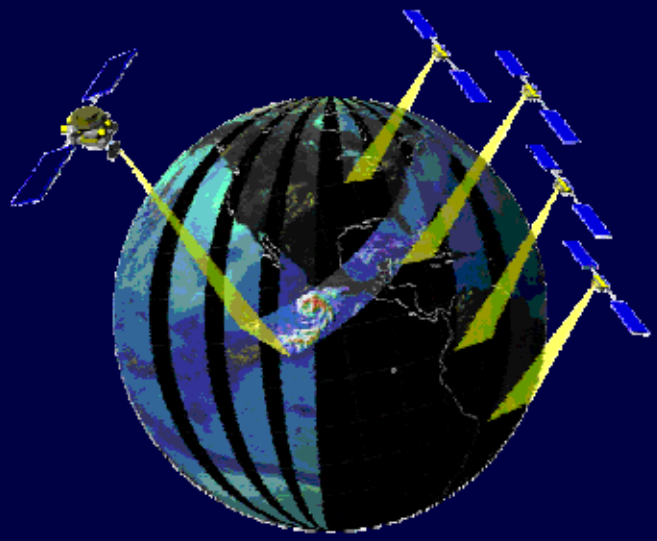
What about a Validation Super Site in West Mediterranean?

What about Catalunya?

Global
Precipitation
Measurement
Mission

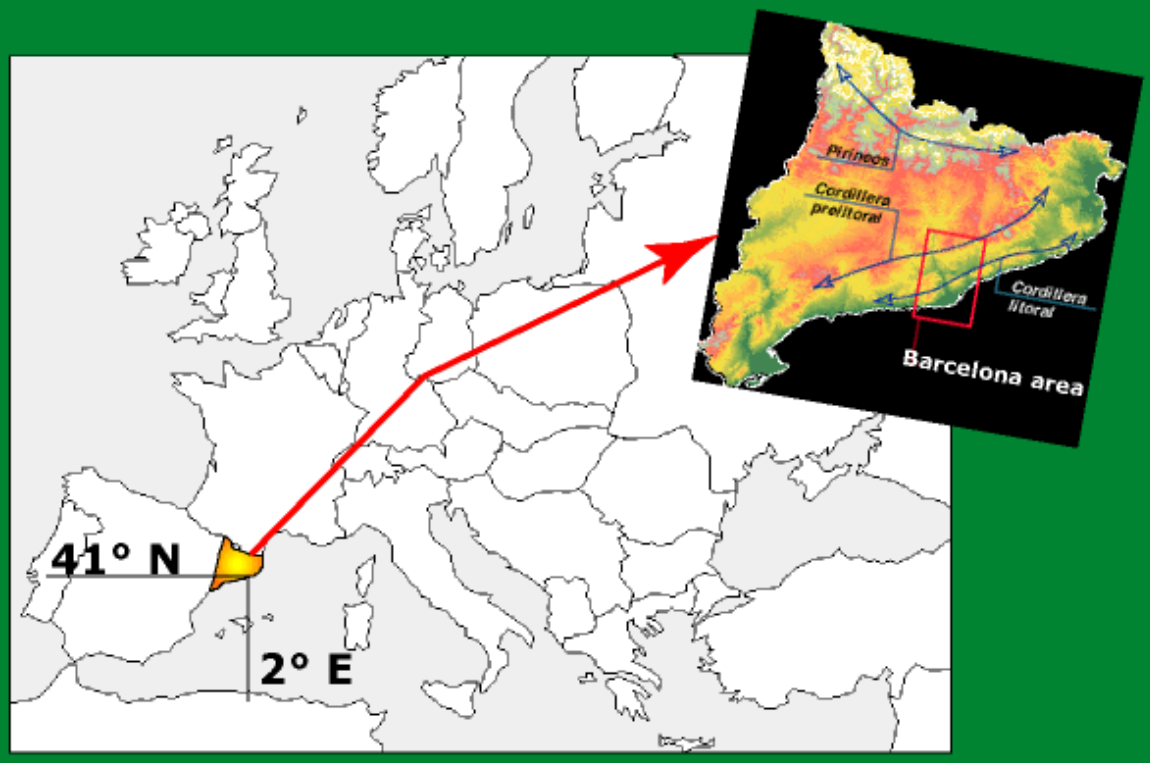


Daniel SEMPERE TORRES
UPC
M. Carmen LLASAT
UB

Mediterranean Region

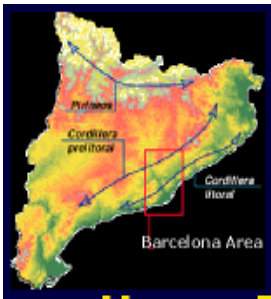
- **Very frequent high rain intensity events**
- **High spatial and temporal variability**
- **High impact of floods on populated areas**

Why Catalunya?



Why Catalunya?

1) High probability to get very interesting events to validate GPM measurements.
2) Good network of grownd based measurements
3) Area of stragegic interest
4) Existence of a supporting consortium
5) Innovative ideas for GPM validation
6) 'Other' excellent reasons (have you ever been there?)



Some Figures

Surface 32,000 Km^2
Mean annual rainfall 600 mm

Heavy Rain's frequency:

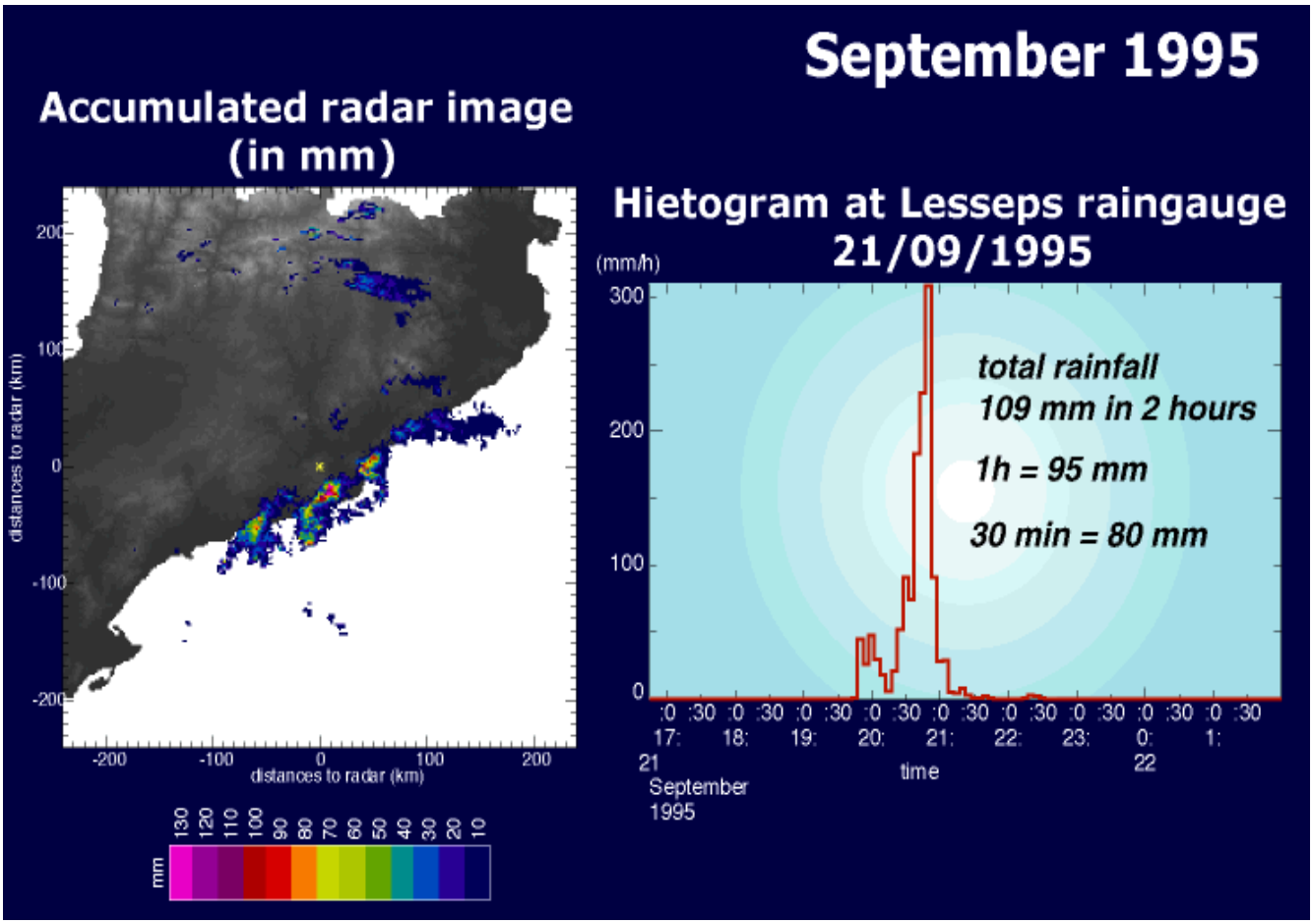
Events over 100 mm/day => twice per year
Event over 200 mm/day => 2 years return period

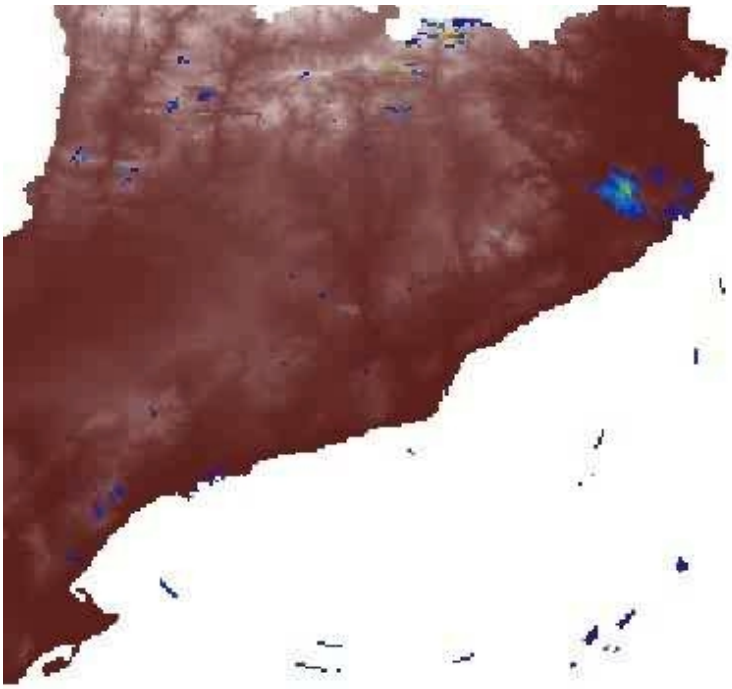
Last flood events:

10 JUNE 2000: Over 250 mm in 6h
(A bridge on the Madrid-Barcelona highway collapsed => 4 deaths)
22 OCTOBER 2000: Over 200 mm in 4 h
24 OCTOBER 2000: Over 450 mm in 48 h
(8 deaths, 5 in Catalunya)

Floods => The most important Natural Hazard in Spain
Average dammages of 350 million €/ year

High probability to get interesting validation events





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UNIVERSITAT POLITÈCNICA DE CATALUNYA

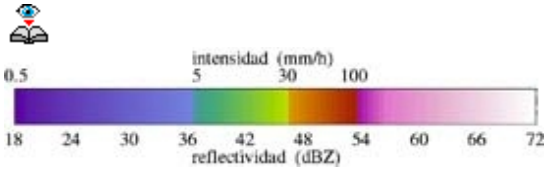
Imágenes brutas de Cataluña

FECHA Y HORA

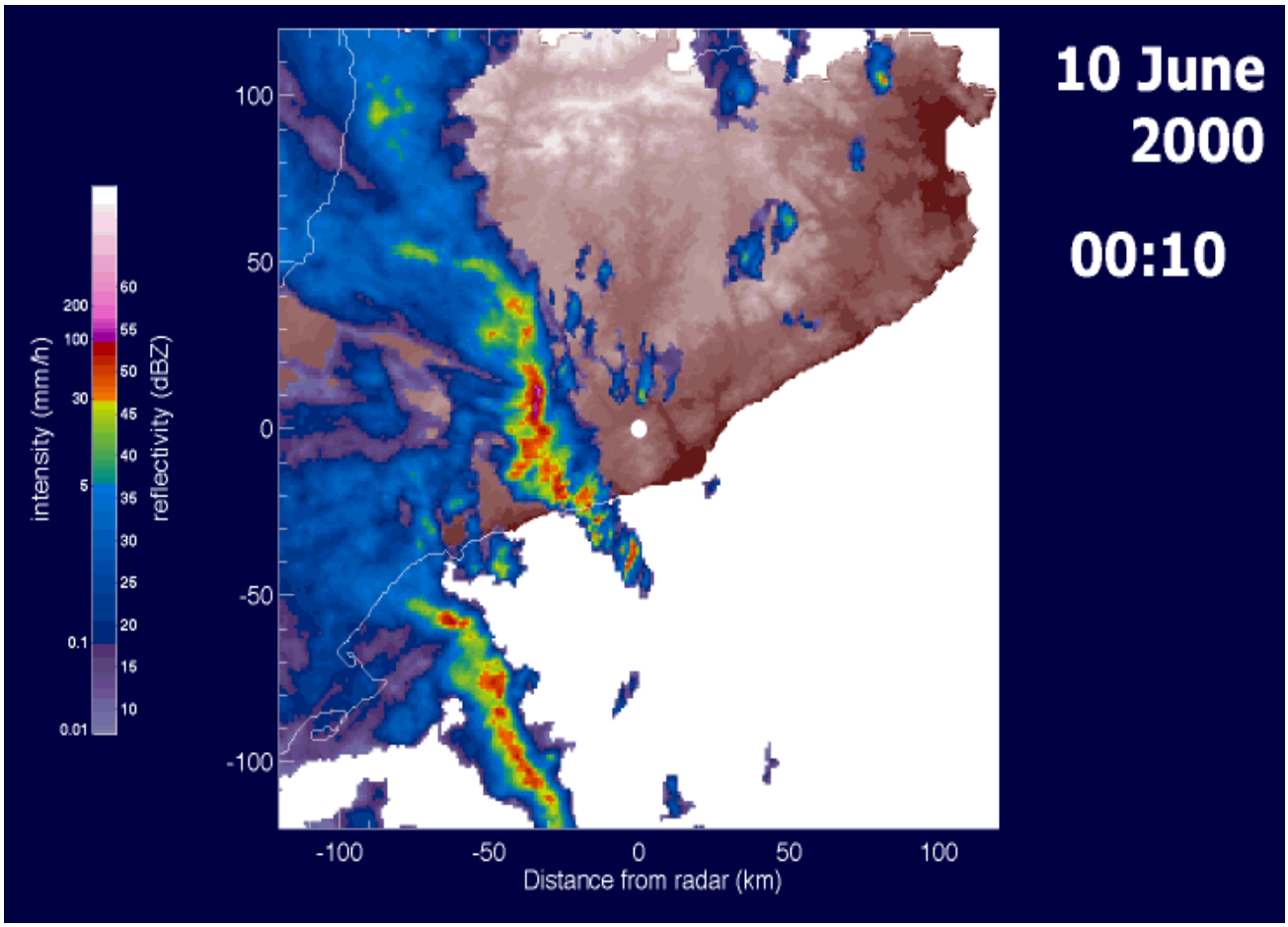
21/09/1995 - 13:07

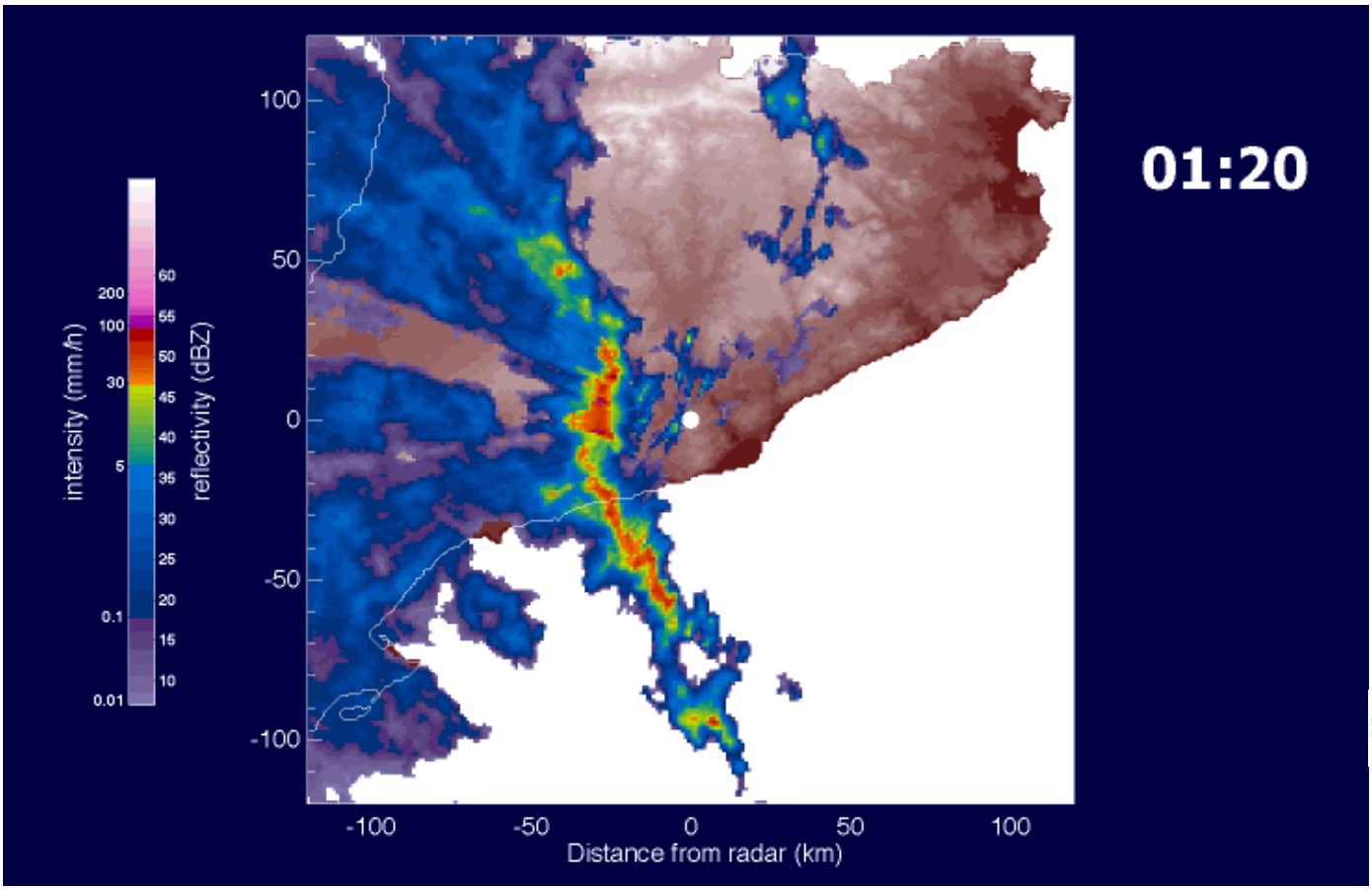
PANEL DE CONTROL

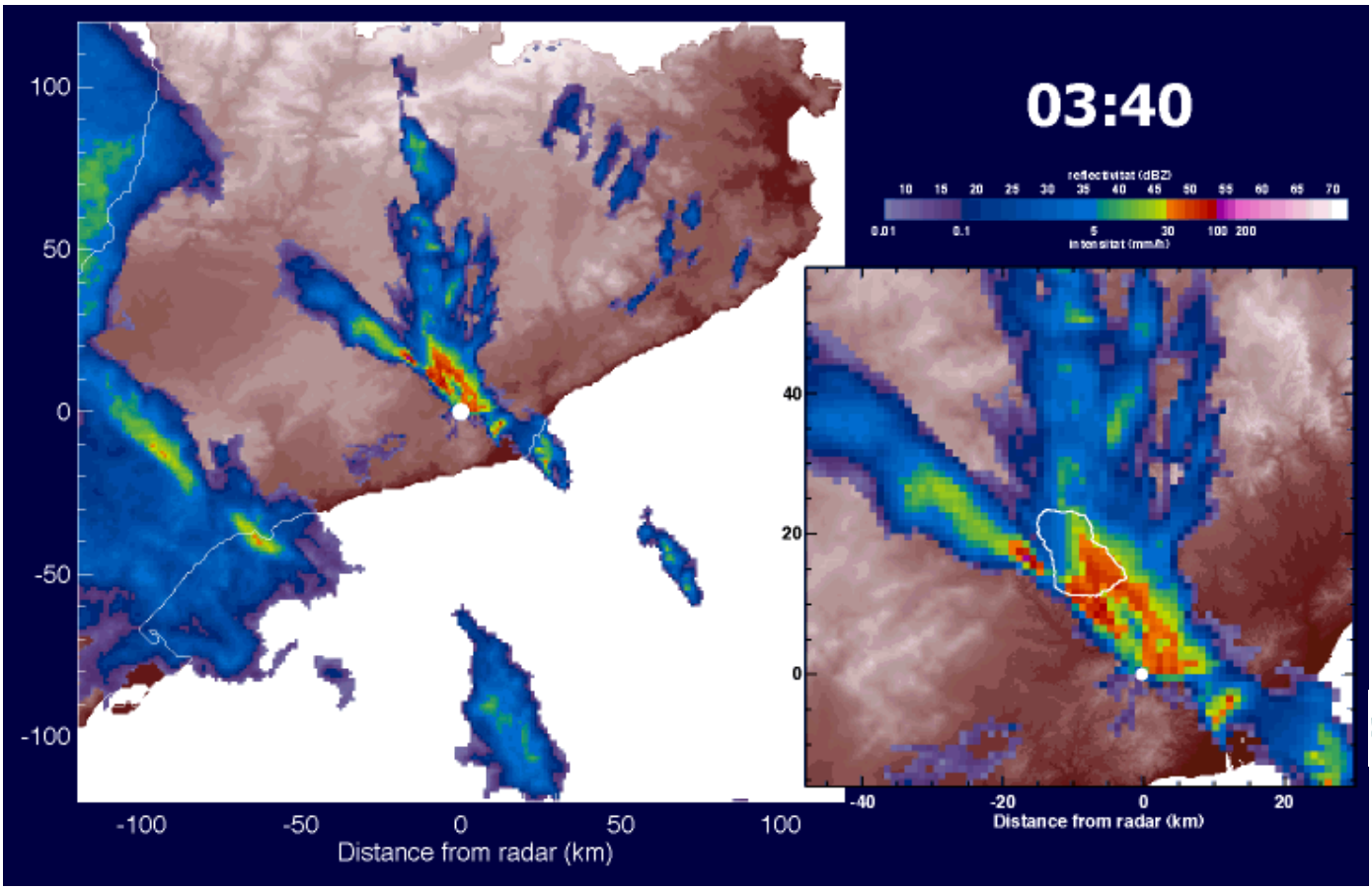
Animar | Parar | Lento | Rápido | > | <



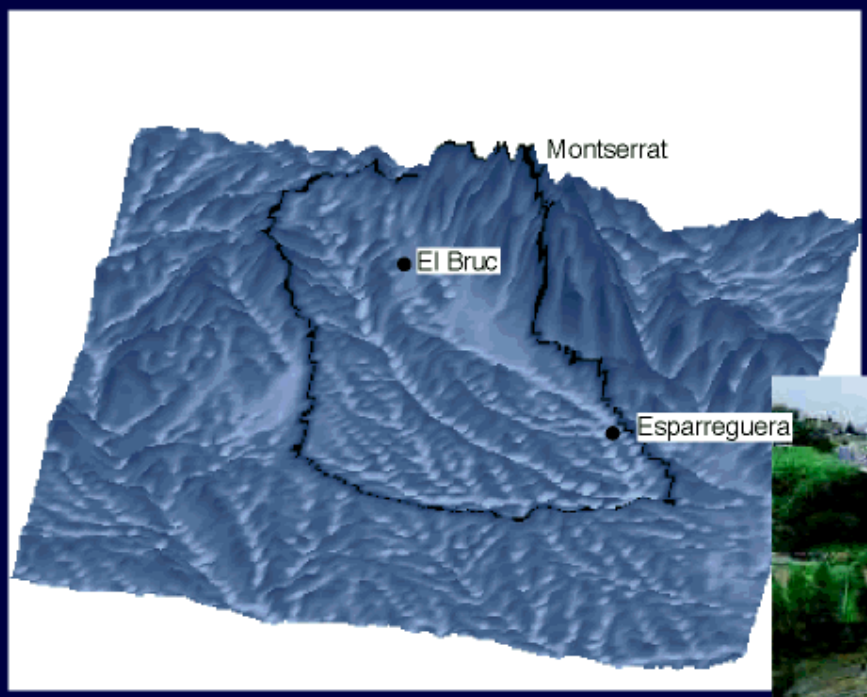
High probability to get interesting validation events

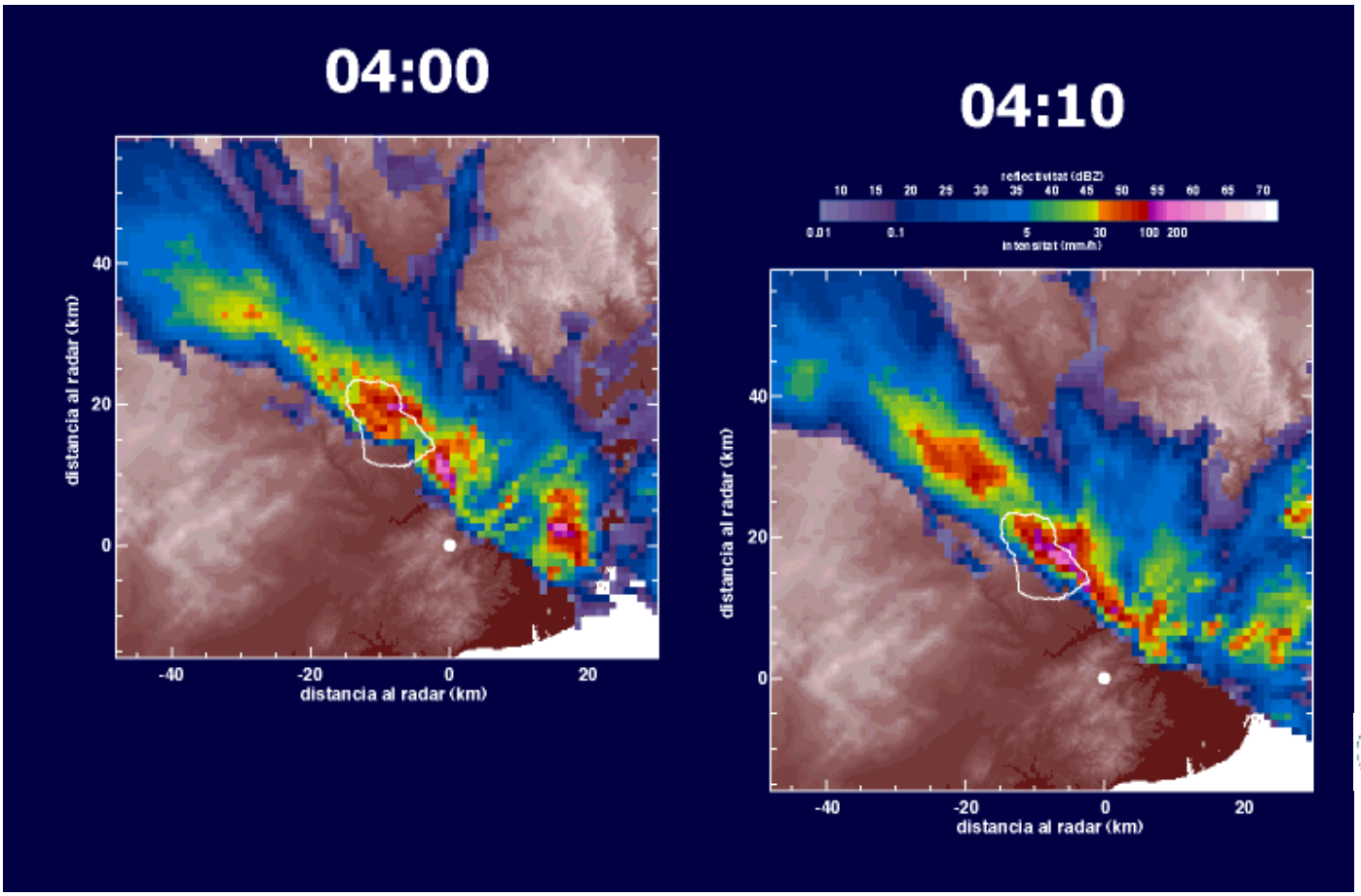


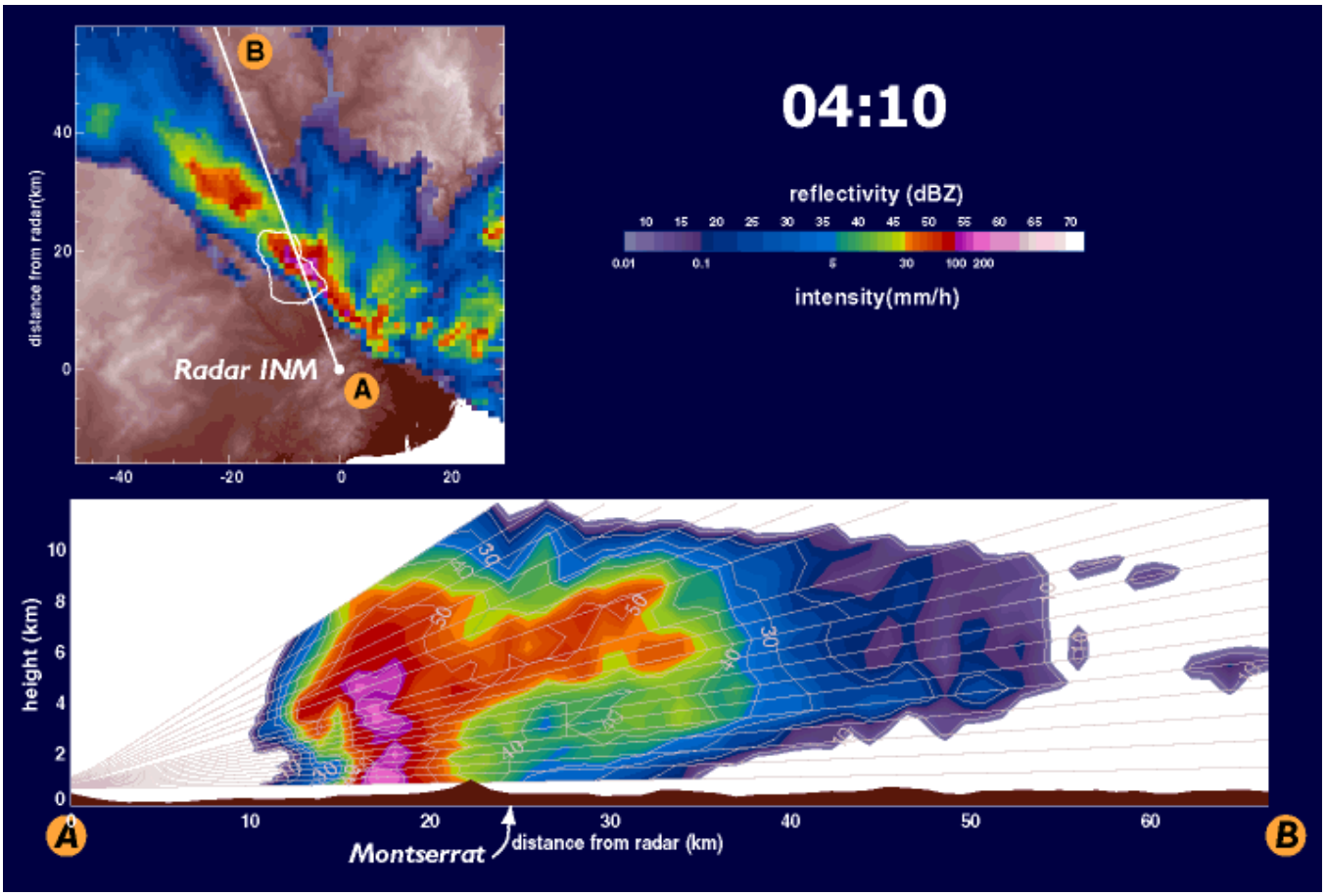

01:20
intensity (mm/h)
200
100
30
5
0.1
0.01
reflectivity (dBZ)
60
55
50
45
40
35
30
25
20
15
10
100
50
0
-50
-100
-100
-50
0
50
100
Distance from radar (km)

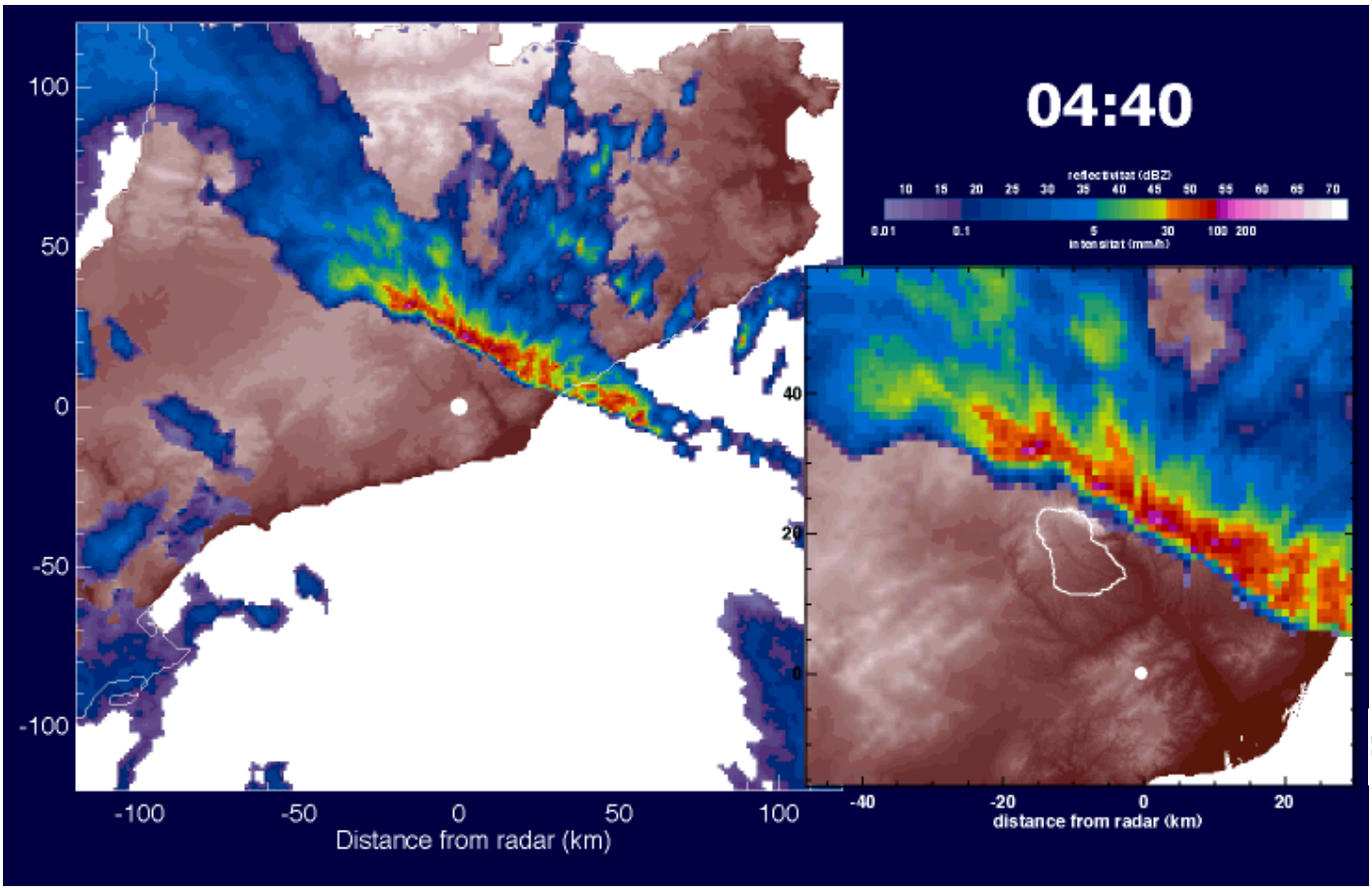

03:40
reflectivitat (dBZ)
10 15 20 25 30 35 40 45 50 55 60 65 70
0.01 0.1 5 30 100 200
intensitat (mm/h)
100
50
0
-50
-100
-100 -50 0 50 100
Distance from radar (km)
40
20
0
-40 -20 0 20
Distance from radar (km)

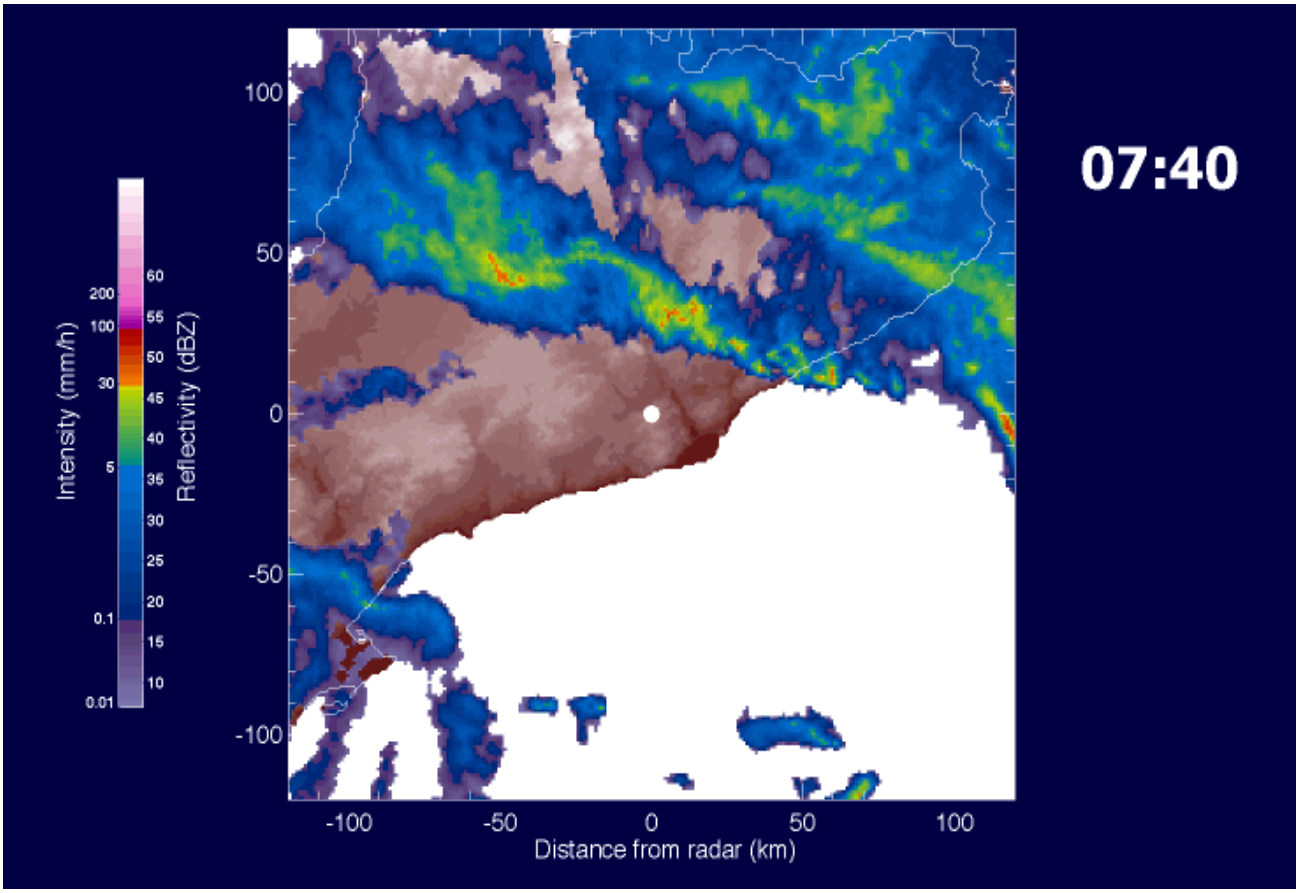
La Riera de Magarola

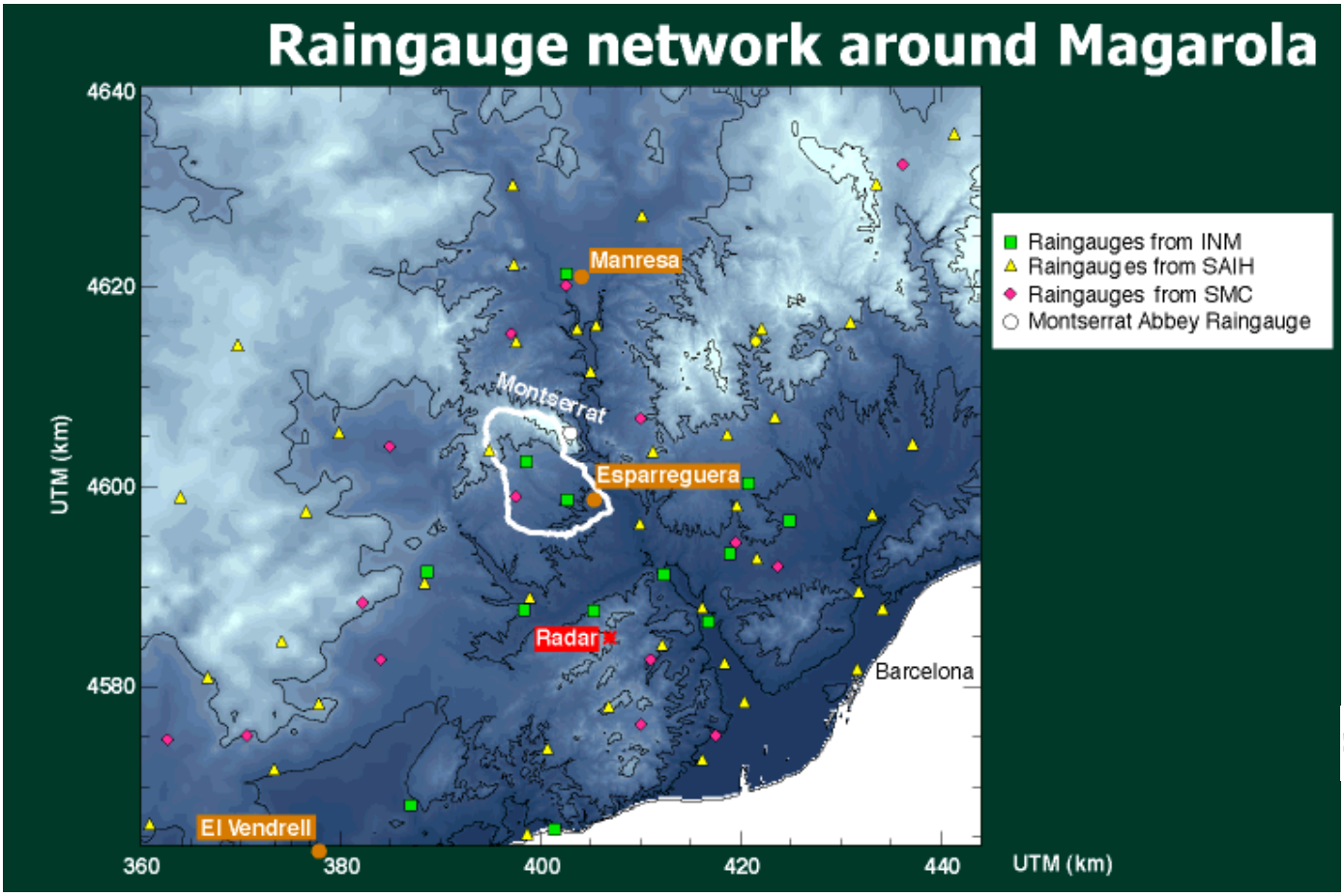


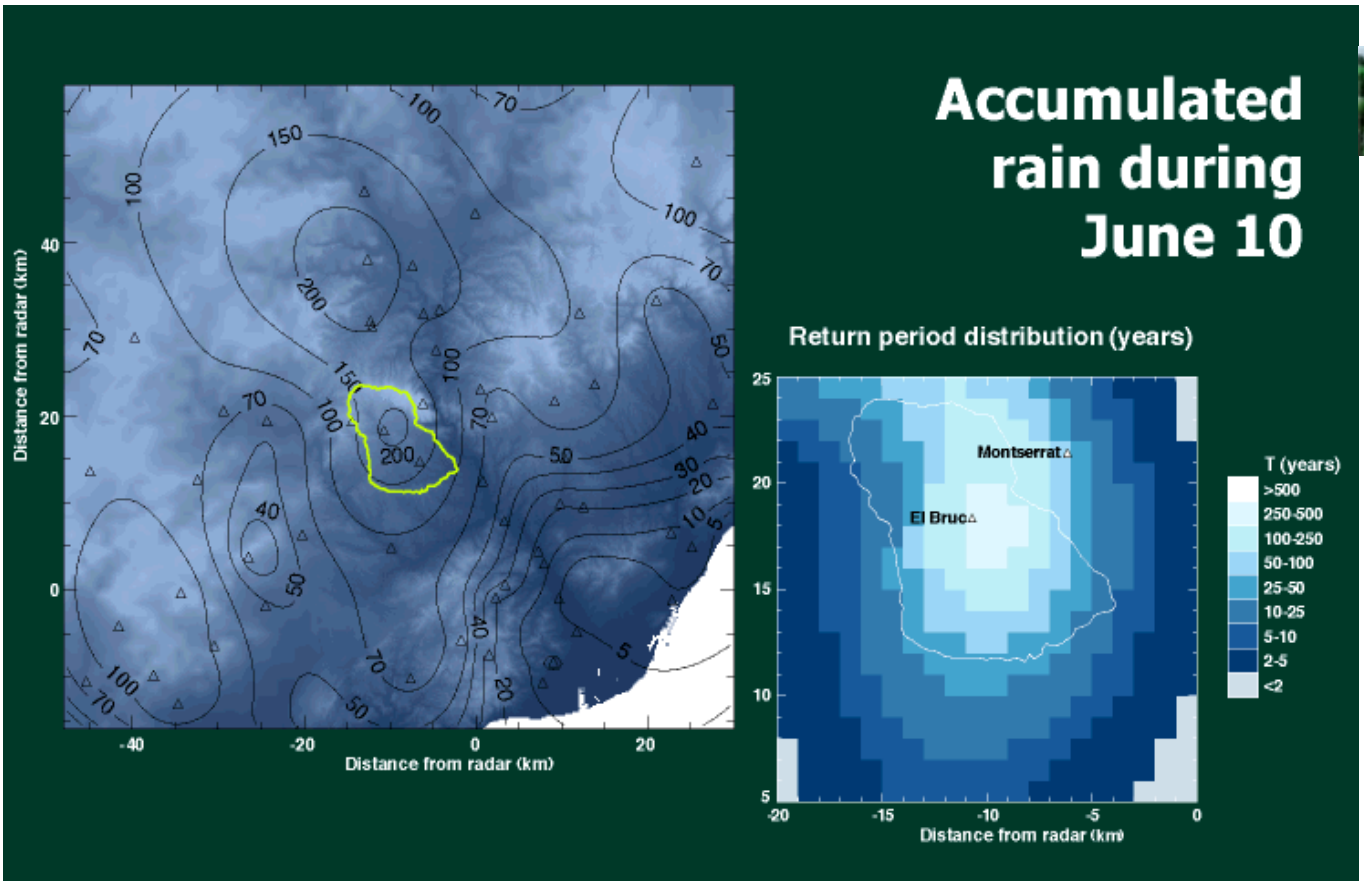

04:00
04:10
reflectivitat (dBZ)
10 15 20 25 30 35 40 45 50 55 60 65 70
0.01 0.1 5 30 100 200
intensitat (mm/h)
distancia al radar (km)
distancia al radar (km)
-40 -20 0 20
40 20 0

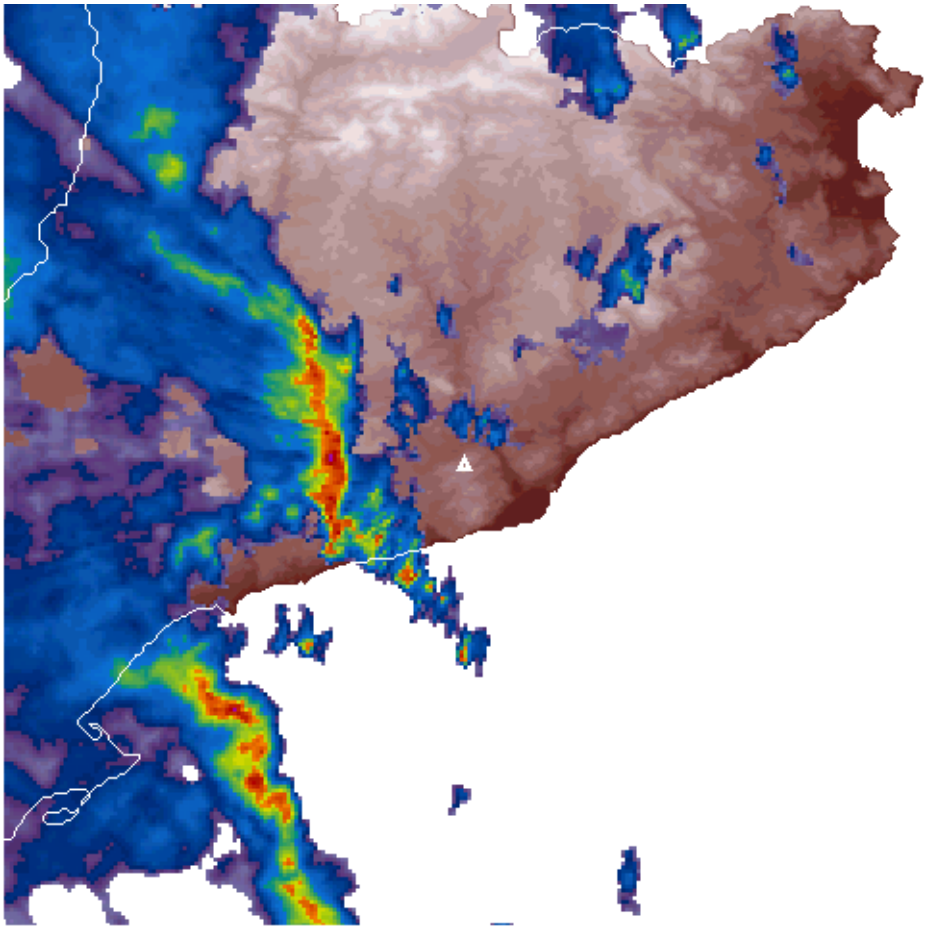

04:10
reflectivity (dBZ)
10 15 20 25 30 35 40 45 50 55 60 65 70
0.01 0.1 5 30 100 200
intensity(mm/h)
Radar INM
A
B
distance from radar(km)
height (km)
Montserrat
distance from radar (km)


04:40
reflectivitat (dBZ)
10 15 20 25 30 35 40 45 50 55 60 65 70
0.01 0.1 5 30 100 200
intensitat (mm/h)
100
50
0
-50
-100
-100 -50 0 50 100
Distance from radar (km)
40
20
0
-40 -20 0 20
distance from radar (km)


07:40
Intensity (mm/h)
Reflectivity (dBZ)
200
100
30
5
0.1
0.01
60
55
50
45
40
35
30
25
20
15
10
100
50
0
-50
-100
-100
-50
0
50
100
Distance from radar (km)


Raingauge network around Magarola
Raingauges from INM
Raingauges from SAIH
Raingauges from SMC
Montserrat Abbey Raingauge
Manresa
Montserrat
Esparreguera
Radar
Barcelona
El Vendrell
UTM (km)
4640
4620
4600
4580
360
380
400
420
440
UTM (km)


Accumulated rain during June 10
Distance from radar (km)
Distance from radar (km)
Return period distribution (years)
Montserrat
El Bruc
T (years)
>500
250-500
100-250
50-100
25-50
10-25
5-10
2-5
<2
Distance from radar (km)



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UNIVERSITAT POLITÈCNICA DE CATALUNYA

Imágenes corregidas de Cataluña

FECHA Y HORA

10/06/2000 - 00:00

PANEL DE CONTROL

Animar | Parar | Lento | Rápido
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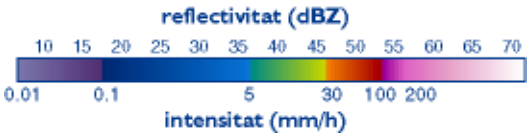


Good network of ground based measurements

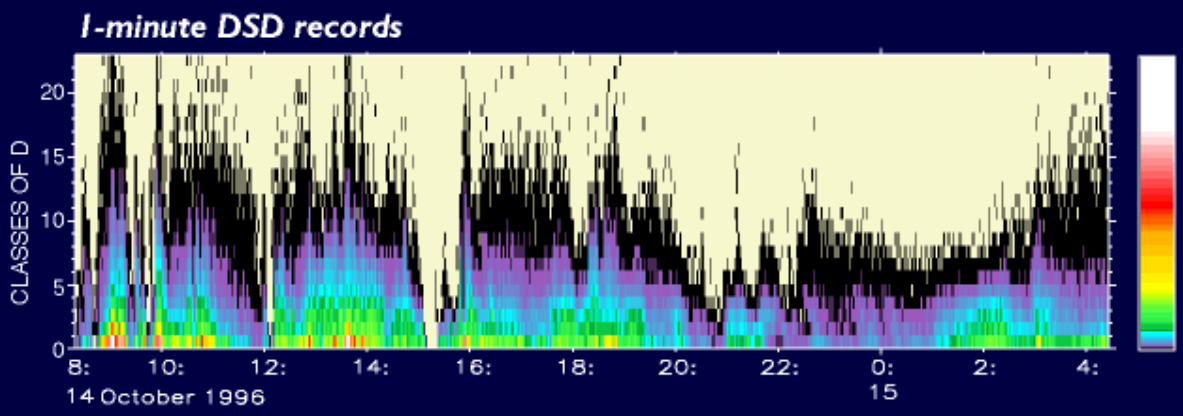
Series of Rain intensities records at Barcelona:

from 1927 (Jardi raingauge at the Fabra Observatory).

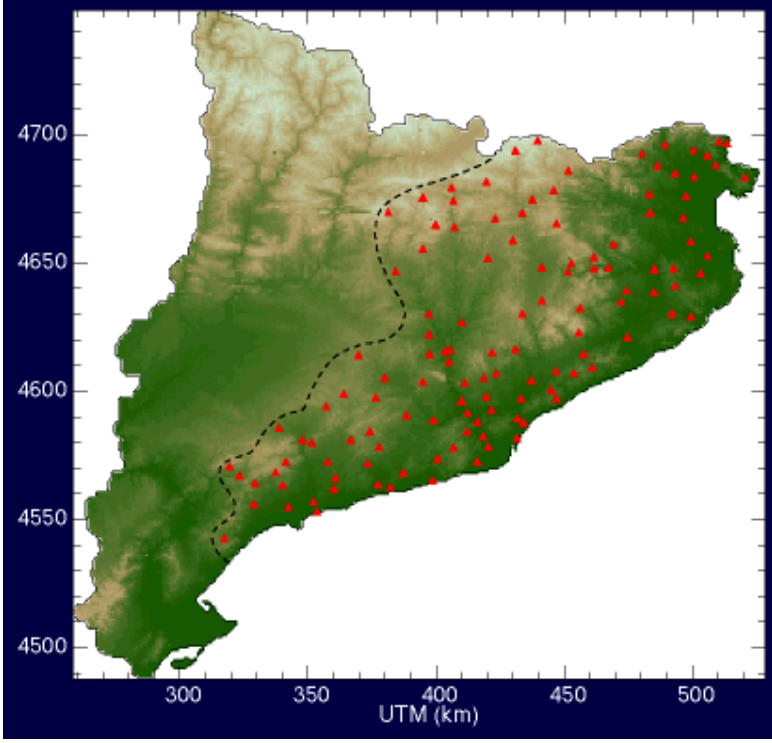
Telemetered operational network of raingauges and other hydrometeorological data.

Several years of DSD data have allowed us to study and analyze DSD dependency on the type of rainfall.

(JAM, 1994, JGR, 1998, JAS, 2001)



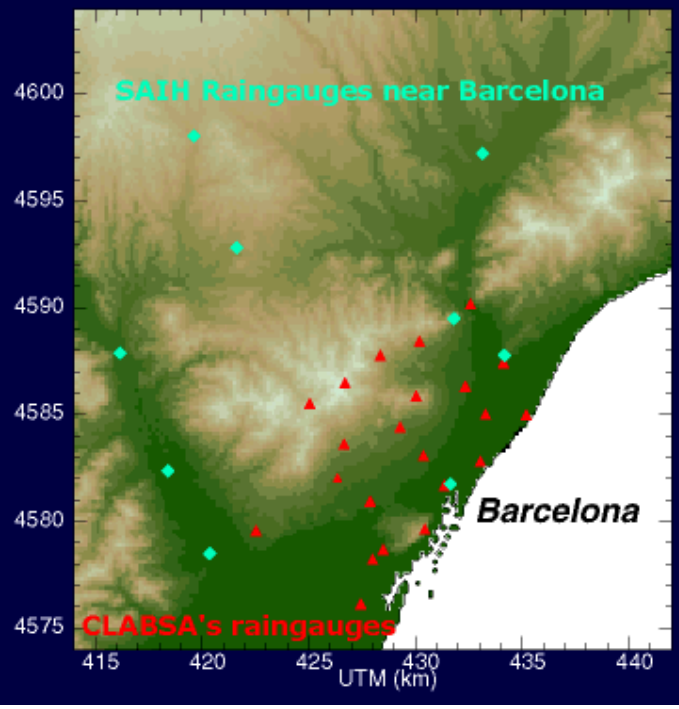
SAIH operational hydrometeorological network (Water Management Authority)



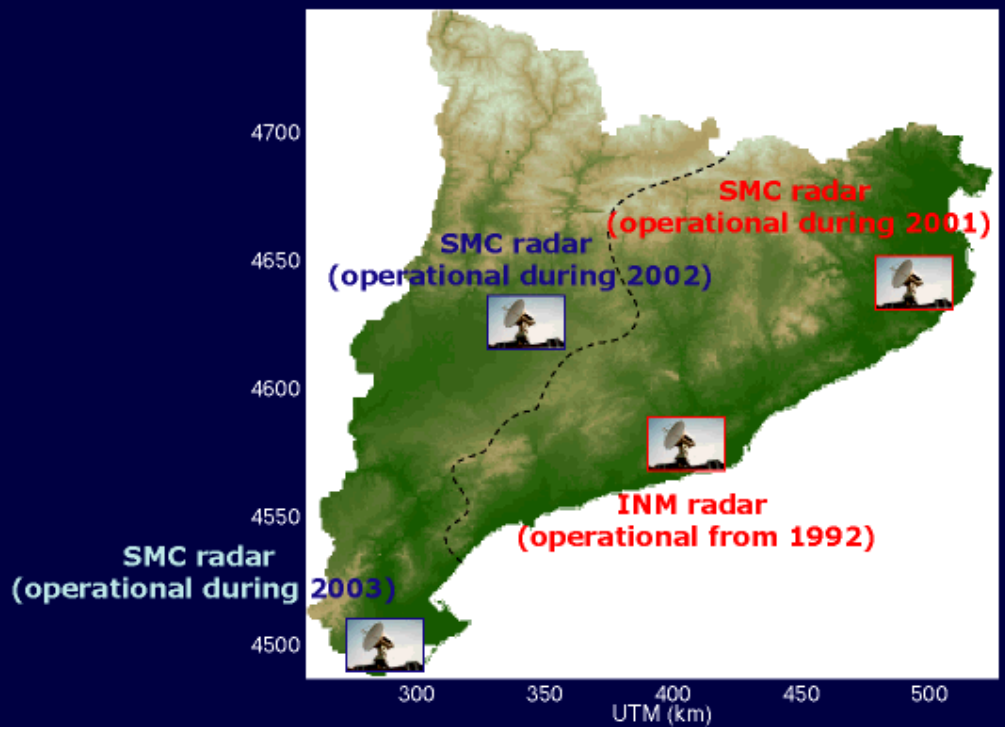
- Density over 1 rain gauge per 200 km^2
- Real time telemetered records.
- Integrated rainfall and runoff measurements.
- Denser network at the Barcelona metropolitan area

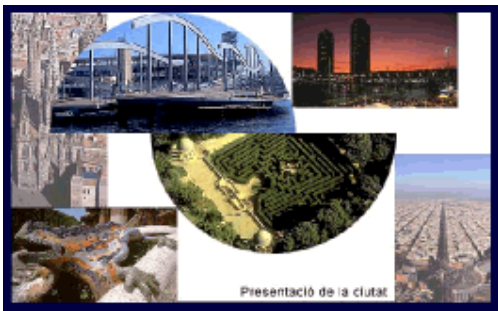
CLABSA's raingauge network at Barcelona

- Density of 1 raingauge per 10 km^2
- Real time telemetered records.
- Runoff at urban basins.
- www.clabsa.es



Operational network of Doppler C-band radars
(Instituto Nacional de Meteorología & Servei de Meteorologia de Catalunya)

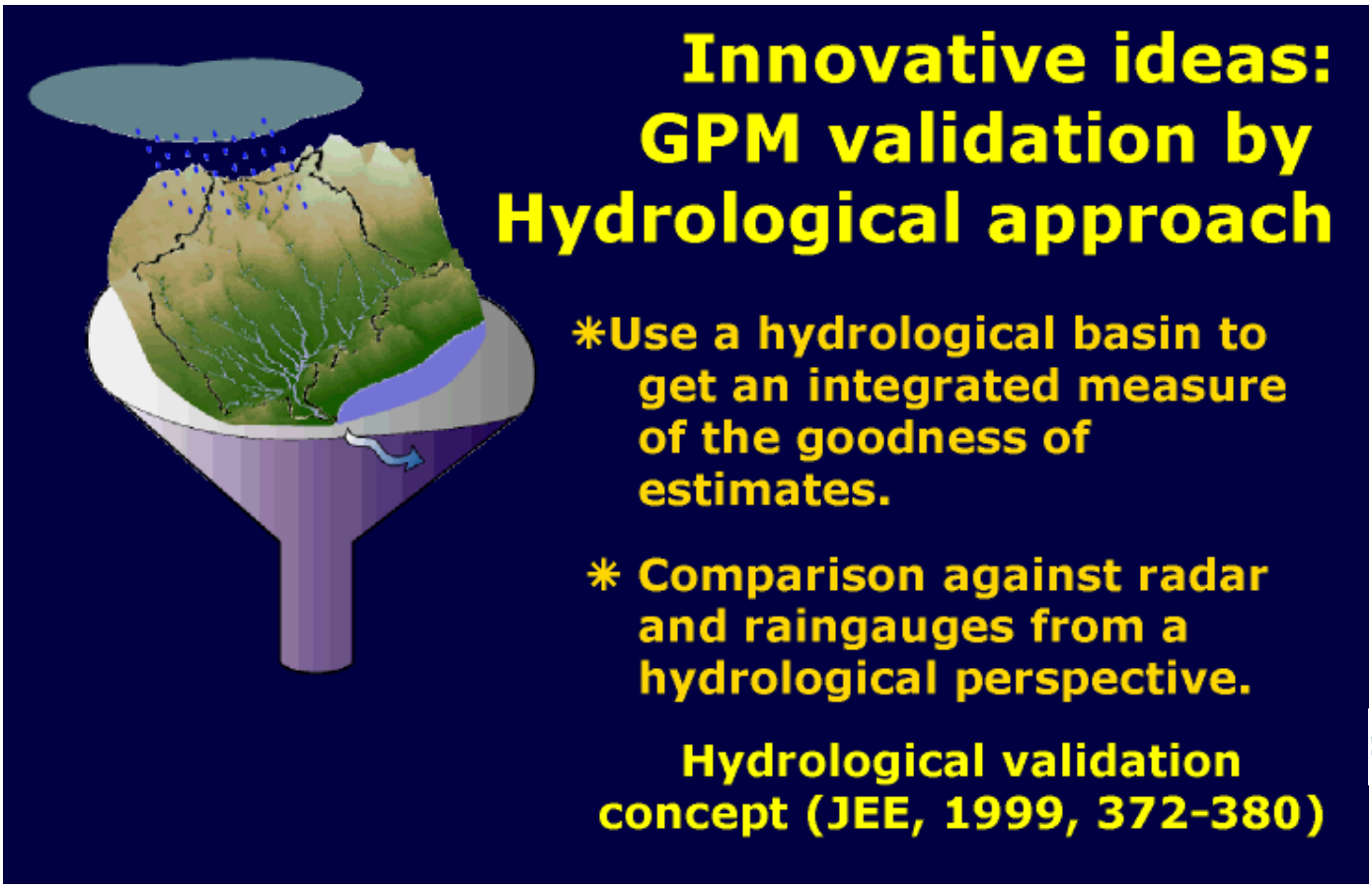




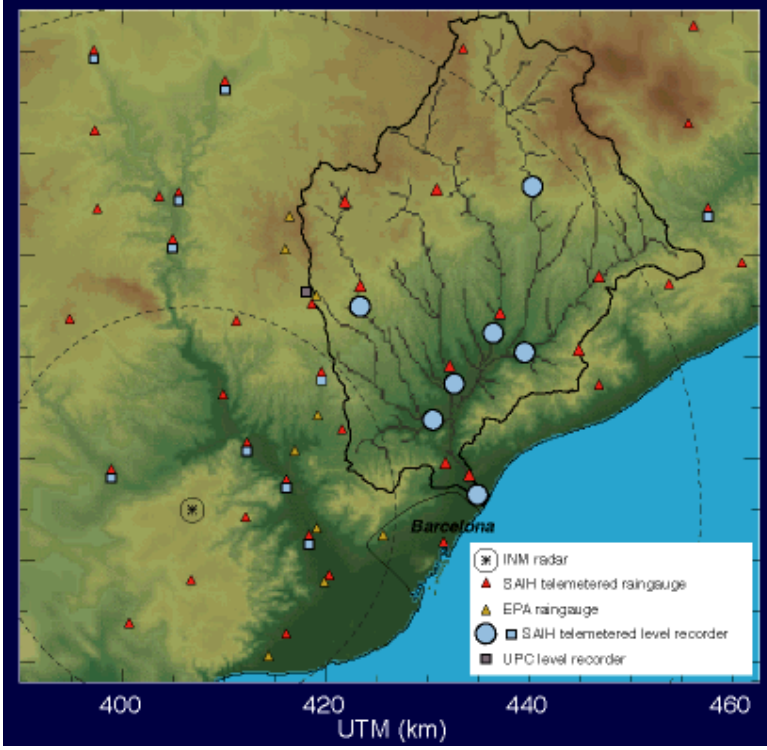
Area of strategic interest

* One of the biggest cities of Mediterranean (over 3 millions inhabitants).
* One of the most touristic areas of the Mediterranean (jointly with Côte d'Azur...)
* High sensitivity to floods.
* Several ongoing programs able to provide excellent basis for ground GPM validation.

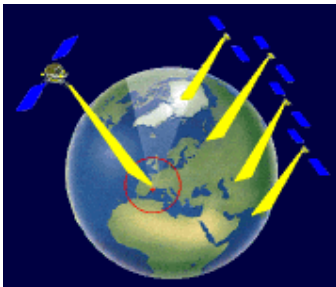
EL PAIS
R+D consortium providing support
* Universitat Politècnica de Catalunya.
* Universitat de Barcelona.
* Institut de Estudis Espacials de Catalunya (IEEC-CSIC).
* Agencia Catalana de l'Aigua.
* Instituto Nacional de Meteorología.
* Servei de Meteorologia de Catalunya.
* Clavegueram de Barcelona S. A.
UPC
UB
CSIC
CLABSA


Innovative ideas:
GPM validation by
Hydrological approach
*Use a hydrological basin to get an integrated measure of the goodness of estimates.
* Comparison against radar and raingauges from a hydrological perspective.
Hydrological validation concept (JEE, 1999, 372-380)

BESOS FLUVIAL PARK



- Operational Flood Warning and Control System.
- 1000 Km^2
- Real time rainfall-runoff forecasting models



CONCLUSIONS

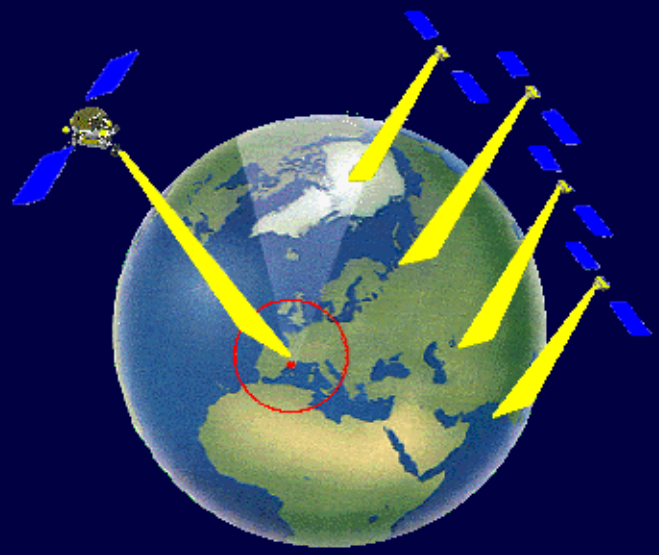
1) Mediterranean region is an excellent location for a GPM validation Supersite.

2) **Catalunya** is specially a good choice

- Climatic reasons
- Interesting hydrometeorological facilities
- Excellent radar coverage
- Feasibility of a hydrological validation
- Existence of a supporting consortium
- Many others you should discover...

What about a Validation Super Site in Catalunya?

Global
Precipitation
Measurement
Mission



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