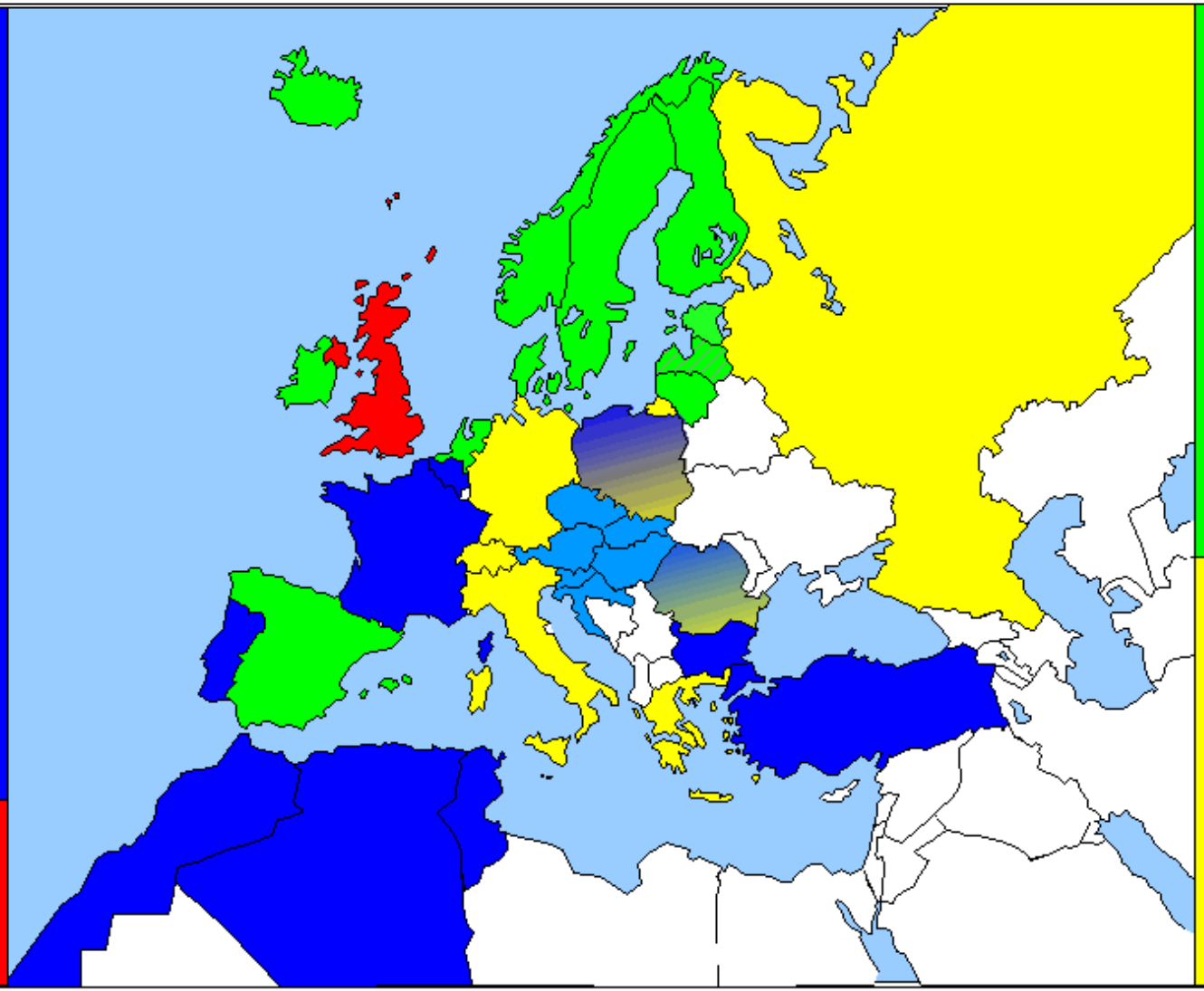
ALADIN overview

Piet Termonia

http://www.cnrm.meteo.fr/aladin/

SRNWP Consortia in Europe



ALADIN
Algeria
Belgium
Bulgaria
France
Morocco
Poland
Portugal
Tunisia
Turkey

Austria
Croatia
Czech Rep.
Hungary
Romania
Slovakia
Slovenia
LACE

UKMO
United Kingdom

HIRLAM
Denmark
Estonia
Finland
Iceland
Ireland
Lithuania
Netherlands
Norway
Spain
Sweden
(Latvia)

COSMO
Germany
Greece
Italy
Poland
Romania
Russia
Switzerland

IFS/ARPEGE/ALADIN/ALARO/AROME code universe

<table>
<tr><th></th><th>Reanalysis</th><th colspan="2">Numerical Weather Prediction</th><th>Climate</th></tr>
<tr><td>Global</td><td>ERA-40
ERA-Int, ...</td><td>IFS</td><td>ARPEGE</td><td>ARPEGE-clim,

CNRM CMIP runs</td></tr>
<tr><td>Meso scale</td><td rowspan="2">Downscaling</td><td rowspan="2"></td><td>ALADIN</td><td>ALADIN-climate

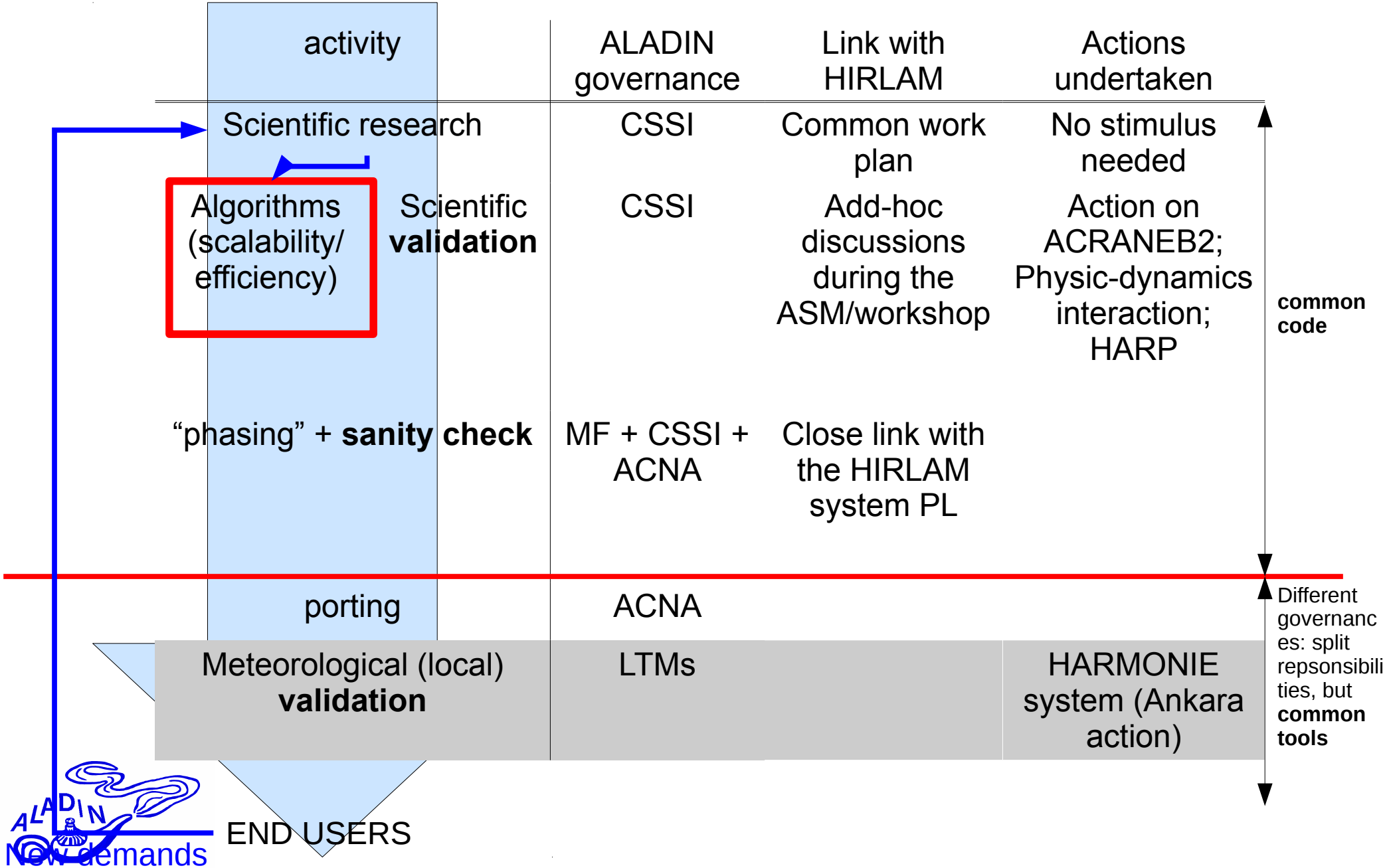
ENSEMBLES, CORDEX, ...</td></tr>
<tr><td>Convection permitting</td><td>HARMONIE
ALARO
AROME</td><td>ALARO-climate

AROME-climate</td></tr>
</table>

Organizational matters

- Main occupation: the redaction of the next MoU(s), The current one will end at the end of 2015.
- Since we use the same code as HIRLAM we should try to write MoUs that are more consistent.
- This has been recognized by both the ALADIN General Assembly and the HIRLAM council
- The common part is the code.
- Hence we need to refine the management structure(s) for a better coordination of code design / development / maintenance.

From science to operations summarized on 1 sheet



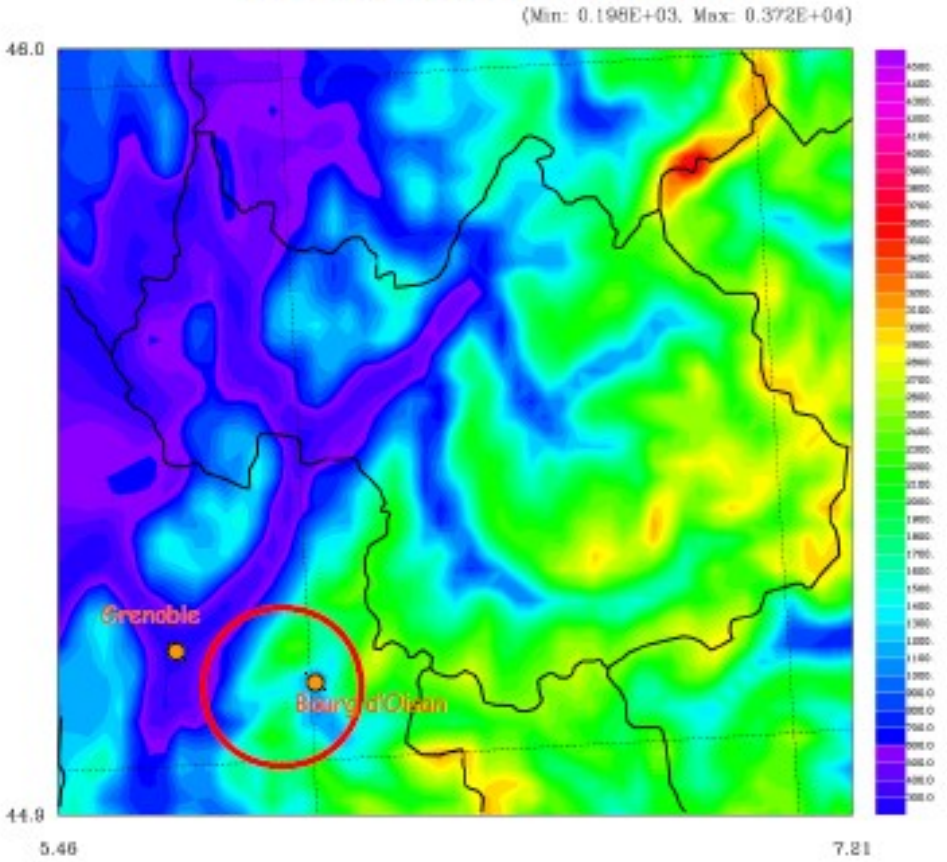
Scientific/technical developments, some highlights

- Defintion of the model configurations via a flexible physics-dynamics interface, to manage the two configurations AROME and ALARO.
- Preparation at Météo France to run AROME operationally at a resolution of 1.3 km:
  - New orography (GMTED2010 instead of GTOPO20).
  - Evaluation shows significant improvements (RR6, V10m). Still some questions concerning T2m.
- Mutli-scaleness (“seamlessness”) of ALARO is confirmed:
  - in the WMO WGNE experiment
  - In a statistical sense in long runs (climate validation)
- preparation of a new baseline ALARO-1 (new turbulence scheme, a final version of the radiation scheme ACRANEB2, some new feature of the microphysics, prognostic graupel and cloud overlap).
- Preparation to supplement the code with a non-spectral solver. Some first theoretical studiy was carried out (Caluwaerts et al. 2014, QJRMS)
- Advances in a new discetization in the vertical with finite elemeents (VFE).

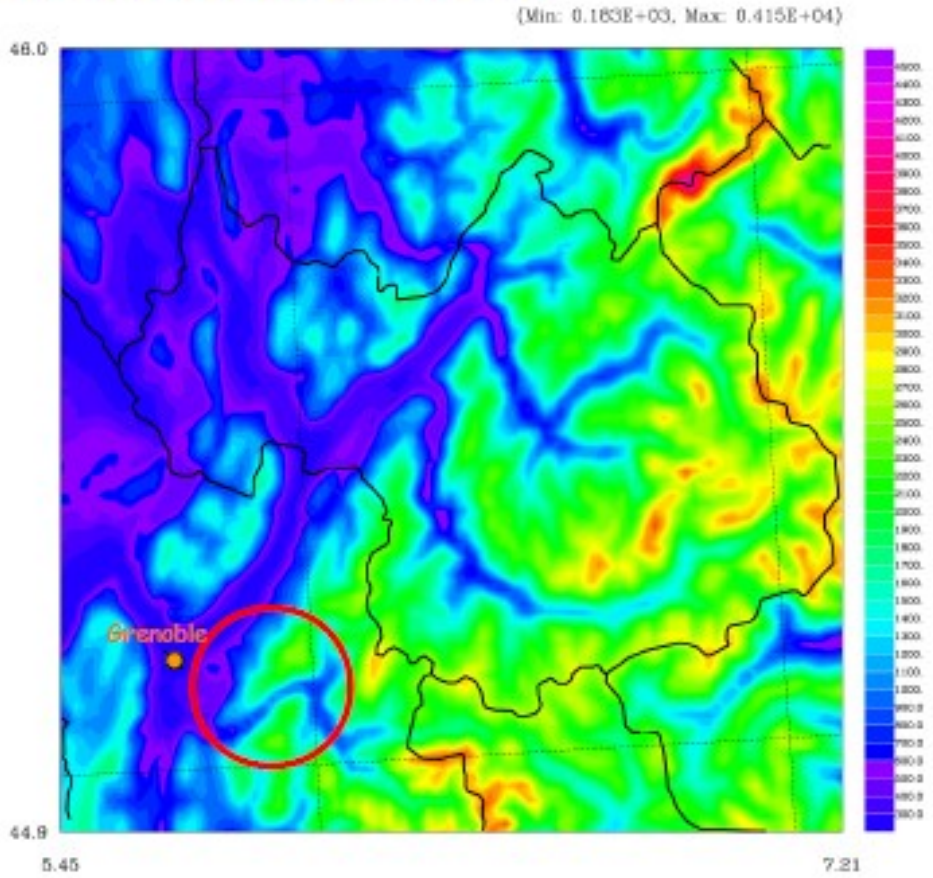
Horizontal grid AROME-France 1.3km : zoom over the Alps

- Deeper valleys, higher peaks

Zoom_Savoie_2.5km :

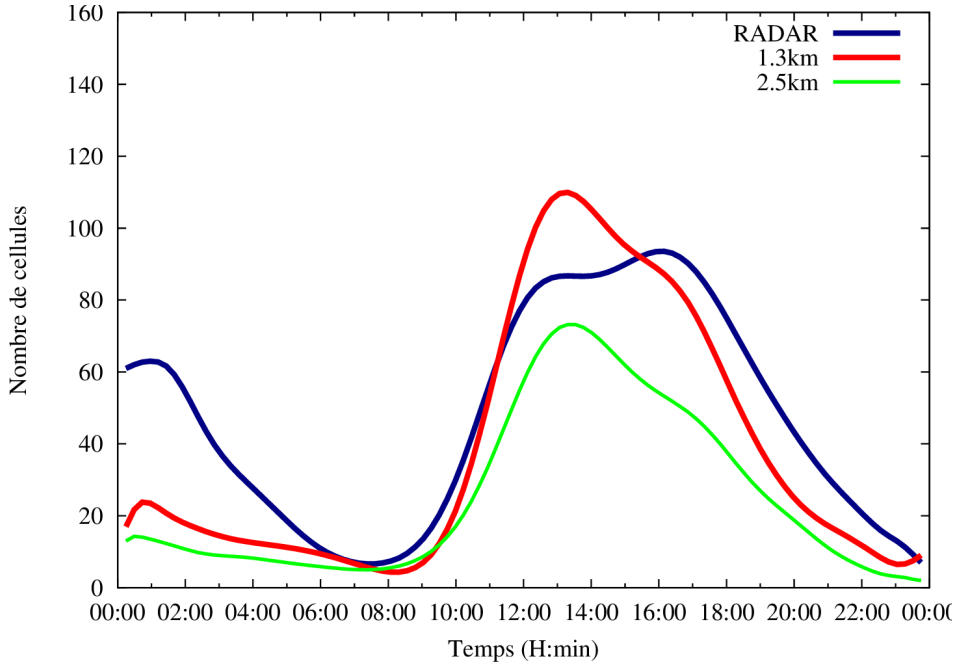


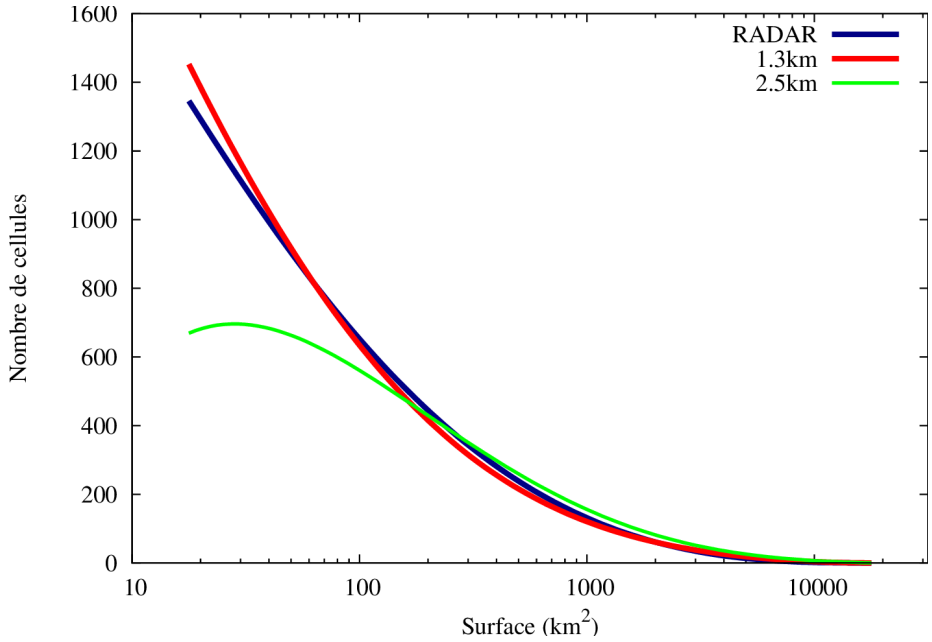
Zoom_Savoie_1.3km :



Evaluation of model performance other than by scores or case studies: Automatic detection of convective cells

21 June 2012 : 41dBz





1.3 km: nb of small convective cells increased and nb of big cells decreased

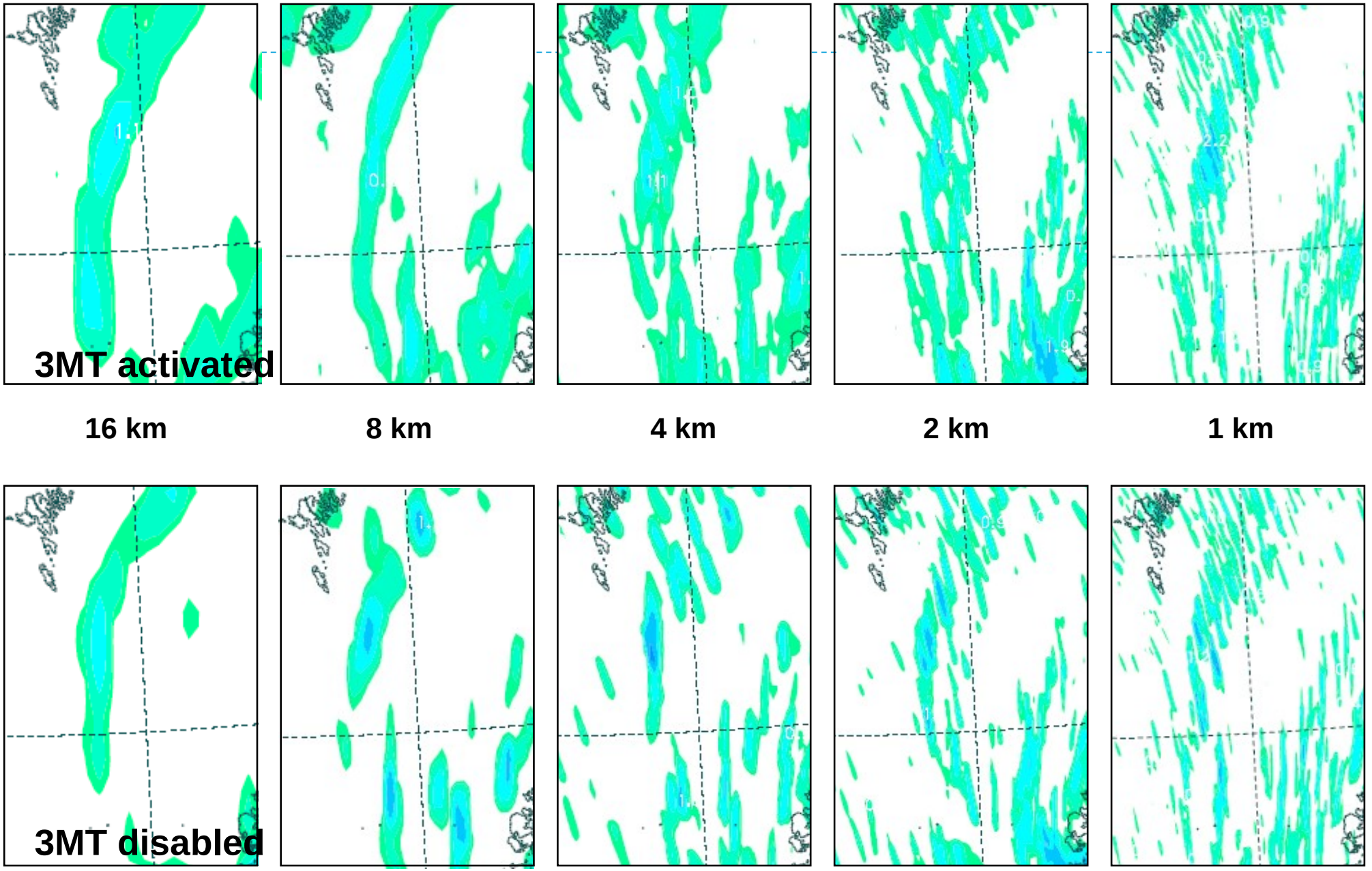
1.3 km: closer to observed radar reflectivity

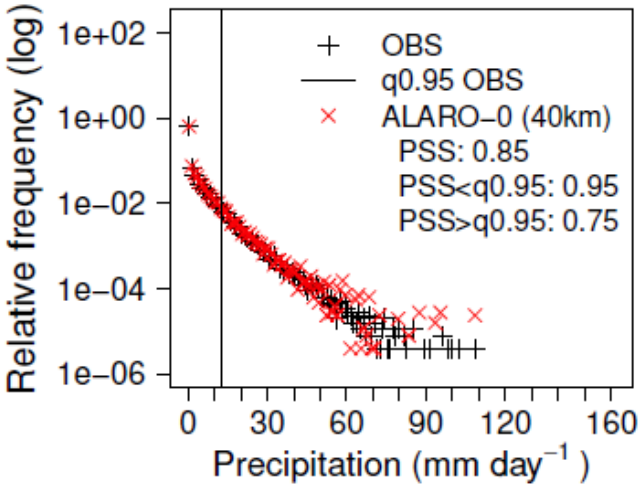
Strong impact of semi-lagrangian horizontal diffusion (not shown)

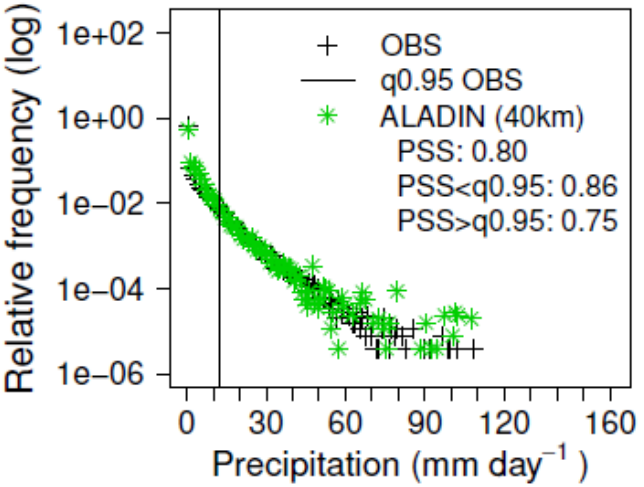
Small impact of spectral diffusion and time-step (not shown)

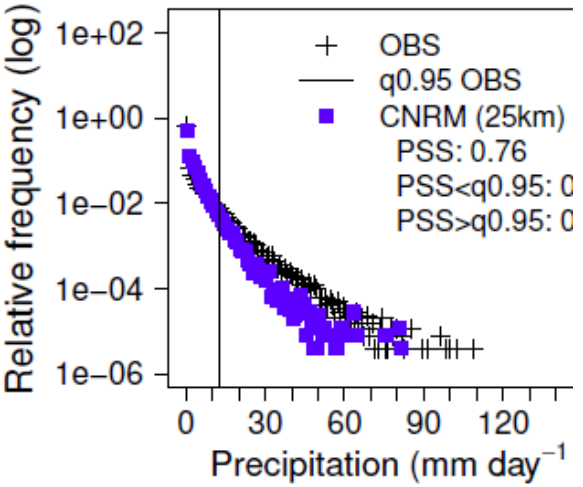
(J. Léger, D. Ricard, Y. Seity)

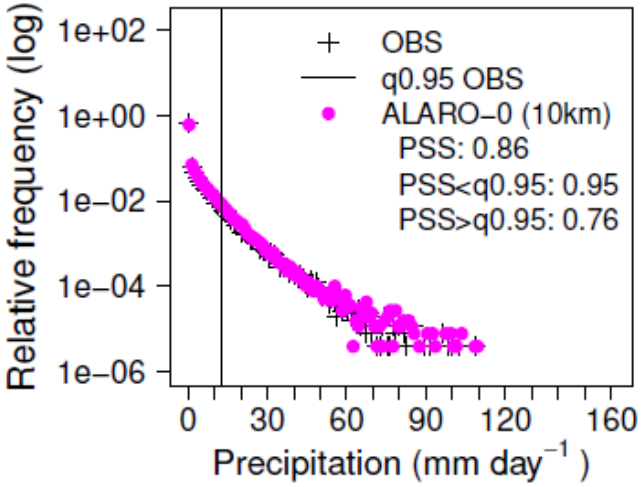
WGNE grey-zone test, ALARO-0, 1h precipitation (30.1.2010 12+31h)

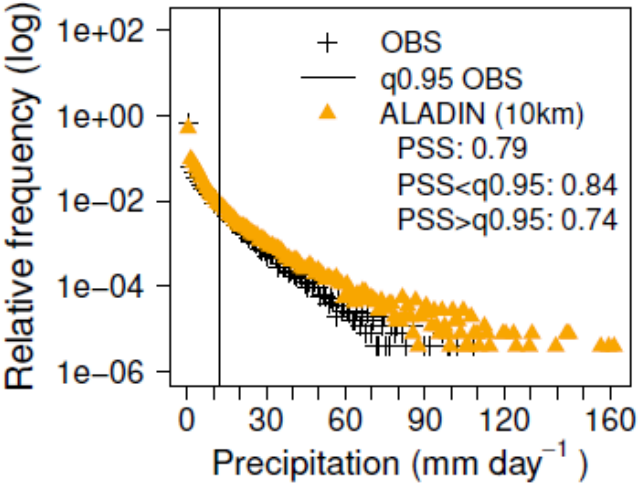


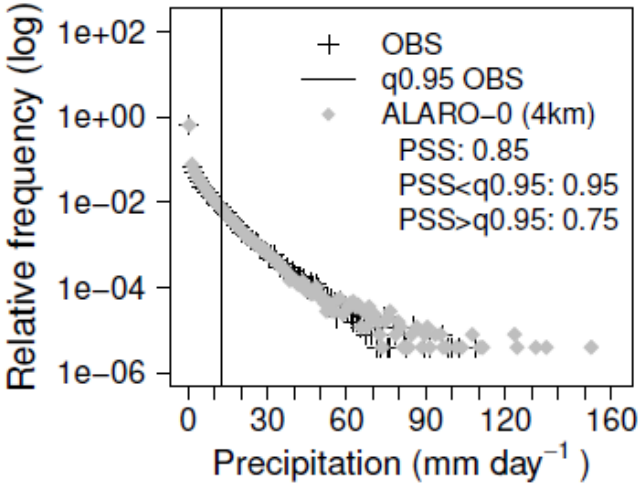






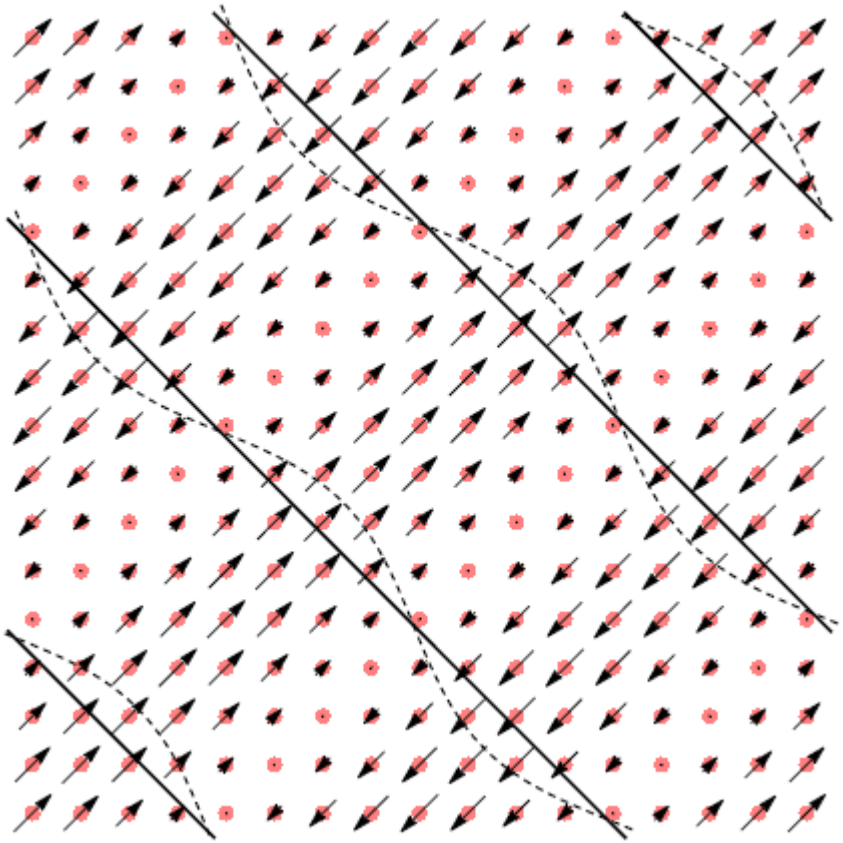


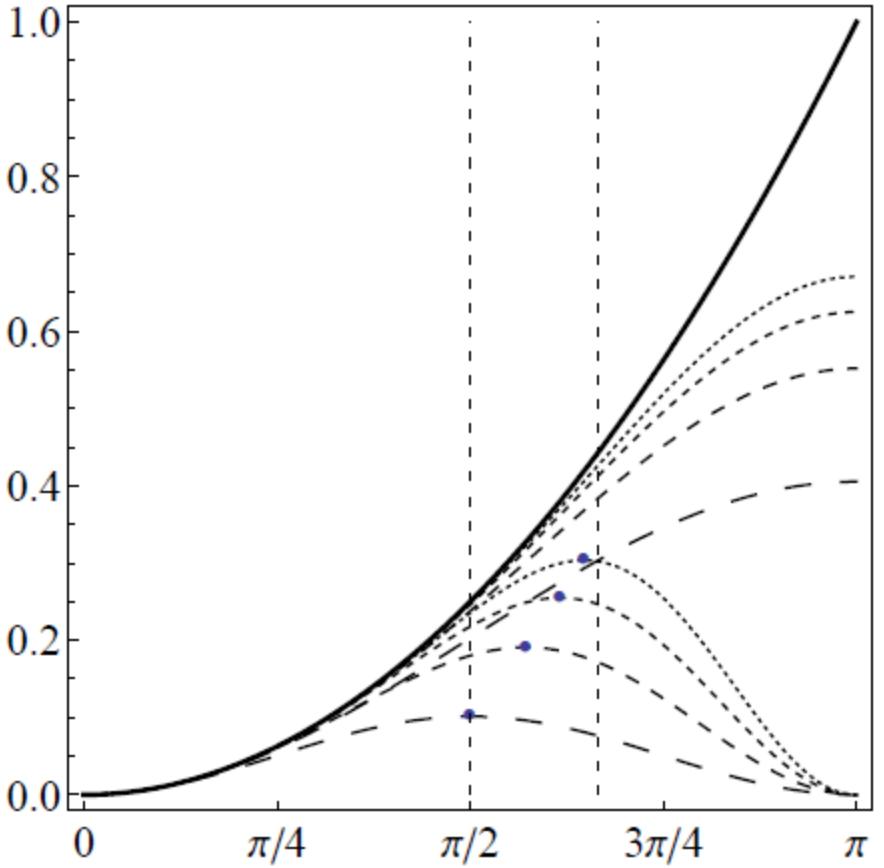




De Troch, Hamdi, Van De Vyver, Geleyn, Termonia 2013:
Multiscale Performance of the ALARO-0 Model for Simulating Extreme Summer Precipitation Climatology in Belgium, *J Climate*, DOI: 10.1175/JCLI-D-12-00844.1

Response of A Grid and C Grid for vortical mixing (Adv T)



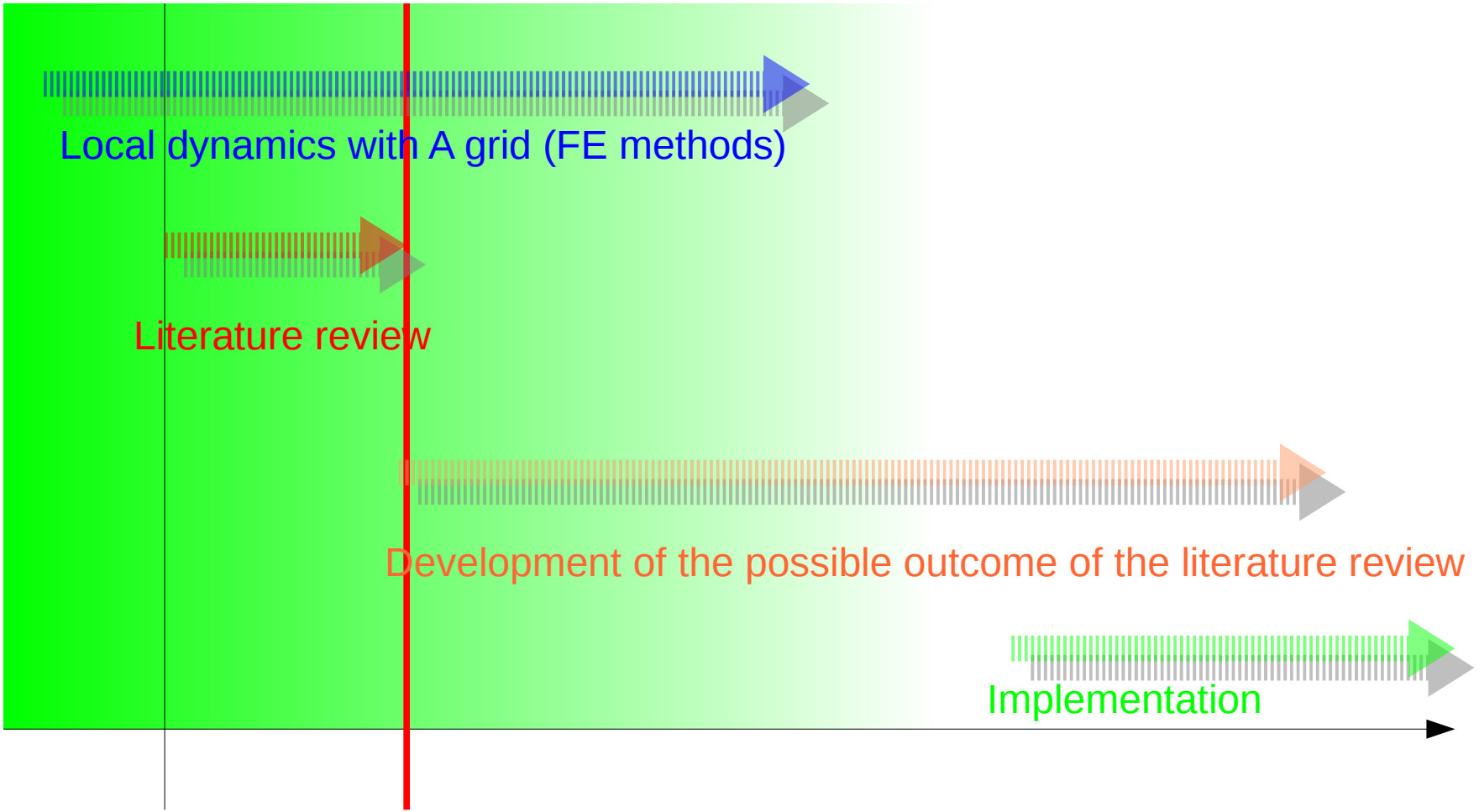


Bottom curves: C-grid; Middle curves : A-grid. Top curve: exact response. The four curves for A and C grids are for accuracy orders 2, 4, 6, 8 in decreasing order of dashing length. Coutresy P. Bénard

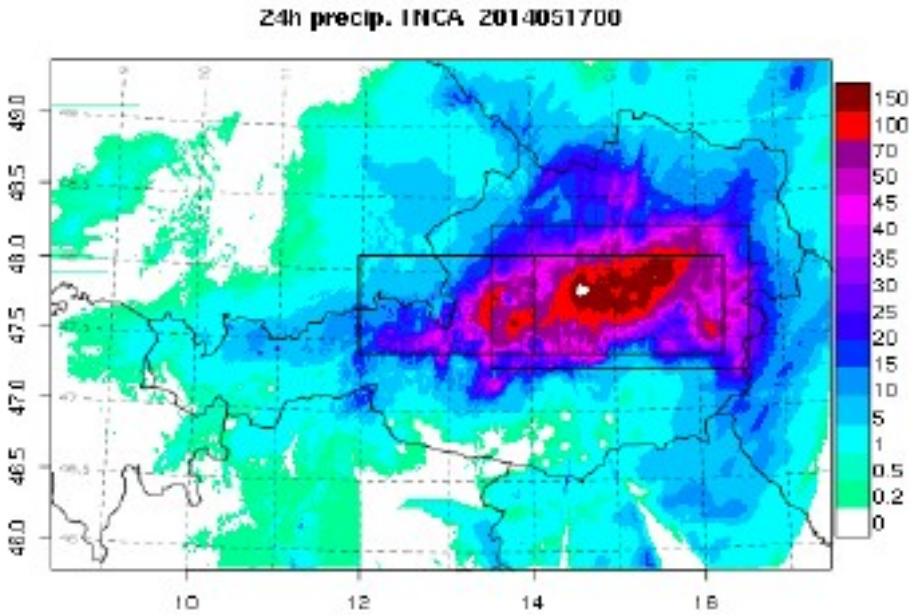
So here C grid is bad and A grid is good

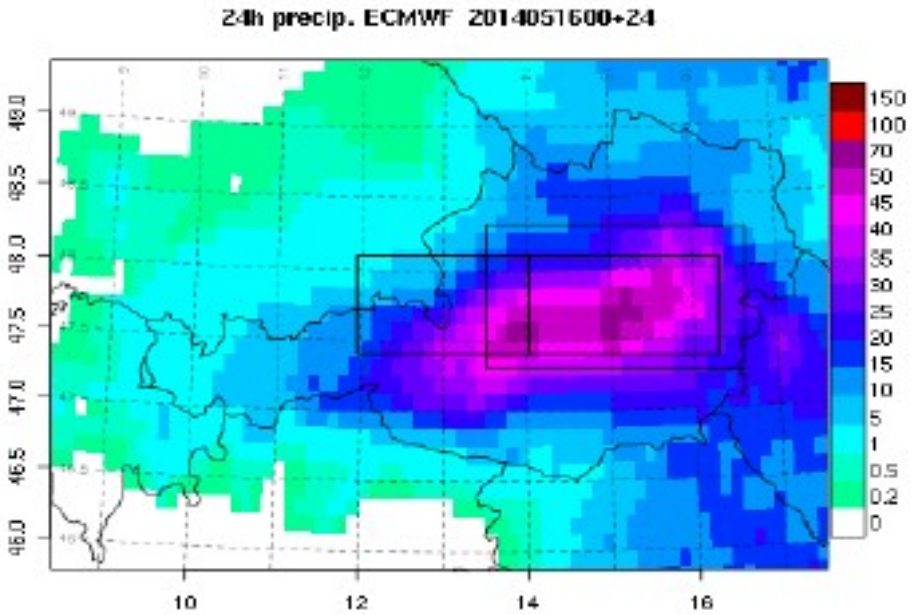
Dynamics: road map

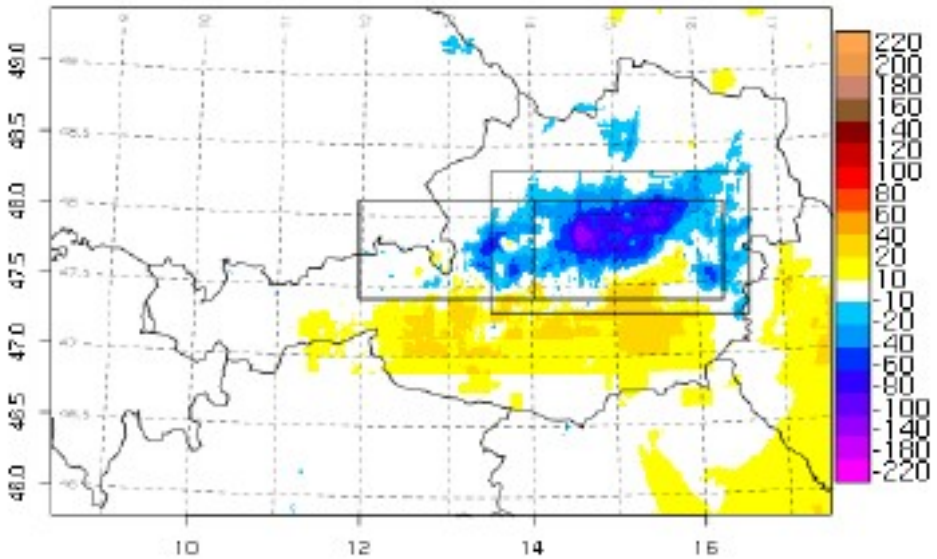
Eliminating the A grid means we have to overhaul the whole system.
We stay with the current system at least for the term of the current strategy plan (green area).



AROME – AUSTRIA: examples of performance







SAL für Region NORDSTAU_NOE_OOE:

Structure:	0.74	Mean Sum Forecast [mm]:	36.89
Amplitude:	-0.35	Mean Sum INCA [mm]:	52.37
Location:	0.05		

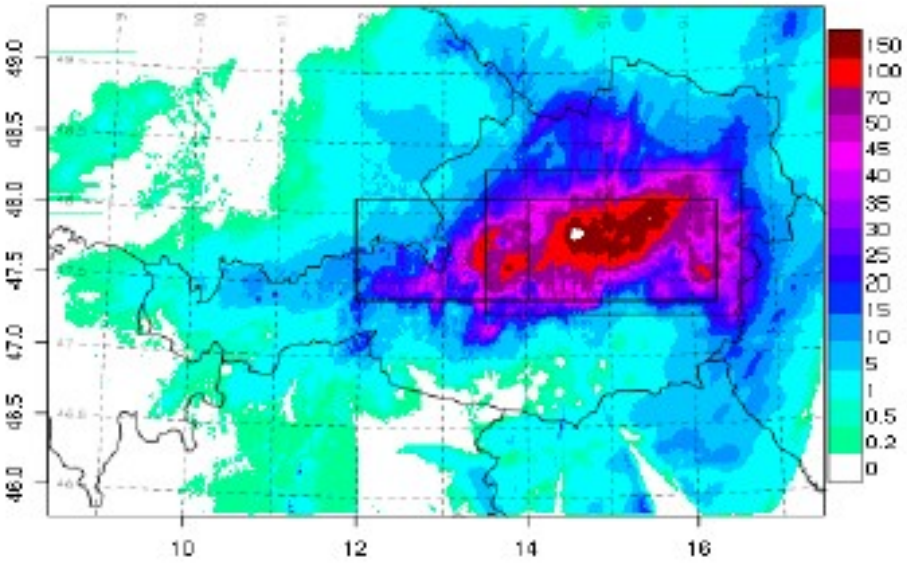
Contingency Table %: Threshold=50mm

Hits:	0.04
False Alarms:	0.01
Missed:	0.4
Corr. Negatives:	0.54

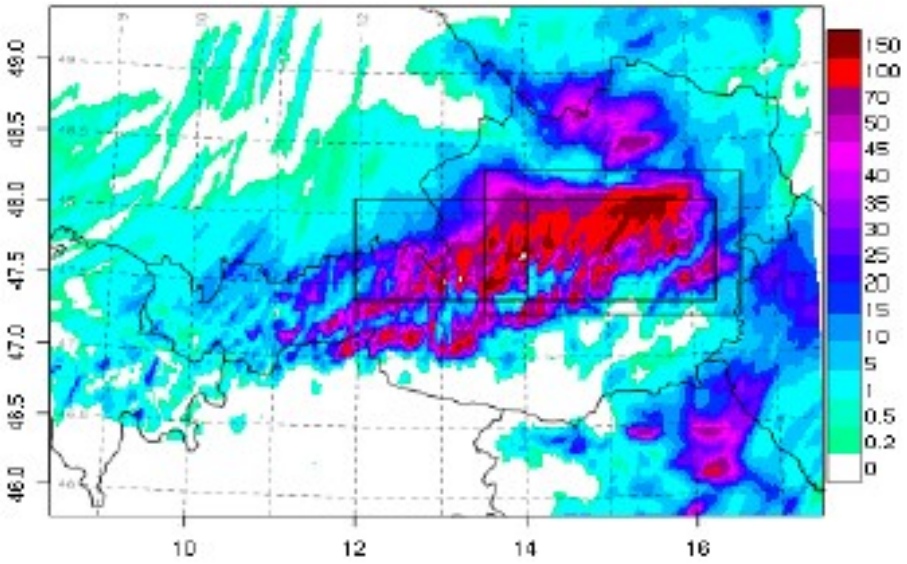
RR-class: 4 - Convective Large-Scale

AROME – AUSTRIA: examples of performance

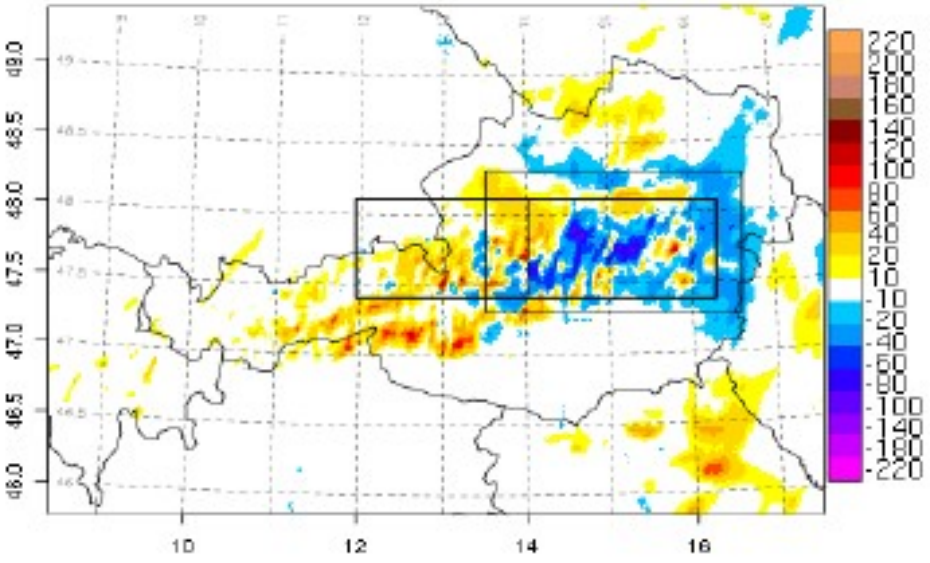
24h precip. INCA 2014051700



24h precip. AROME 2014051600+24



24h precip.diff. AROME 2014051600+24 minus INCA



SAL für Region NORDSTAU_NOE_OOE:

Structure:	-0.11	Mean Sum Forecast [mm]:	48.14
Amplitude:	-0.08	Mean Sum INCA [mm]:	52.37
Location:	0.05		

Contingency Table %: Threshold=50mm

Hits:	0.34
False Alarms:	0.14
Missed:	0.11
Corr. Negatives:	0.42

RR-class: 4 - Convective Large-Scale

Main issues (as I see it) for Short-range NWP

- Scalability (numerics, platforms, ...)
- Topographic/physiographic datasets (for the high resolutions)
- Demonstrating our added value with respect to the global models, and the need for EPS.