

# Some validation cases for AROME, the recommended and tested options

Yann Seity

(Météo-France CNRM/GMAP)

1<sup>st</sup> AROME training course

Poiana Brasov November 21-25 2005

# CONTENTS

## I. Good forecasts

- a) 21-06-05 squall line on MIDPYR
- b) 05-09-05 red alert on SUDE
- c) 05-01-05 Fog on MIDPYR

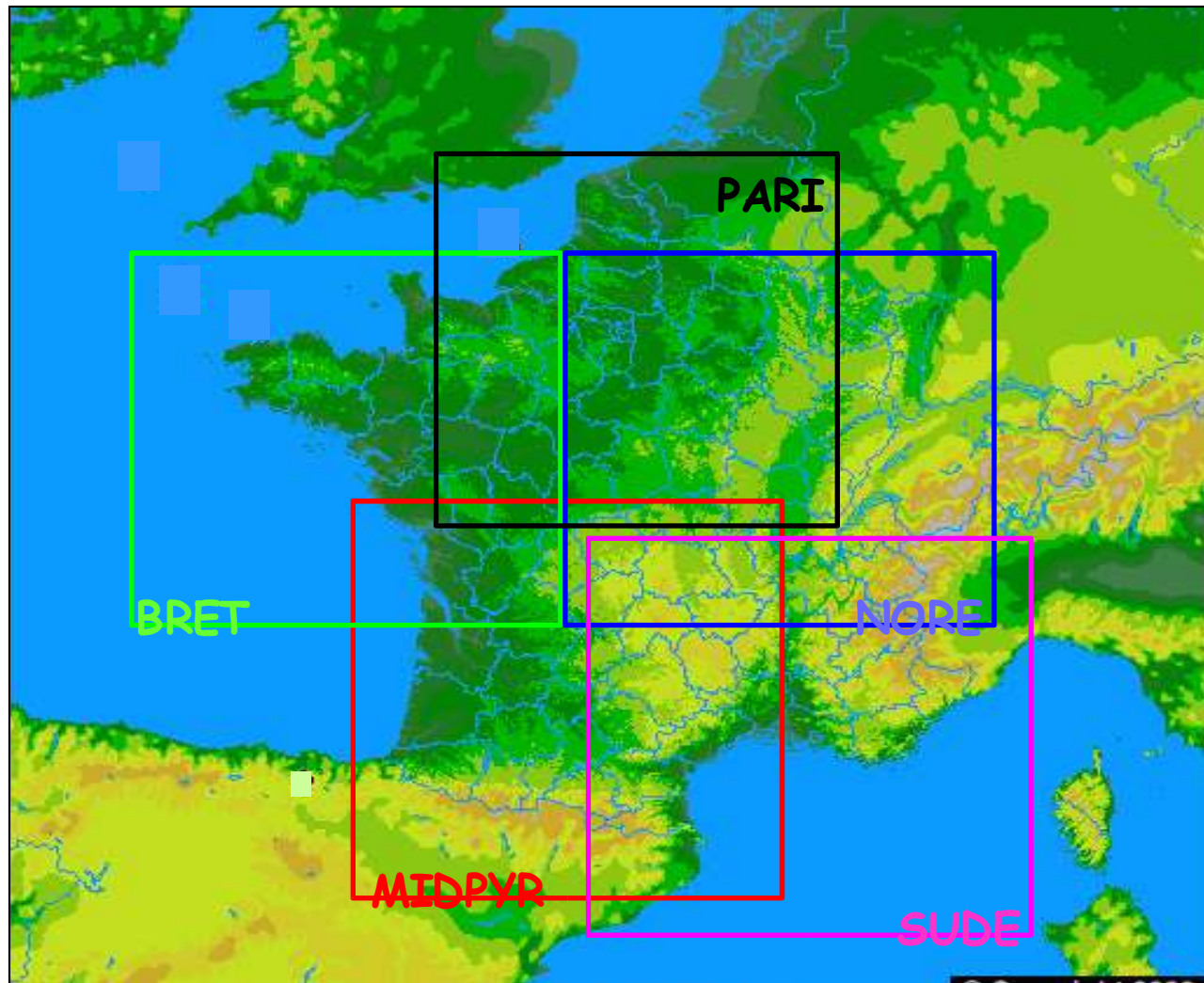
## II. Bad forecasts

- a) 23-06-05 Paris

## III. Problems/tested options

- a) influence of domain
- b) coupling
- d) rainfalls over orography

# AROME domains over FRANCE

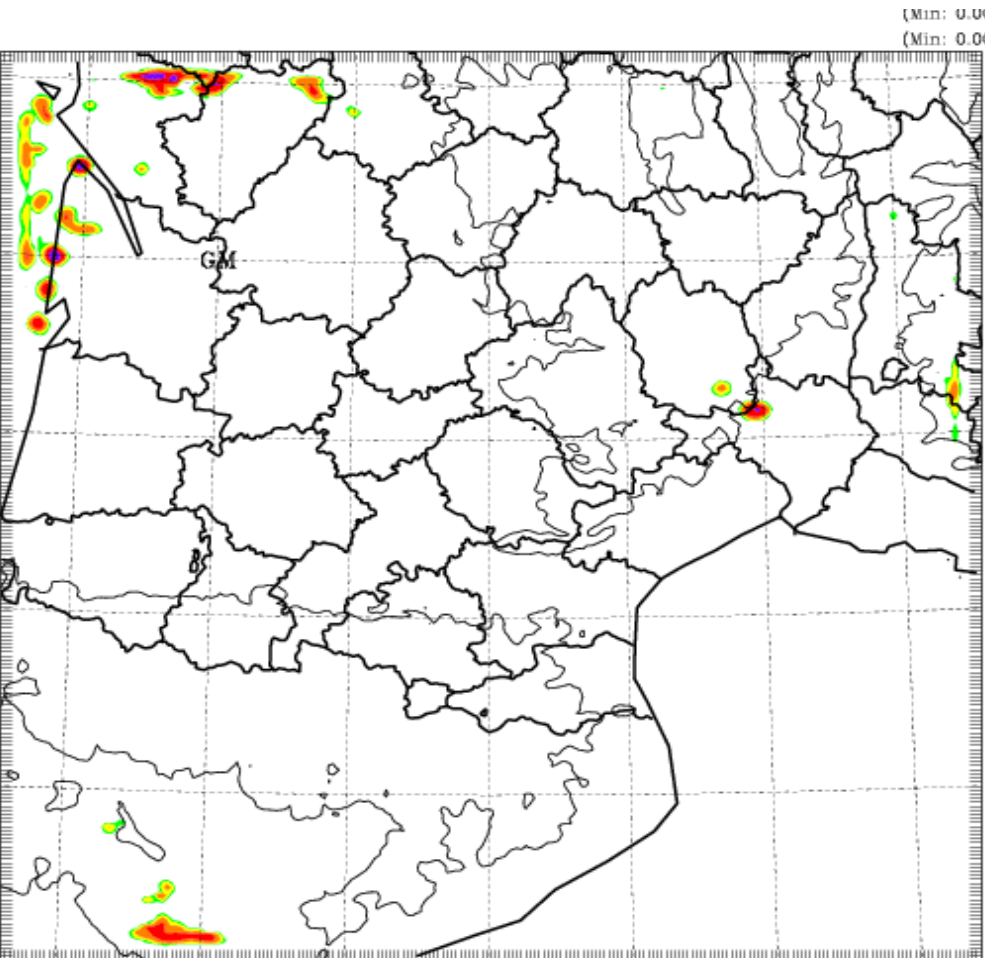


MIDPYR since june 2005, SUDE since september 2005  
(plots on ALADIN2 WebSite)

# 21 June 2005 Case

24 TU

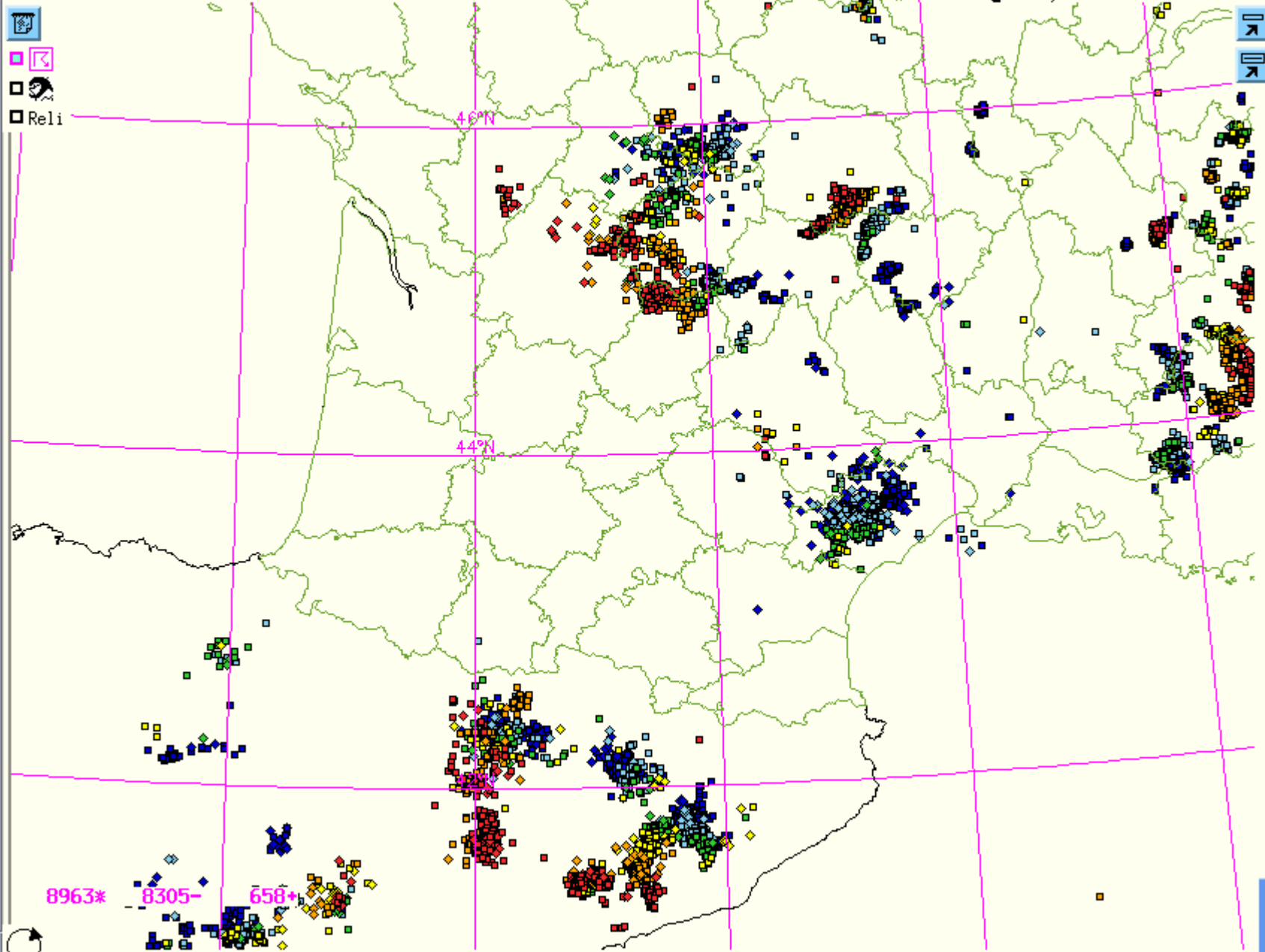
Inst. AROME rainfalls



L41 AROME wind



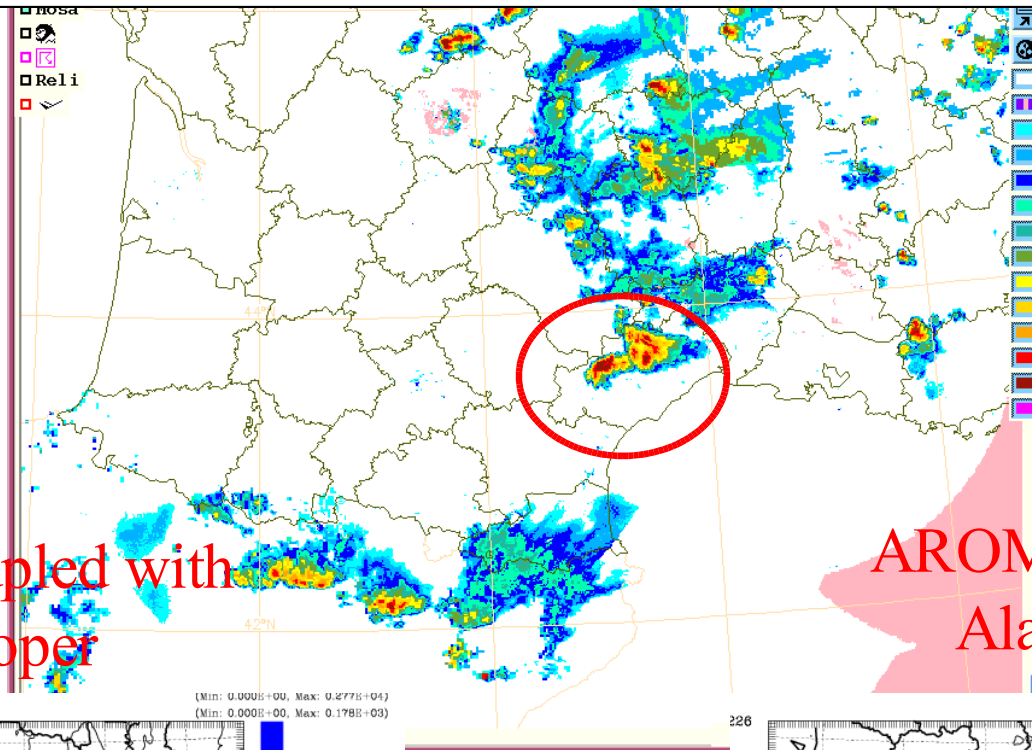
METEORAGE NS\_LOC, mardi, 21 juin 2005, 18:00:00 GMT, 3h





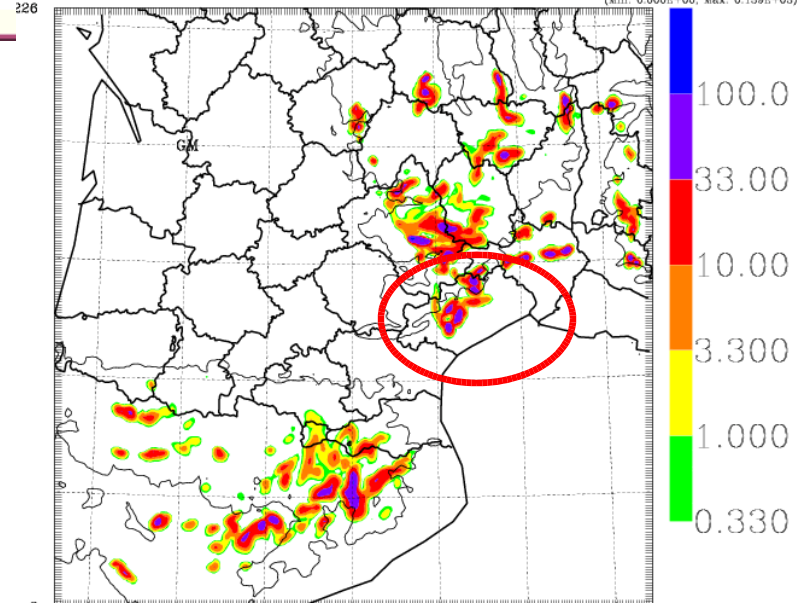
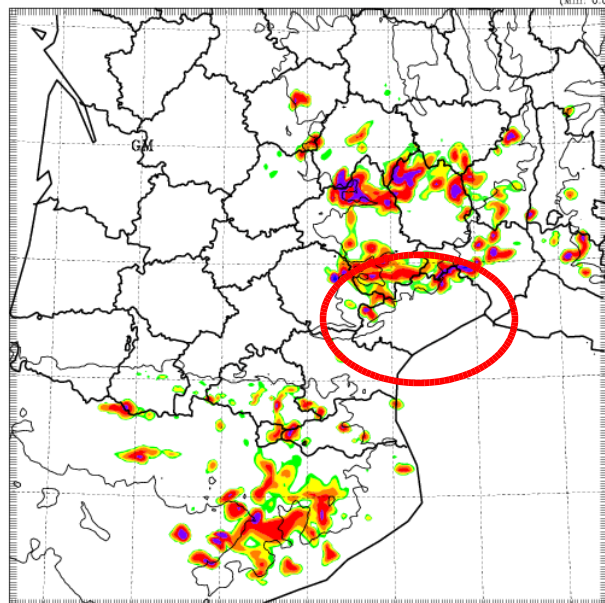
# 21 June 2005 Case

15 TU



AROME coupled with  
Aladin oper

AROME coupled with  
Aladin 3DVAR

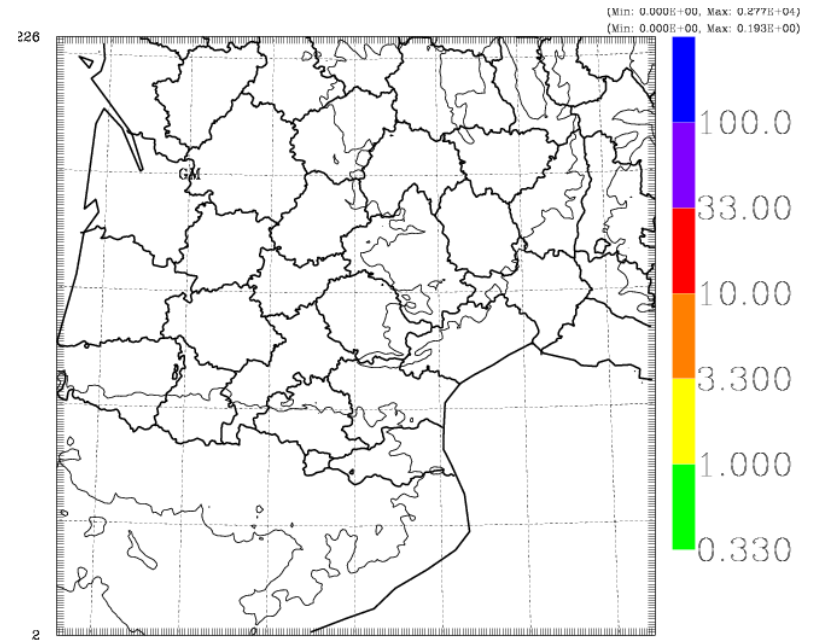
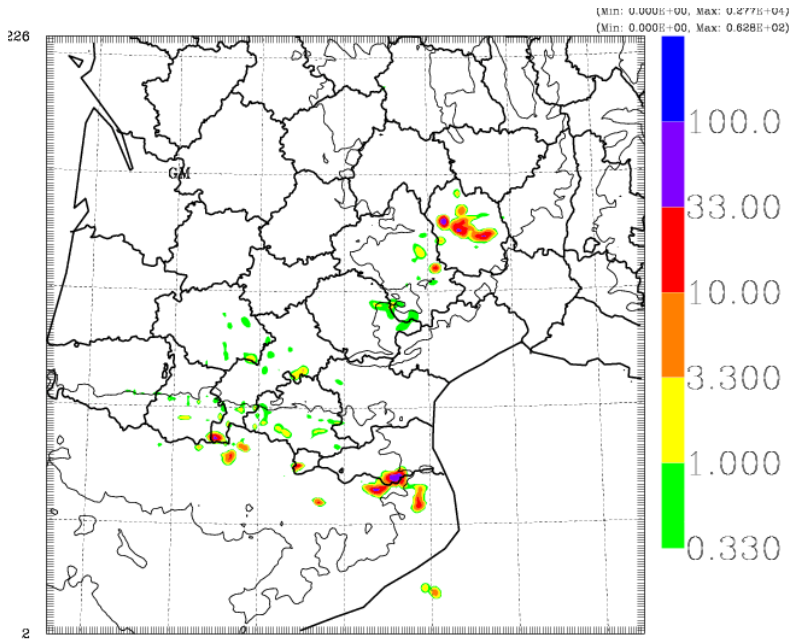


# 21 June 2005 Case

AROME coupled with  
Aladin oper

03 TU

AROME coupled with  
Aladin 3DVAR

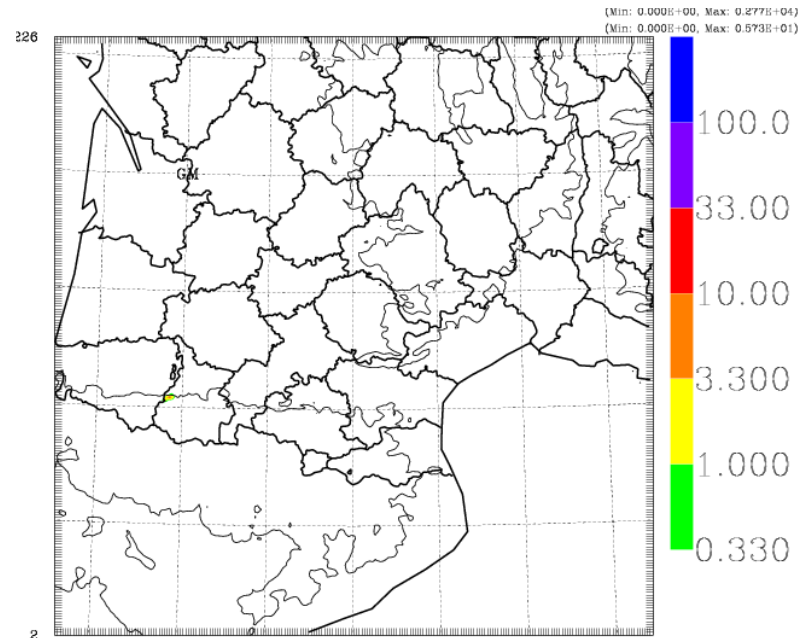
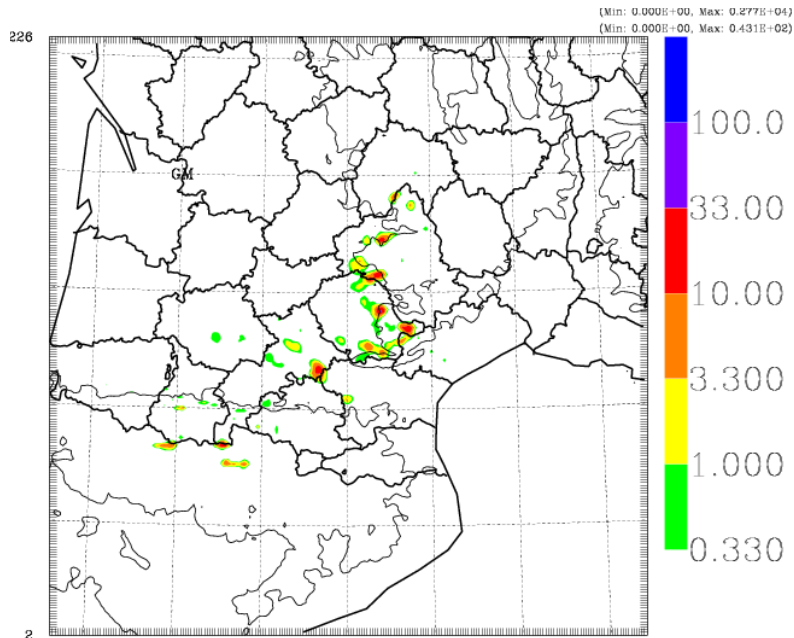


# 21 June 2005 Case

AROME coupled with  
Aladin oper

06 TU

AROME coupled with  
Aladin double

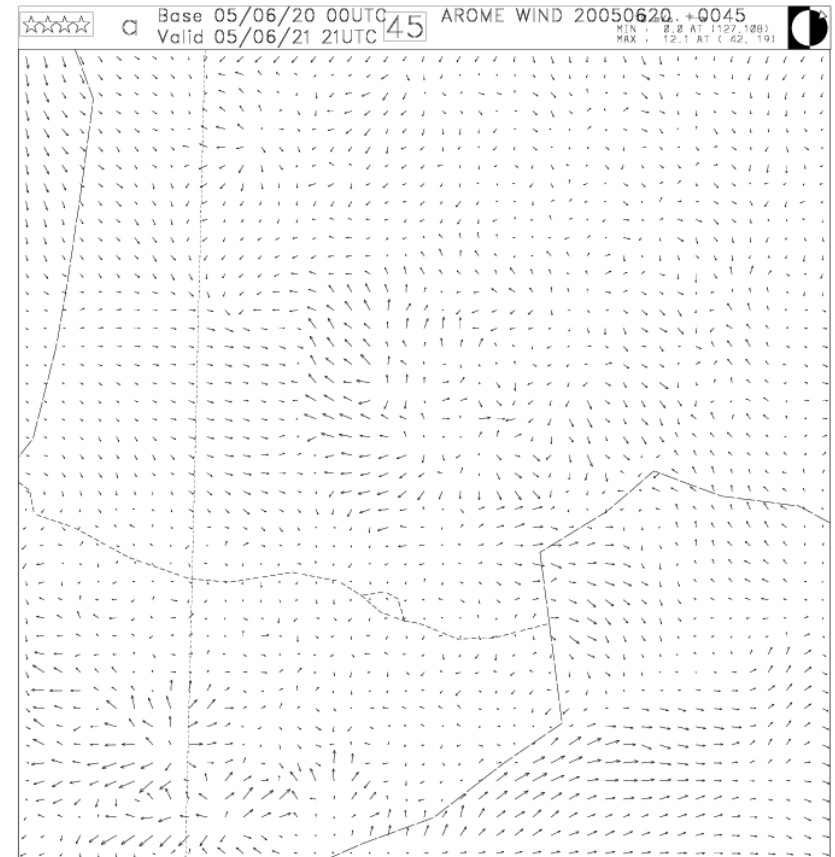
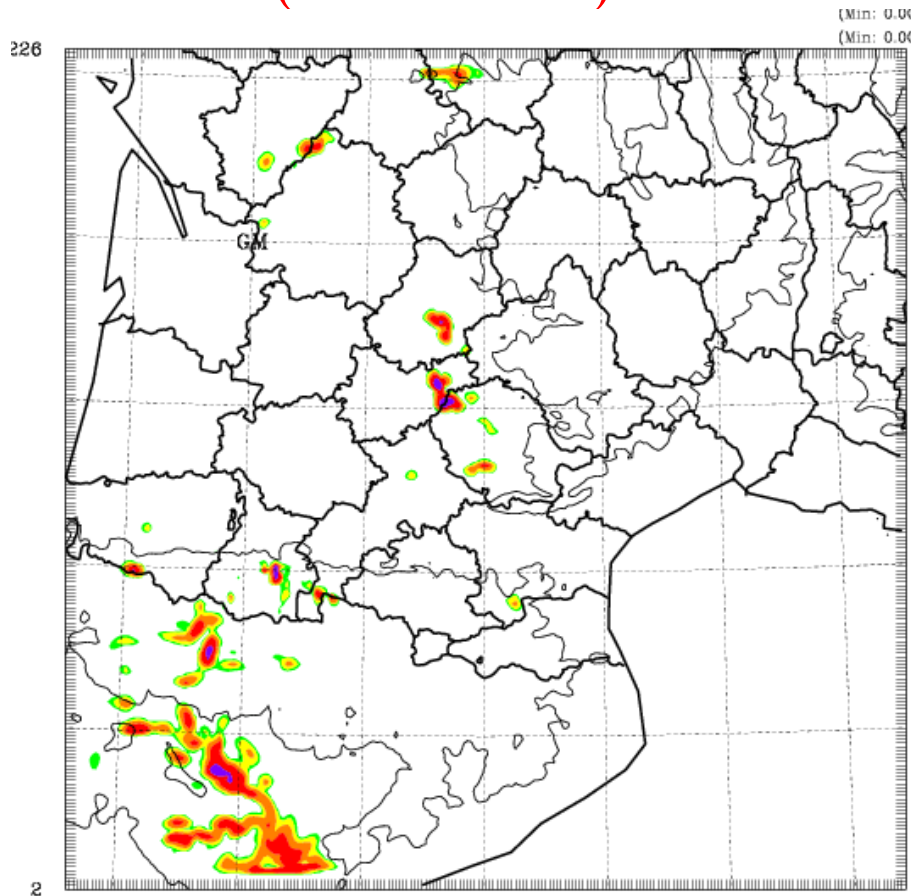




# 21 June 2005 Case

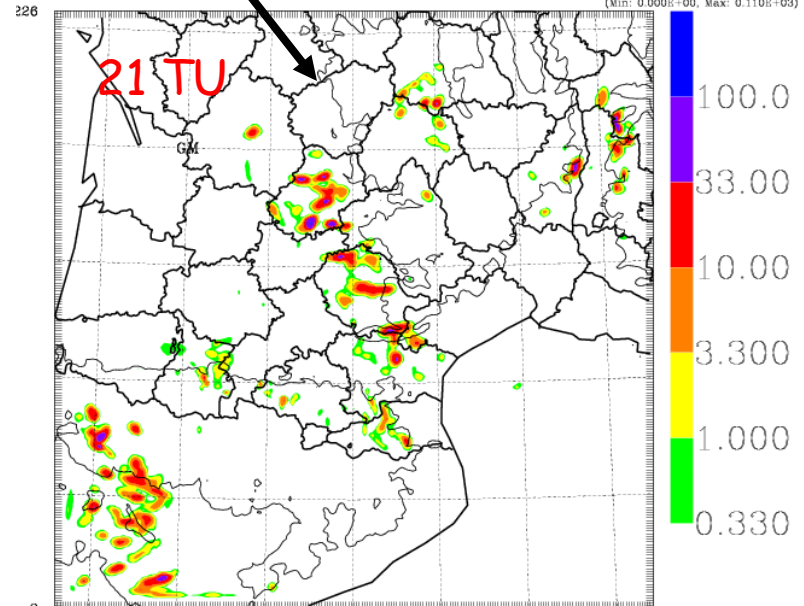
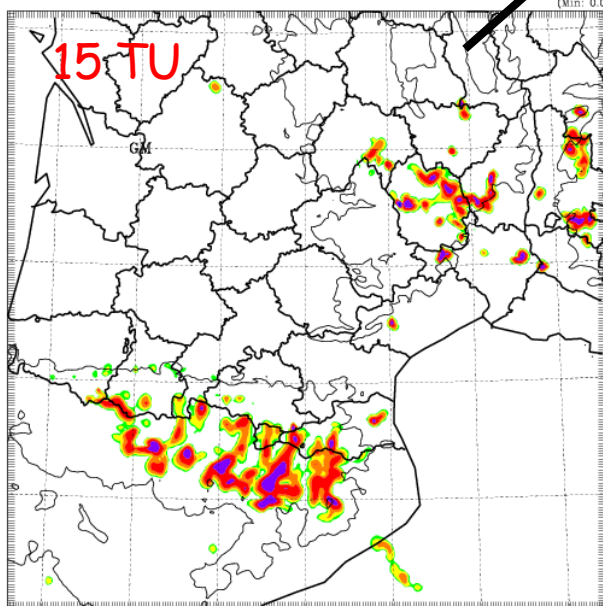
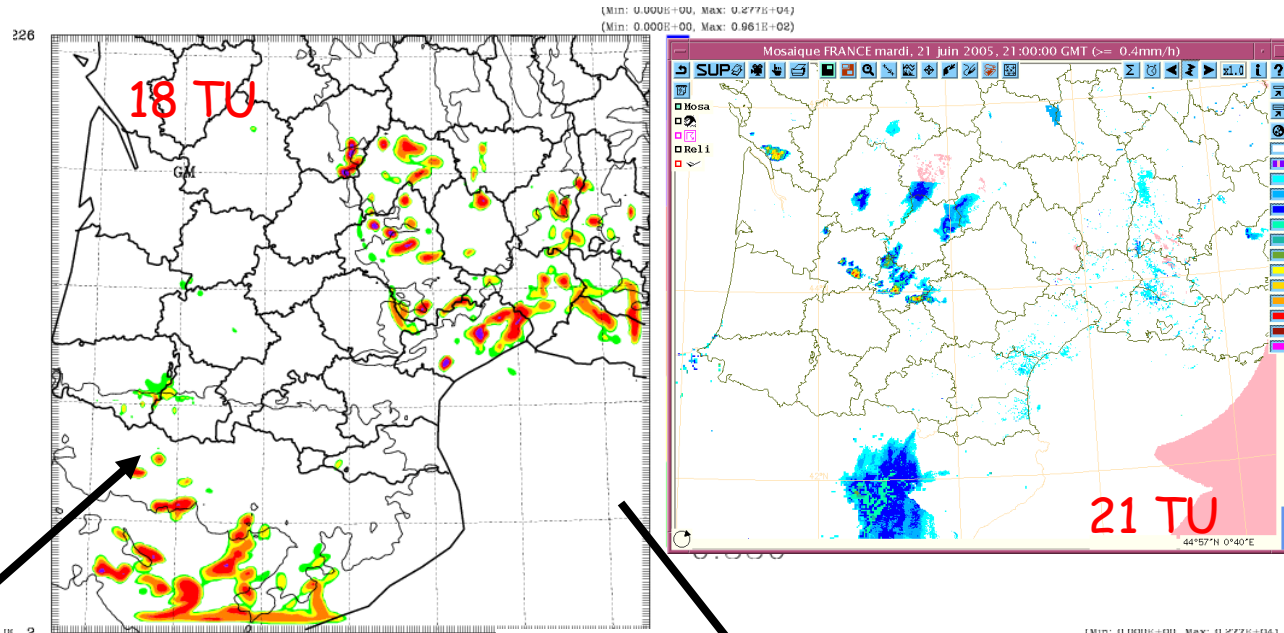
AROME coupled with  
Aladin oper but 24h sooner  
(r0 20-06-05)

21 TU



# 21 June 2005 Case

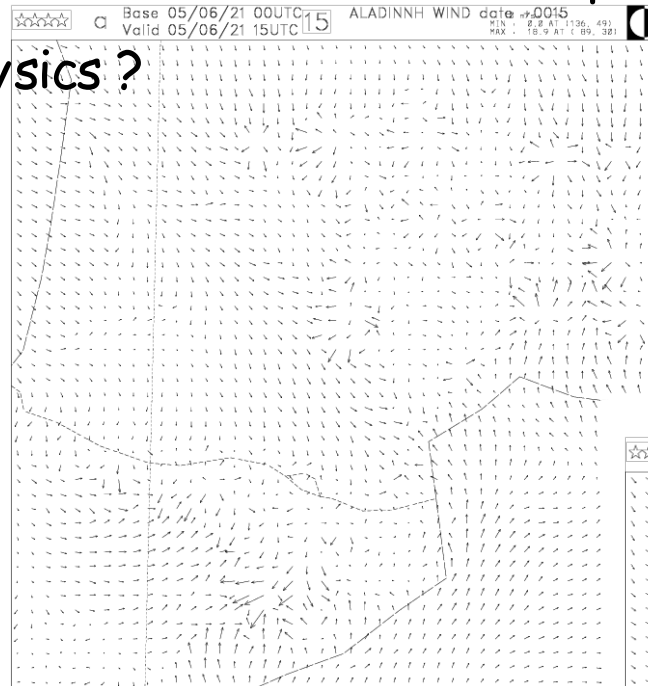
AROME coupled with  
Aladin oper but 12h  
later (21-06-05 r12)



# 21 June 2005 Case

What are the main ingredients to simulate the squall line ?

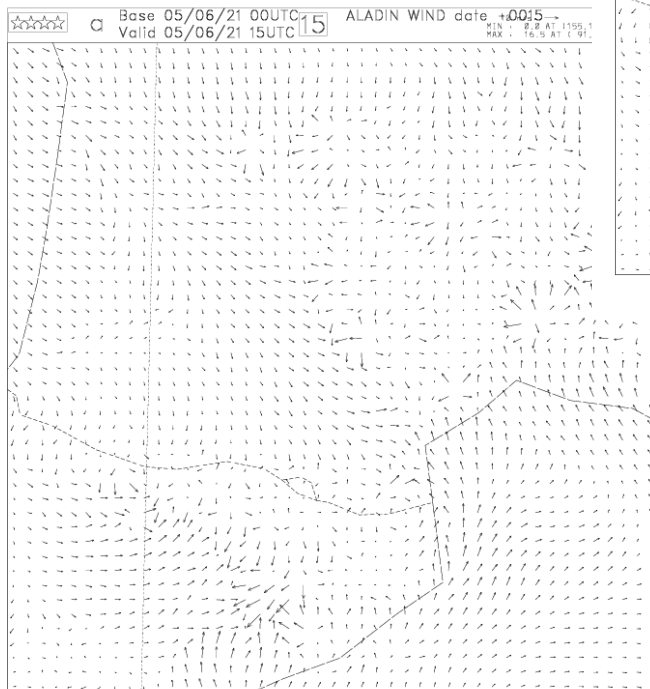
Resolution, dynamics, physics ?



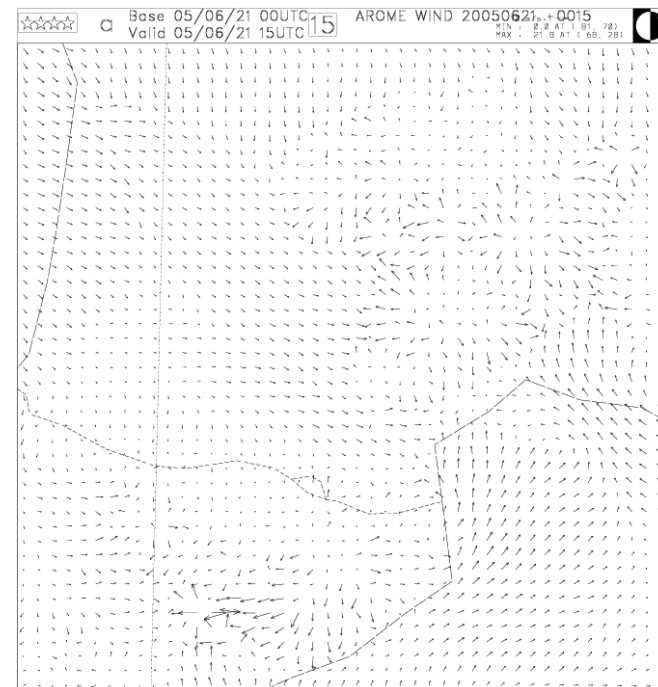
ALADIN\_NH\_2.5km

15 TU

(coupled with oper)

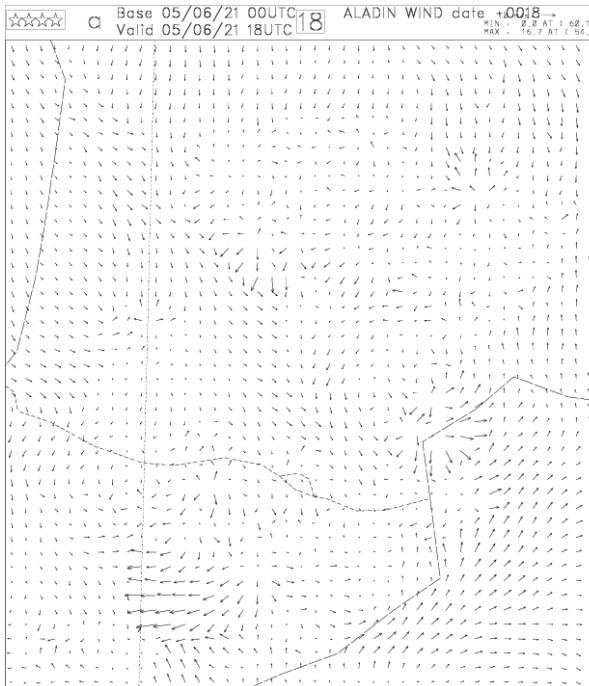
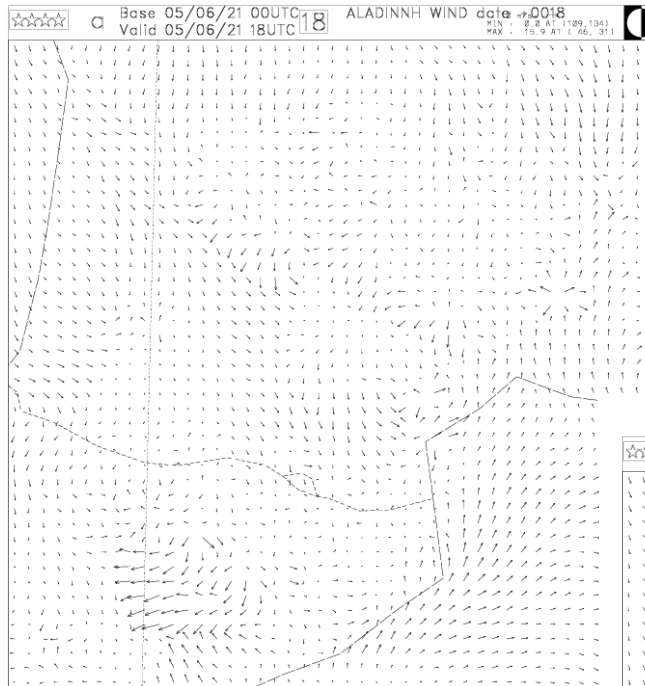


ALADIN\_2.5km



AROME\_2.5km

# 21 June 2005 Case

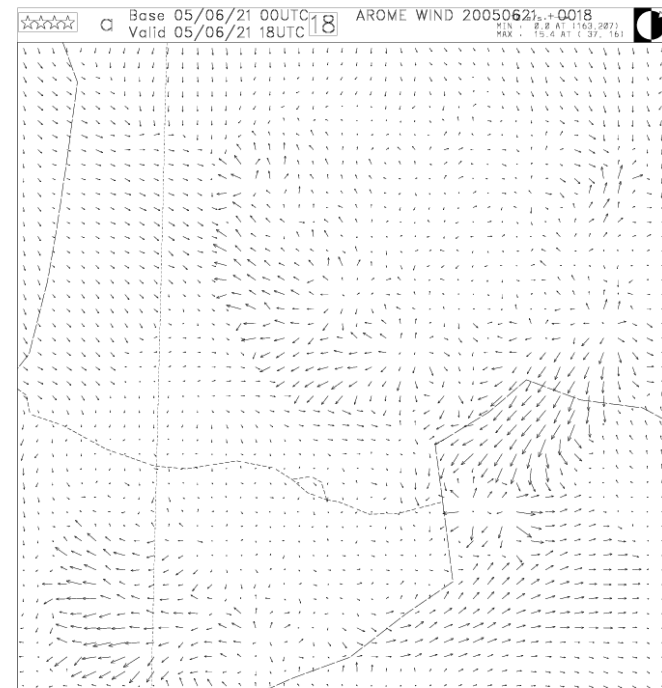


ALADIN\_2.5km

ALADIN\_NH\_2.5km

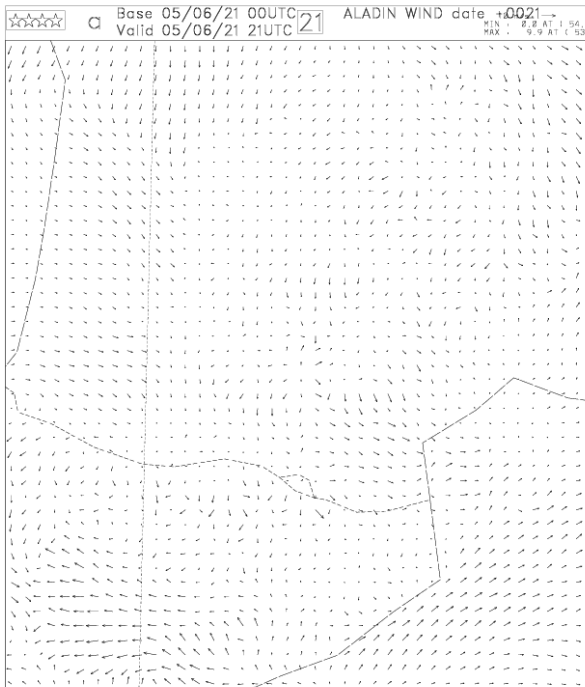
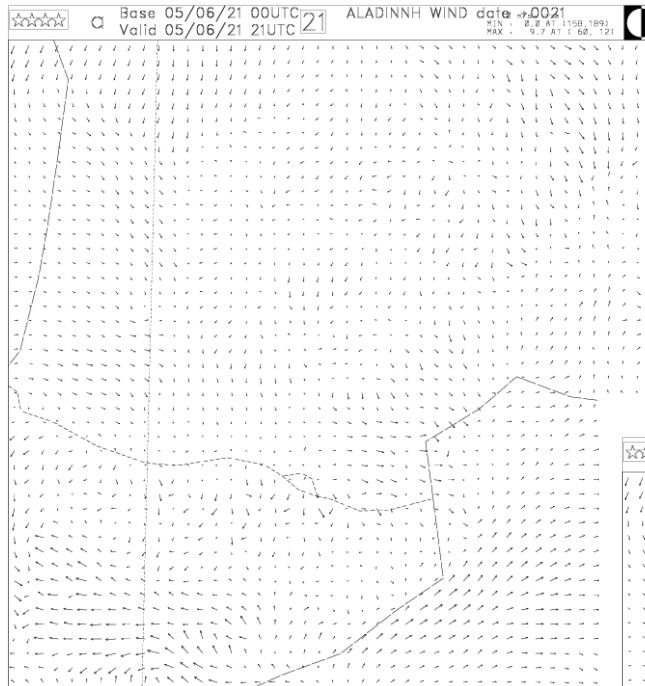
18 TU

(coupled with oper)



AROME\_2.5km

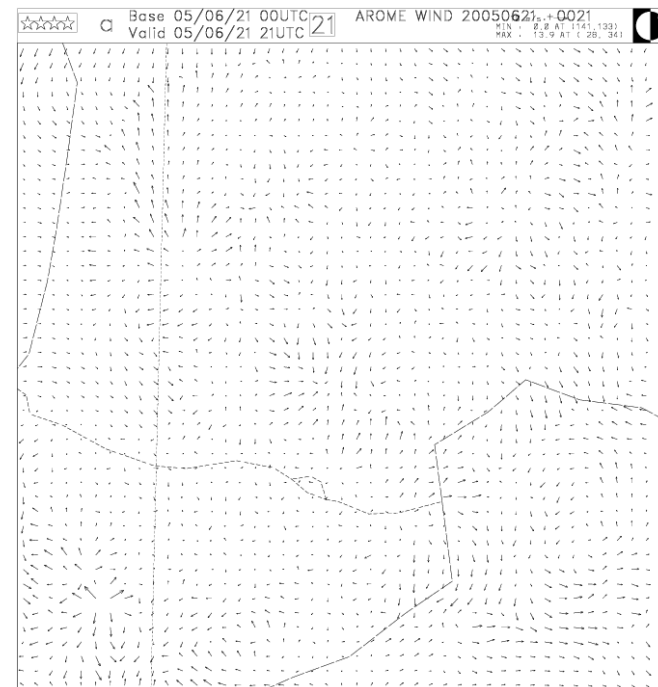
# 21 June 2005 Case



ALADIN\_2.5km

ALADIN\_NH\_2.5km

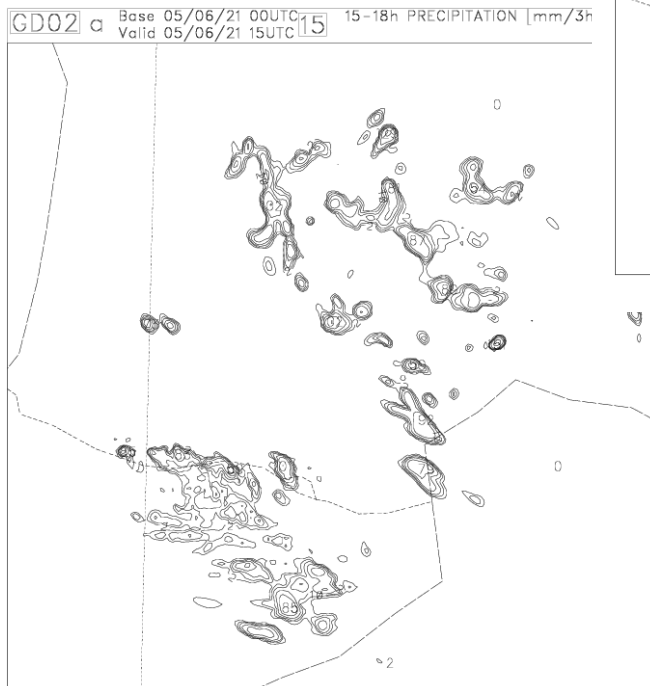
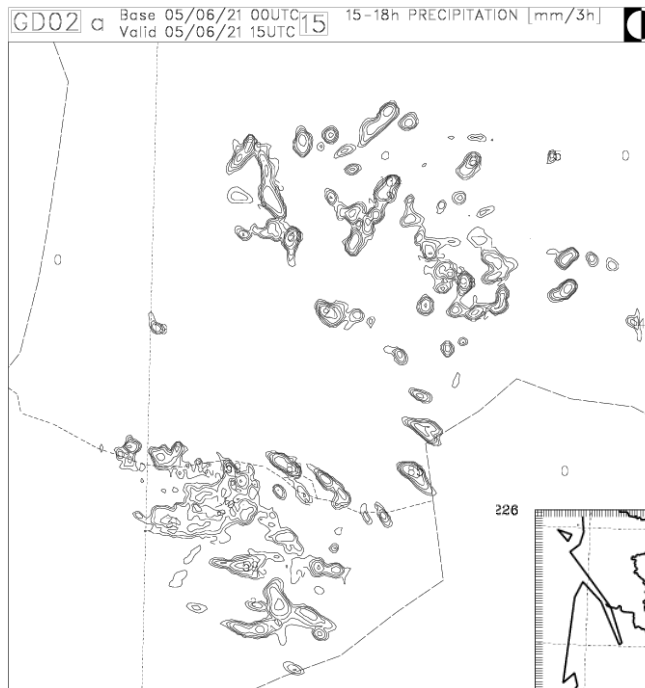
21 TU  
(coupled with oper)



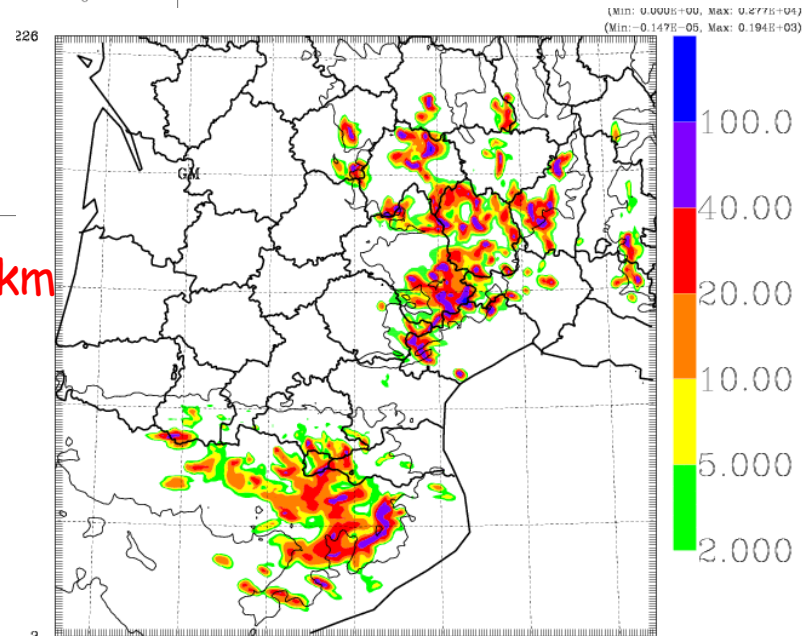
AROME\_2.5km



# 21 June 2005 Case



ALADIN\_NH\_2.5km



15 TU

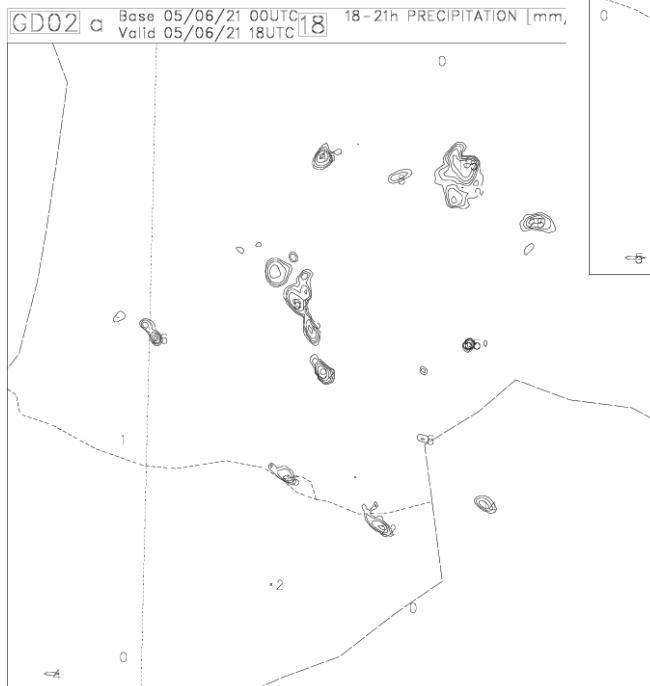
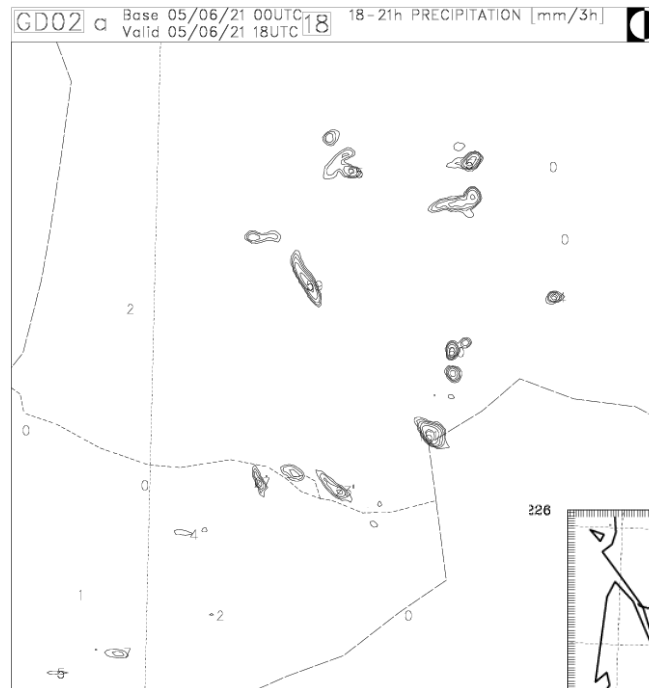
ALADIN\_2.5km

(coupled with oper)

AROME\_2.5km



# 21 June 2005 Case

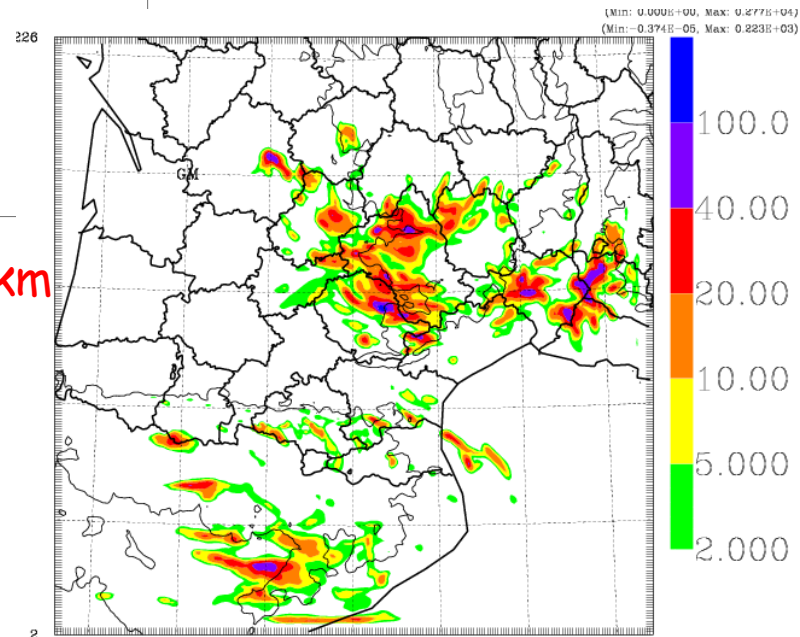


ALADIN\_2.5km

ALADIN\_NH\_2.5km

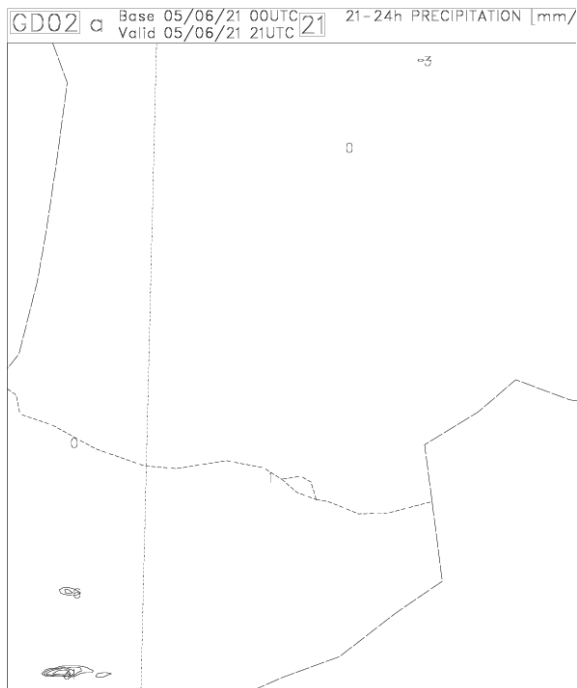
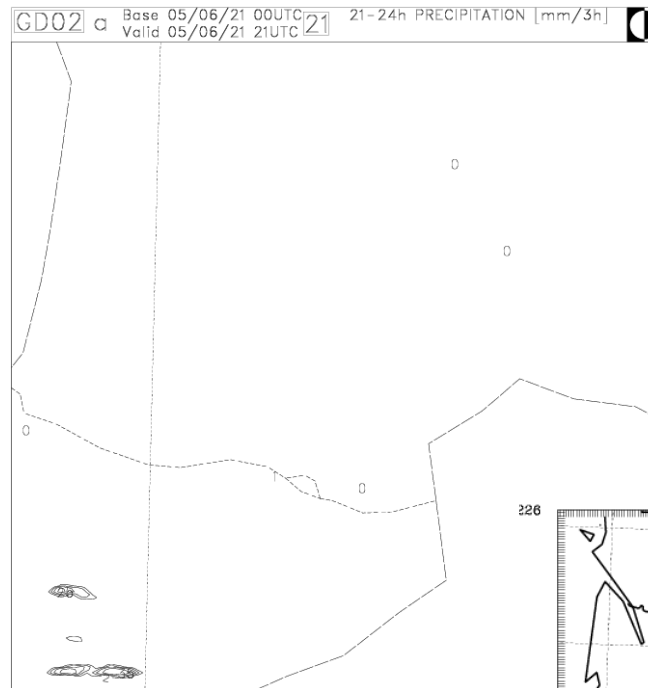
18 TU

(coupled with oper)



AROME\_2.5km

# 21 June 2005 Case

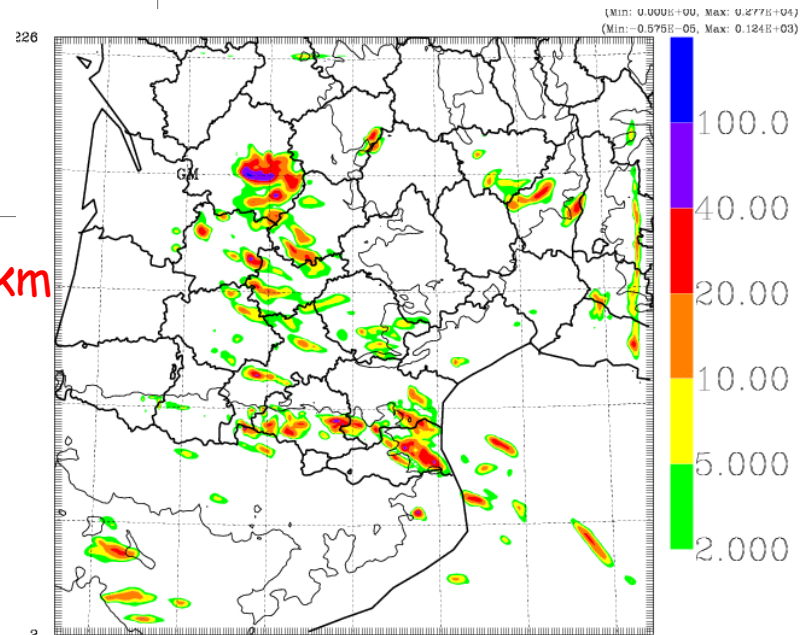


ALADIN\_2.5km

ALADIN\_NH\_2.5km

21 TU

(coupled with oper)



AROME\_2.5km

## 21 June 2005 Case (summary)

- AROME was able to simulate a westward moving squall line not seen by ALADIN oper
- Coupling with ALADIN 3DVAR improves the forecast (best localisation, no more rain before 6 TU)
- Starting 24h before, the system is seen, but not enough strong
- Starting 12h after, the system is delayed
- Testing impact of resolution, dynamics and physics, it seems that the resolution + physics are the key parameters to simulate this system
- What about AROME H ?

# 6 Septembre 2005 flood case



## METEO FRANCE

### Carte de vigilance météorologique

Diffusée le mardi 06 septembre 2005 à 11h06

Valable jusqu'au mercredi 07 septembre 2005 à 06h00

Actualisation de la carte diffusée  
le 06 septembre 2005 à 05h57

#### Commentaires Météo-France

De fortes précipitations orageuses concerneront le quart sud-est du pays jusqu'à l'est de Midi-Pyrénées ainsi que la Corse jusqu'à mercredi après-midi. Sur le Gard et l'Hérault, ces précipitations pourront être diluviennes.

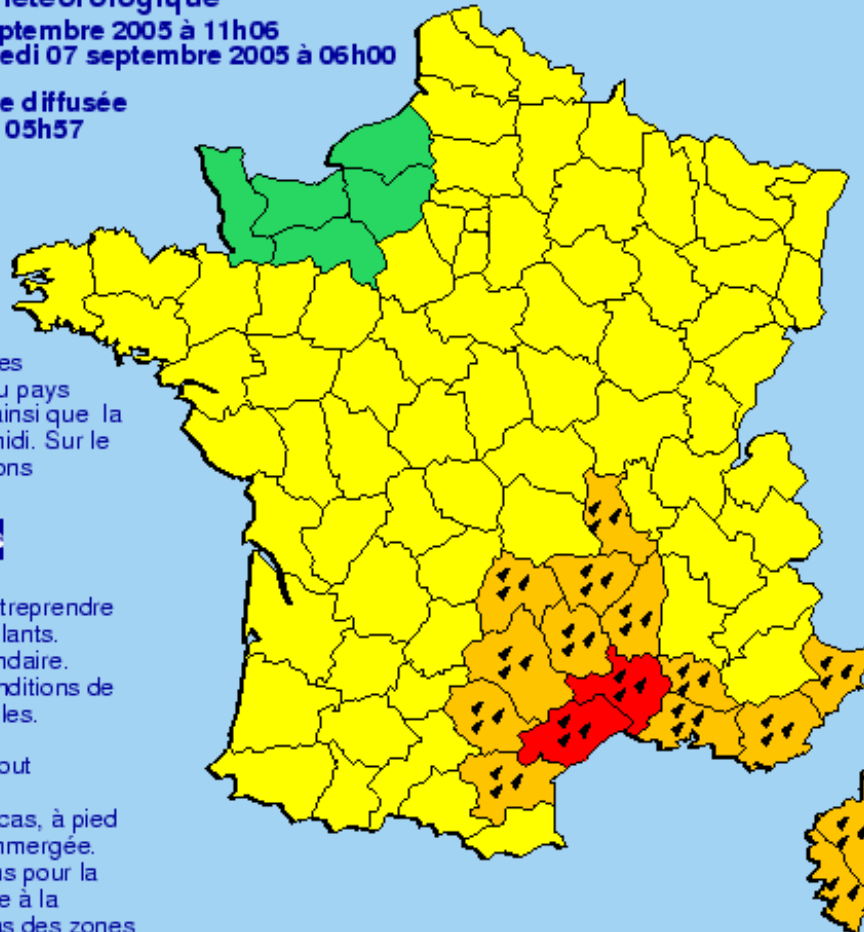
#### Conseils des pouvoirs publics

##### Précipitations/orange

- Renseignez vous avant d'entreprendre un déplacement et soyez vigilants. Evitez le réseau routier secondaire.
- Soyez prudents face aux conditions de circulation pouvant être difficiles.

##### Précipitations/rouge

- Restez chez vous et évitez tout déplacement.
- Ne vous engagez en aucun cas, à pied ou en voiture, sur une voie immergée.
- Prenez toutes les précautions pour la sauvegarde de vos biens face à la montée des eaux, même dans des zones rarement touchées par les inondations.



Vent violent



Fortes précipitations



Orages



Neige-Verglas



**Rouge** : Une vigilance absolue s'impose; des phénomènes météorologiques dangereux d'intensité exceptionnelle sont prévus; tenez-vous régulièrement au courant de l'évolution météorologique et conformez vous aux conseils ou consignes émis par les pouvoirs publics.



**Orange** : Soyez très vigilant; des phénomènes météorologiques dangereux sont prévus; tenez-vous au courant de l'évolution météorologique et suivez les conseils émis par les pouvoirs publics.



**Jaune** : Soyez attentif si vous pratiquez des activités sensibles au risque météorologique; des phénomènes habituels dans la région mais occasionnellement dangereux (ex mistral, orage d'été) sont en effet prévus; tenez-vous au courant de l'évolution météorologique.



**Vert** : Pas de vigilance particulière.

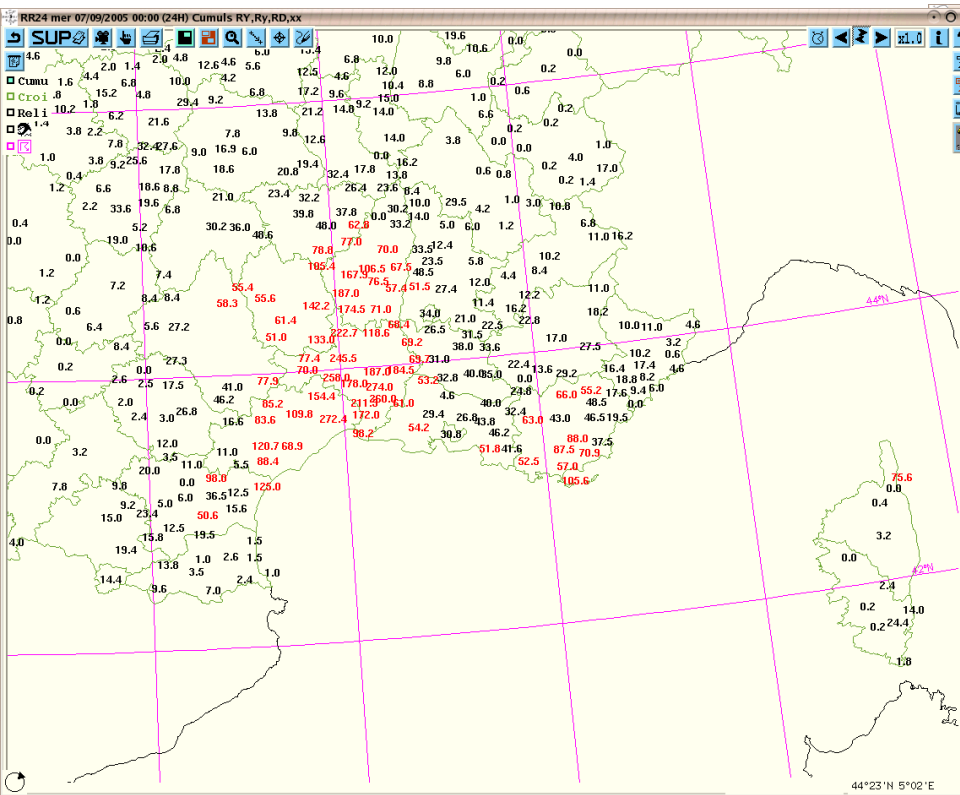
Les cartes de vigilance météo paraissent 2 fois par jour à 06h et à 16h.

En cas de vigilance orange ou rouge des bulletins de suivi sont disponibles.

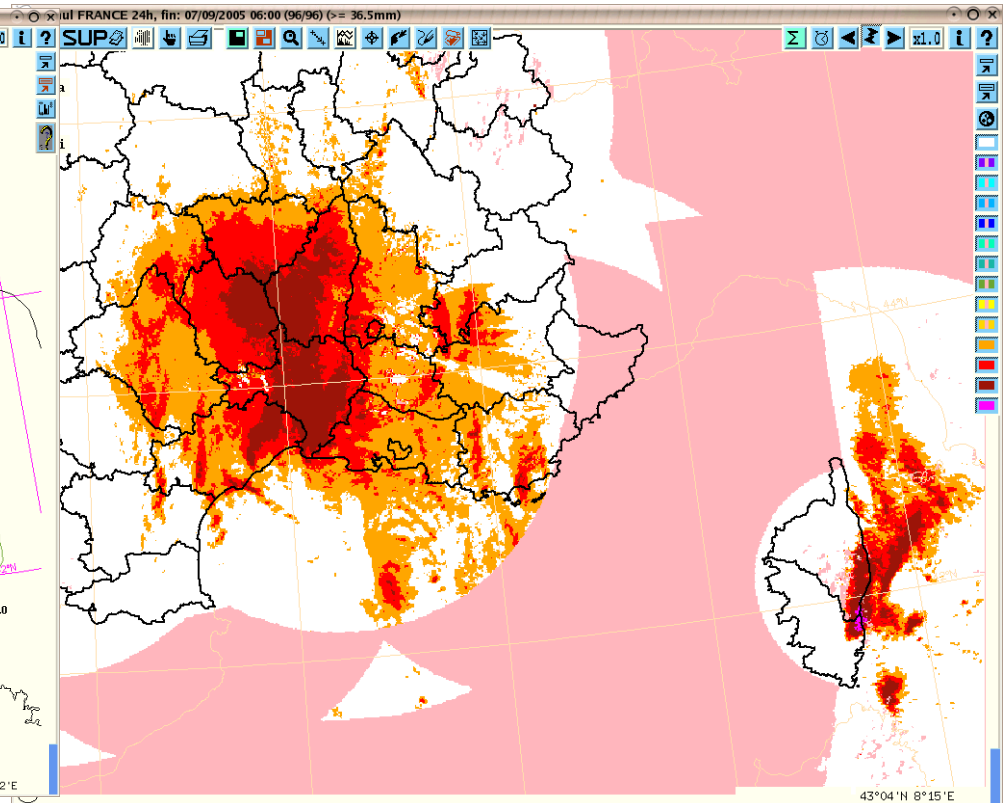
# 6 Septembre 2005 flood case

## Cumulative rainfalls in 24h, 6-09-2005

RR



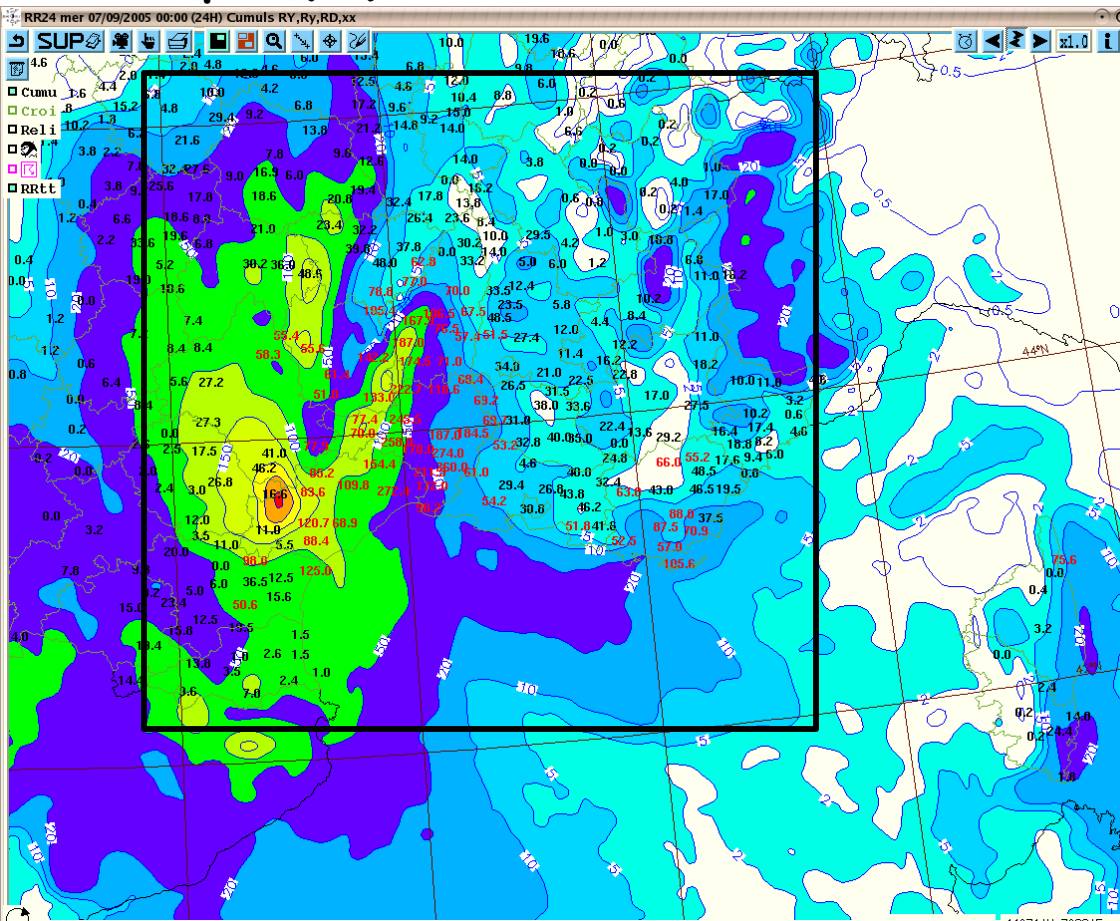
radar



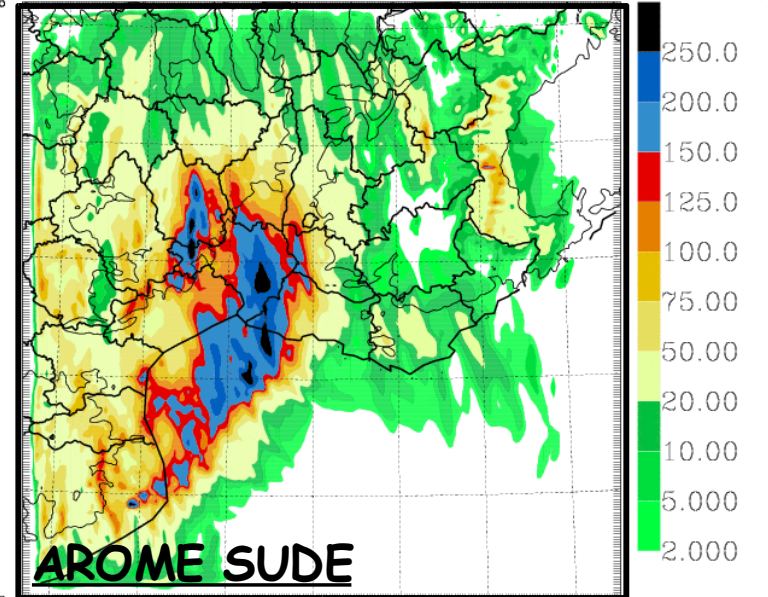
# 6 Septembre 2005 flood case

Cumulated rain in 24h, 6-09-05

Aladin oper (r0) + obs



226

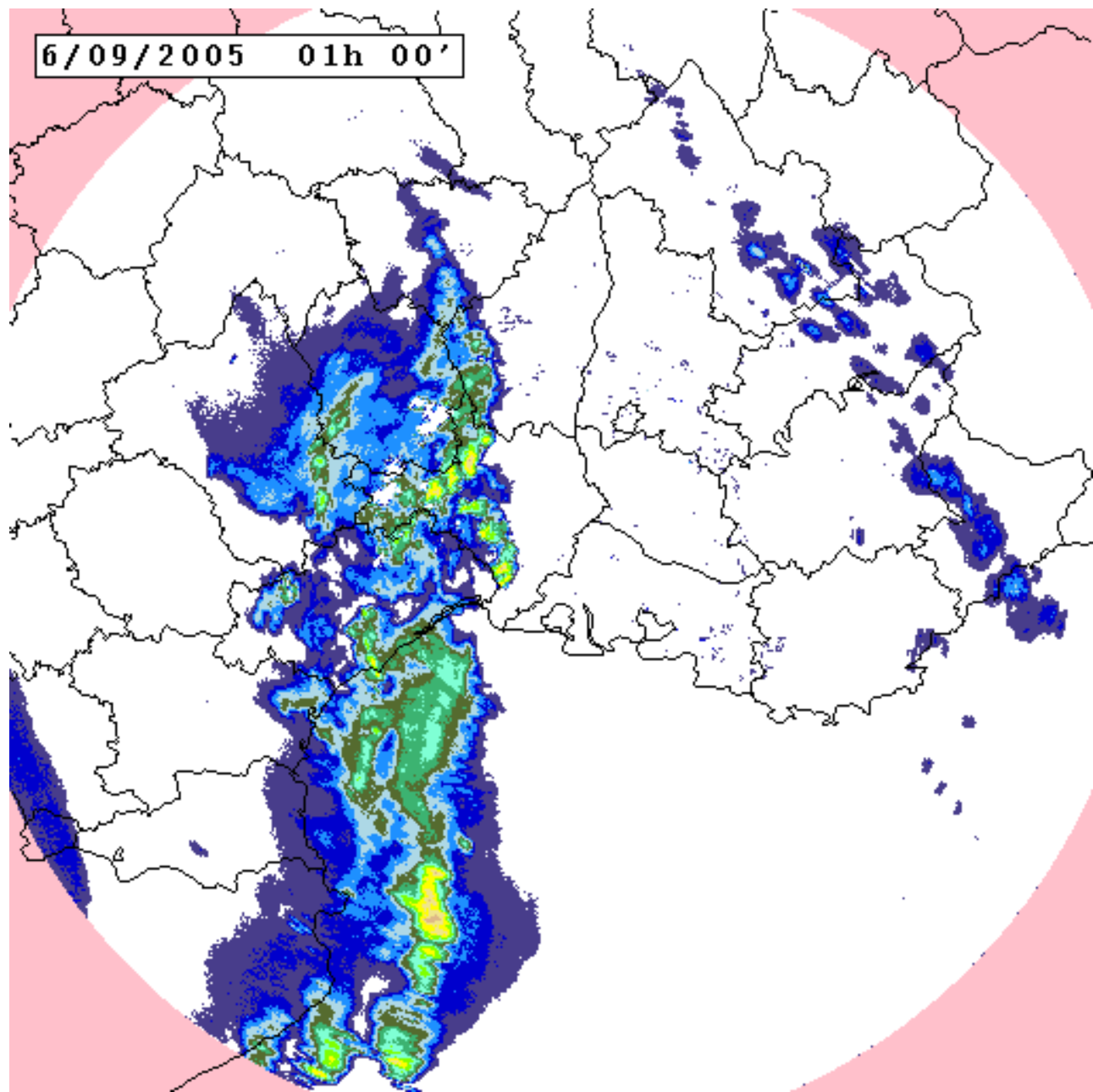


AROME better estimates the localization



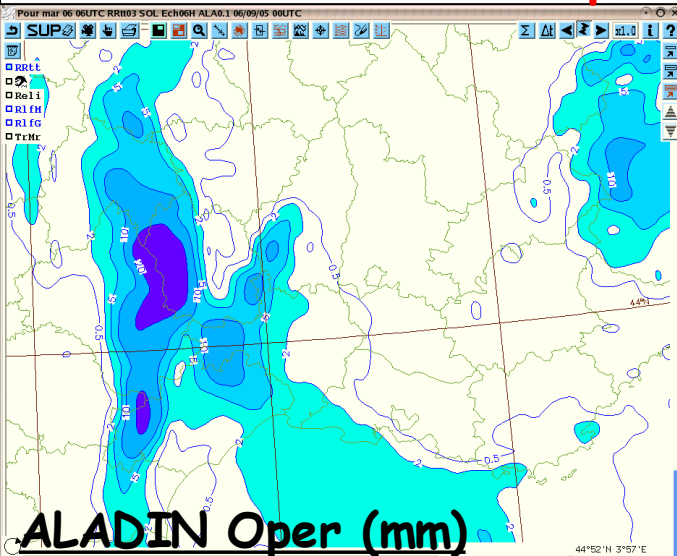
## 6 Septembre 2005 flood case

Animation radar  
Nîmes

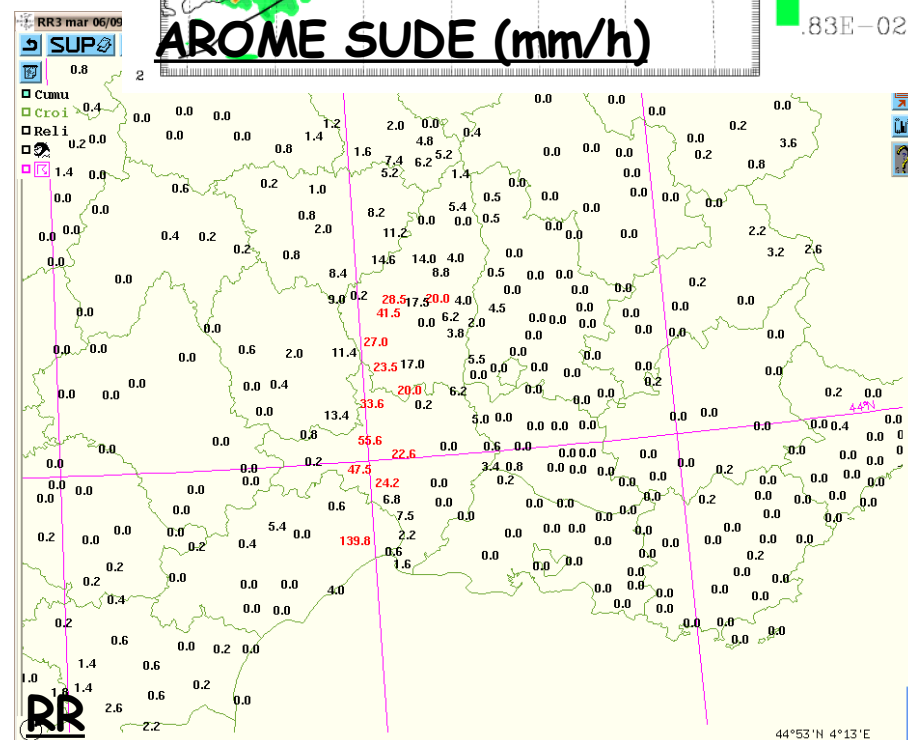
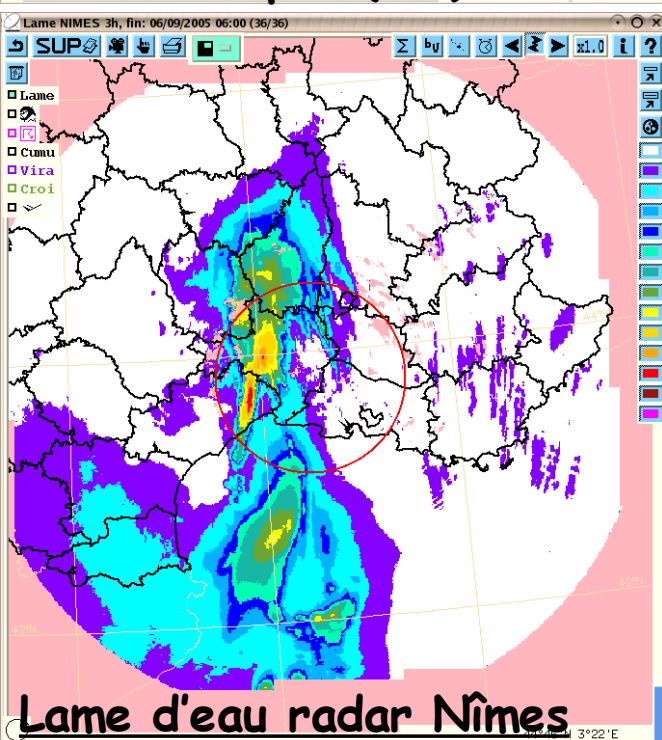
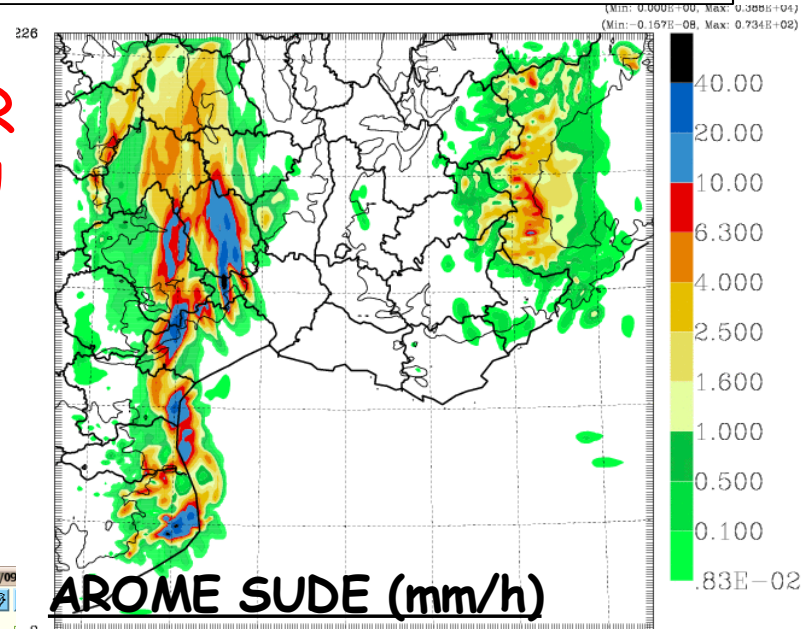




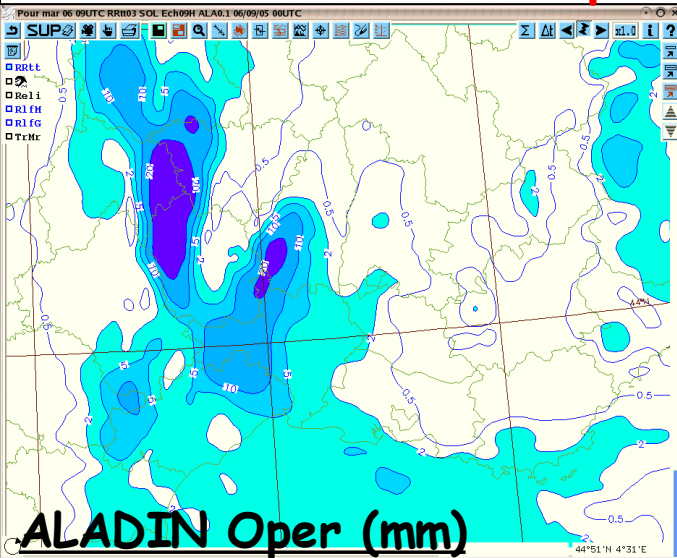
# 6 Septembre 2005 flood case



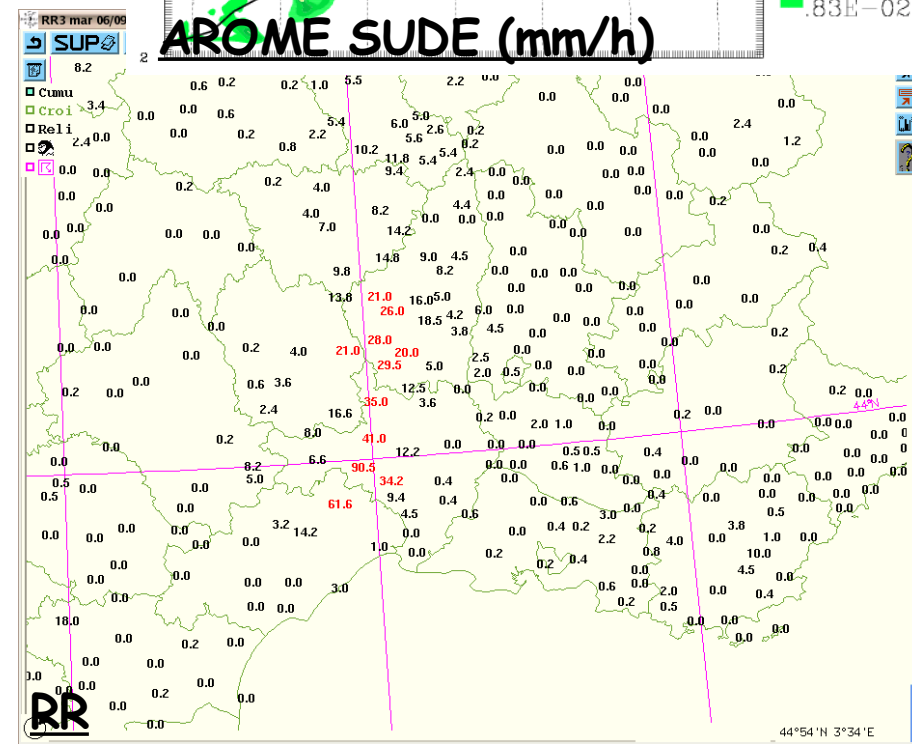
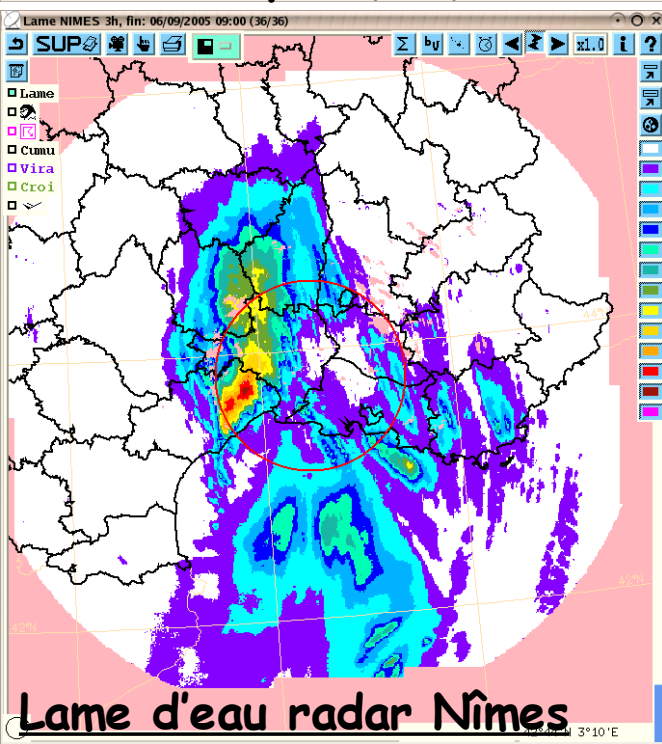
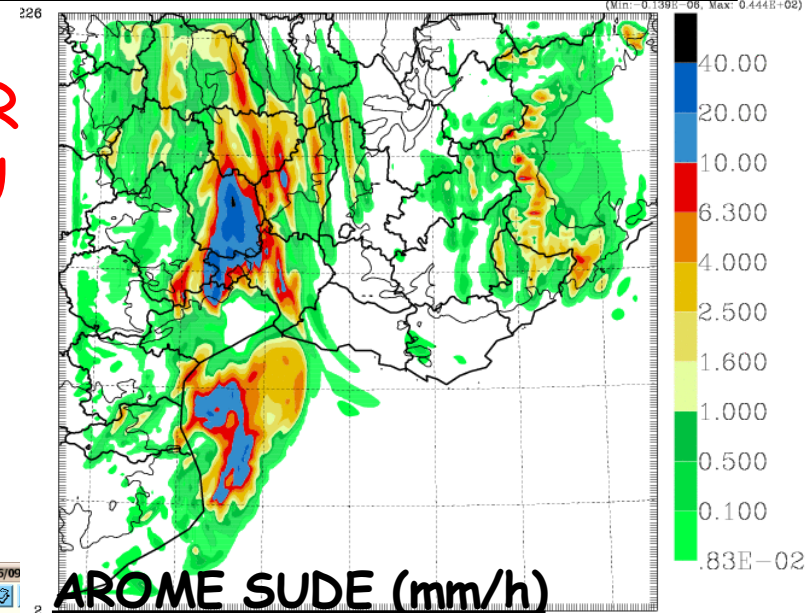
Cumulative RR  
in 3h, 3-6 TU



# 6 Septembre 2005 flood case



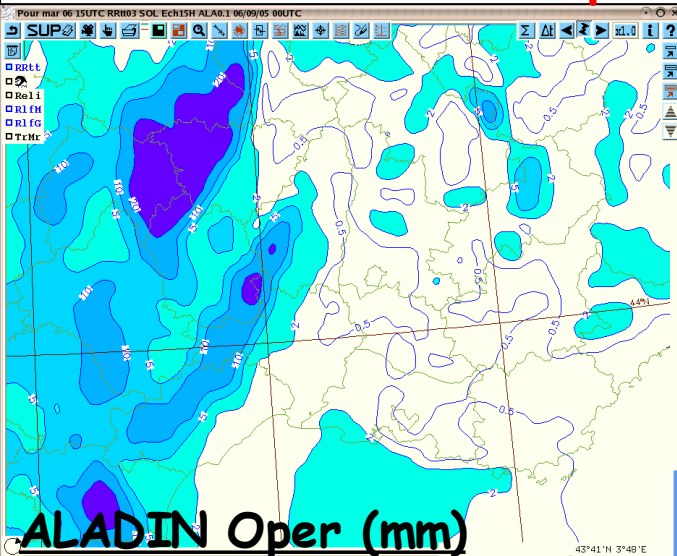
Cumulative RR  
in 3h, 6-9 TU



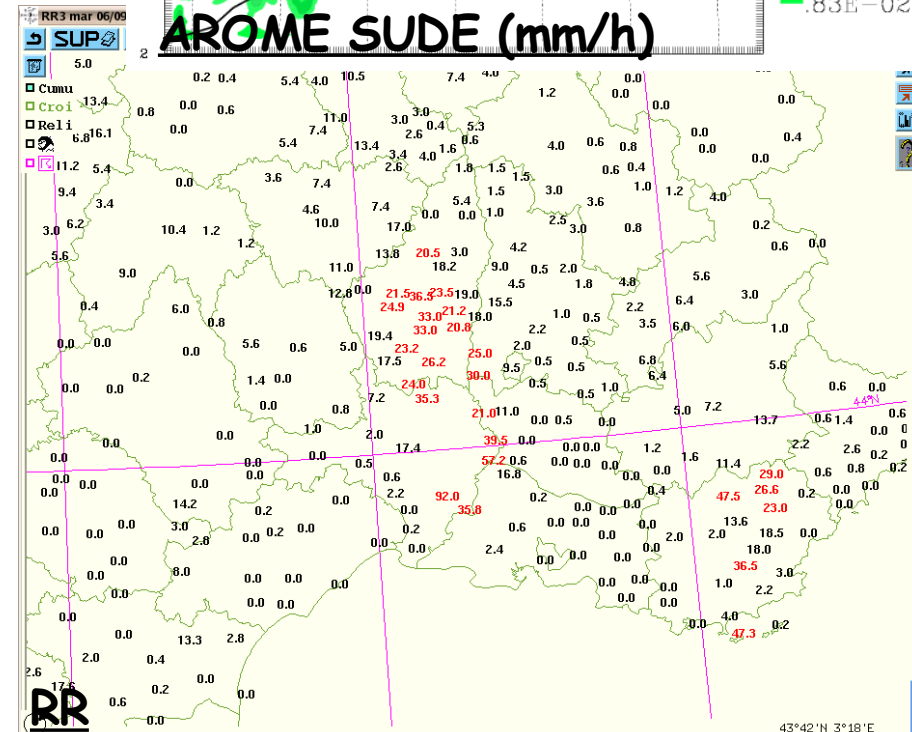
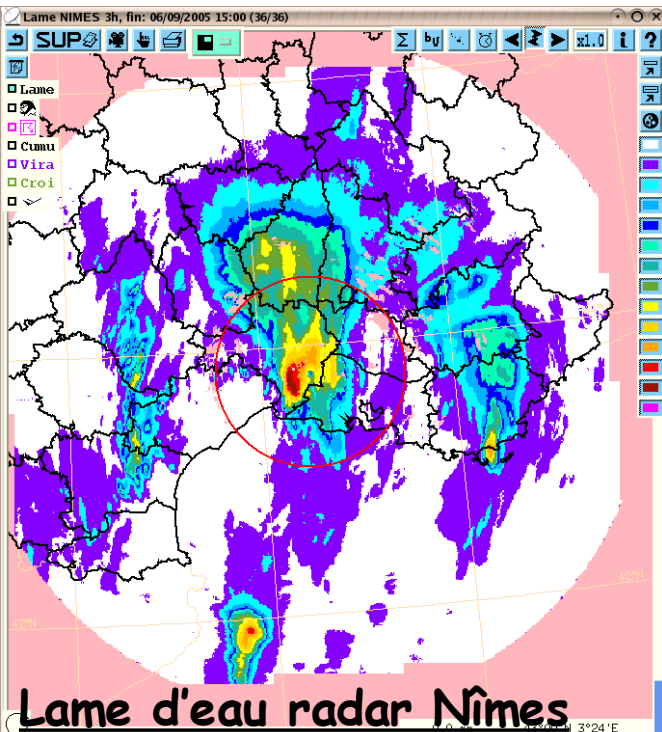
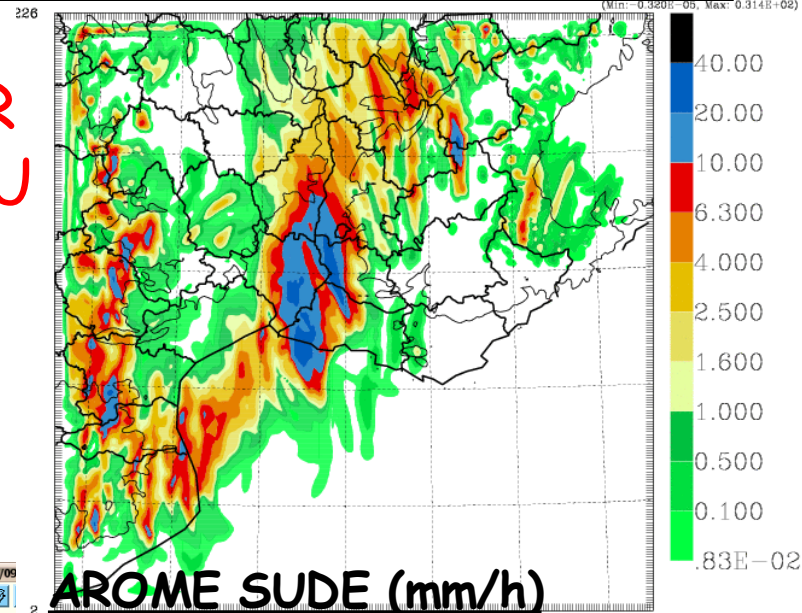




# 6 Septembre 2005 flood case

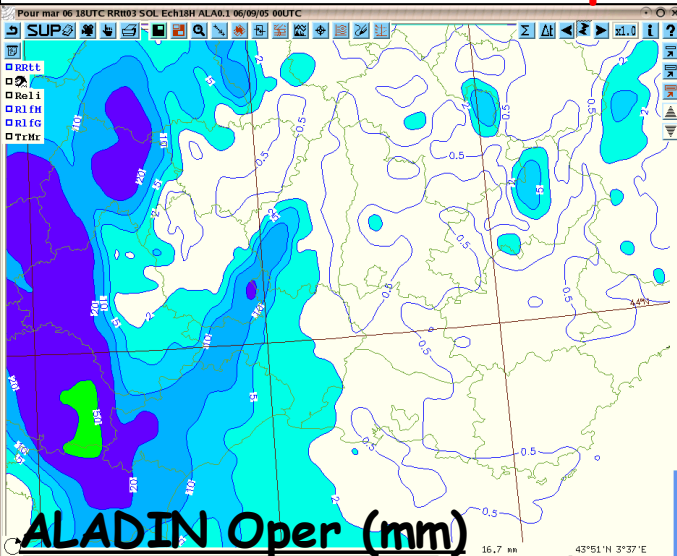


Cumulative RR  
in 3h, 12-15 TU

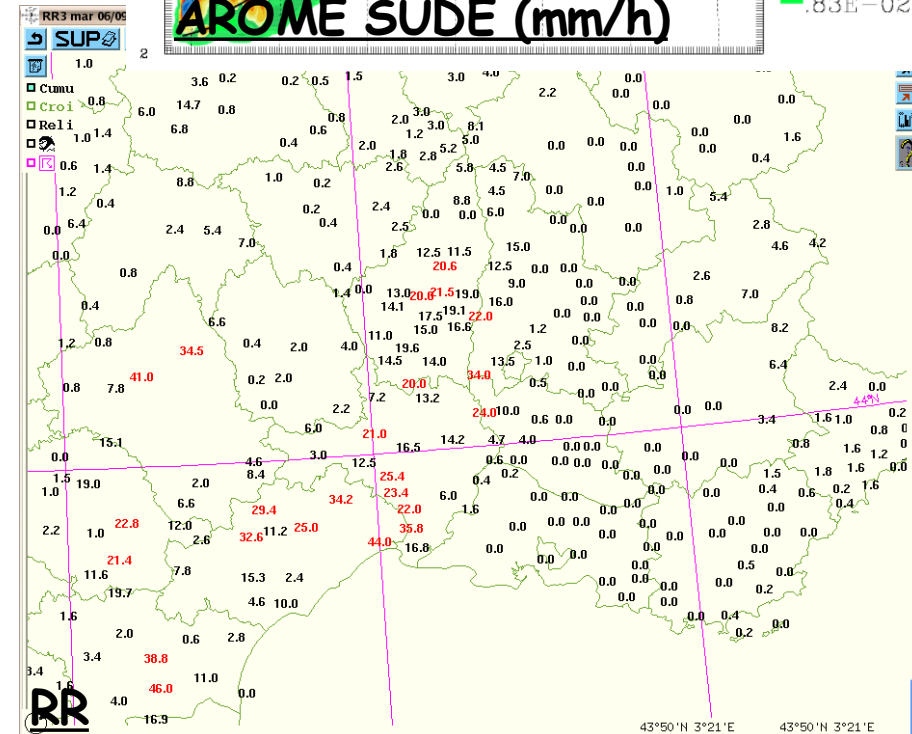
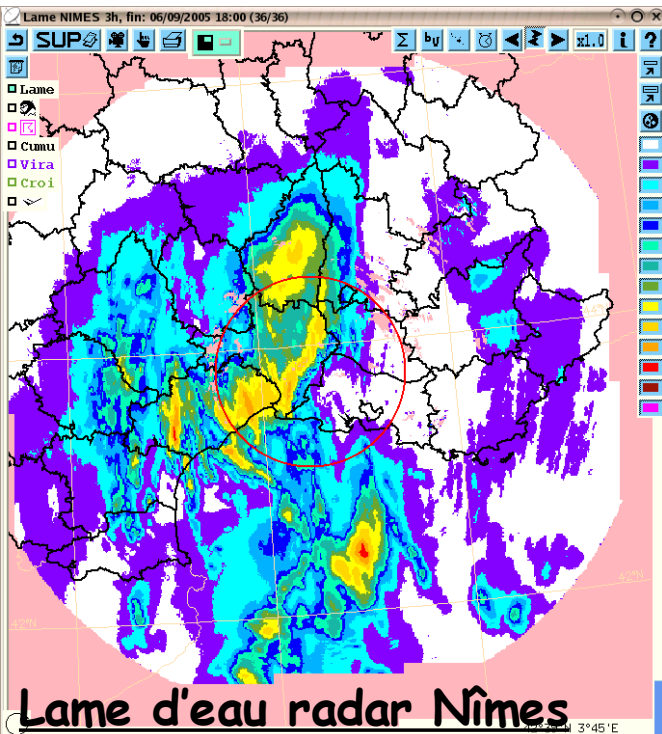
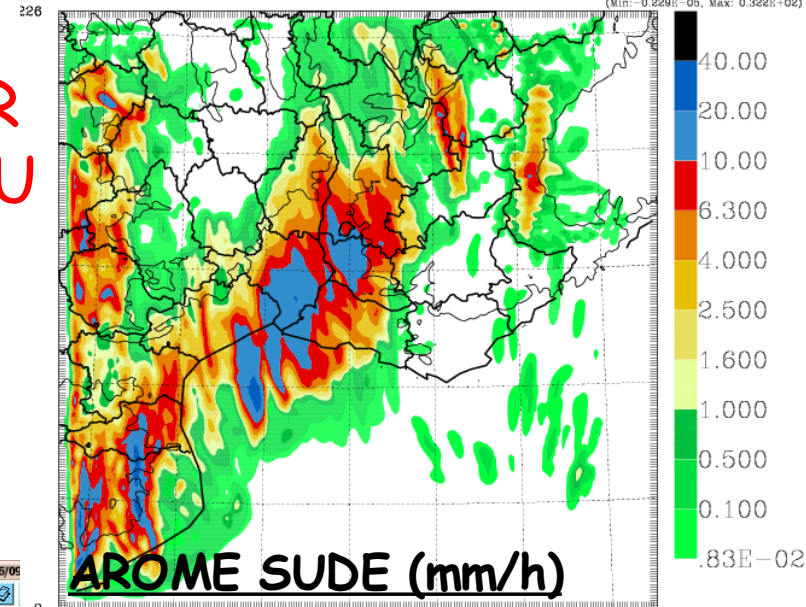




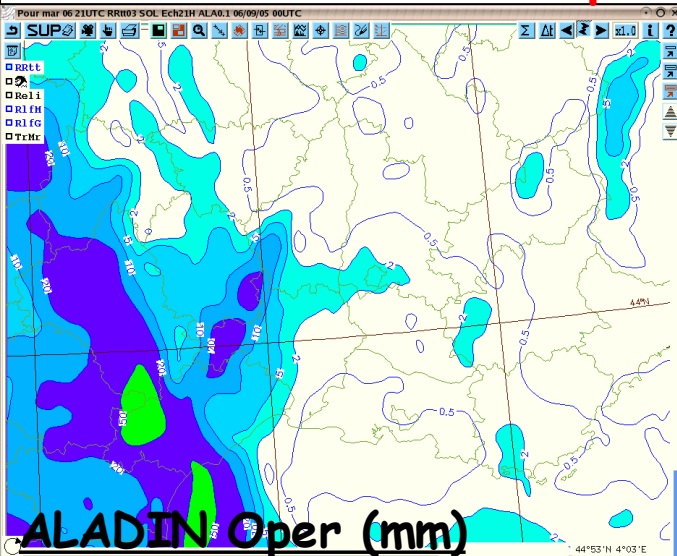
# 6 Septembre 2005 flood case



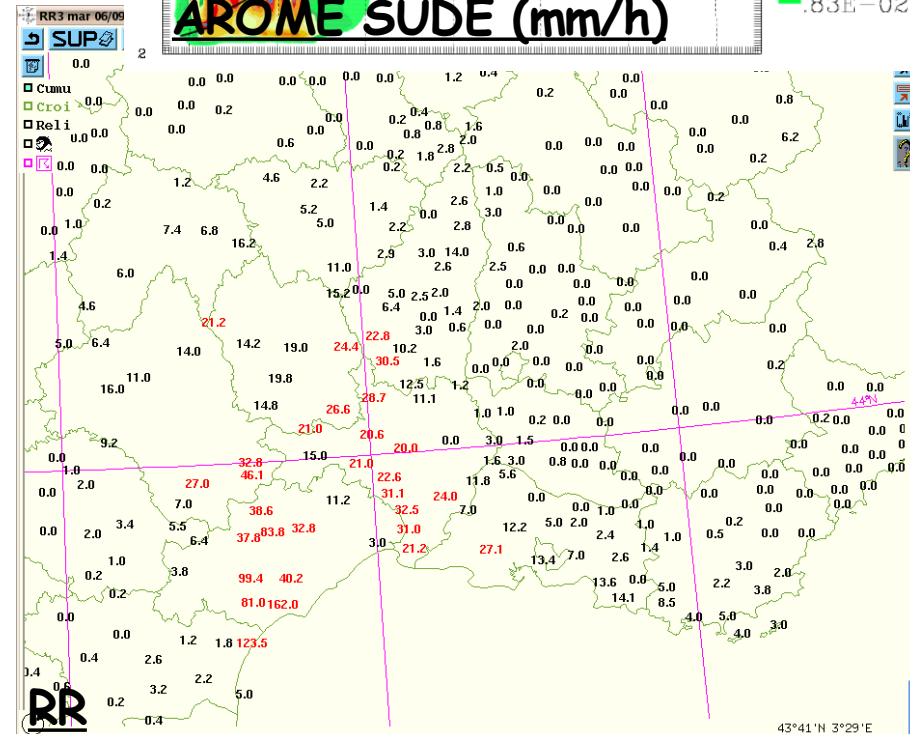
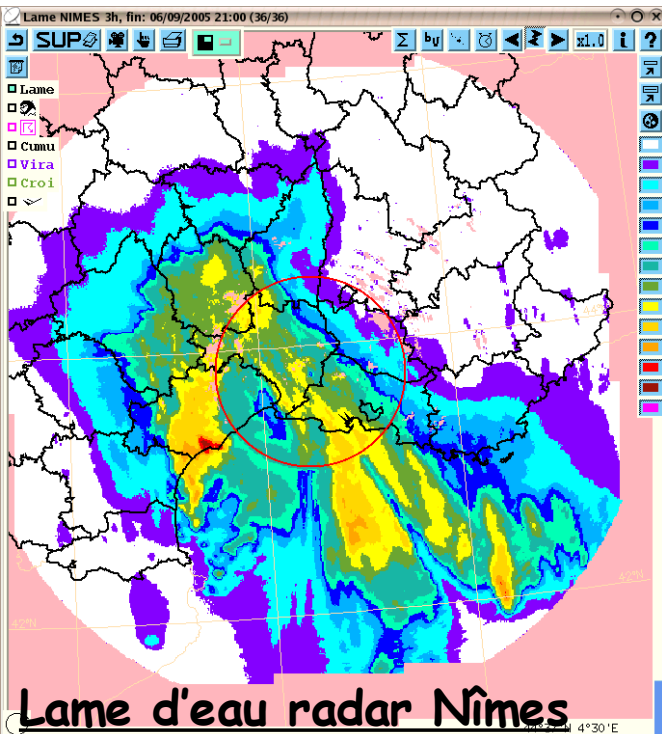
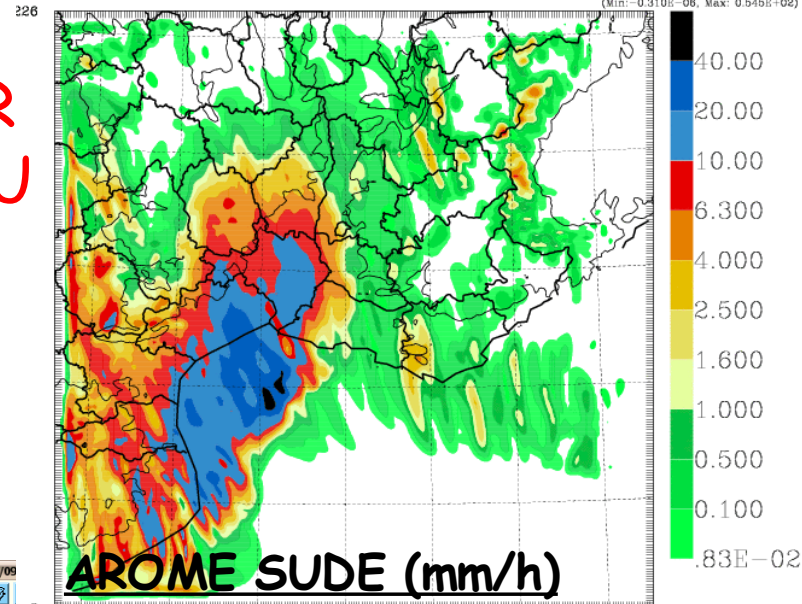
Cumulative RR  
in 3h, 15-18 TU



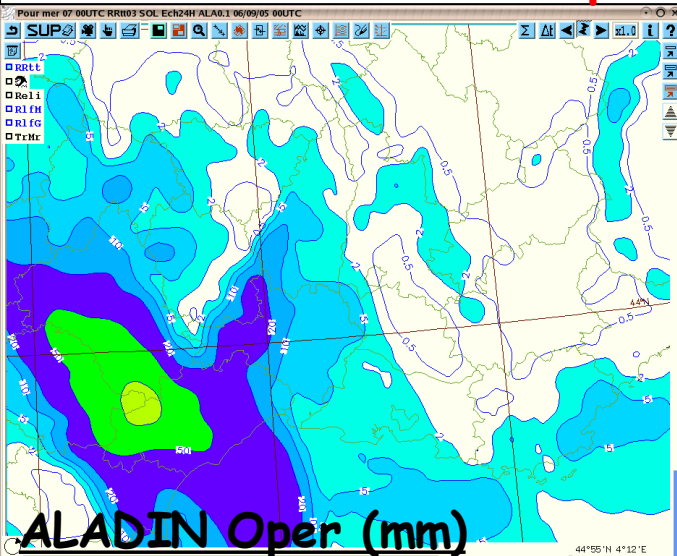
# 6 Septembre 2005 flood case



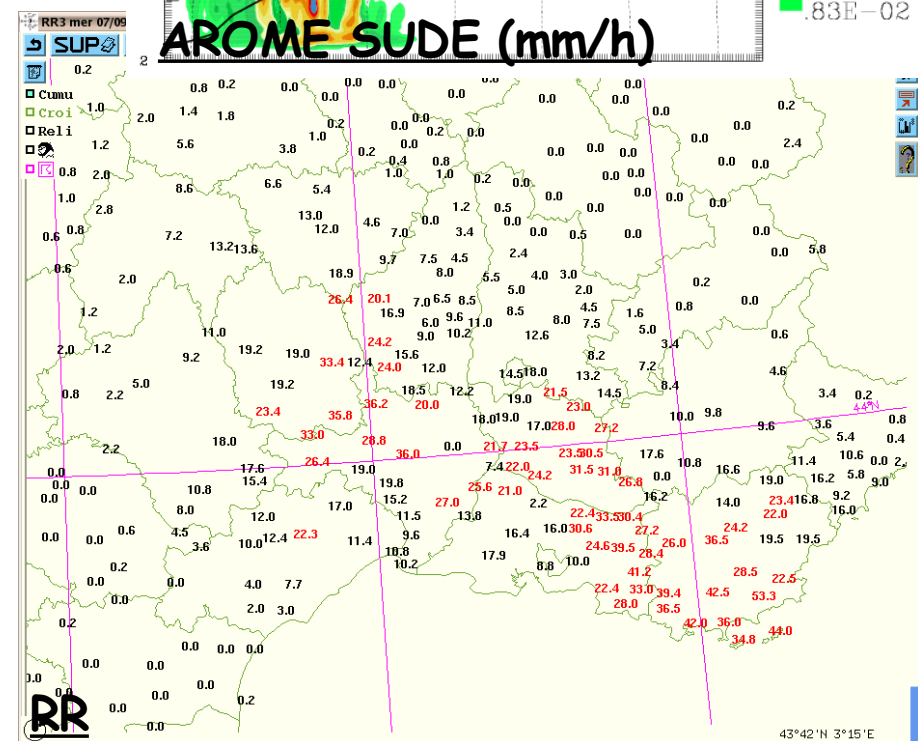
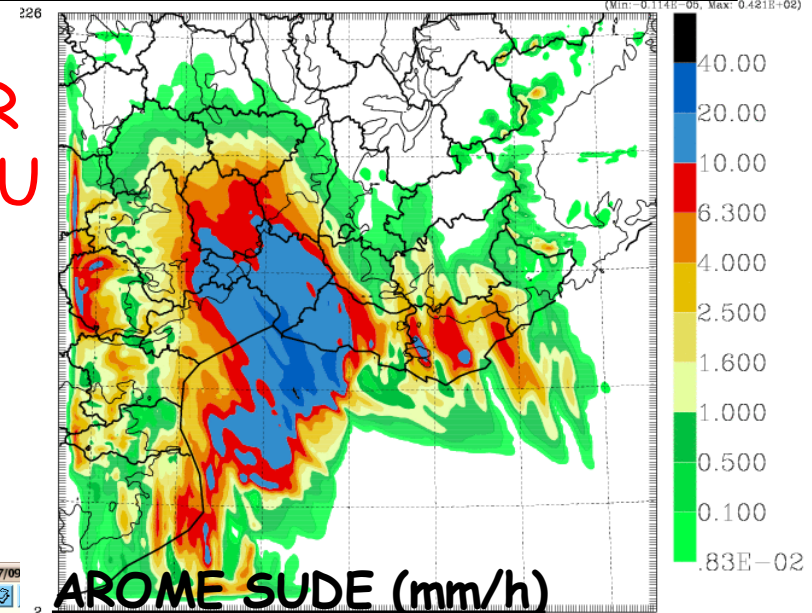
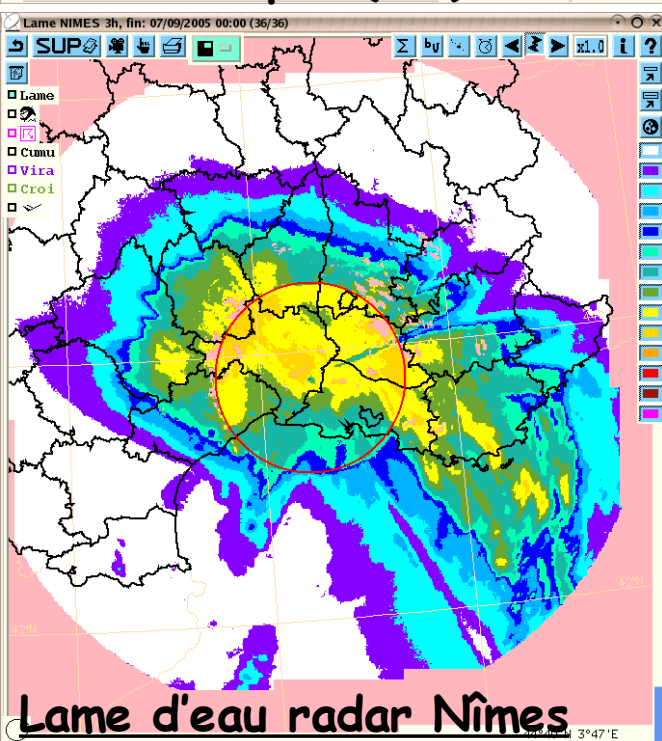
Cumulative RR  
in 3h, 18-21 TU



# 6 Septembre 2005 flood case



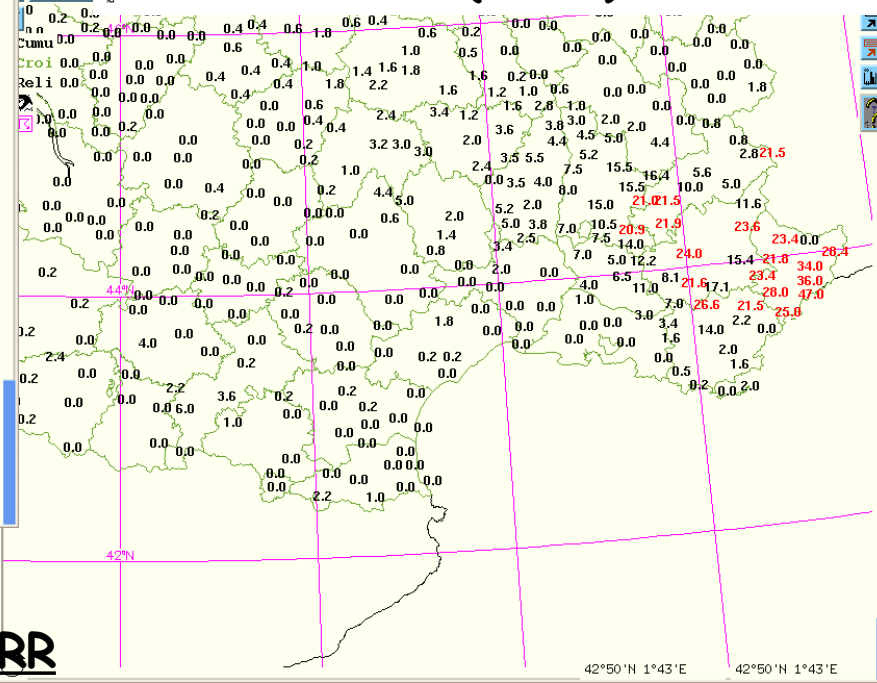
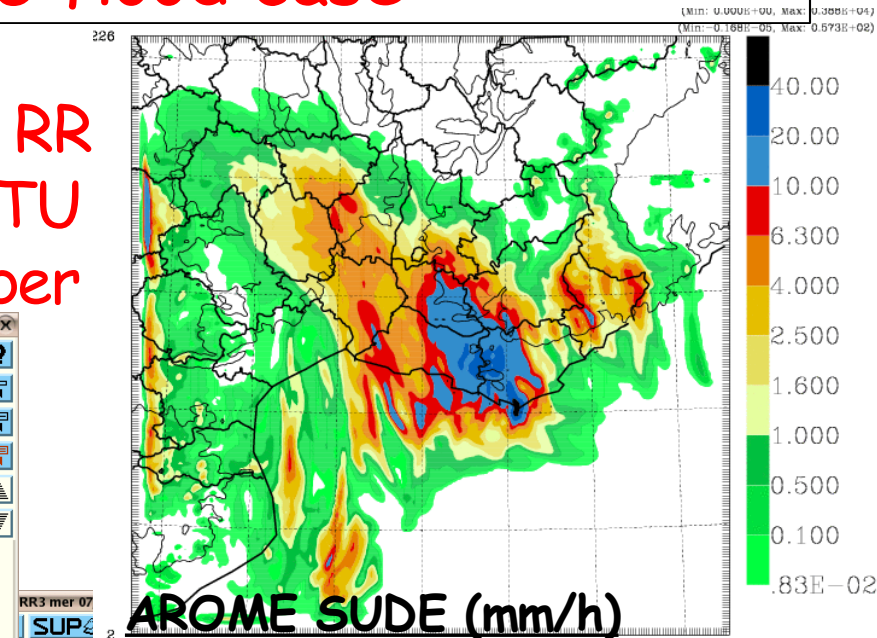
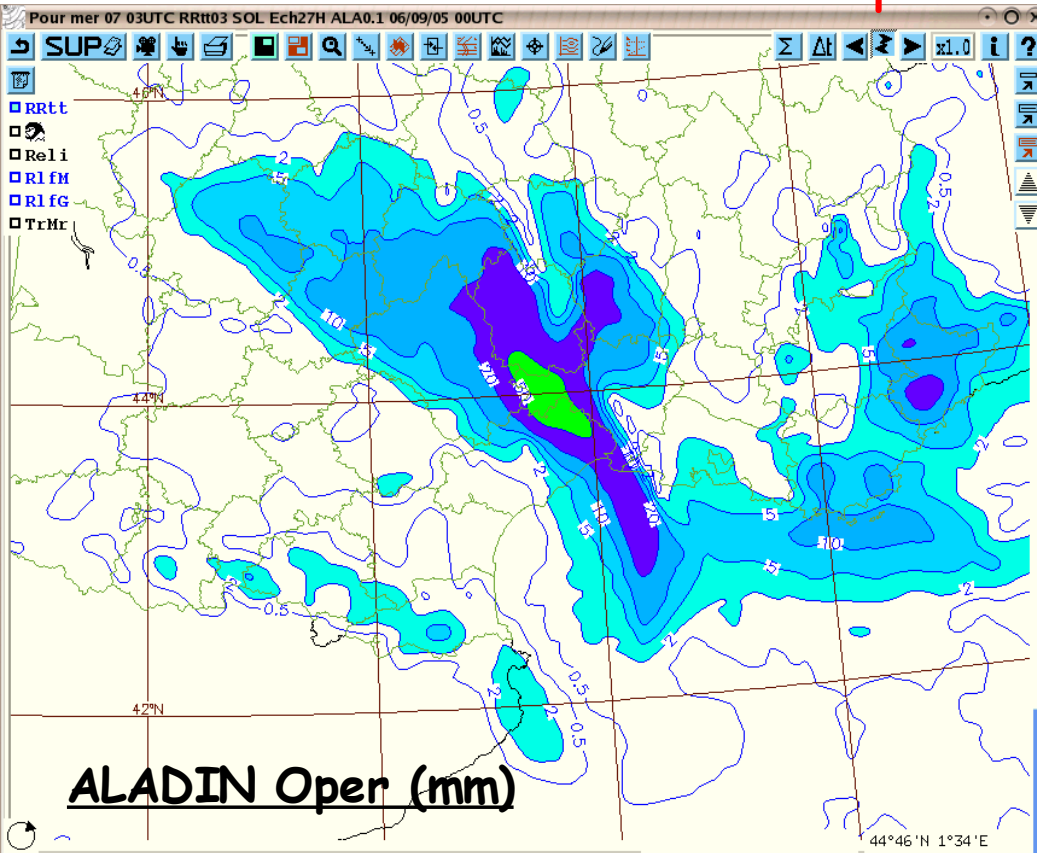
Cumulative RR  
in 3h, 21-24 TU





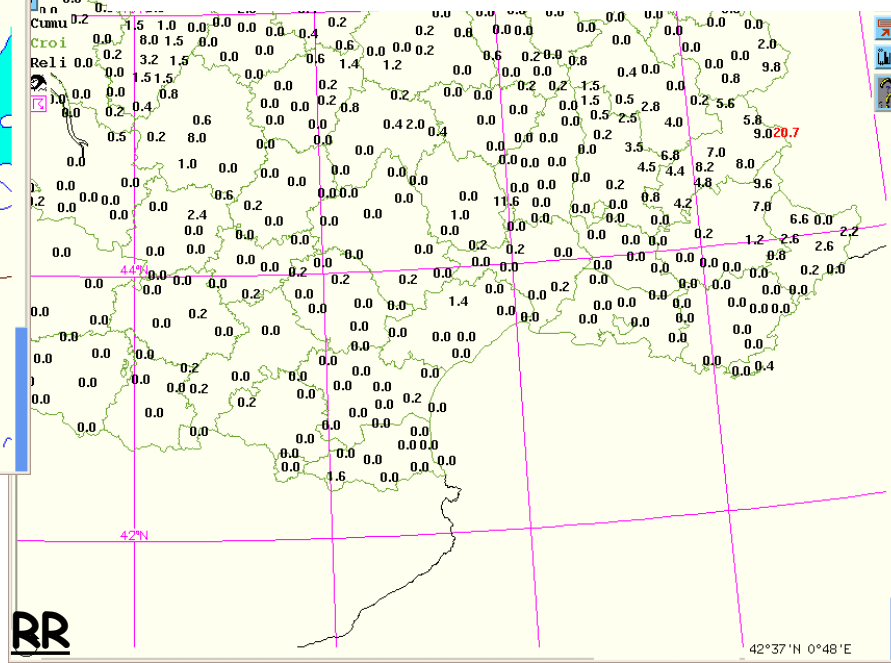
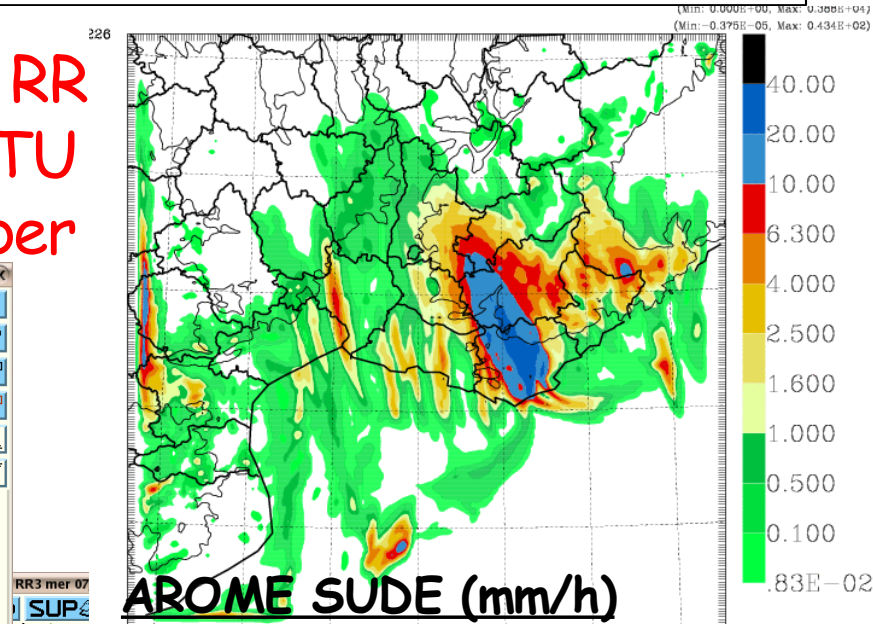
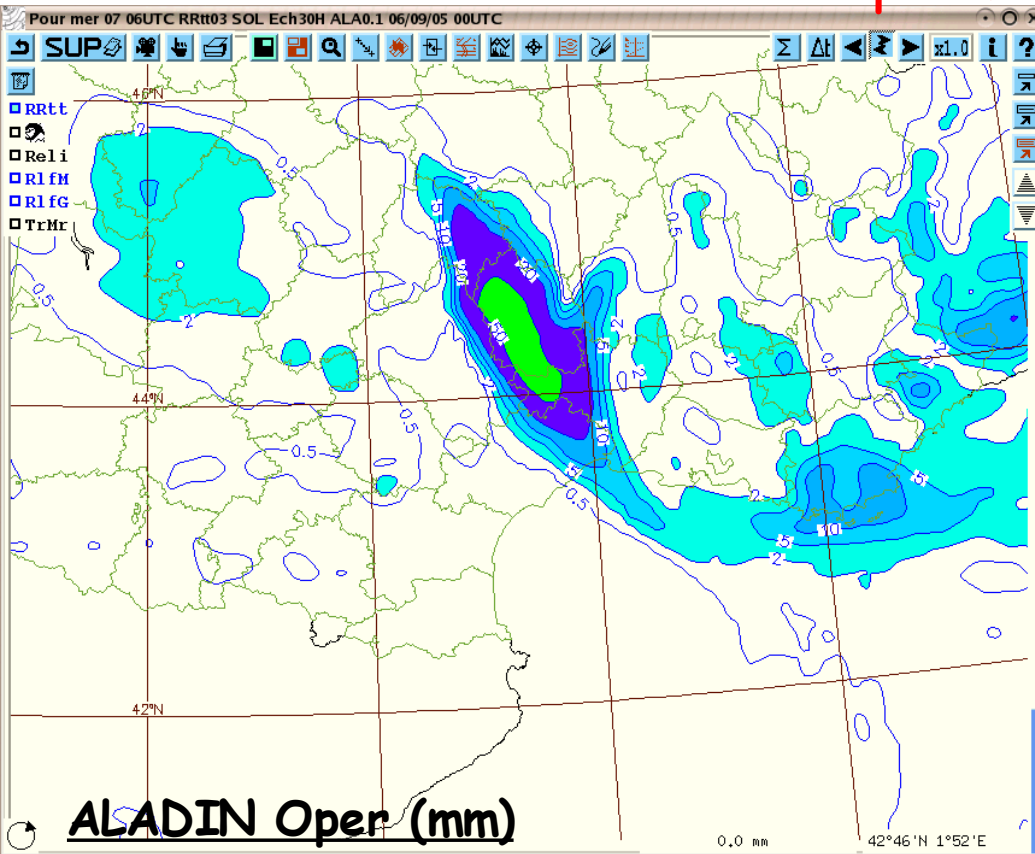
# 6 Septembre 2005 flood case

Cumulative RR  
in 3h, 0-3 TU  
7-September



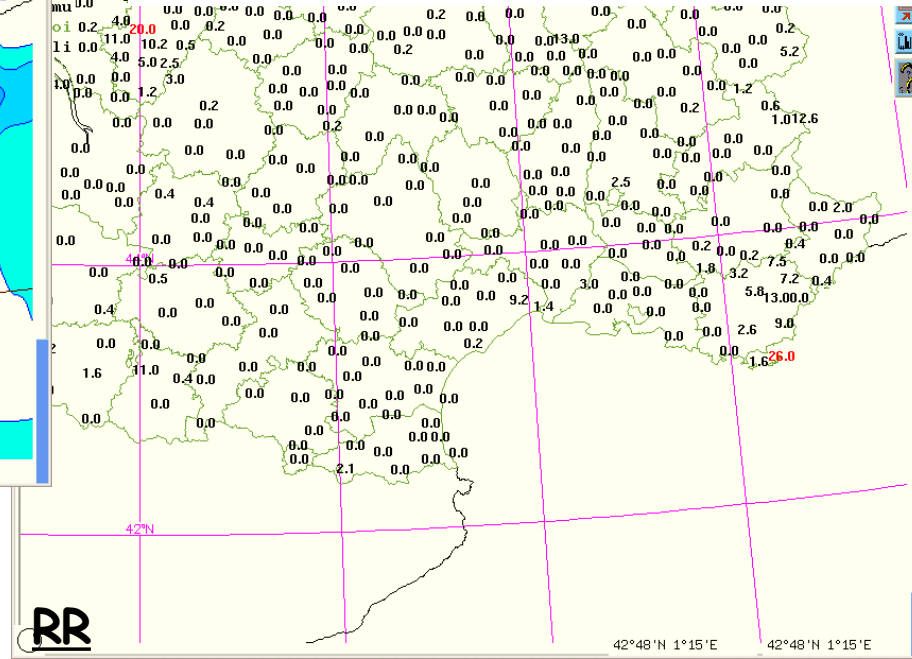
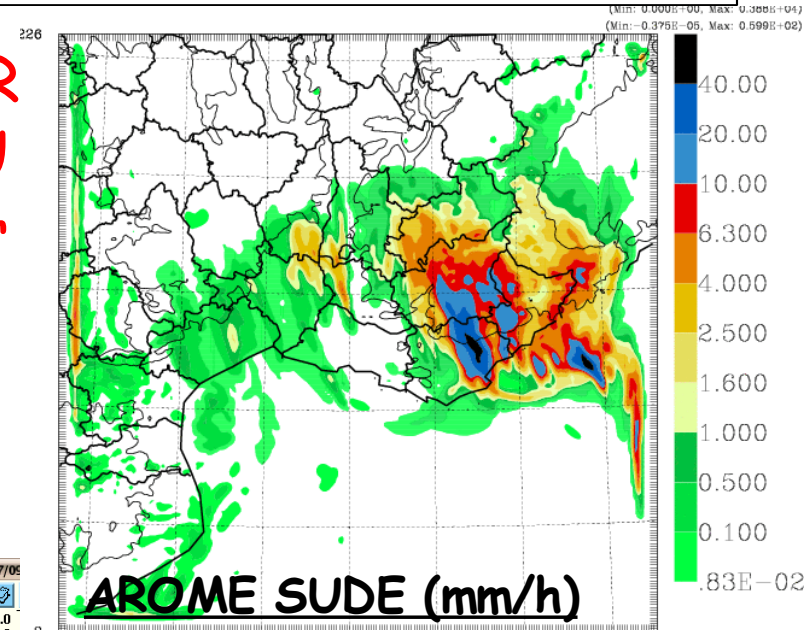
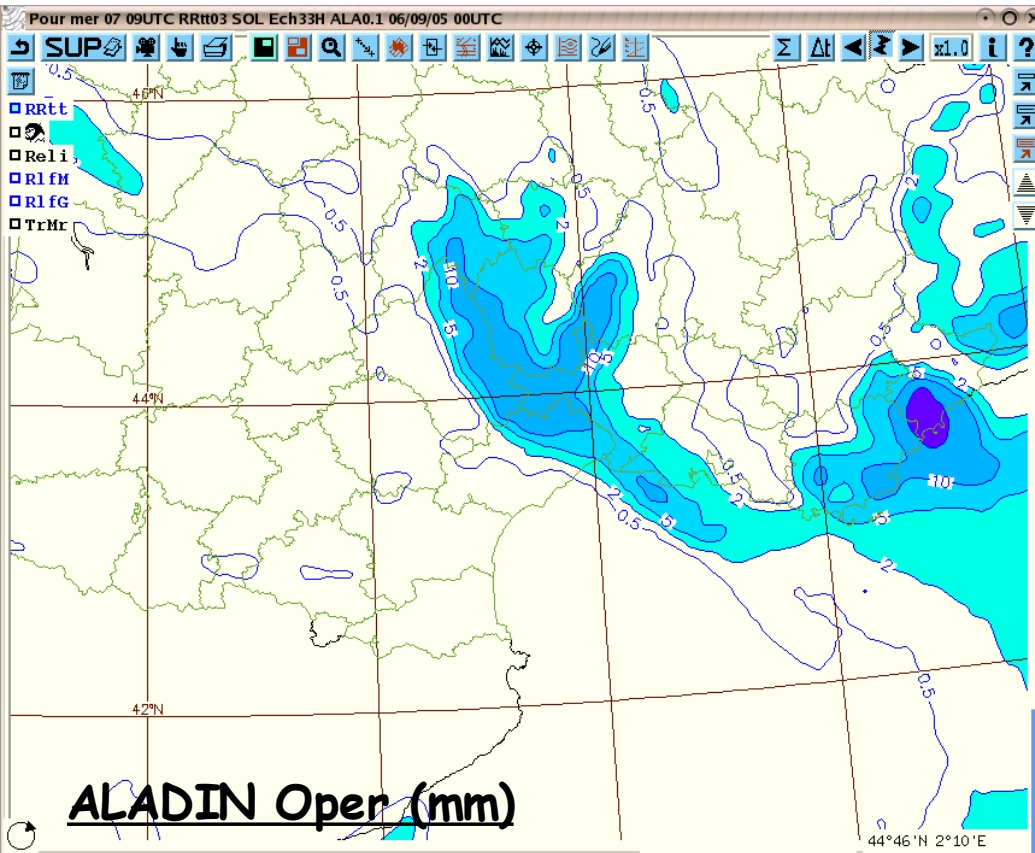
# 6 Septembre 2005 flood case

Cumulative RR  
in 3h, 3-6 TU  
7-September



# 6 Septembre 2005 flood case

Cumulative RR  
in 3h, 6-9 TU  
7-September

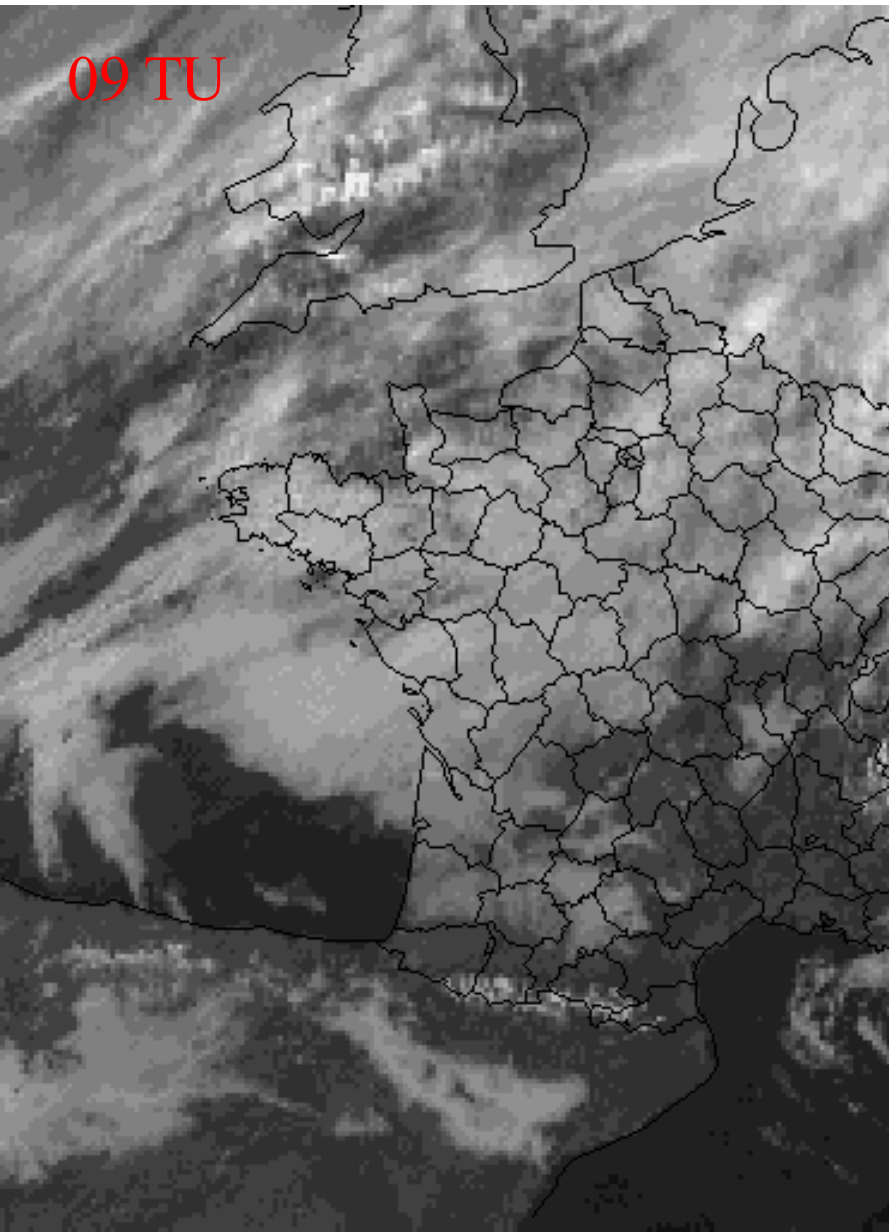




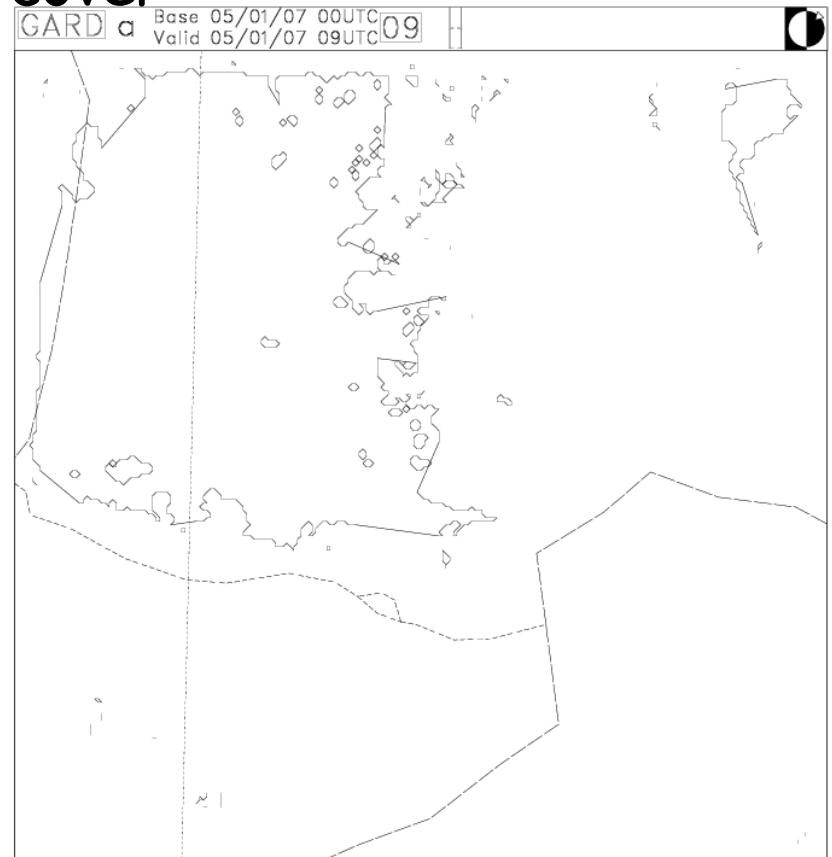
## 6 Septembre 2005 flood case (summary)

- AROME was able to better localize and estimate the maxima of rainfalls over Gard area, compared with Aladin oper.
- In the first 3 hours, the system is localized as in ALADIN, but after, it moves faster to stay in the Gard area. This AROME behaviour is mainly due to diabatic processes and especially cold microphysics.
- AROME is also able to evacuate the system easterly in the first hours of 7 September (ALADIN did not) even if it was not fast enough.

# First case of Fog : 7 January 2005

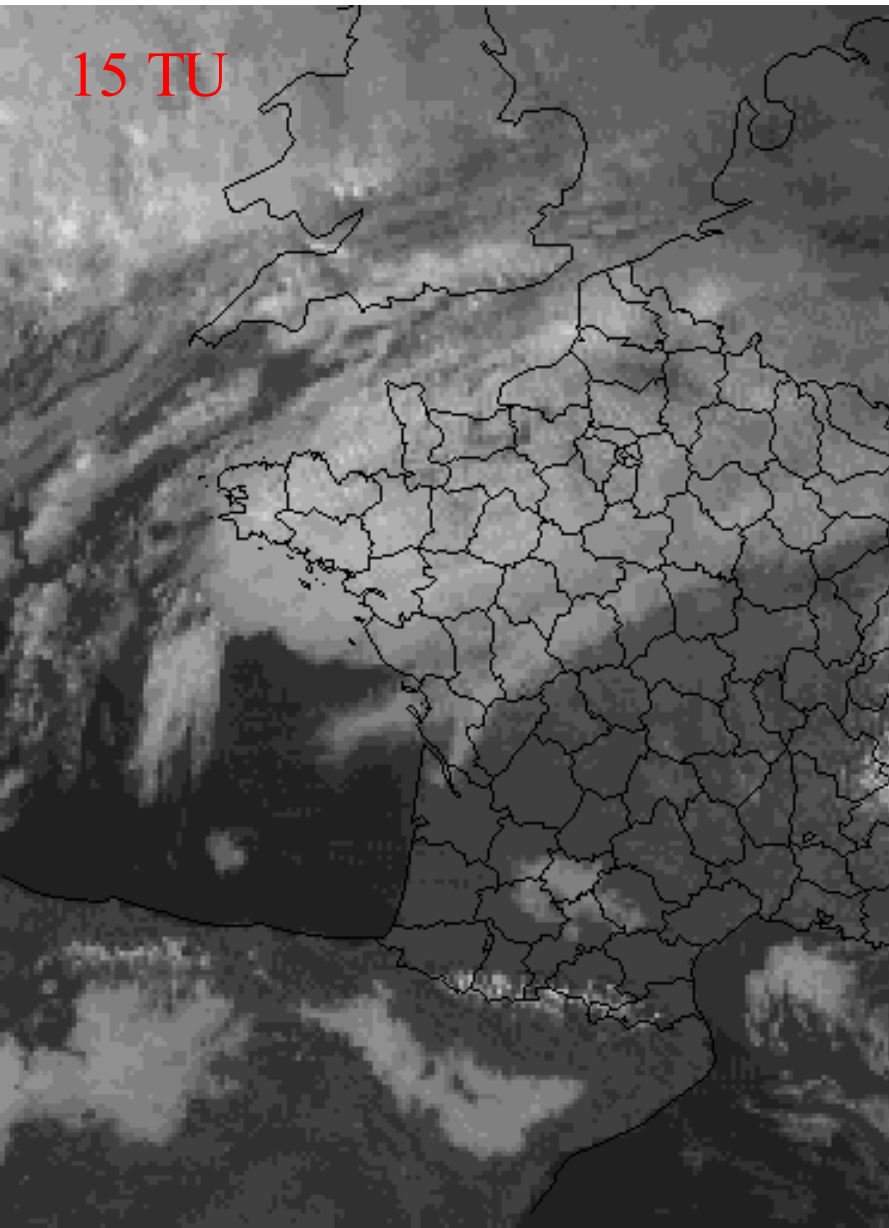


## AROME 2 last levels cloud cover

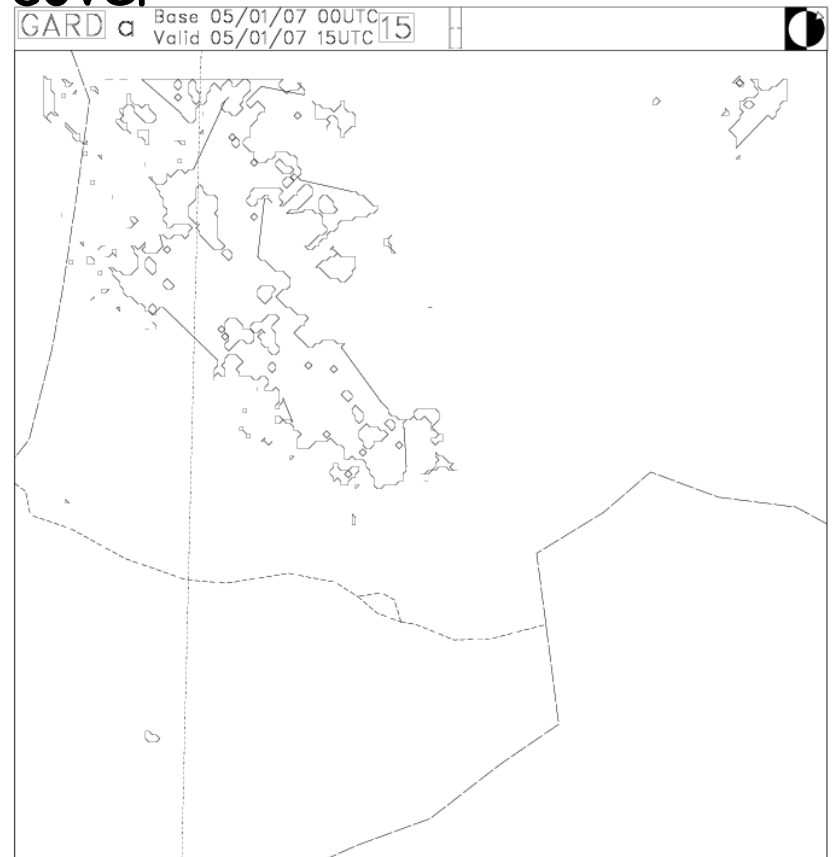


# First case of Fog : 7 January 2005

15 TU



AROME 2 last levels cloud cover



# CONTENTS

## I. Good forecasts

- a) 21-06-05 squall line on MIDPYR b)
- 05-09-05 red vigilance on SUDE c)
- 05-01-05 Fog on MIDPYR

## II. Bad forecasts

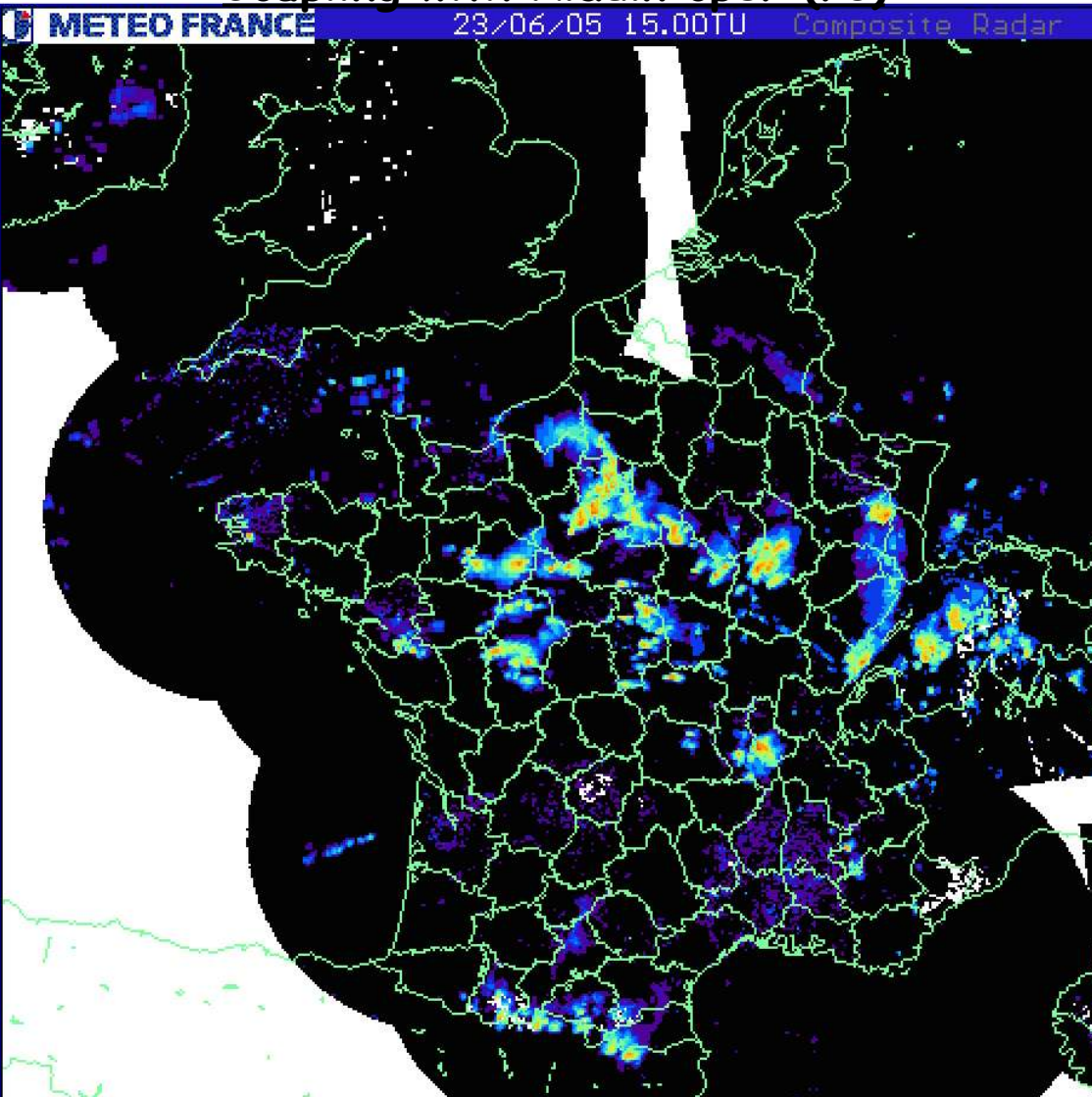
- a) 23-06-05 Paris

## III. Problems/tested options

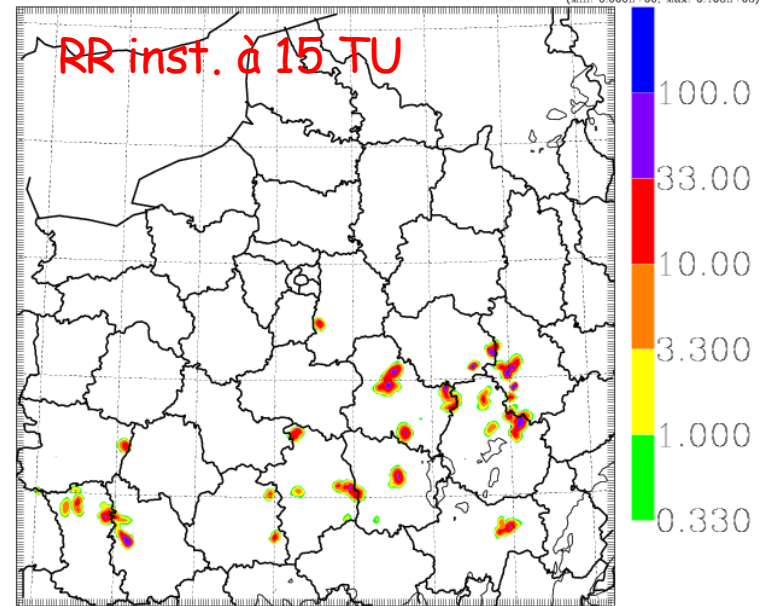
- a) influence of domain
- b) coupling
- d) rainfalls over orography

# 23 June 2005 case

Coupling with Aladin oper (r0)

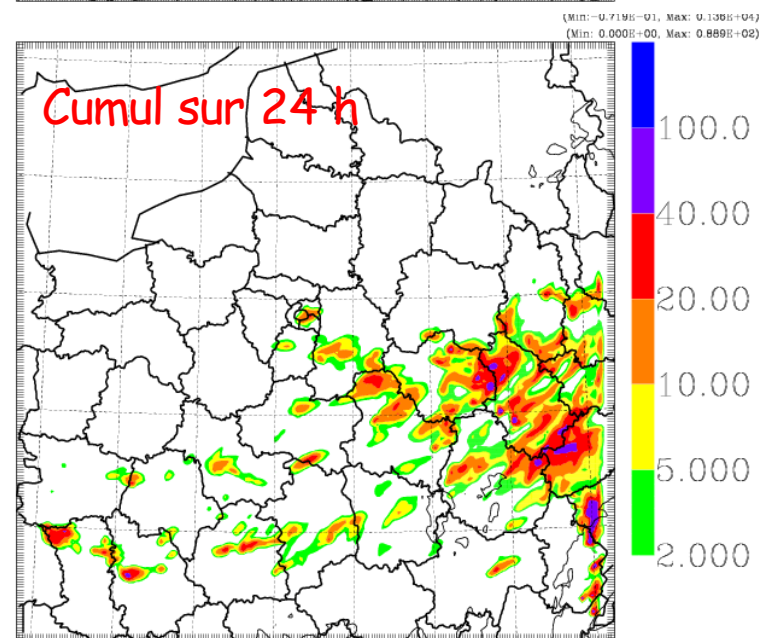


226



(Min: -0.7195+01, Max: 0.1385+04)  
(Min: 0.0005+00, Max: 0.1085+03)

2



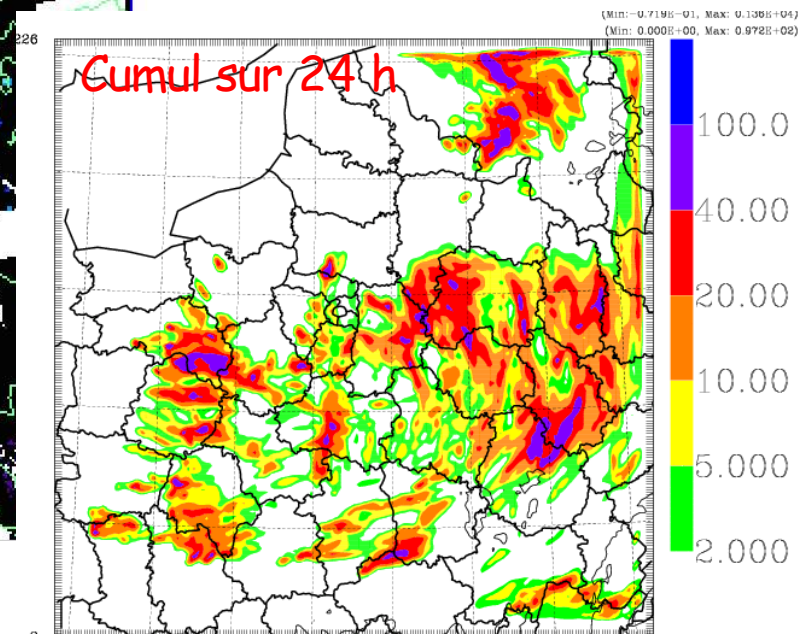
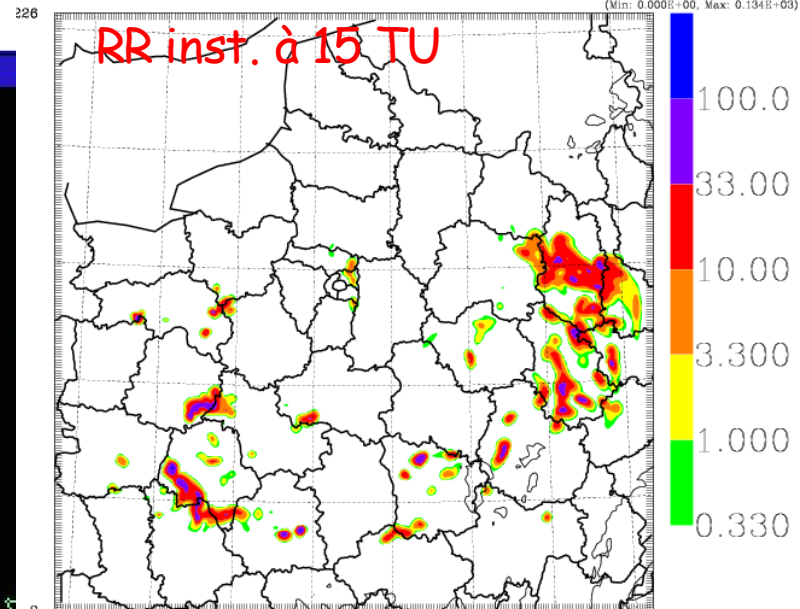
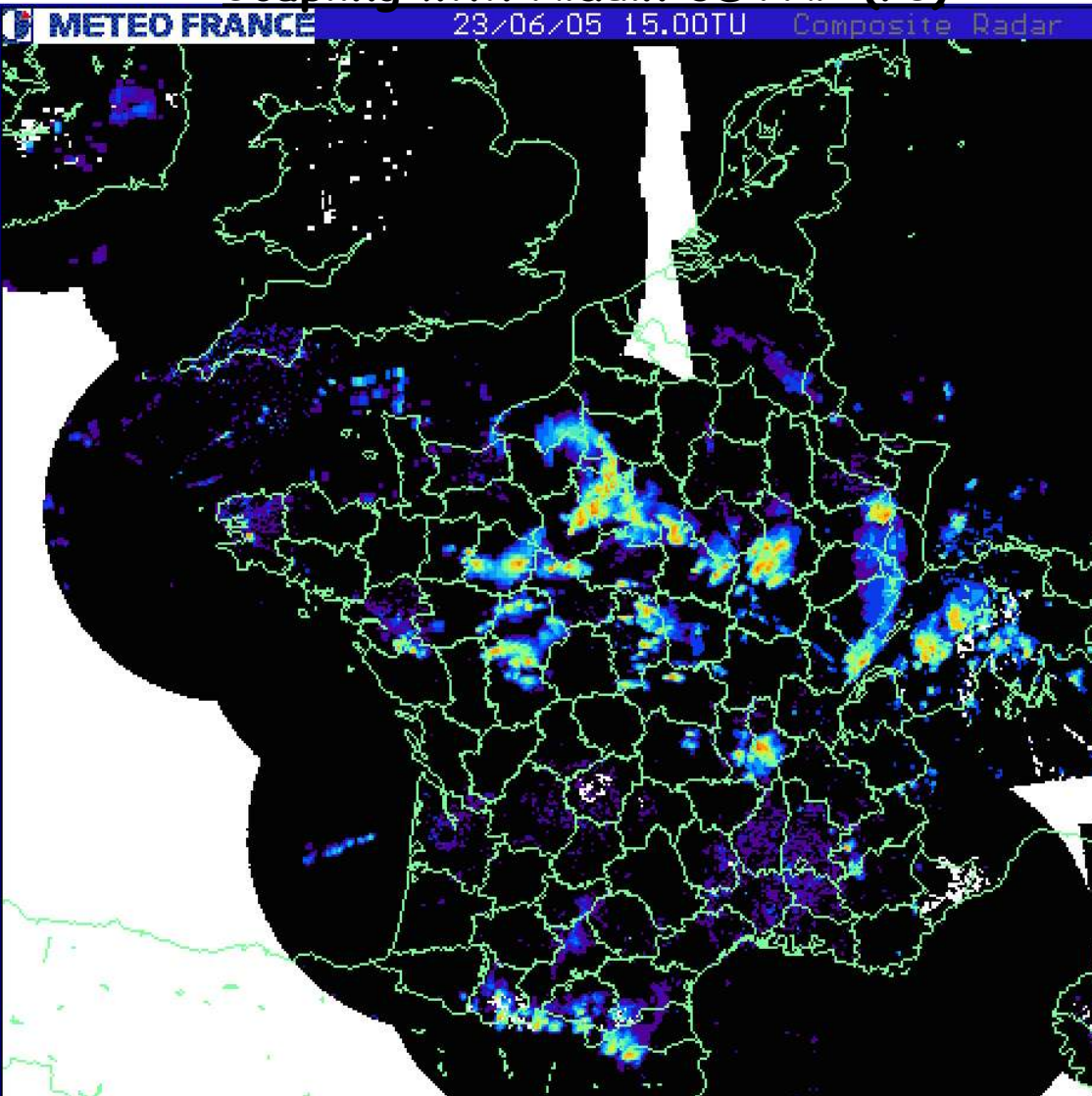
(Min: -0.7195+01, Max: 0.1385+04)  
(Min: 0.0005+00, Max: 0.8895+02)

2



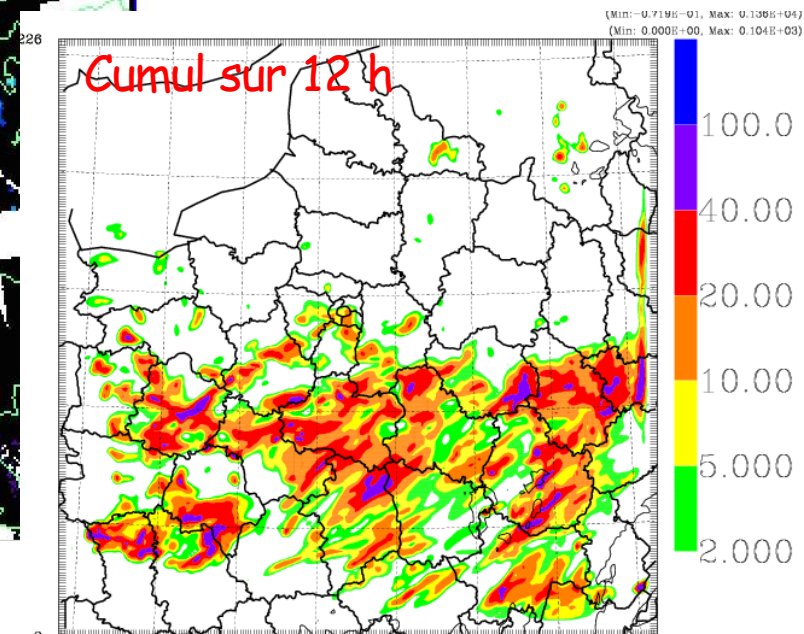
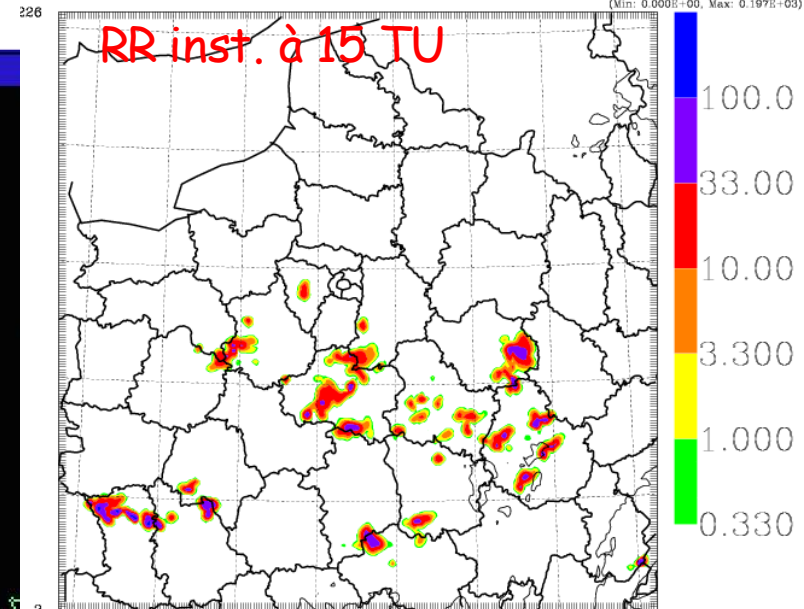
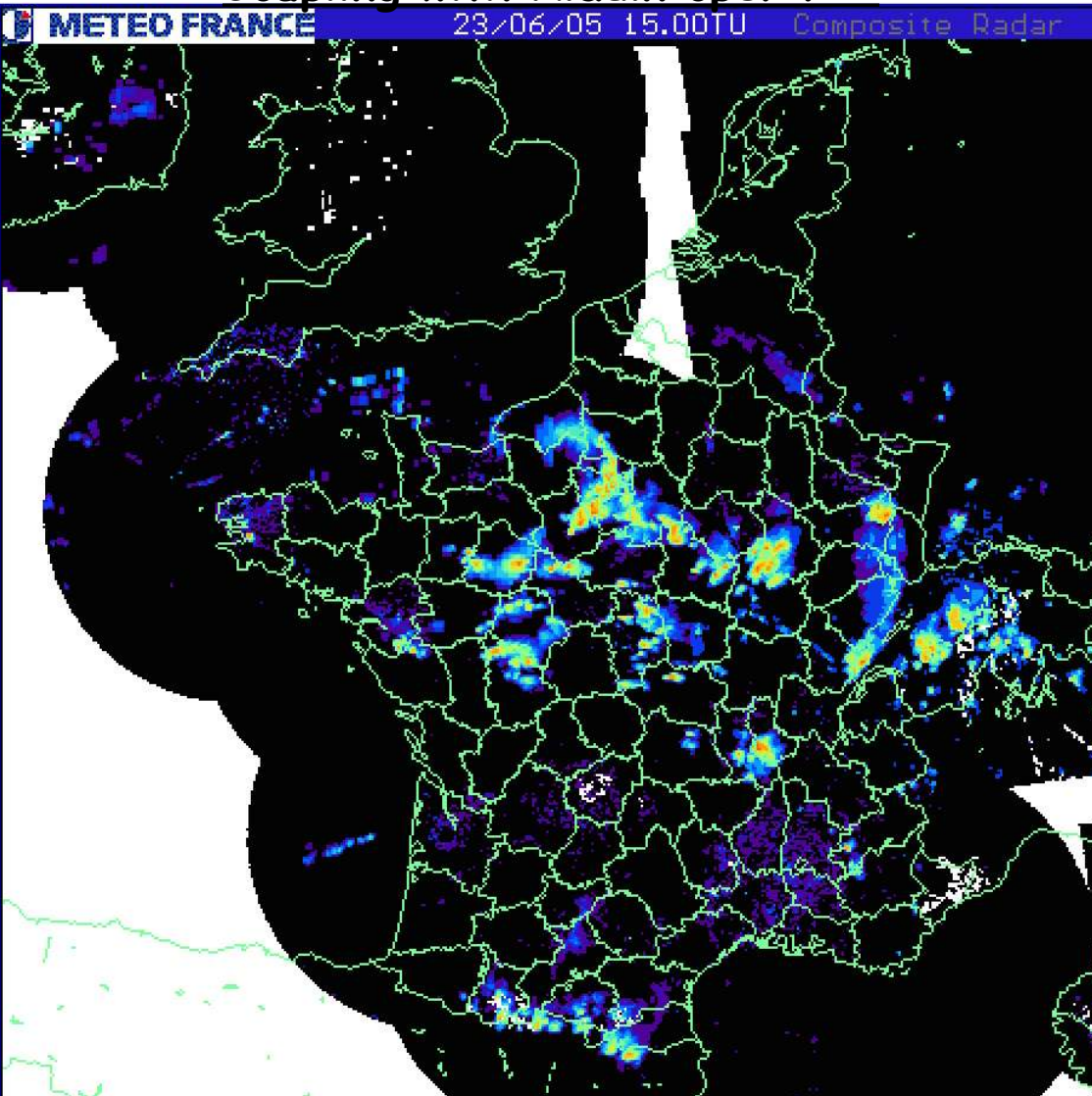
# 23 June 2005 case

## Coupling with Aladin 3DVAR (r0)



# 23 June 2005 case

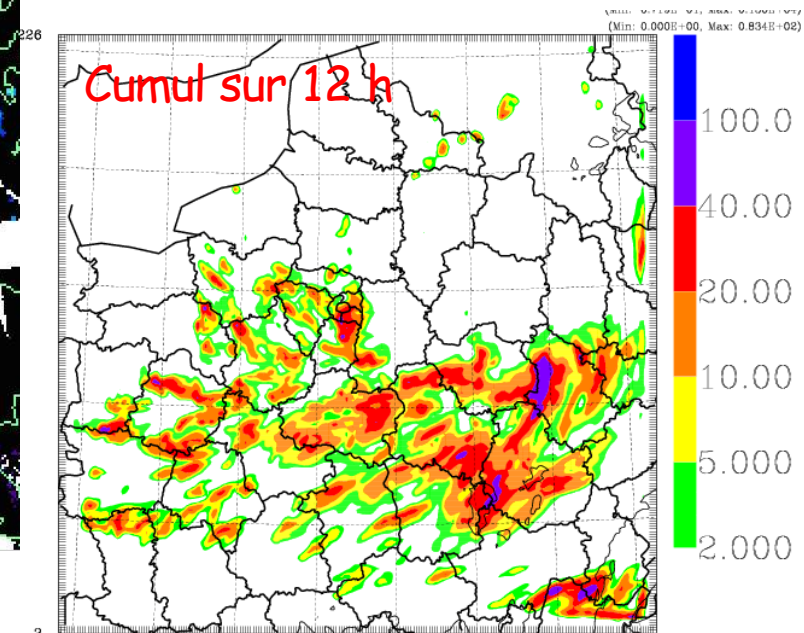
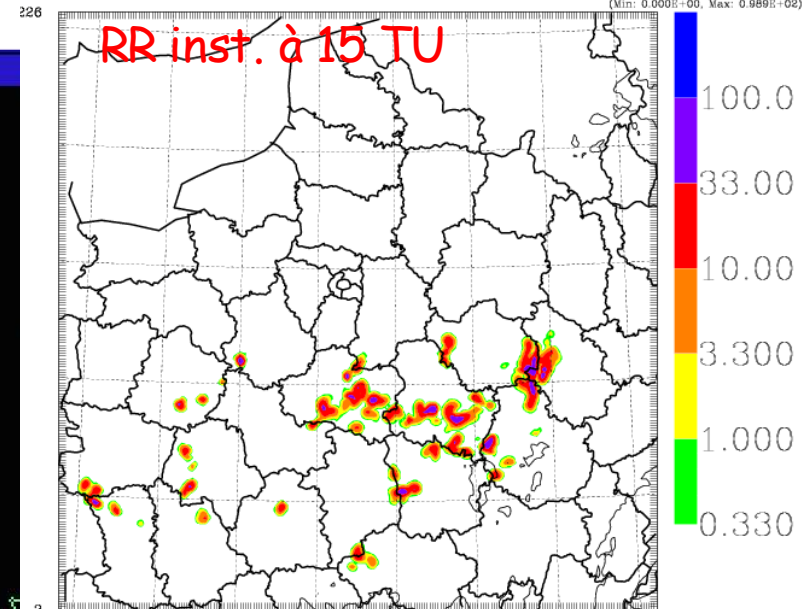
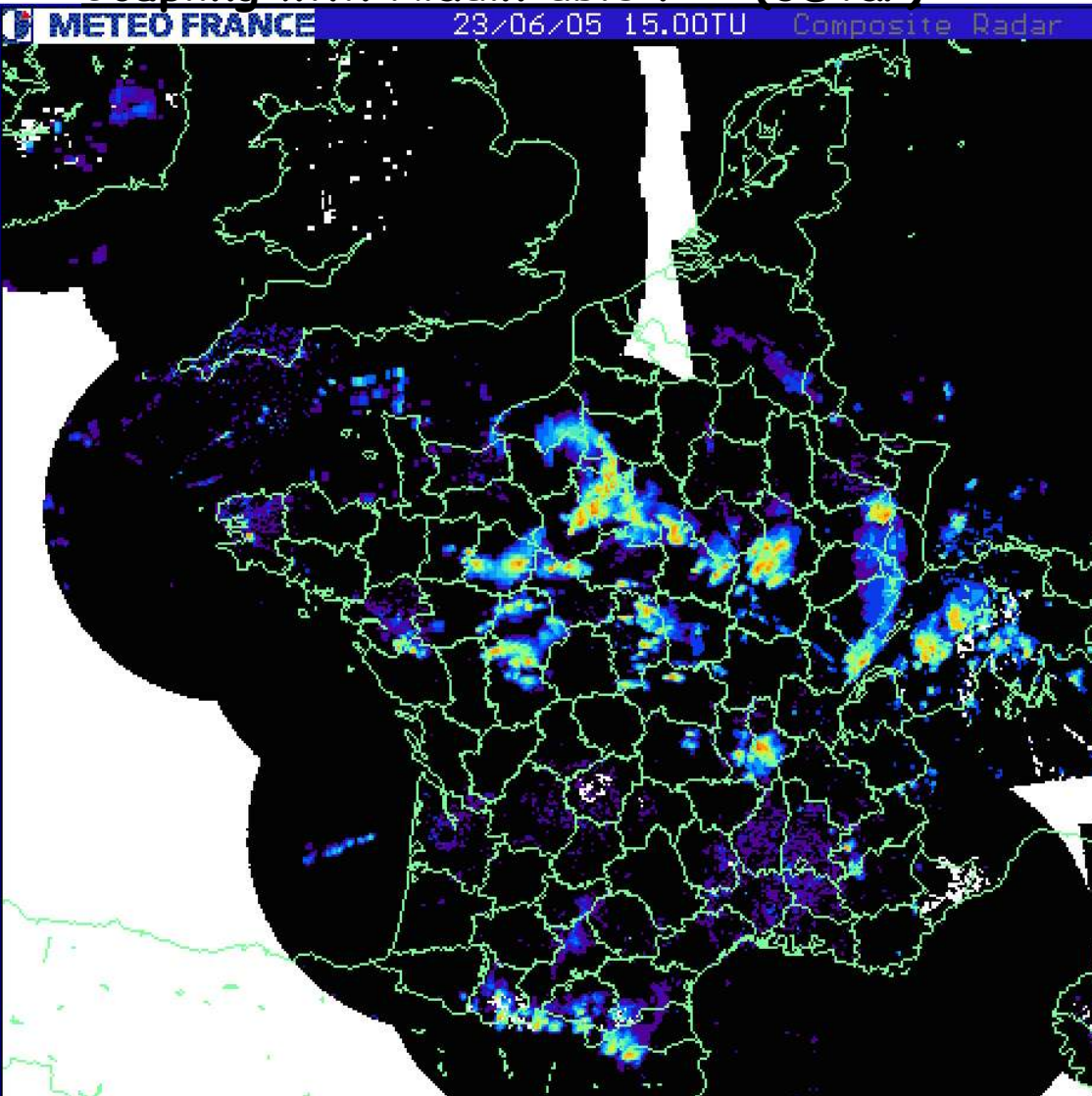
Coupling with Aladin oper r12





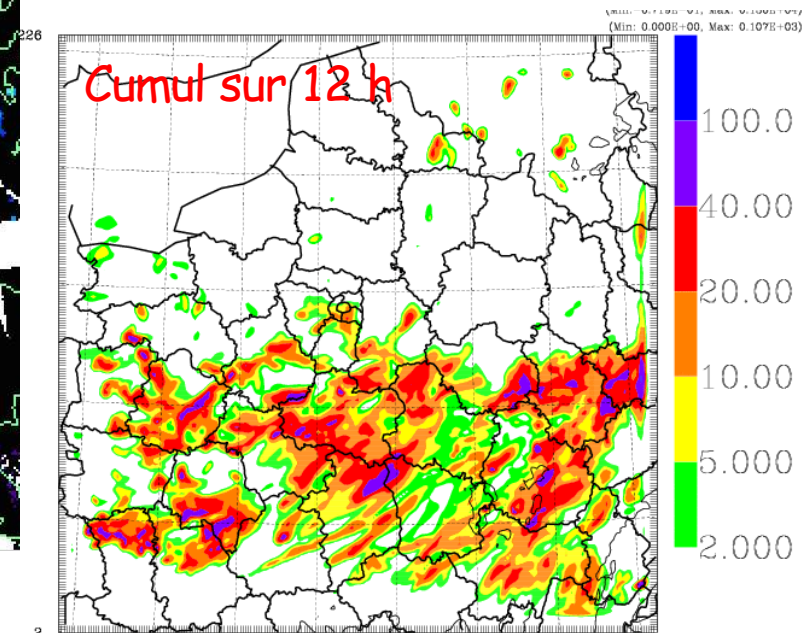
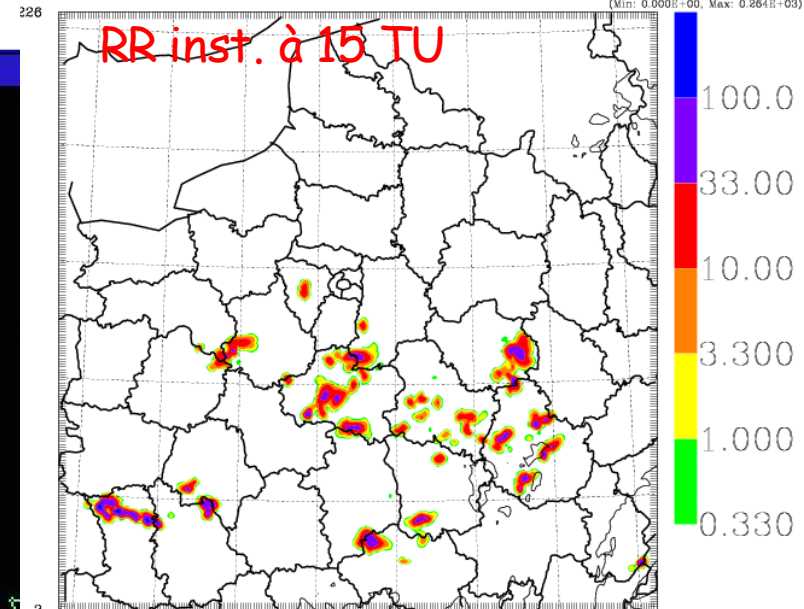
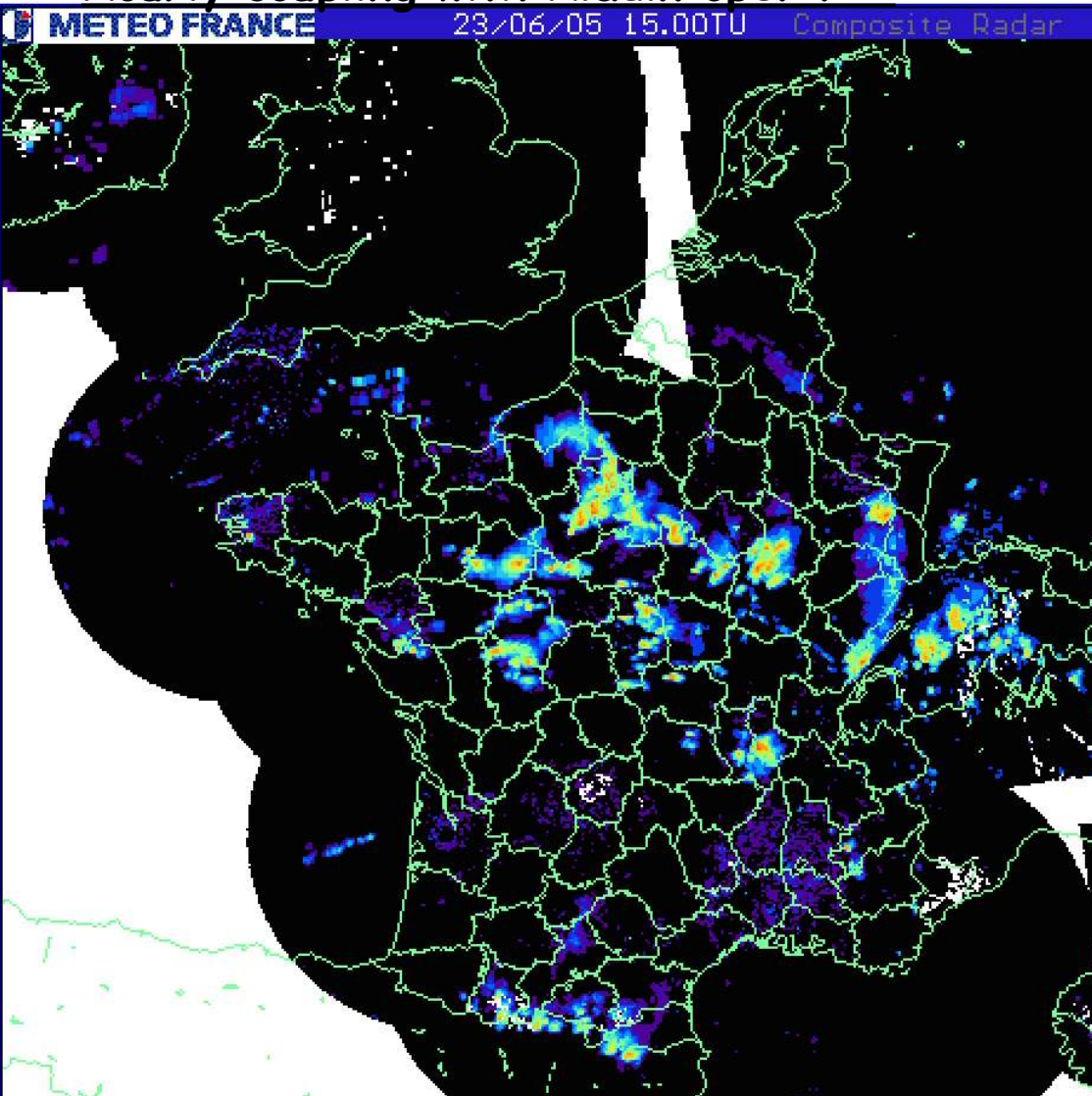
# 23 June 2005 case

Coupling with Aladin dble r12 (3Dvar)



# 23 June 2005 case

Hourly coupling with Aladin oper r12



## 23 June 2005 (Summary)

- AROME is not able to simulate the thunderstorms over PARIS. Changing coupling time and model does not improve the reference run enough. (need of mesoscale data assimilation)



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## II. Bad forecasts

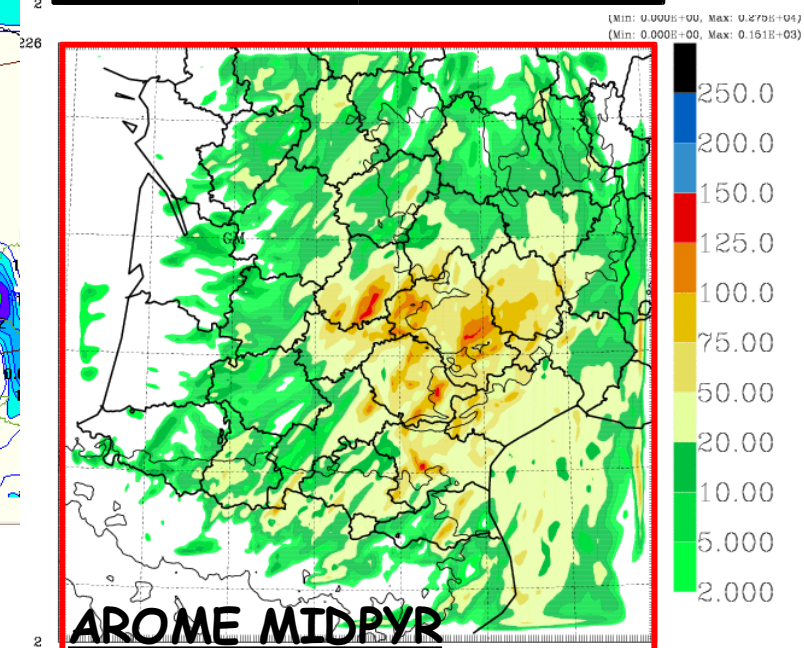
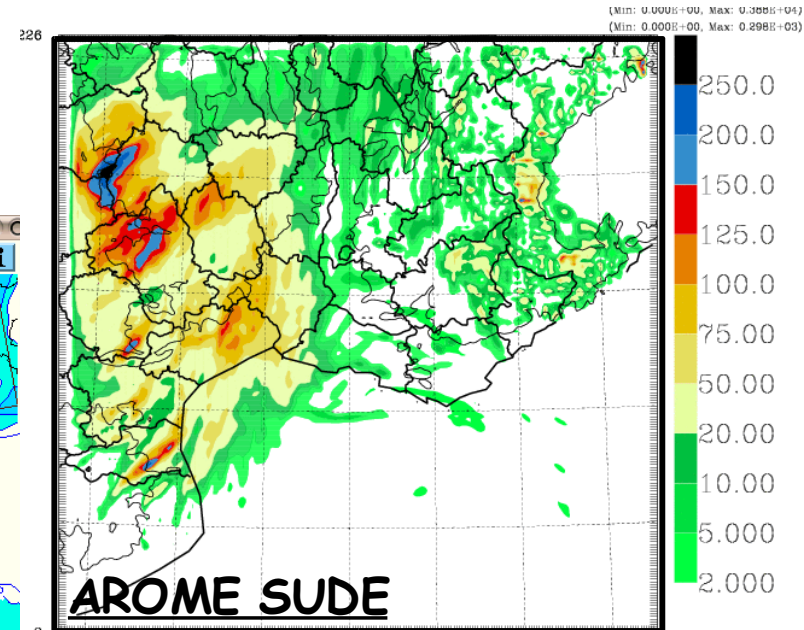
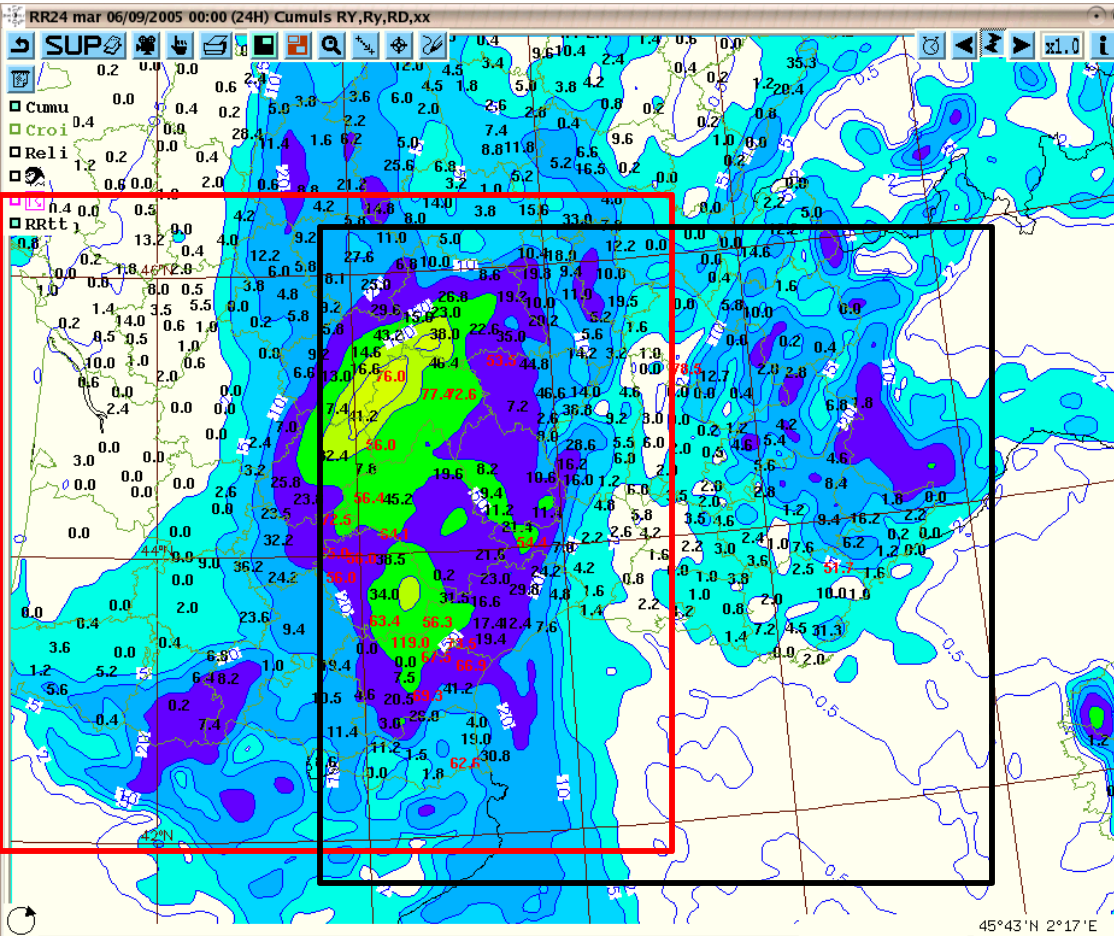
- a) 23-06-05 Paris

## III. Problems/tested options

- a) influence of domain
- b) coupling
- d) rainfalls over orography

# Influence of domain : 05 Septembre 2005

## 24h Cumulated rainfalls :

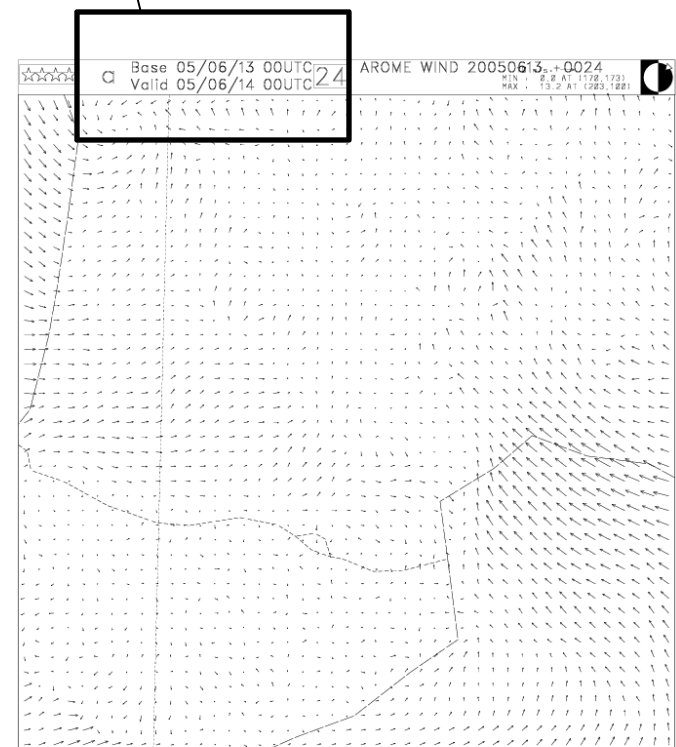
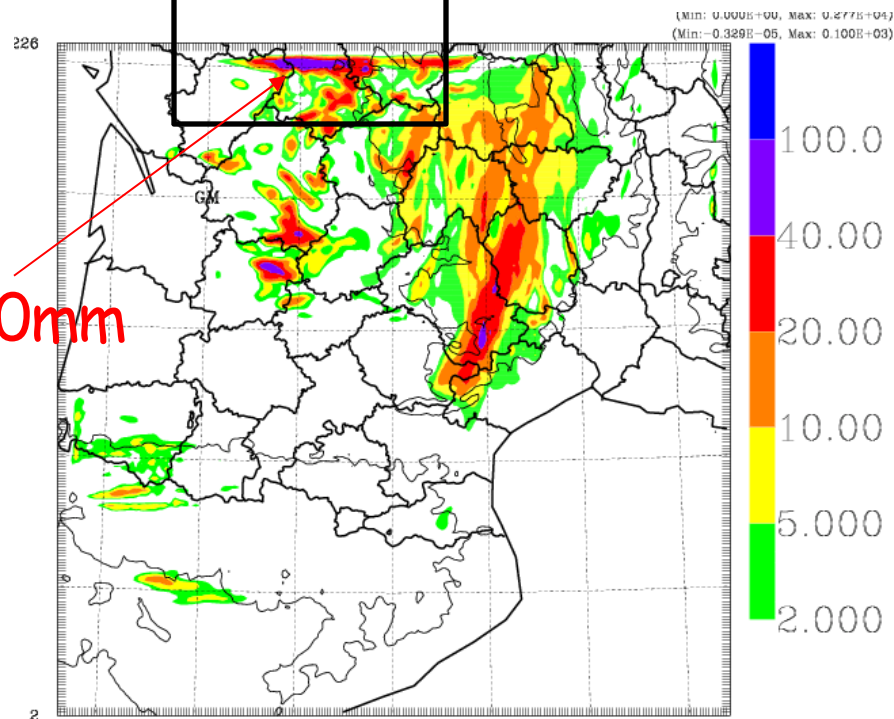
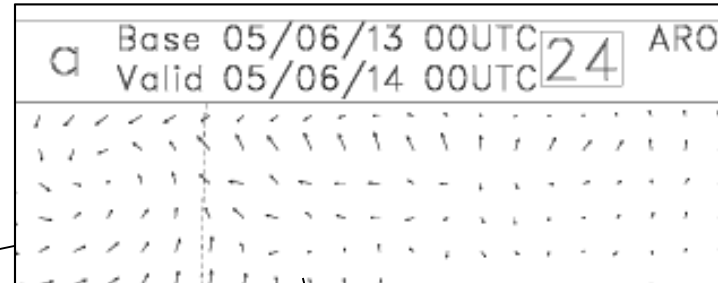


Aladin oper (r0) + obs

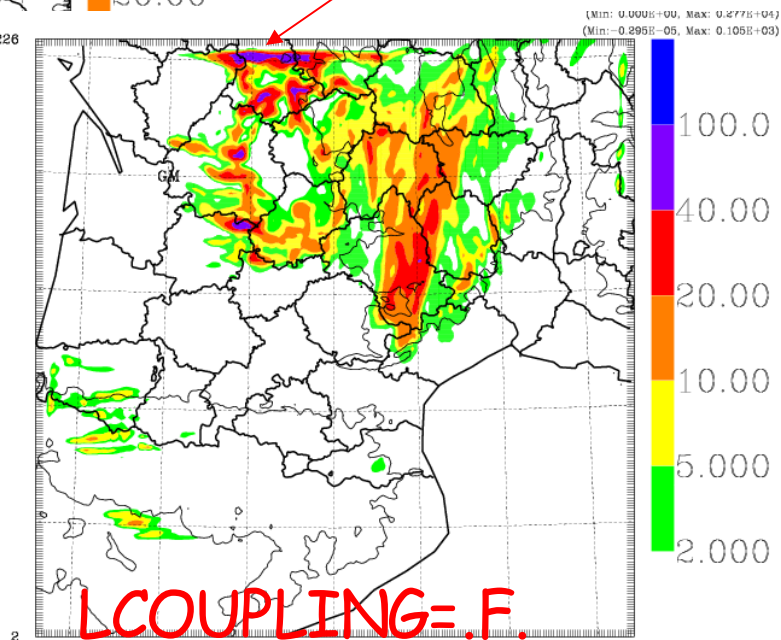
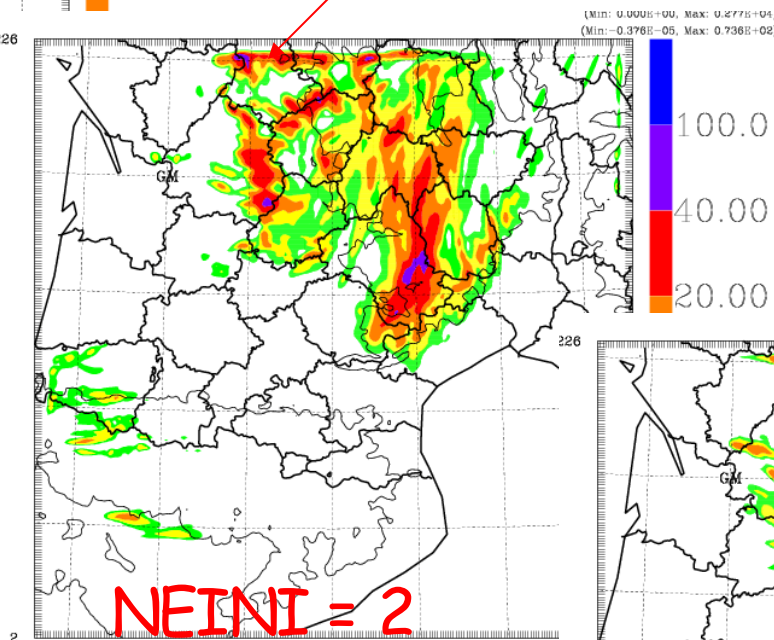
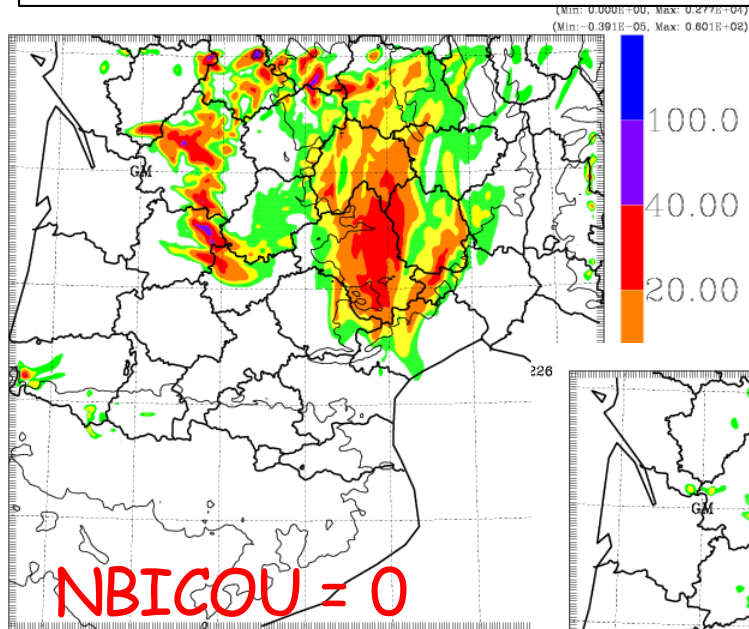
# Problems in the coupling area : 13 June 2005

13 June 2005

21-24 TU cumulated  
rainfalls



# Problems in the coupling area : 13 June 2005

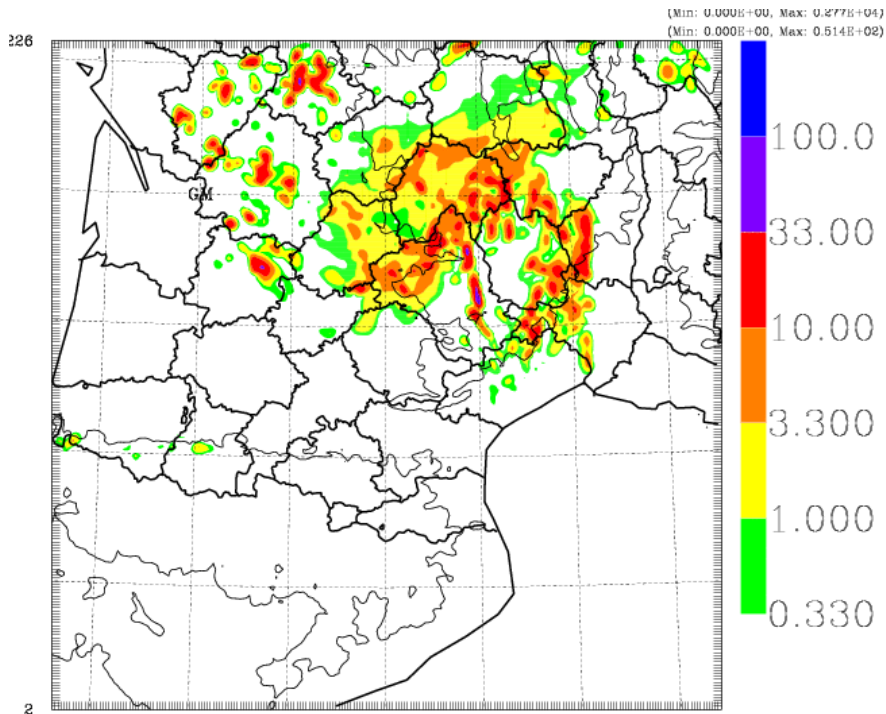




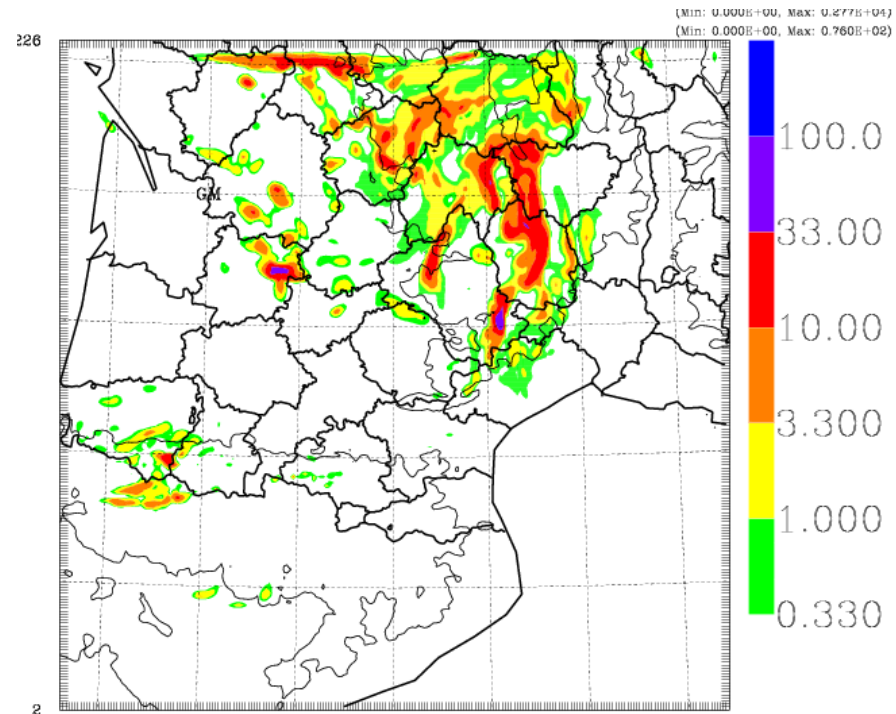
# Problems in the coupling area : 13 June 2005

Inst. RR at +24h

Meso-NH

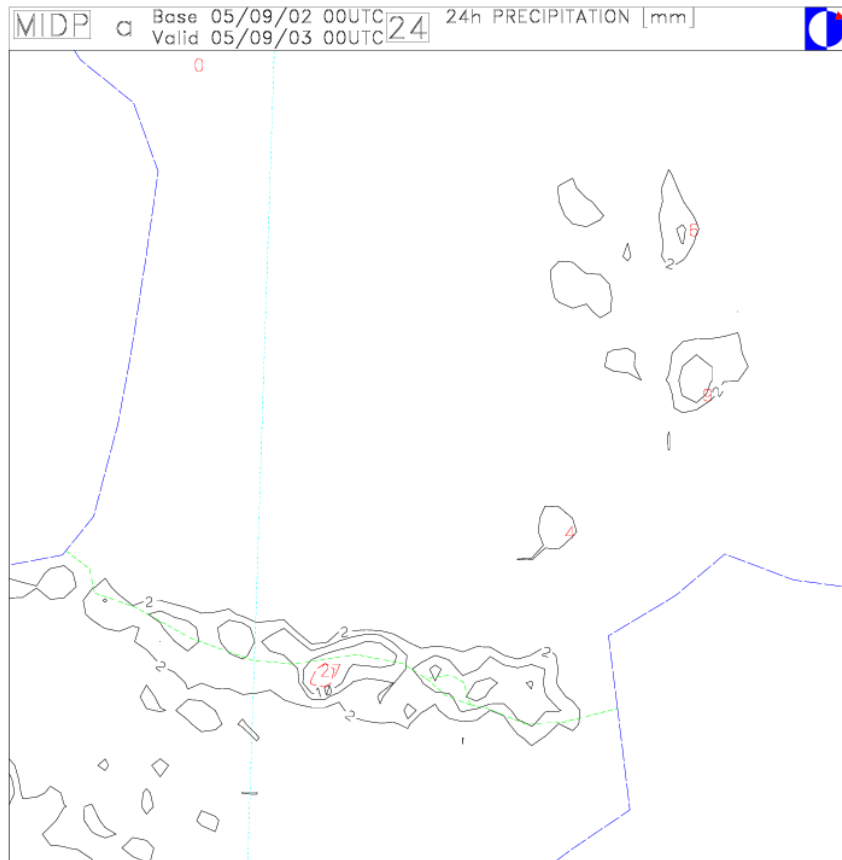


AROME

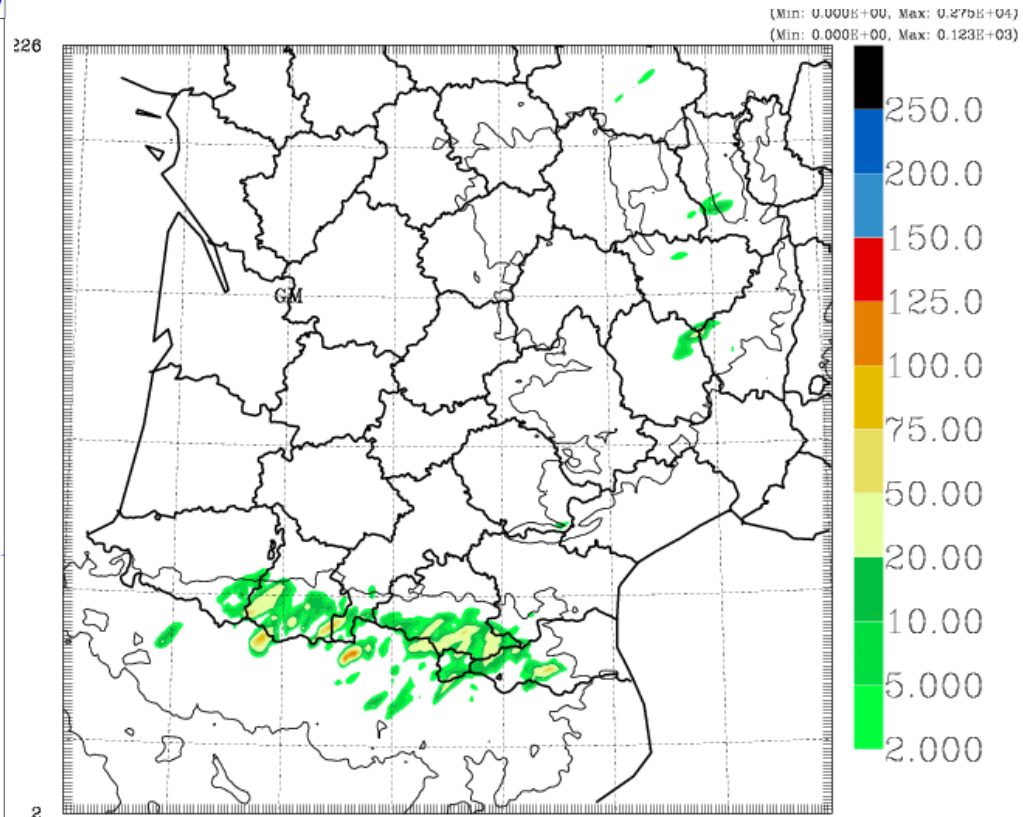


## Rainfalls over orography

# ALADIN oper

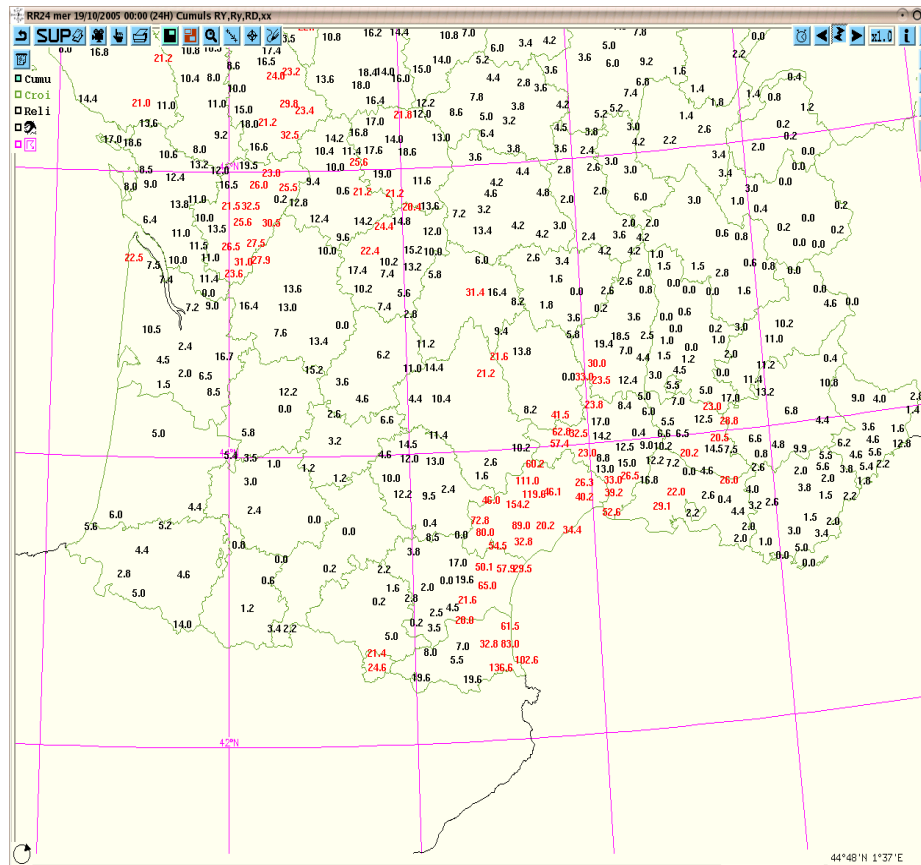


# AROME

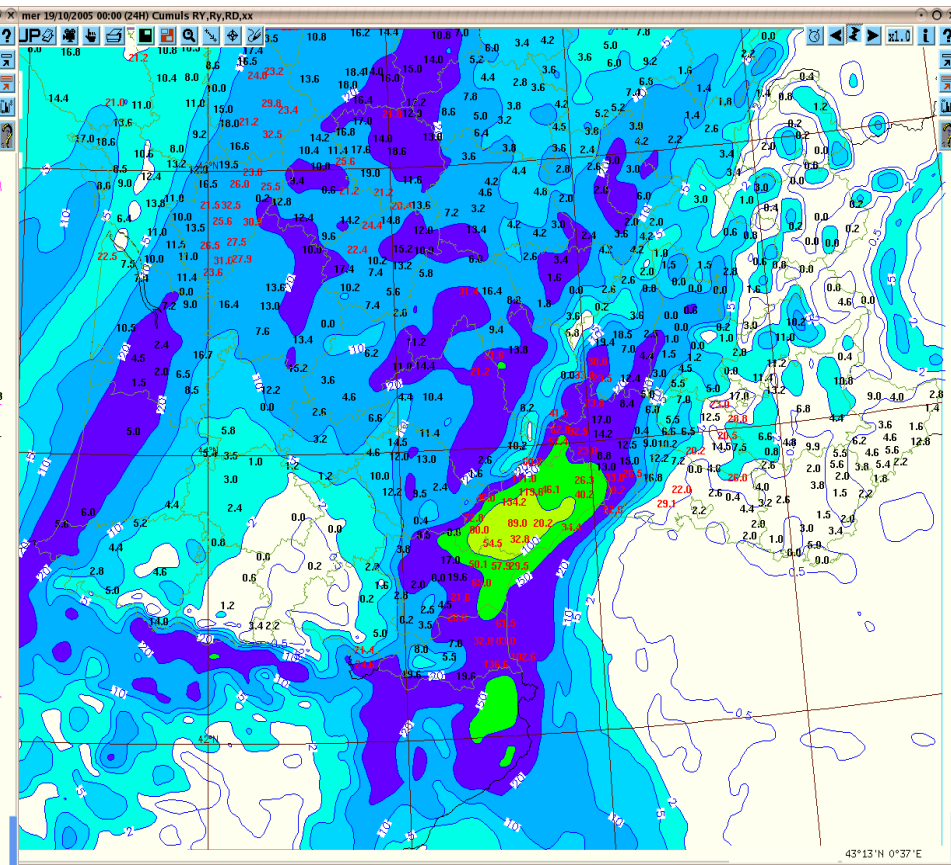


But no rain observed this day !!!

# 18-10-2005 case: Cumul RR 24h



Raingauges



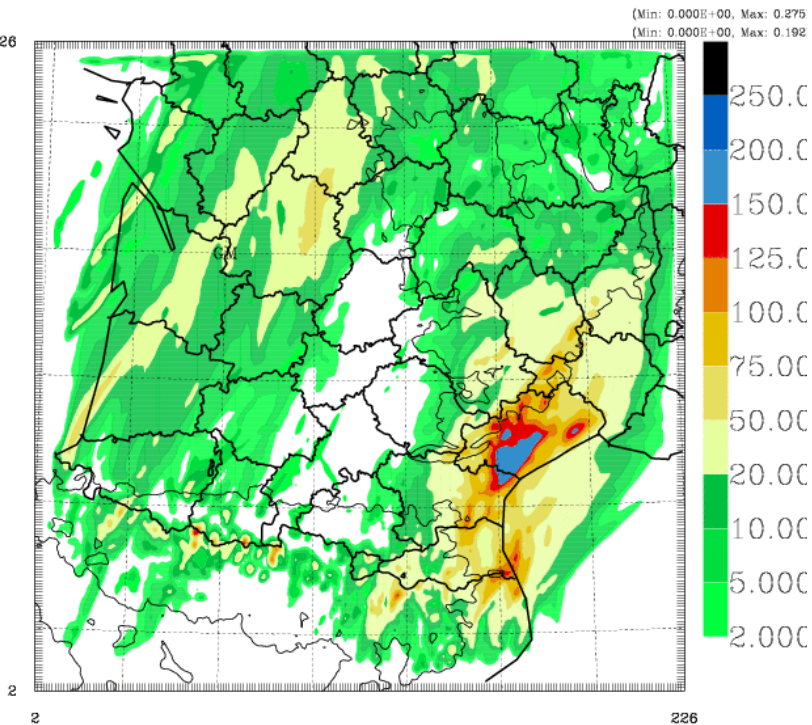
ALADIN r0

# AROME 24h cumulative rainfalls

03-10-05 00UTC

Acc. Rainfall (mm) Rel=500m

03/11/05  
AROMOUT MIDP



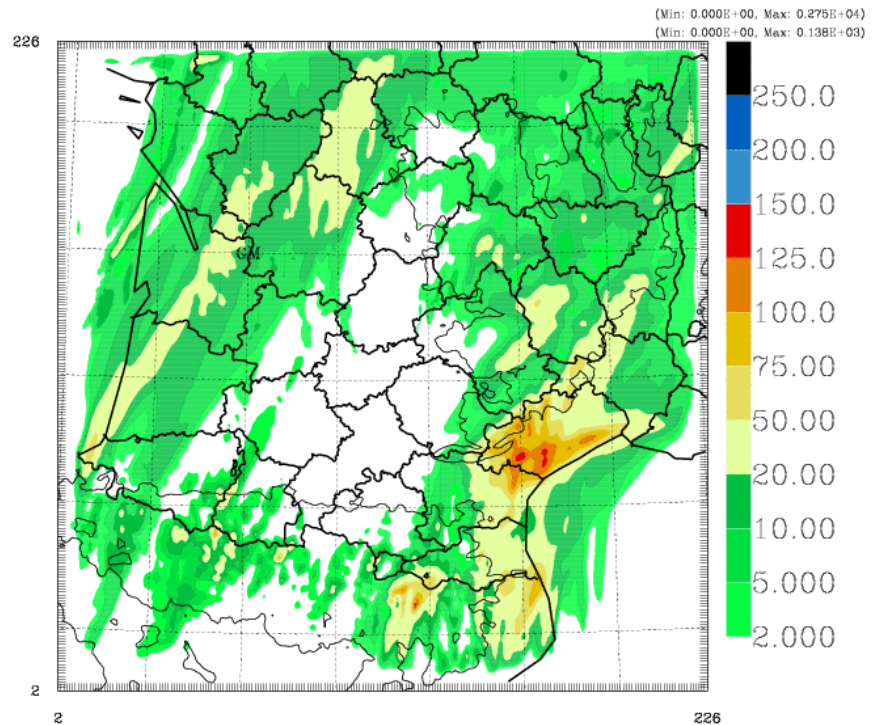
ACPRR (0.) + ACPRS (0.) + ACPRG (0.)  
DATE MOD. 2005/10/18 23H59M OS DATE CUR. 2005/10/18 23H59M OS  
DATE EXP. 2005/10/18 23H59M OS DATE SEC. 2005/10/18 23H59M OS LAMBERT

AROME MIDPYR old diffusion

19-10-05 00UTC

Acc. Rainfall (mm) Rel=500m

03/11/05 09H16M59  
AROMOUT MIDPS.024.dia



ACPRR (0.) + ACPRS (0.) + ACPRG (0.)  
DATE MOD. 2005/10/18 23H59M OS DATE CUR. 2005/10/18 23H59M OS  
DATE EXP. 2005/10/18 23H59M OS DATE SEC. 2005/10/18 23H59M OS LAMBERT

AROME MIDPYR LRDBBC+SLHD

(Last talk of Jozef Vivoda concerning  
BBC treatment)

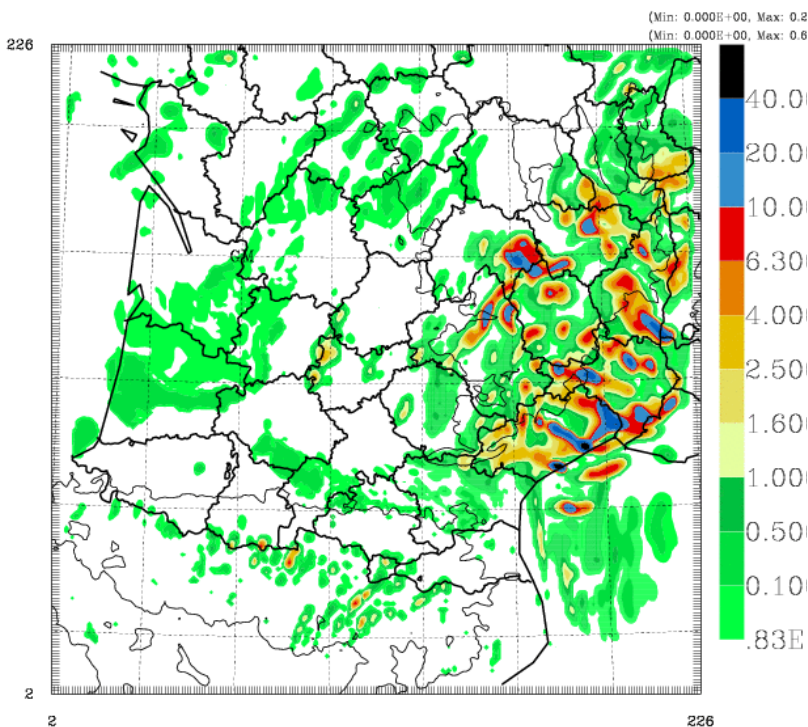


# AROME 24h Instantaneous rainfalls

19-10-05 00 UTC

Inst. Rainfall (mm/h) Rel=500m

03/11/05  
AROMOUT MII



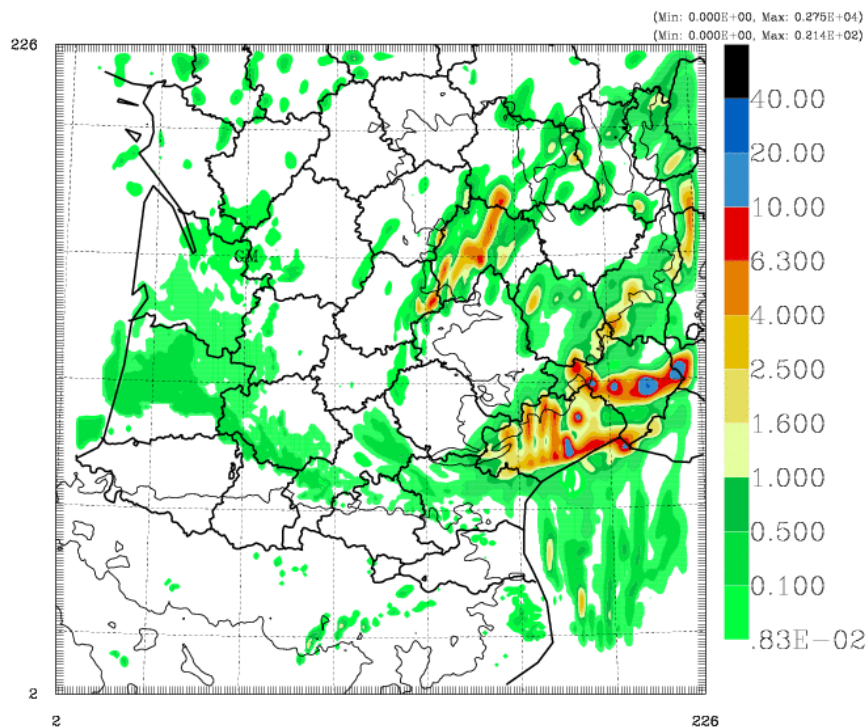
IPRR (0. ) + INPRS (0. ) + INPRG (0. )  
DATE MOD. 2005/10/18 23H59M OS DATE CUR. 2005/10/18 23H59M OS  
DATE EXP. 2005/10/18 23H59M OS DATE SEC. 2005/10/18 23H59M OS LAMBERT

AROME MIDPYR old diffusion

19-10-05 00 UTC

Inst. Rainfall (mm/h) Rel=500m

03/11/05 09H16M58  
AROMOUT MIDPS.024.dia



INPRR (0. ) + INPRS (0. ) + INPRG (0. )  
DATE MOD. 2005/10/18 23H59M OS DATE CUR. 2005/10/18 23H59M OS  
DATE EXP. 2005/10/18 23H59M OS DATE SEC. 2005/10/18 23H59M OS LAMBERT

AROME MIDPYR LRDBBC+SLHD

(Last talk of Jozef Vivoda concerning  
BBC treatment)

# Conclusions

- We have cases in which AROME produces better forecasts than Oper. Aladin
- We do not have cases in which this improvement is due to NH, but some other tests will be done.
- We also have cases in which AROME produces bad forecasts and we hope data assimilation will improve the results.
- AROME results are domain dependant
- AROME have sometimes problems near the border
- AROME produces too much rain over orography in some situations
- SLHD+LRDBBC seems to improve the forecast on the case tested)
- Need of assimilation part to better evaluate the quality of the prototype
- Need of scores to more objectives and systematic evaluation