

# Orographically-induced initiation of convection

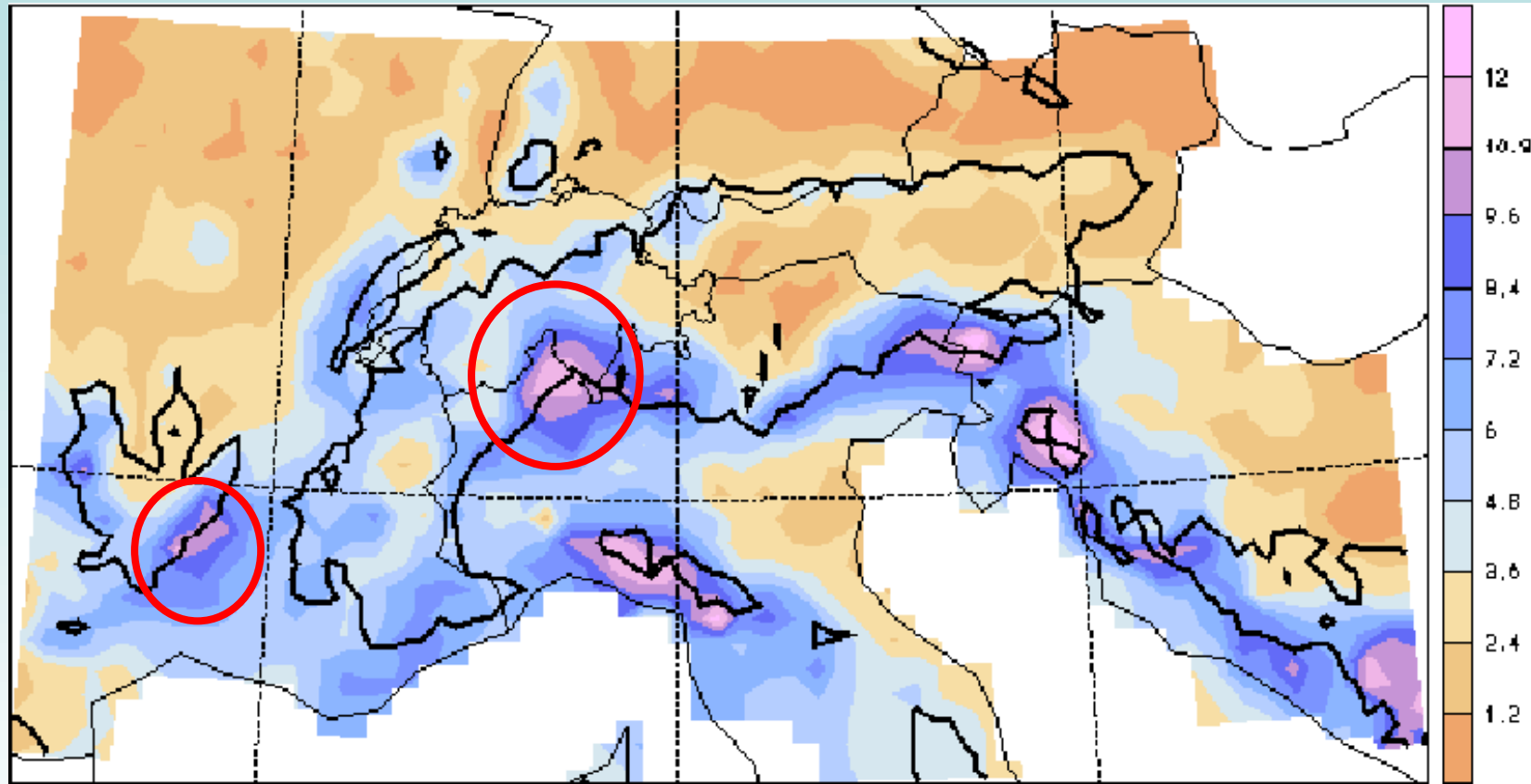
- How good/bad are the high-resolution NWP models?
- What should/could be improved ?

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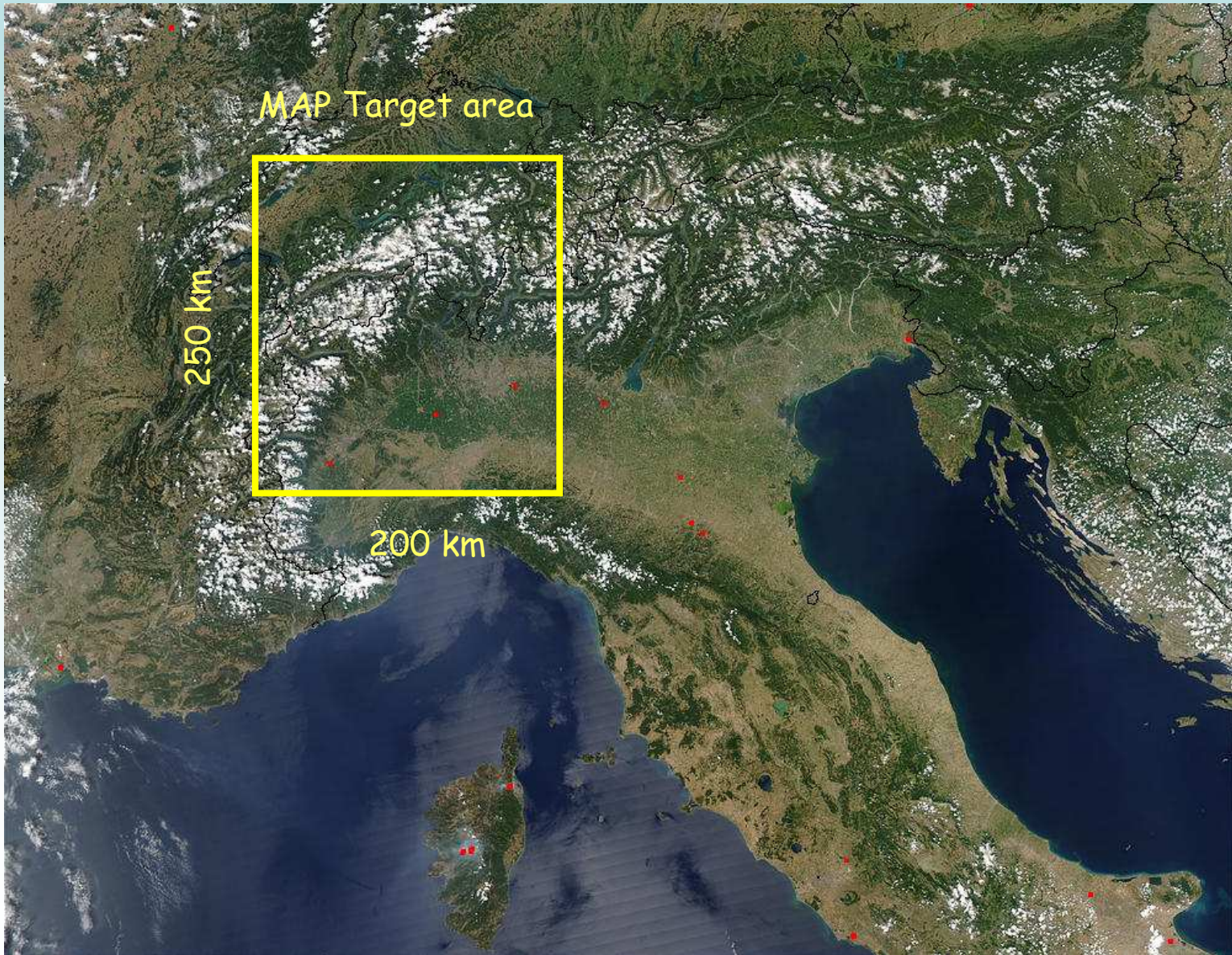
Toulouse



Climatological frequency of high precip in October

$P > 20\text{mm/day}$

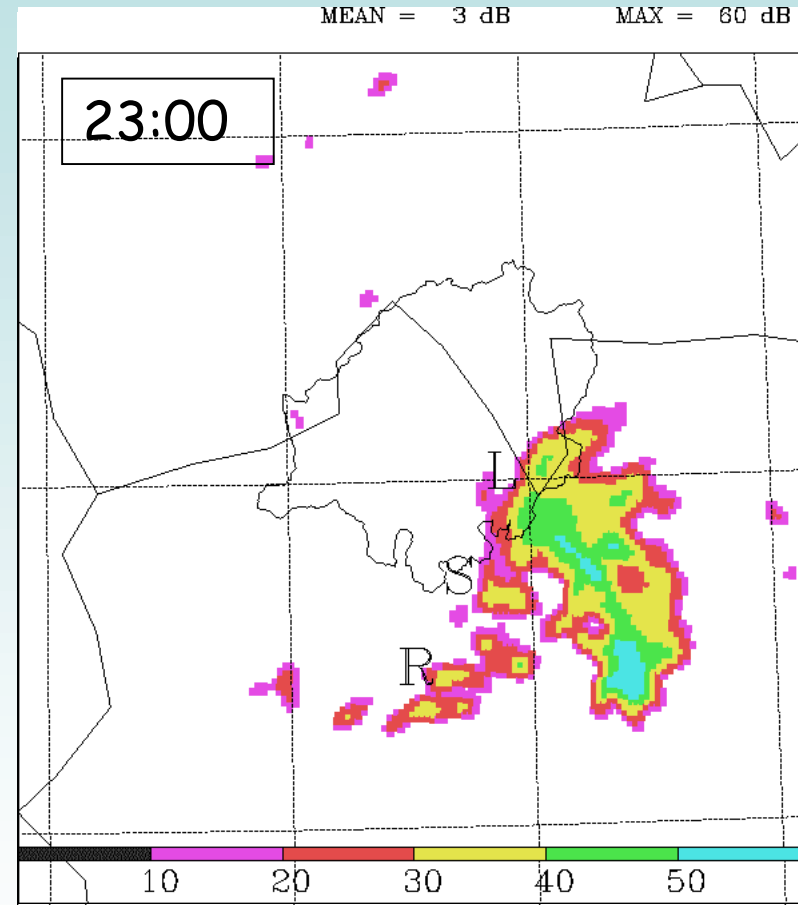
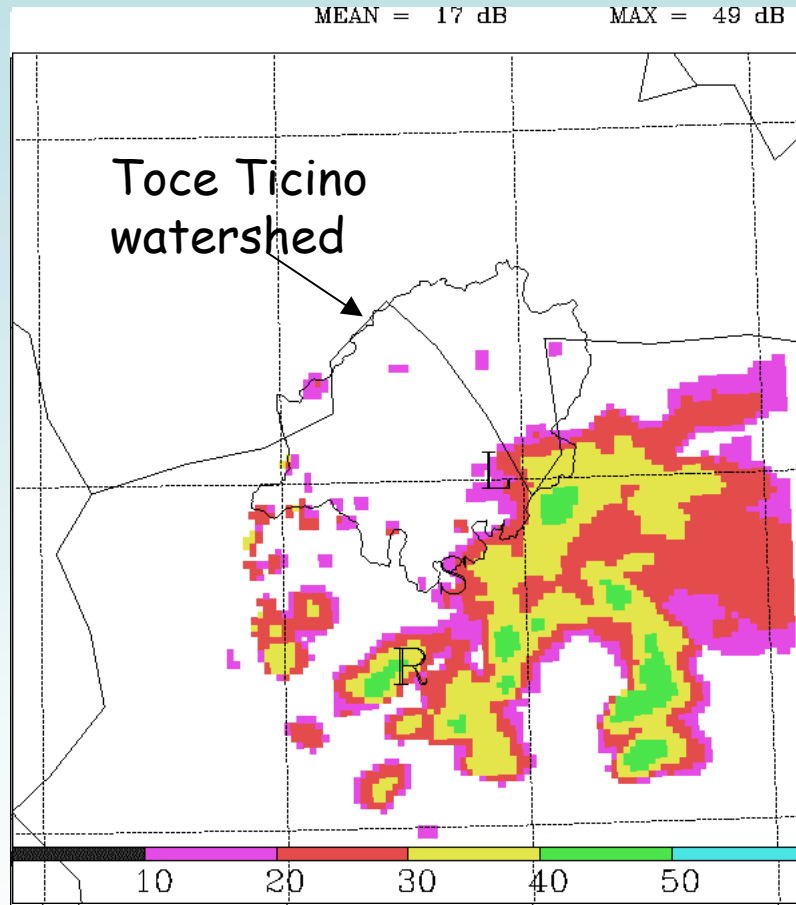
Frei and Schär, 1998



# Hourly time evolution

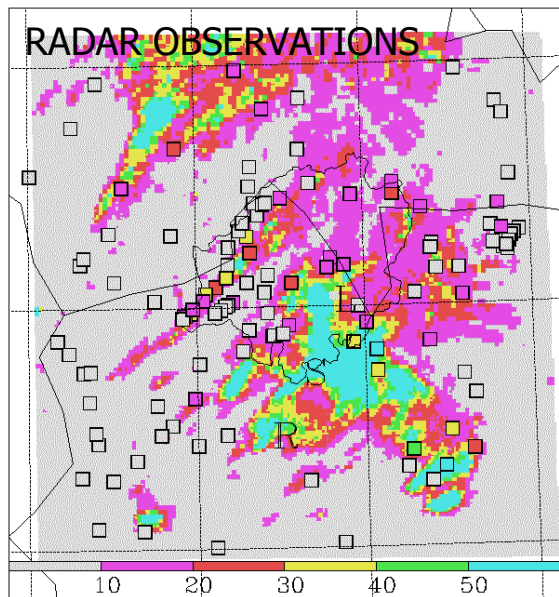
OBSERVATION

COMPUTATION  $\Delta x=2\text{km}$

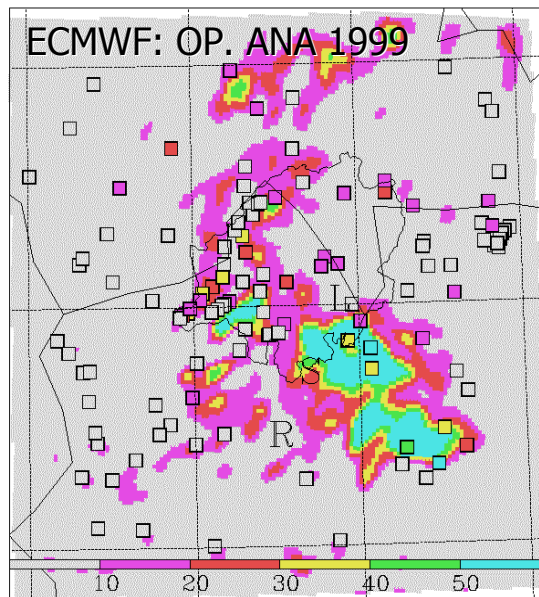


RADAR Reflectivity Z= 2000m

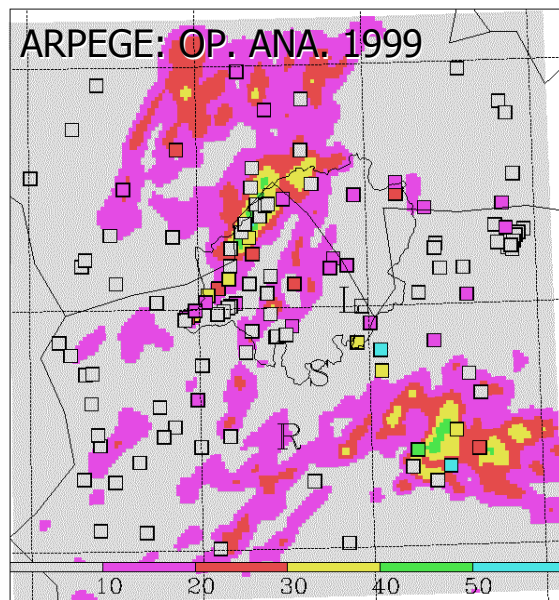
RAD 17-12 - 18-00 MEAN = 12 mm MAX = 205 mm



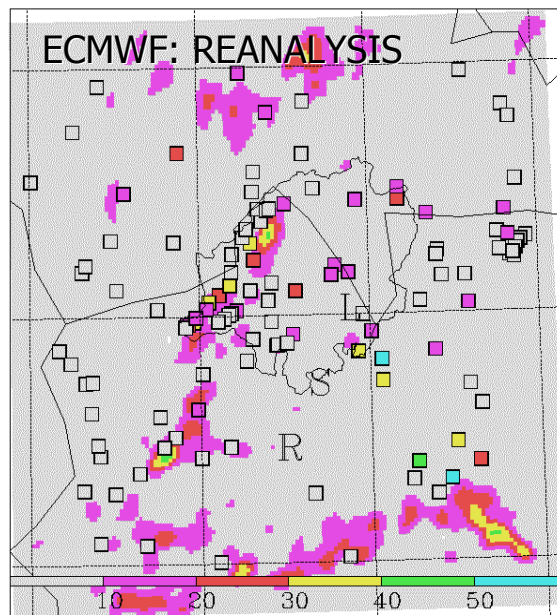
HAIL1 17-12 - 18-00 MEAN = 6 mm MAX = 122 mm



ARP 17-12 - 18-00 MEAN = 7 mm MAX = 50 mm



E9JR 17-12 - 18-00 MEAN = 3 mm MAX = 48 mm



MAP -IOP 2A  
12h accumulated  
precipitation

Predictability of this  
Event ?

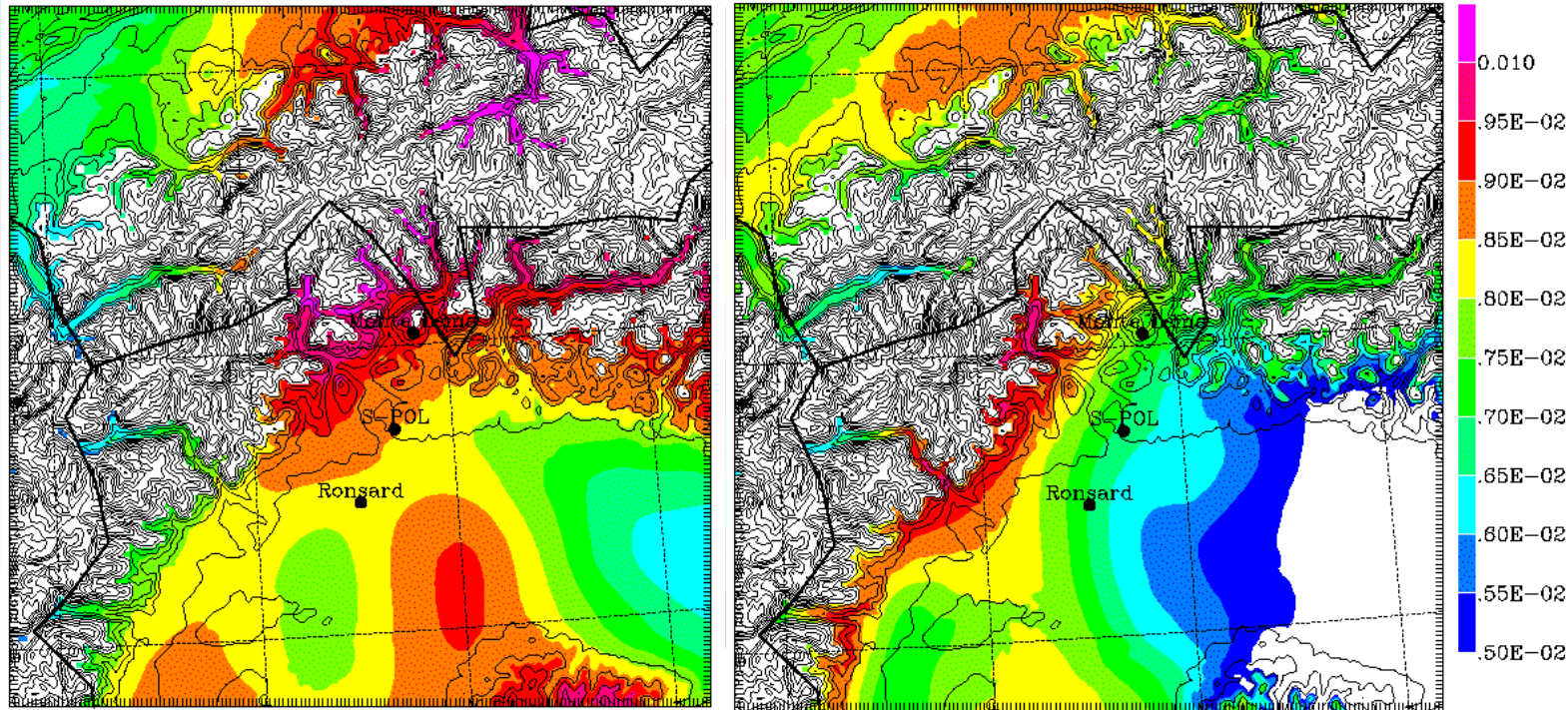
# MAP IOP 2a

850hPa water vapor mixing ratio :

17/09/99 12 UTC

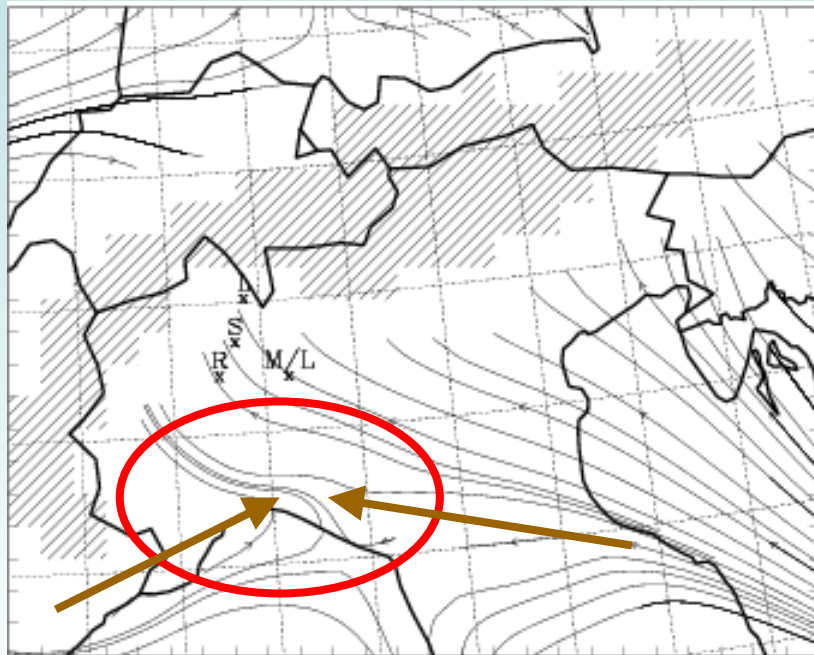
ECMWF ANALYSIS

MAP ECMWF REANALYSIS



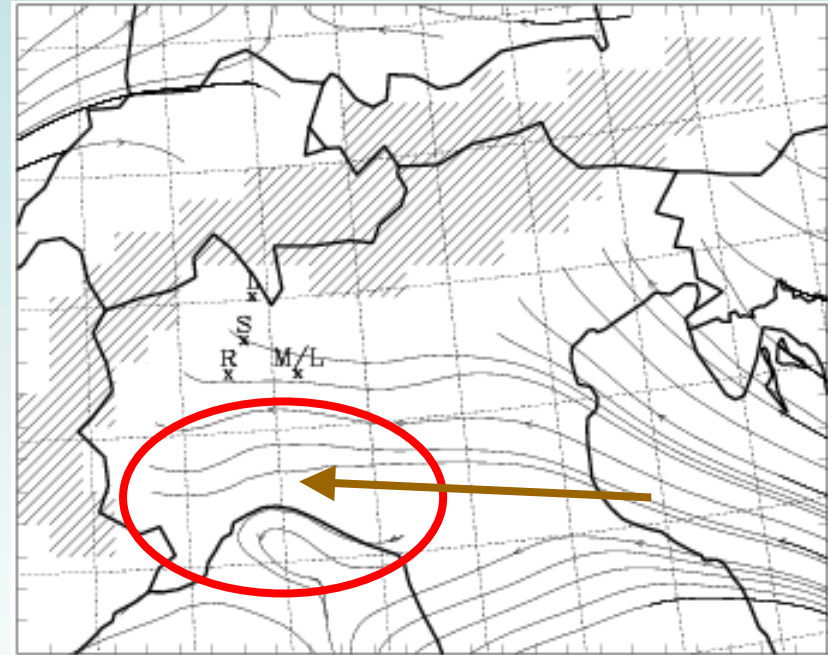
# MAP IOP 2a

## Streamlines at 1000 m, 17/09/99 12 UTC



**ECMWF ANALYSIS**

Low-level convergence between the Ligurian and Adriatic flows



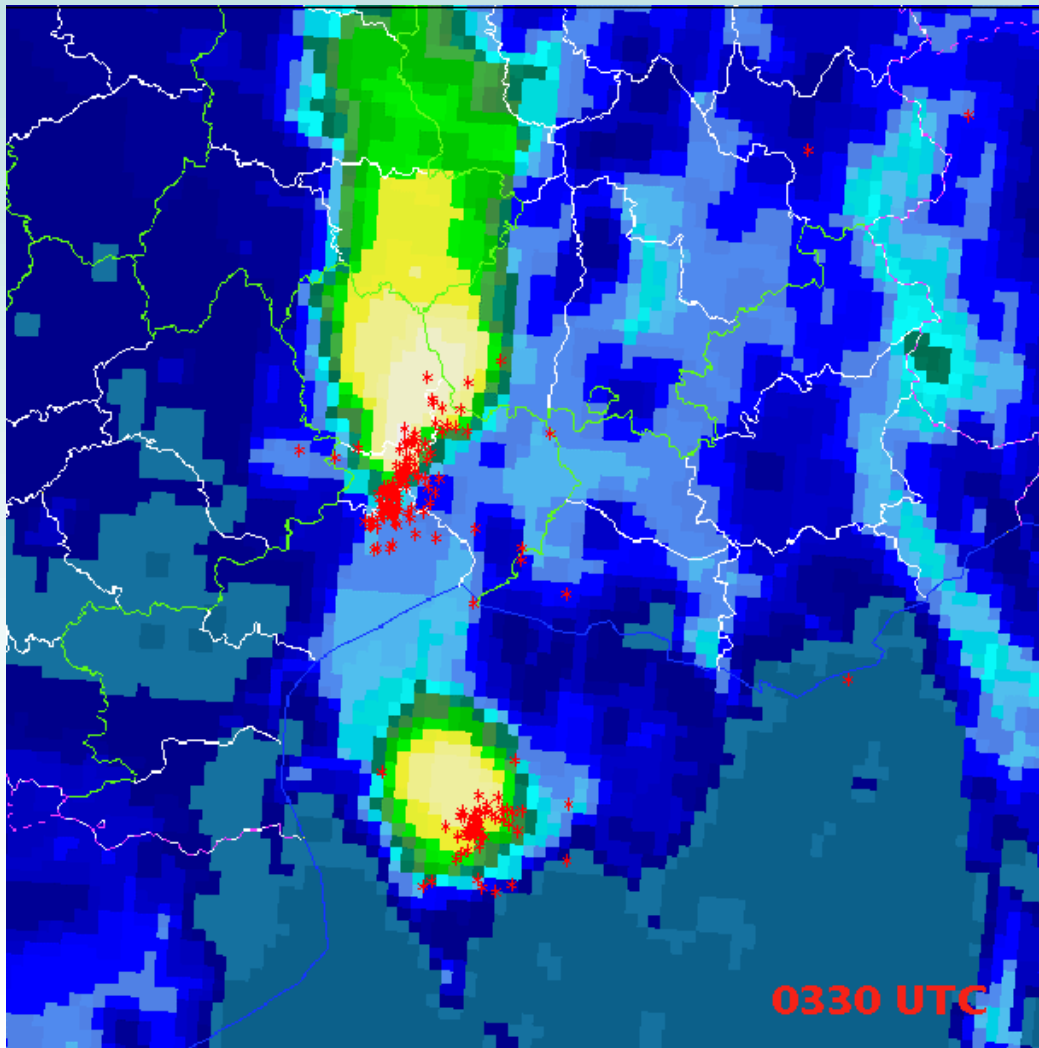
**MAP ECMWF REANALYSIS**

Increase in the model resolution  
-> higher mountains -> the  
Ligurian flow is blocked

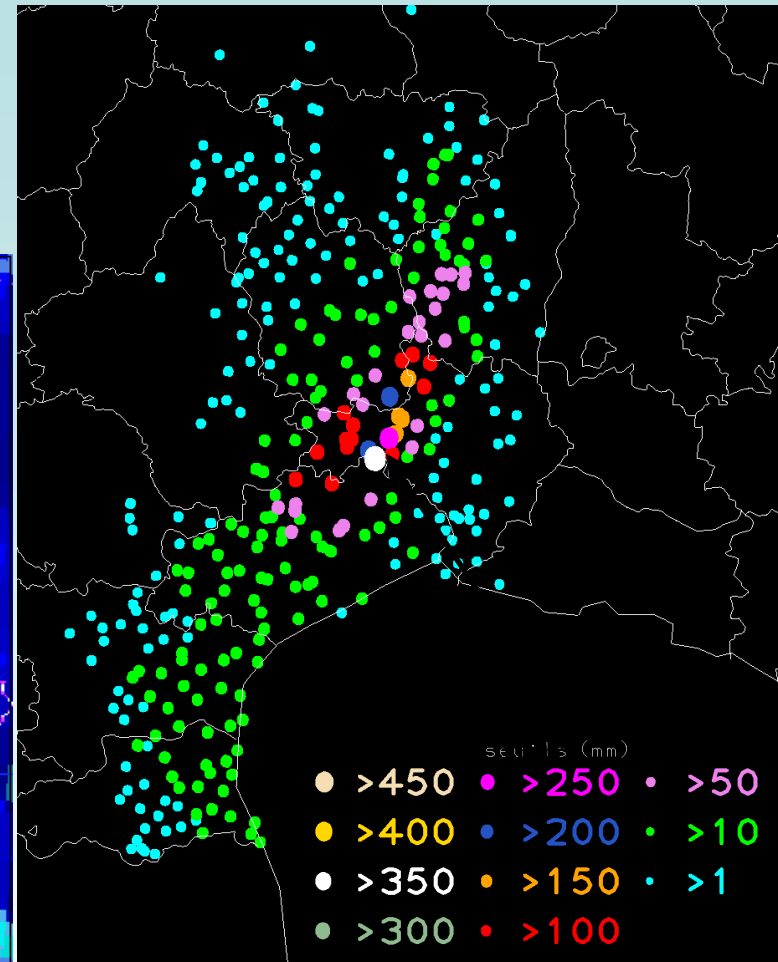


# The convective system of 13/14 October 95

Ricard, 2002



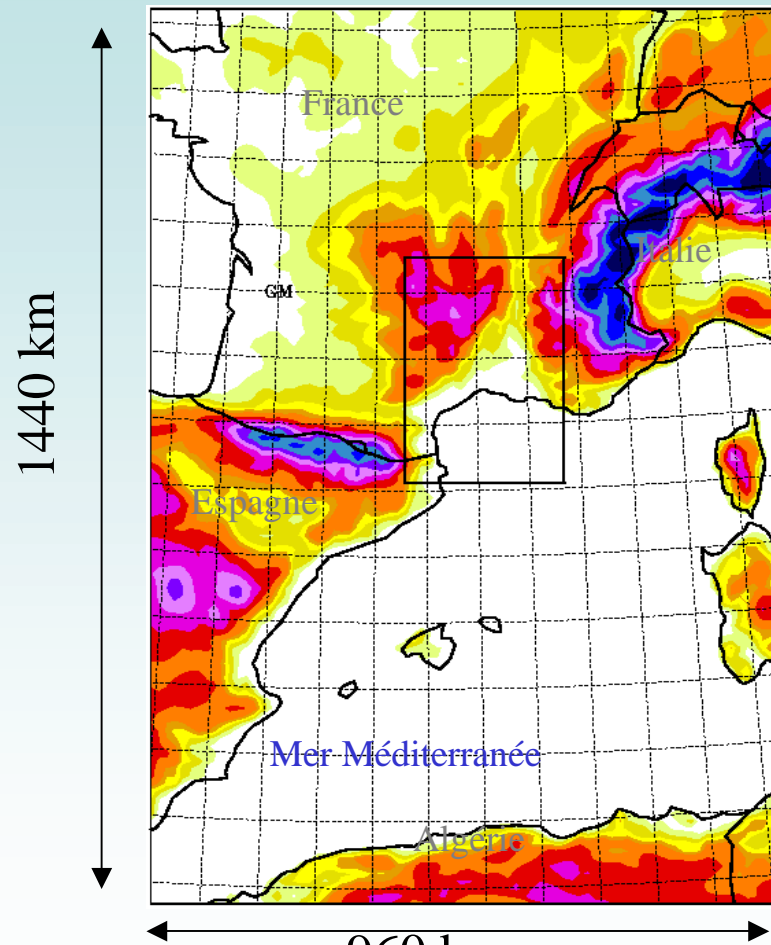
METEOSAT IR



Accumulated Precipitation  
13-14 October

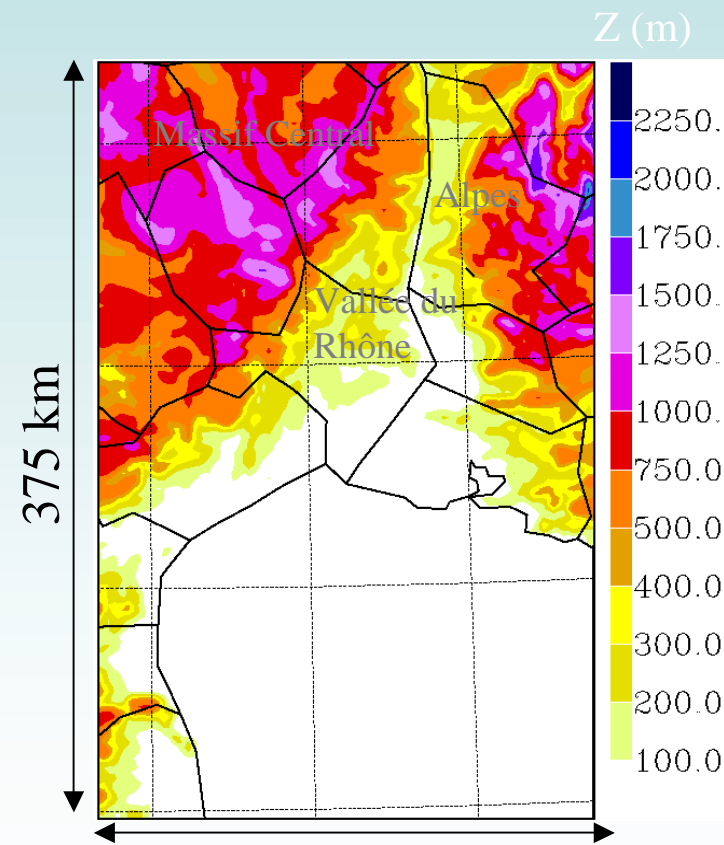


# Simulation domains :



960 km  
Outer domain

$\Delta x = 10$  km



250 km  
Inner domain

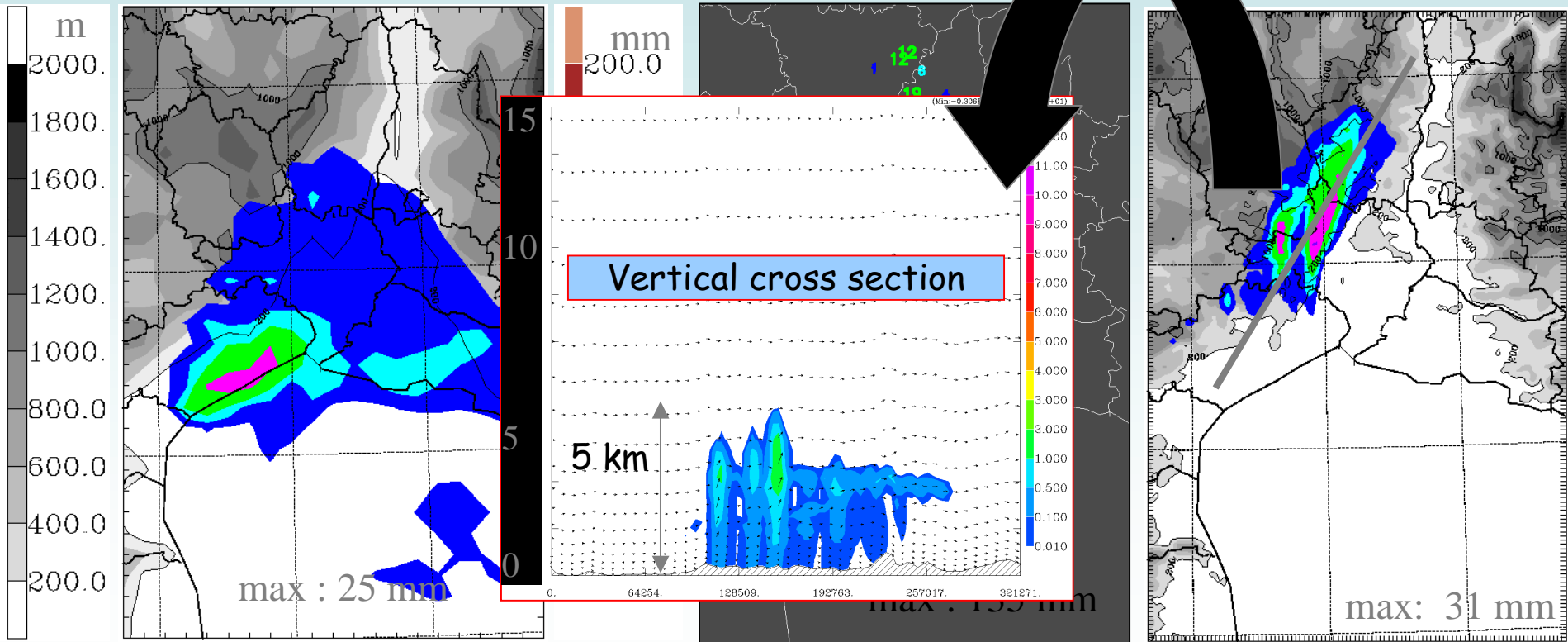
$\Delta x = 2.5$  km

# Initialization with a large scale analysis

10 km resolution  
(parameterized convection)

Observations

2.5 km resolution  
(explicit convection)



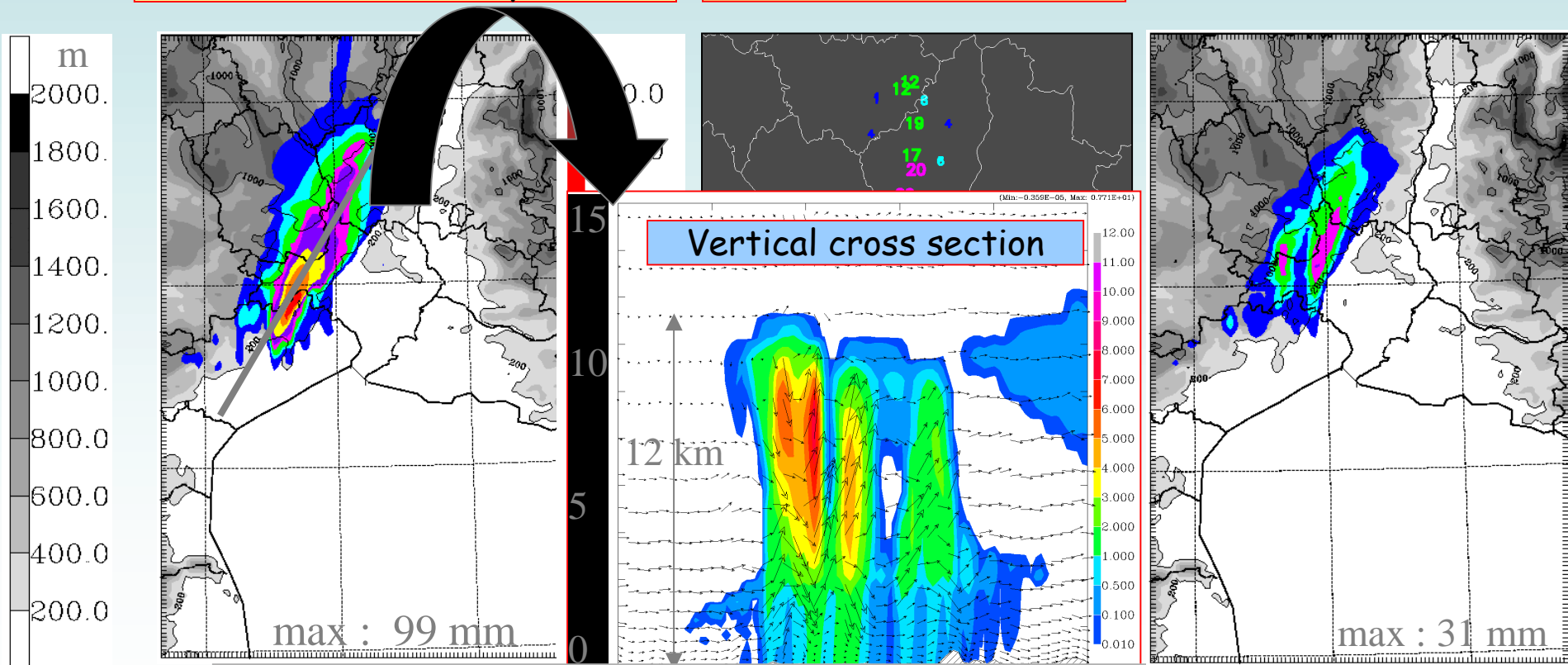
Underestimation of the precipitation  
No deep system

# Initialization with a mesoscale analysis (Ducroq et al., 2000)

Mesoscale analysis

Observations

Large scale analysis



Deep convective system, increase of the precipitation

The use of non-hydrostatic high-resolution models will improve the precipitation forecast but only to some extent.

Further improvement is tied to the improvement of the model initial state

High need to develop **mesoscale** data assimilation systems as adding mesoscale data in a global assimilation system is insufficient