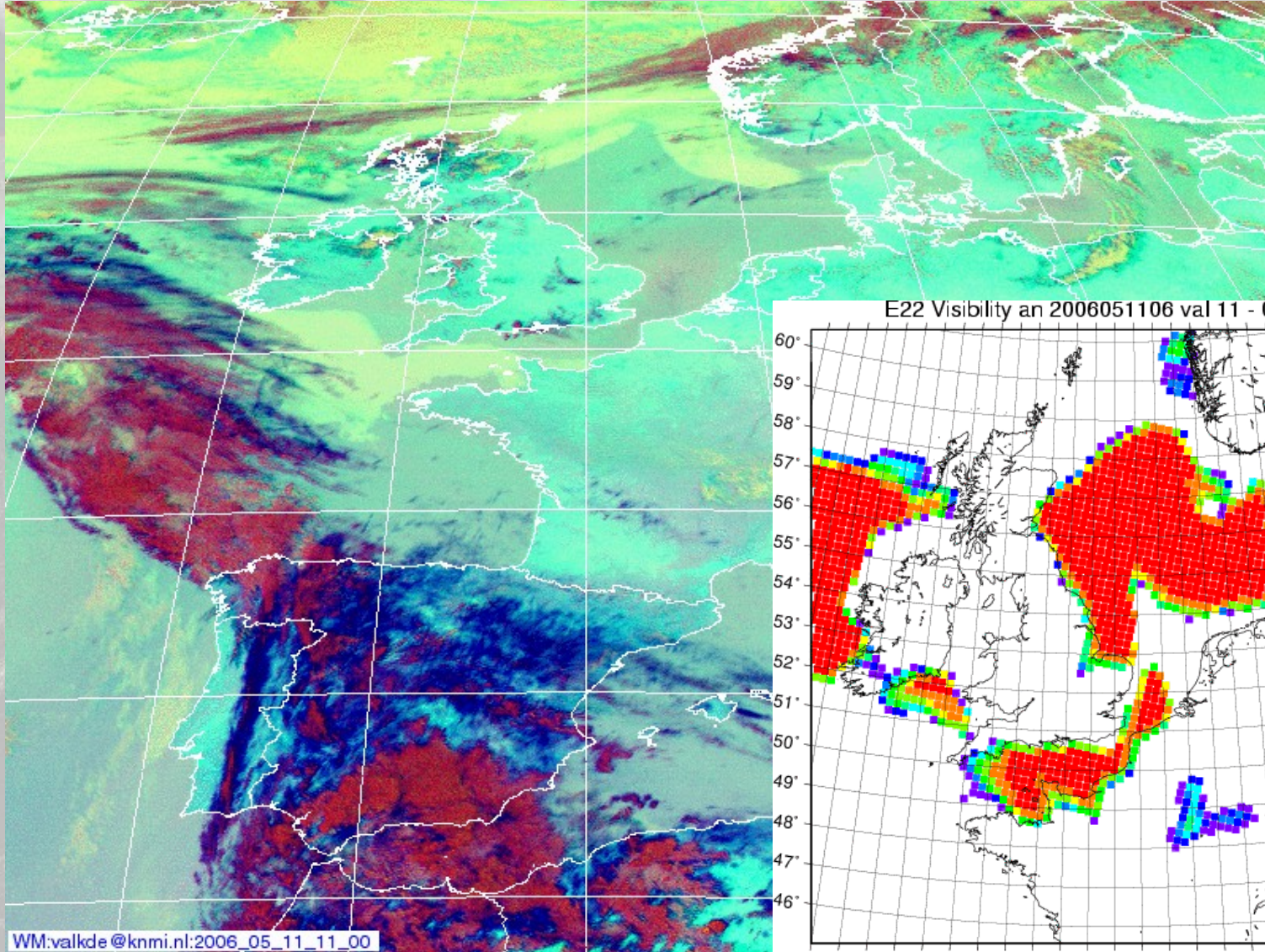Date and time of plot : 14:40:58 11-Apr-07   User : aidan
min-3.06E+00,max 1.46E+01,ave 9.08E+00,abs 9.12E+00,rms 9.46E+00   zer 0.00E+00,del 1.00E+00

min-8.94E+00,max 1.36E+01,ave 8.72E+00,abs 8.83E+00,zers 0.00E+00,del 1.00E+00

Fog over the sea

E22 Visibility an 2006051106 val 11 - 05, 11 UTC

WM:valkde@knmi.nl:2006_05_11_11_00