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IMDROFLOOD

Short and medium term meteorological forecasting

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MeteoGRID

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Background

- Based in Spain
- Technical team working on meteorology and climatology for the last 23 years
- 1996-1999: design and development of a Weather Forecasting System focused in fulfilling technical user needs
- This system has been acquired and widely used by Regional and National Meteorological Services in Spain

Background

Forecasts requirements for technical users

- Good forecasting skill (decisions based on forecasts)
- Larger temporal ranges (they need time to plan and react)
- Quantification of uncertainty: probabilistic forecasts (to include in technical decision making processes)
- Packaging adapted to user needs (ICT allow it)
- Weather forecasts are not only the final product, but they are also input of derived variables models

Background

- MeteoGRID: **Added Value Weather Services for Technical Users and Risk Management**
- The developed services are used in Spain for the management of technical activities affected by weather:
 - Production, transportation, distribution of energy
 - Civil protection
 - Management of wildland areas, prevention of natural hazards, forest fires
 - Hydrology, water management
 - Agriculture, livestock and forestry
 - Construction, civil engineering
 - Transportation, railroads, road maintenance
 - Mass media, weather information

Background

Key points

- Production of weather forecasts fulfilling all the requirements for technical users
- Meteorological information is “translated” into specific information of the selected activity (forest fires, hydrology, agriculture, energy...), working together with experts on that activity
- Meteorological and derived information is integrated in powerful GIS platforms, implementing useful Early Warning Systems



GOBIERNO
DE ESPAÑA

MINISTERIO
DE AGRICULTURA, ALIMENTACIÓN
Y MEDIO AMBIENTE

SECRETARIA GENERAL DE
AGRICULTURA Y ALIMENTACIÓN
DIRECCIÓN GENERAL DE
DESARROLLO RURAL Y POLÍTICA
FORESTAL

AEMet
Agencia Estatal de Meteorología

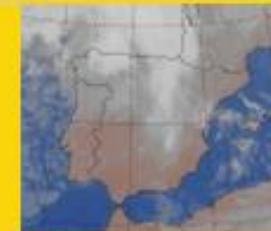
Sistema de Información Meteorológica para Incendios Forestales

Nombre de usuario

admin

Contraseña

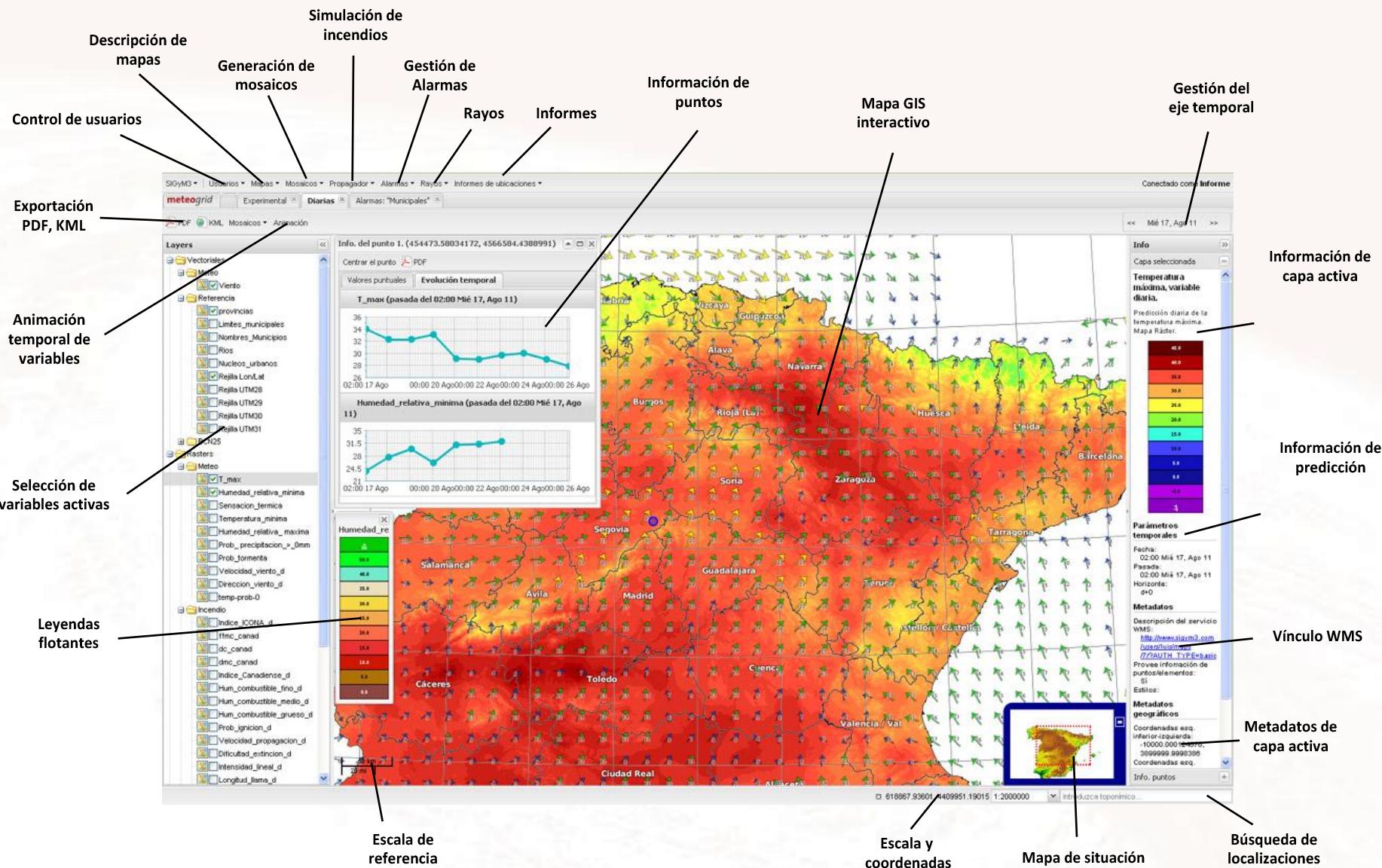
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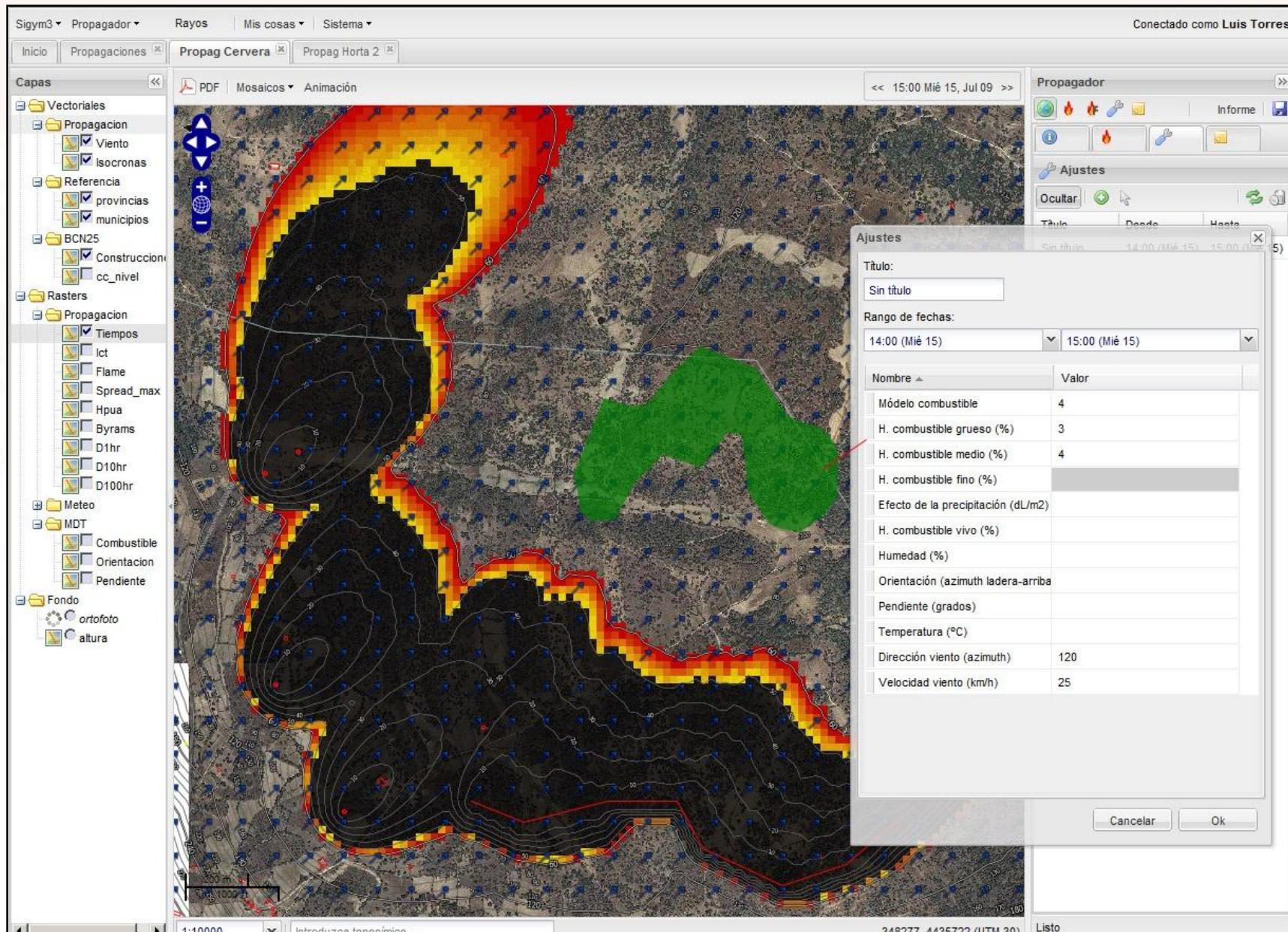
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Página compatible Explorer 8 o posteriores.

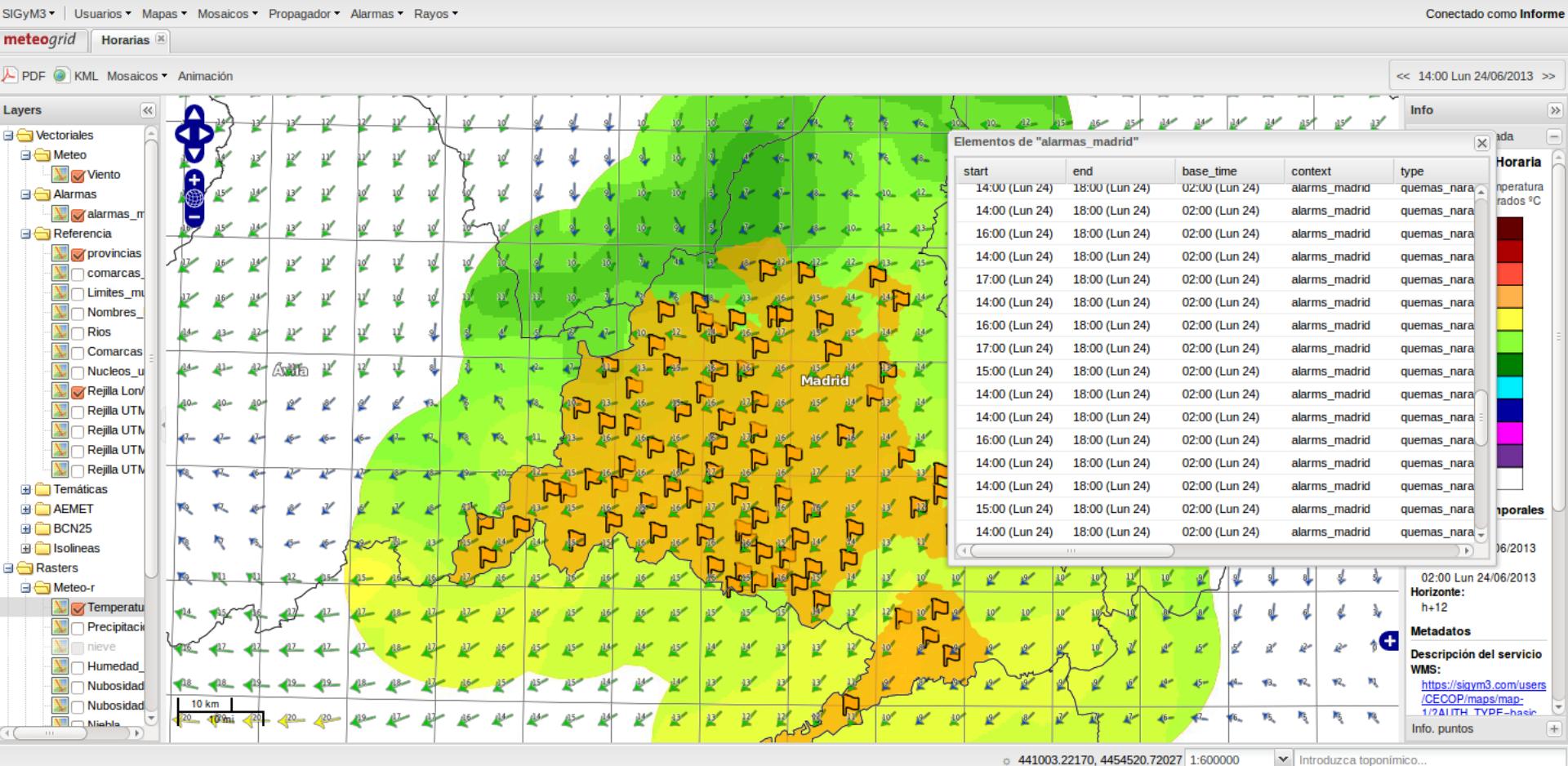
EARLY WARNING GIS



Simulation tools



Custom alerts module



Background

Short (6 mins) video about SIMIF

https://www.youtube.com/watch?v=33Apw_yIYoo

Background

Climate Research Foundation
(www.ficlima.org)



Background

Climate Research Foundation (www.ficlima.org)

- Established in 1996
- Focused in climate change research and adaptation
- Internal development of FICLIMA, an statistical downscaling method (very good verification results –EU STARDEX, ENSEMBLES, VALUE COST Action–)
- Used to produce scenarios for the Spanish National Plan on Adaptation to CC
- Successfully adapted to other regions (America, Asia, Africa)
- RESCCUE (H2020): CC on cities (floods, heat waves)

Participation in IMDROFLOOD

What we plan to do within
IMDROFLOOD...

Methodology

SHORT AND MEDIUM TERM FORECASTING

- Numerical Weather Prediction (NWP)
 - Use of dynamical model outputs provided by ECMWF and others
 - Combination of dynamical and statistical models, such as the analogue + transfer functions approach
- Error Feedback Correction of weather forecasts using real time observations
- Spatial interpolation of forecasts considering the effect of topography

Methodology

PRECIPITATION ESTIMATION AND NOWCASTING

- Rainfall fields estimation and prediction
 - 1.- Calculation of the motion equations of radar echoes:
 - * Technical innovations (some are being published in 2016)
 - 2.- Estimation of observed rain fields combining radar reflectivity and surface observations:
 - 3.- Projections coupling numerical forecasts and radar:
 - * Correction of motion vectors and of the main rainfall features (intensity, extension)

Pilot case

Pilot case

Pilot case

- Ebro basin

Length **930 km**
 Basin **80,093 km²**
 Discharge **426 m³/s**

- Observations

Meteorological variables.

Precipitation:	PREC (mm)		
Temperature:	TMAX (°C)	TMIN (°C)	TMED (°C)
Humidity:	HMAX (%)	HMIN (%)	HMED (%)
Wind:	WMED (m/s)	WMAX (m/s)	DEWPT (°C)



Pilot case

- Weather radar fields

- Constant Altitude Plan Position Indicator (CAPPI):
 - <> Frequency: 10-minute time intervals.
 - <> Spatial resolution: 1 km x 1 km
- Quality control: Detailed study on shaded areas and other problems.

- Numerical Weather Prediction (NWP)

- For the short-term forecasting:
 - <> HIRLAM 00Z, 0,05°: 34 horizons (+3h to +36h; 1h)
 - <> HIRLAM 00Z, 0,16°: 6 horizons (+42h to +72h; 6h)
- For the medium-term and long-term forecasting:
 - <> ECMWF 00Z, 0,25°: 10 days (+78h a +240h; 6h)

Variables: 2m temperature, humidity, 10m wind, solar radiation.

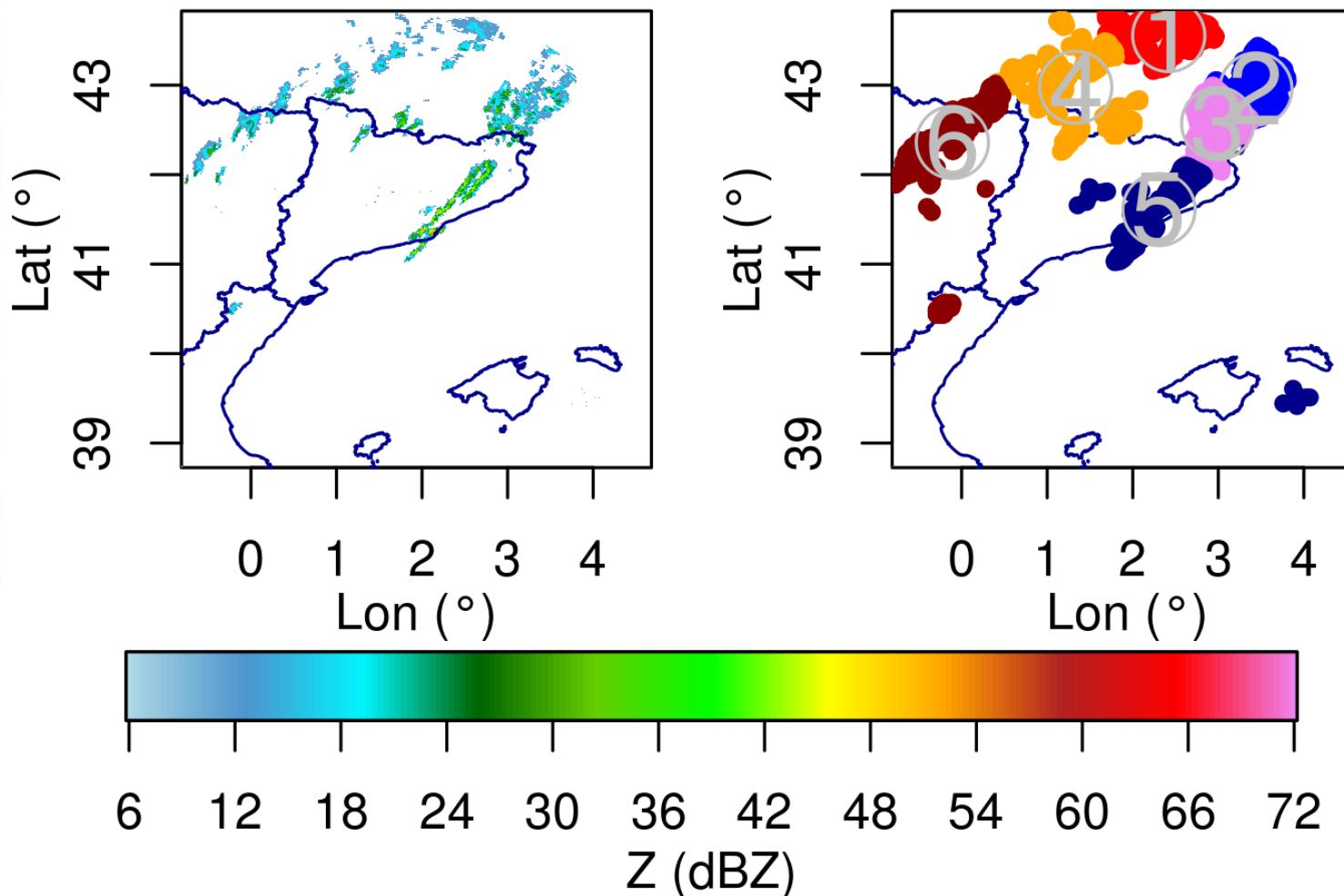
Example

Example of 22 July 2016
at 10:00 UTC

Example

1.- Obtaining of the motion equations of rainfall fields

* Automatic identification of main rain clusters

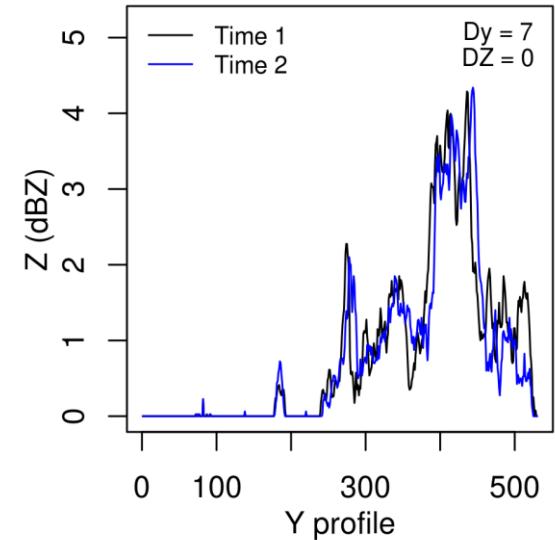
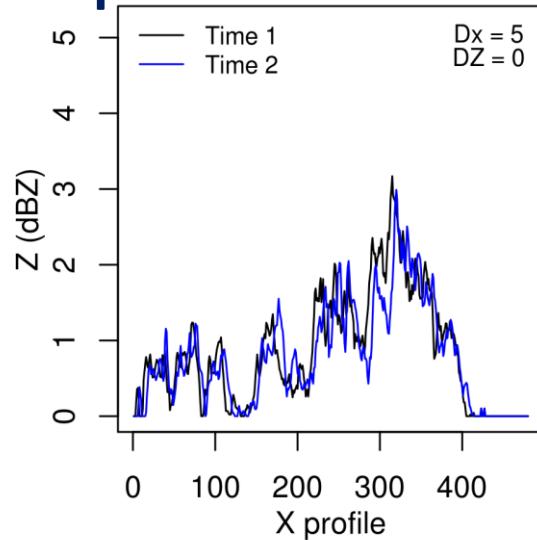


Example

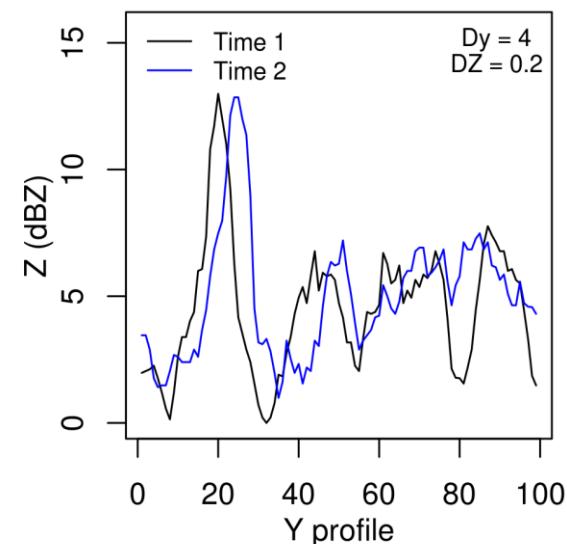
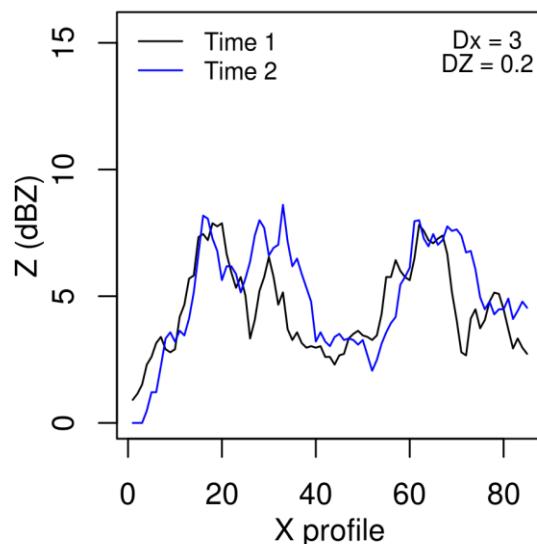
1.- Obtaining of the motion equations of rainfall fields

* Automatic identification of their displacements.

x & y projection profiles for all clusters



x & y projection profiles for cluster 5

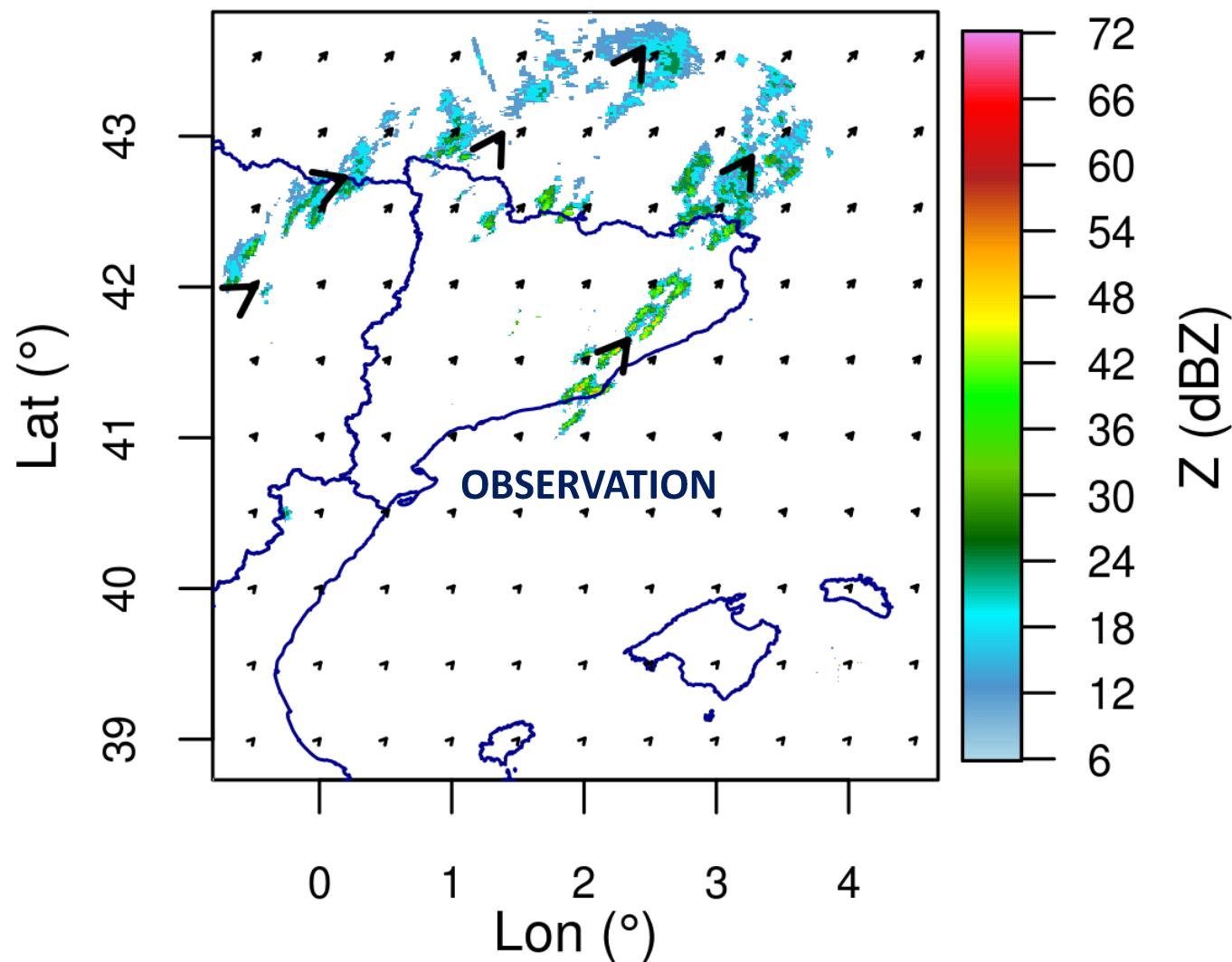


Example

Temporal extrapolation

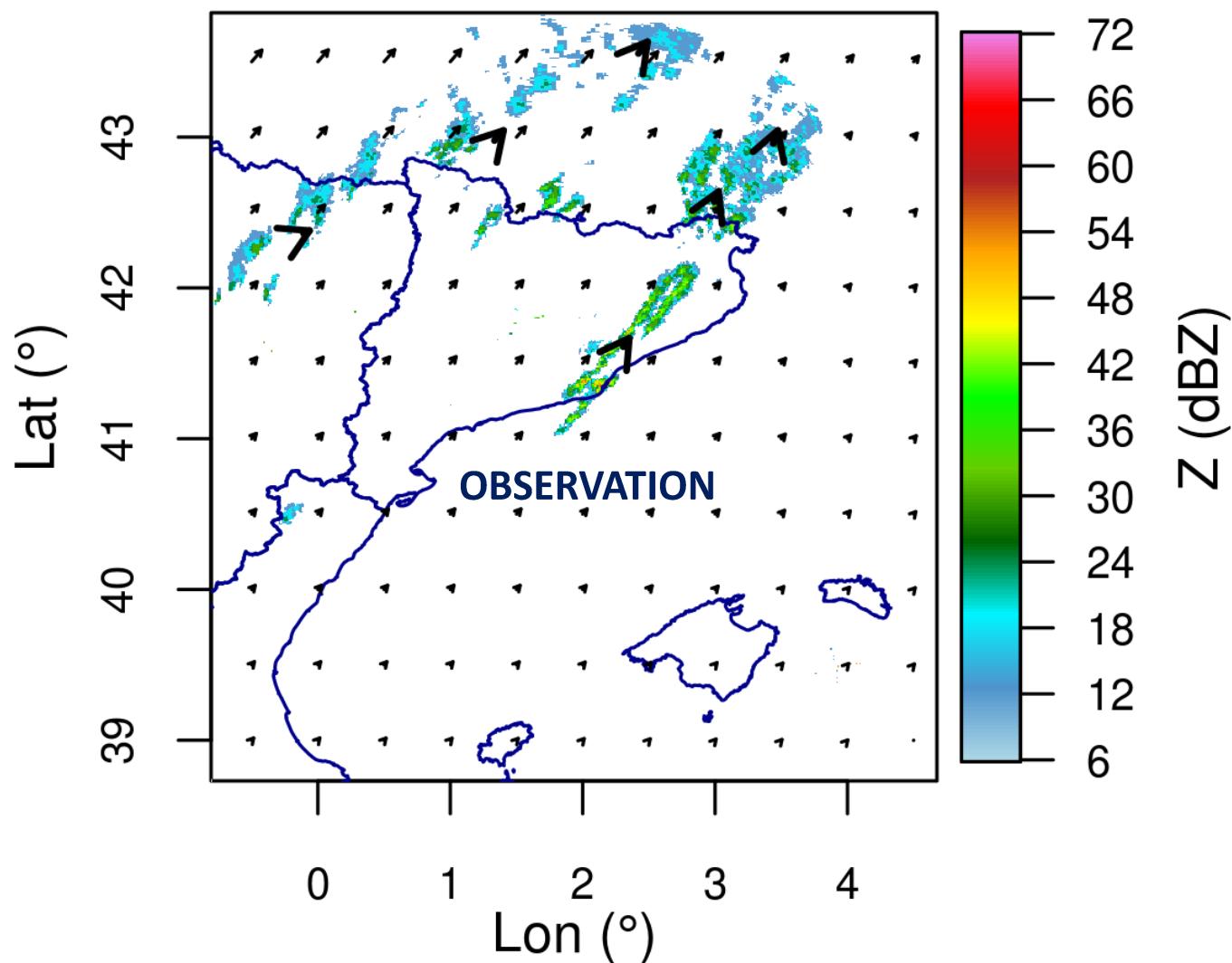
Example

2016/07/22 10:20 UTC



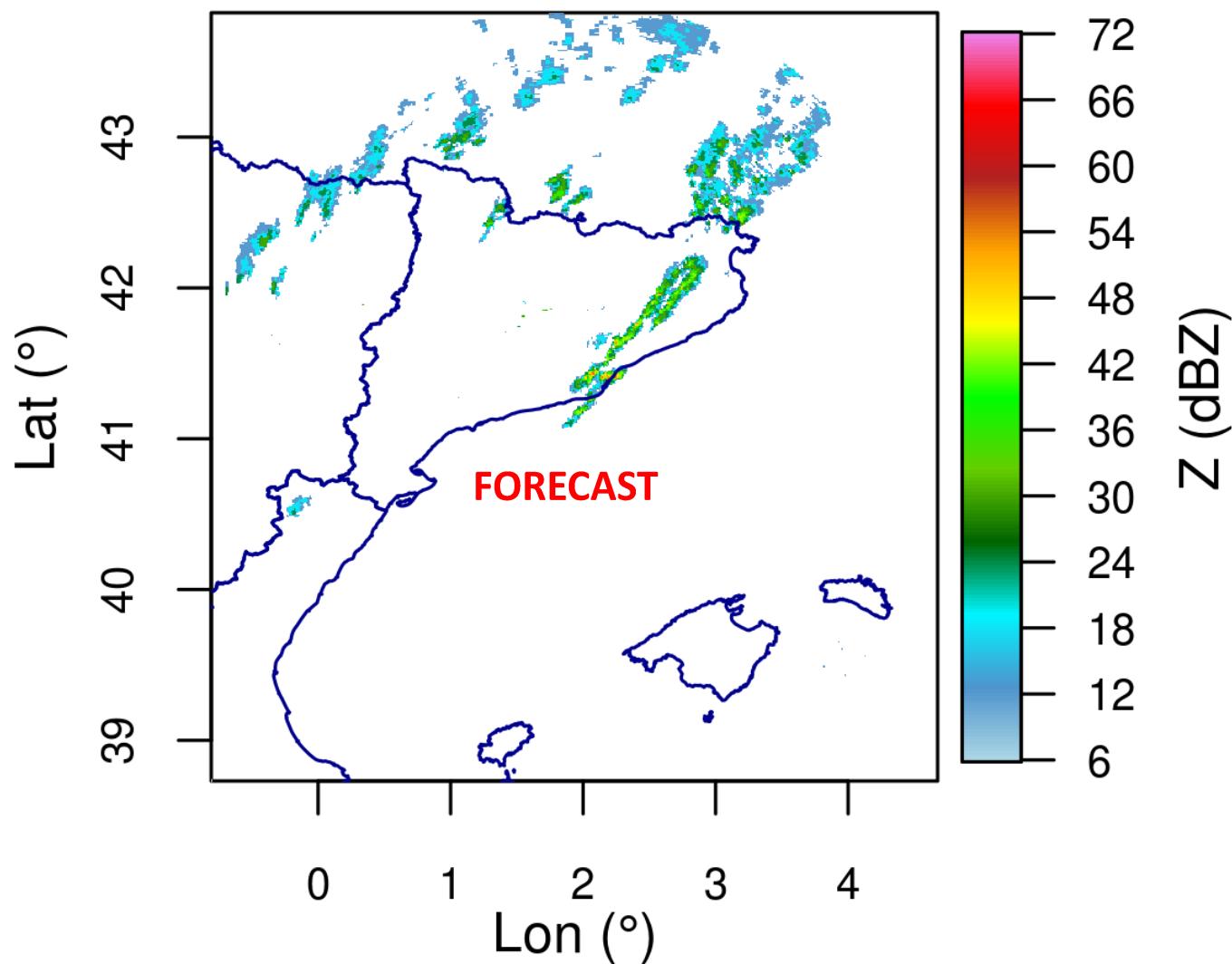
Example

2016/07/22 10:30 UTC



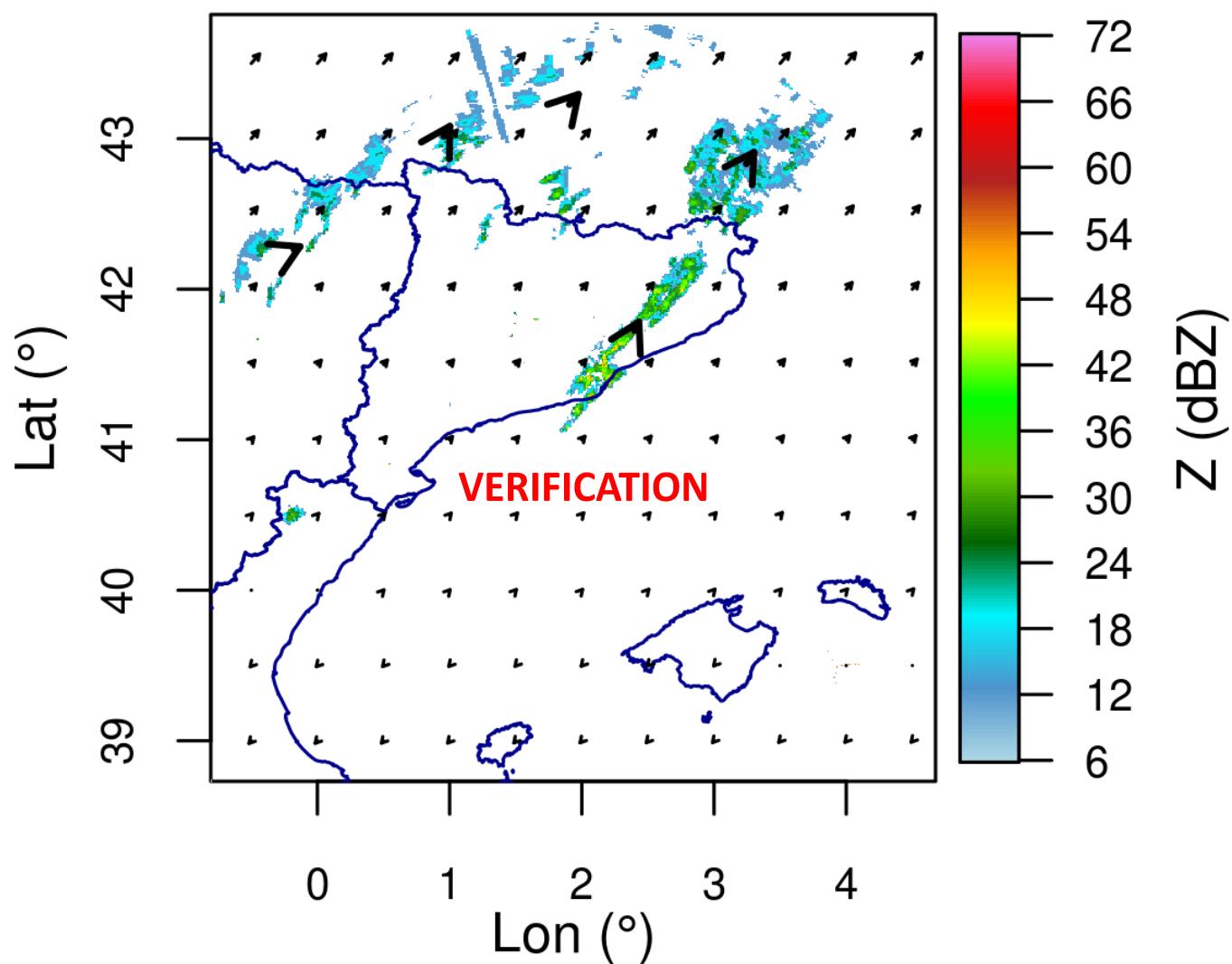
Example

2016/07/22 10:40 UTC



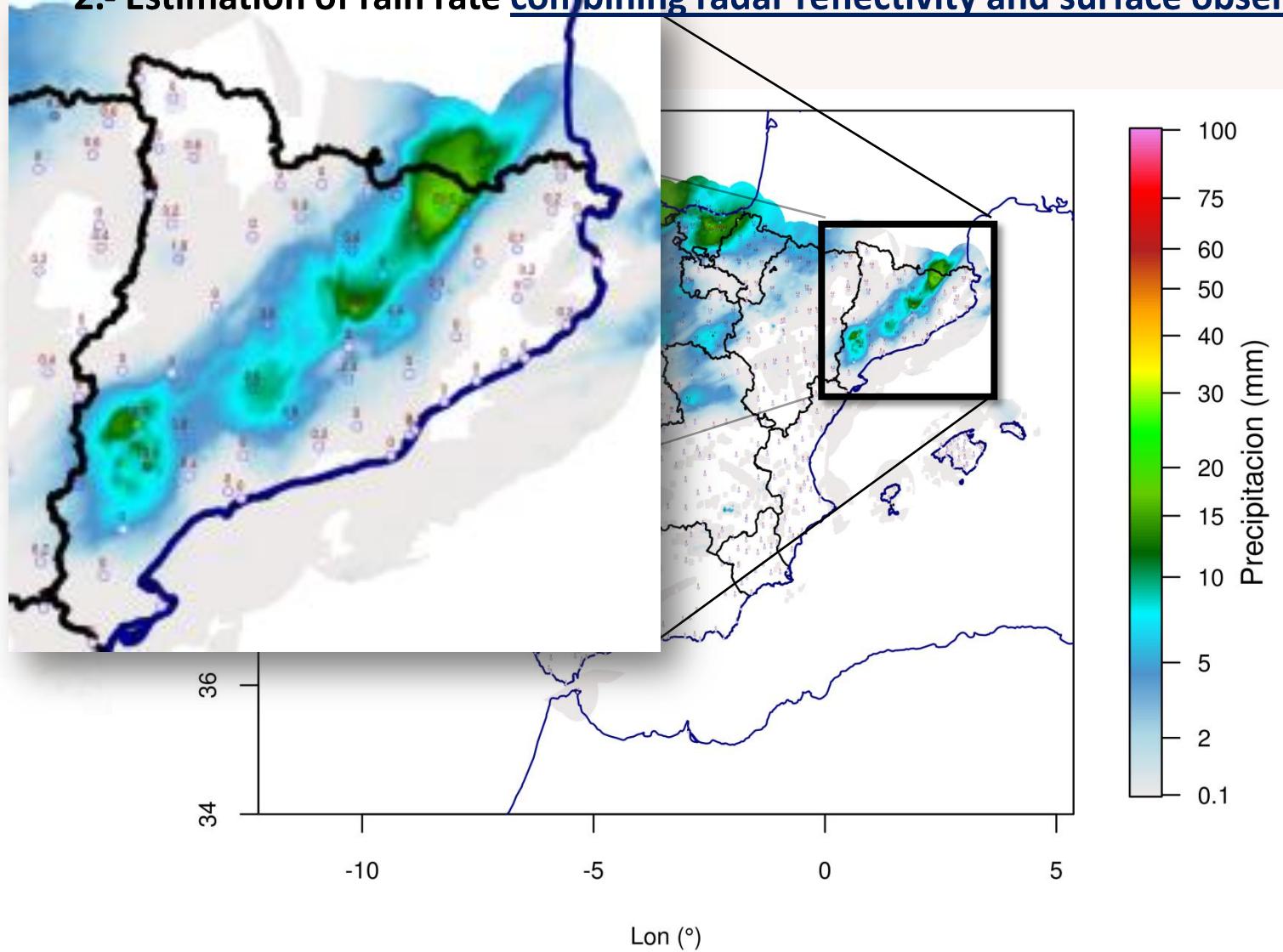
Example

2016/07/22 10:40 UTC



Example

2.- Estimation of rain rate combining radar reflectivity and surface observations:



Precipitation

SHORT AND MEDIUM TERM FORECASTS

- Numerical Weather Prediction (NWP) with real time feedback correction: Transfer functions.

OBSERVATION AND NOWCASTING

- Observed rainfall fields estimation combining observations and radar images
- Coupling radar and NWP for forecasting of frontal systems and thunderstorms.

Other issues

- Integration of meteorological information as input of other models (hydrological...)
- Forecasting Atmospheric Rivers? (collaboration with FFCUL)
- Seasonal forecasts for drought??? (low skill)
- Implementation of (pre-) operational system??? (more resources and exploitation plan needed)

Questions?

Thanks!
Questions?