



GOBIERNO
DE ESPAÑA

MINISTERIO
DE MEDIO AMBIENTE
Y MEDIO RURAL Y MARINO

AEMet
Agencia Estatal de Meteorología

AROME at AEMet

Javier Calvo

Outline

- AROME daily runs at AEMET from June 2008.
- 2 cases studies of heavy precipitation.

AROME daily runs at AEMet

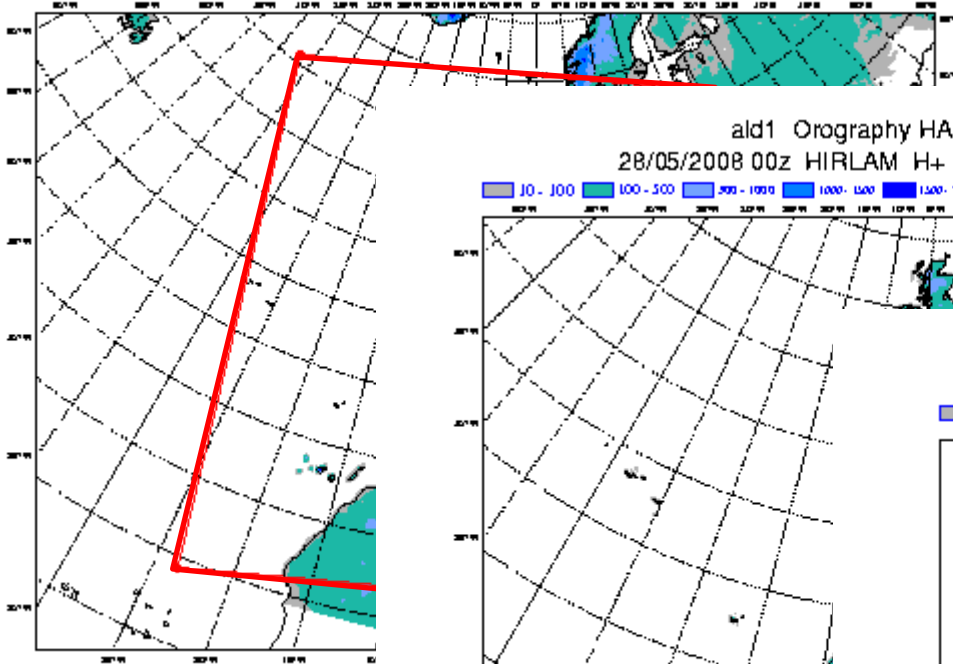
- Cycle 32h2
- Nesting strategy:
 - Hirlam 0.16 » ALADIN 11km » AROME 2.5 km
- Small domain: 300x300 and 40 levels
- NO analysis for ALADIN and AROME

Nesting strategy

ONR orography 16km

18/11/2008 00z HIRLAM H+ 00 Valid: 18/11/2008 00z

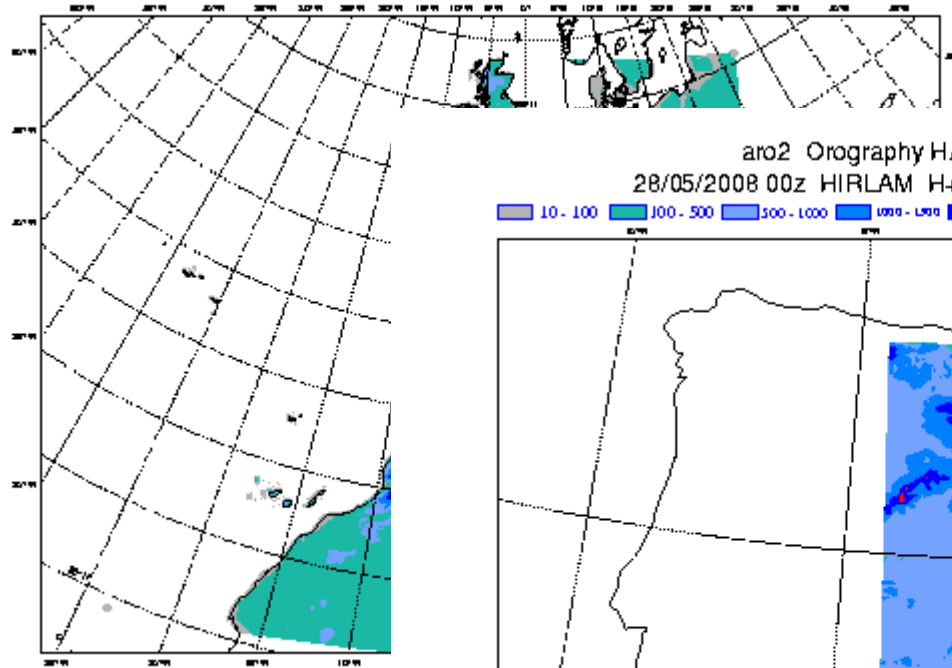
10 - 100 100 - 500 500 - 1000 1000 - 1500 1500 - 2000 2000 - 2500 2500 - 3000 3000 - 3500



ald1 Orography HARMONIE 11 km

28/05/2008 00z HIRLAM H+ 06 Valid: 28/05/2008 06z

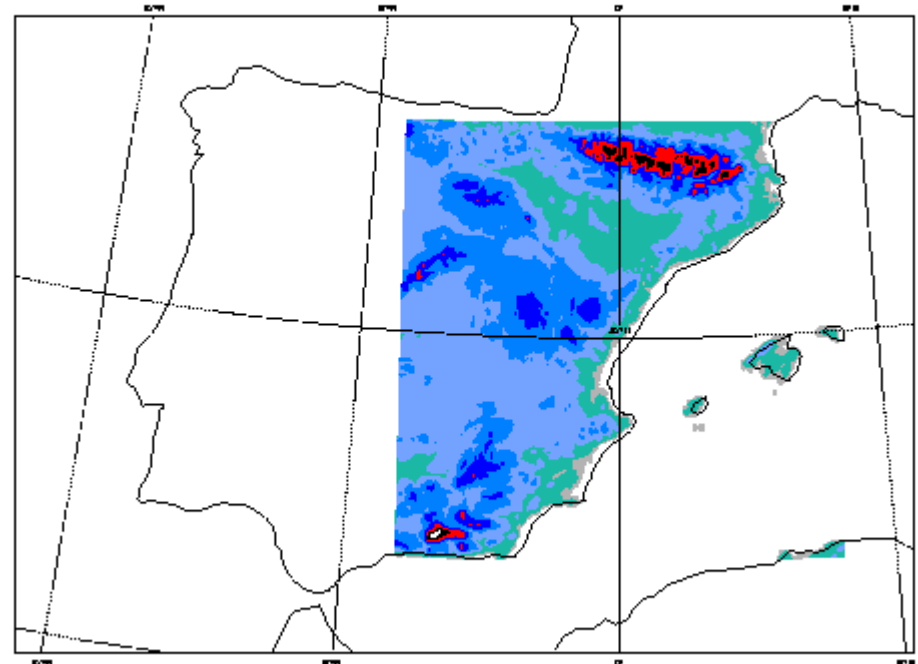
10 - 100 100 - 500 500 - 1000 1000 - 1500 1500 - 2000 2000 - 2500 2500 - 3000 3000 - 3500 3500 - 4000



aro2 Orography HARMONIE 2.5 km

28/05/2008 00z HIRLAM H+ 06 Valid: 28/05/2008 06z

10 - 100 100 - 500 500 - 1000 1000 - 1500 1500 - 2000 2000 - 2500 2500 - 3000 3000 - 3500



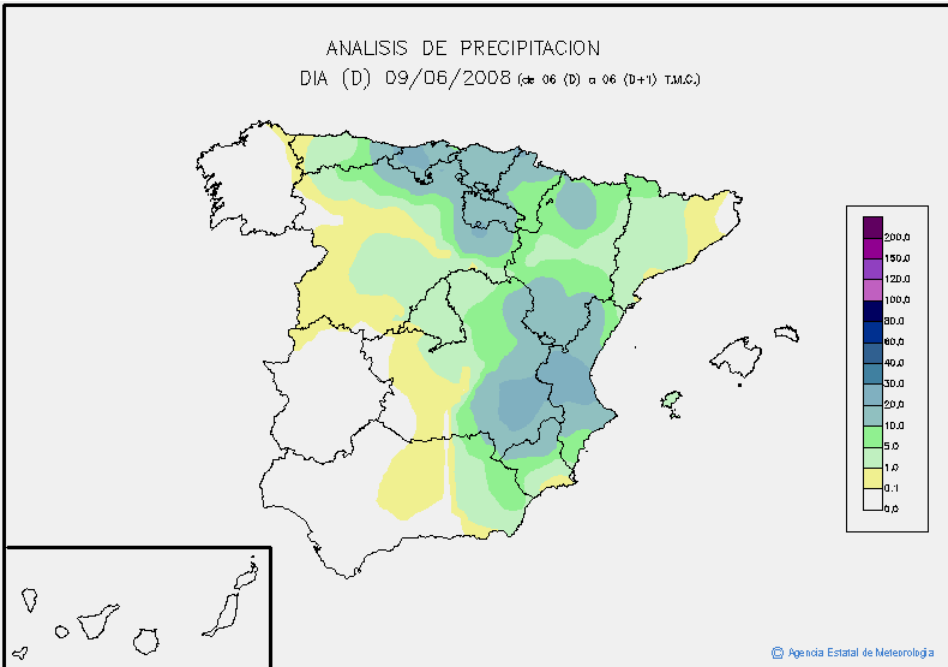
AROME daily runs at AEMet

- Cycle 32h2
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 - Hirlam 0.16 » ALADIN 11km » AROME 2.5 km
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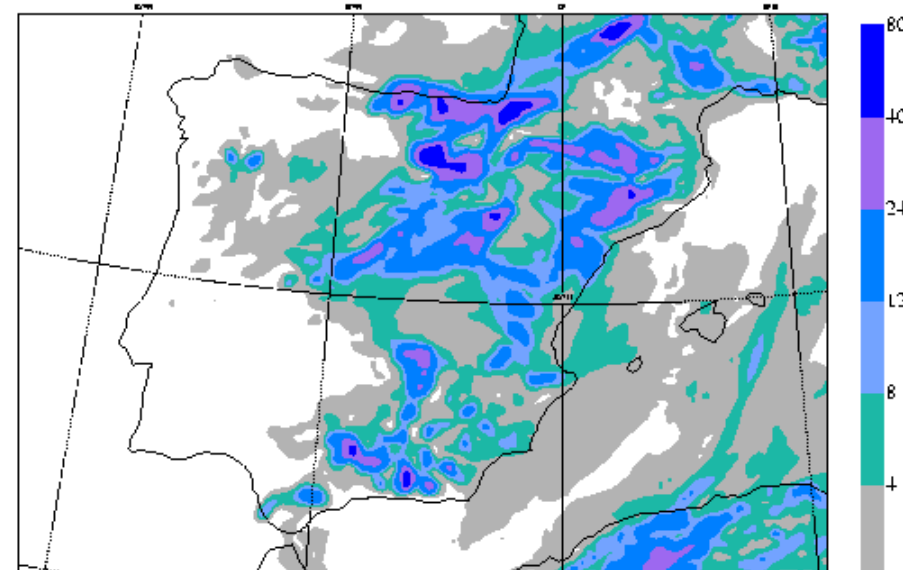
24 hour accumulations

ALADIN 11km

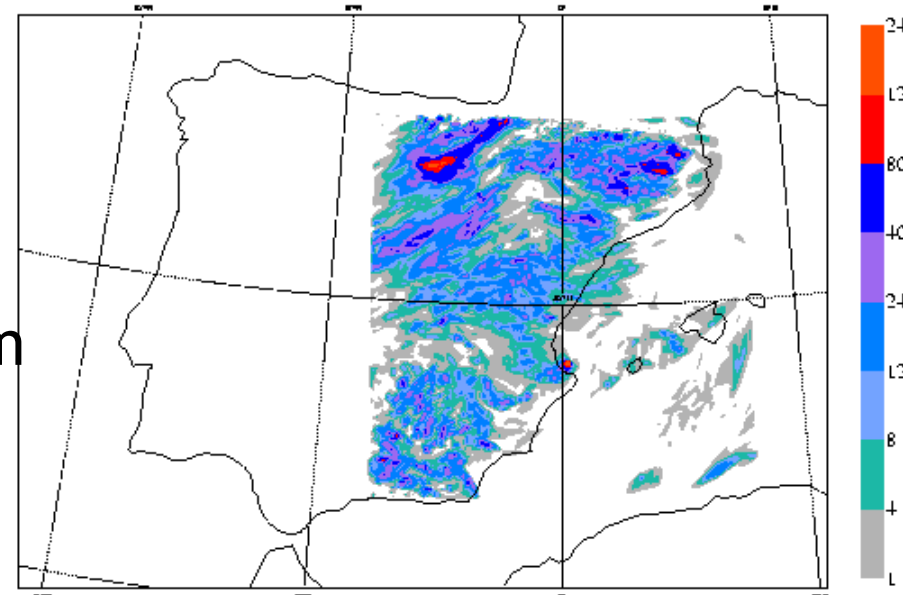
Obs analysis



ald1 Total precipitation (24 hr)
09/06/2008 00z HIRLAM H+ 30 Valid: 10/06/2008 06z



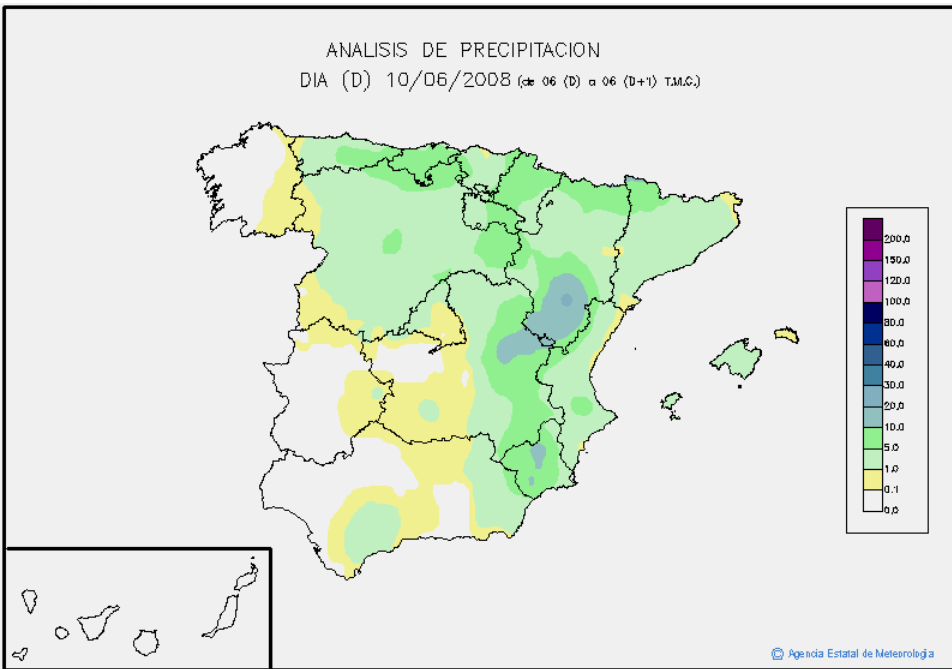
aro2 Total precipitation (24 hr)
09/06/2008 00z HIRLAM H+ 30 Valid: 10/06/2008 06z



AROME 2.5km

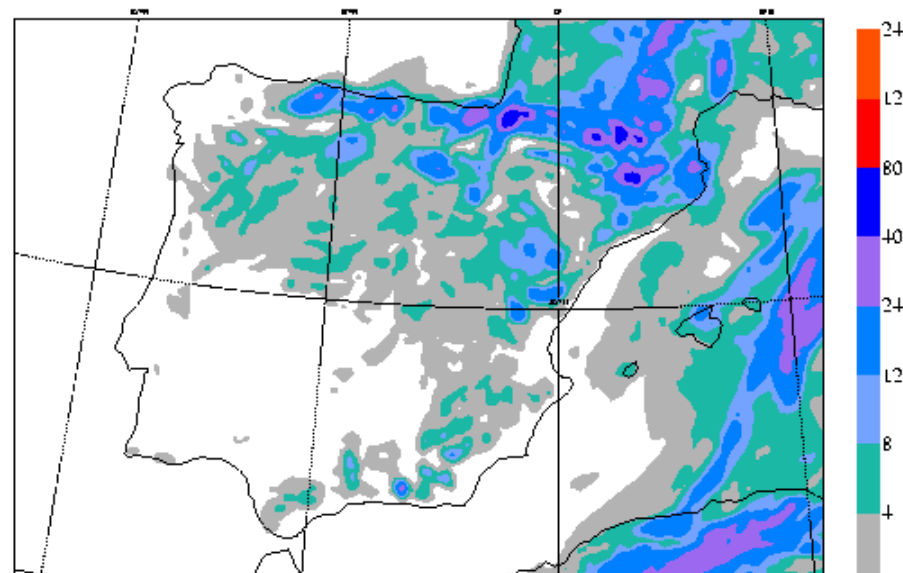
AROME: very large amounts at some locations

24 hour accumulations

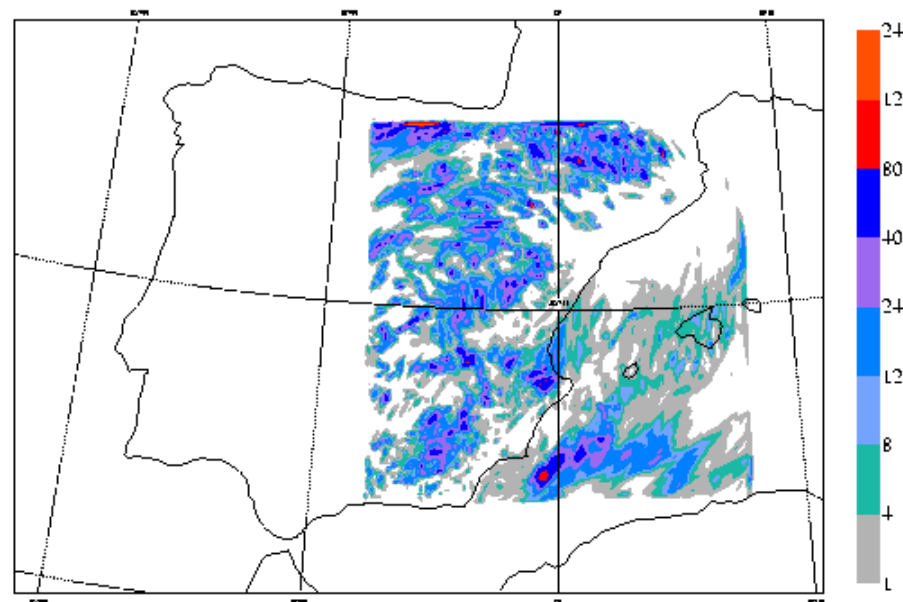


Similar amounts

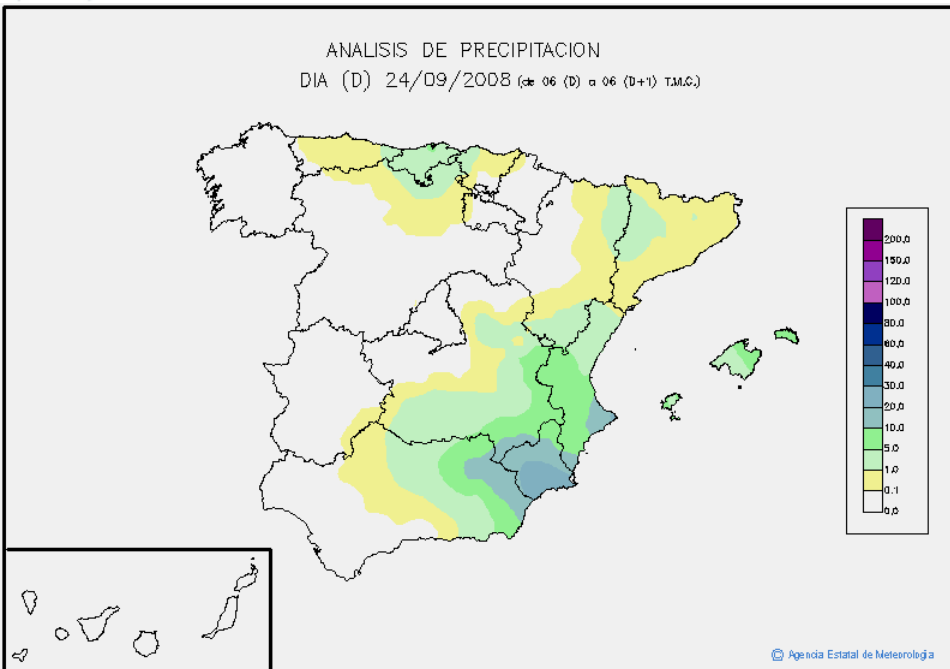
ald1 Total precipitation (24 hr)
11/06/2008 00z HIRLAM H+ 30 Valid: 12/06/2008 06z



aro2 Total precipitation (24 hr)
10/06/2008 00z HIRLAM H+ 30 Valid: 11/06/2008 06z

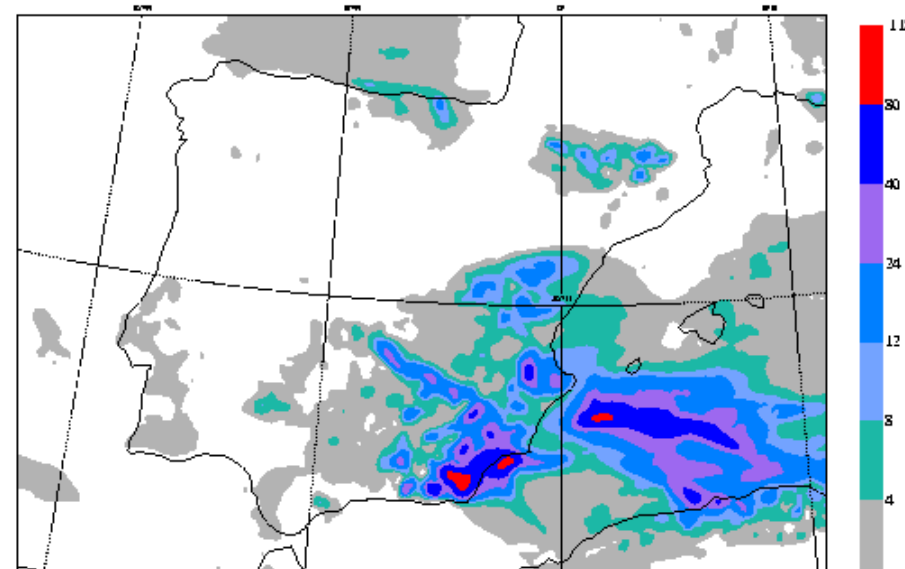


24 hour accumulations

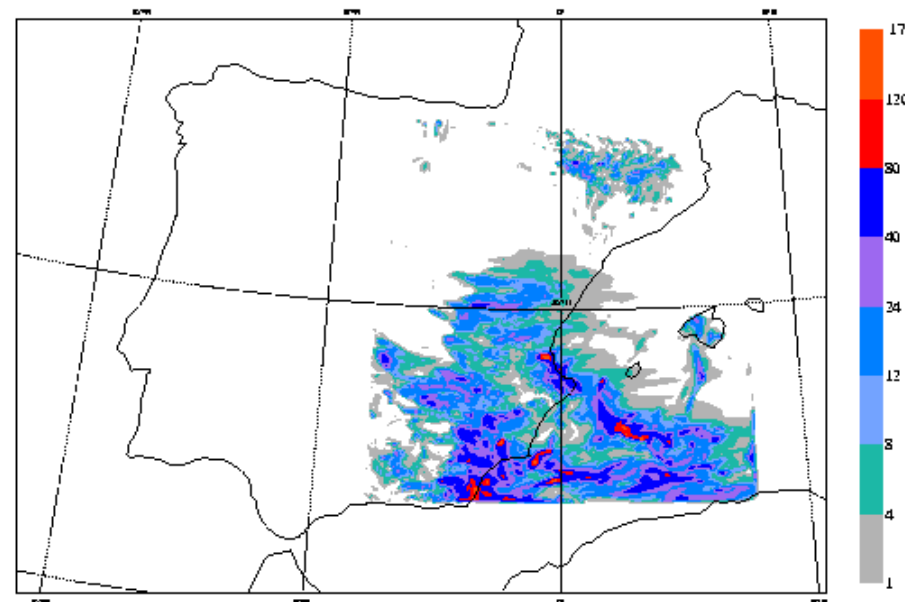


Similar distribution.
AROME more ppt

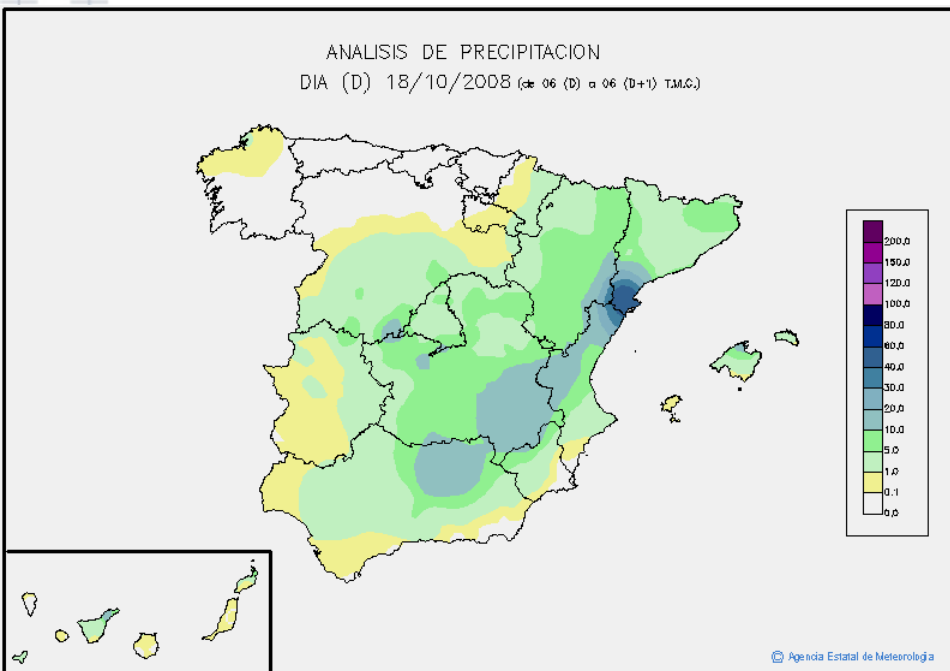
ald1 Total precipitation (24 hr)
24/09/2008 00z HIRLAM H+ 30 Valid: 25/09/2008 06z



aro2 Total precipitation (24 hr)
24/09/2008 00z HIRLAM H+ 30 Valid: 25/09/2008 06z

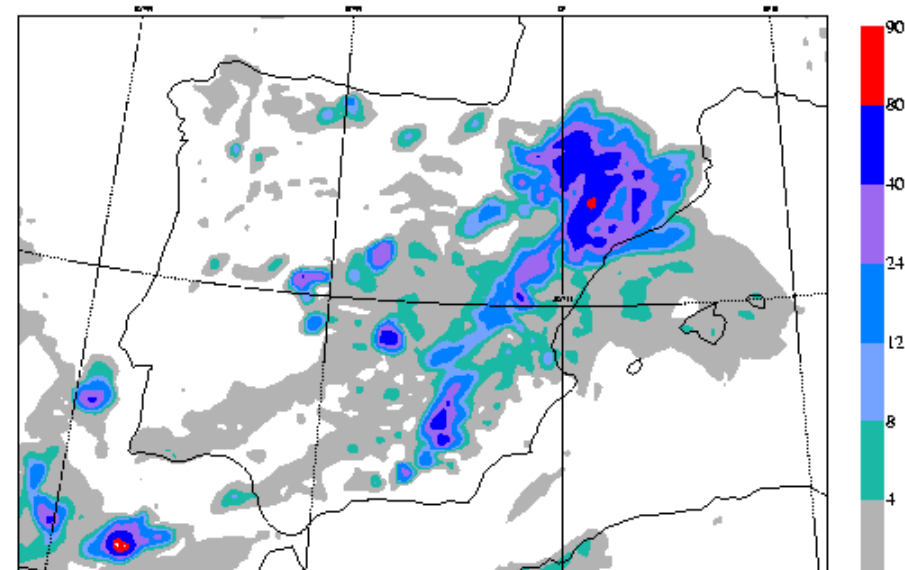


24 hour accumulations

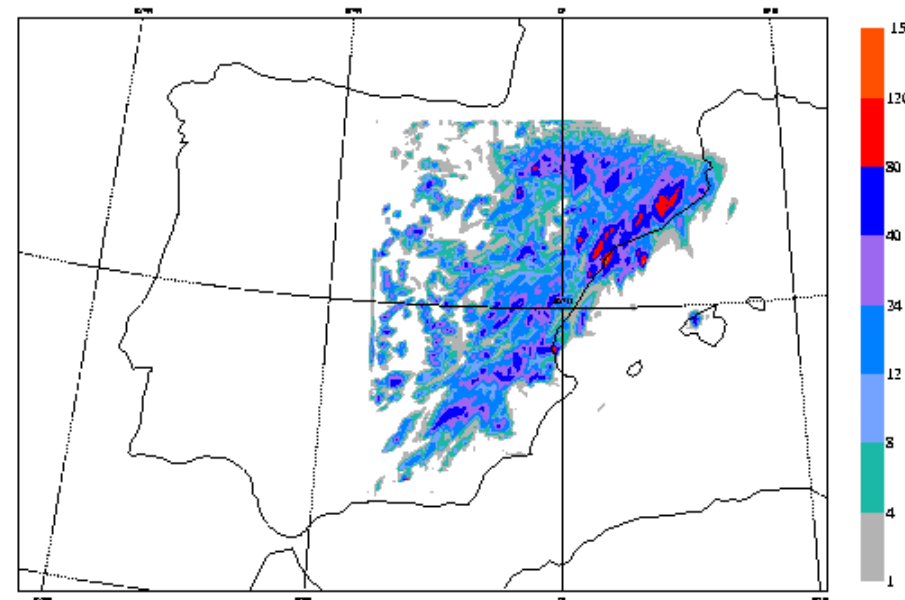


AROME matched the maximum but overestimate

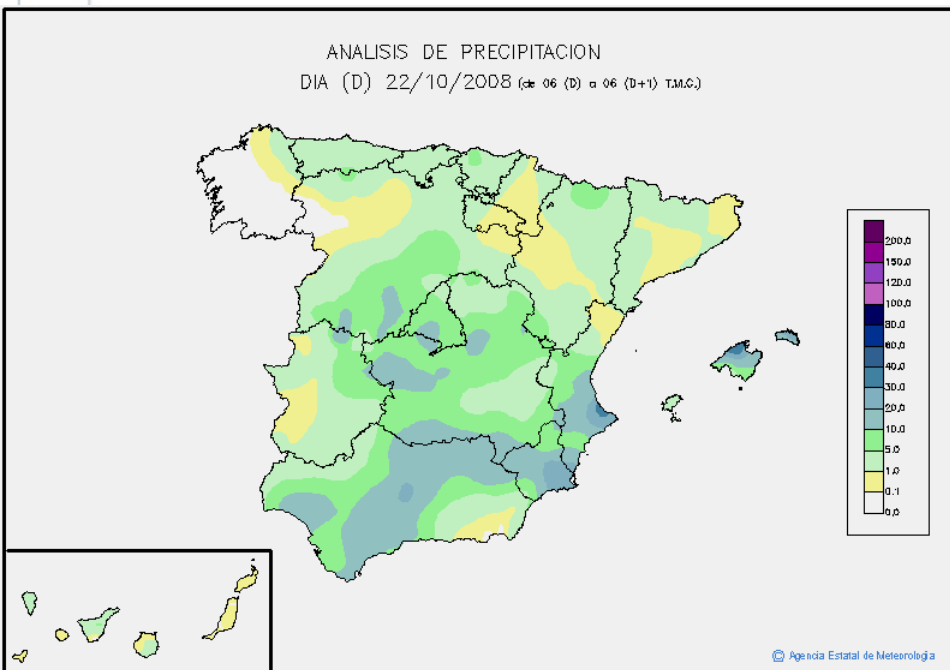
ald1 Total precipitation (24 hr)
18/10/2008 00z HIRLAM H+ 30 Valid: 19/10/2008 06z



aro2 Total precipitation (24 hr)
18/10/2008 00z HIRLAM H+ 30 Valid: 19/10/2008 06z

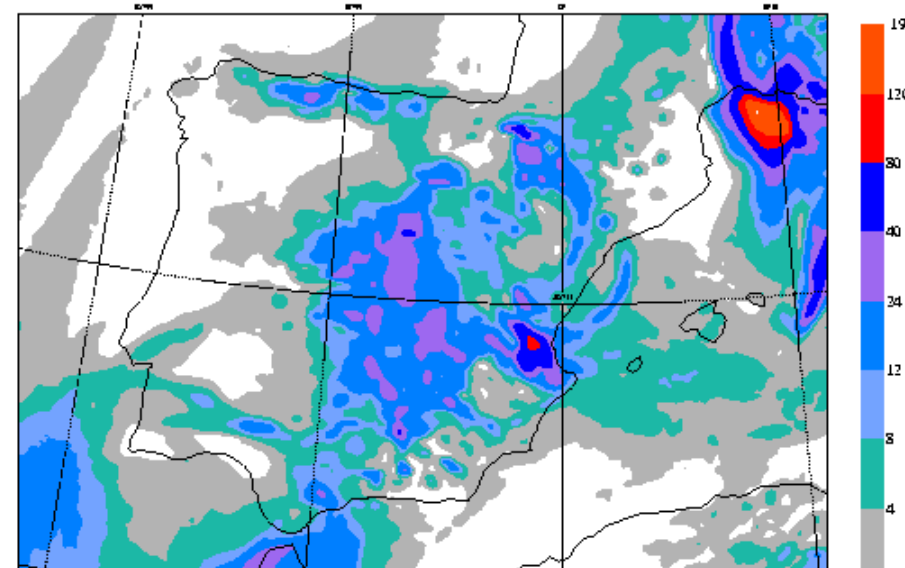


24 hour accumulations

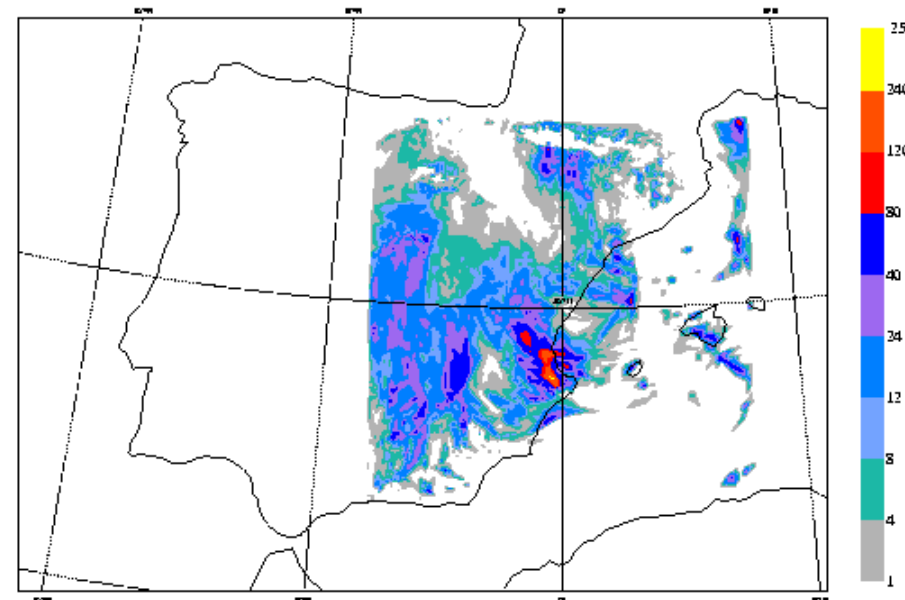


Similar distributions.
AROME larger
amounts

ald1 Total precipitation (24 hr)
22/10/2008 00z HIRLAM H+ 30 Valid: 23/10/2008 06z



aro2 Total precipitation (24 hr)
22/10/2008 00z HIRLAM H+ 30 Valid: 23/10/2008 06z



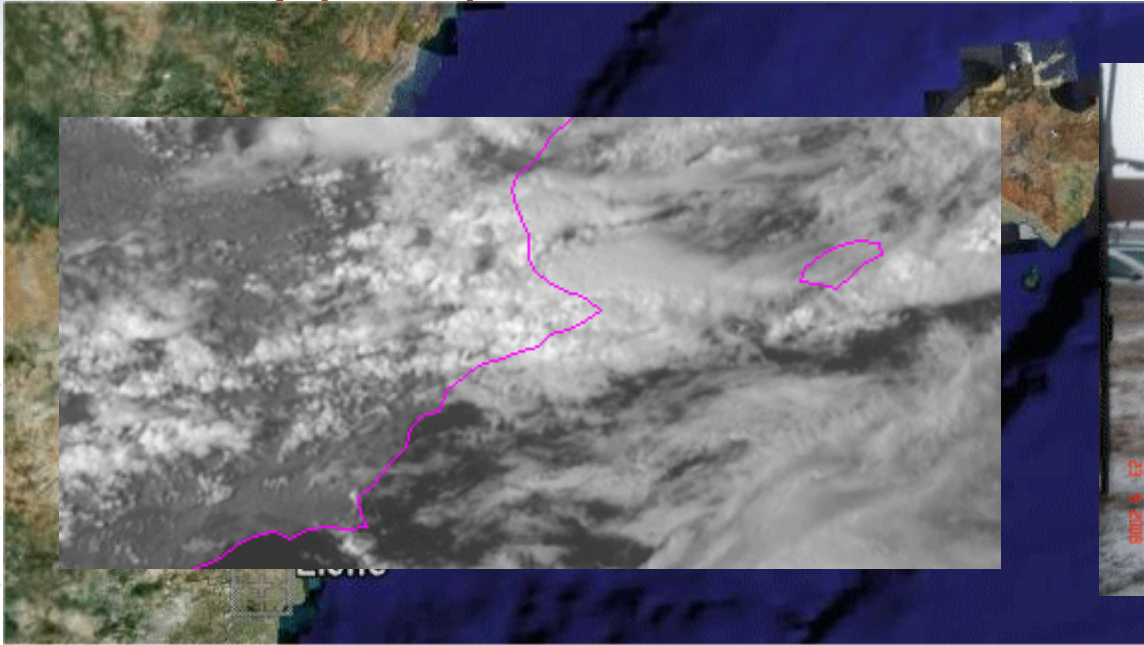
Some conclusions from the daily runs

- Intensities of precipitation bigger in AROME but 24 hour accumulations only slightly larger.
- Is it possible to match the observations at these scales in a deterministic way?

Two case studies of heavy precipitation over the Mediterranean

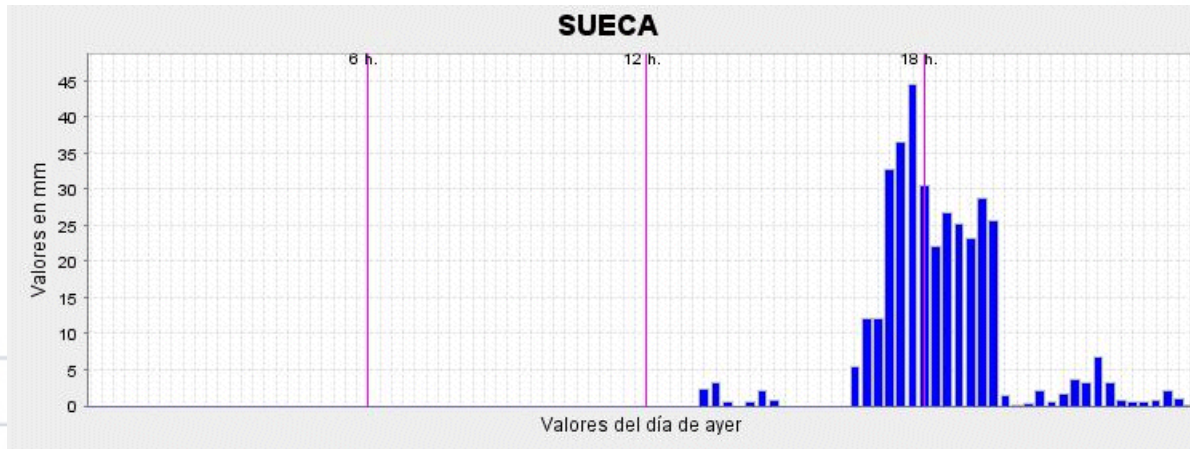
September 23, 2008:

Heavy precipitation in Valencia and Alicante

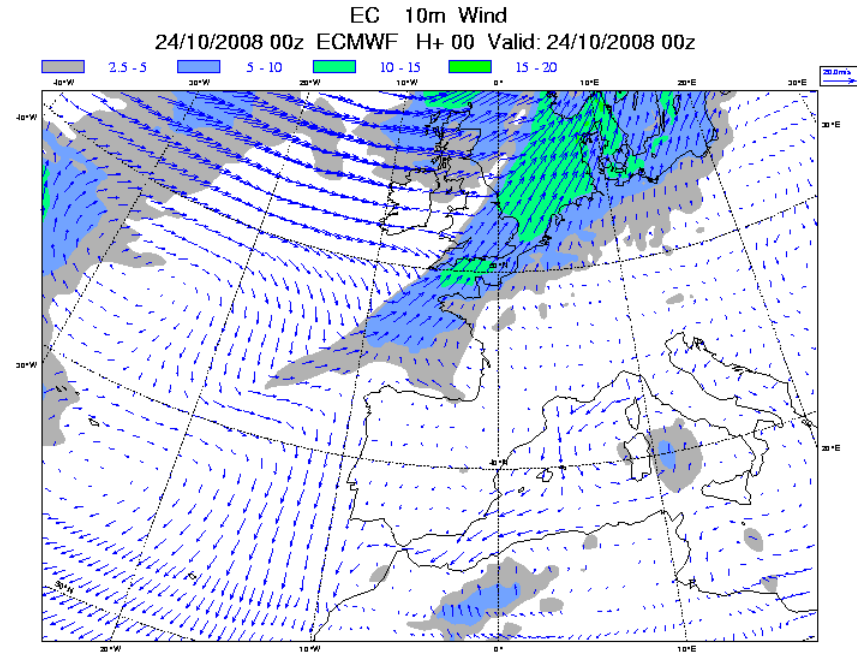
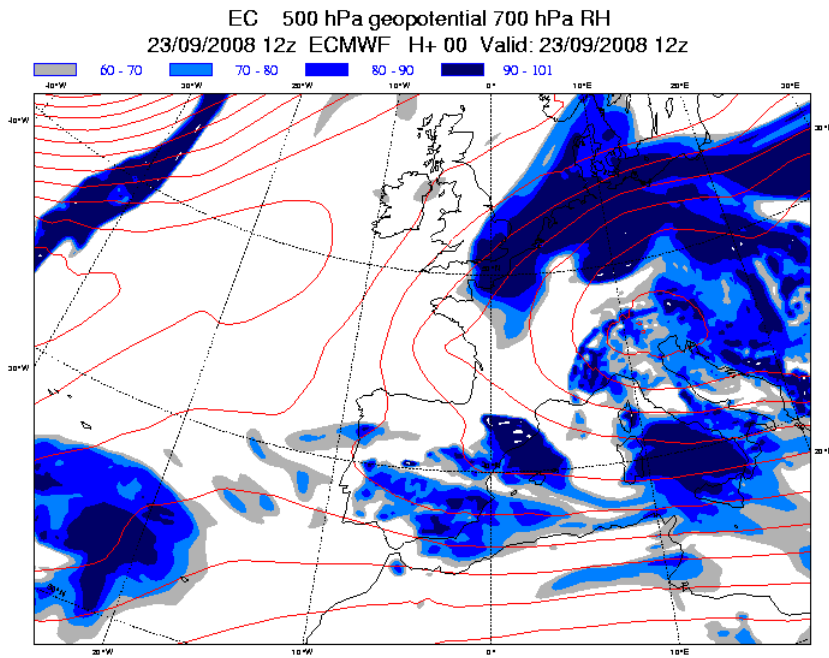


- 326 mm in 3 hours, from 14:30 to 17:30 UTC (144 mm in 1 hour!) in Sueca (Valencia)
- 140 mm in less than 30 minutes in Elche (Alicante) -non official obs-,

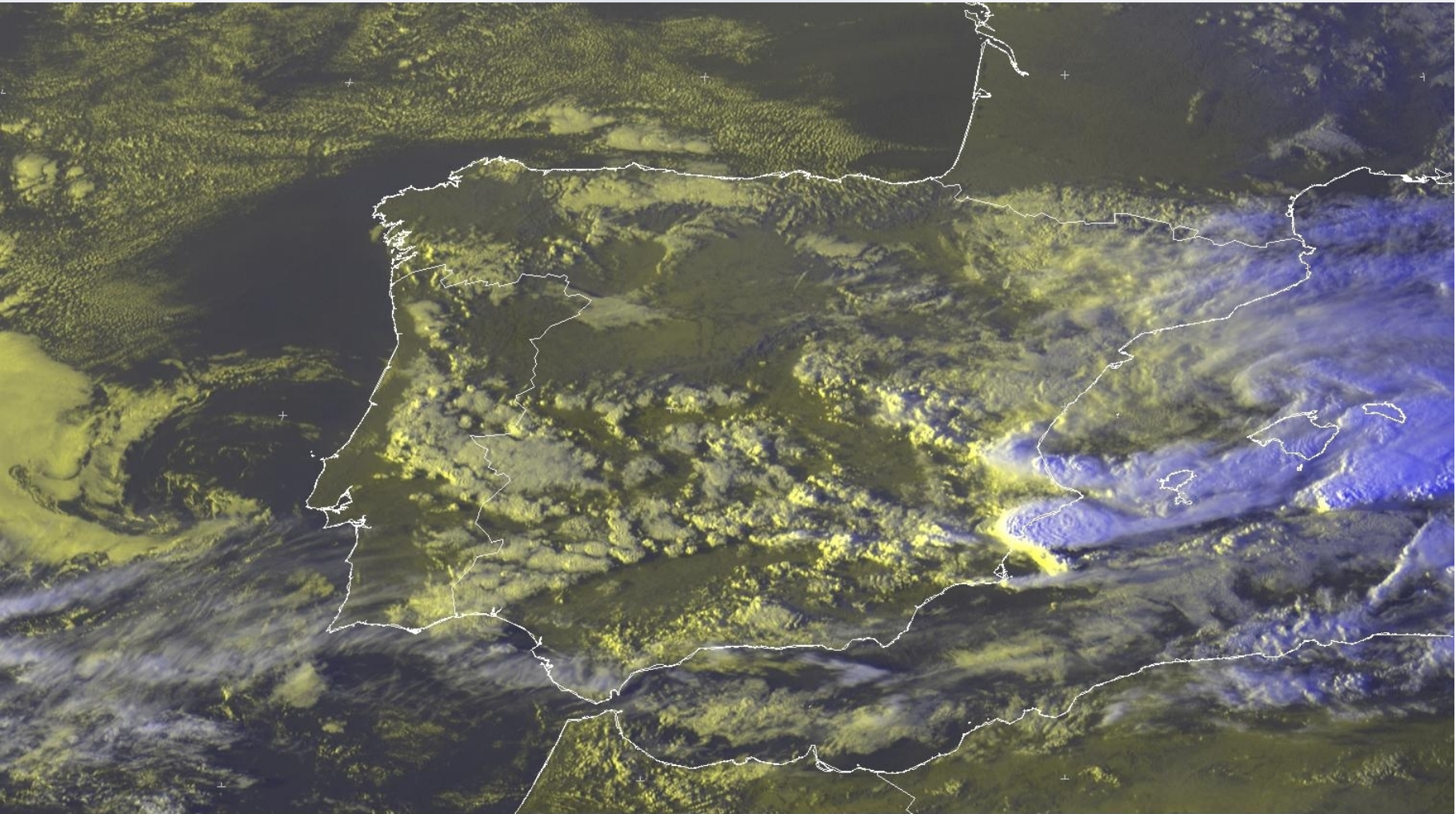
Data compiled by Ramón Vazquez AEMet



September 23, 2008: Synoptic environment



September 23, 2008: Valencia y Alicante



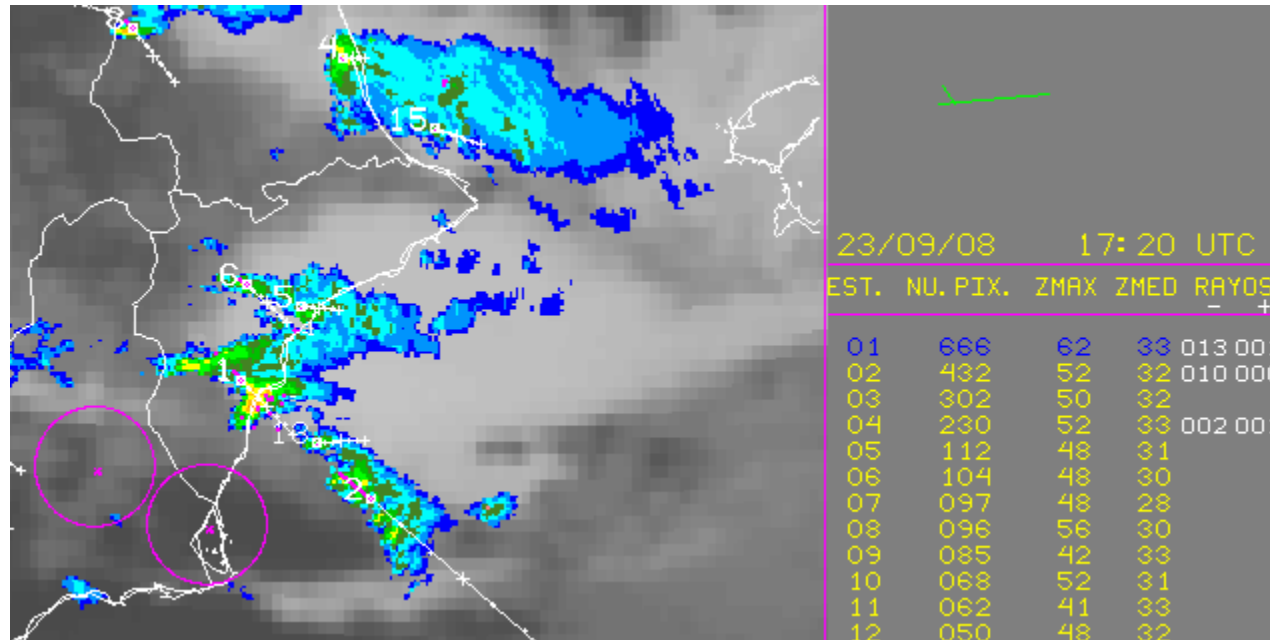
MET9 RGB-12-12-9i 2008-09-23 17:00 UTC

 EUMETSAT

MET RGB-12-12-9i 2008-09-23 17:00

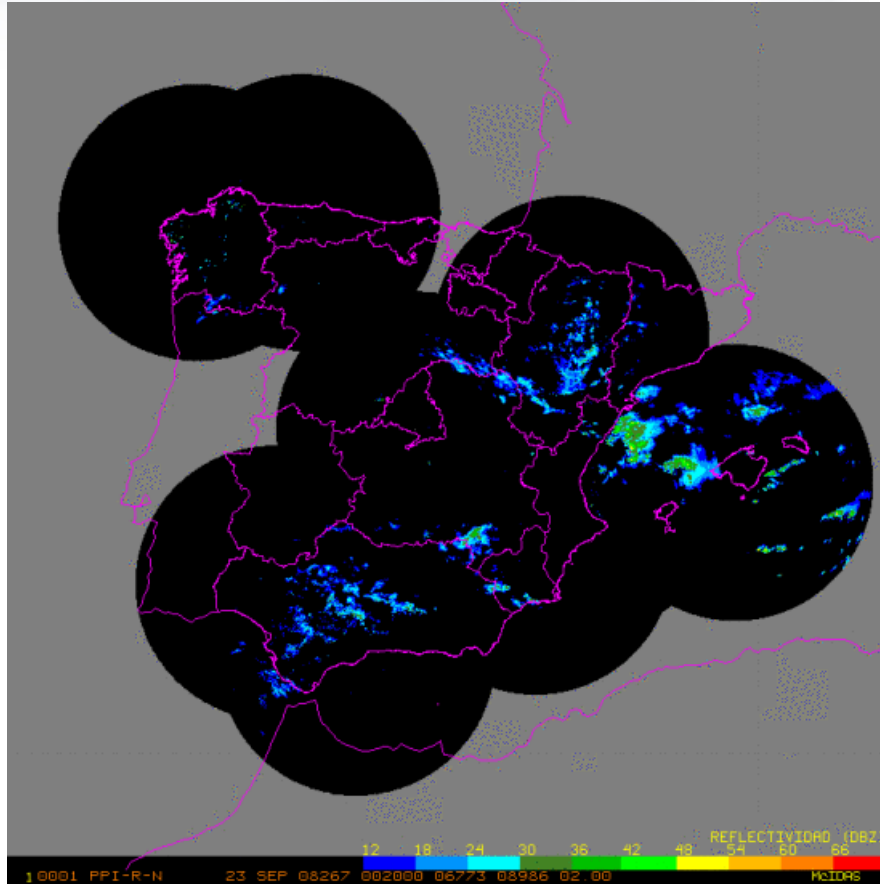
September 23, 2008: Radar + Satellite

1 hour radar (PPI reflectivity) + Satellite (MSG/IR 10.8)



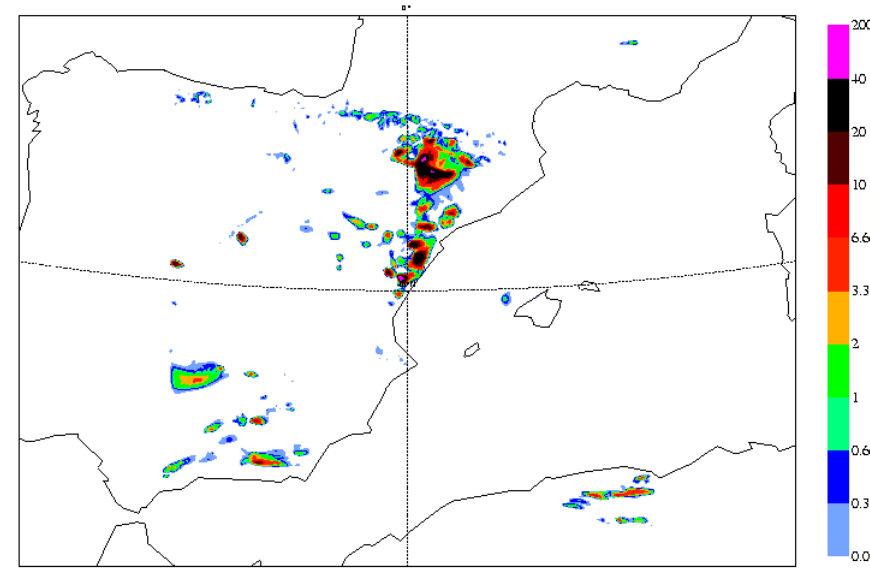
The small system north from the supercell was the one that produced the highest precipitation. The Elche event lasted only about 20 minutes, because the core of the supercell travelled fast.

AROME 2.5 km

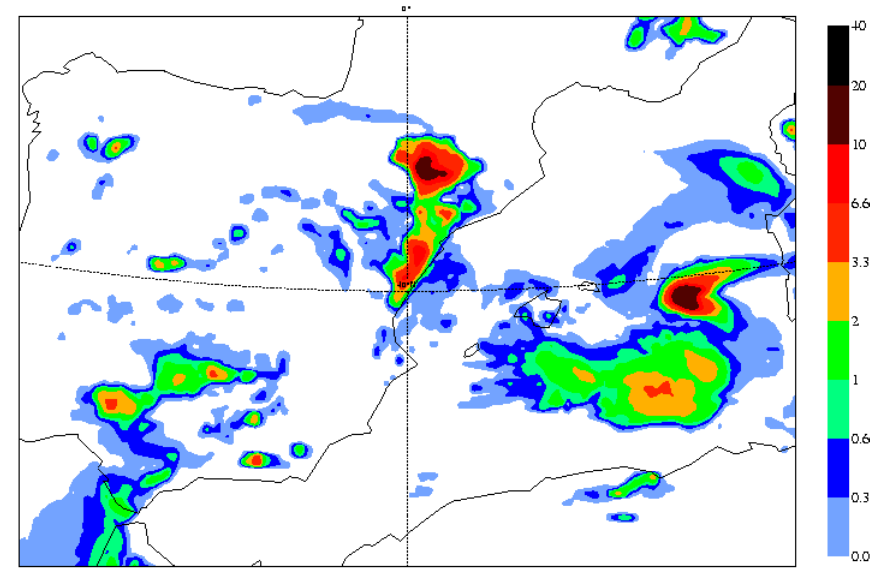


AROME reproduce better the maxima but also overestimate others. Systems delayed

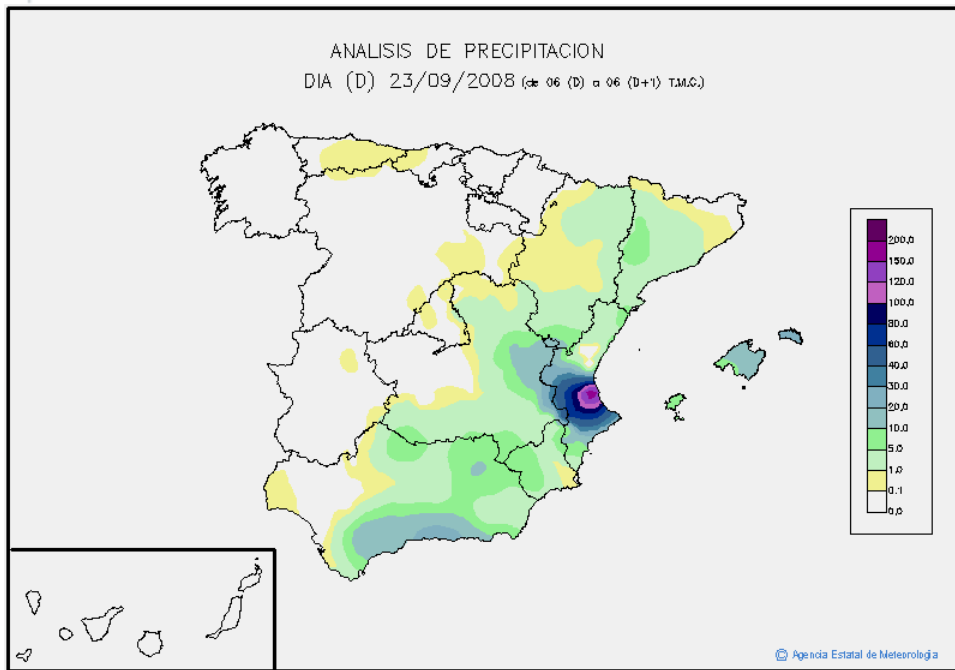
ARO LS precipitation (2hr)
23/09/2008 00z HIRLAM H+ 02 Valid: 23/09/2008 02z



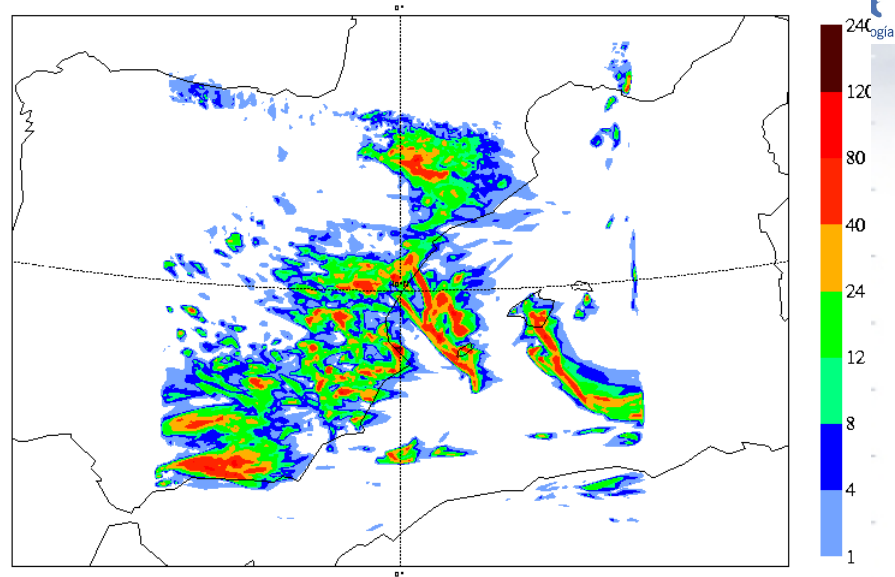
ALD Total precipitation (2hr)
23/09/2008 00z HIRLAM H+ 02 Valid: 23/09/2008 02z



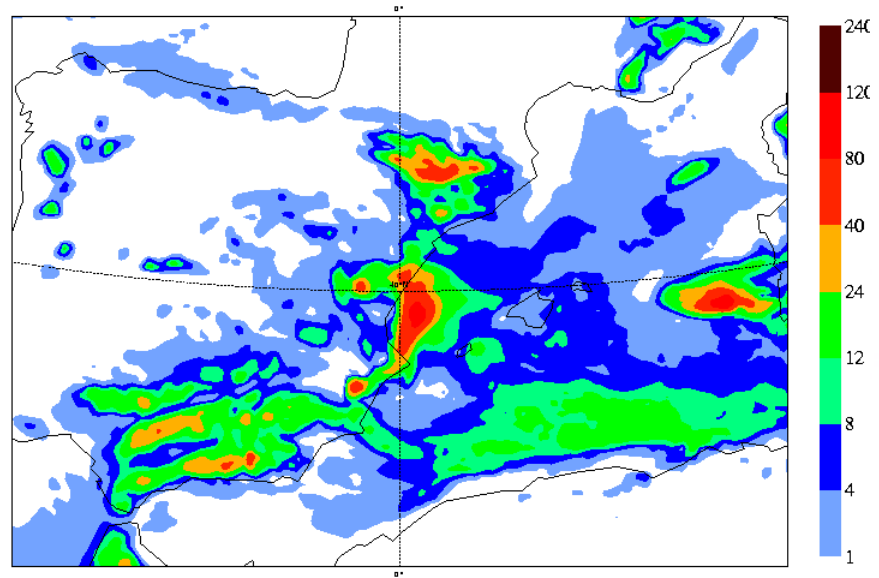
Accumulated precipitation in 24 hours



ARO LS precipitation (24hr)
23/09/2008 00z HIRLAM H+ 24 Valid: 24/09/2008 00z



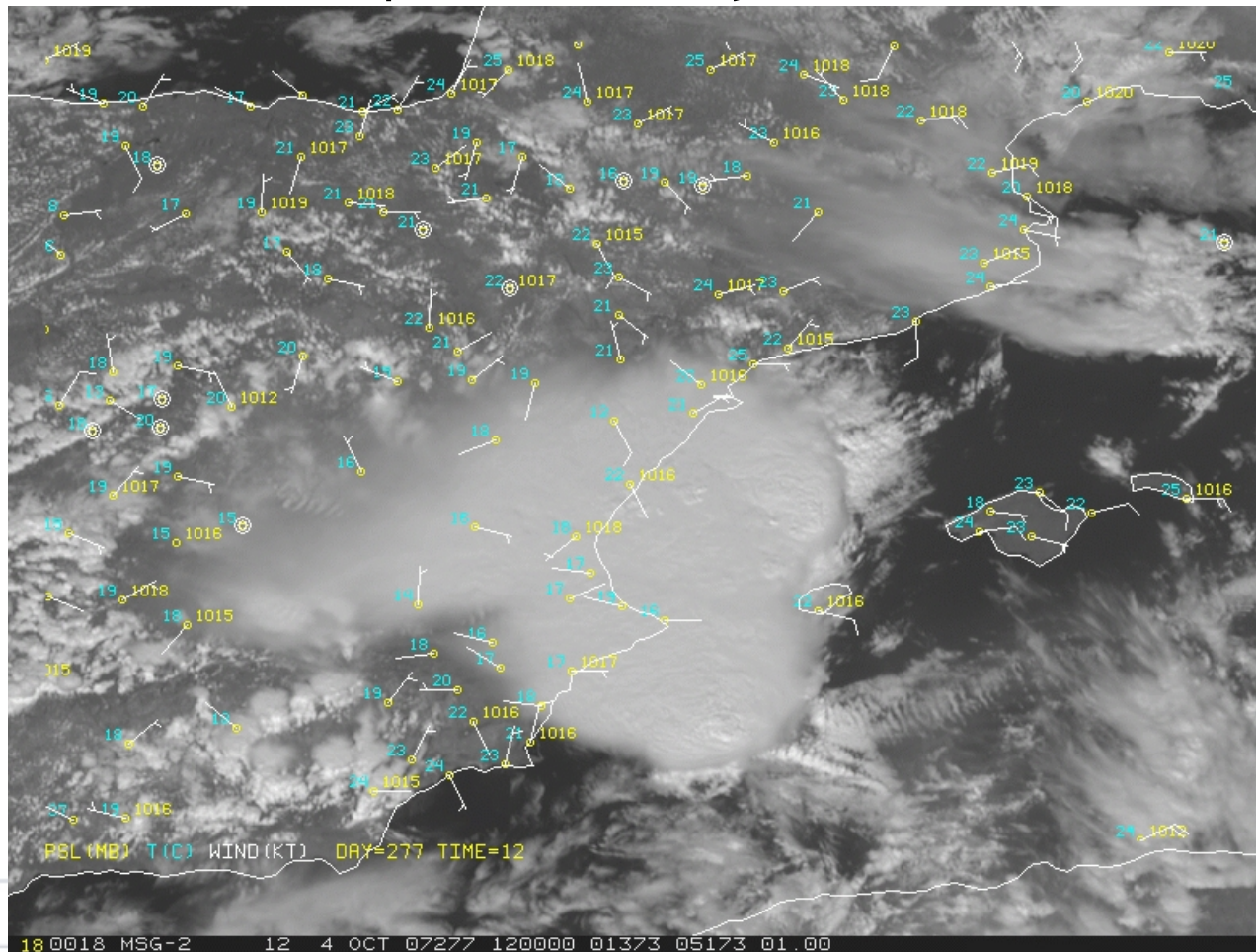
ALD Total precipitation (24hr)
23/09/2008 00z HIRLAM H+ 24 Valid: 24/09/2008 00z



October 4, 2007:

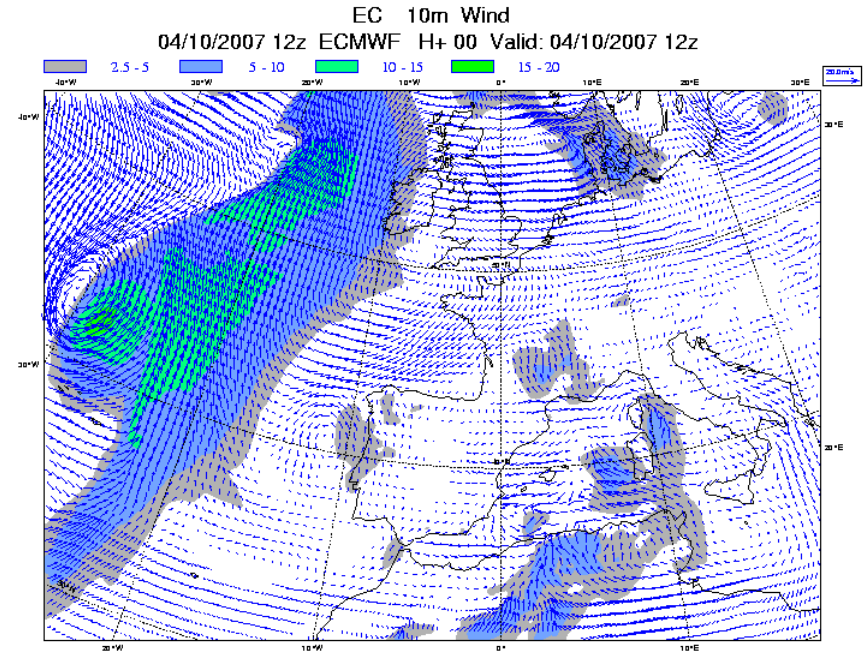
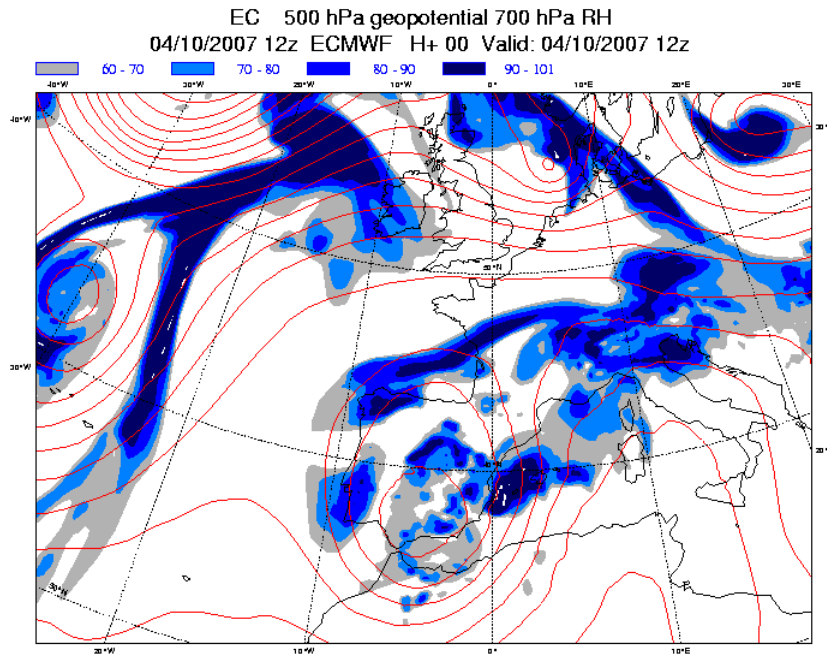
MCS, Hail and F2 tornado over Mallorca

1st week of October 2007: heavy rain and floods over Southern Spain due to a persistent cyclone. The 4th a MCS developed and moved rapidly towards Mallorca Island where it produced heavy rain, hail and a F2 tornado.



<http://www.zamg.ac.at/eumetrain/jarno/spain/mal.htm>

October 4, 2007: Synoptic environment



October 4, 2007: Evolution seen by the radar

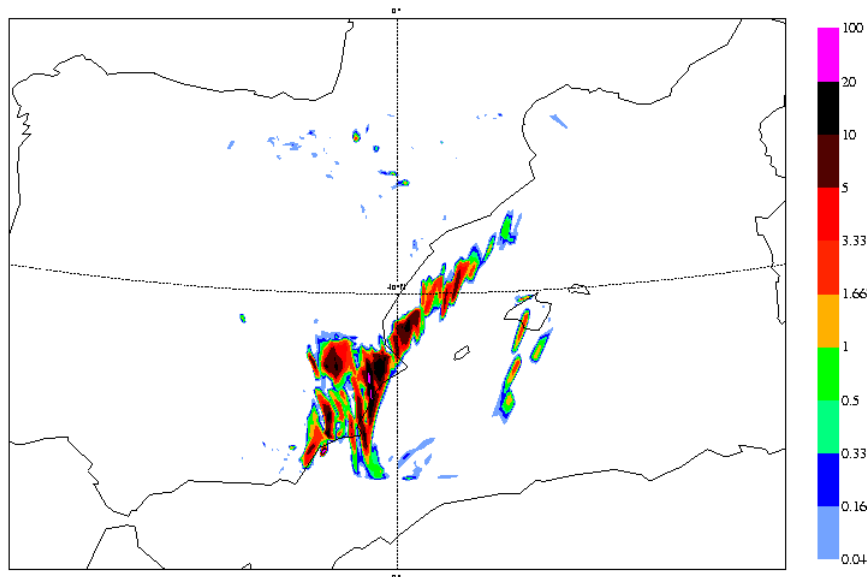
Radar: EUMeTrain Case Study

AROME 2.5 km: Domain size

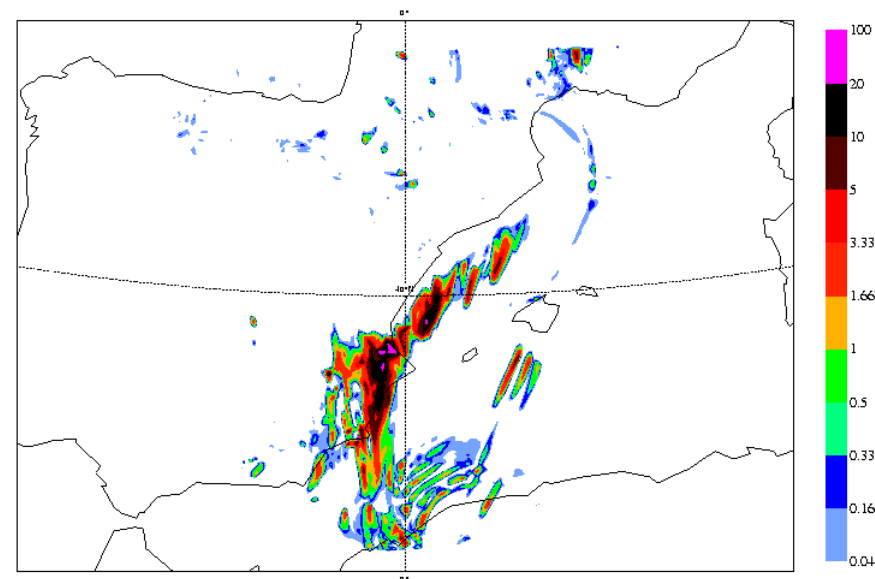
300x300 versus 384x400

small domain

AROs LS precipitation (1hr)
04/10/2007 00z HIRLAM H+ 10 Valid: 04/10/2007 10z



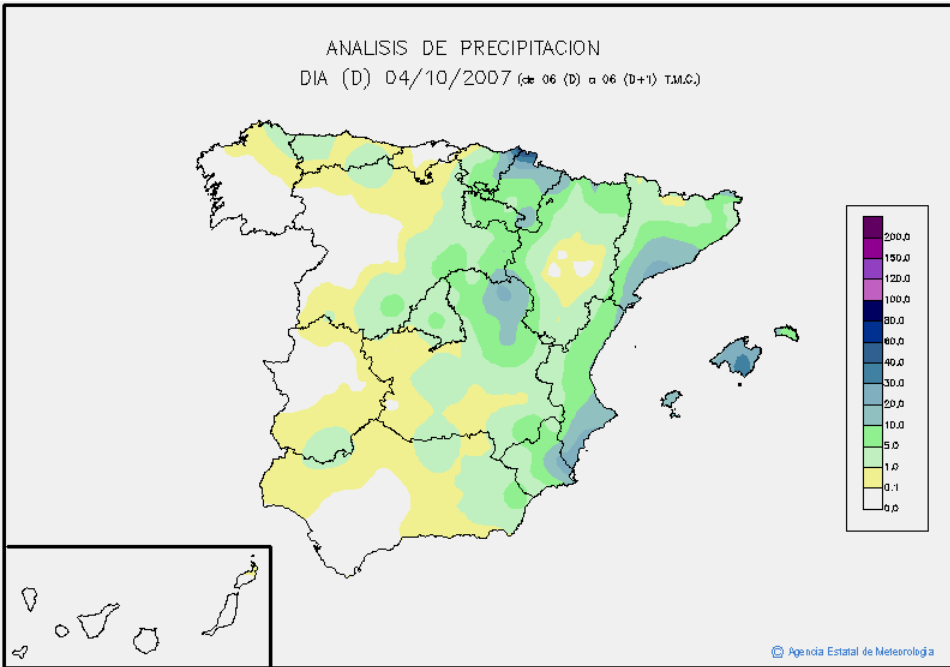
ARO LS precipitation (1hr)
04/10/2007 00z HIRLAM H+ 10 Valid: 04/10/2007 10z



- In both runs main system is delayed compared with the observations
- Too much precipitation in the outflow boundaries
- The impact of the size of the domain is significant

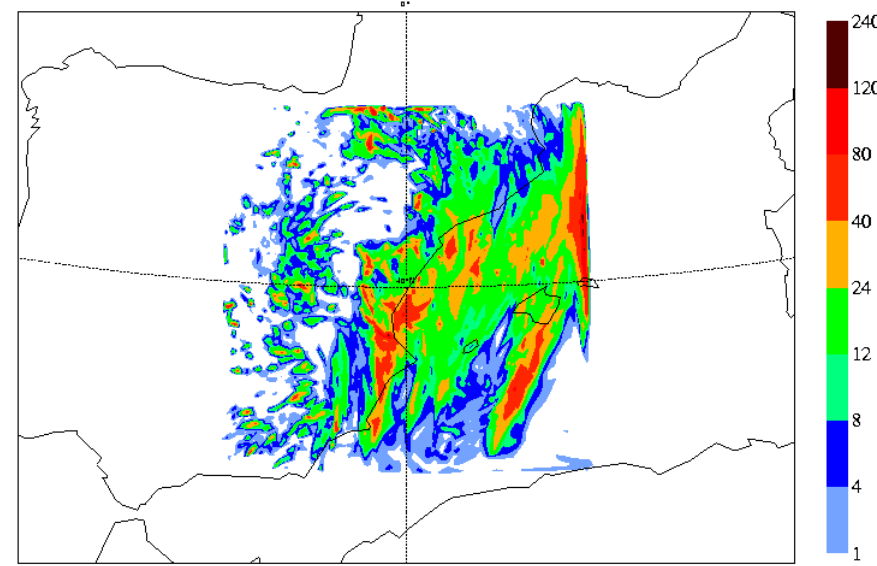
Size of the domain

24 hour accumulated precipitation

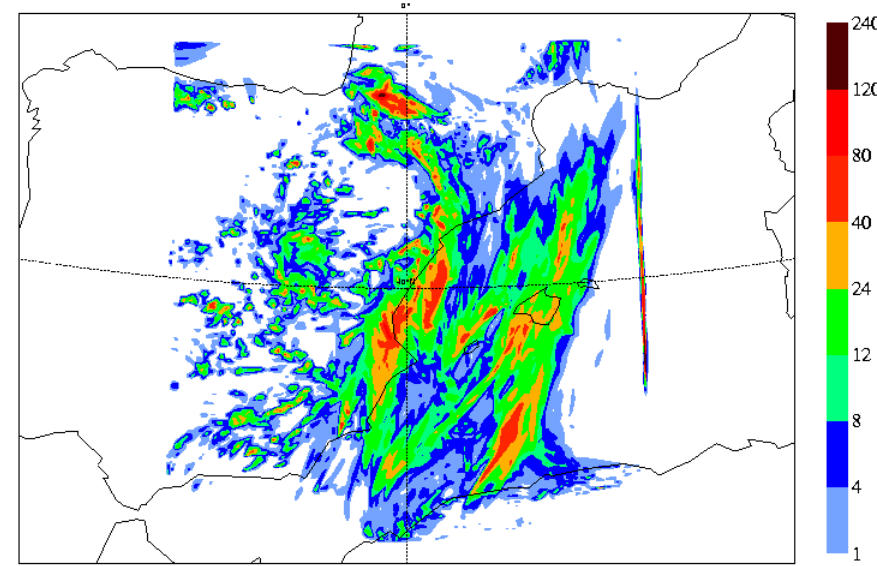


Significant impact specially near
outflow boundaries

AROs LS precipitation (24hr)
04/10/2007 00z HIRLAM H+ 24 Valid: 05/10/2007 00z



ARO LS precipitation (24hr)
04/10/2007 00z HIRLAM H+ 24 Valid: 05/10/2007 00z



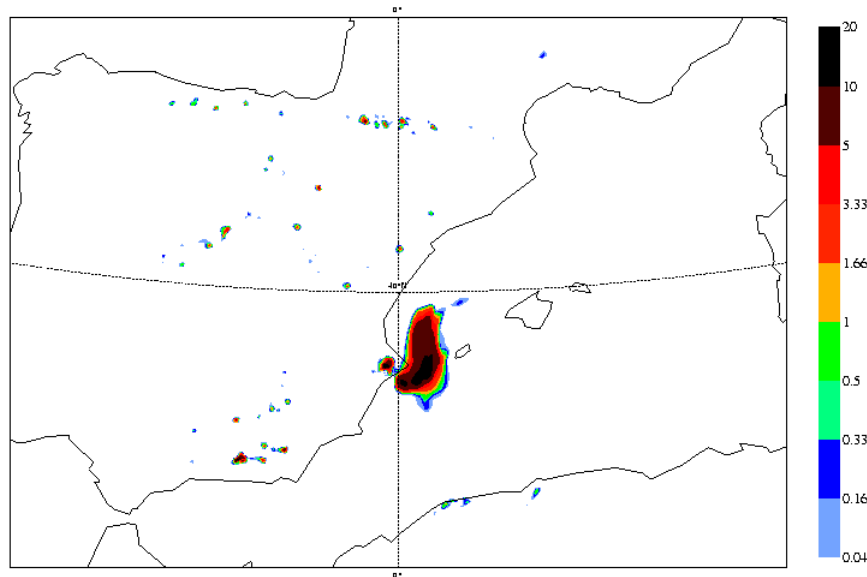
AROME 2.5 km: Initial condition

00 UTC versus 12 UTC

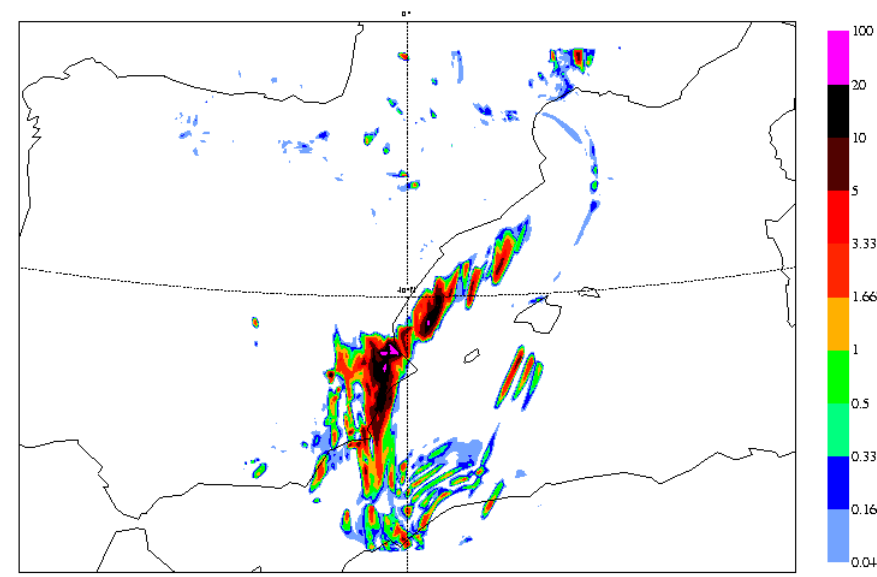
12 UTC

Not synchronized

ARO LS precipitation (1hr)
04/10/2007 12z HIRLAM H+ 01 Valid: 04/10/2007 13z



ARO LS precipitation (1hr)
04/10/2007 00z HIRLAM H+ 10 Valid: 04/10/2007 10z



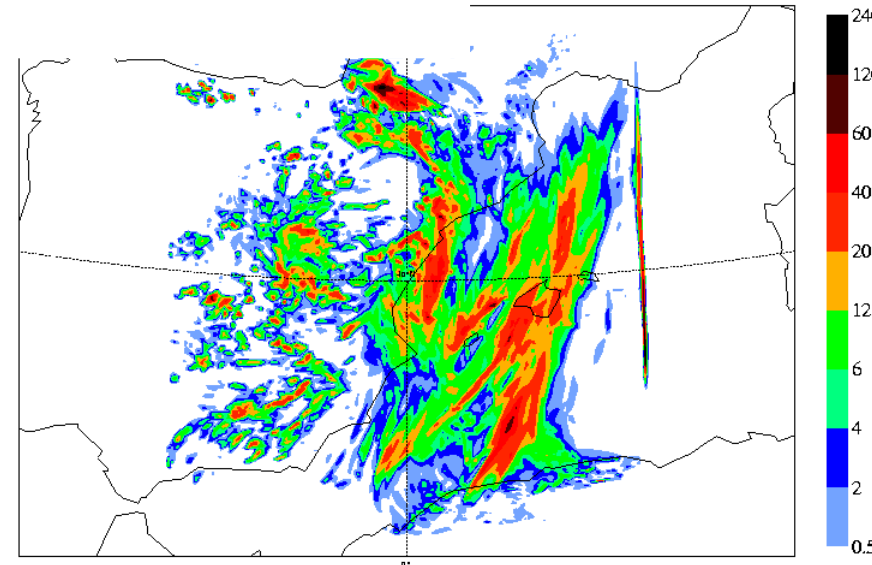
Significant impact. Anyway none of them was able to produce the small cyclone which crossed Mallorca: Need of a proper analysis

AROME 2.5 km: Initial condition

- 12 hr accumulation: Significant impact.

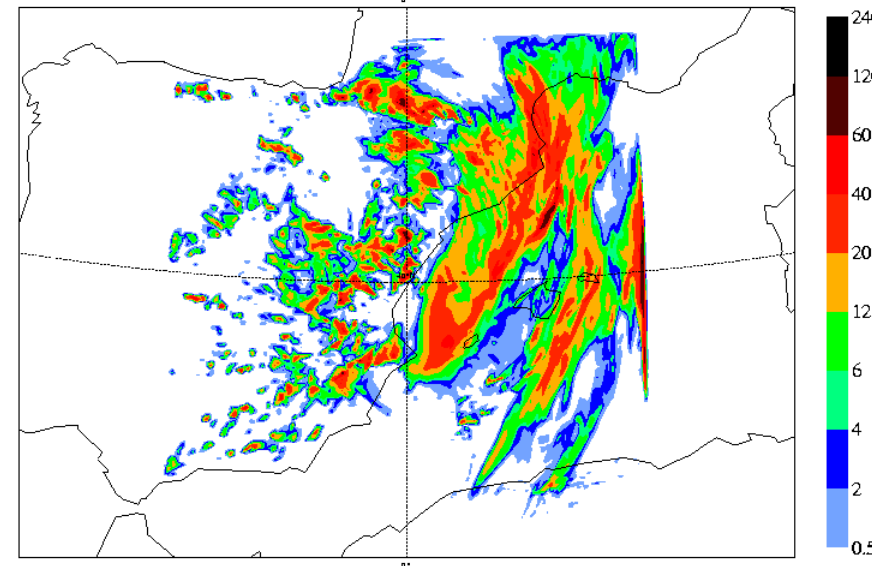
ARO LS precipitation (12hr)

/alid: 05/10/2007 00z



ARO LS precipitation (12hr)

04/10/2007 12z HIRLAM H+ 12 Valid: 05/10/2007 00z



Some preliminary conclusions from the case studies

- Need of large domains
 - Problems in the outflow boundaries
- Need of a proper initial condition (analysis)
- Delay of the systems?
- Concerning precipitation some added value (small) of AROME runs compared to ALADIN 11km.
- Intensities tend to be bigger in AROME but accumulations only slightly larger.