



*INTERNATIONAL WORKSHOP ON FORECASTING RAINFALL INDUCED HAZARDS
AT EUROPEAN SCALE*

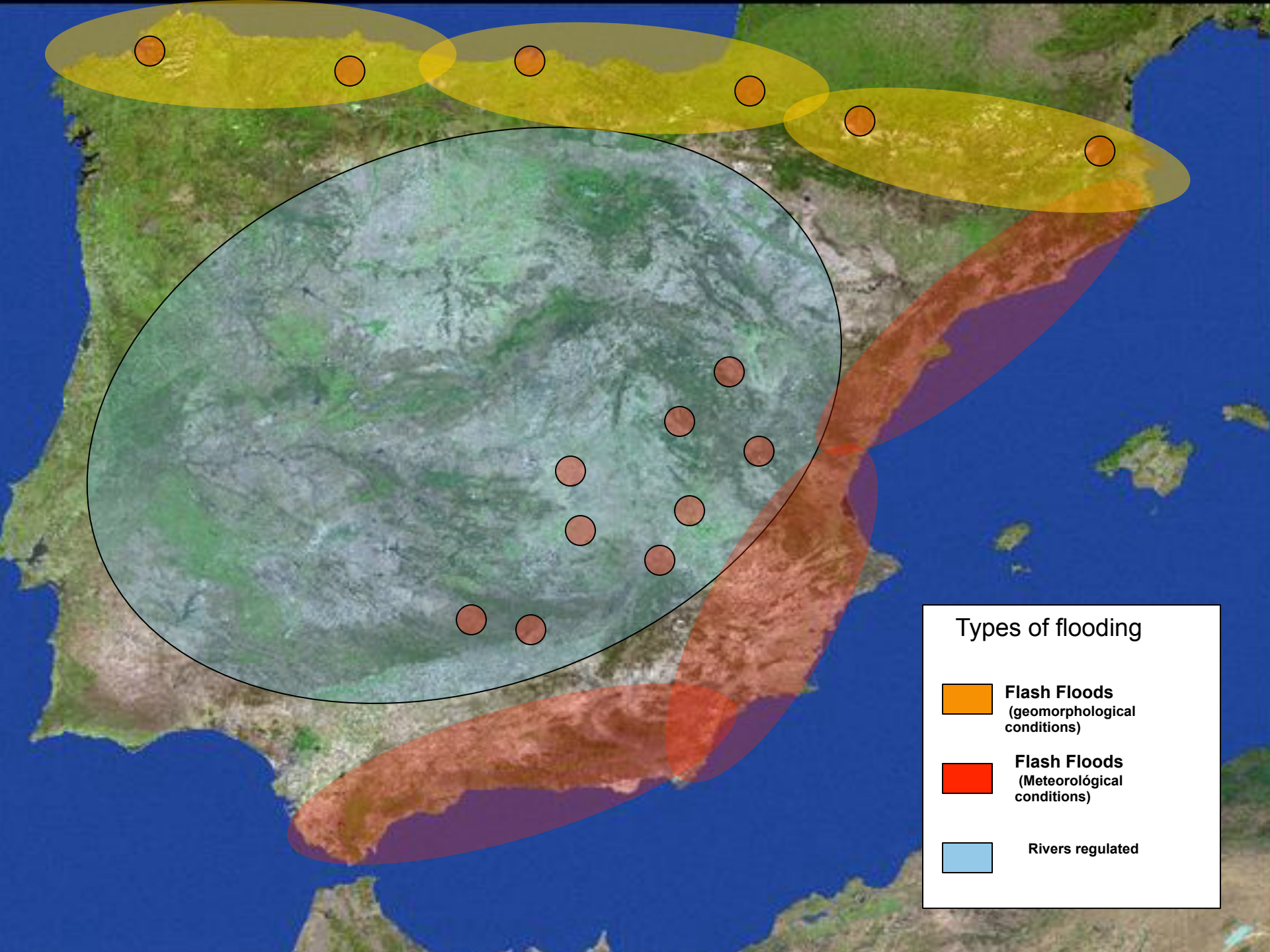
Case Study of the floods of September 2012: Test of the HAREN products by the Spanish Civil Protection



European
Civil Protection

Emergency Response Center
4th June 2013

Ariane Alvarez Seco
General Directorate of Civil Protection
aalvarez@procivil.mir.es



Types of flooding



Flash Floods
(geomorphological conditions)



Flash Floods
(Meteorological conditions)



Rivers regulated

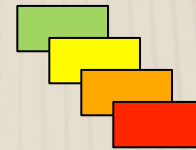


Año	Localización	Daños
1963	Murcia-Almería	Big Damages . 300 Casualties
1971	Cataluña	26 Casualties.
1973	Sureste	Big Damages. 300 Casualties.
1982	Levante	2000 mill € losses. 38 Casualties.
1983	País Vasco	1000 mill € losses. 40 Casualties.
1989	Málaga	1300 mill € losses. 2 Casualties.
1996	Biescas (Huesca)	87 Casualties
1997	Badajoz	22 Casualties
2000	Cataluña, Murcia, Valencia, Aragón	13 Casualties
2012	Almería/Murcia	14 Casualties

The total of casualties for the period 2000-2012: 131

The majority due to carelessness: crossing watercourse and being dragged.

METEOALARM



SEVERE
WEATHER
WARNINGS FOR
EUROPE



METEOALERTA (Spain)

2006



Meteorological Warnings



- Define with accuracy of the thresholds
- Delimit the territory merging counties with climatic conditions and using the experience of past events
- Shorten the gap between the meteorological warning issue and the Civil Protection making decisions.

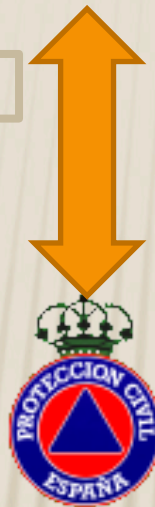
The National Civil Protection Flood Plan

PROCEDURES

METEOROLOGICAL ALERT



HIDROLOGICAL ALERT



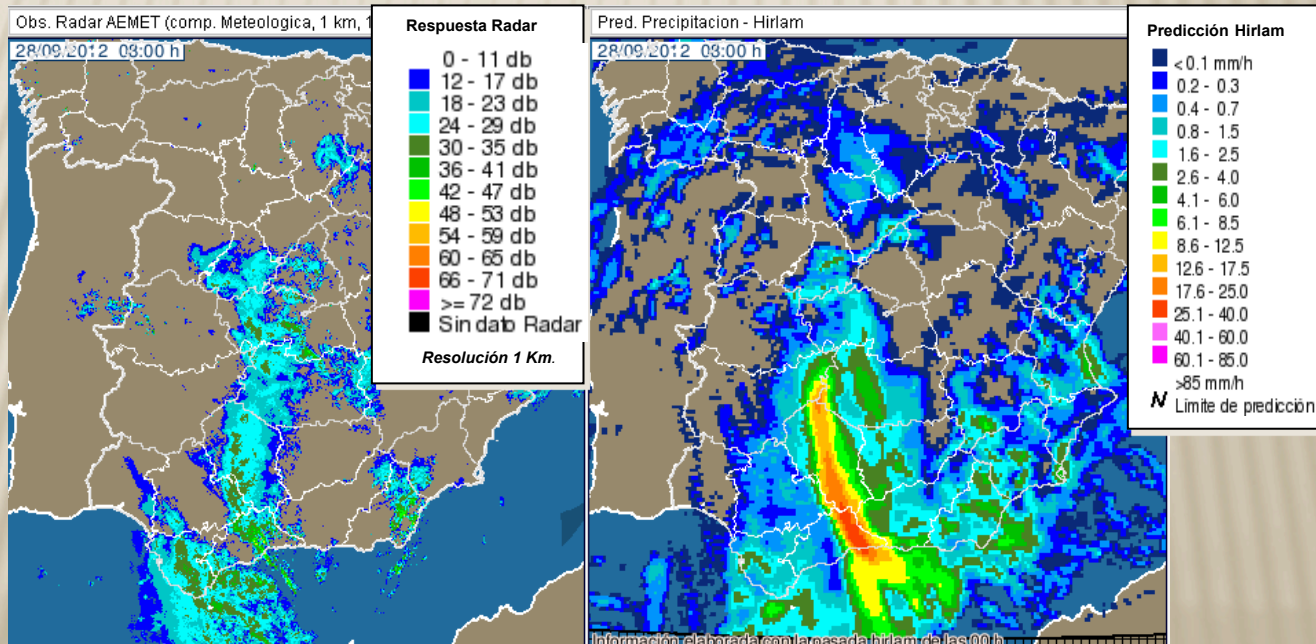
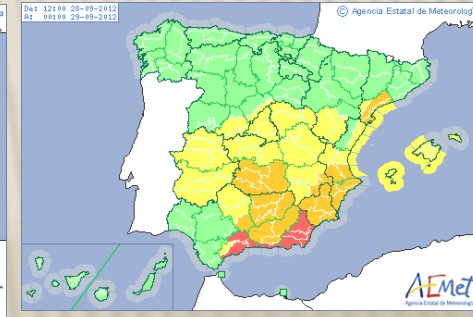
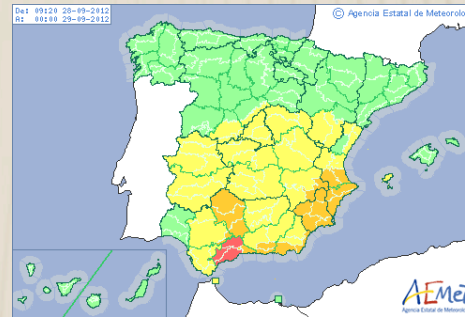
PROCEDURE defining forecast (accuracy) through threshold of risk, the uncertainties, the communication...

A special monitoring of the phenomena that can evolve to heavy or very strong thunderstorms have to be done in order to define a quick response in the Civil Protection Authorities.

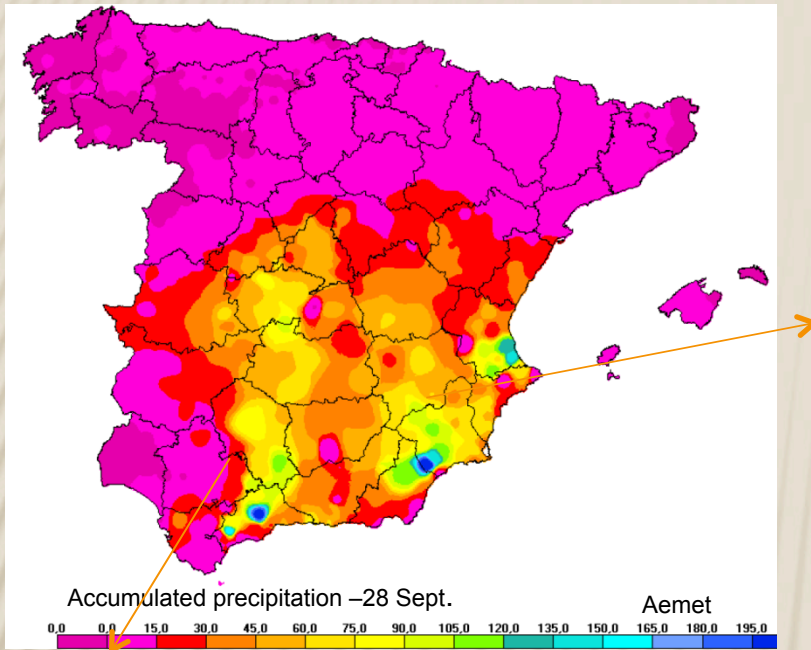
Case Study of the floods of September 2012

WARNINGS

27 September 2012: 7:00	
27 September 2012 12:00 SPECIAL FORECAST	
28 September 2012 9:00	
28 September 2012 12:00	
28 September 2012 12:00 SPECIAL FORECAST	
28 September 2012 14:30	
28 September 2012 22:30	



Case Study of the floods of September 2012



Almería – Murcia 12:00 – 18:00 (28/09/2012)
Puerto Lumbreras :220 mm accumulated in 12 h and 120 mm in 1h.
Lorca : 150 mm accumulated in 12 h and 68 mm in 1 h.

Málaga – 7:30 – 9:30 (28/09/2012)
Alora: 210,6 mm accumulated in 12h and 85,4 mm in 1h.

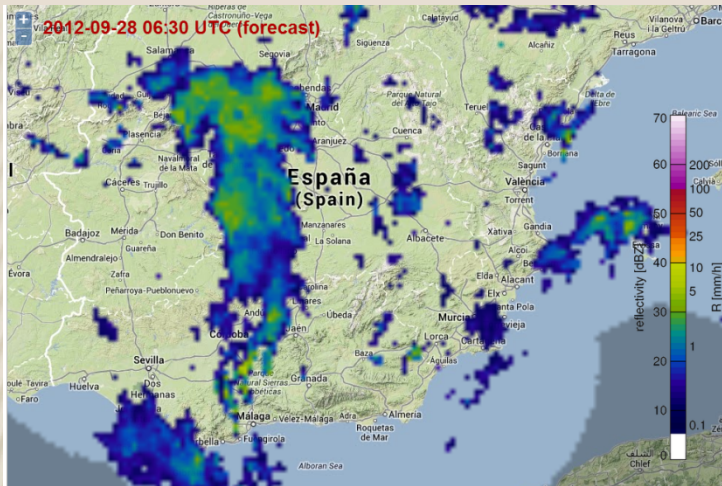
Consequences



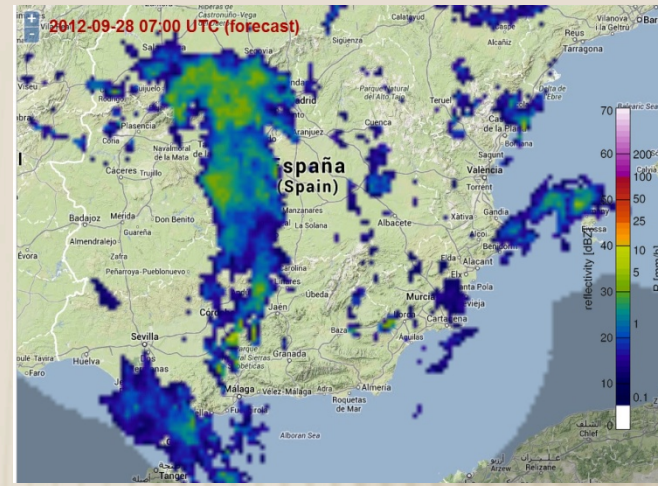
- 13 casualties
- Evacuation of thousands of people
- Overflowing of rivers and watercourses
- Damages in cars, houses, bridges, roads
- casualties in livestock



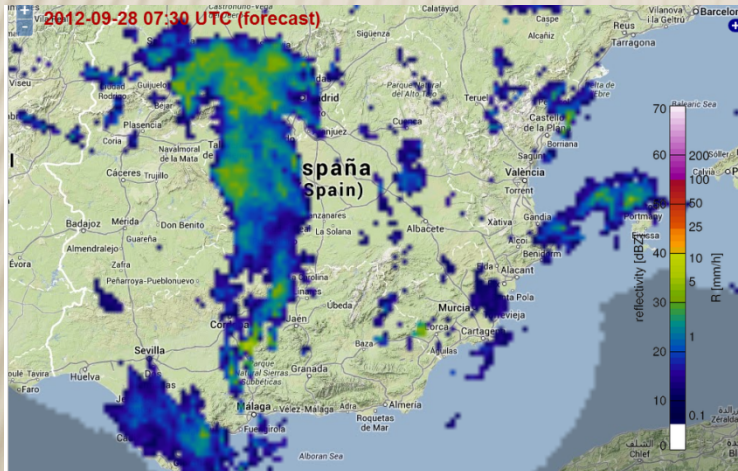
Flash flood in a river gauging station in the Segura basin



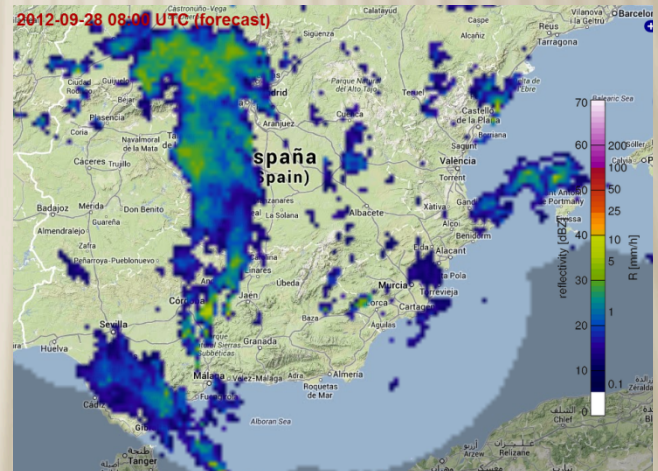
Forecast 6:30 UTC/7:30 local time



Forecast 7:00 UTC/8:00 local time



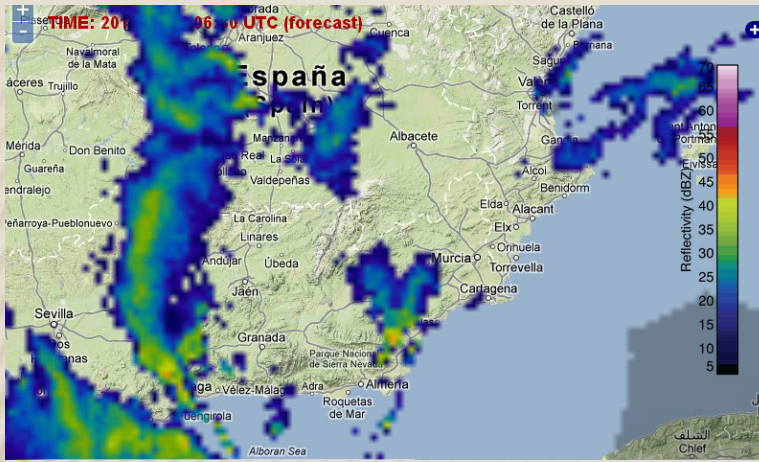
Forecast 7:30 UTC/8:30 local time



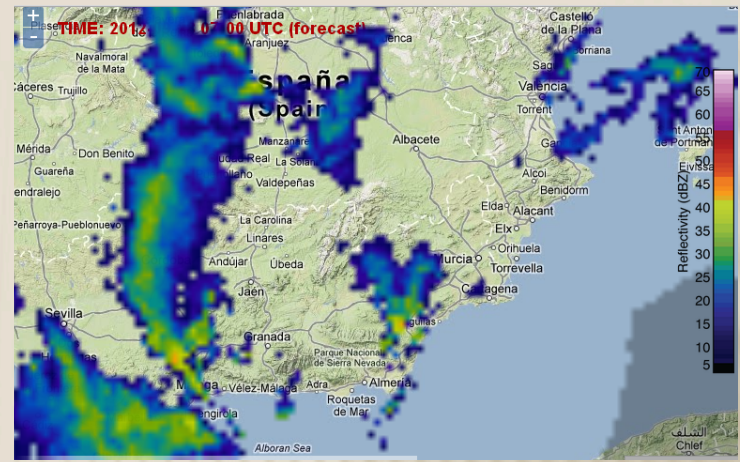
Forecast 8:00 UTC/9:00 local time

Forecast from 4:00

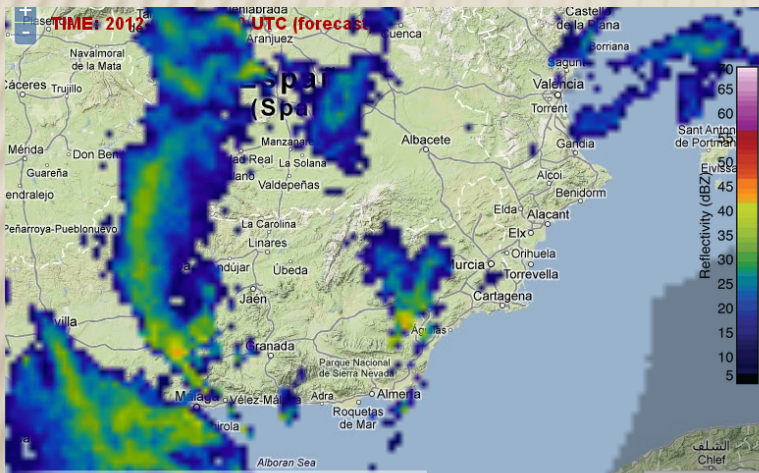
Monitoring with HAREN for Málaga -



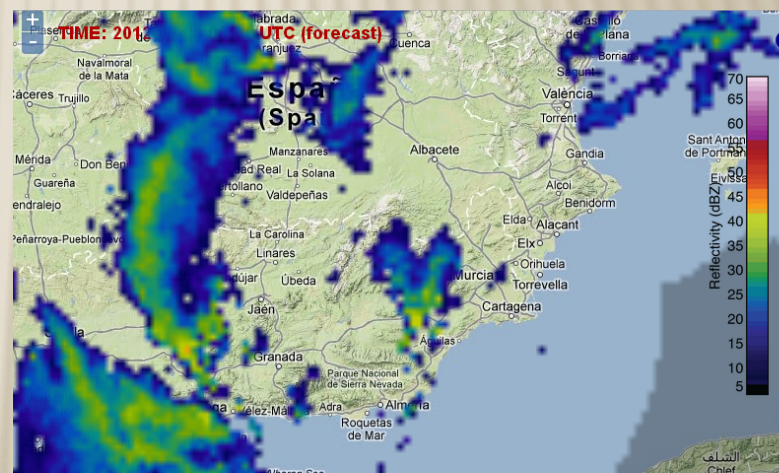
Forecast 6:30 UTC/7:30 local time



Forecast 7:00 UTC/8:00 local time



Forecast 7:30 UTC/8:30 local time



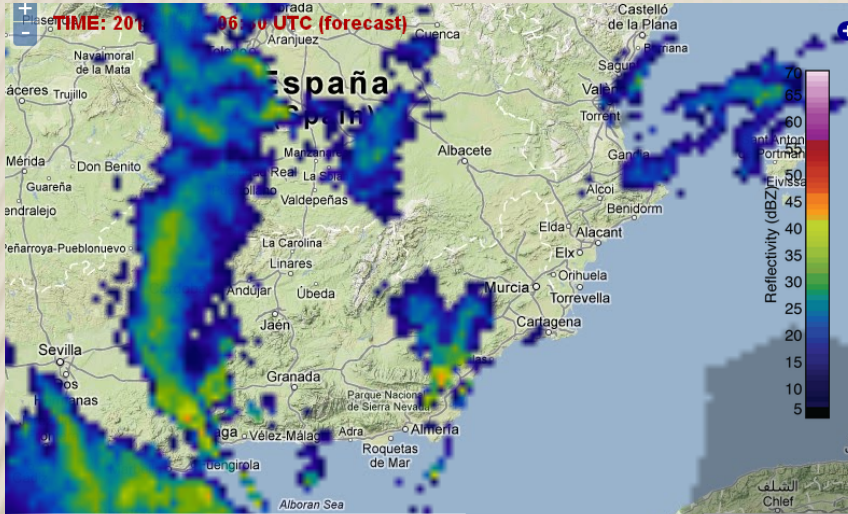
Forecast 8:00 UTC/9:00 local time

Forecast from 5:00

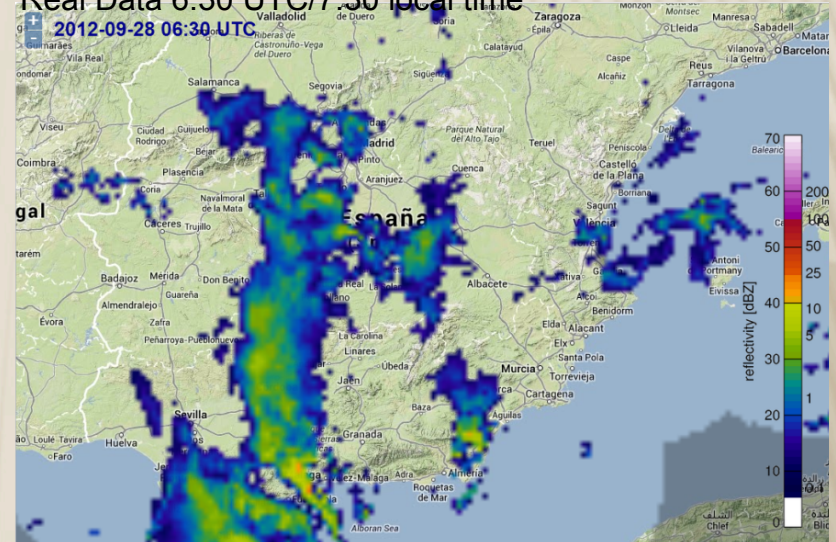
Monitoring with HAREN for Málaga -

Comparing forecast – real data

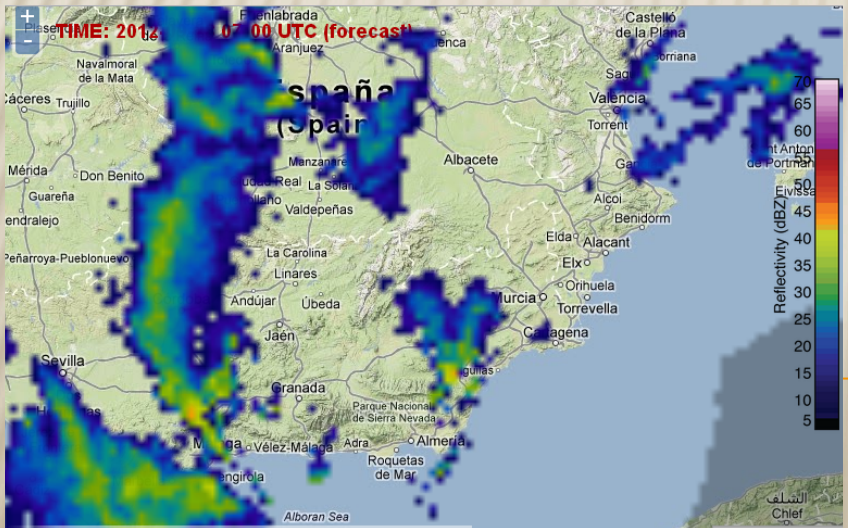
Forecast 6:30 UTC/7:30 local time



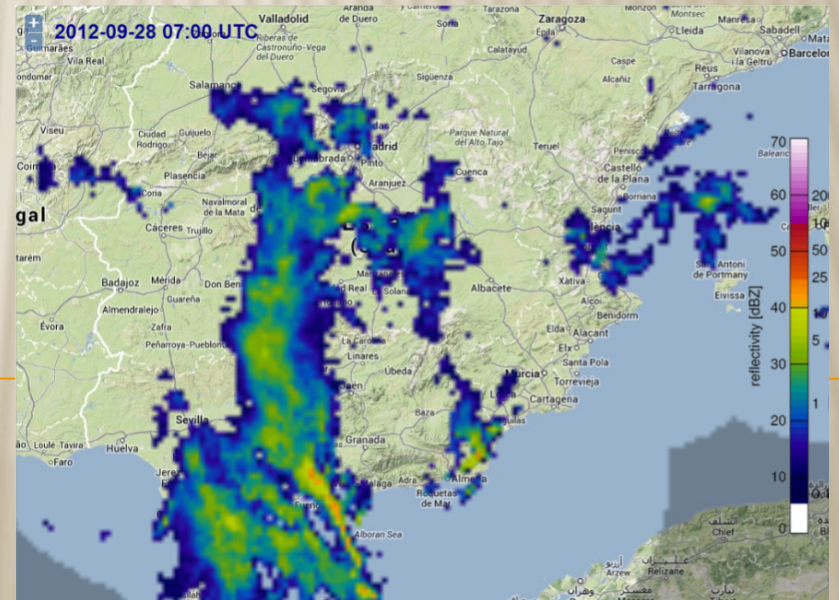
Real Data 6:30 UTC/7:30 local time



Forecast 7:00 UTC/8:00 local time

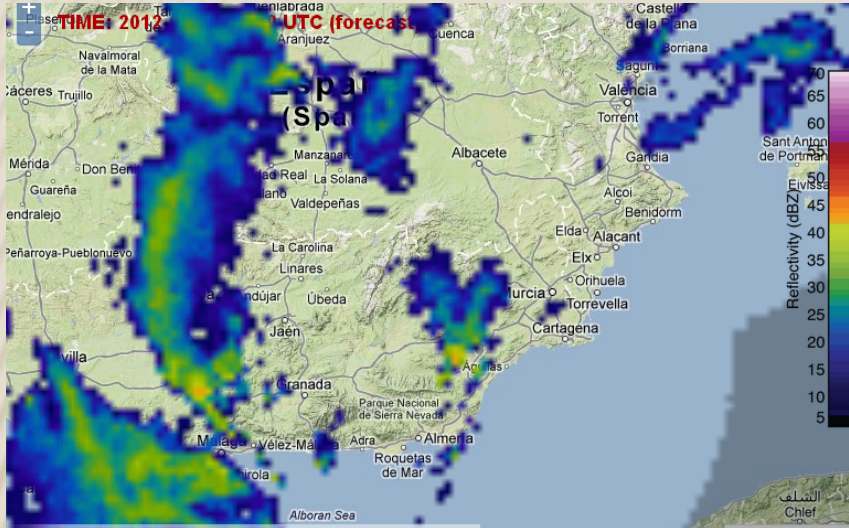


Real Data 7:00 UTC/8:00 local time

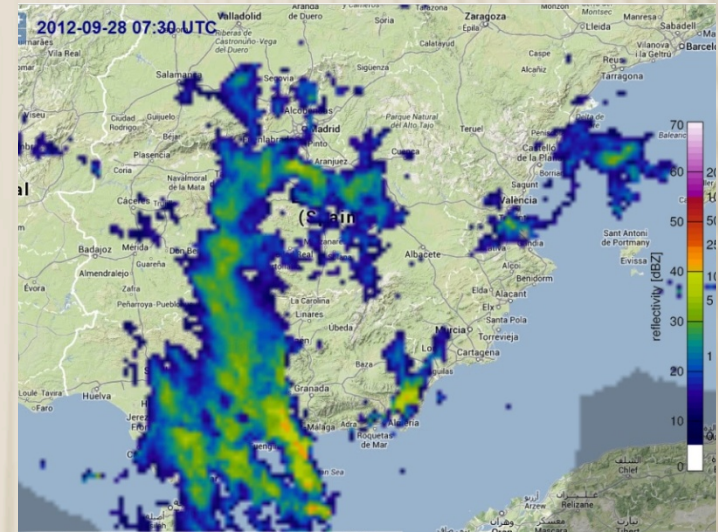


Comparing forecast – real data

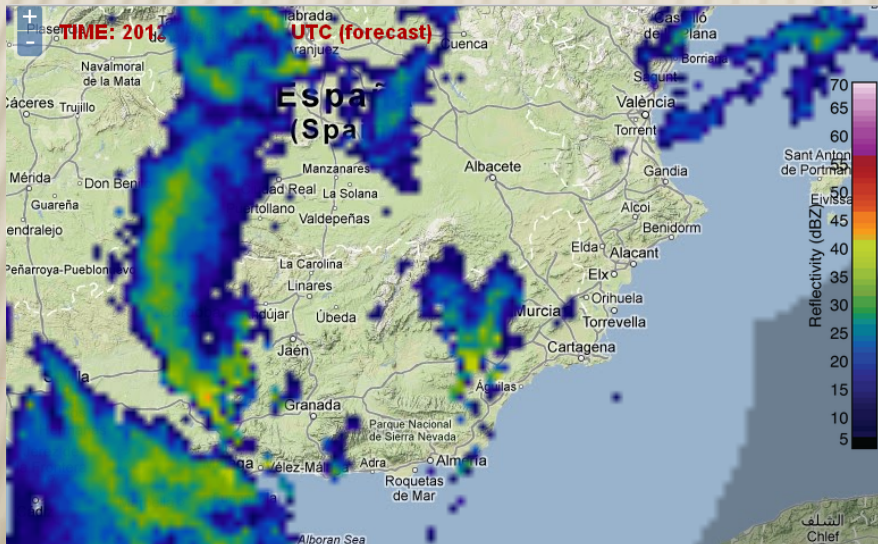
Forecast 7:30 UTC/8:30 local time



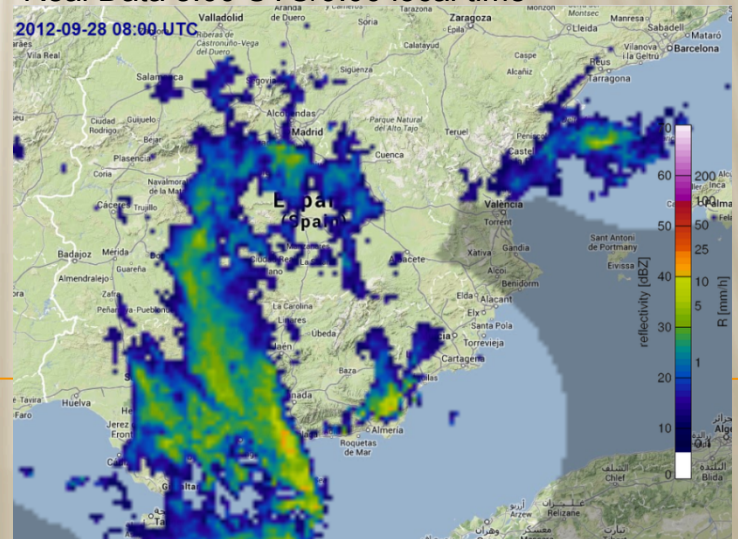
Real Data 7:30 UTC/8:30 local time



Forecast 8:00 UTC/9:00 local time

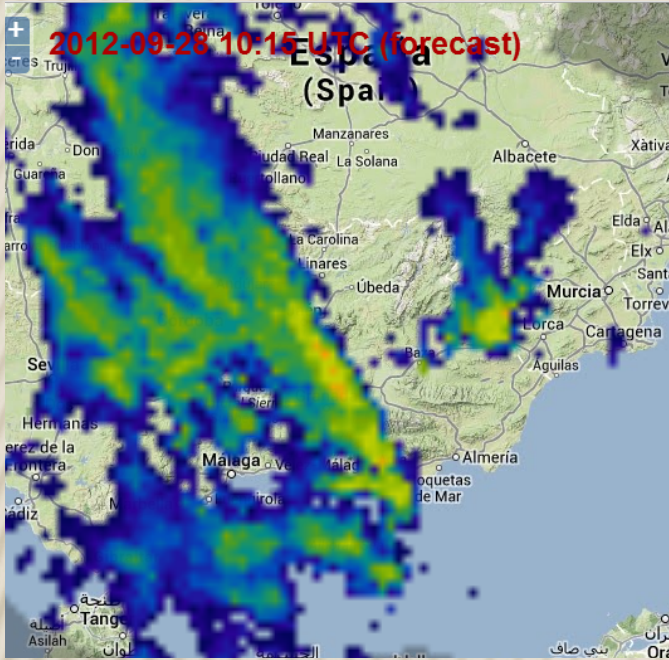


Real Data 8:00 UTC/9:00 local time

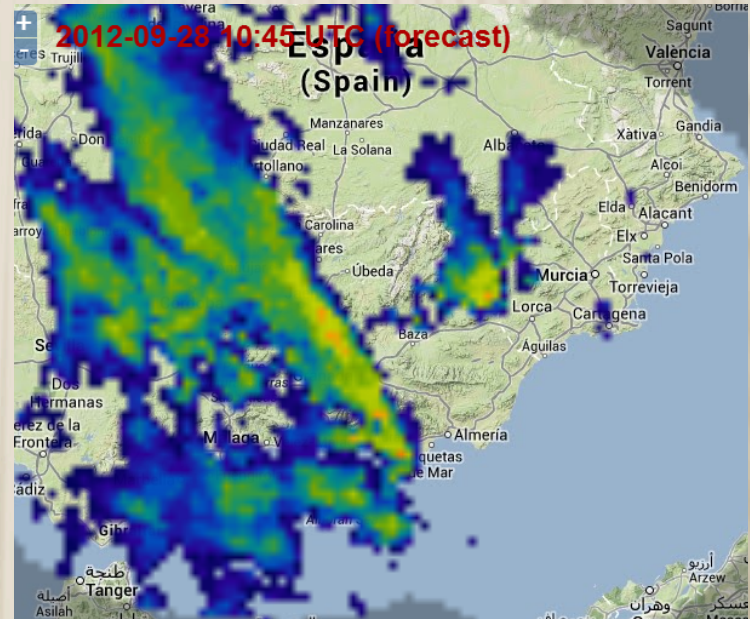


Monitoring with HAREN for Murcia -

Forecast 10:15 UTC/11:15 local time



Forecast 10:45 UTC/11:45 local time

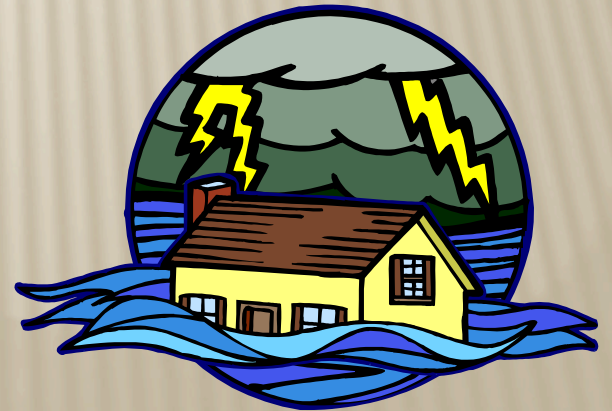


NO RADAR – 8:30 UTC-12:45 UTC



CONCLUSIONS

- Forecast rapidly growing weather phenomena such as severe thunderstorms.
- Increase the numbers of radars in flood prone areas
- Use different radars with better calibration and sensitivity and trying to avoid or mitigate the radar echoes.
- Continuity of the radars



**THANK YOU FOR
YOUR ATTENTION**
