

AROME 500m, some preliminary results

Convection days, 24-25 November 2008

Outline

After a brief presentation of the configuration, I will show various aspects of Arome 500m runs, and their comparison with Arome-France.

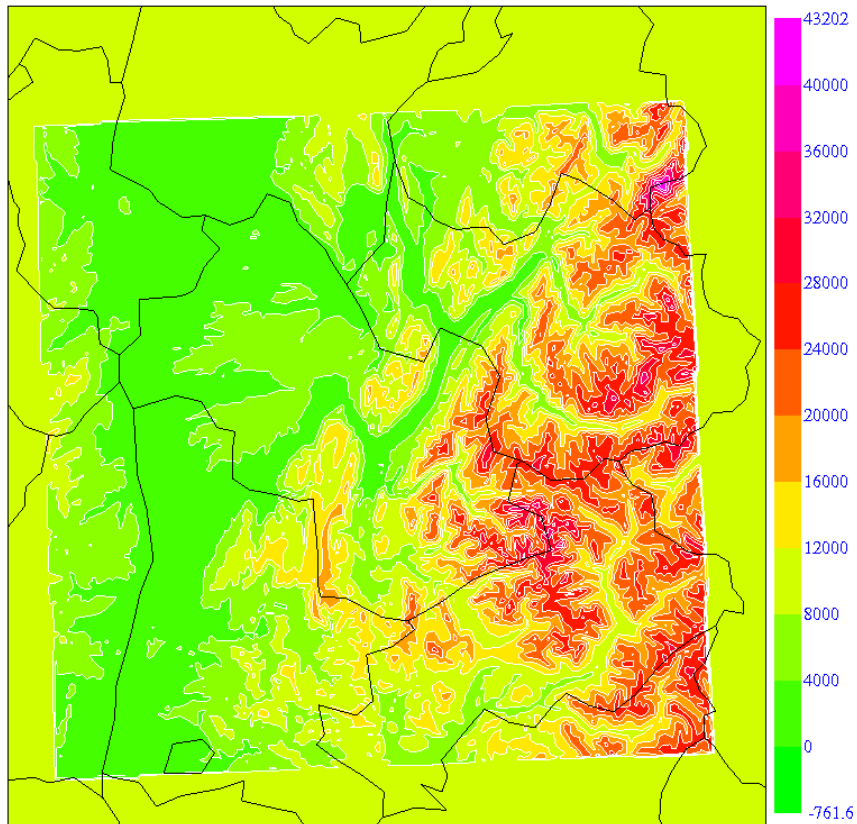
AROME 500m configuration

- 60 vertical levels
- Hydrometeors are coupled
- LGWADV = .TRUE.
- Predictor corrector scheme
- timestep=10s
- Coupling to AROME-FRANCE (2.5 km)
- A sponge is applied (Linear forcing towards coupling files for the last 10 levels)

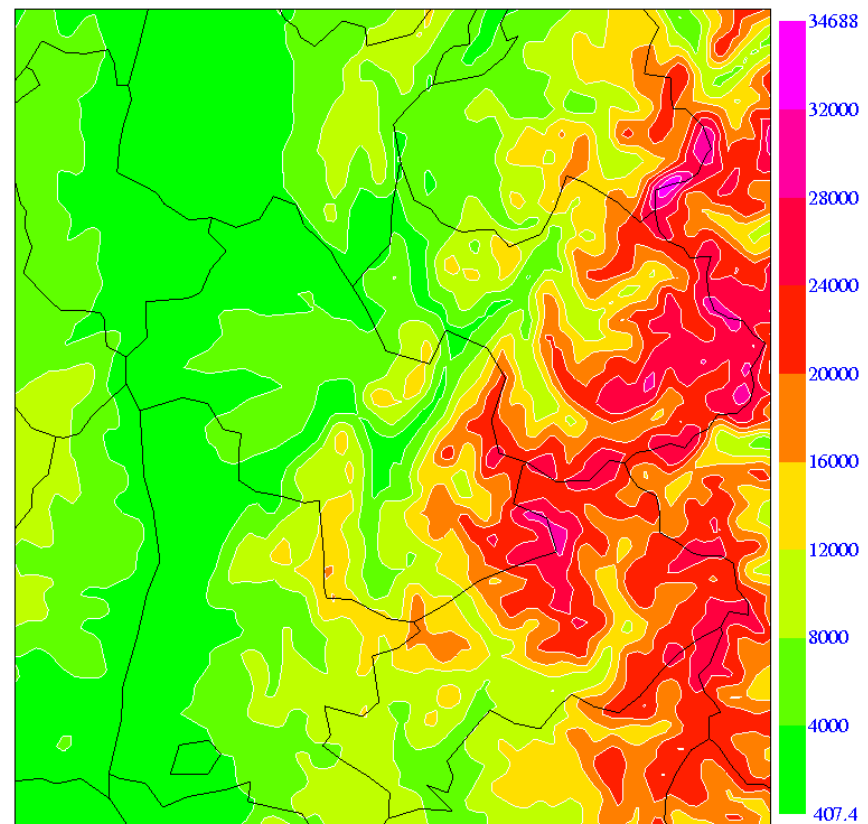
Sponge effect is important, otherwise spurious gravity waves cause wind too strong in the upper part of the atmosphere.

Orography

orography 500m



orography 2.5km

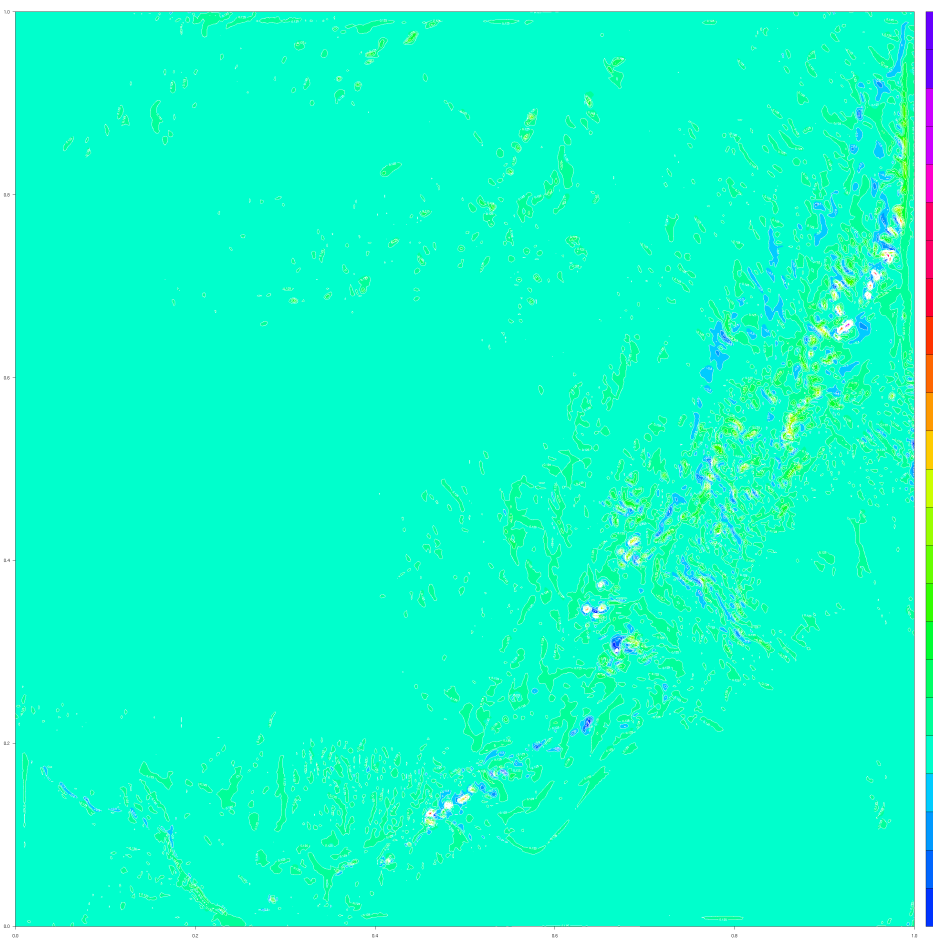


- I will now focus on one specific day : 19/08/2008.
- It is a casual convective summer day over the alps. No Squall lines, no multi-cellular systems, only mild convection leading to classic precipitations.
- All the run are starting from an AROME analysis at 12H00 in dynamical adaptation mode.

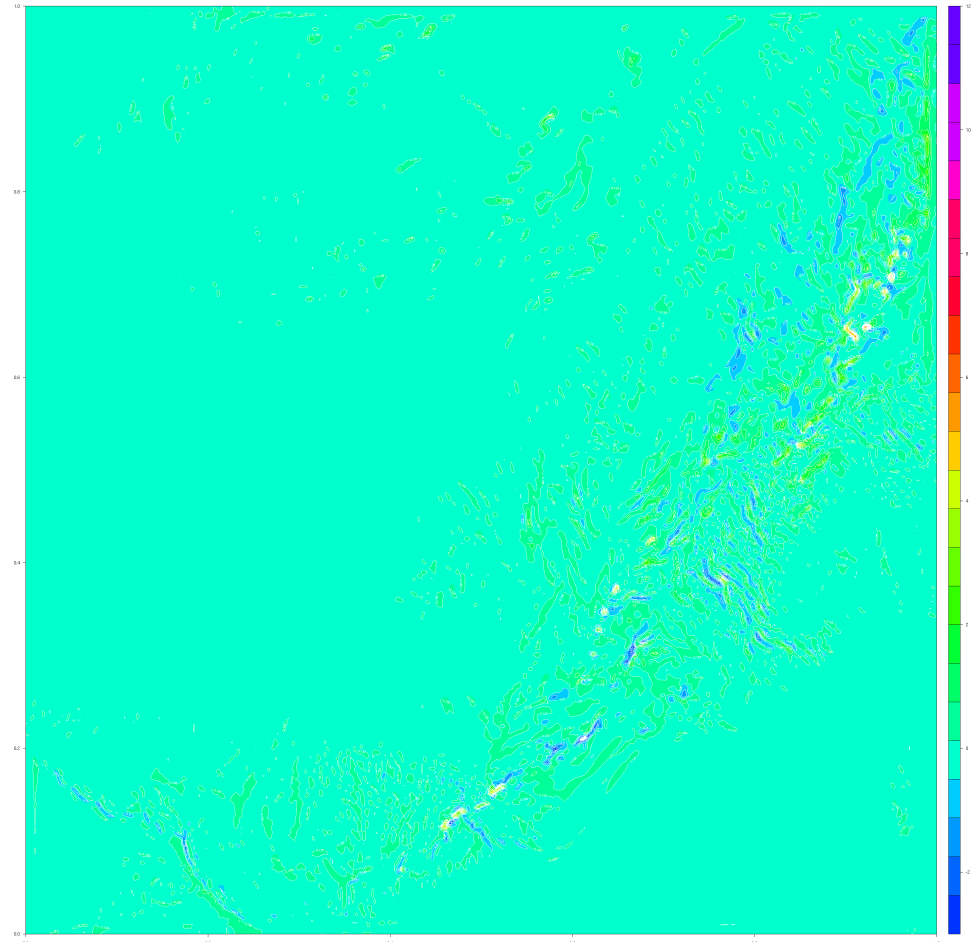
- In the following slides, I will show a comparison of 2 AROME-FRANCE forecasts, one in hydrostatic mode, the other one in non-hydrostatic mode.

H/NH effects

- AROME-FRANCE 2.5km whole domain, **vertical velocity** at 3km height, AROME-FRANCE domain.



H



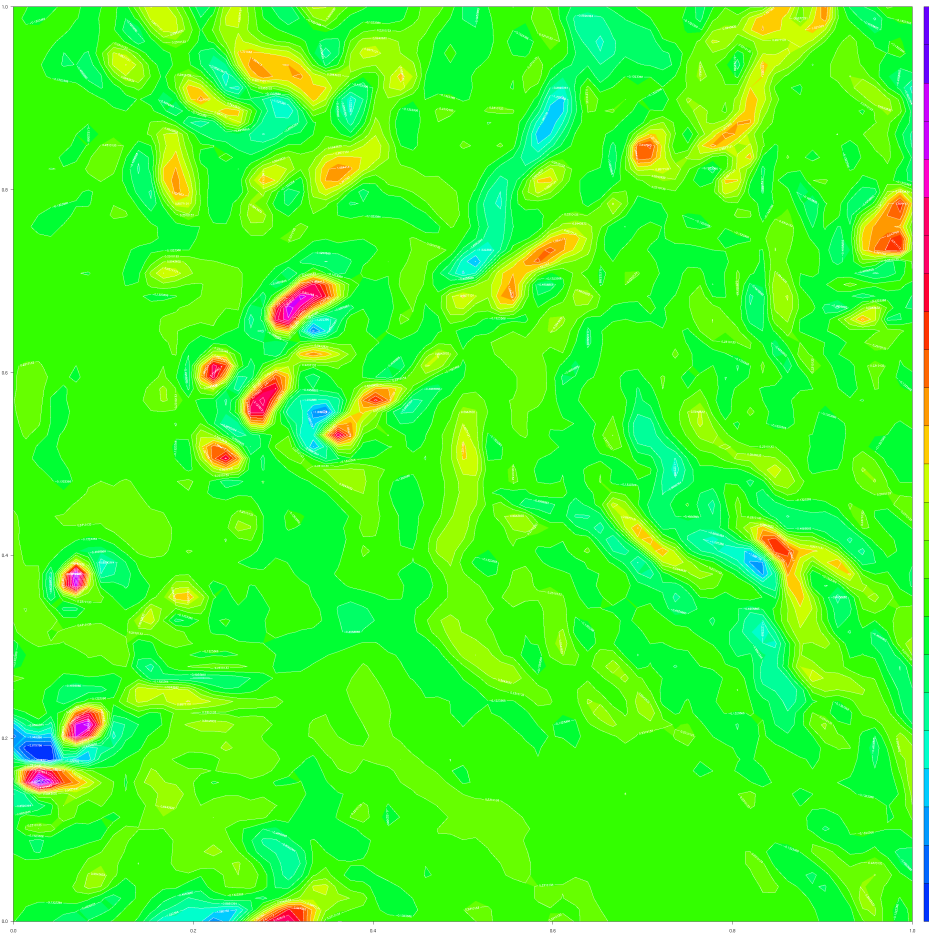
NH



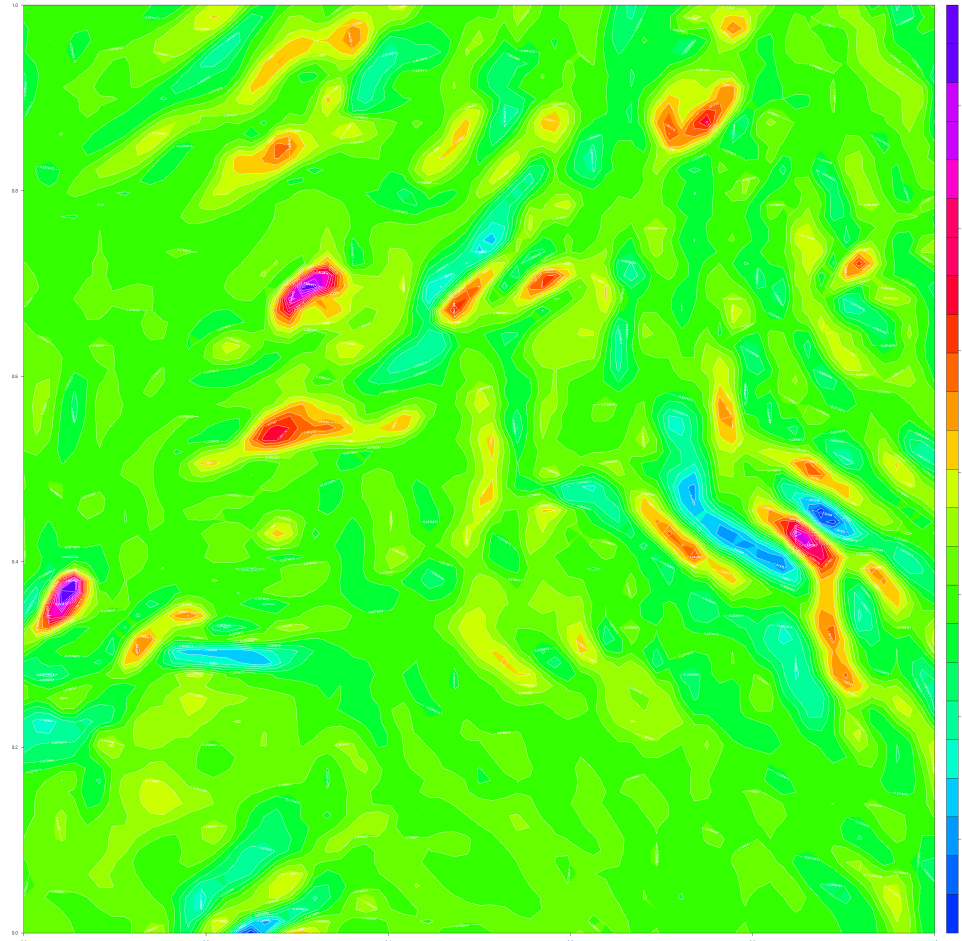
METEO FRANCE
Toujours un temps d'avance

H/NH effects

- AROME-FRANCE 2.5km whole domain, **vertical velocity** at 3km height, zoom over the alps.



H



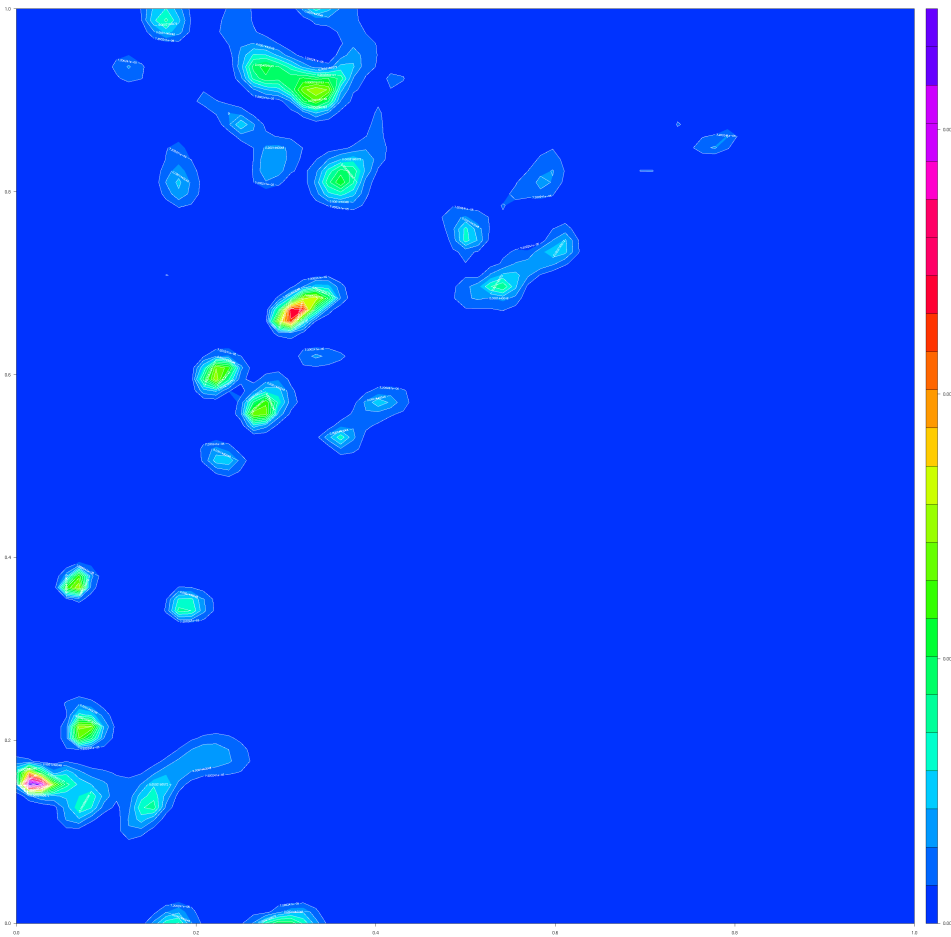
NH



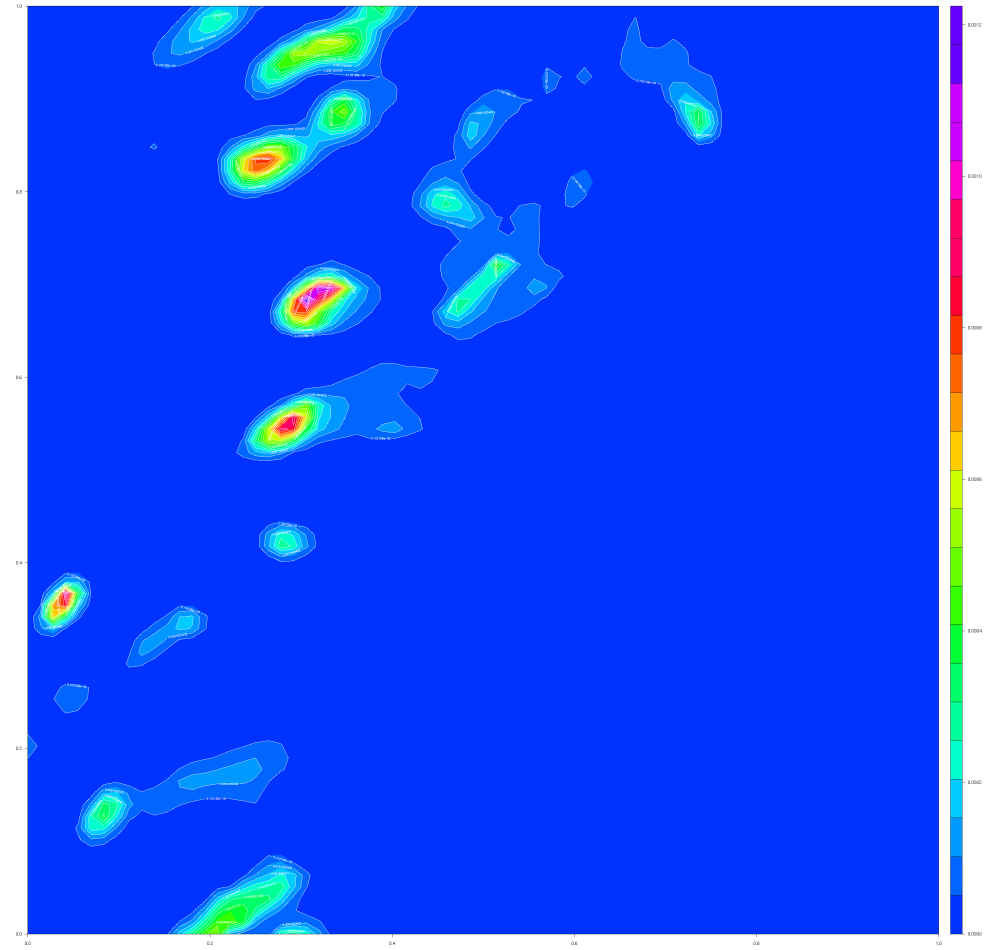
METEO FRANCE
Toujours un temps d'avance

H/NH effects

- AROME-FRANCE 2.5km whole domain, **instantaneous rain** at 3km height, zoom over the alps



H



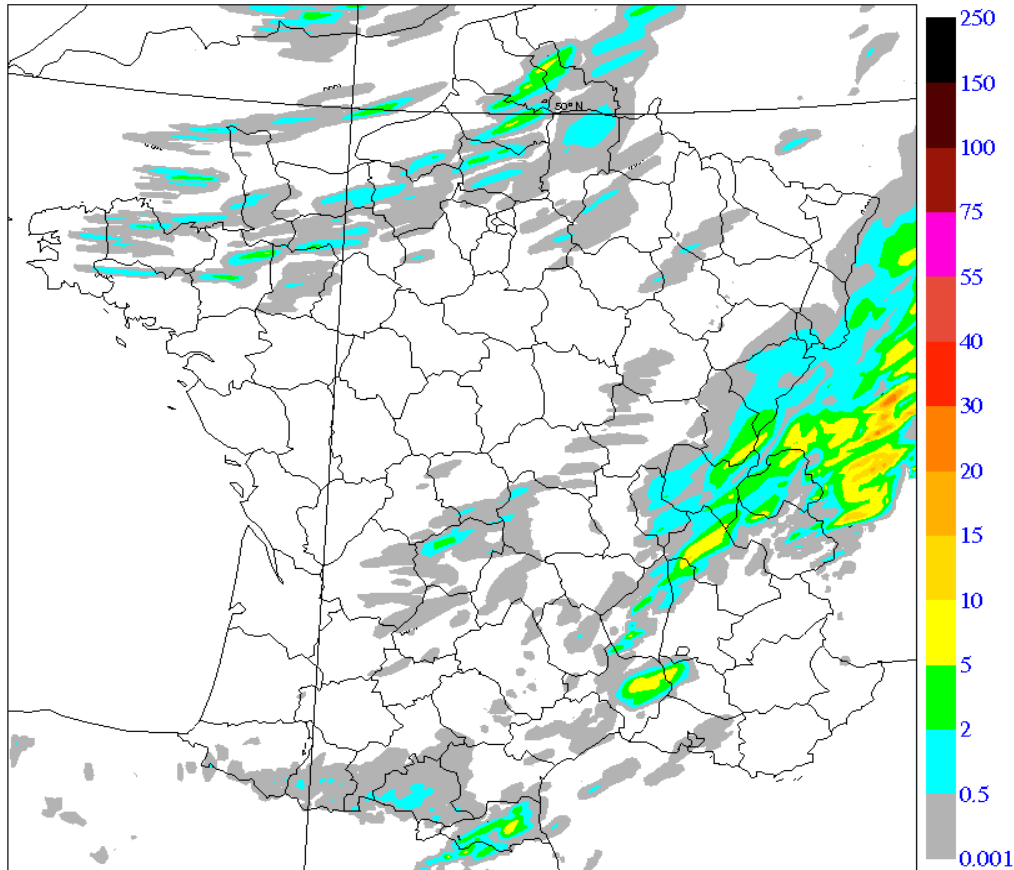
NH



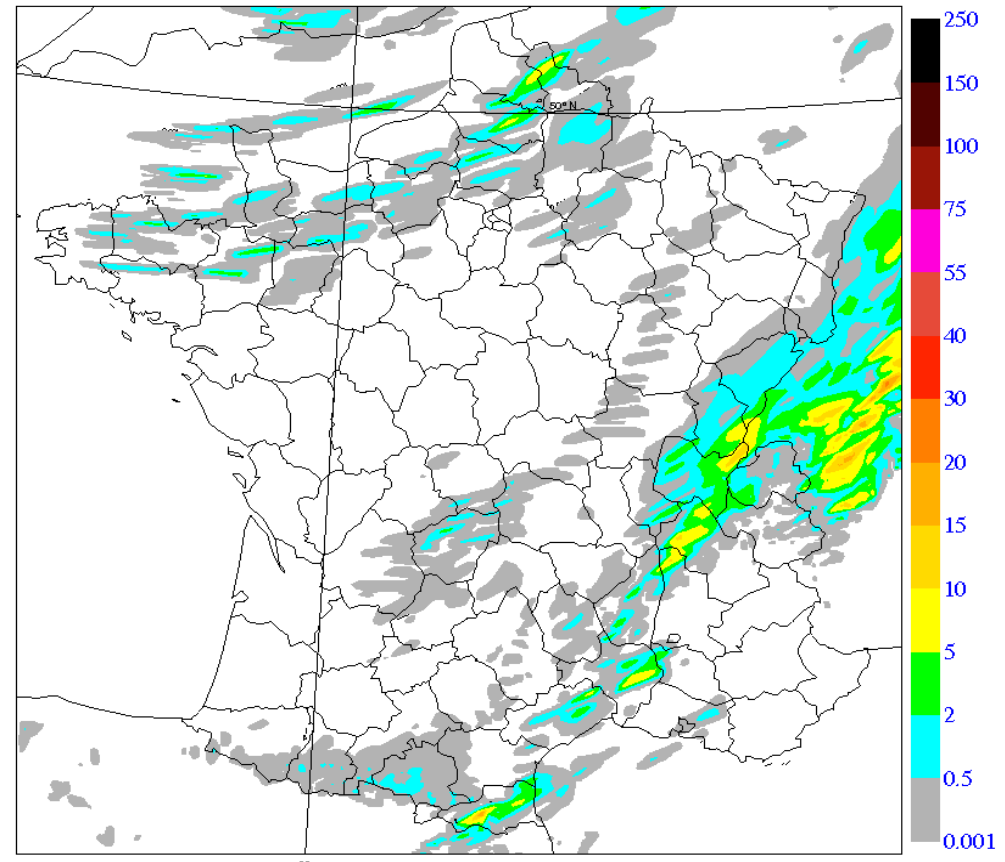
METEO FRANCE
Toujours un temps d'avance

H/NH effects

- AROME-FRANCE 2.5km whole domain, 1 hour cumulative rain



H



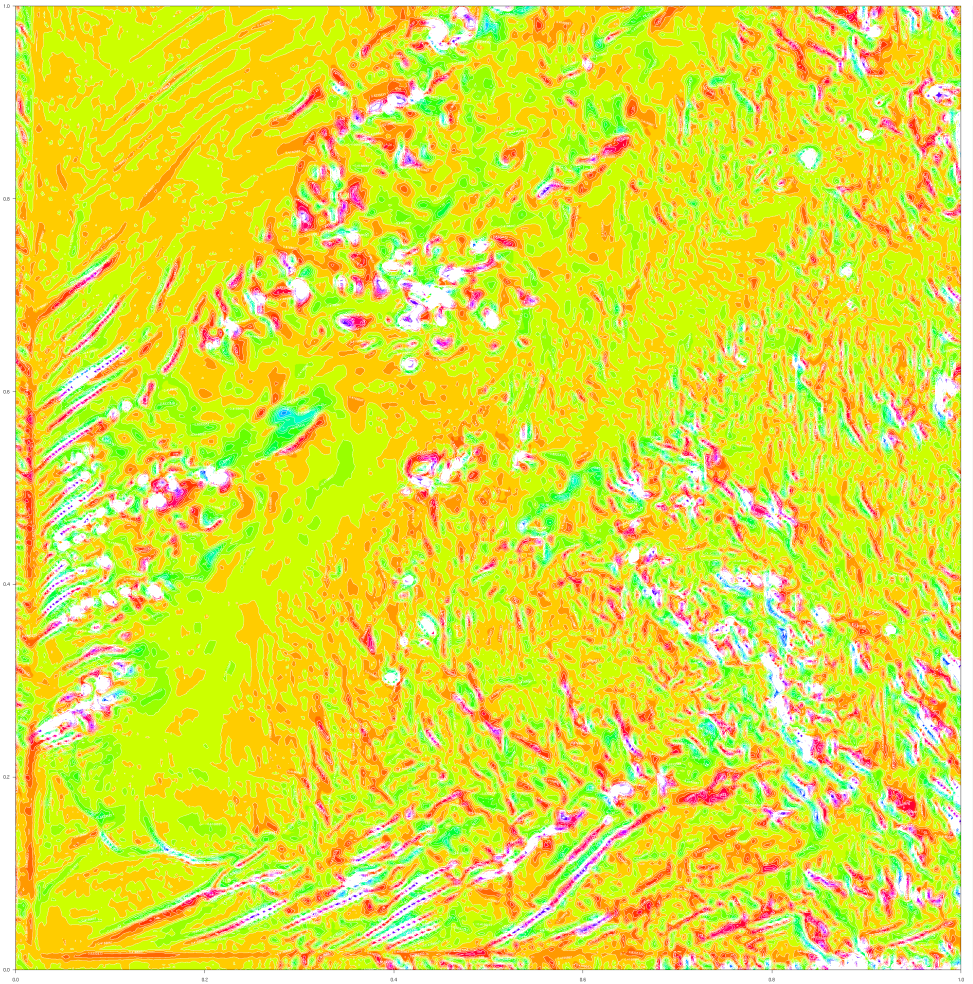
NH

Although there is visible differences between H and NH runs concerning dynamical variables, cumulative precipitations are little affected.

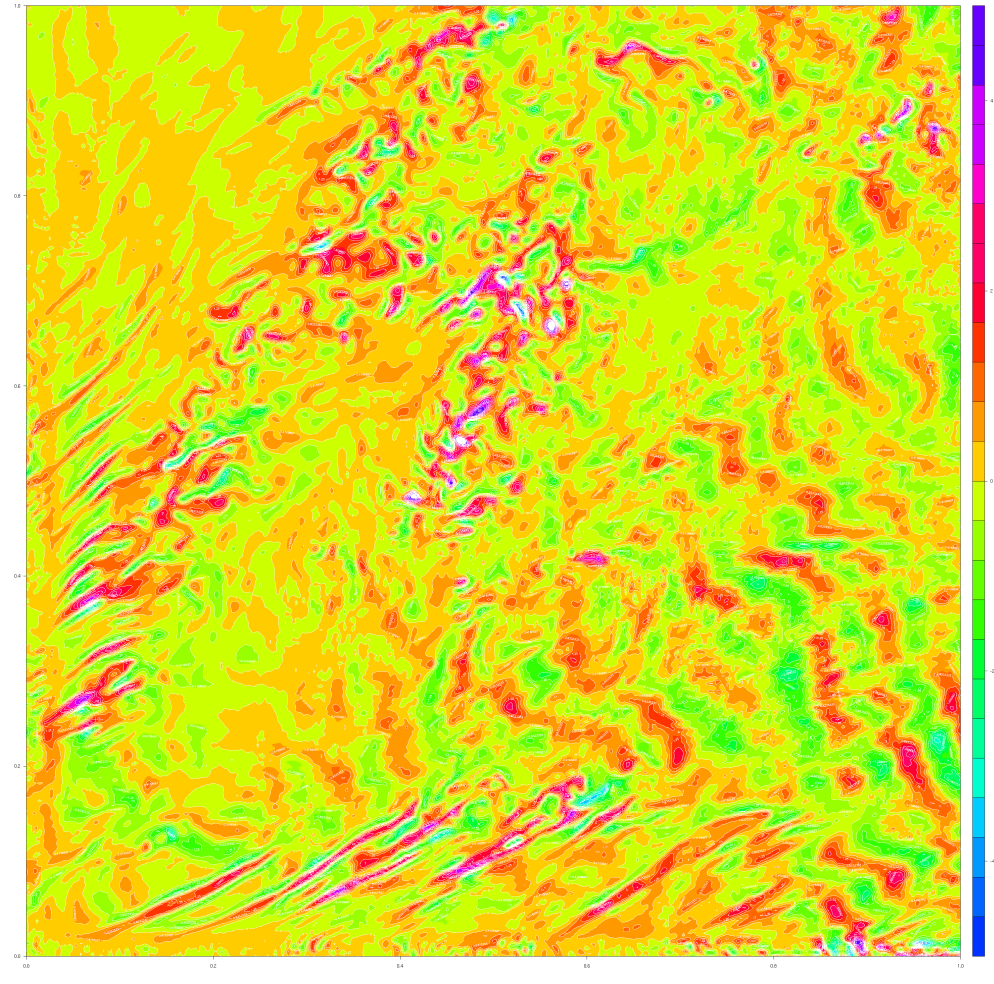
Now We will compare H and NH runs with AROME-500m

H/NH

- AROME 500m, **vertical velocity** at 1km height



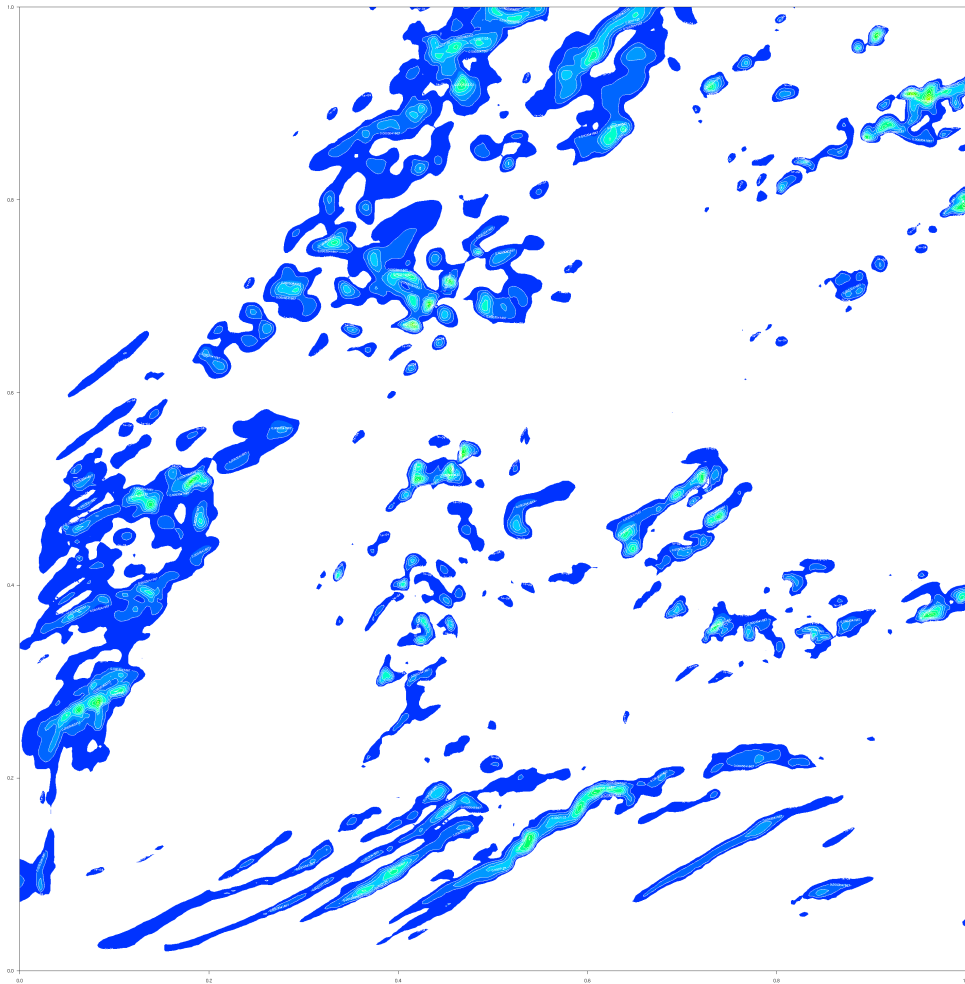
H



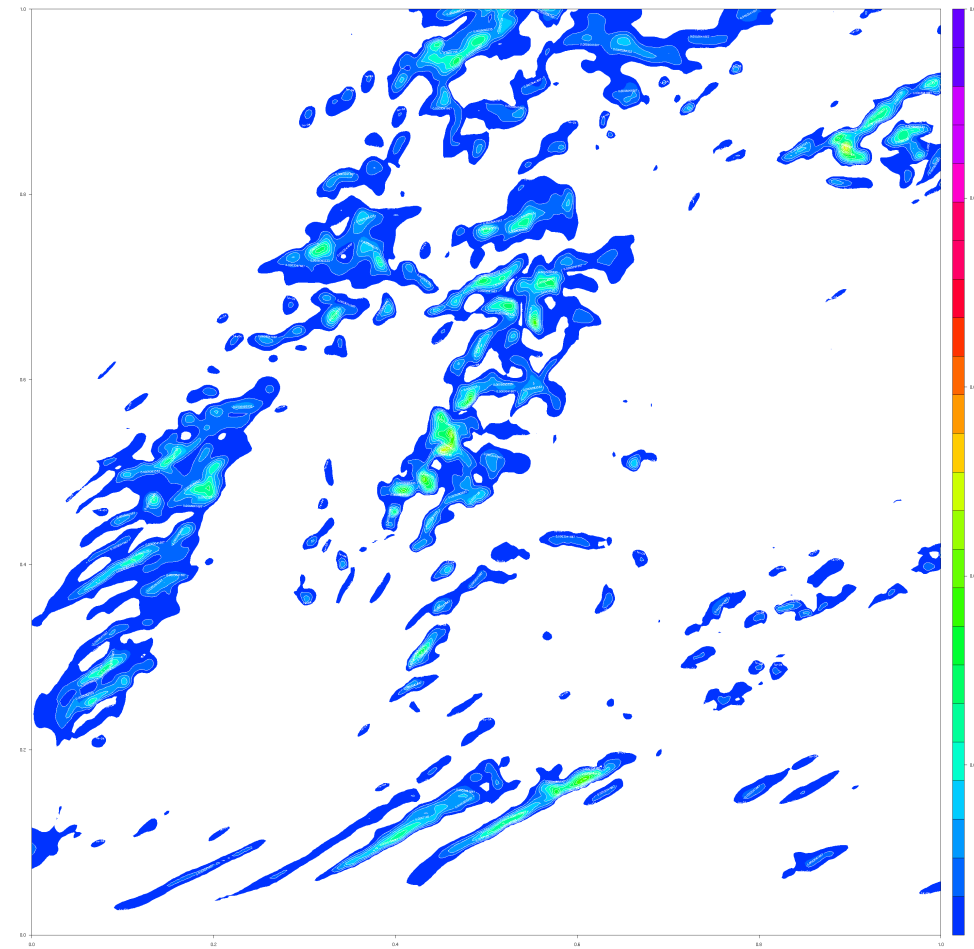
NH

H/NH

- AROME 500m, **instantaneous rain at 1km height**



H

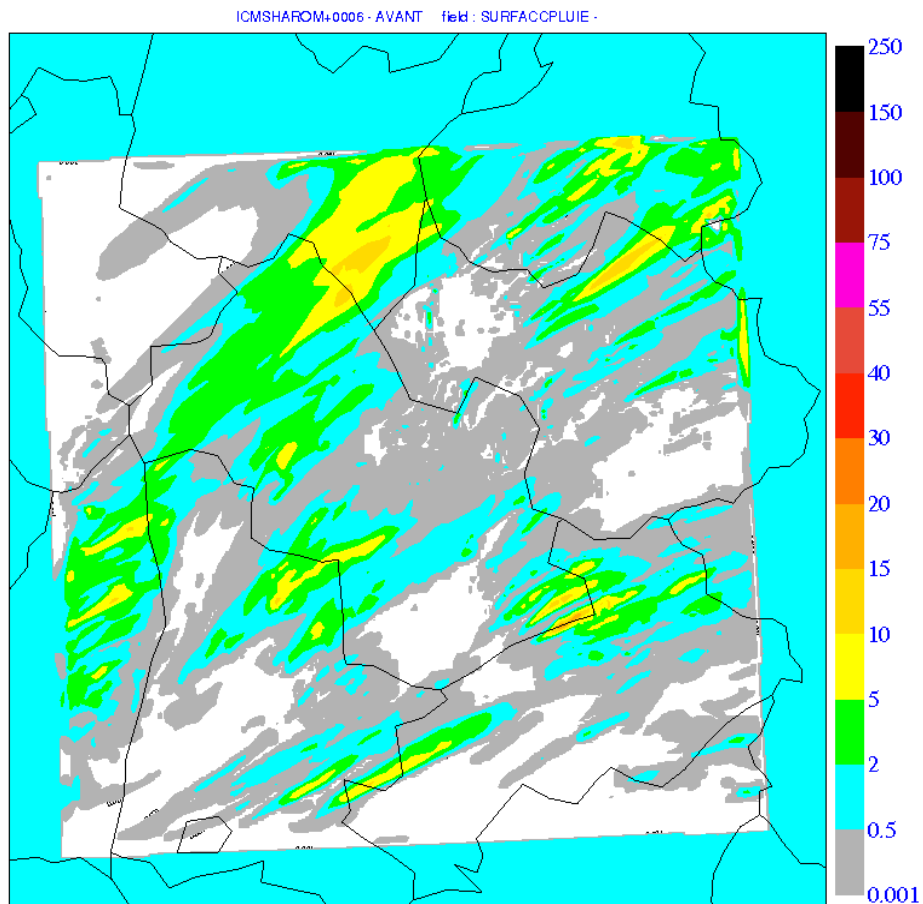


NH

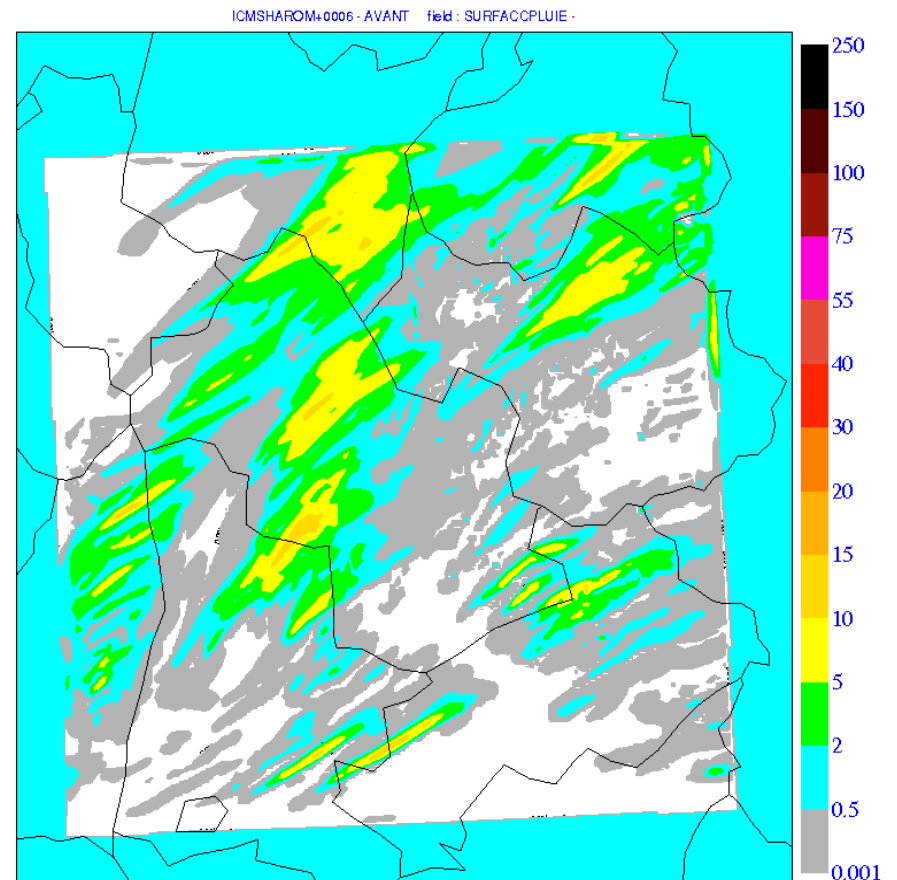


H/NH

- AROME 500m, 1 hour cumulative rain



H



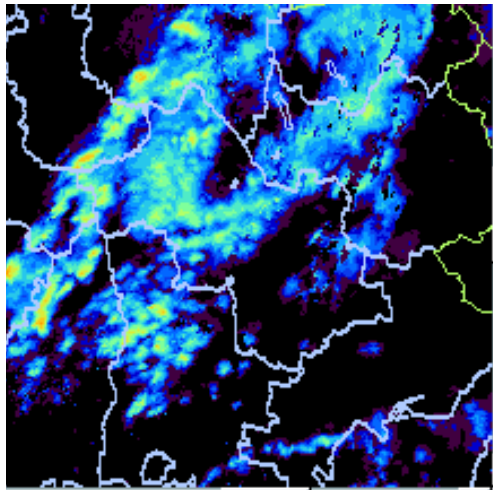
NH

There are differences as in AROME-FRANCE on dynamical variables, but now even cumulated precipitation is rather different.

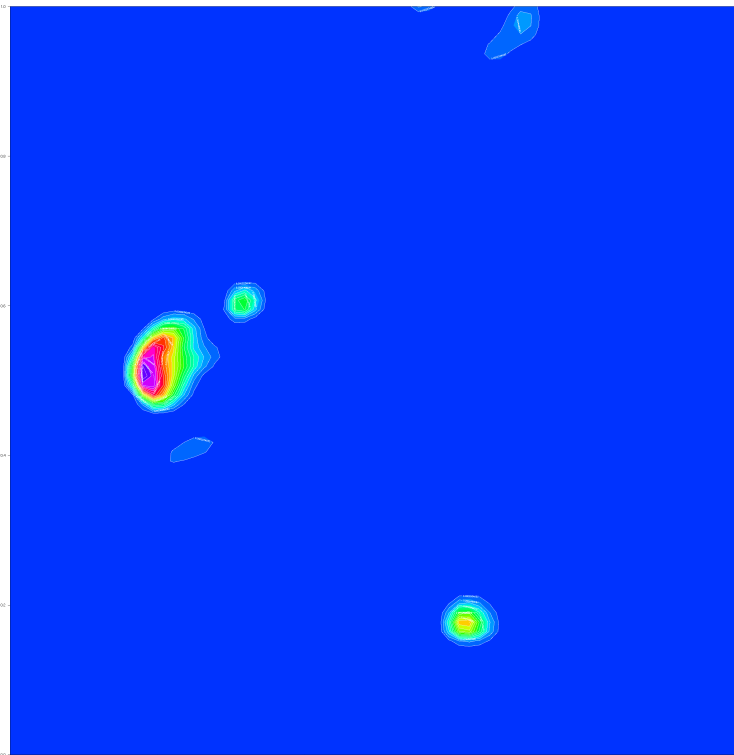
In the next slides I will present some comparison between AROME 2.5 km and AROME 500m on the same alps domain.

GRAUPEL at 18H00

Horizontal cross section at 6km

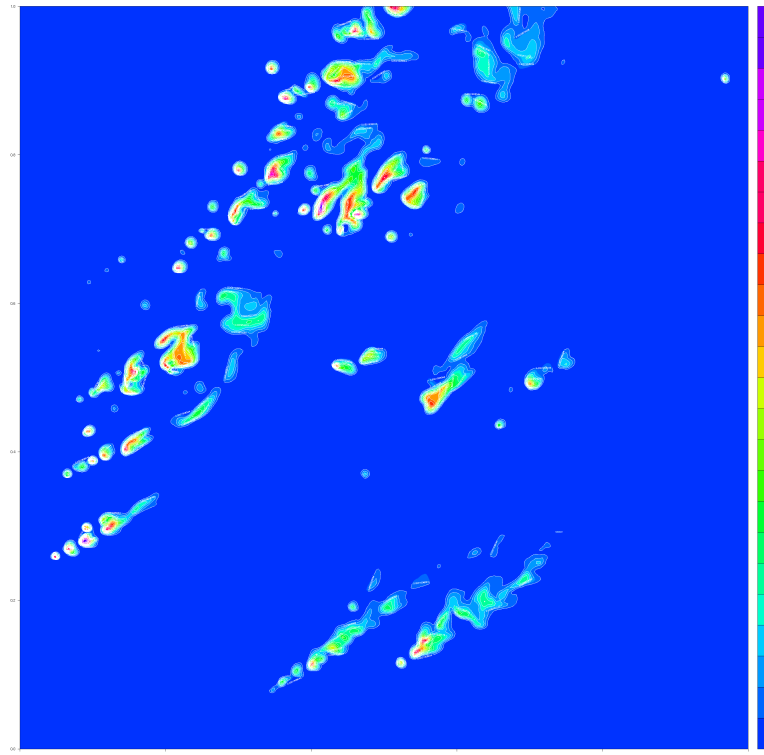


2.5km



Zoom over the alps

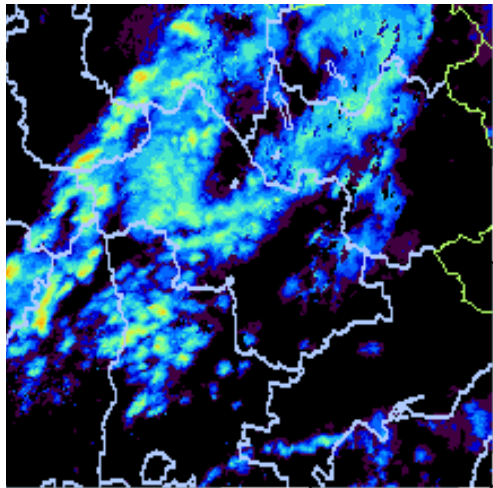
500m



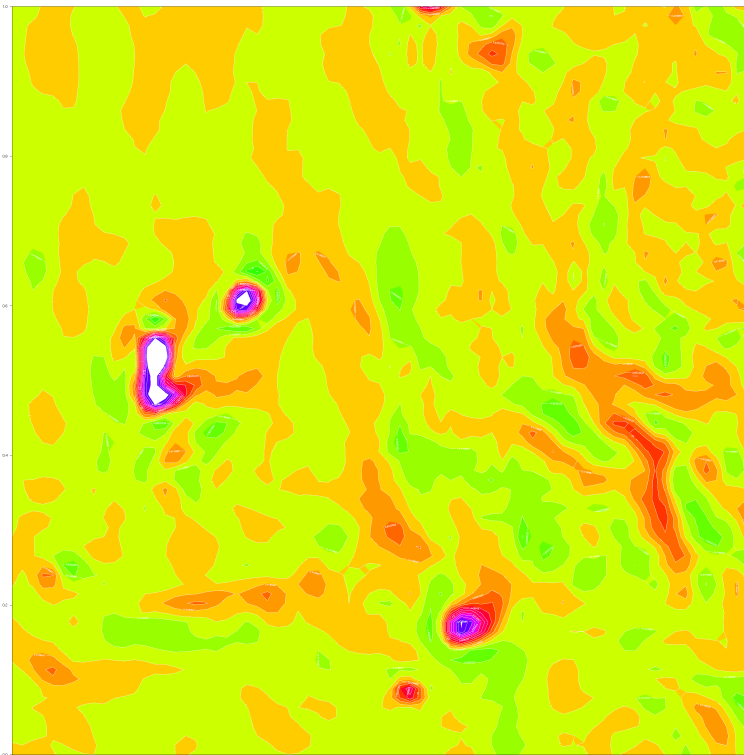
Same domain

VERTICAL VELOCITY at 18H00

Horizontal cross section at 6km

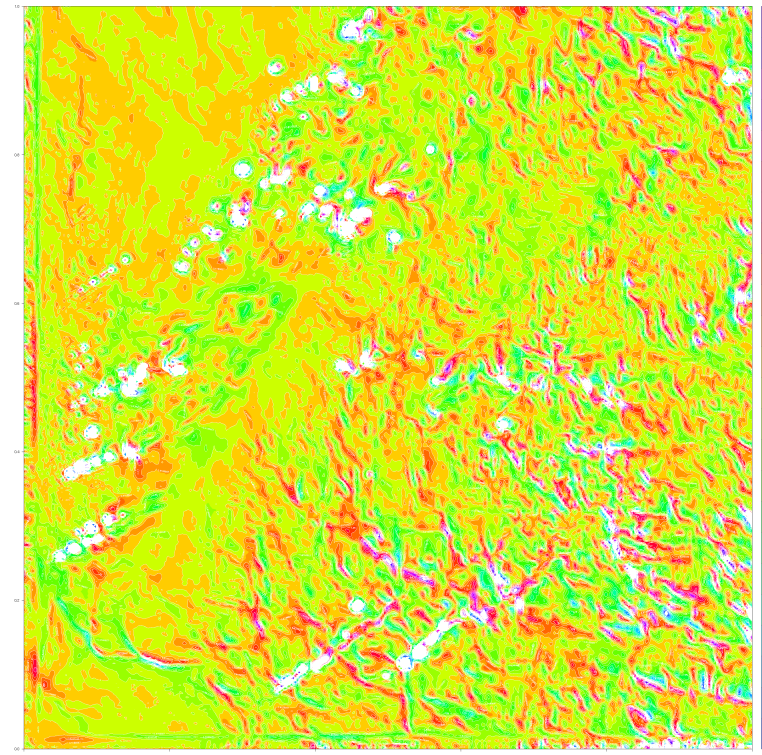


2.5km



Zoom over the alps

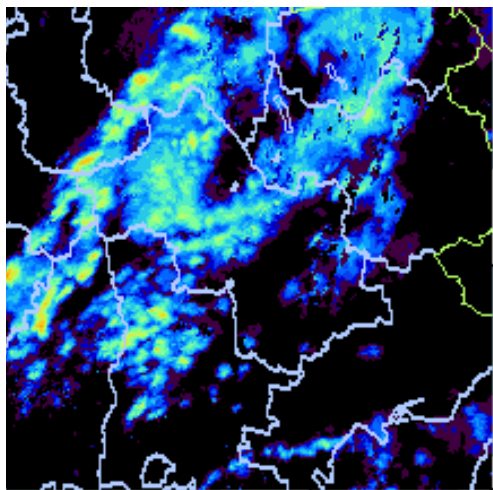
500m



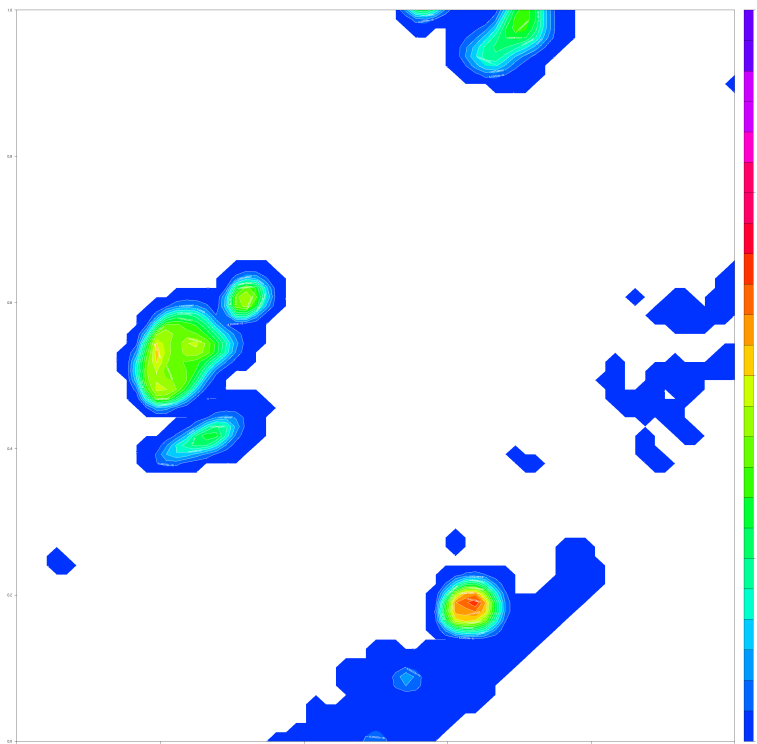
Same domain

SNOW at 18H00

Horizontal cross section at 6km

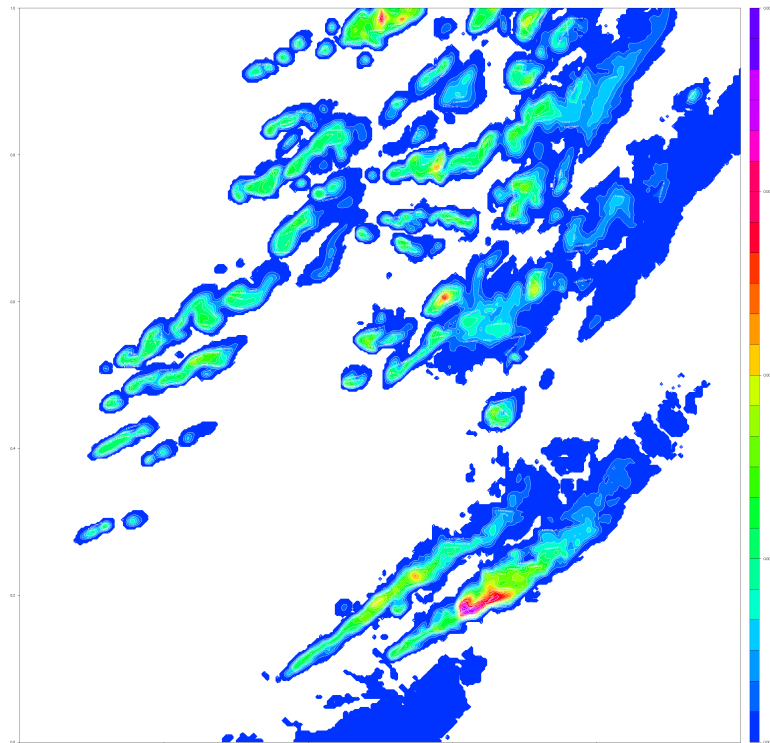


2.5km



Zoom over the alps

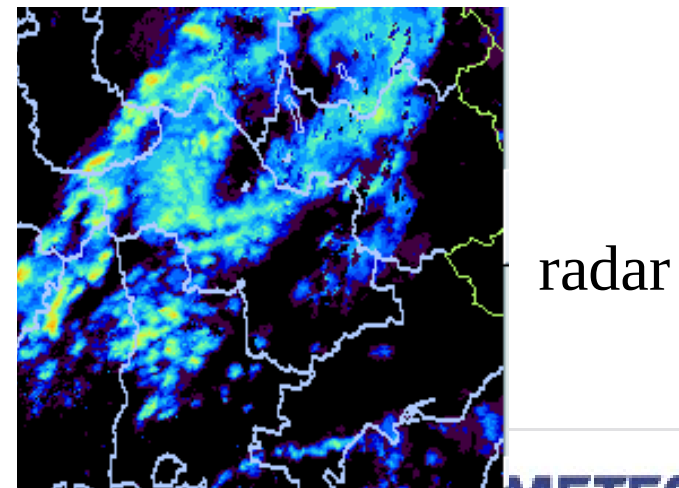
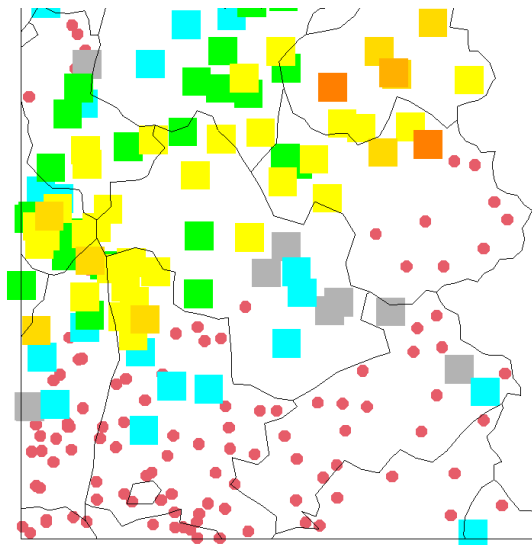
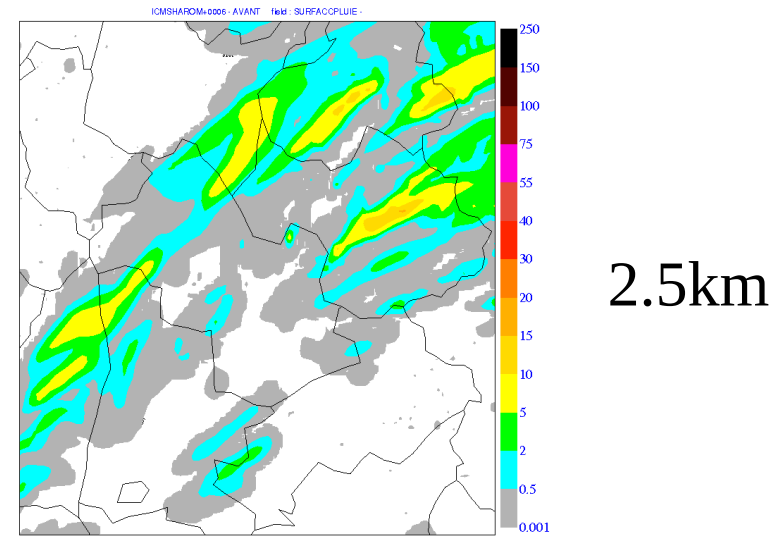
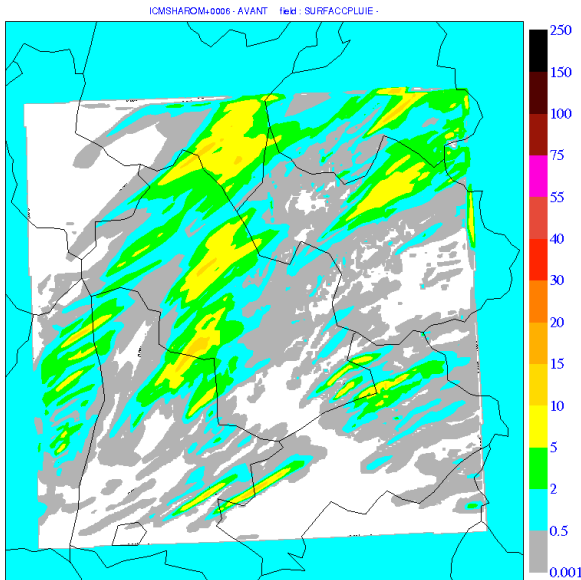
500m



Same domain

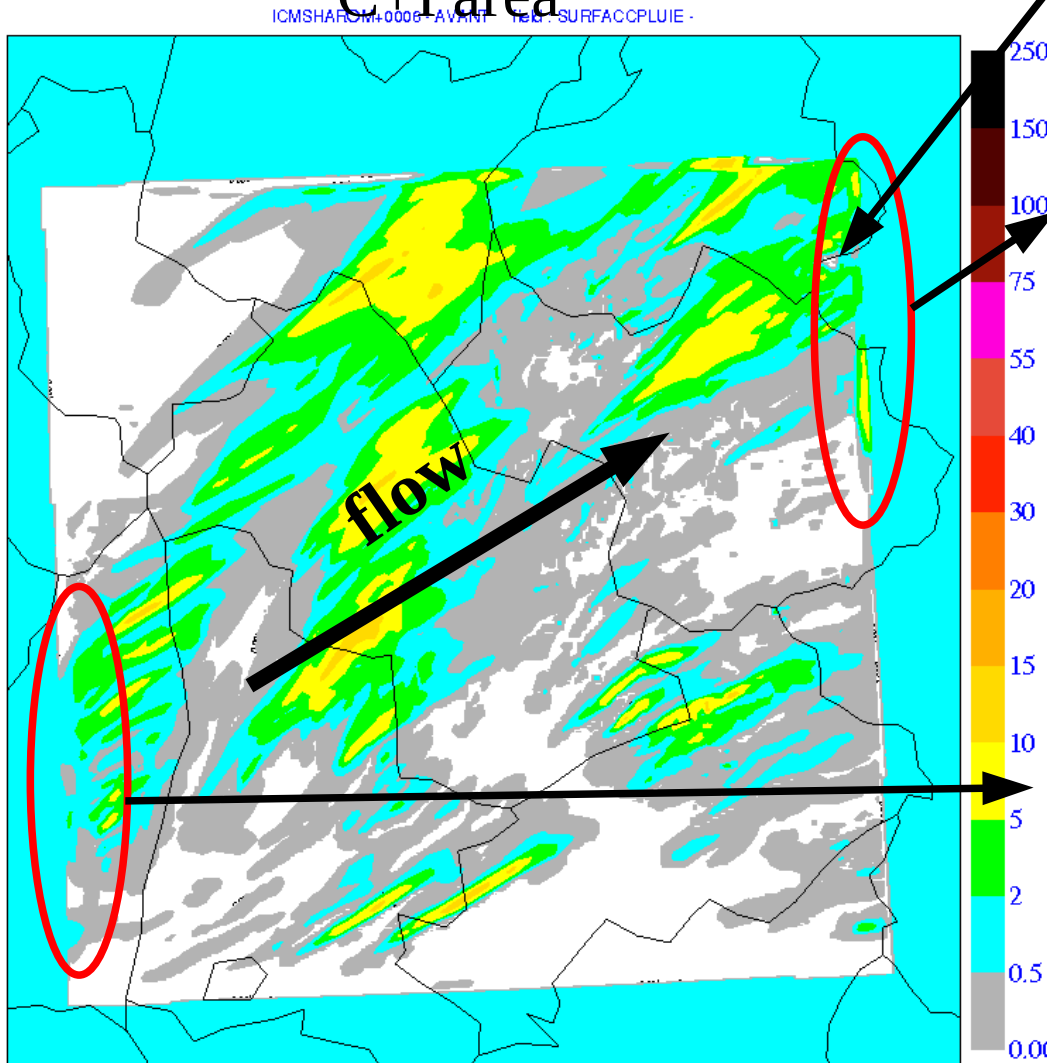
COMPARISON CUMUL of PRECIPITATION

- 17H00-18H00 rain



Any coupling problems ?

- Hydrometeors are coupled
1 hour cumulated rain
C+I area



Coupling is done on a rather mountainous area (location of the Mont Blanc)

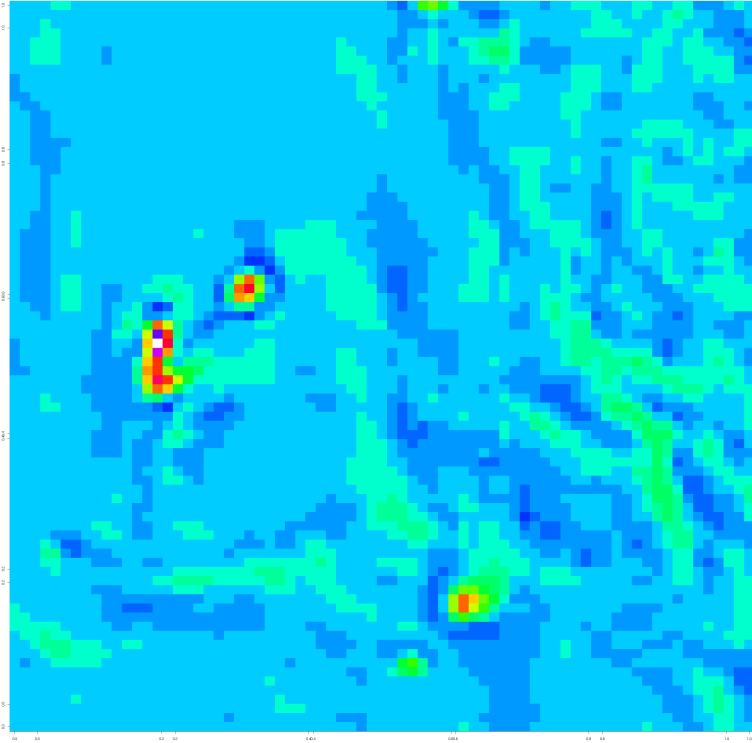
Outgoing flow :
Coupling does its job, on the edge (return to large-scale field in the I zone) but does not affect central zone.

Incoming flow:
Hydrometeors coupling allows to produce precipitations at the edge.

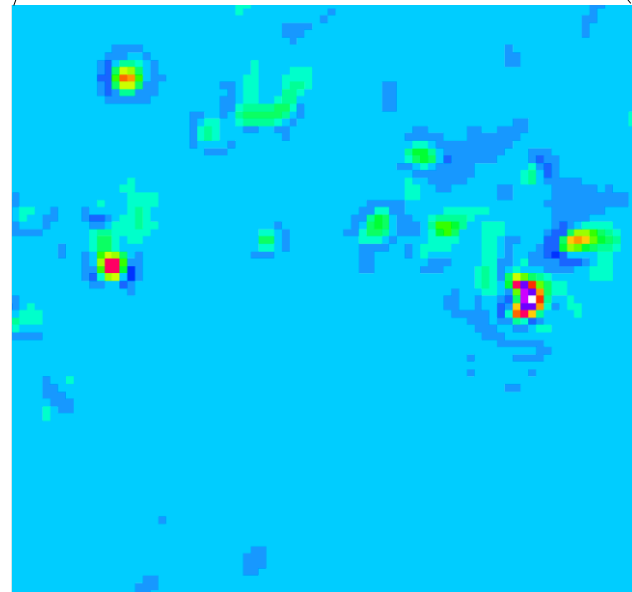
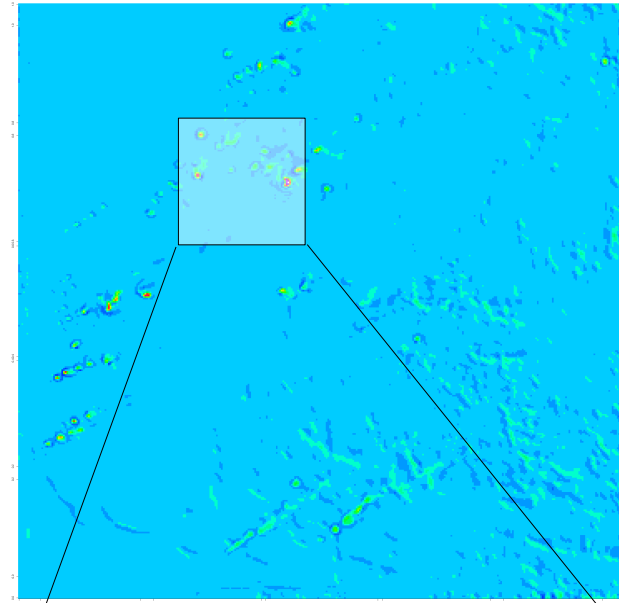
Davis relaxation seems quite robust over orography

Updraft characteristic size

2.5 km



500m



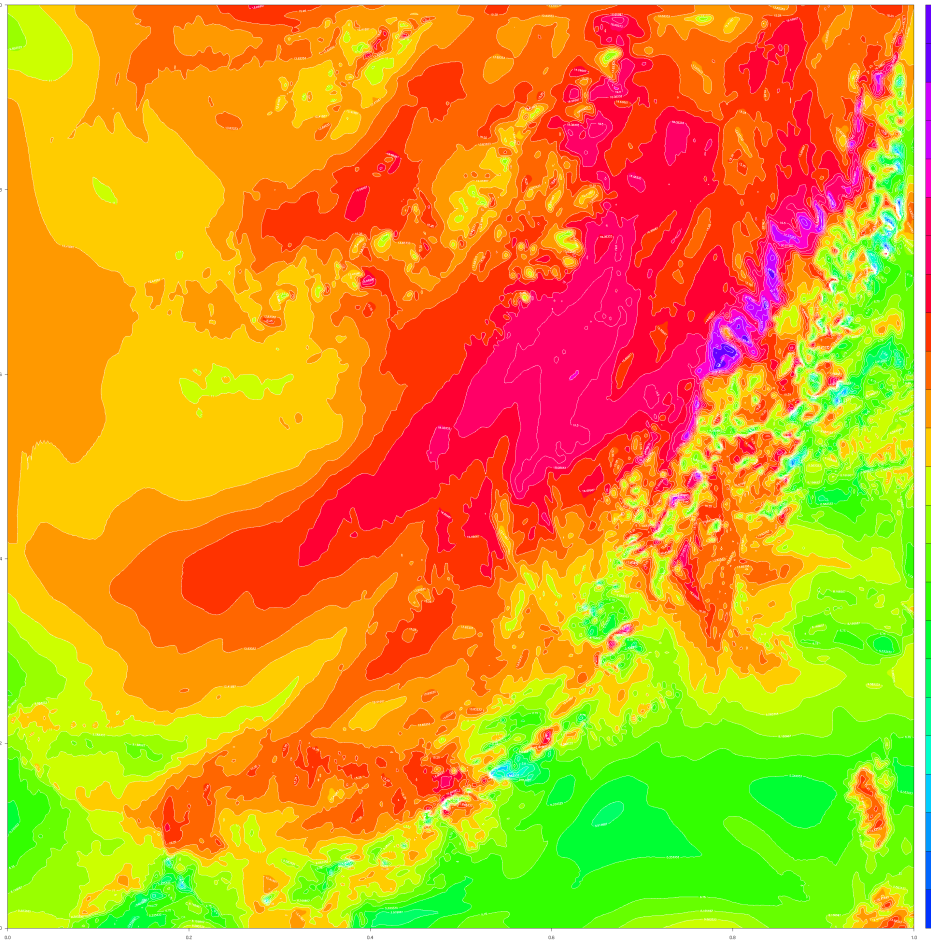
- For 2.5km size ~ 5km
- For 500m size ~1.5km

CONCLUSION

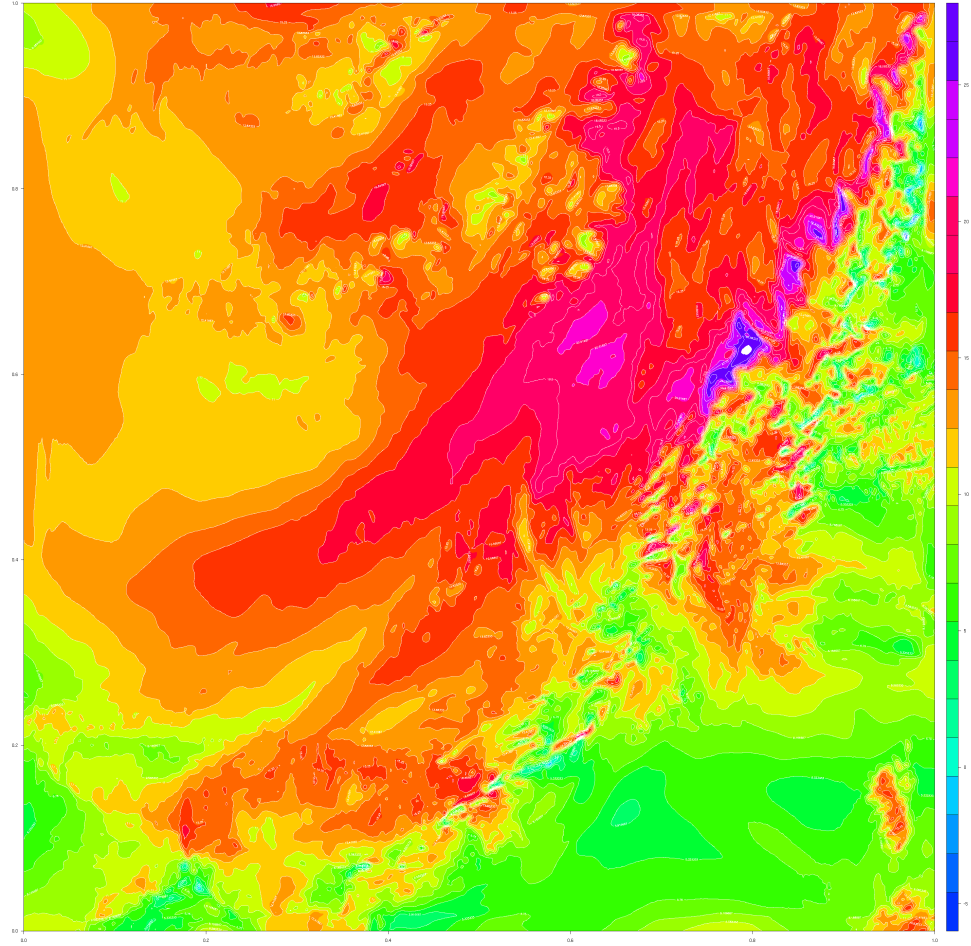
- No “major” coupling difficulties
- No obvious strong slope problem (does not mean there is not a problem)
- Convective systems seem to be better represented (not a big surprise), better agreement with radar images.
- For several days of comparison (both summer and autumn situations), 1-h rain cumul do not seem to be improved (different but not better).
- That configuration seem to be robust (ran on multiple days so far), now more scientific aspects can be questioned : 3d turbulence, strong slopes, relevant vertical levels.....

H/NH effects

- AROME-FRANCE 2.5km whole domain, **zonal wind** at 3km height



H



NH



METEO FRANCE
Toujours un temps d'avance