

# Alertas Hidrometeorológicas: Herramientas potenciales para el Plan Estatal de Inundaciones

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Universitat Politècnica de Catalunya  
Barcelona



# Genova (Italia) 4th of November of 2011



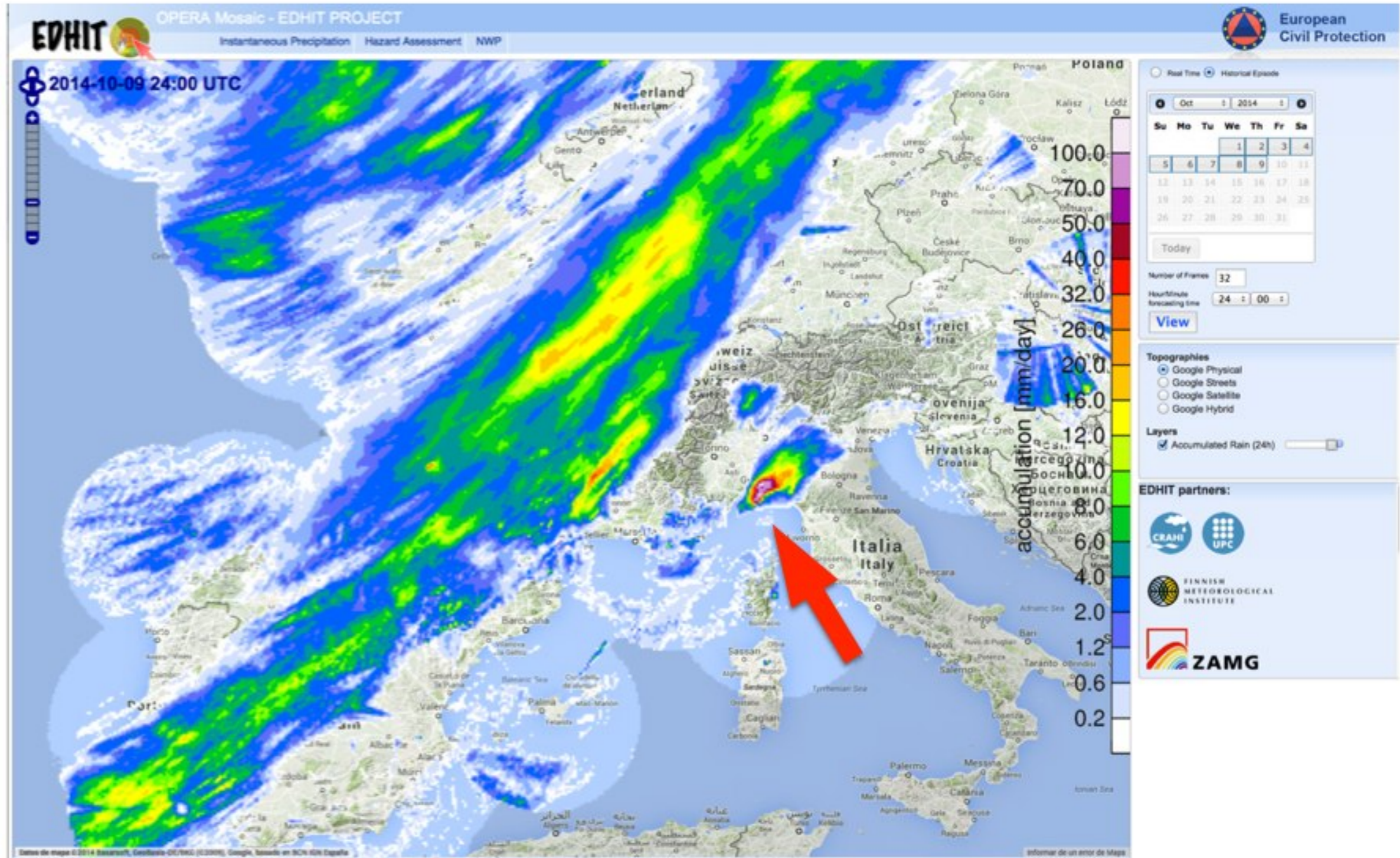
after  $> 300$  mm of accumulated rainfall in few hours

# Genova (Italy) on 10<sup>th</sup> of October 2014



after  $> 300$  mm of accumulated rain in few hours

# Genova (Italy) on 10<sup>th</sup> of October 2014



after  $> 300$  mm of accumulated rain in few hours

# Experience from three European projects coordinated by CRAHI

FP 7 Cooperation Work Programme: Environment  
Collaborative Project

## IMproving Preparedness and Risk maNagement for flash floods and debris flow events



FP7-ENV-2008-1-226555  
January 2009 - November 2012

**EC FP7 PROJECT COORDINATED BY**



Centre de Recerca Aplicada en Hidrometeorologia  
UNIVERSITAT POLITÈCNICA DE CATALUNYA




## Hazard Assessment based on Rainfall European Nowcasts

# HAREN



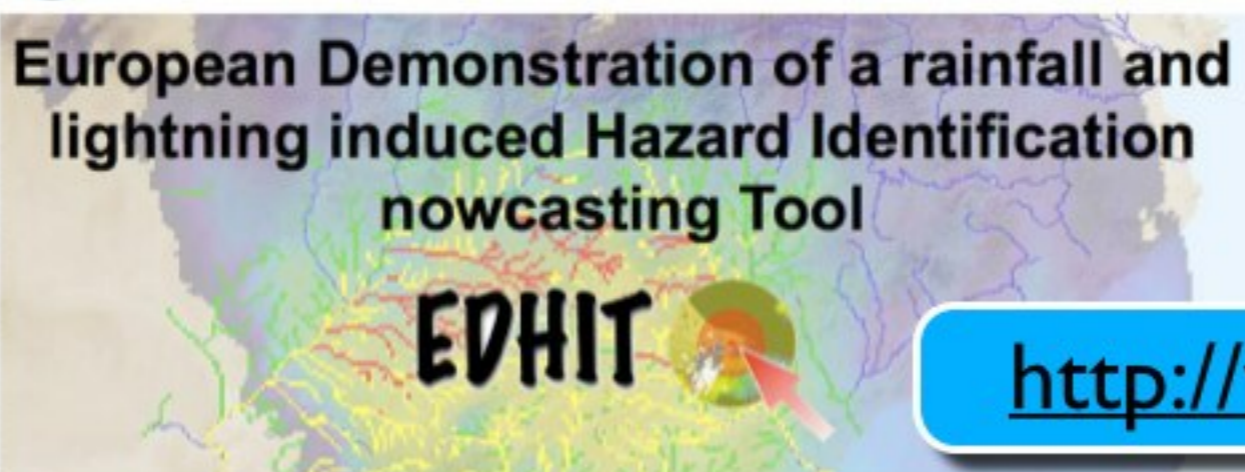
<http://www.haren-project.eu/>



Prevention & Preparedness Projects

## European Demonstration of a rainfall and lightning induced Hazard Identification nowcasting Tool

# EDHIT



<http://www.edhit.eu>

Coordinator:



Stakeholders:



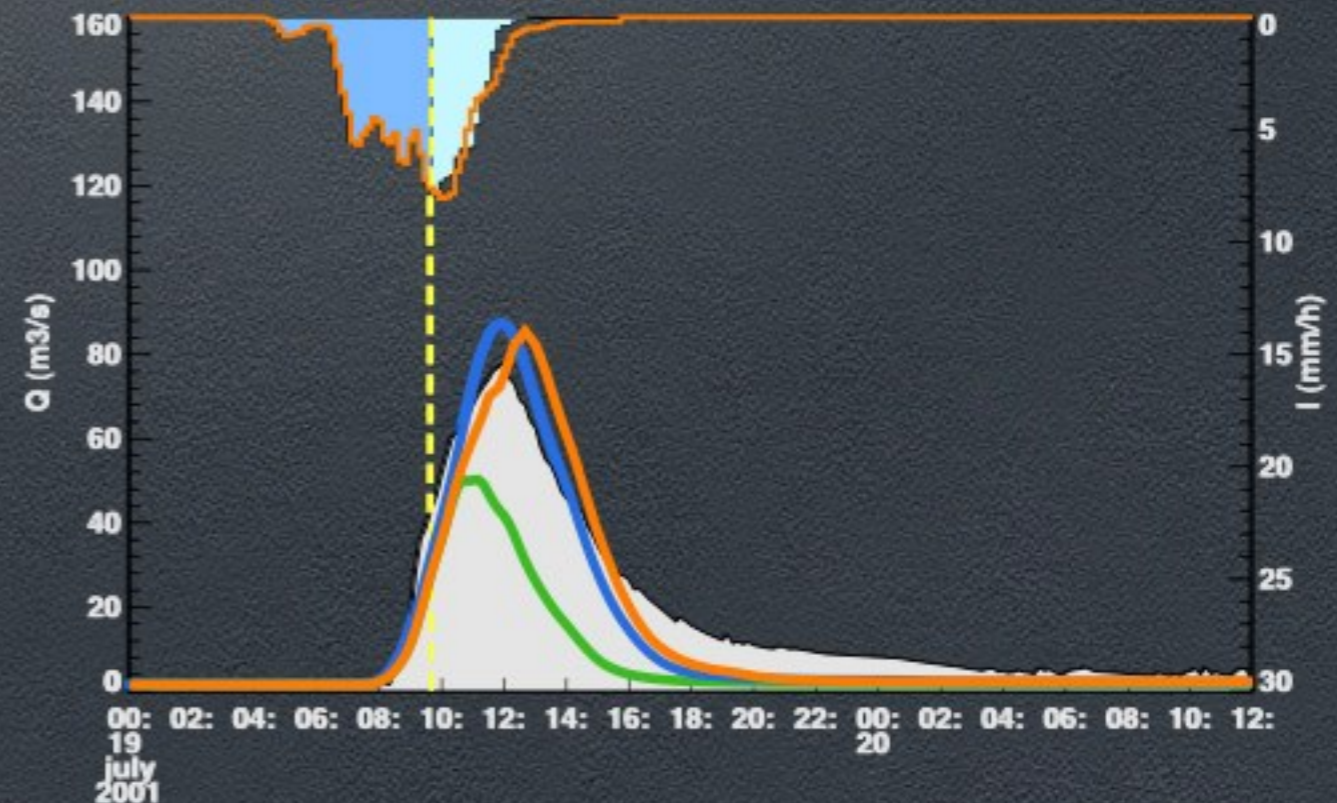
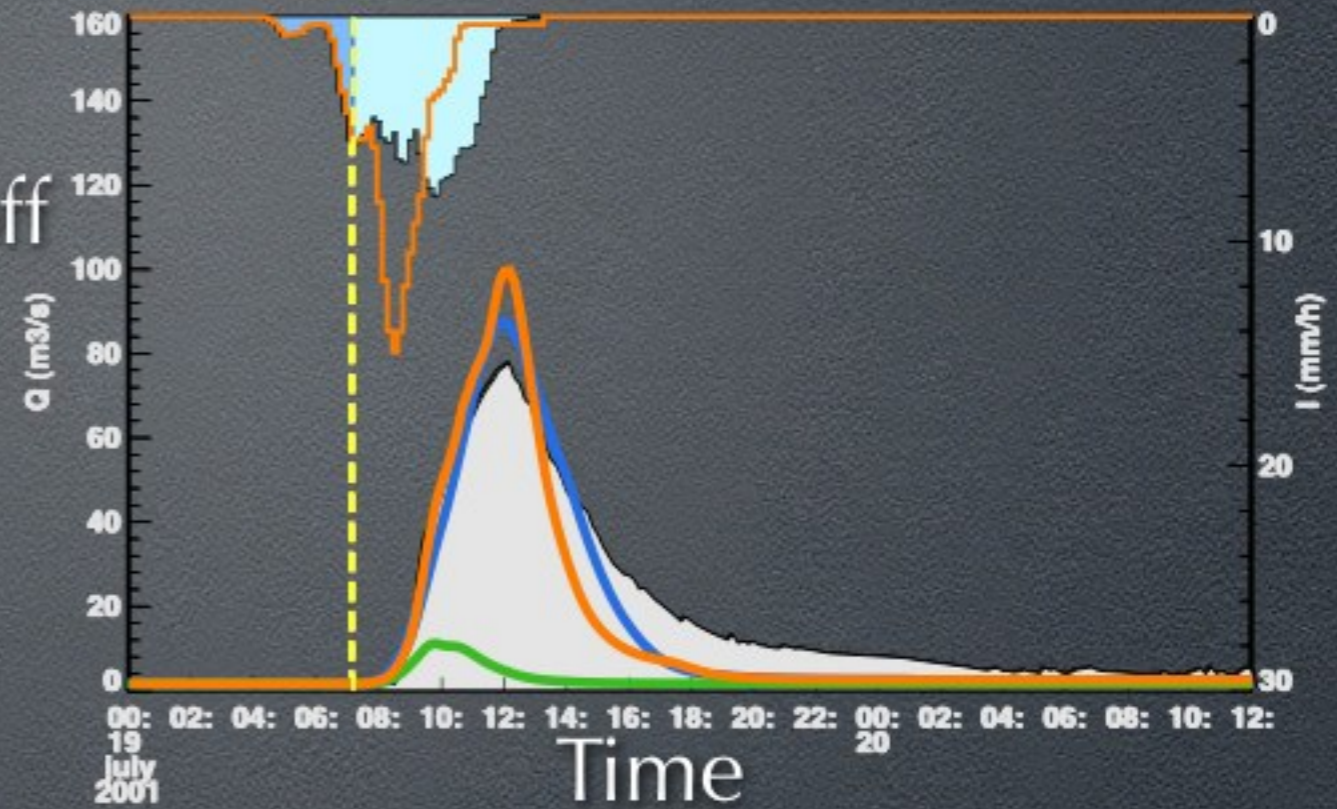
# Why precipitation nowcasting is crucial in hydrology?



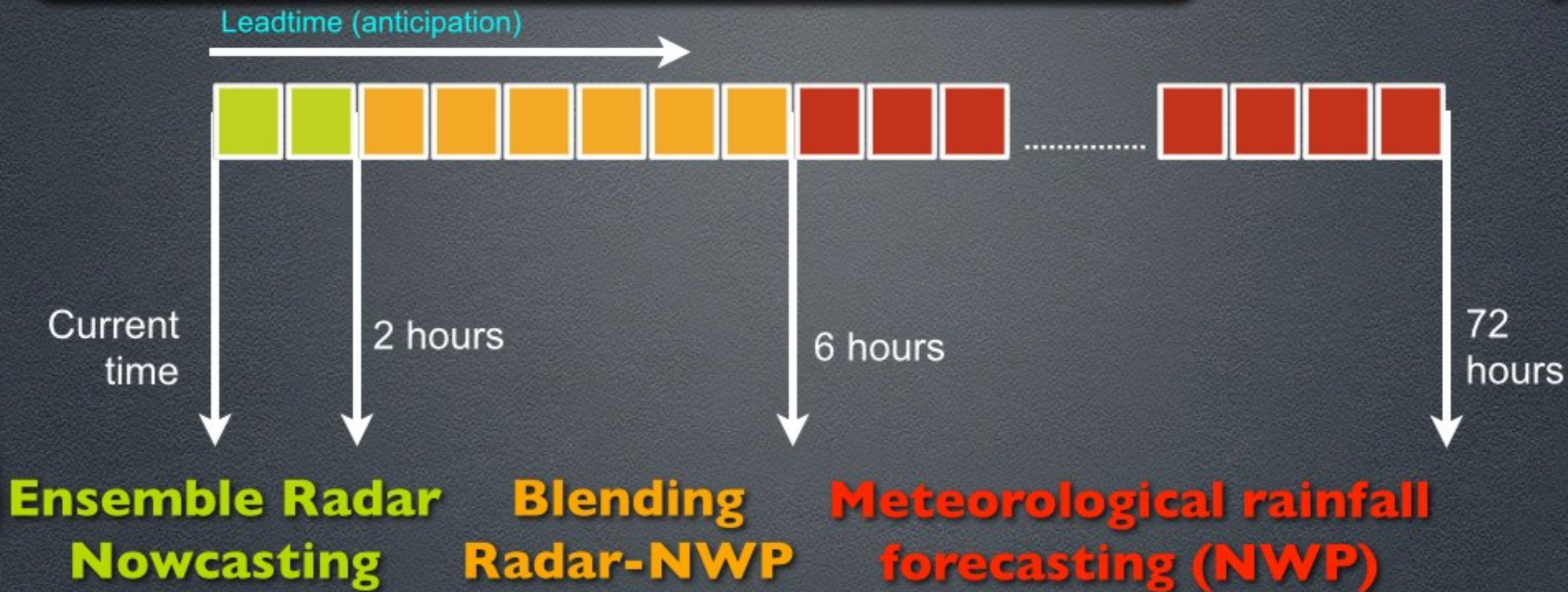
forecasting example using radar  
(Besòs river at Montcada, July 2001)

Runoff

- observed runoff
- model
- model (without QPF)
- model (with radar based nowcasting)



# Increasing anticipation of heavy rainfalls



- **High resolution radar nowcasting probabilistic outputs** (ensembles) for FF & DF forecasting **(up to 2 h)**
- **Combining (blending) radar rainfall nowcasting with probabilistic NWP products** **(between 2h and 6h)**
- **Adapting high-resolution meteorological model forecasts** to FF & DF early warnings **(from 6h to 72 h)**



**IMPRINTS** 

**EDHIT** 

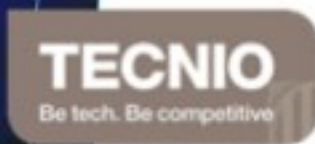


European  
Civil Protection

CIAT ELOGGIU

**From 6h to few days in advance**

**Flash Flood Module based on EPIC  
developed in IMPRINTS and  
operationally running in EFAS**





# EUROPEAN FLOOD AWARENESS SYSTEM (EFAS)

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JOINT RESEARCH CENTRE



EFAS European Flood Awareness System

European Commission > JRC > IES > FLOODS action > EFAS-15

RESOURCES: Floods portal | EU Floods directive | WISE | GDACS |

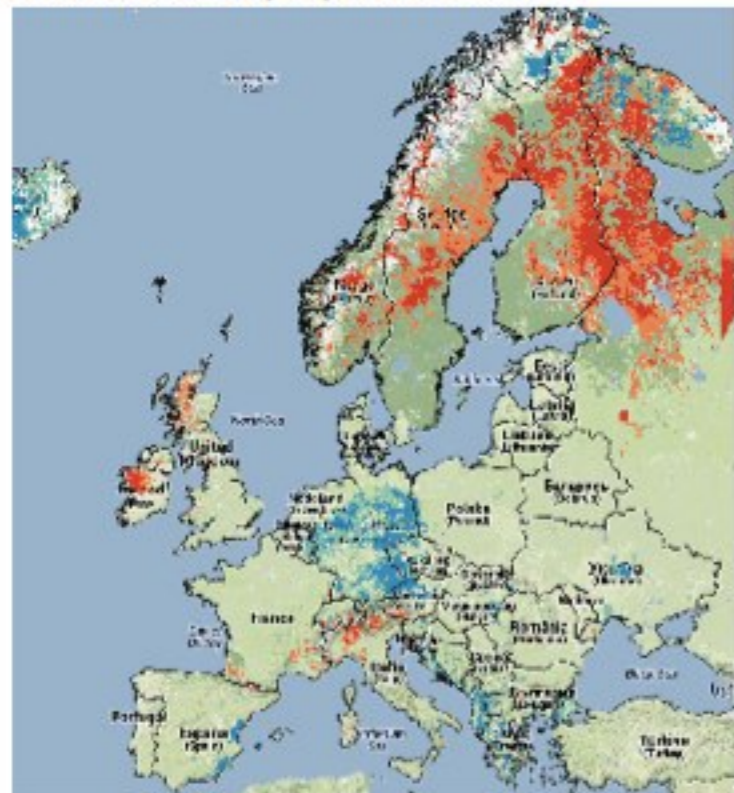
## European Flood Awareness System (EFAS)

The European Commission's "Towards a Stronger European Union Disaster Response" adopted and endorsed by the Council in 2010, underpins the importance of strengthening concerted actions for natural disasters including floods, which are amongst the costliest natural disasters in the EU. The European Flood Awareness System (EFAS), developed to produce European overviews on ongoing and forecasted floods, contributes to better protection of the European Citizen, the environment, property and cultural heritage in support to the EU Mechanism for Civil Protection.

EFAS was developed at the Joint Research Centre of the European Commission in close collaboration with the National hydrological and meteorological services, European Civil Protection through the Emergency Response Coordination Centre (ERCC) and research institutes.

Since 2012 EFAS is an operational service under the umbrella of the Copernicus emergency management service and run by Member States organisations. EFAS also represents the 1st operational hydrological network in Europe.

### Soil Moisture Anomaly Map of 22nd of Mar 2014



Deviation of the LISFLOOD simulated daily soil moisture from normal conditions. The normal conditions have been derived using the simulated soil moisture from a 22 year model climatology (1991 - 2012).

- High water than normal ( $SMA < -2$ )
- High water than normal ( $-2 = SMA < -1.5$ )
- Near normal ( $-1.5 = SMA < -1$ )
- Near normal ( $-1 = SMA < -0.5$ )
- Near normal than normal ( $-0.5 = SMA < 0$ )
- High drier than normal ( $SMA > 1$ )

### Aims of EFAS operational

- added value early flood forecasting products to hydrological services
- unique overview products of ongoing and forecast floods in Europe more than 3 days in advance

### MoU PARTNERS LOGIN

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### EFAS Bulletins

2014-02-17

The COPERNICUS Emergency Management Service - Rush Mode Mapping has been triggered for floods by

- Slovenia (Ministry of Defence - Administration for Civil Protection and Disaster Relief) on 2014-02-11 14:16 UTC
- UK's Cabinet Office (Civil Contingencies Secretariat) on 10.2.2014 at 10:10 UTC
- France (Centre Operationnel de Gestion Interministeriel de Crises (C.O.G.I.C)) on 2014-02-07 at 11:40
- Portugal (National Command for Relief Operations National Authority Protection) on 2014-02-07 at 10:21 UTC

All details about the activation can

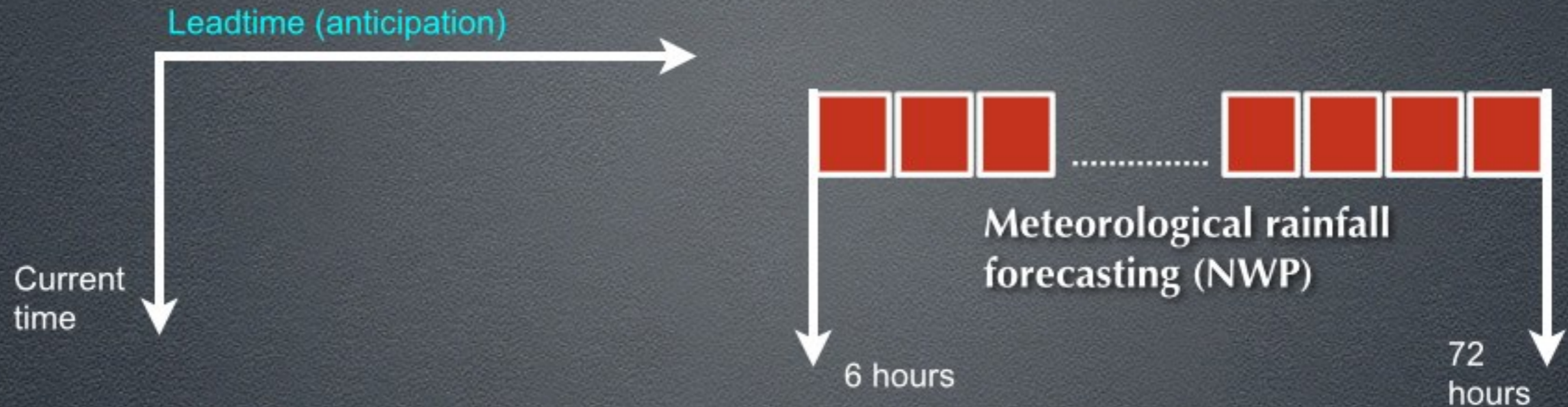
# IMPRINTS



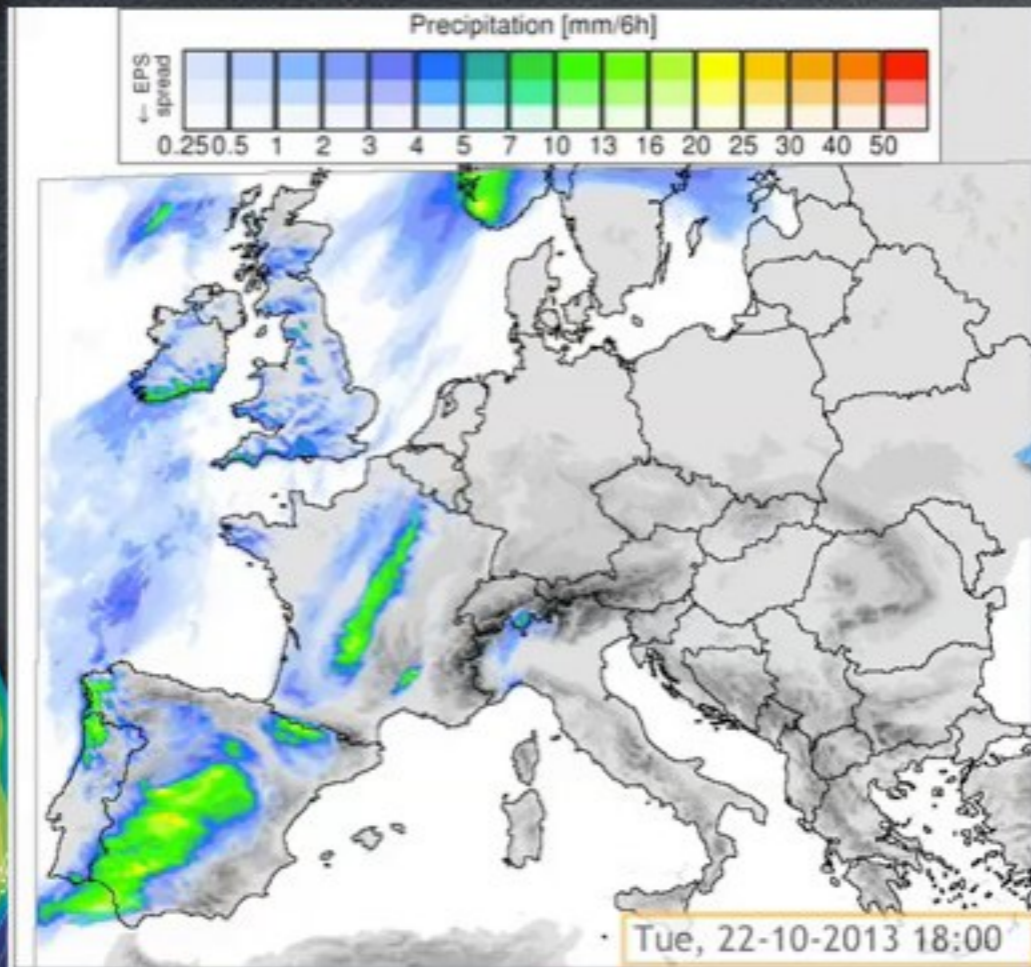
## Flash Flood FF-EWS module

<http://www.efas.eu/>

# Increasing anticipation of heavy rainfalls



- Adapting high-resolution meteorological weather forecasts to their use for FF & DF early warnings (from 6h to 72 h)



Initialisation with ECMWF-VAREPS  
(15 days, 51 members, 32 km resolution)

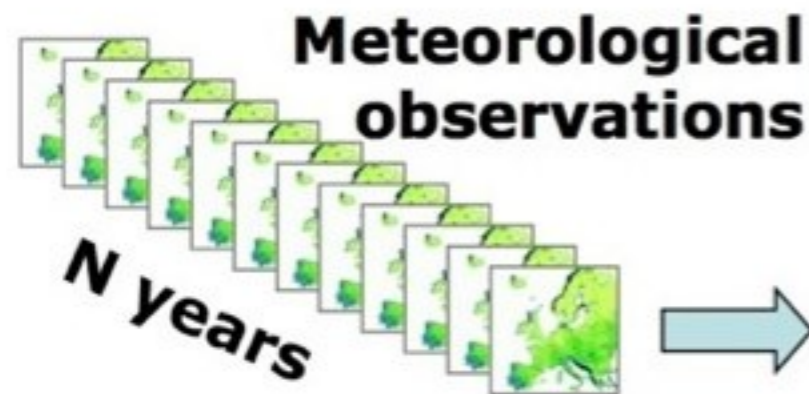
Operational COSMO-LEPS 7  
7 km spatial resolution  
since Dec 2009

Probabilistic Forecast COSMO-LEPS  
16 Ensembles

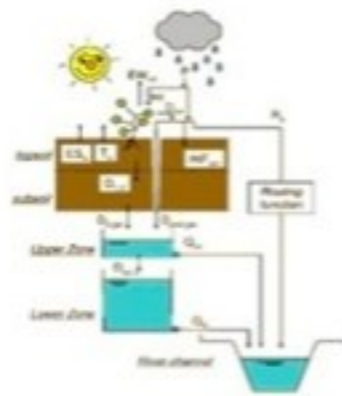
Source: MeteoSwiss-  
COSMO Consortium



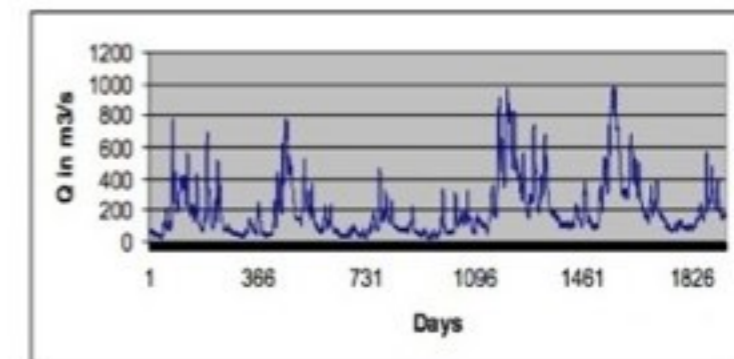
## Establish thresholds – from model climatology



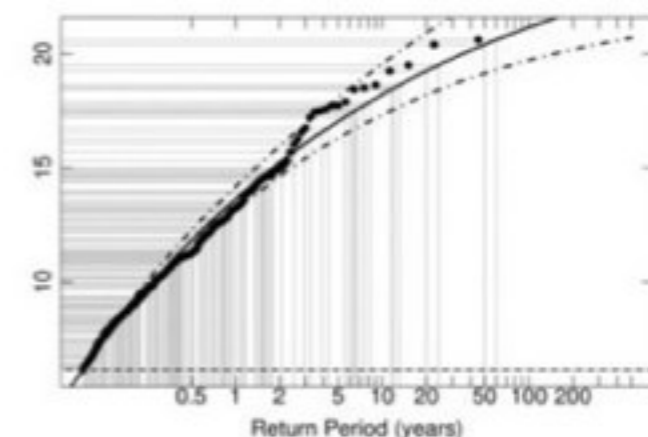
### LISFLOOD



### Discharge time series



### Return period statistics



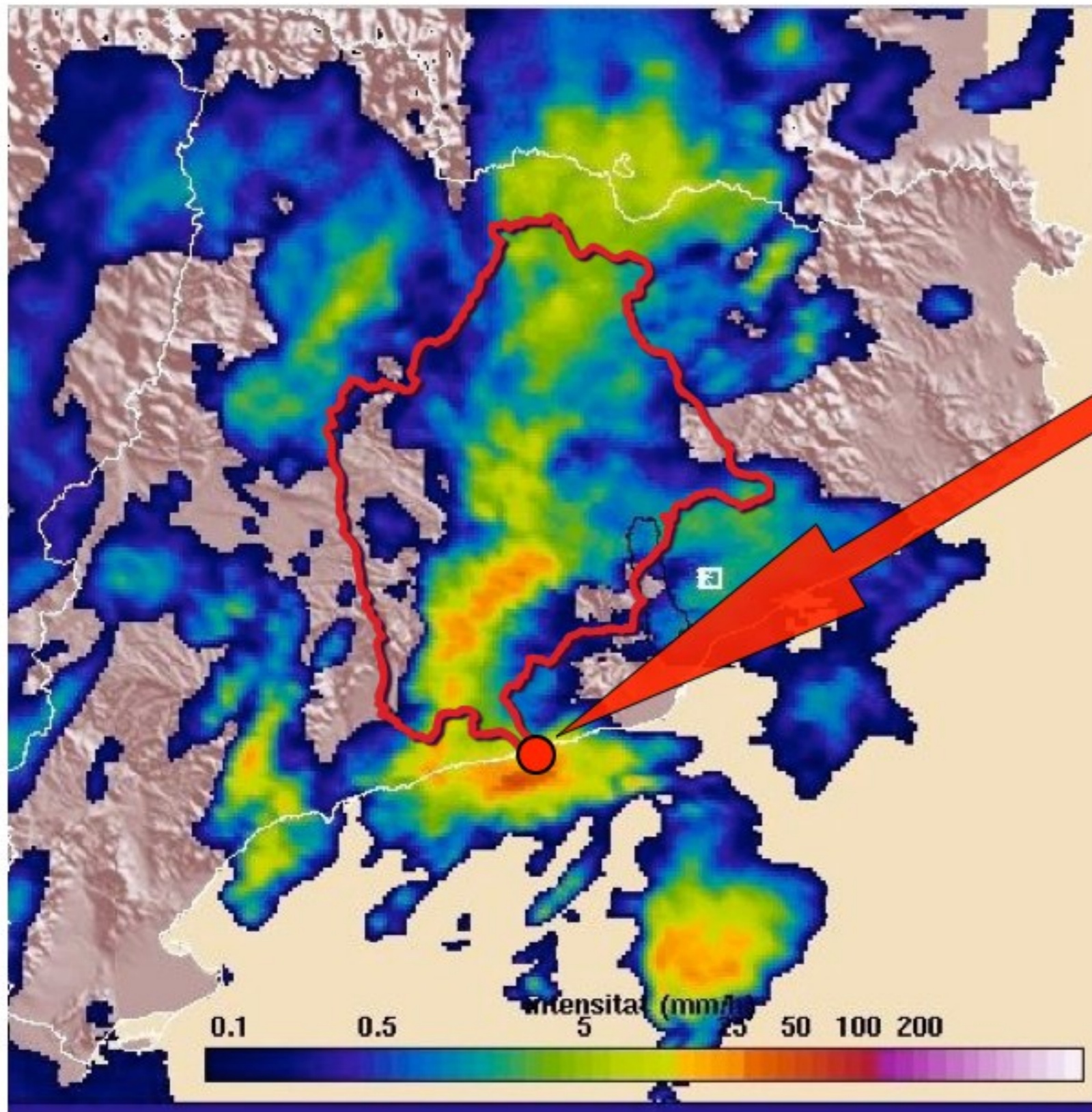
### Thresholds



- Thresholds are derived from simulated time series.

- The same model set-up and parameterisations are used in the forecasts to remain model consistent

# Flash Flood Indicator: Basin aggregated rainfall exceedances

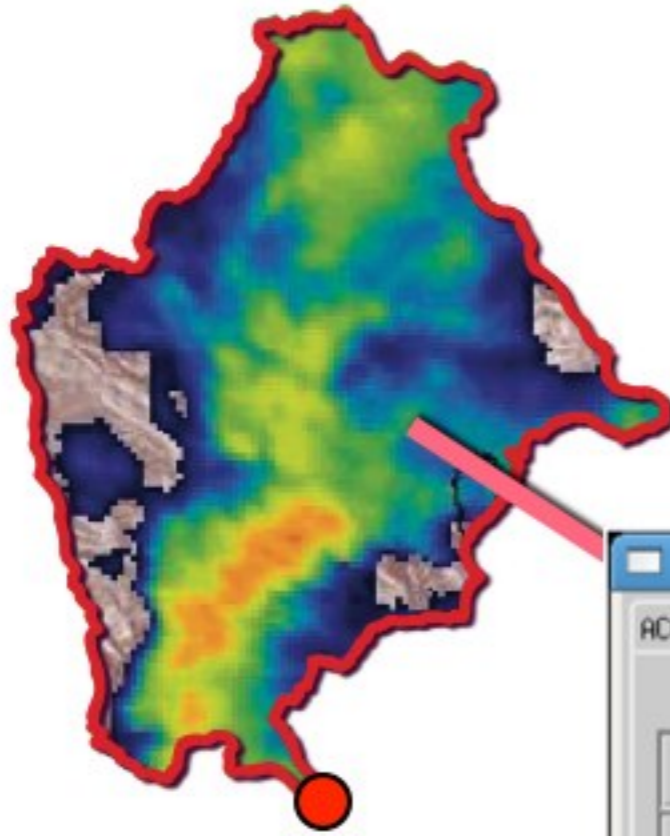


Given a point in the drainage system,

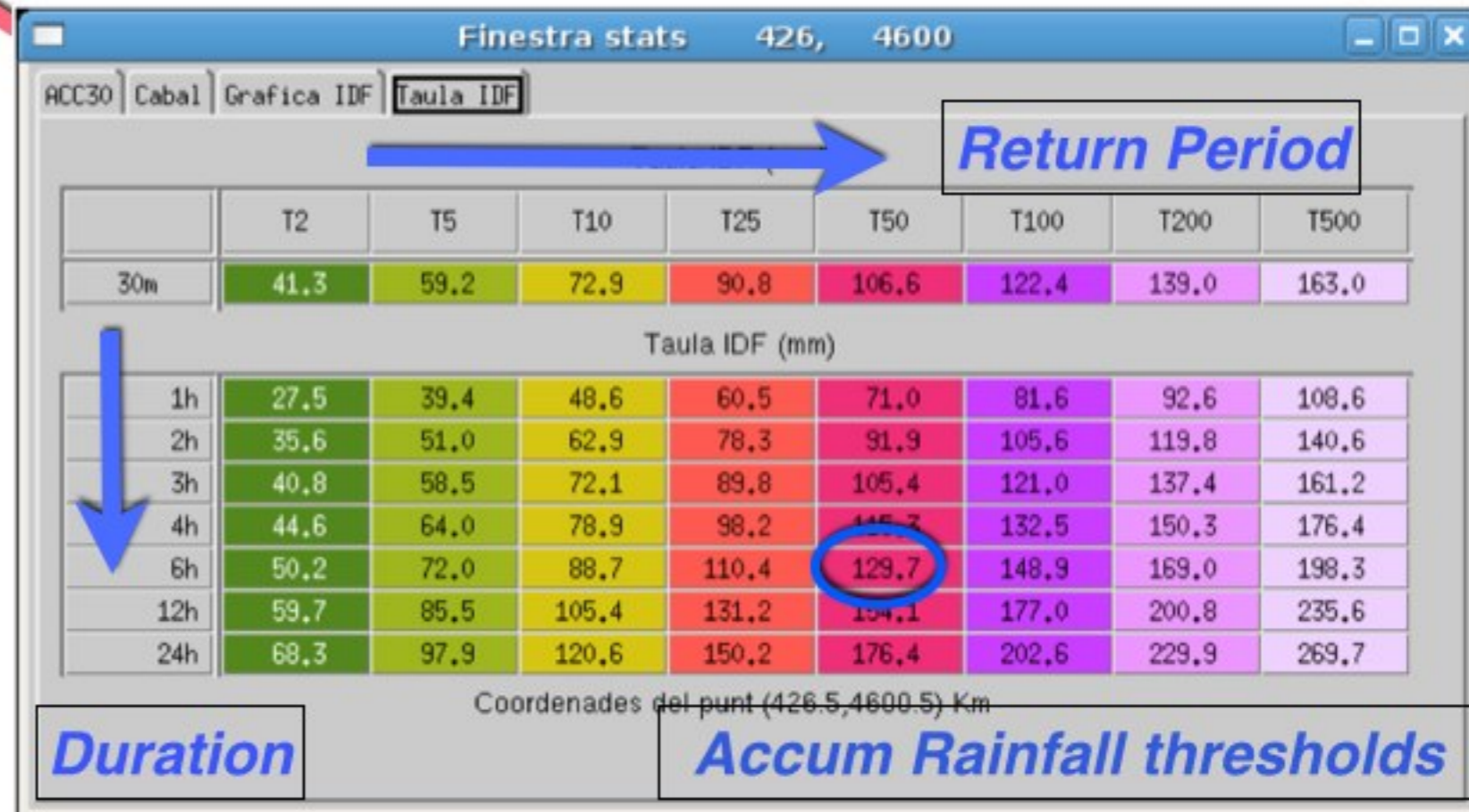
We can define the associated basin, and calculate the rainfall that will be collected by the selected point

# Flash Flood Indicator: Basin aggregated rainfall exceedances

This basin aggregated rainfall is accumulated over the hydrological characteristic time of the basin



And a probability of Exceedance is associated (return period in years)



## EPIC: European Precipitation Index Climatology

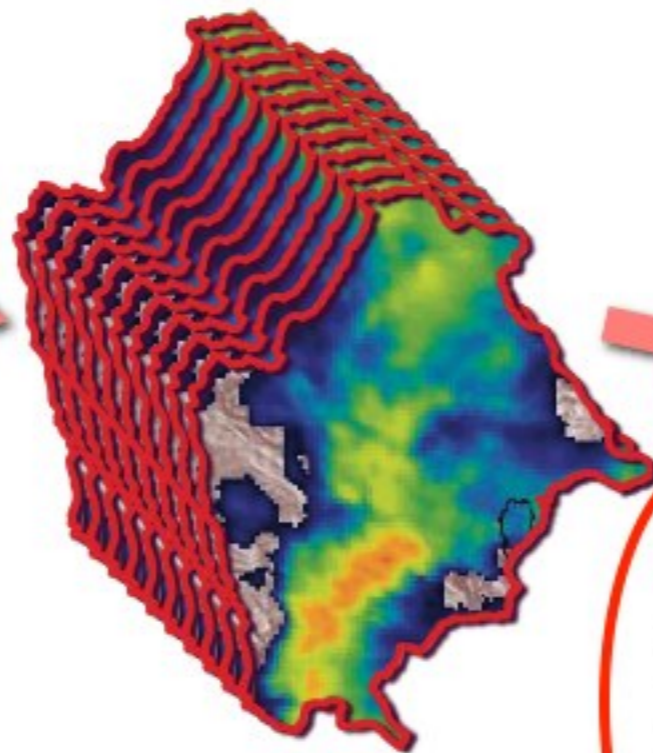
- **30 Years of COSMO-LEPS** reanalysis have been generated.
- For any point in the river system ( $1 \text{ km}^2$ ) a **Climatology of its basin aggregated rainfall** is calculated.
- A Precipitation Index based on Climatology is thus calculated at European scale (**EPIC**).
- For any new event the rainfall forecasted is used to calculate the **basin aggregated rainfall, and compared against the EPIC CLIMATOLOGY.**

## FF & DF early warning systems

COSMO-LEPS  
Probabilistic Rainfall  
forecasts

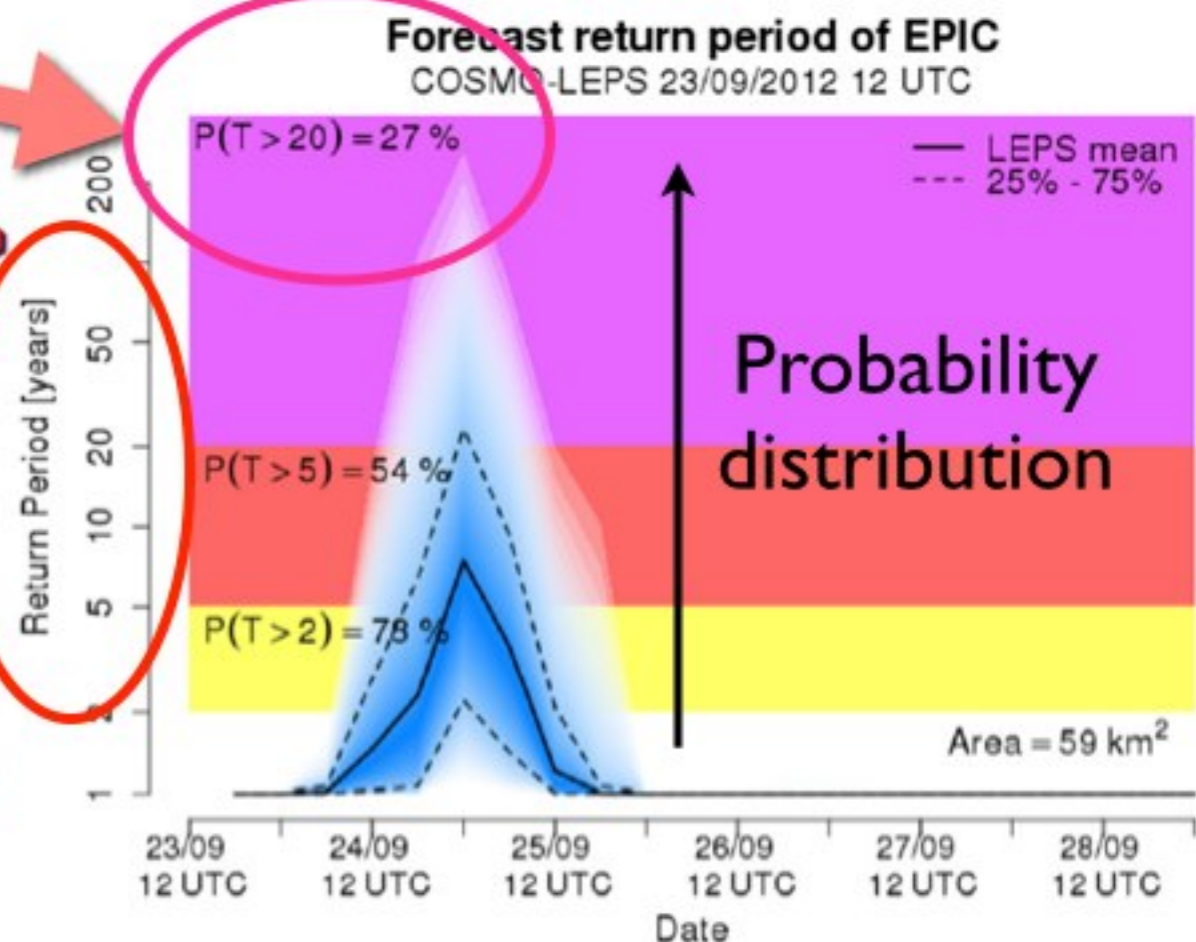


Probabilistic basin  
aggregated rainfall  
forecasts



Return Period of any  
member calculated by  
comparison against EPIC  
climatology

Warning code associated  
to the 75% percentile  
member

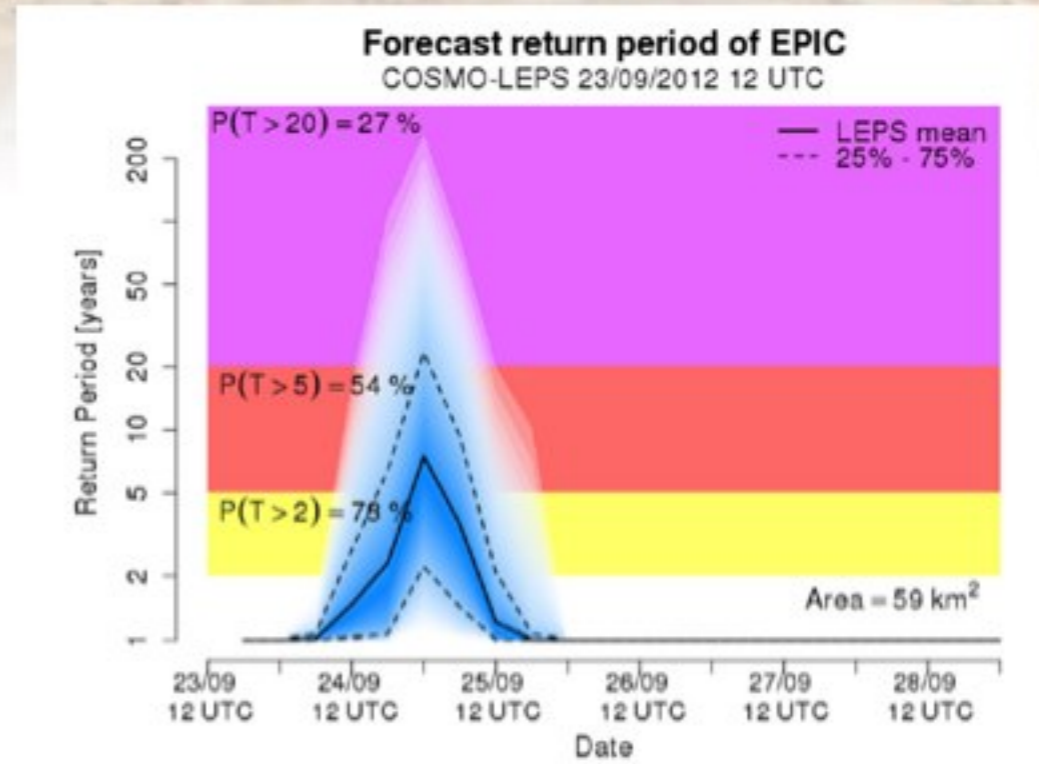




## FF & DF early warning systems

### Event of 2012-09-25 in Newcastle Upon Tyne (UK)

**EPIC 2012-09-23 12:00**



**Forecast 48h  
in advance**

#### Top story



**Floods hit 300 homes in north England**

26 Sep 2012: River defences under pressure in downpours, while fishing village is left covered in sea foam

#### Most recent

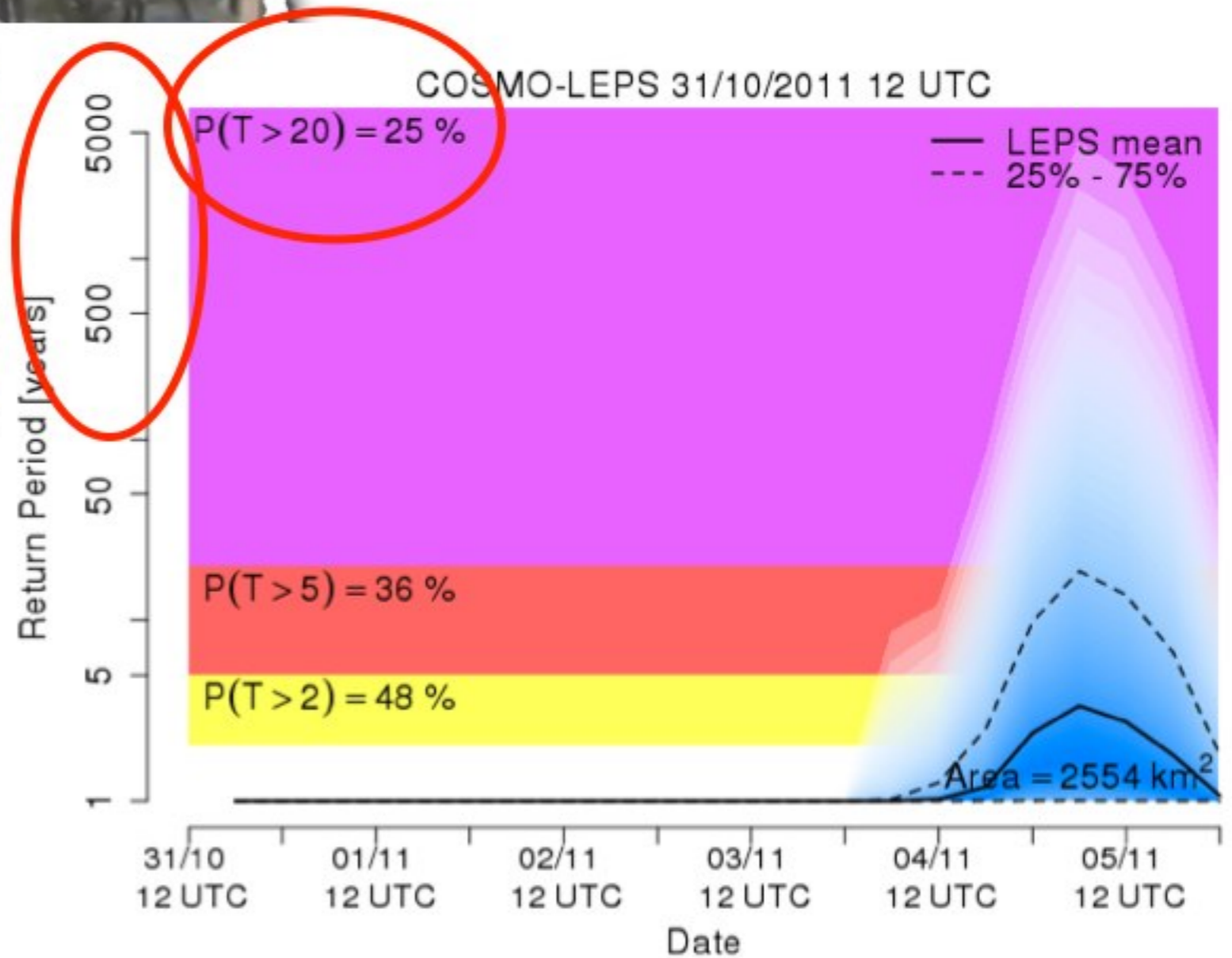


**Looters of flooded shop condemned by police**

26 Sep 2012: Newcastle upon Tyne cycle shop targeted as swollen rivers cause havoc in northern England



# Genova (Italia) 4/11/2011



**4 days** ahead Forecast

# Genova (Italia) 4/11/2011



European Commission  
**Joint Research Centre**  
 Institute for Environment and Sustainability

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Gmes EFAS

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Sánchez-Diezma Rafael Log out

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EFAS forecasting Forecasts available from 2009-05-01 to 2012-06-12 (12 UTC)

2011-11-02 (12 UTC)

search for location...

SELECTED POINT - Close all

Report an error

COSMO-LEPS 02/11/2011 12 UTC

Return Period [years]

Area = 148 km<sup>2</sup>

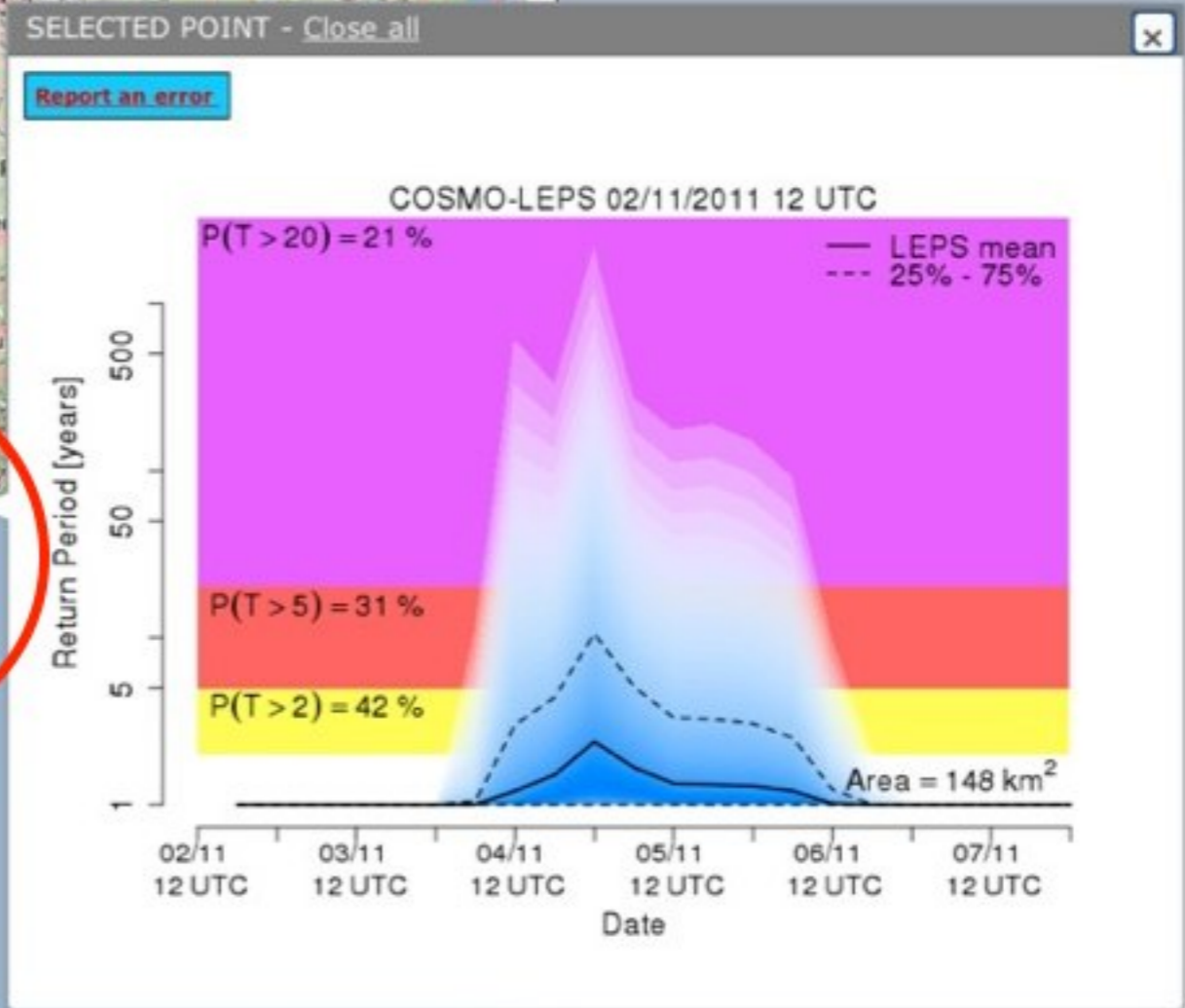
02/11 12 UTC 03/11 12 UTC 04/11 12 UTC 05/11 12 UTC 06/11 12 UTC 07/11 12 UTC

Date

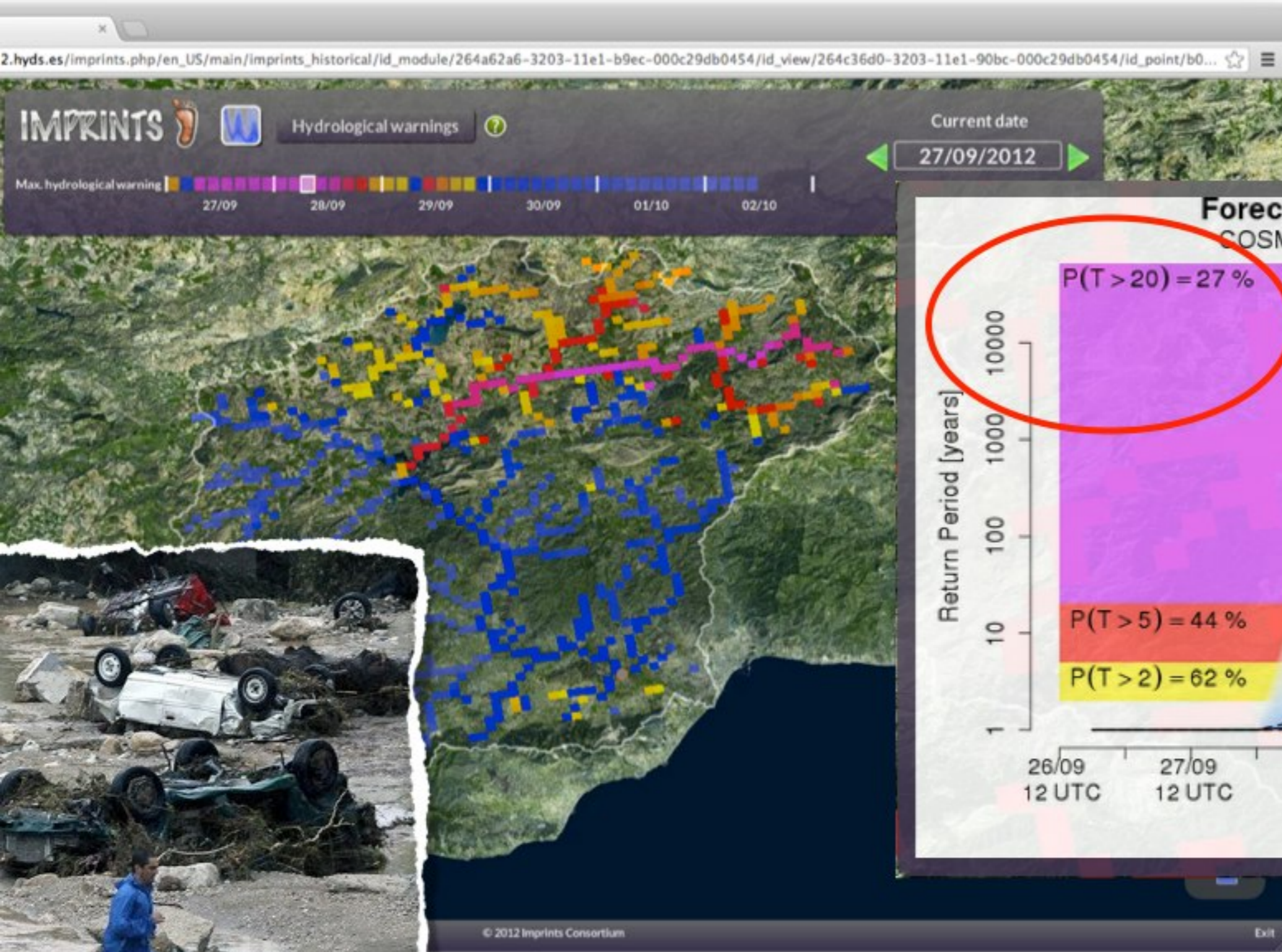
8.95386, 44.06759

EFAS Team

2 days ahead Forecast



# Guadalhorce 28/09/2012



**36 hours ahead Forecast**



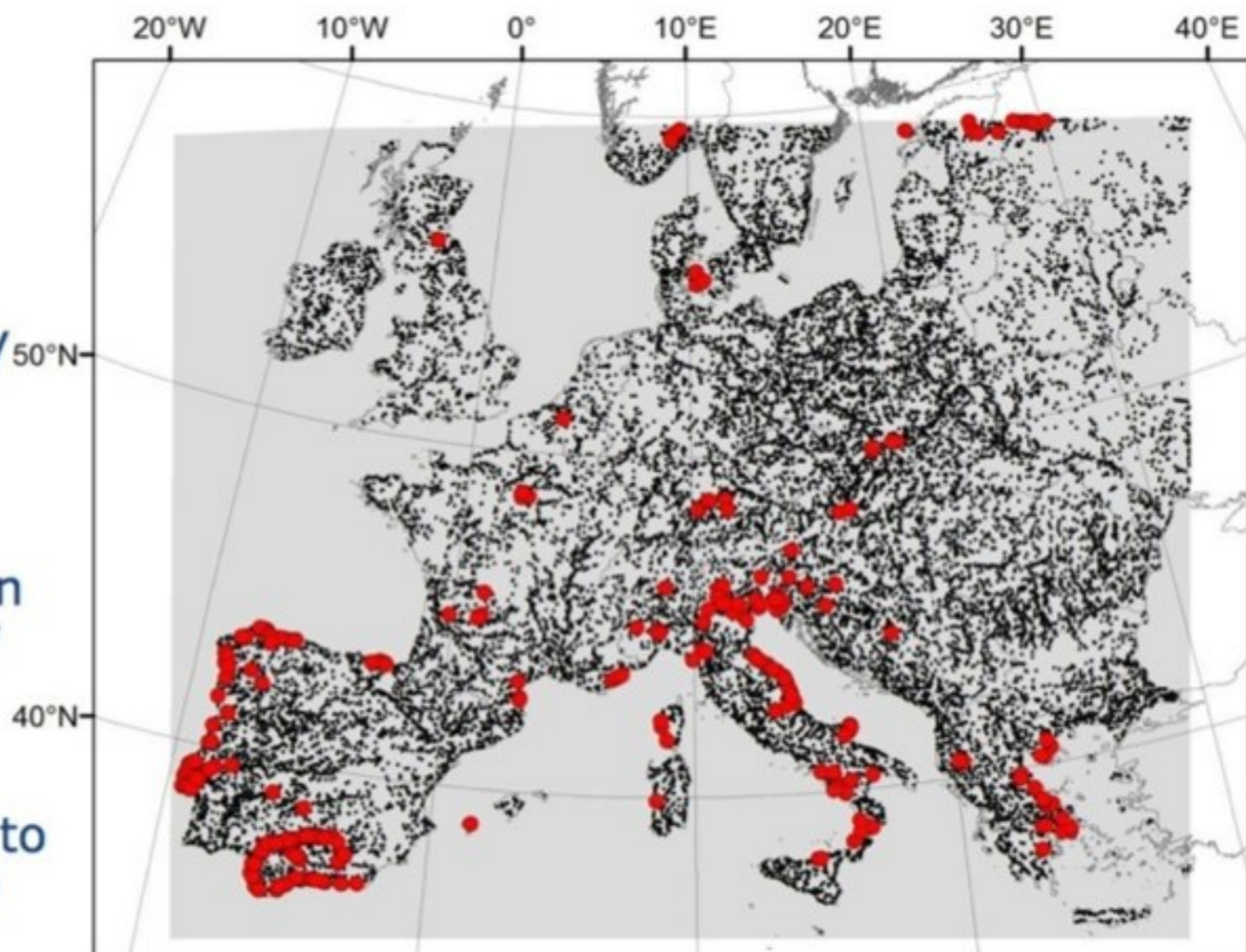
## Performance of EPIC

22 months data starting on 1/12/2009.

We derived an alert criterion for extreme events of 60% probability of exceeding the 5-year return period.

363 points above the alert criterion were clustered in 50 events, 42 of which were confirmed events.

Out of 8 false alarms, 3 were due to boundary issues and can be easily recognized and removed





**IMPRINTS** 

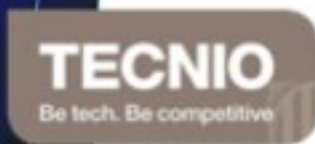
**EDHIT** 



European  
Civil Protection

CIAI E LOGICION

**Can we increase the resolution  
in time and space  
using radar data?**

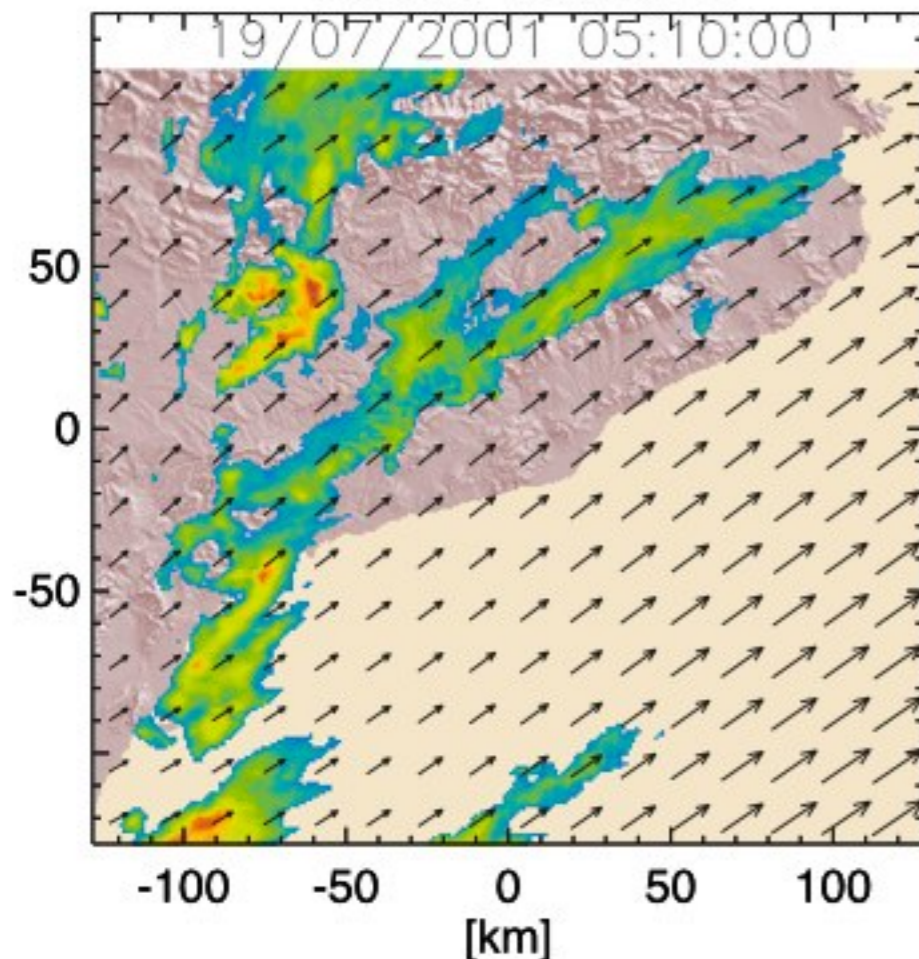


# *Radar-based rainfall nowcasting*

## Precipitation nowcasting by extrapolation of radar observations

**I. Tracking:** The motion field of rainfall is estimated from observations.

observations



# Radar-based rainfall nowcasting

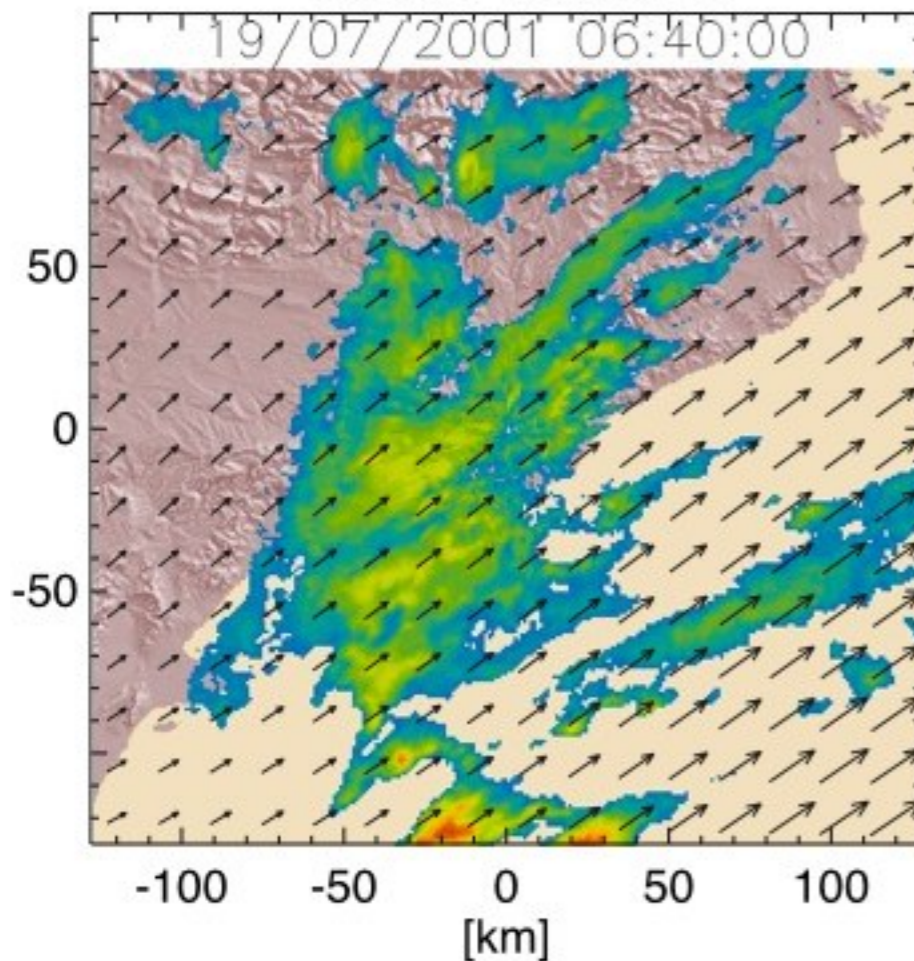
## Precipitation nowcasting by extrapolation of radar observations

**1. Tracking:** The motion field of rainfall is estimated from observations.

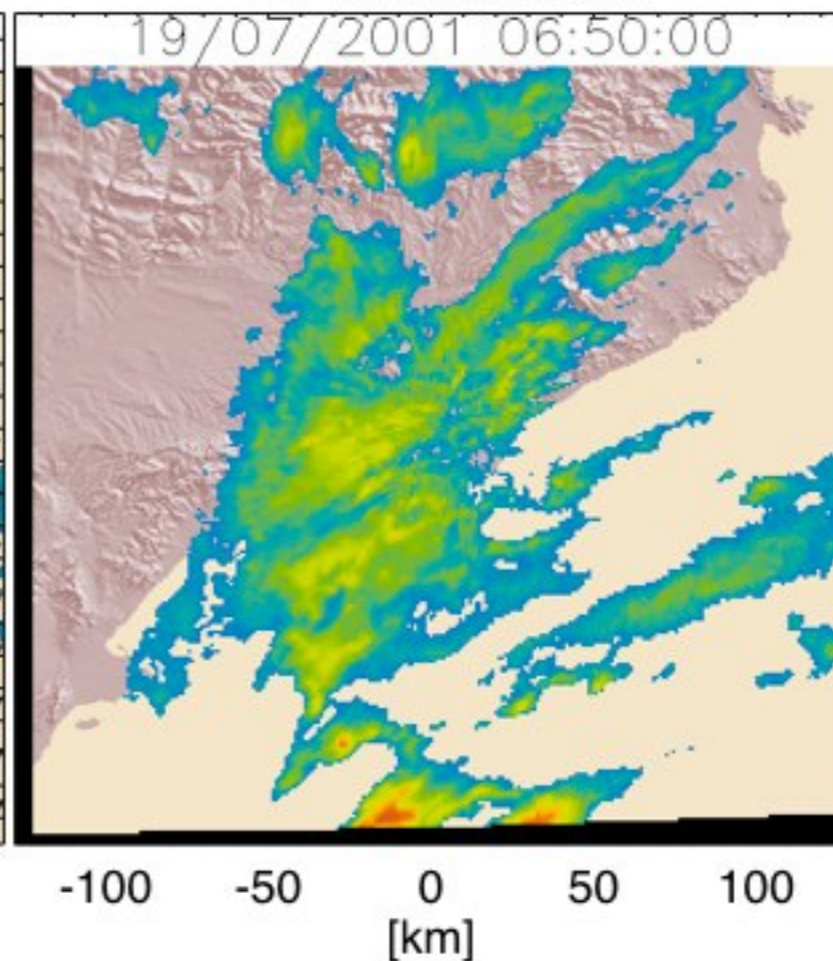
**2. Extrapolation:** The most recent field is extrapolated accordingly.

1 radar → up to 2 hours

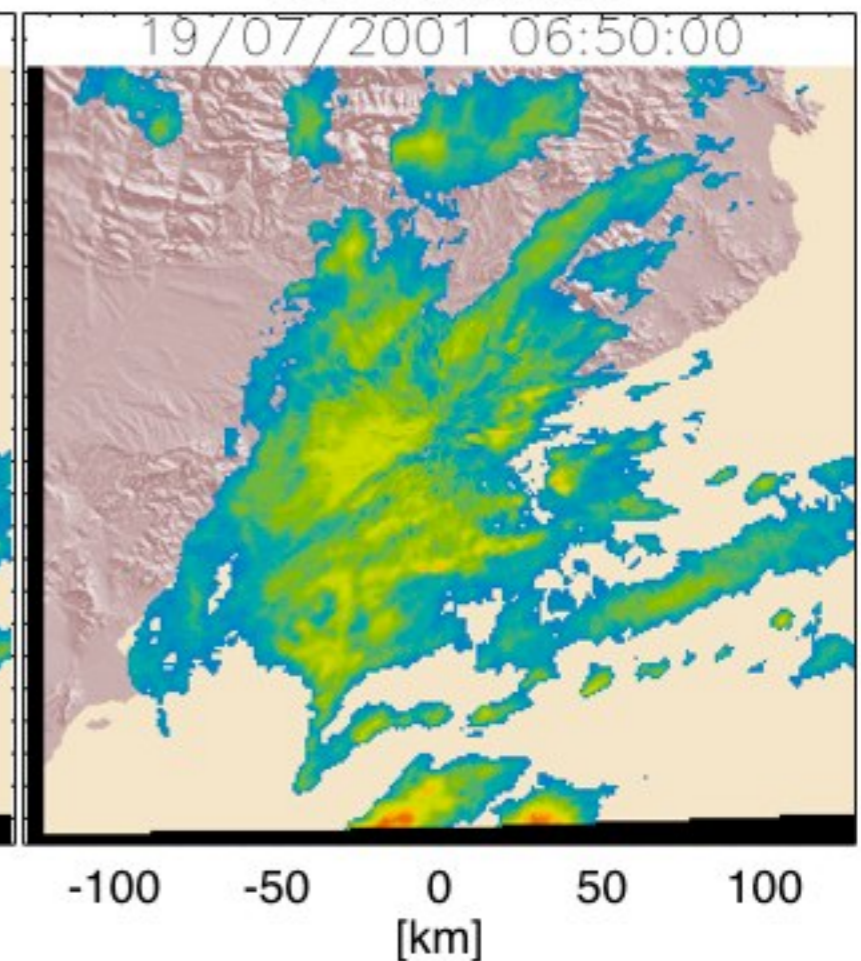
observations



LP nowcasts



verification

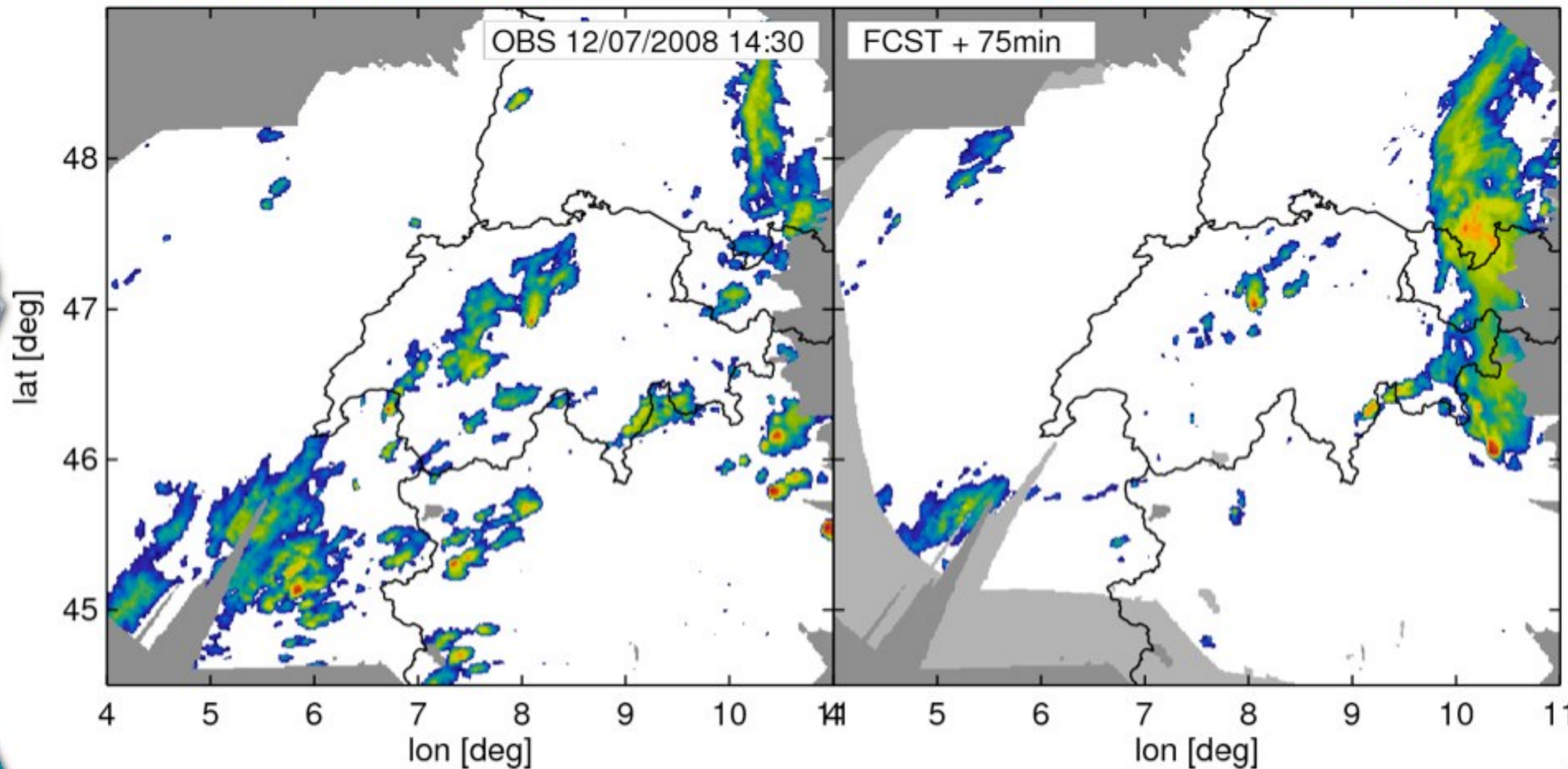


# Examples (II) - Switzerland

Over a 3-radar network: **75-min forecasts**.

**Observations**

**75 min Forecasts**



**CRAHI Algorithm of nowcasting by lagrangian persistence**

*Berenguer et al. J. Hydrometeorology, 2005*



# EU radar mosaic



OPERA  
EIG EUMETNET PROGRAMME

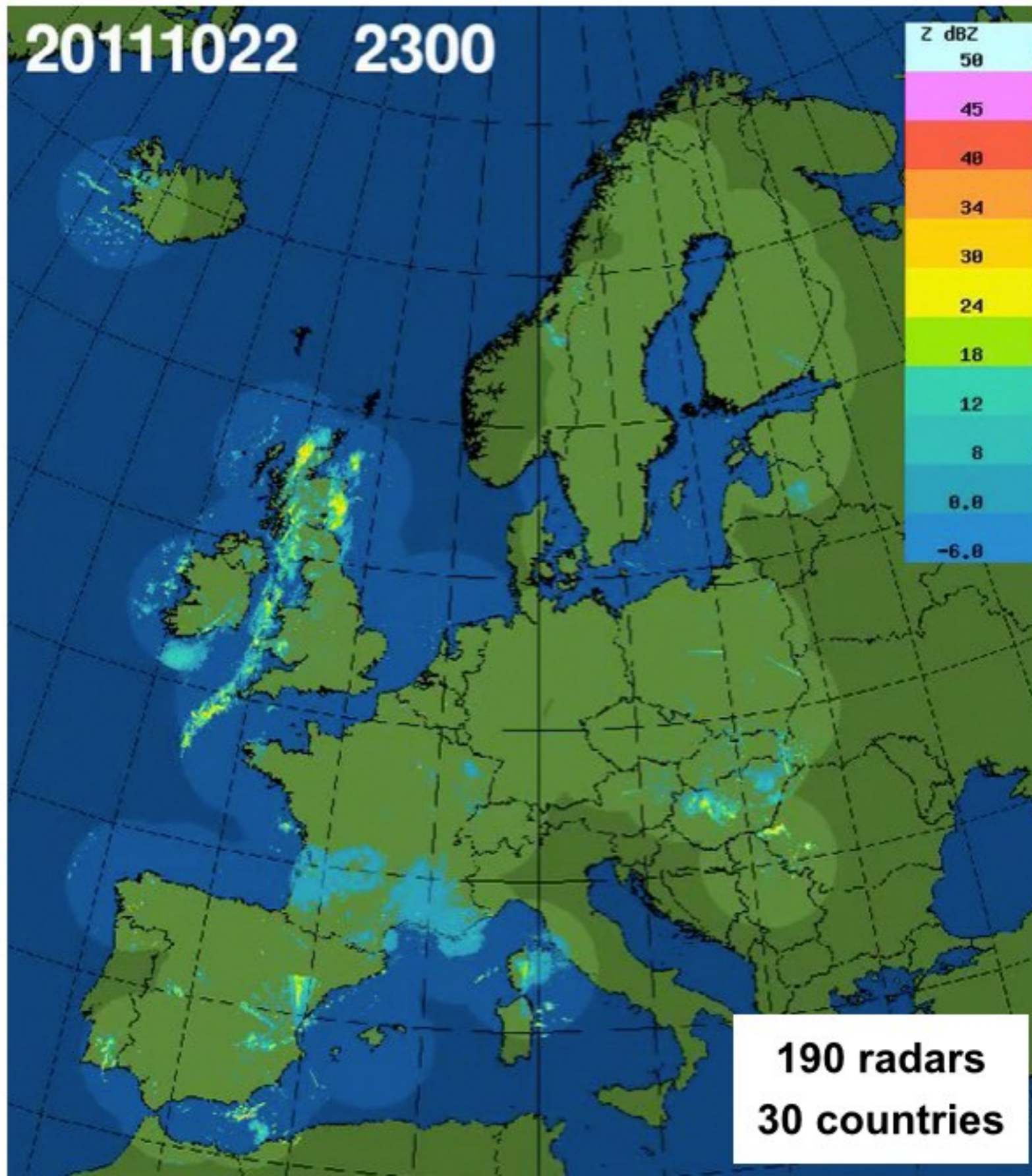
## OPERA radar mosaic:

- Precipitation observations over Europe @2 km and every 15 minutes.
- Operationally produced since mid 2011.
- First nowcasting demonstration (HAREN project): June 2012-September 2013
- Second demonstration:  
**June 2014-July 2015**

# EDHIT



European  
Civil Protection





# **Radar-based rainfall nowcasting at European Scale based in OPERA EDHIT products**

**Improved Nowcasting  
of RAINFALL  
INTENSITIES  
(up to 6h)**

**Rainfall hourly  
Accumulations  
forecasts  
(up to 6h)**

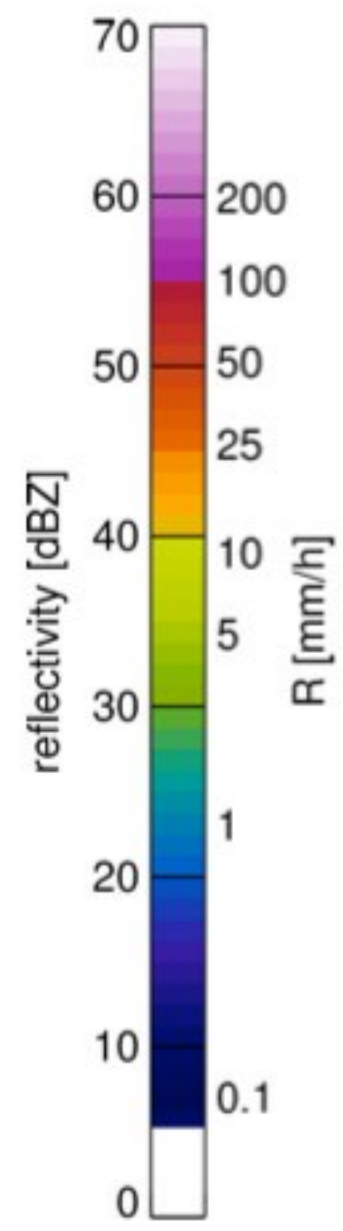
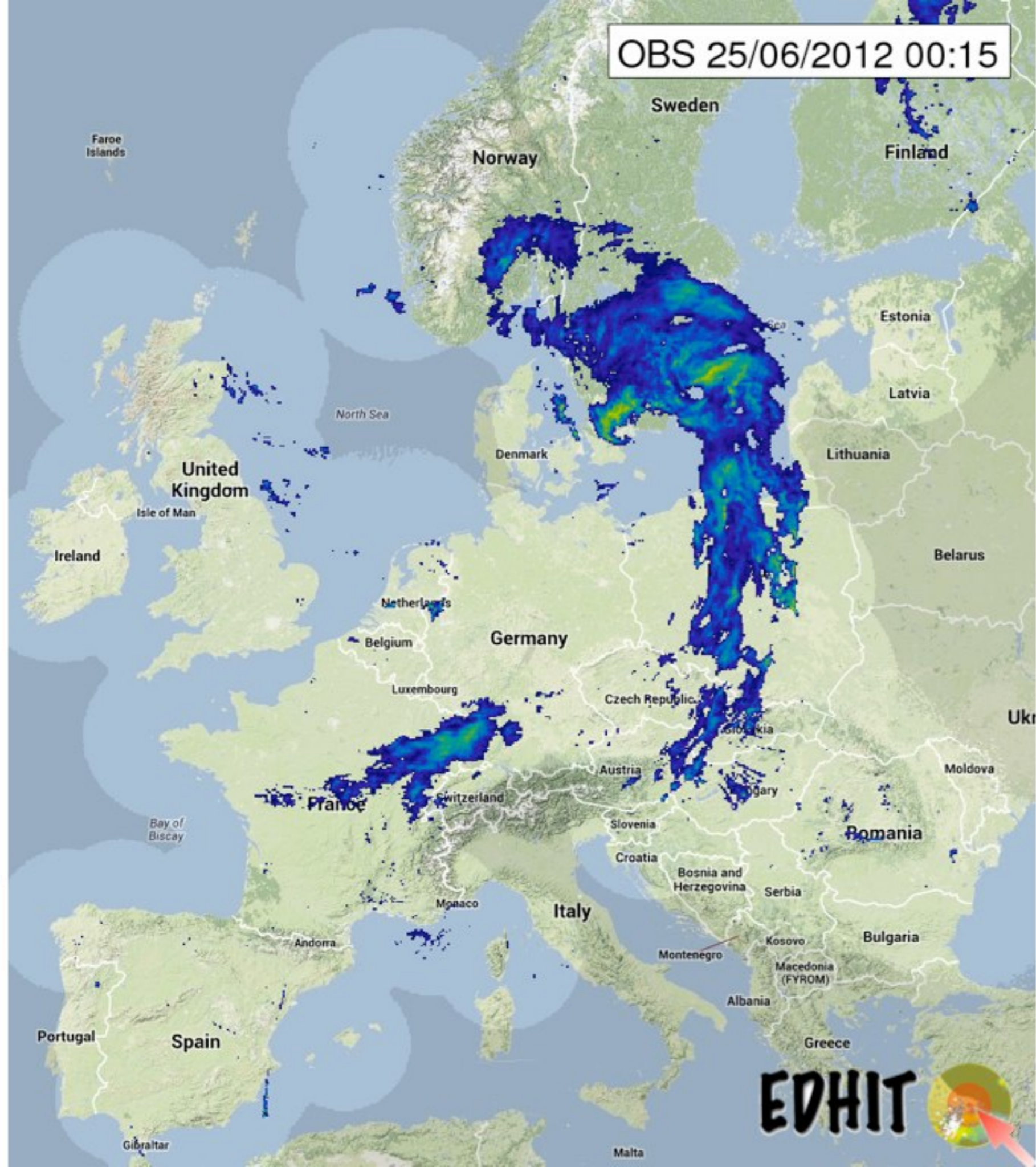
**Daily rainfall  
Accumulations**

**Hydrological  
Hazard forecasts  
(up to 6h)**

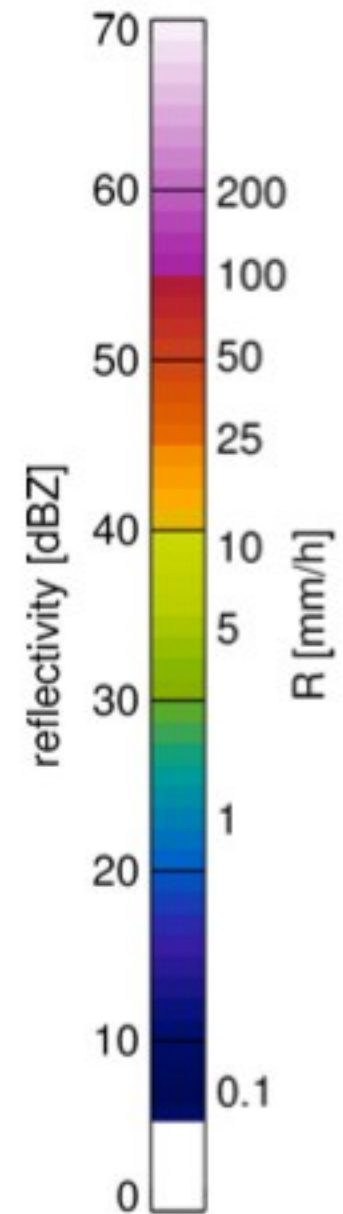
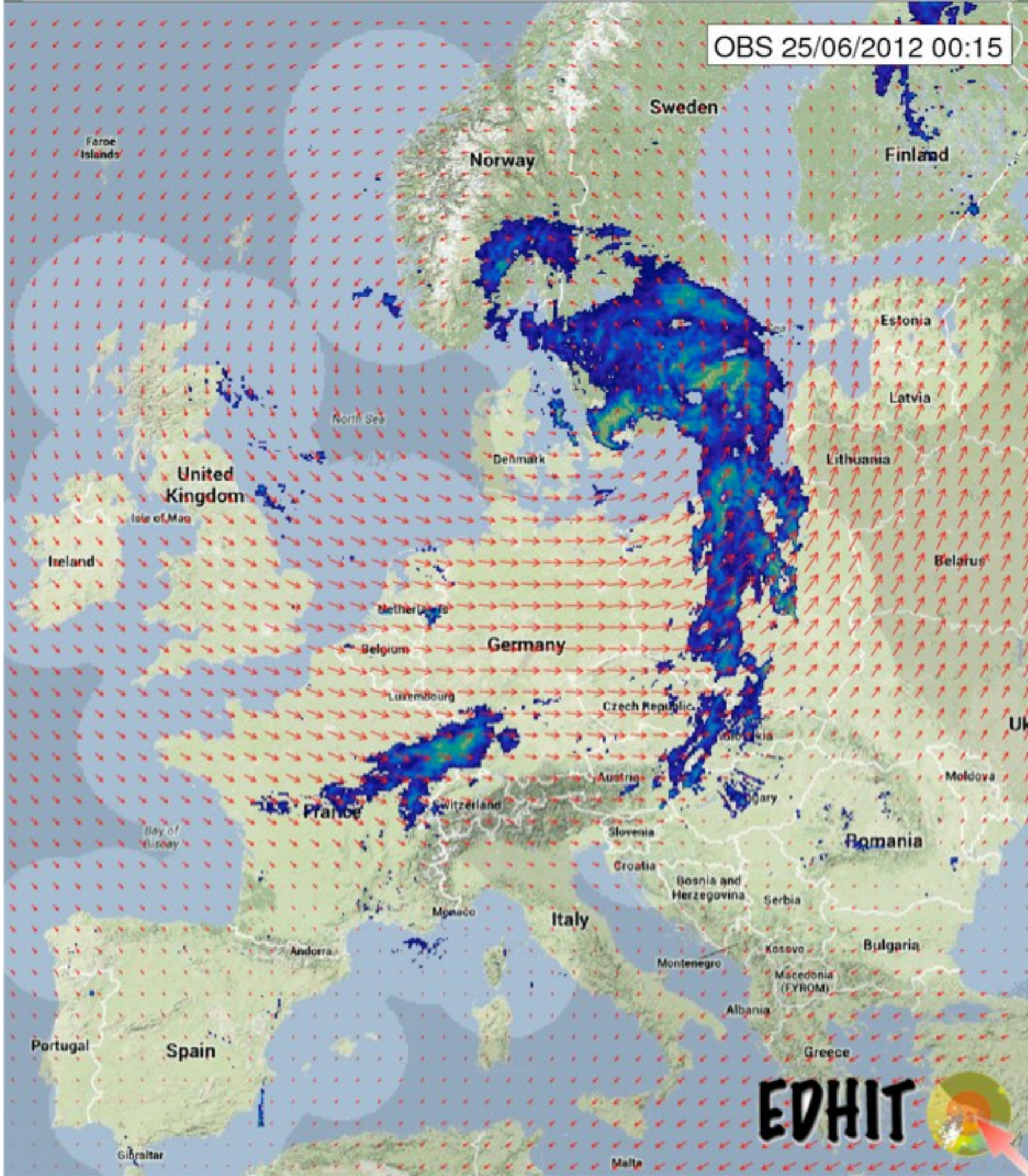
**Hourly HAZARD  
IDENTIFICATION  
forecasts  
(up to 6h)**

**Nowcasting of  
Lightening  
(up to 3h)**

OBS 25/06/2012 00:15



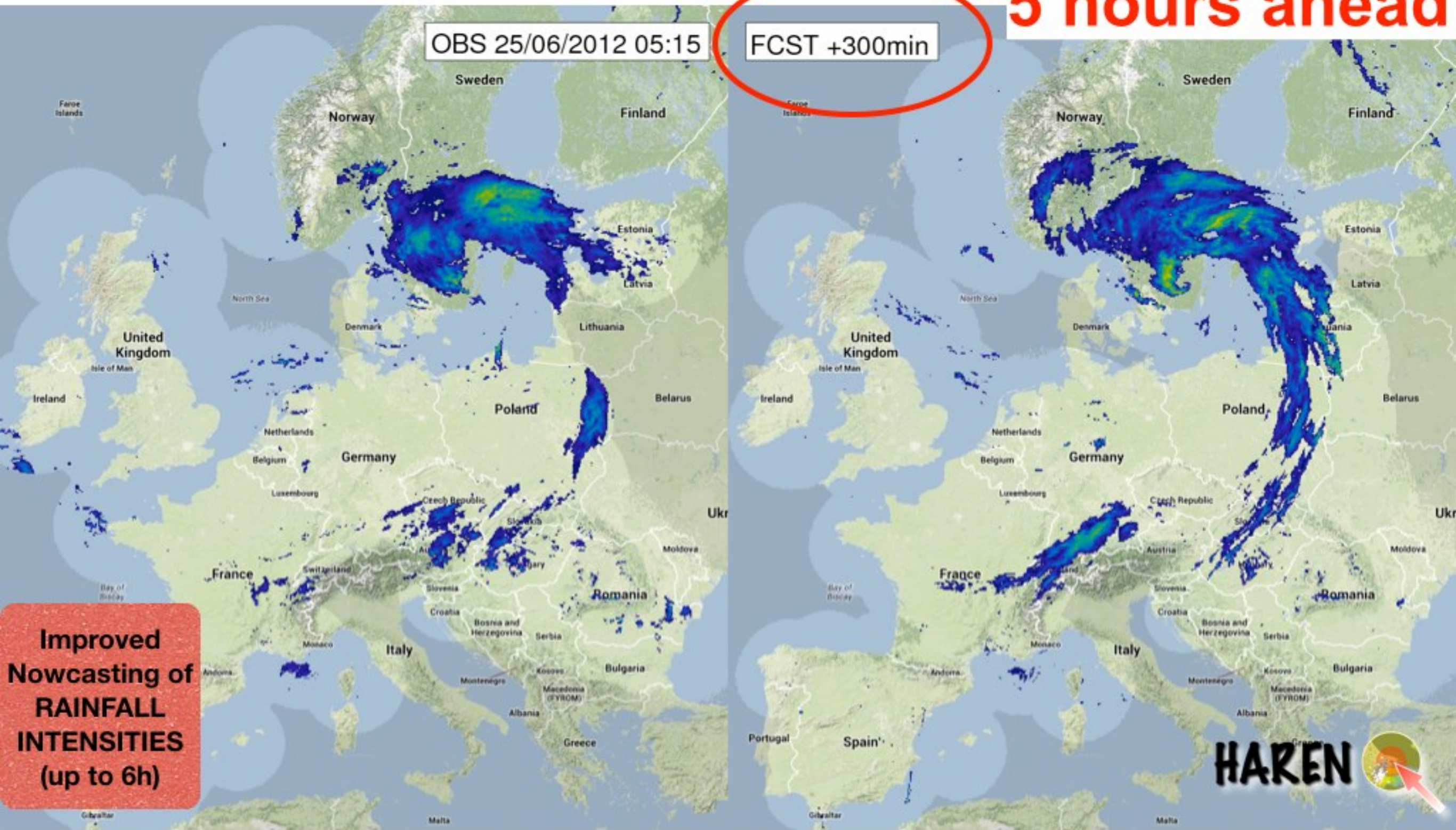
OBS 25/06/2012 00:15



# European Radar Nowcasting - OPERA mosaics

Over a network of 150+ radars.

**5 hours ahead**

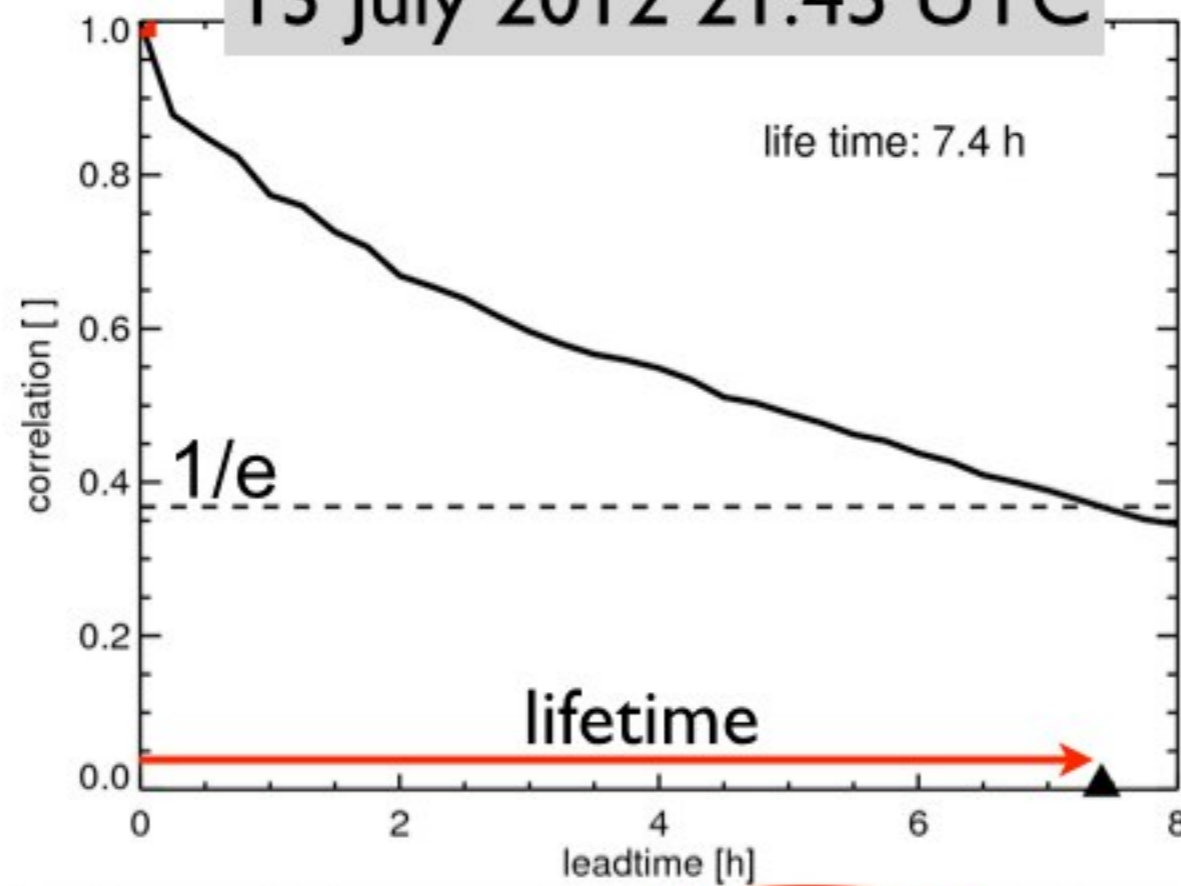


**CRAHI Algorithm of nowcasting by lagrangian persistence**

*Berenguer et al. J. Hydrometeorology, 2005; J. of Hydrology, 2011*

# Nowcasting evaluation

13 July 2012 21:45 UTC

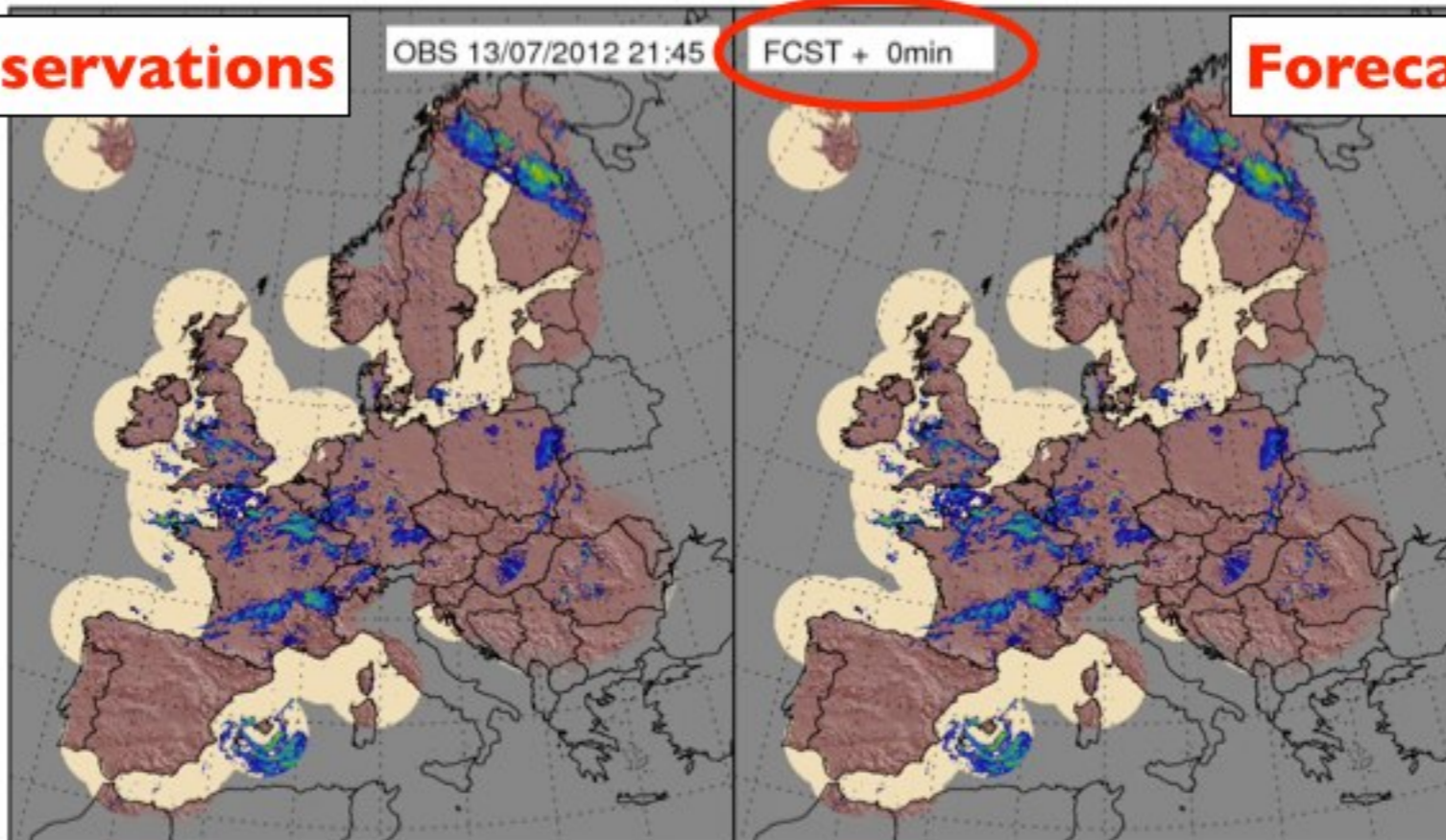


**Observations**

OBS 13/07/2012 21:45

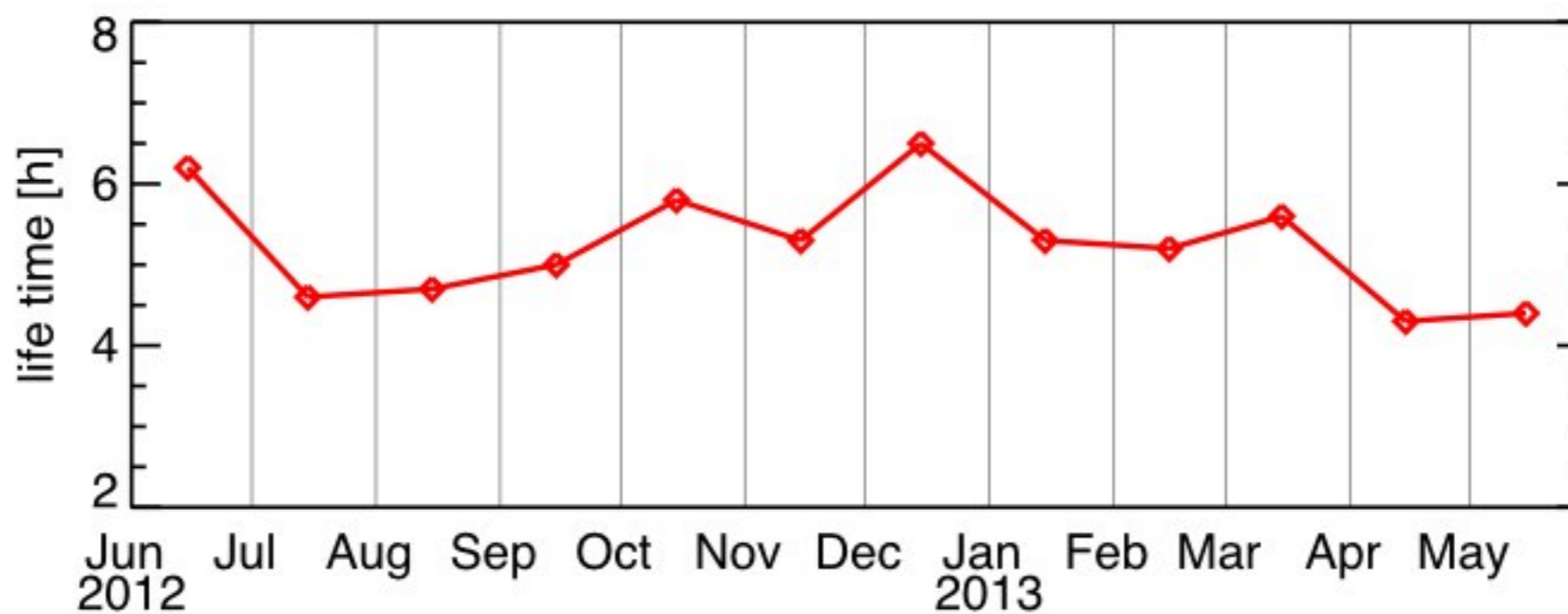
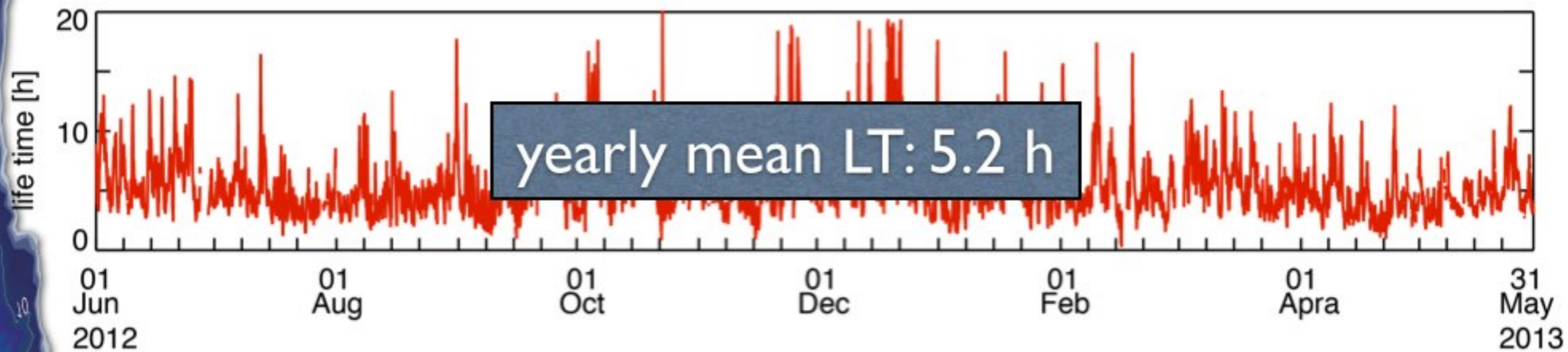
FCST + 0min

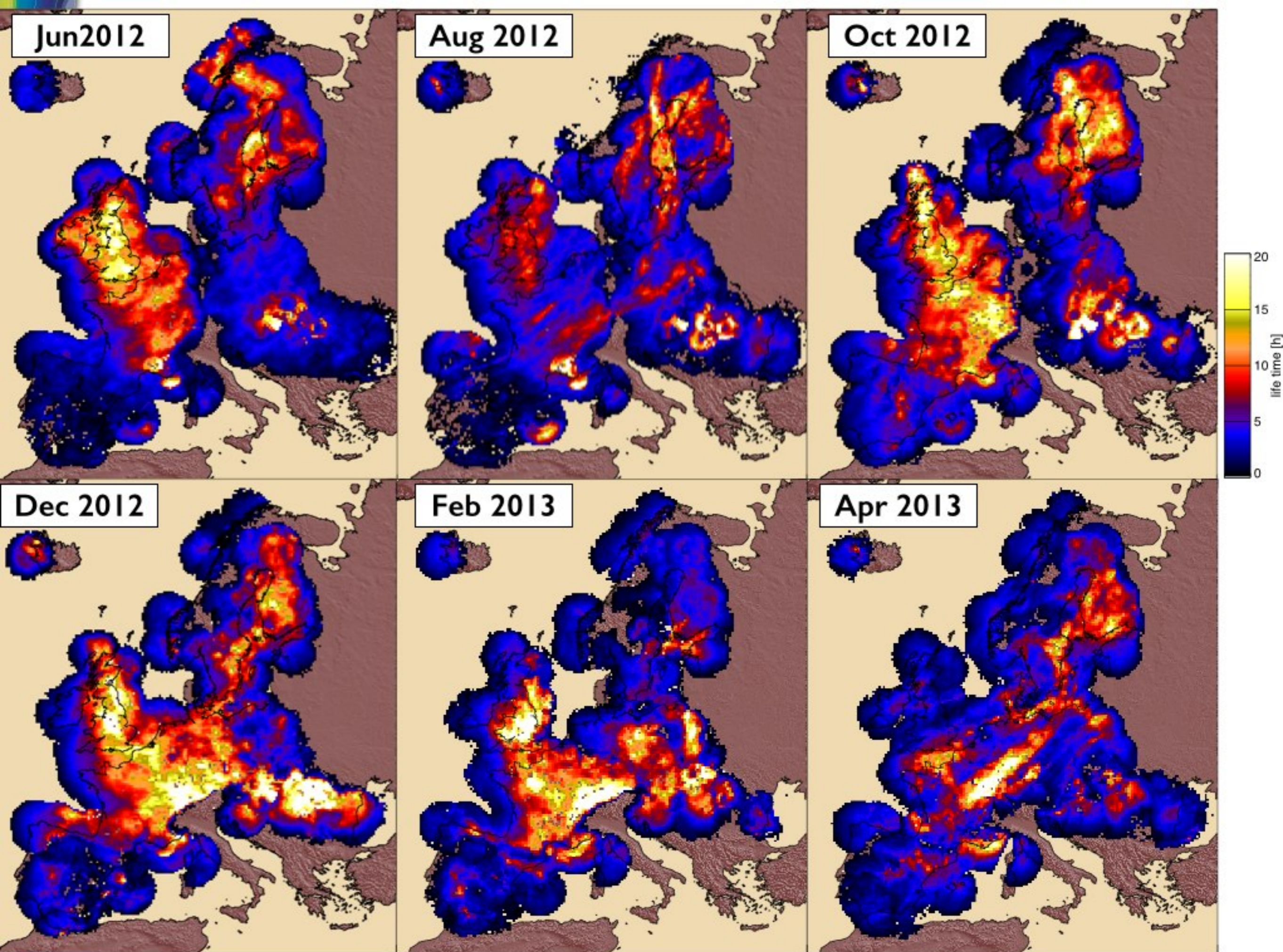
**Forecasts**



# Long-term evaluation

in the period **01 June - 31 May 2013**

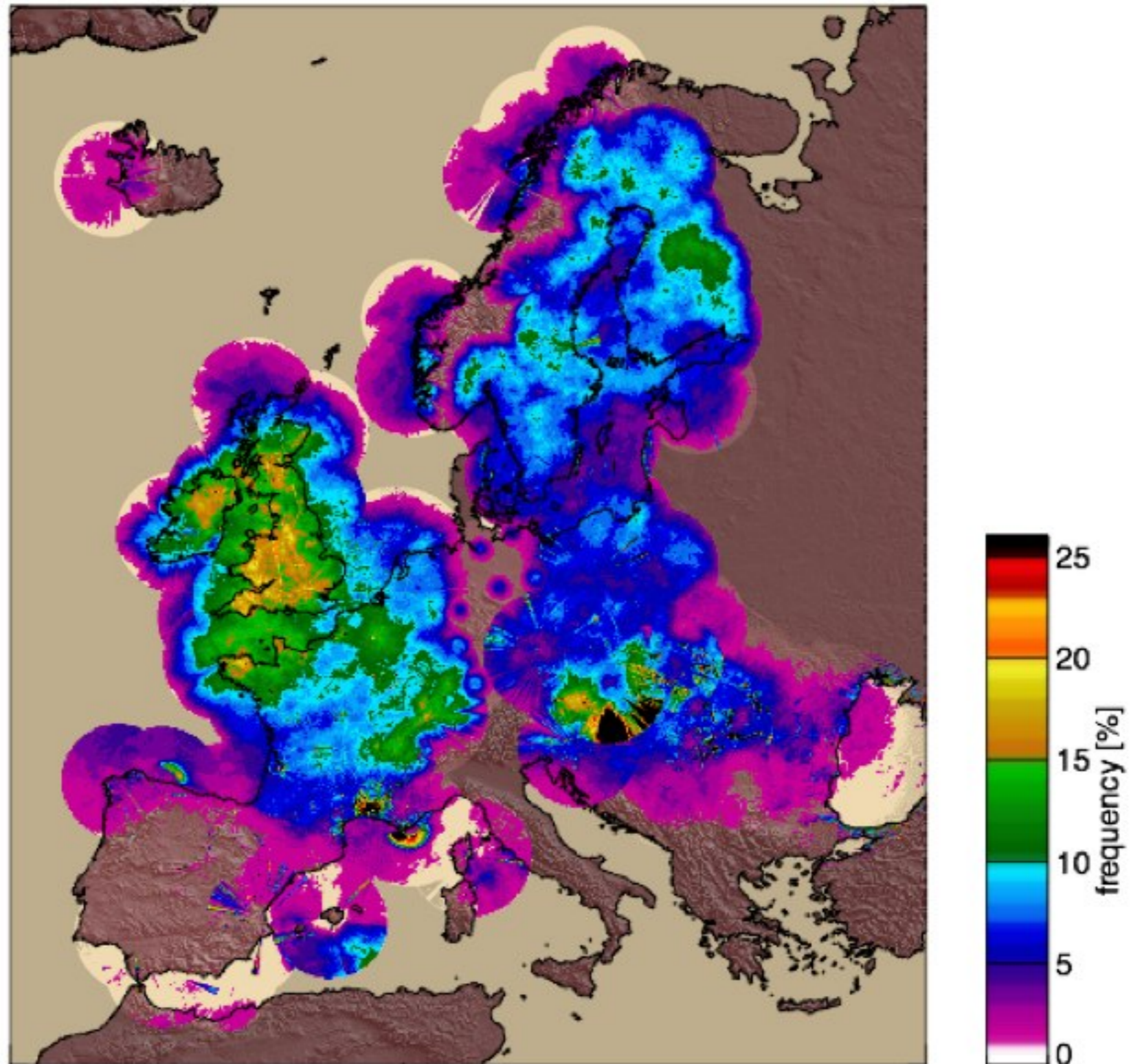




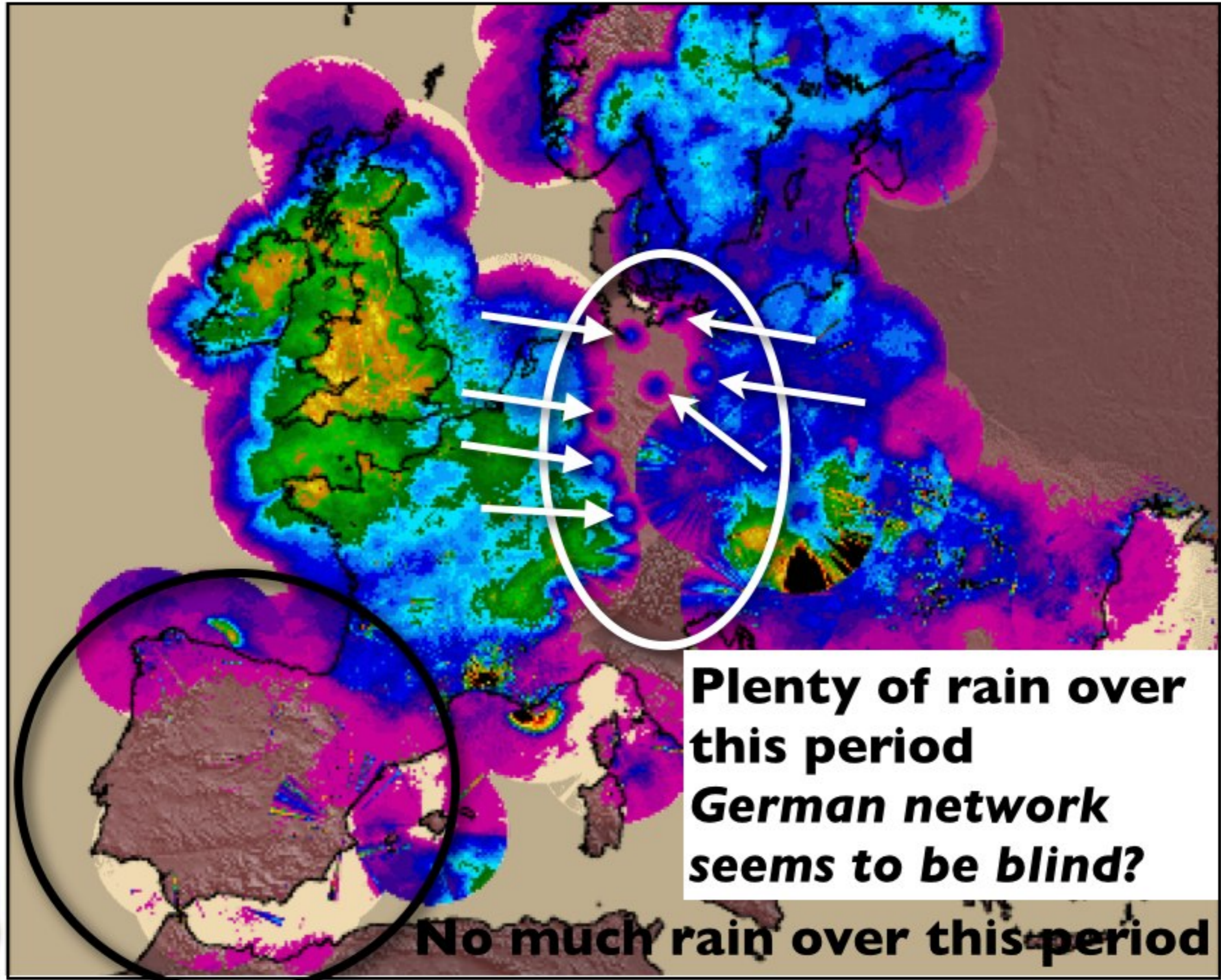


# Frequency dBZ > 10 dBZ

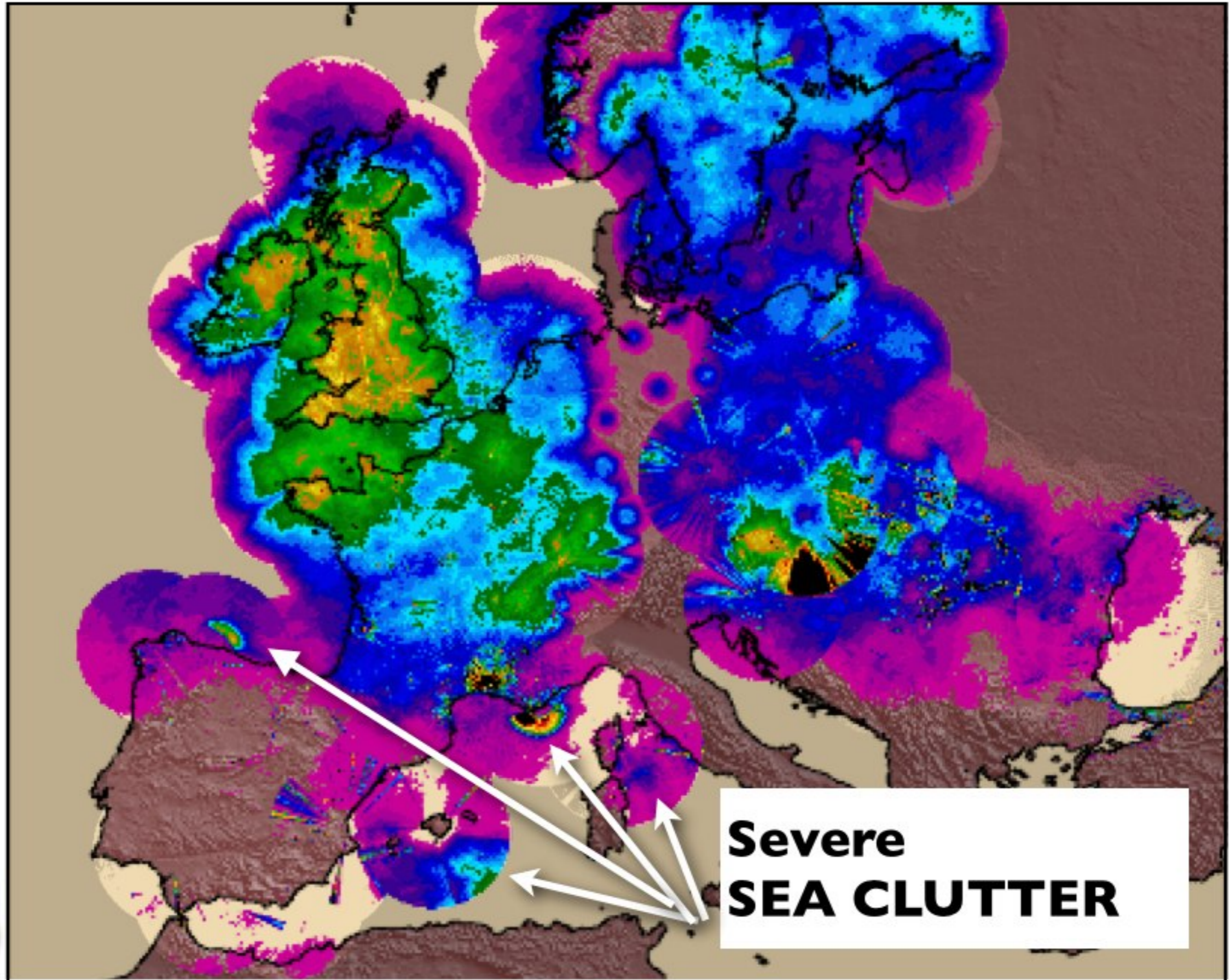
in the period **01 June - 31 July 2012 (5856 maps)**



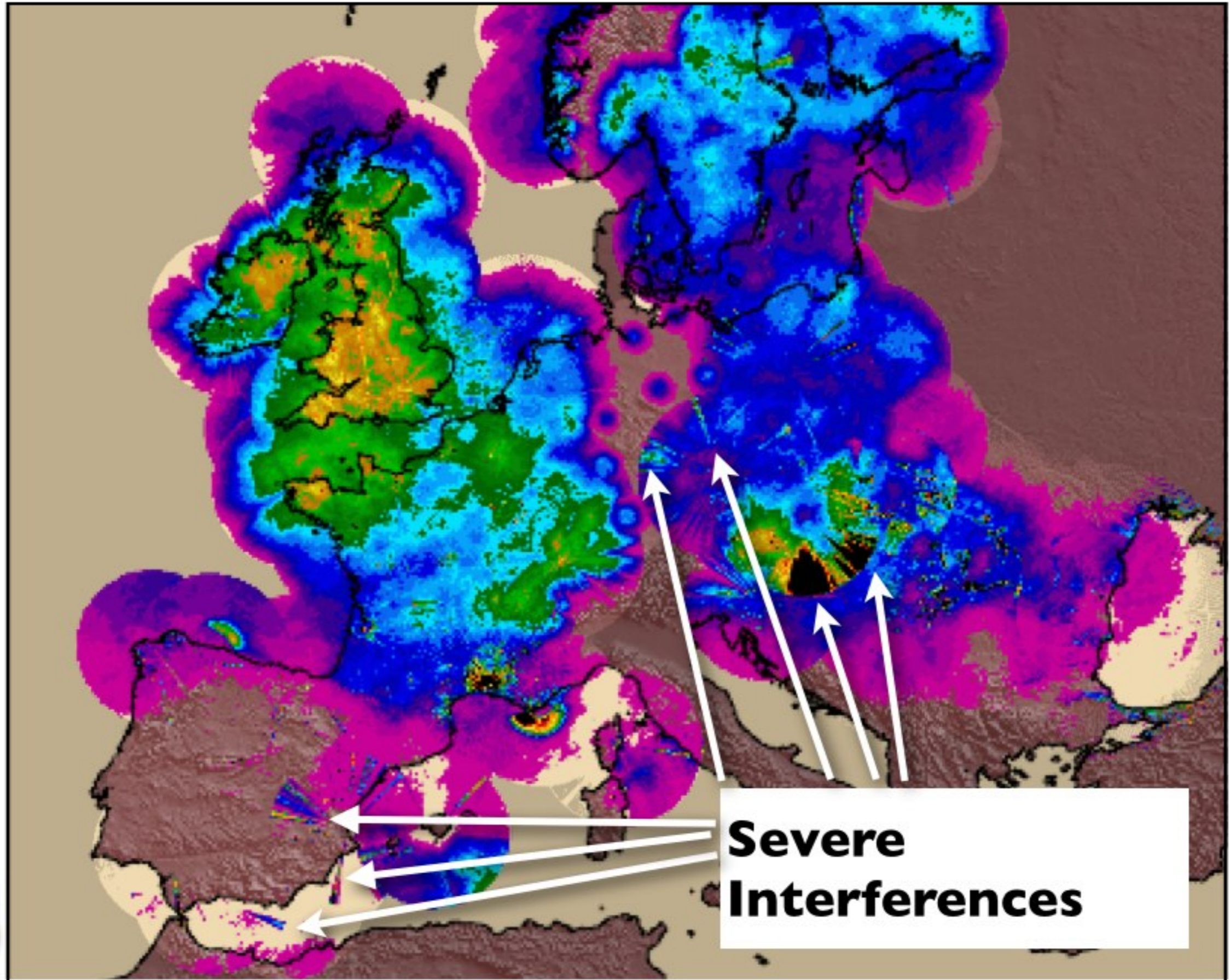
# Frequency dBZ > 10 dBZ



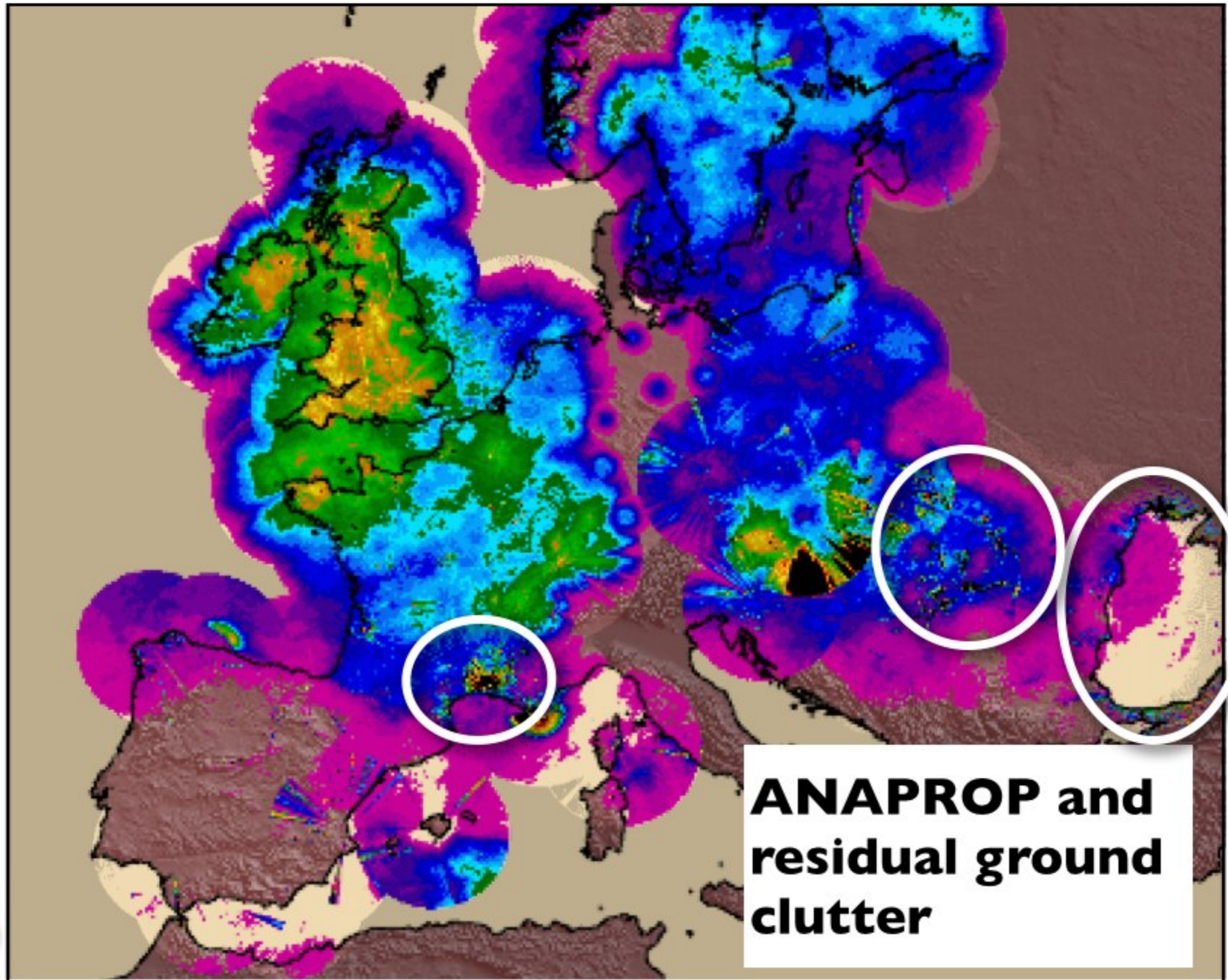
Frequency dBZ > 10 dBZ



Frequency dBZ > 10 dBZ



Frequency dBZ > 10 dBZ



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Password:

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Register(\*)

User guide

(\*)Access to the EDHIT platform is limited to the project partners and stakeholders and to OPERA delegates.



FINNISH  
METEOROLOGICAL  
INSTITUTE



ZAMG



DIRECCIÓN GENERAL  
DE PROTECCIÓN CIVIL  
Y EMERGENCIAS



SISÄMINISTERIÖ  
INRIKESMINISTERIET

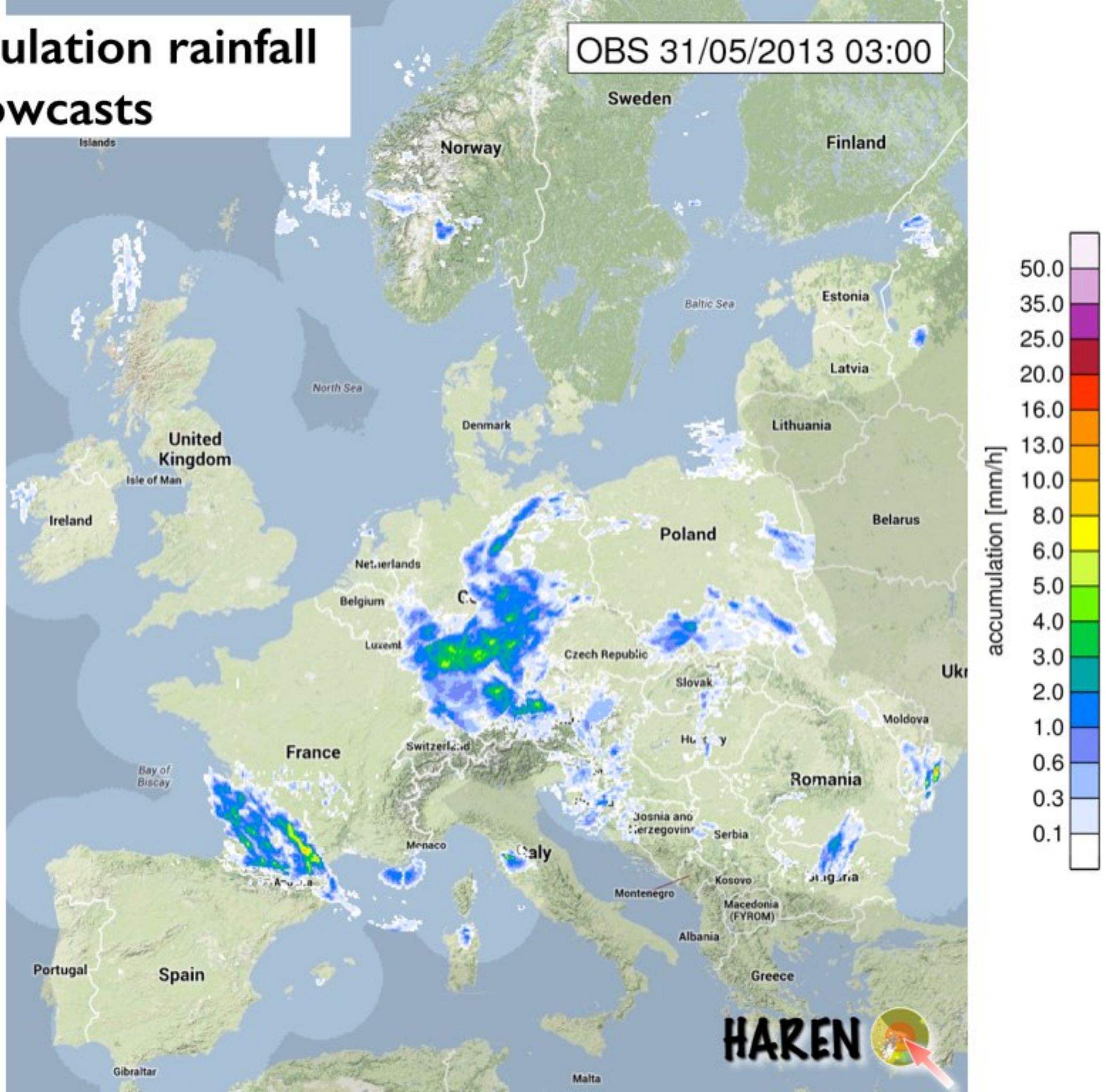


SMHI

<http://www.edhit.eu>

# 1h-accumulation rainfall nowcasts

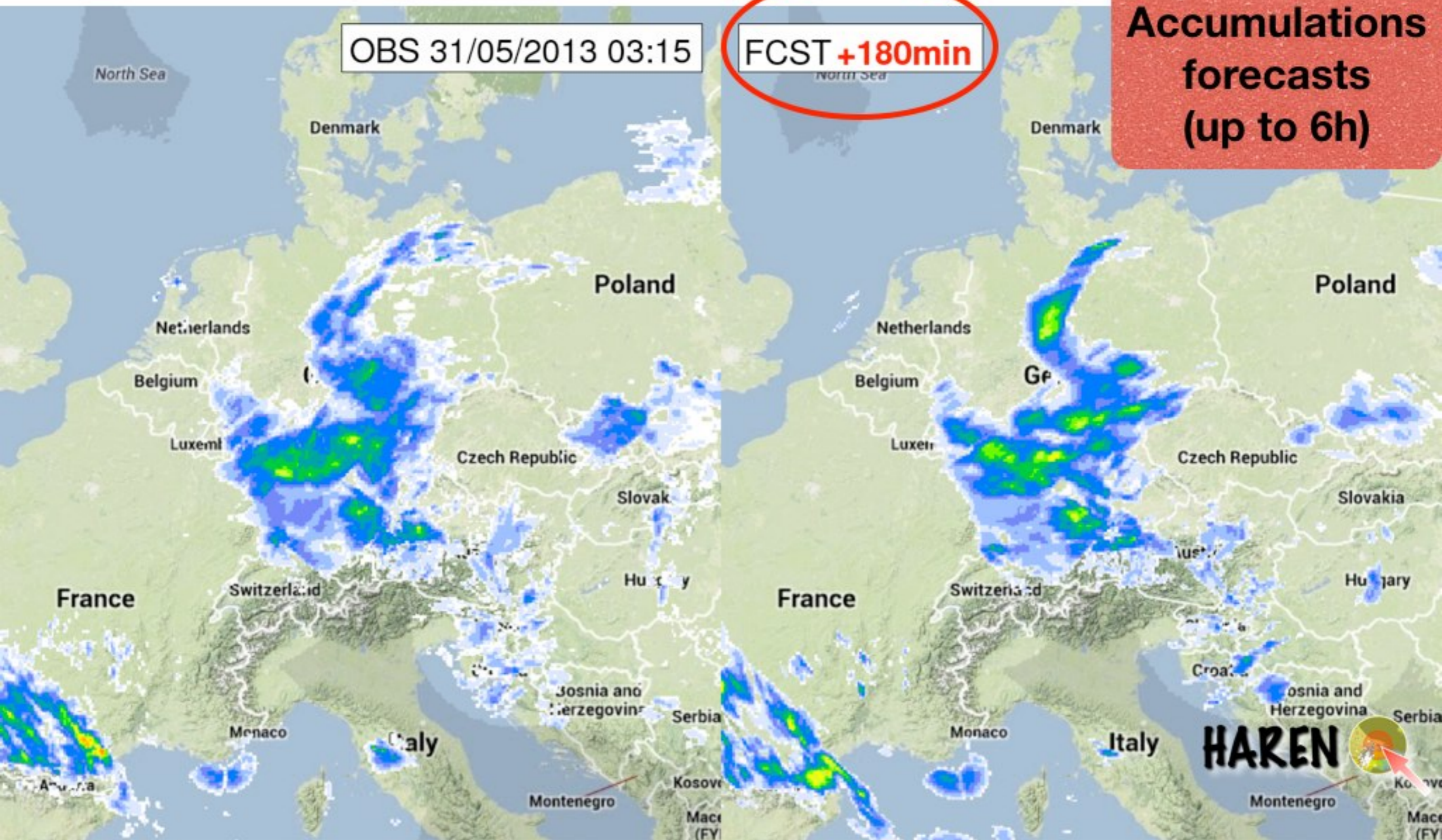
OBS 31/05/2013 03:00



# 1h-accumulation rainfall nowcasts

## Nowcasts @ 31 May 2013 3h ahead

Rainfall hourly  
Accumulations  
forecasts  
(up to 6h)



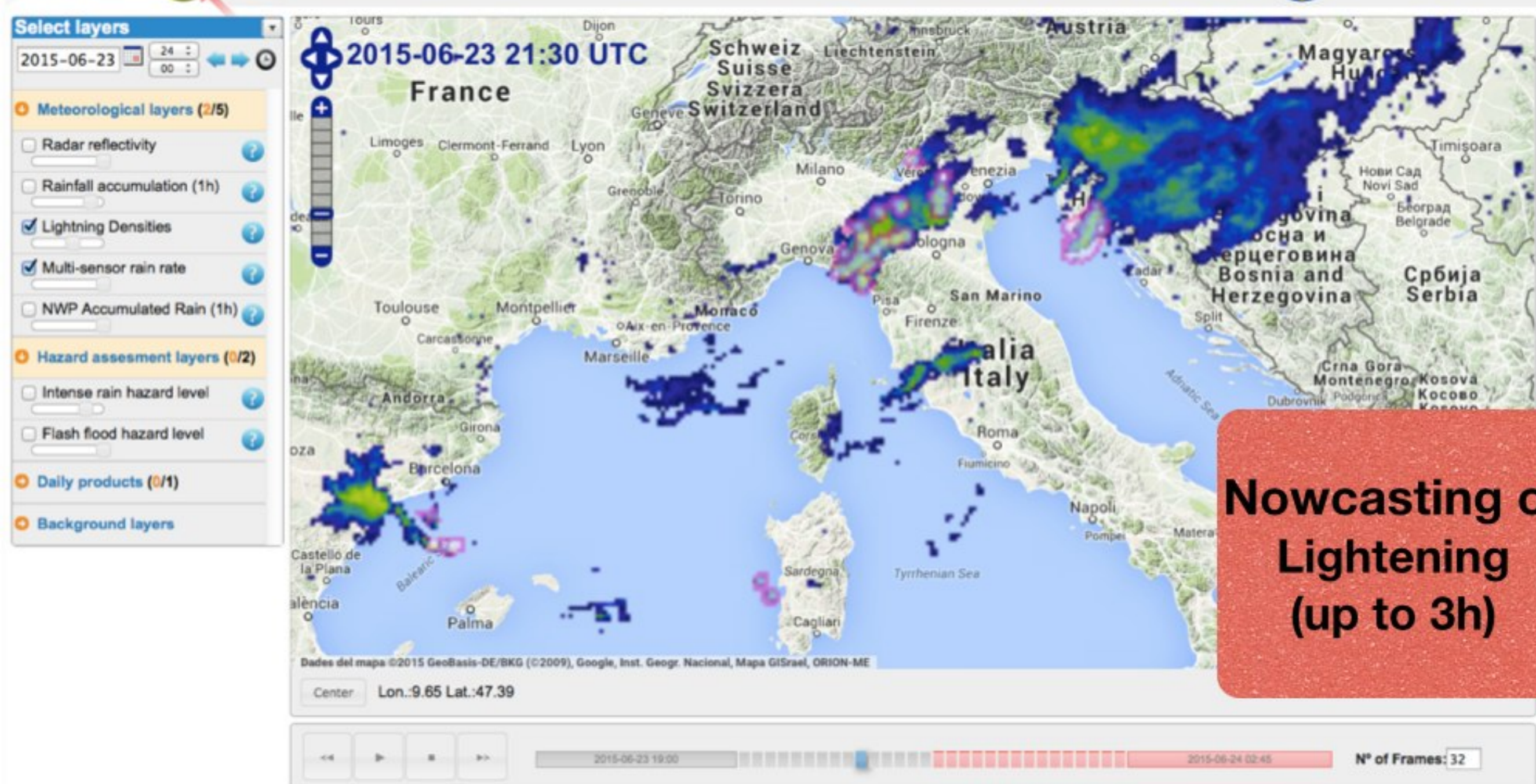


# Genova (Italy) on 10<sup>th</sup> of October 2014



**Daily rainfall  
Accumulations**

after  $> 300$  mm of accumulated rain in few hours



**Nowcasting of Lightning (up to 3h)**



EDHIT partners:



EDHIT stakeholders:



Select layers

2014-09-29 17:00

N° of Frames 64

**Meteorological layers 1/5**

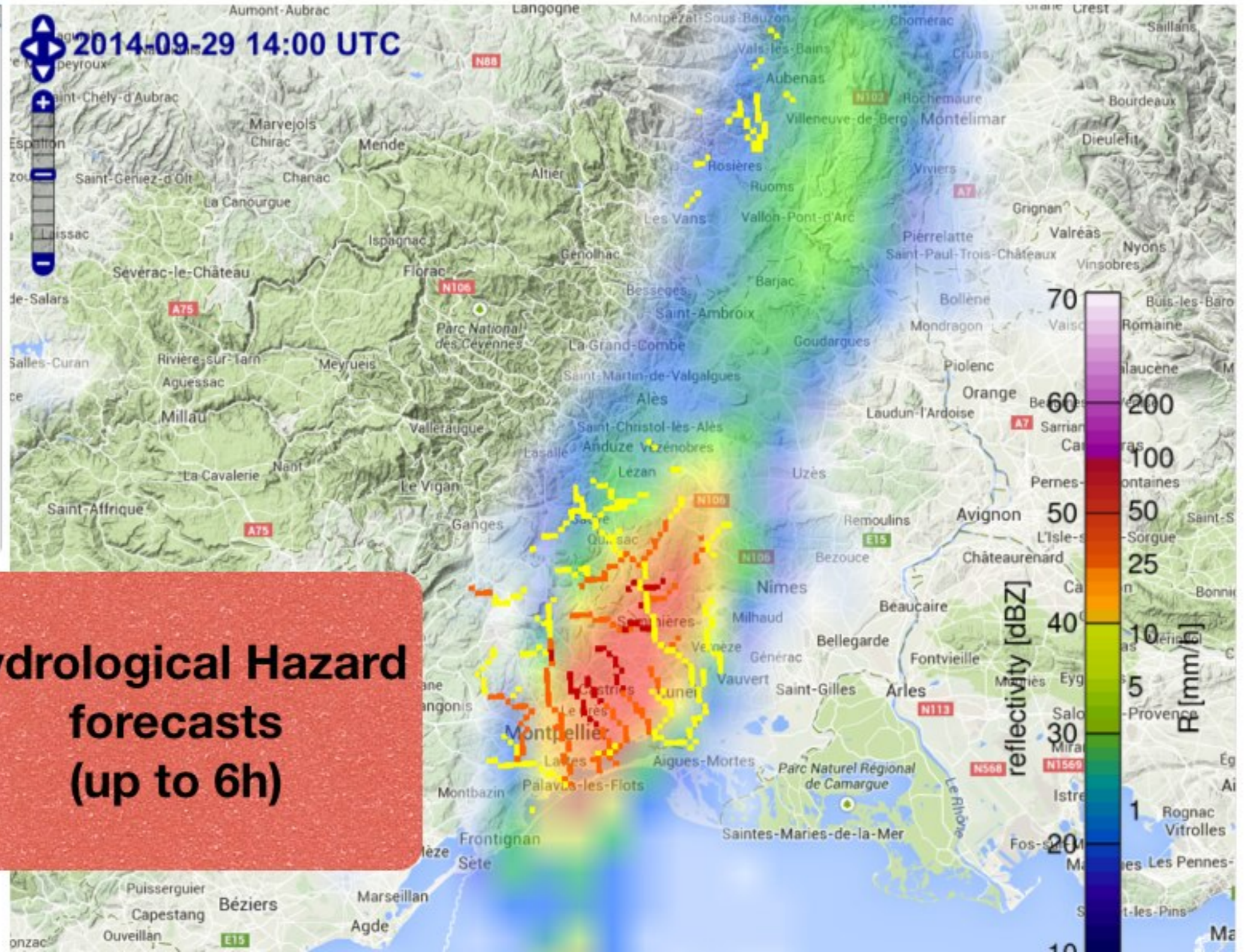
- Reflectivity (dBZ)
- Accumulated Rain (1h)
- Lightning Densities
- Combined Radar + Lightning
- NWP Hourly Accumulations

**Hazard assesment layers 1/2**

- Hazard Assessment
- Drained Rain Alert

**Daily products 0/1**

Topographies



**Hydrological Hazard forecasts (up to 6h)**

# CASE STUDY in The Netherlands (20 June 2013)

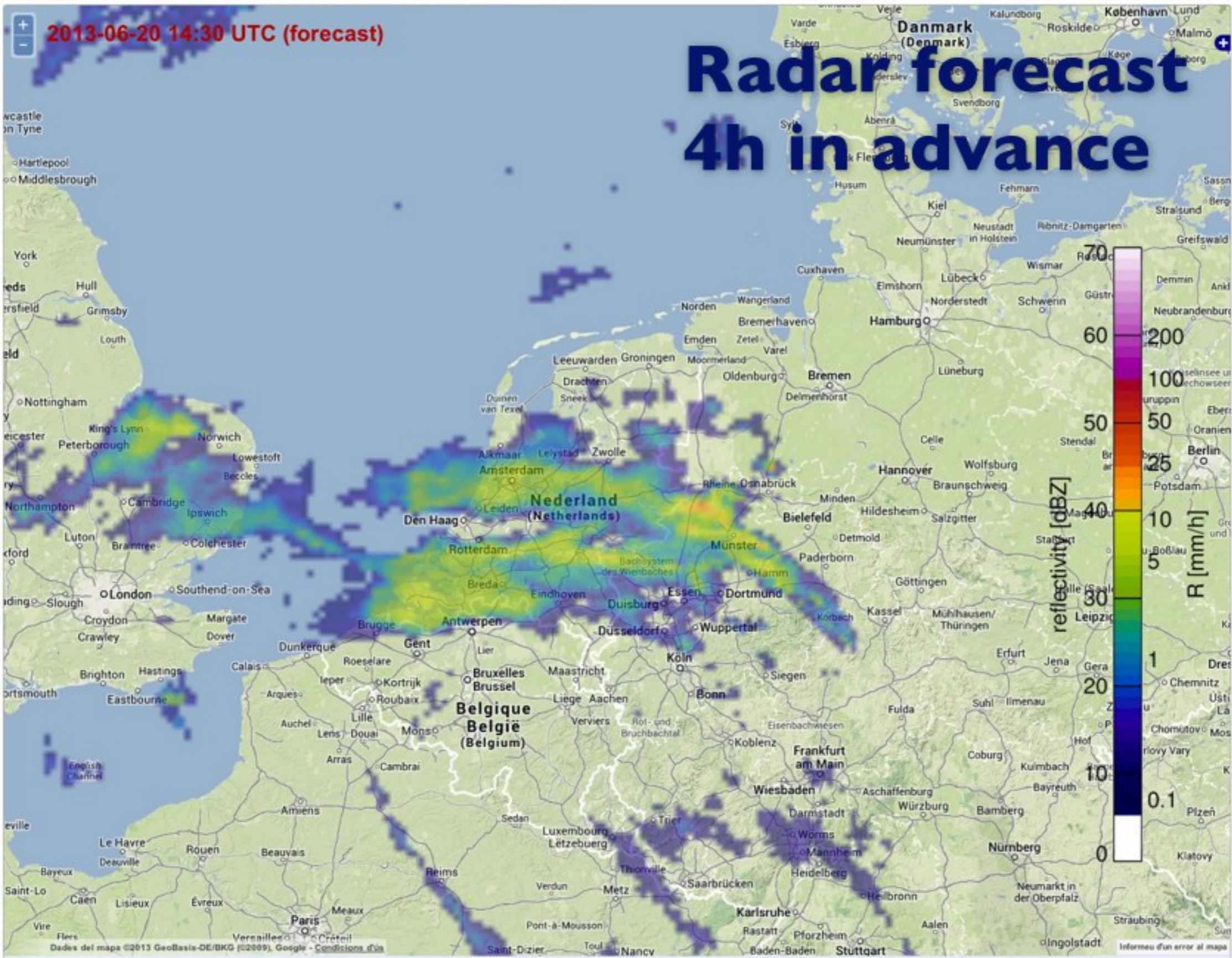
Ondertussen in het oosten van het land:  
zandzakken en rubberbootjes



Noodweer in Enschede. Screenshot van WeerGroningen.

2013-06-20 14:30 UTC (forecast)

# Radar forecast 4h in advance



Real Time | Historical Episode

Jun 2013

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Today

Number of Frames: 32  
Hour/Minute: 24 : 00 :

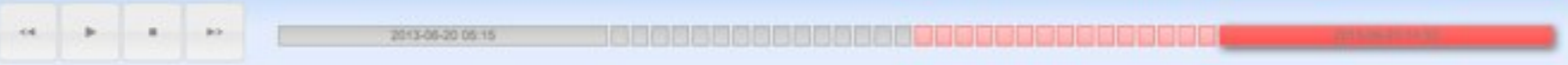
- Topographies**
- Google Physical
  - Google Streets
  - Google Satellite
  - Google Hybrid

- Layers**
- Convective cells
  - Reflectivity (dBZ)
  - FMI Product

HAREN partners:



Center Lon.:0.99 Lat.:54.81 X (Km utm):109844.92 Y (Km utm):7324521.07

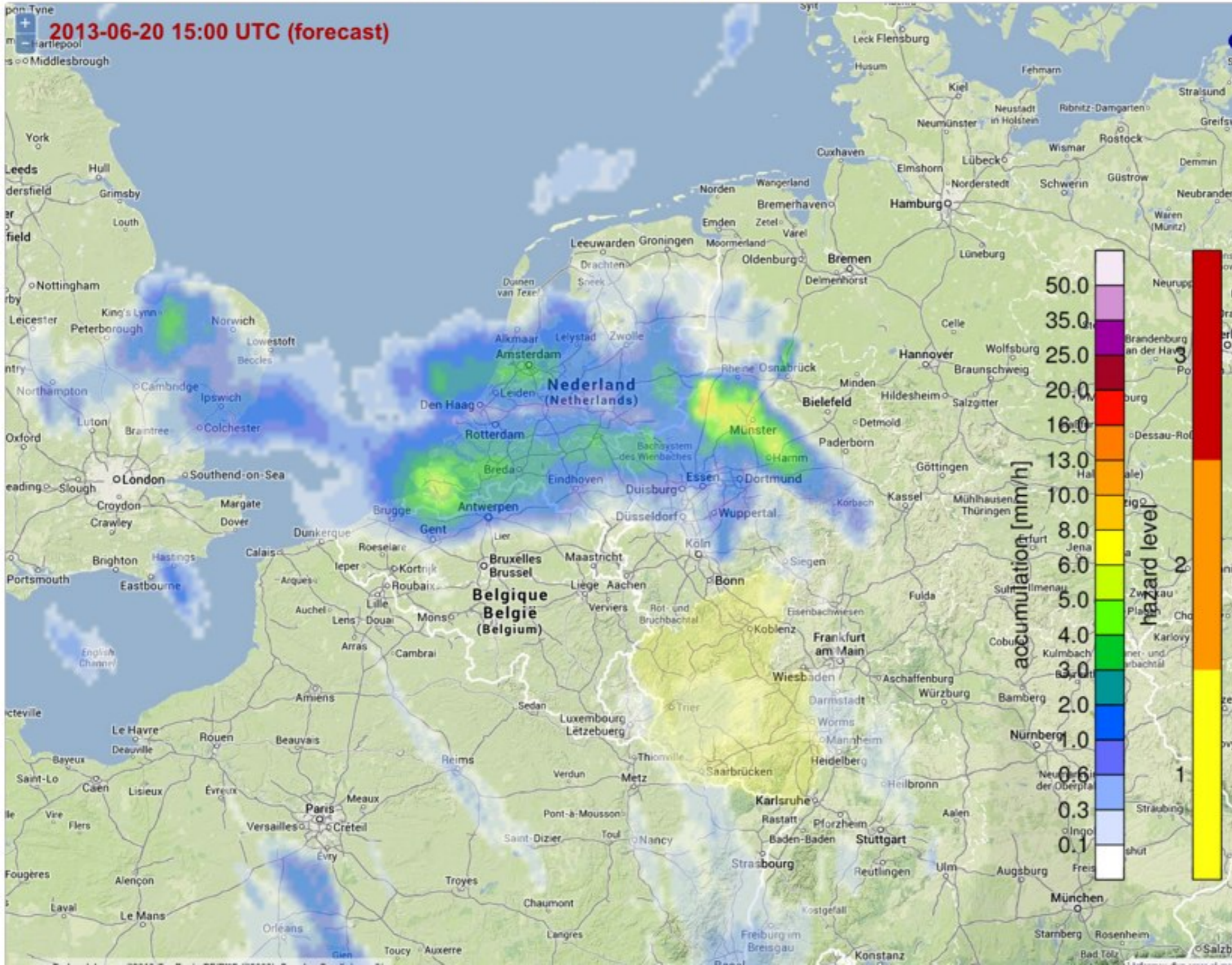


# 1h Radar Accumulation 4h in advance



OPERA Mosaic - HAREN PROJECT

Instantaneous Precipitation Hazard Assessment NWP



Real Time  Historical Episode

Jun 2013

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Today

Number of Frames: 48

Hour/Minute: 24 : 00 :

Topographies

- Google Physical
- Google Streets
- Google Satellite
- Google Hybrid

Layers

- Hazard Assessment
- Accumulated Rain (1h)

HAREN partners:

# 1h Radar Accumulation

OPERA Mosaic - HAREN PROJECT

OPERA Mosaic - HAREN PROJECT

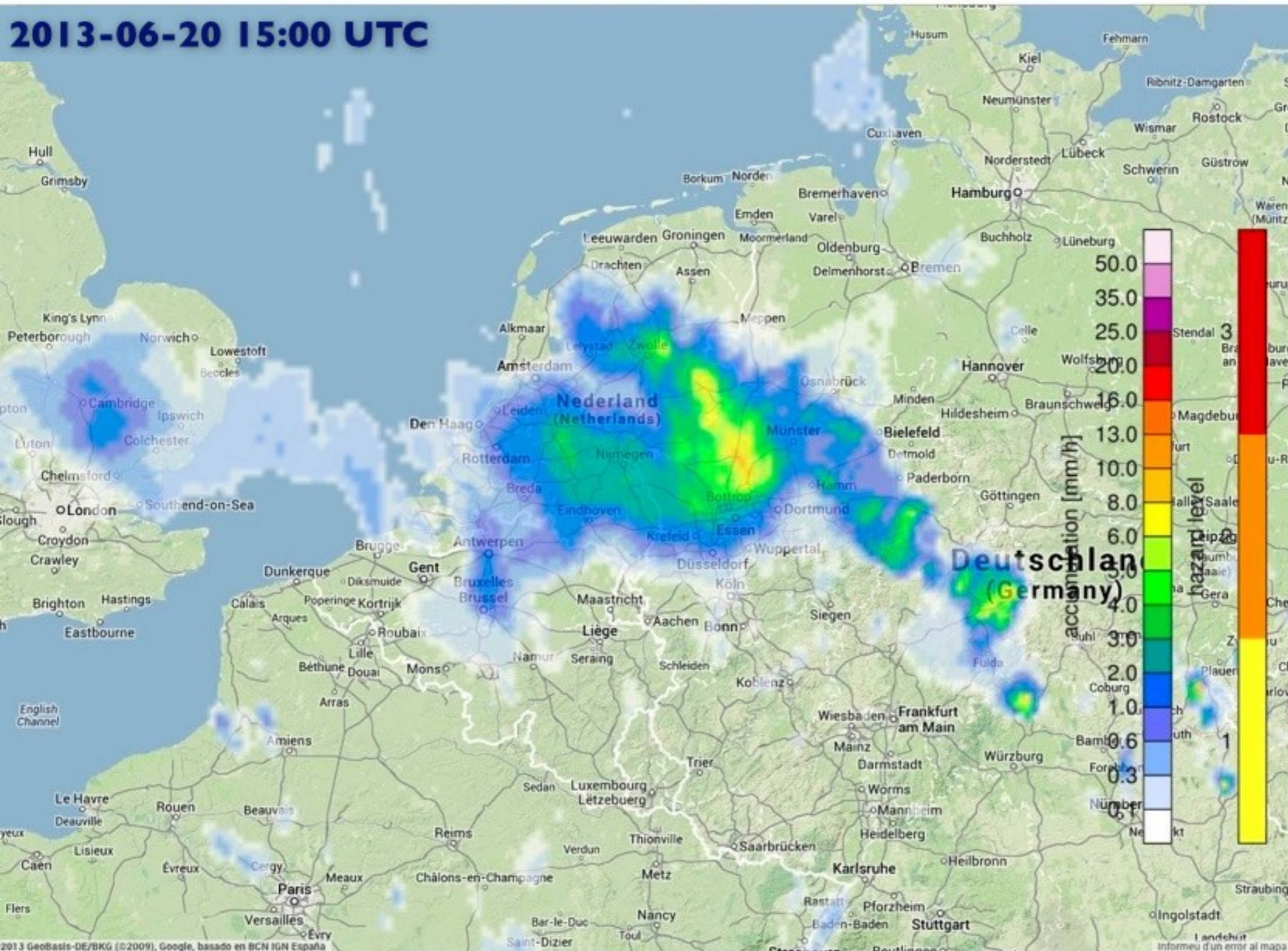
Instantaneous Precipitation | Hazard Assessment | NWP

## Observed



European Civil Protection

### 2013-06-20 15:00 UTC



Real Time  Historical Episode

Jun 2013

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Today

Number of Frames 32

HourMinute forecasting time 15 00

[View](#)

#### Topographies

- Google Physical
- Google Streets
- Google Satellite
- Google Hybrid

#### Layers

- Hazard Assessment
- Accumulated Rain (1h)

#### HAREN partners:



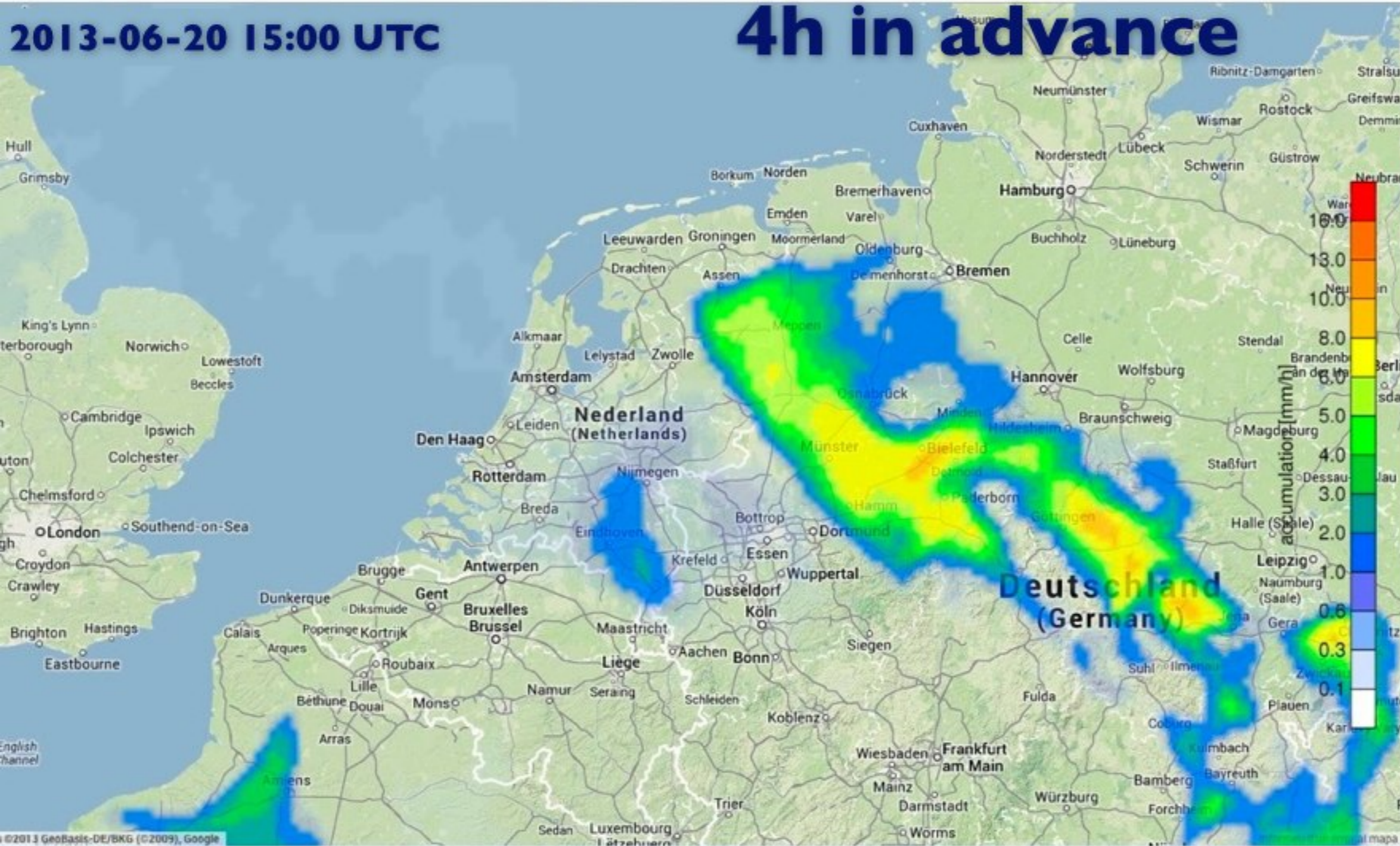


# Model forecast



## 2013-06-20 15:00 UTC

## 4h in advance



Real Time  Historical Episode

Jun 2013

Su Mo Tu We Th Fr

2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30				

Today

Number of Frames 32

Hour/Minute forecasting time 15 : 00

[View](#)

### Topographies

- Google Physical
- Google Streets
- Google Satellite
- Google Hybrid

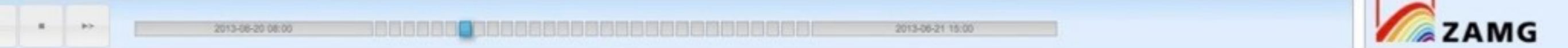
### Layers

- NWP hourly accumulation
- % [R > 1mm]

### HAREN partners:



on.:8.81 Lat.:54.36 X (Km utm):981227.04 Y (Km utm):.7238911.60

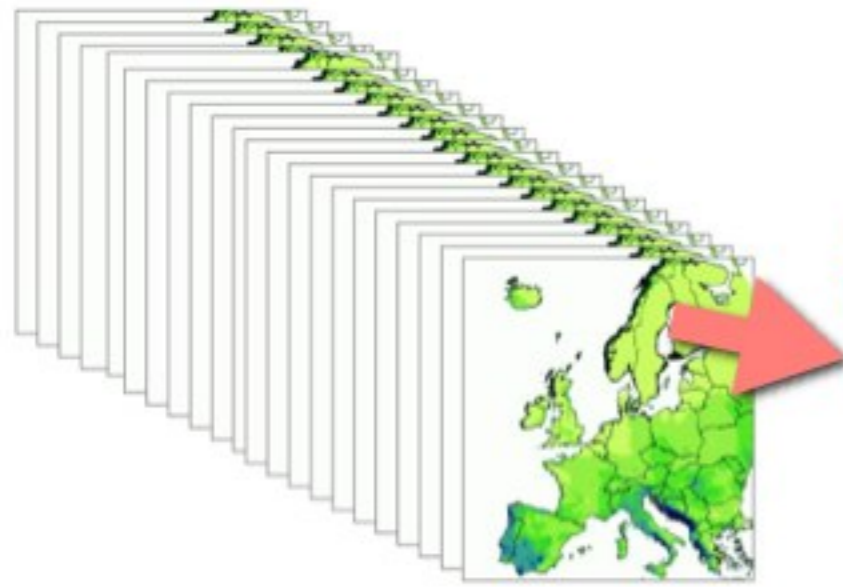




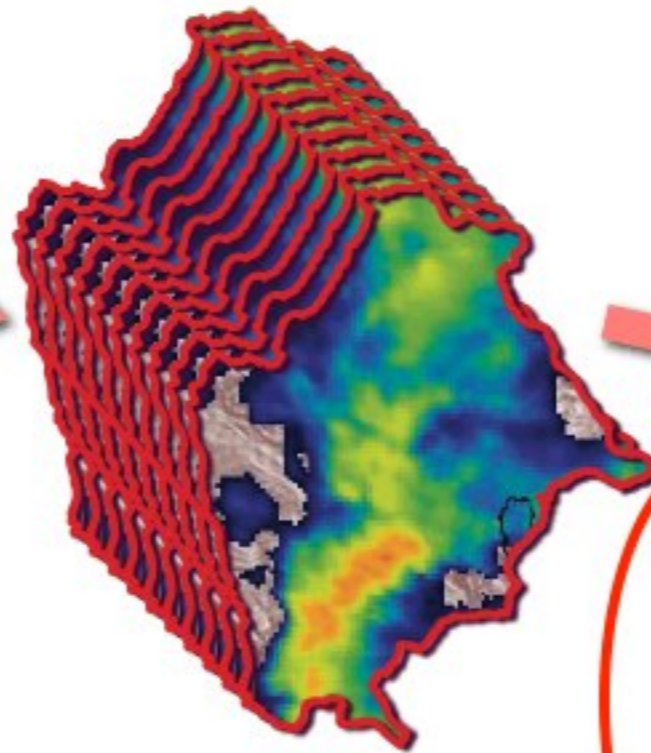
# EFAS Flash Flood module based on IMPRINTS



COSMO-LEPS  
Probabilistic Rainfall  
forecasts

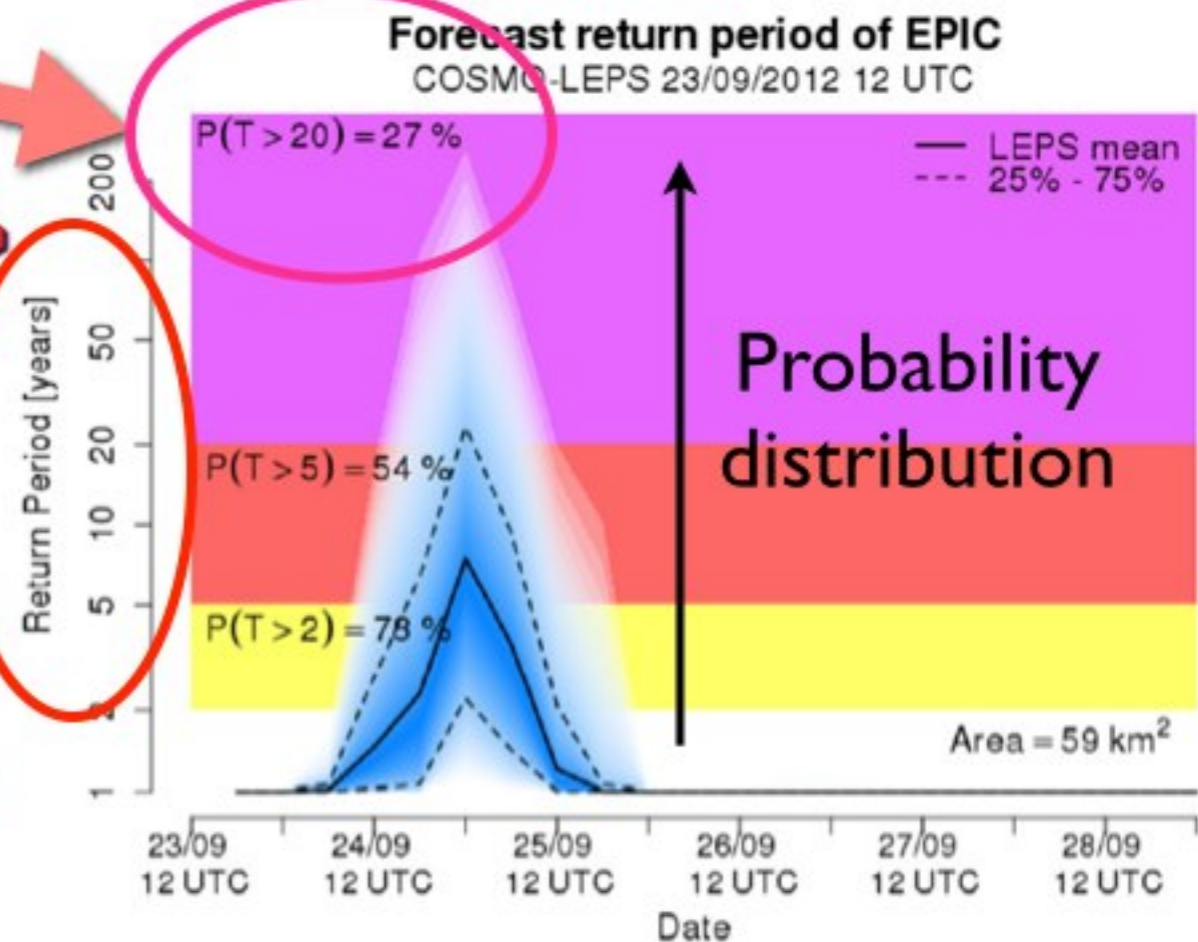


Probabilistic basin  
aggregated rainfall  
forecasts



Return Period of any  
member calculated by  
comparison against EPIC  
climatology

Warning code associated  
to the 75% percentile  
member

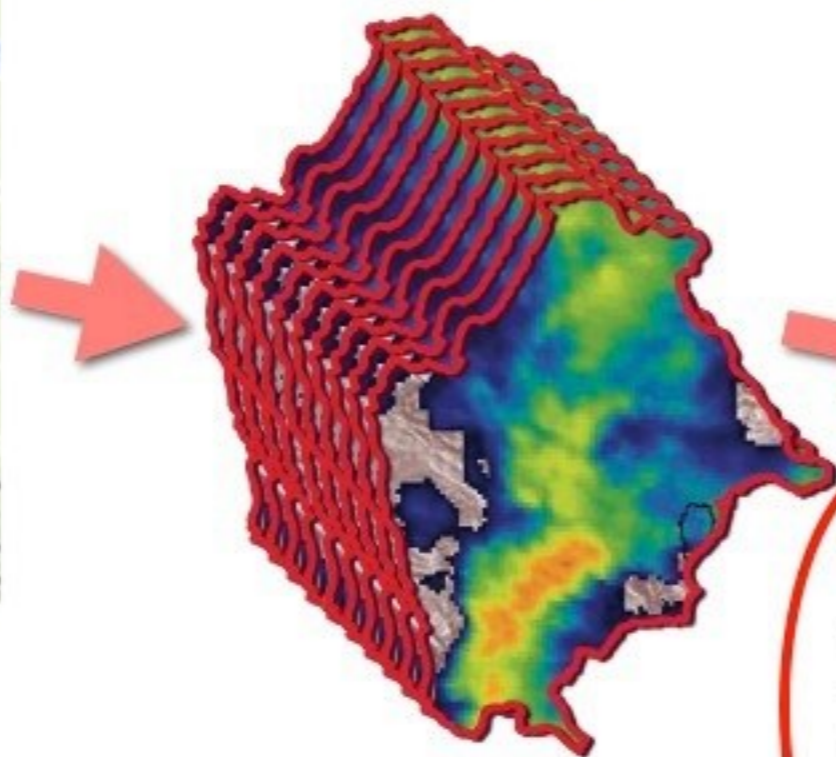


# EDHIT Flash Flood Index up to 6h ahead

## EDHIT Radar Rainfall forecasts

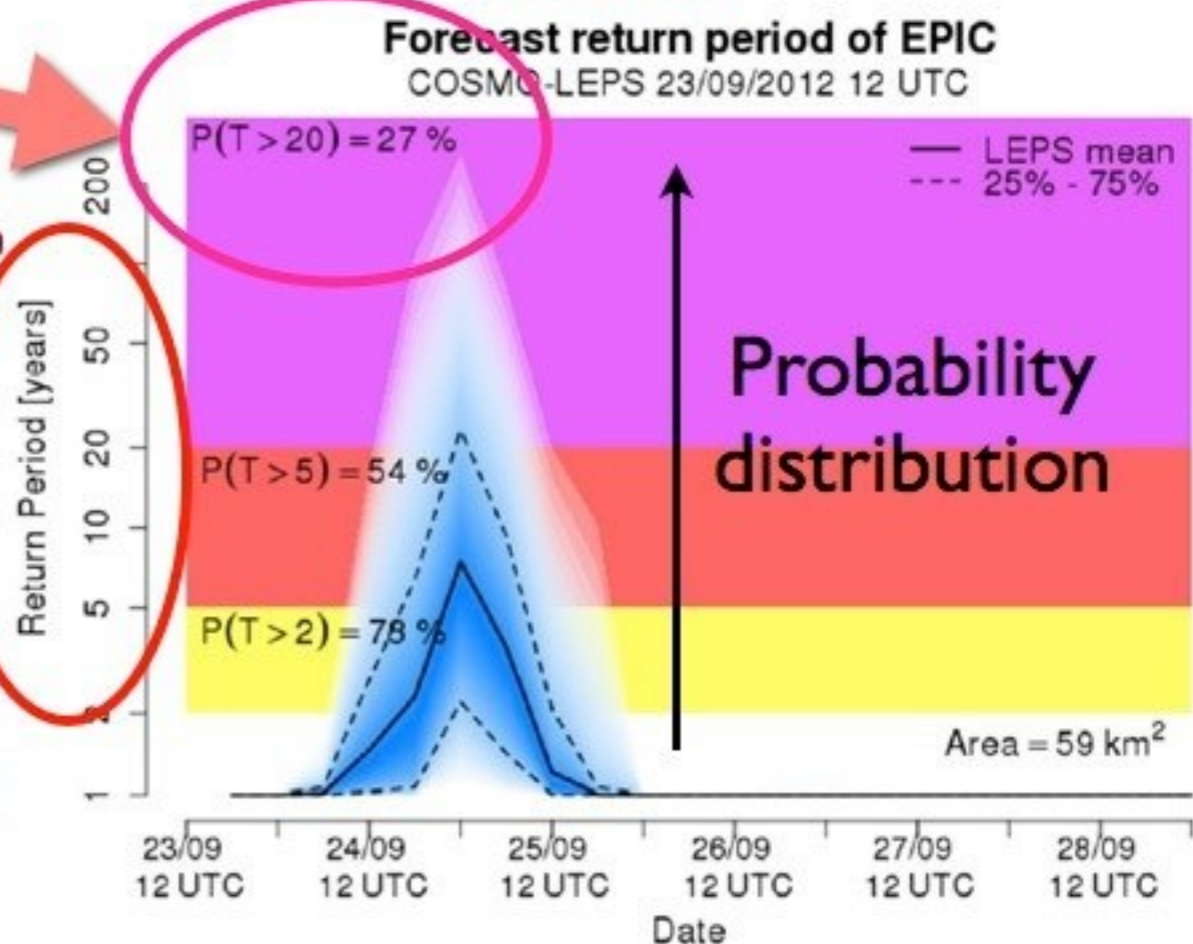


## Probabilistic basin aggregated rainfall forecasts



Return Period of any member calculated by comparison against EPIC climatology

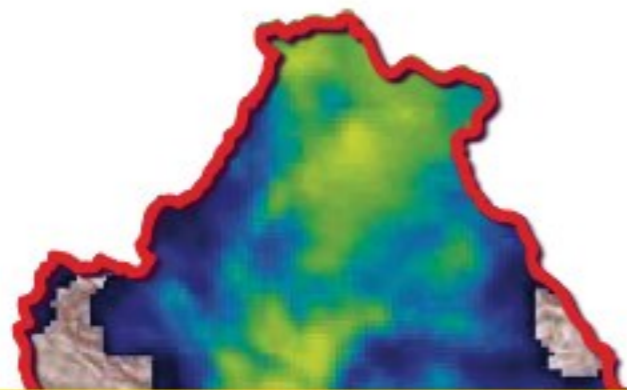
Warning code associated to the 75% percentile member



*FF-EWS: Critical improvement*

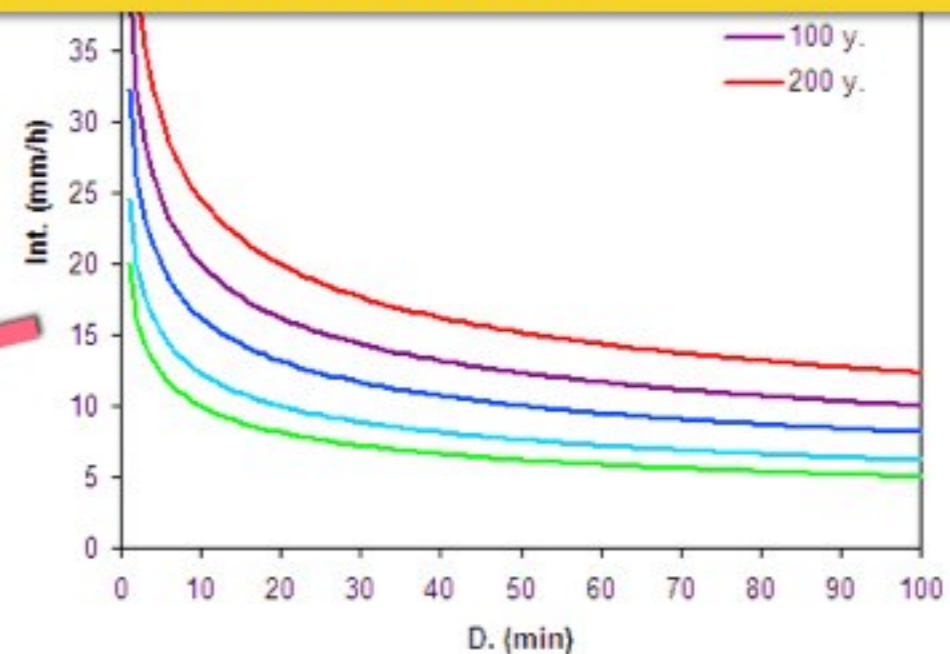
# Build a basin-aggregated rainfall Climatology

Statistical analysis of the probability of Exceedance of the basin-aggregated rainfall



Current version: based on an adapted version of METEOALARM thresholds

Thresholds for the Warning levels



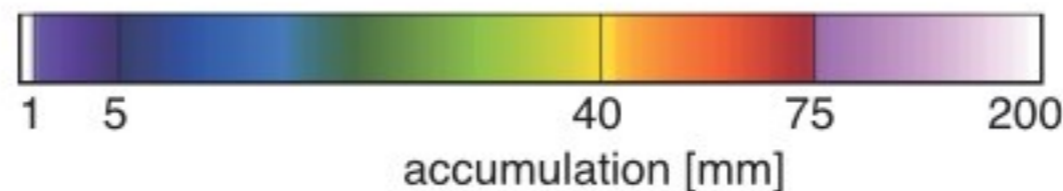
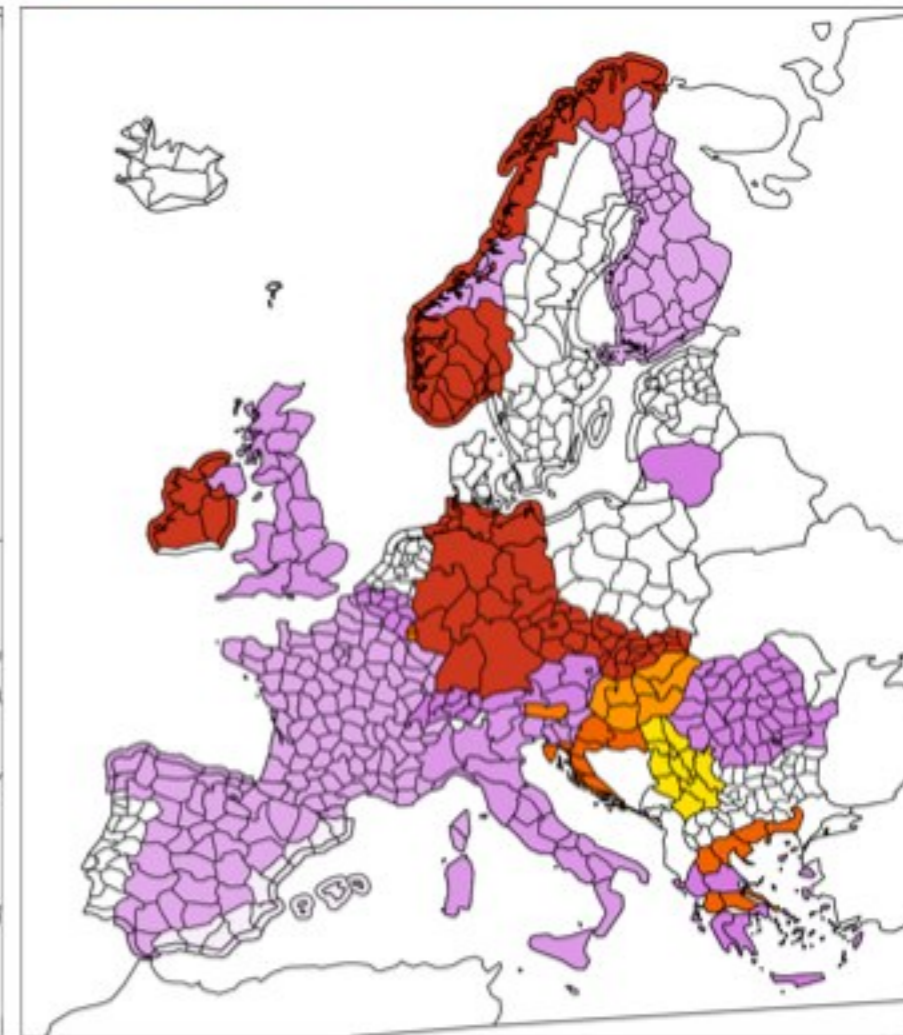
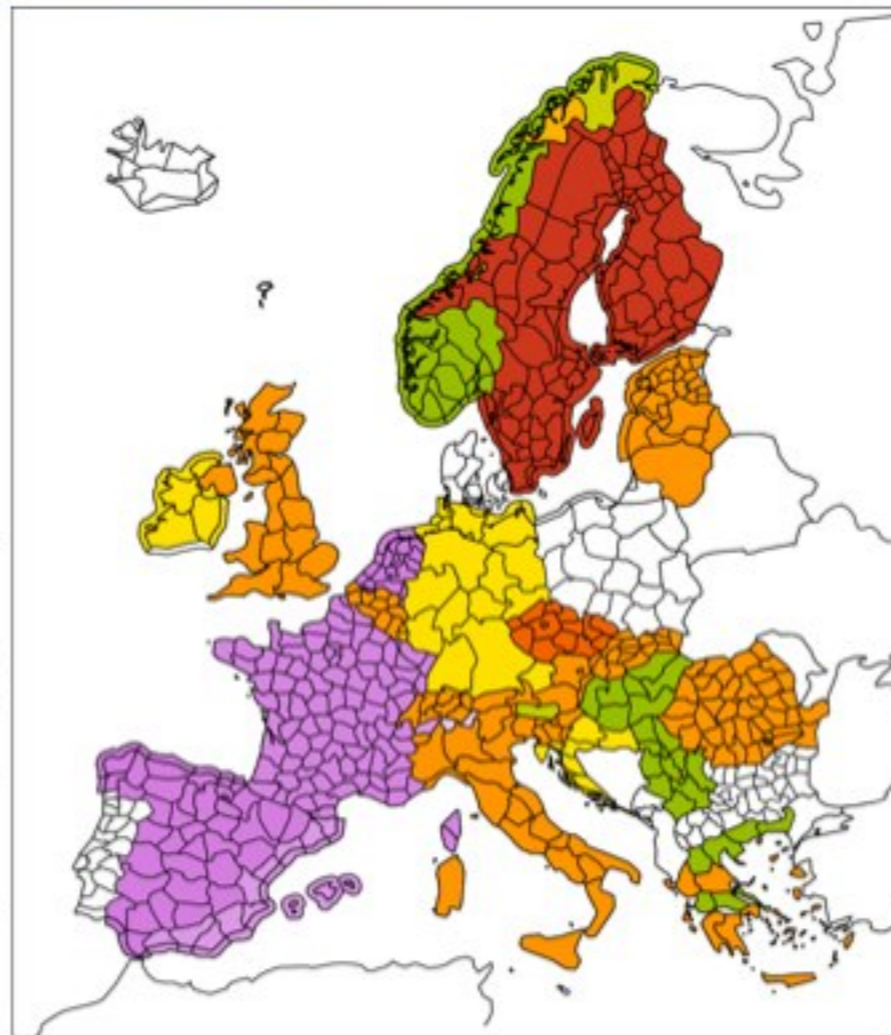
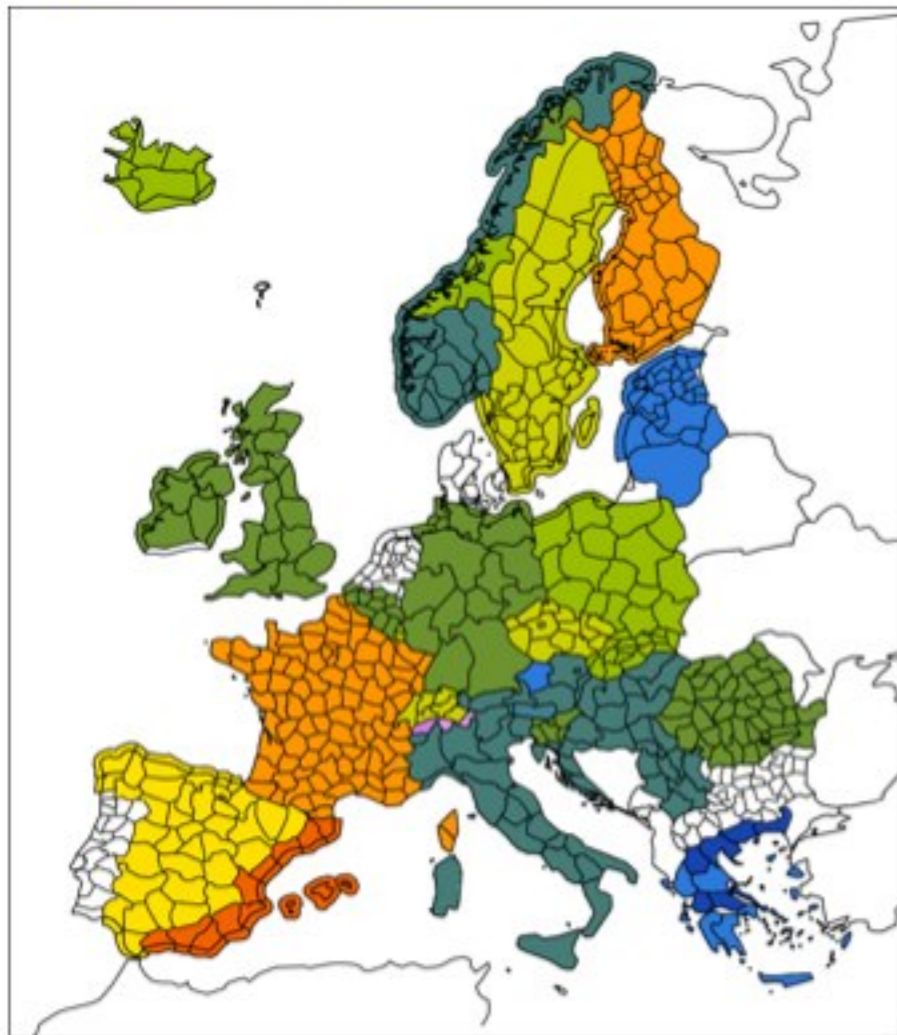
# HAZARD ASSESSMENT

regional thresholds for 12-h accumulations  
defined by METEOALARM

hazard level 1

hazard level 2

hazard level 3



# Hazard identification related to Meteoalarm EU regional thresholds

meteoalarm  
alerting europe for extreme weather

www.meteoalarm.eu

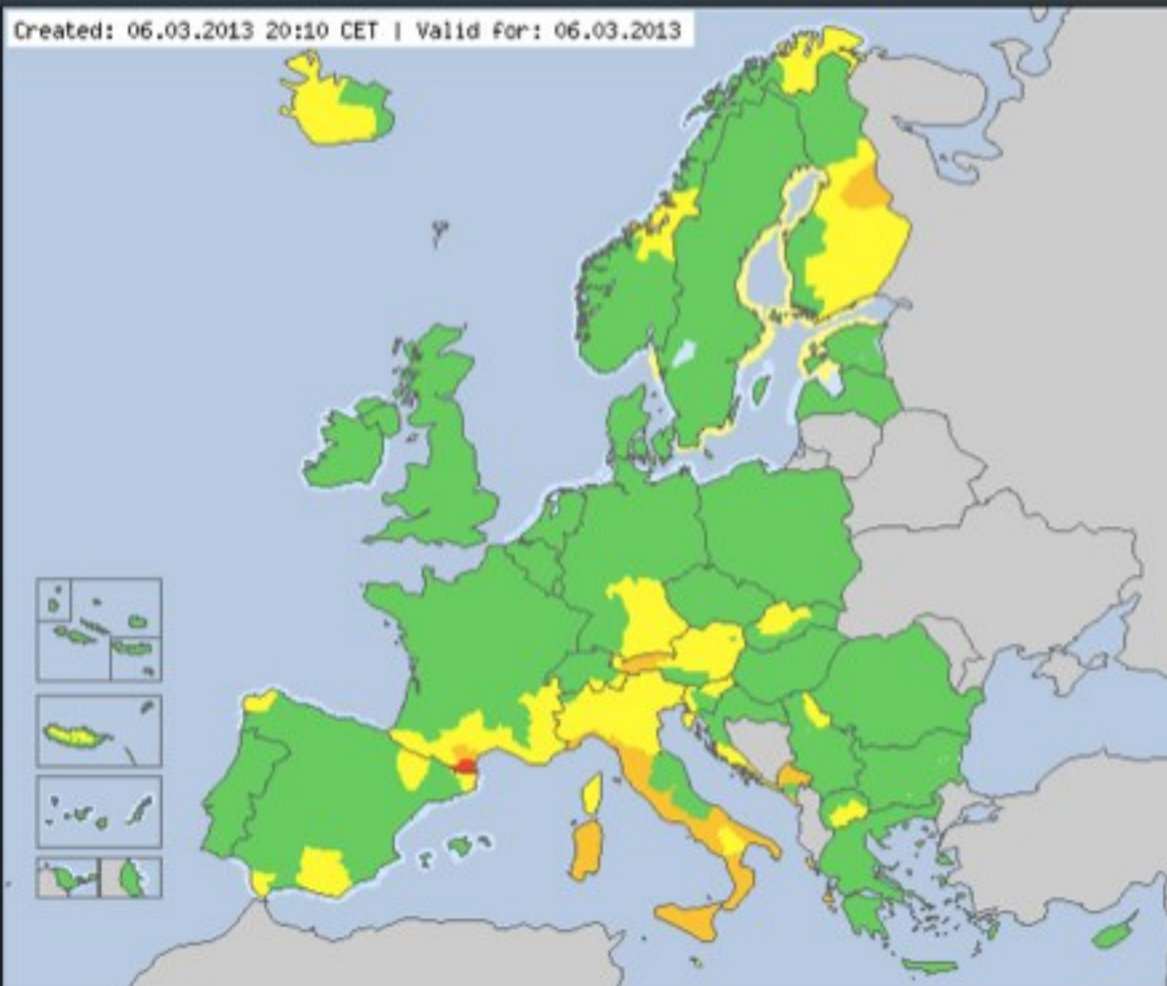
EUMETNET  
The Network of European Meteorological Services

Start | Neuigkeiten | Über Meteoalarm | Hilfe | Nutzungsbedingungen | Links | Anzeige Optionen

deutsch

» Europa:

Created: 06.03.2013 20:10 CET | Valid For: 06.03.2013



## Wetter-Warnungen: Europa

Gefahrenstufenberichte - Sie finden detaillierte Informationen über Warnungen in den Berichten der Länder. Wählen Sie das gewünschte Land aus.

- AT
- BE
- BG
- CH
- CY
- CZ
- DE
- DK
- EE
- ES
- FI
- FR
- GR
- HR
- HU
- IE
- IS

## Awareness type at regional scale:

### Green

No particular awareness of the weather is required.

### Yellow

The weather is potentially dangerous. The weather phenomena that have been forecast are not unusual, but be attentive if you intend to practice activities exposed to meteorological risks. Keep informed about the expected meteorological conditions and do not take any avoidable risk.

### Orange

The weather is dangerous. Unusual meteorological phenomena have been forecast. Damage and casualties are likely to happen. Be very vigilant and keep regularly informed about the detailed expected meteorological conditions. Be aware of the risks that might be unavoidable. Follow any advice given by your authorities.

### Red

The weather is very dangerous. Exceptionally intense meteorological phenomena have been forecast. Major damage and accidents are likely, in many cases with threat to life and limb, over a wide area. Keep frequently informed about detailed expected meteorological conditions and risks. Follow orders and any advice given by your authorities under all circumstances, be prepared for extraordinary measures.

Warntypen:

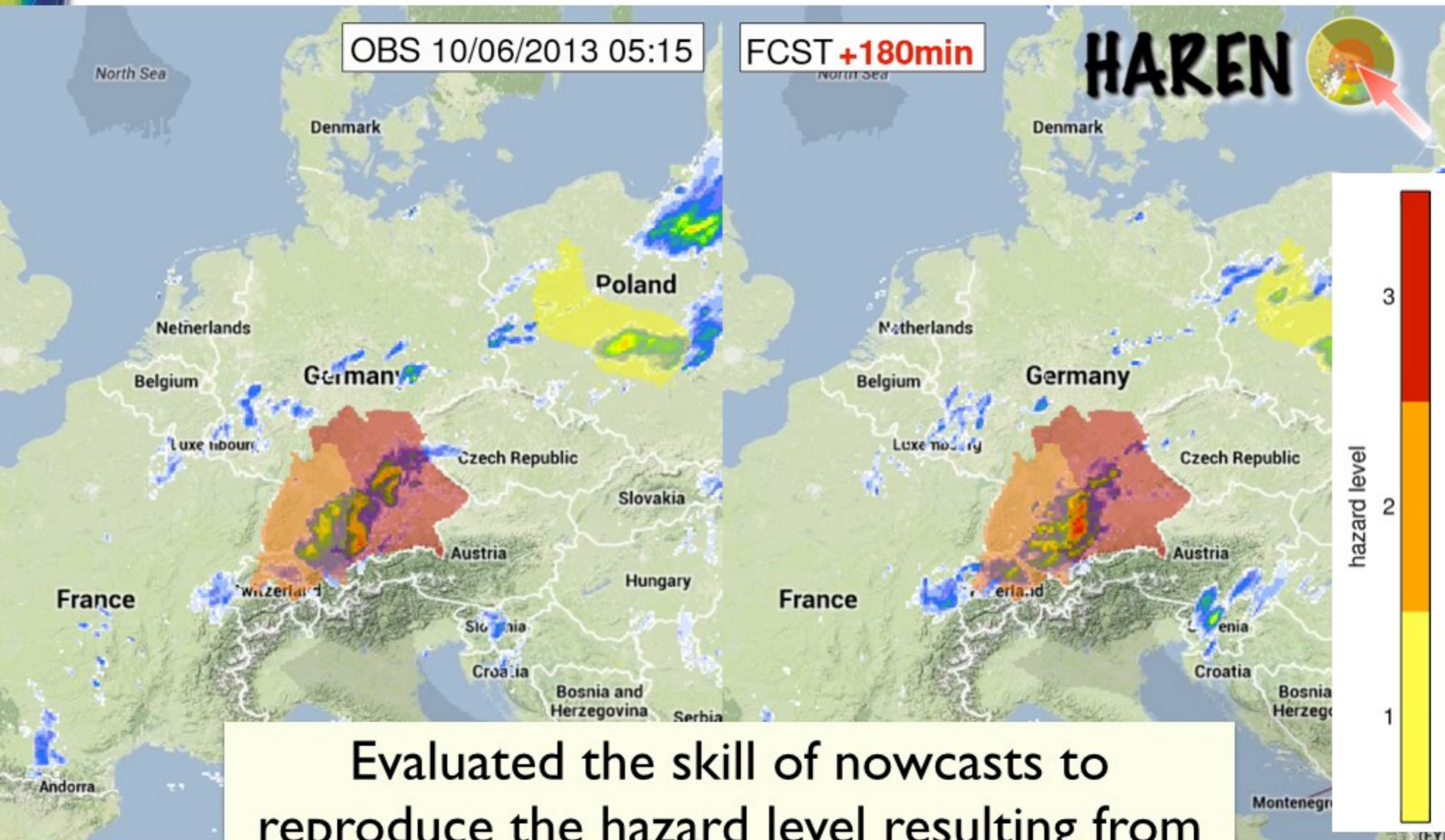
Anzeigen:

Legende:



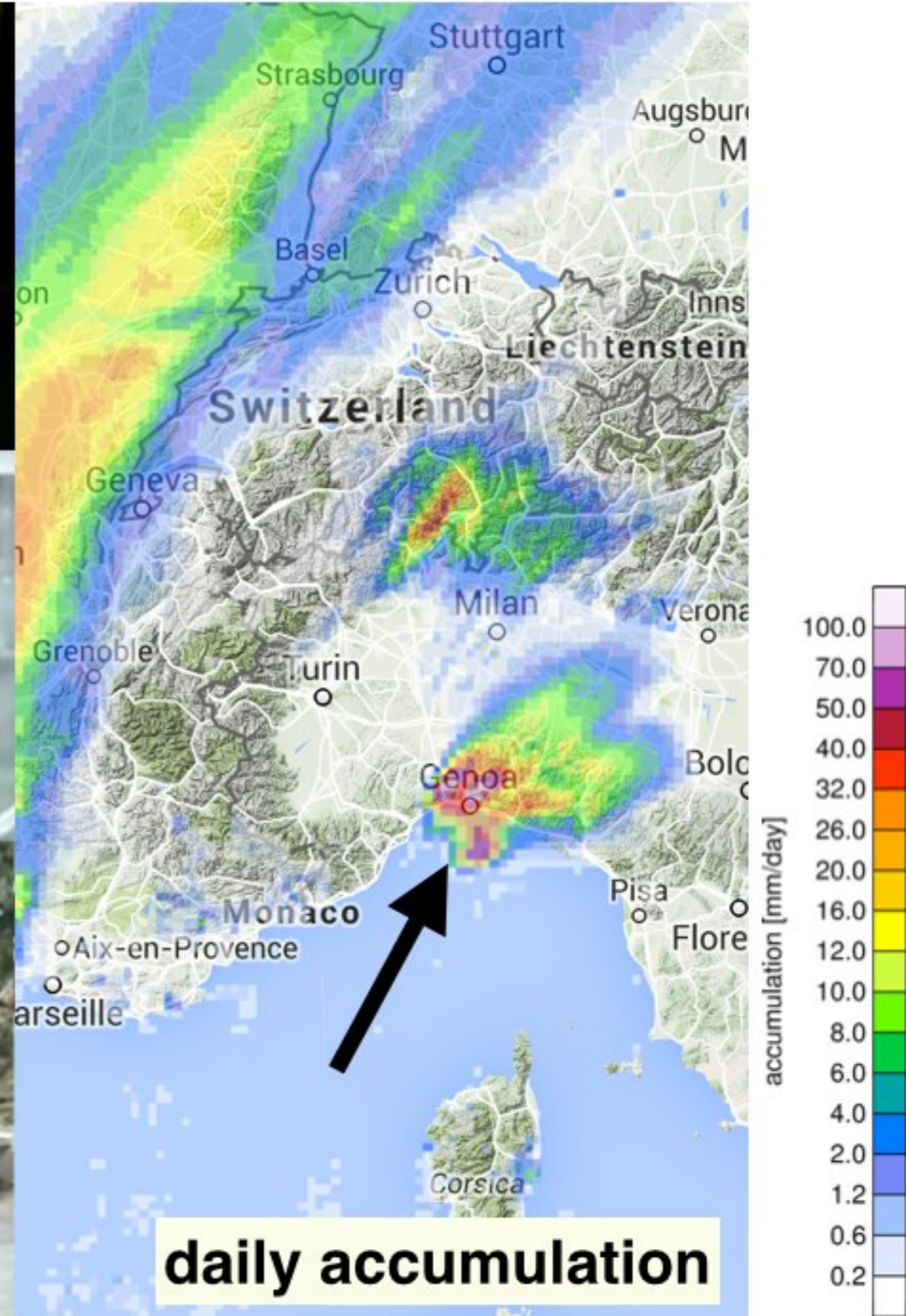
Sprache ändern: | BG | CZ | DA | DE | EE | EN | ES | ES | E

# HAZARD ASSESSMENT - Intense rain



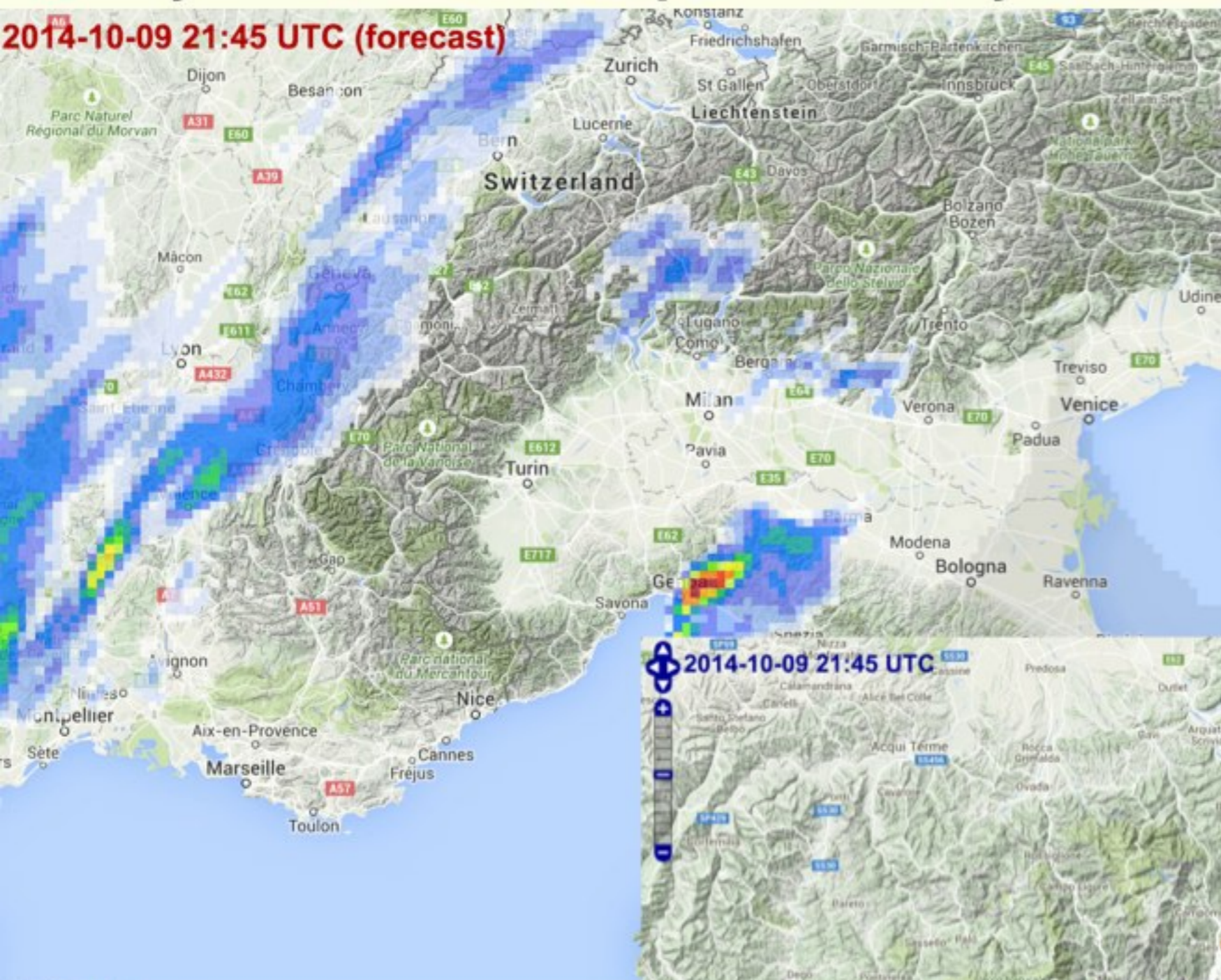
Evaluated the skill of nowcasts to reproduce the hazard level resulting from observations

# Genoa - 09 Oct 2014



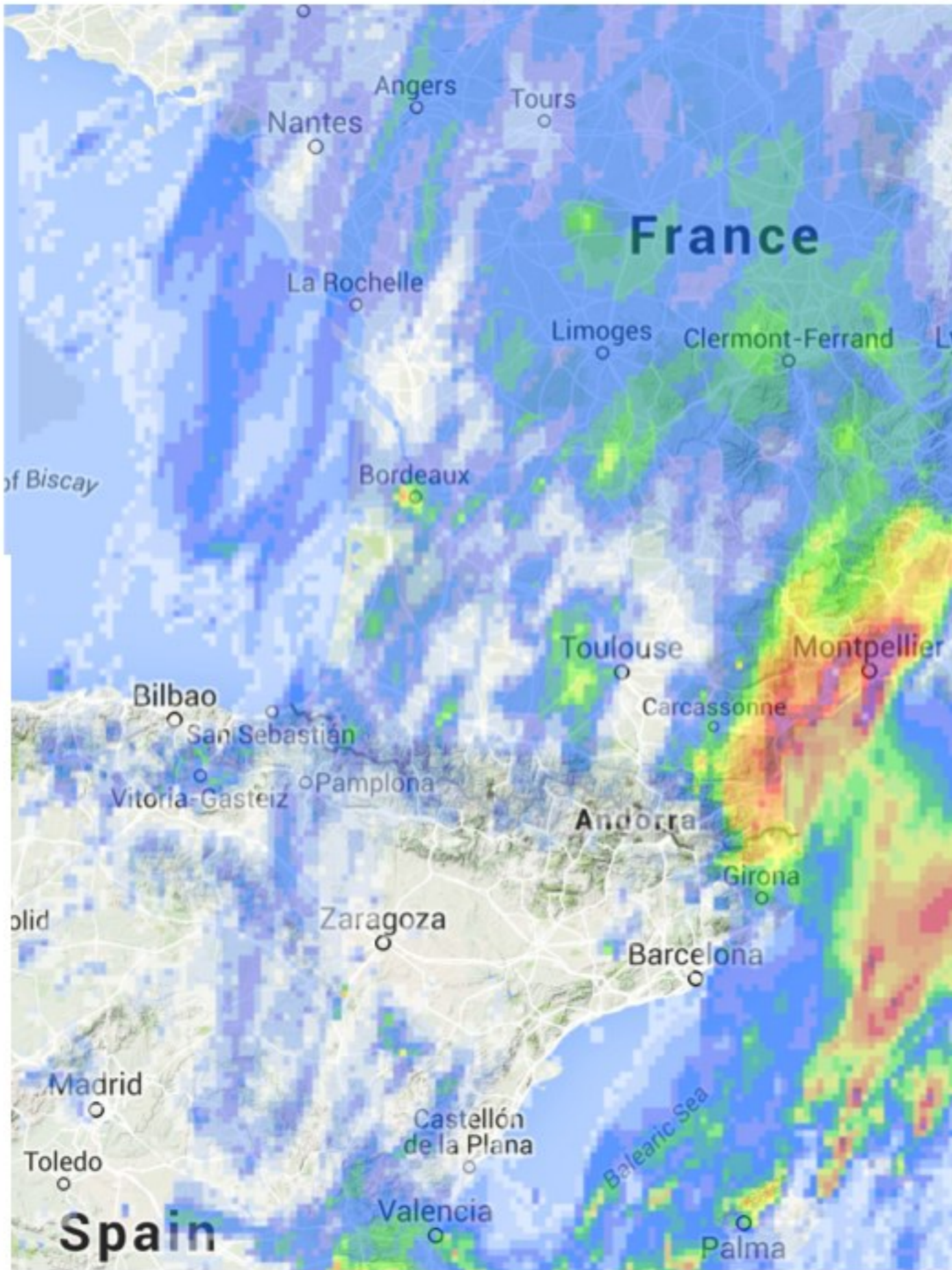
# Genoa - 09 Oct 2014

Hourly accumulation updated every 15min





# Montpellier - 29 Sep 2014



20 MONTPELLIER SOUS LES EAUX



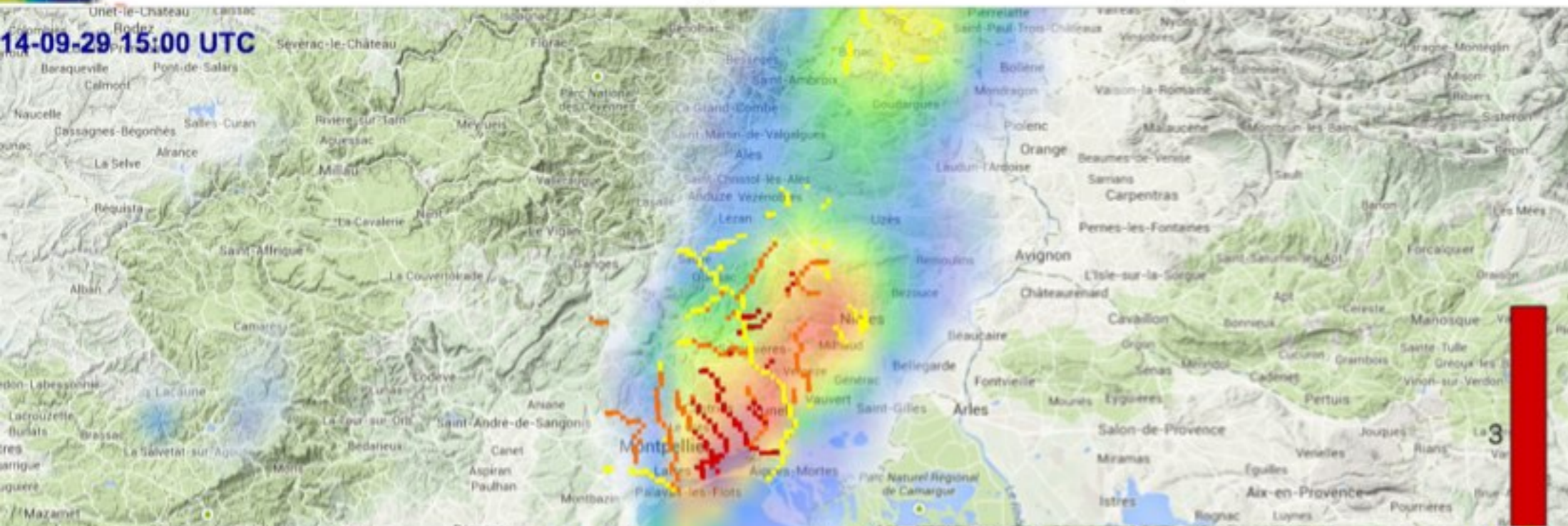
20 MONTPELLIER SOUS LES EAUX



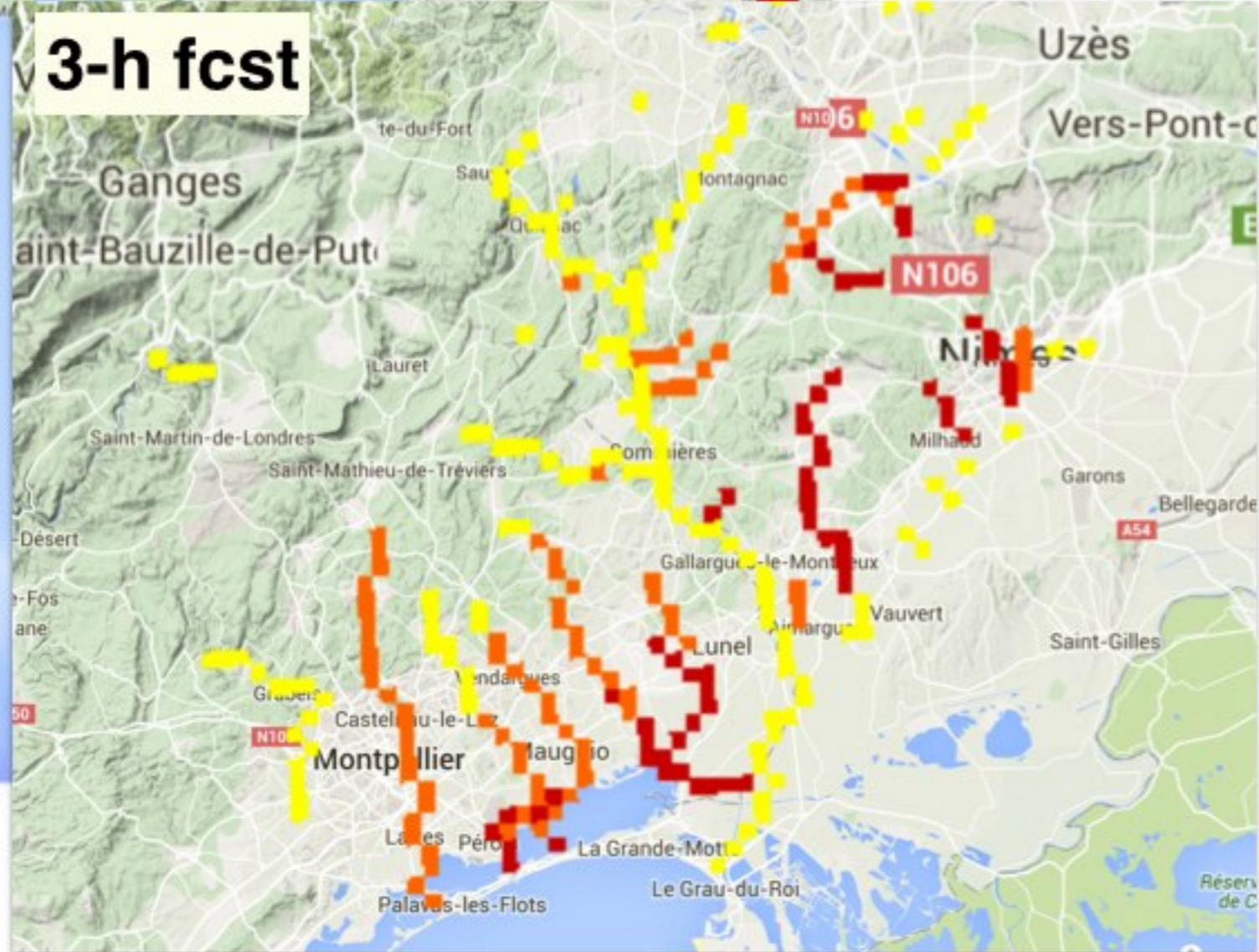
Courtesy Jan (Berlin) & Yann (Montpellier)

# Montpellier - 29 Sep 2014

14-09-29 15:00 UTC

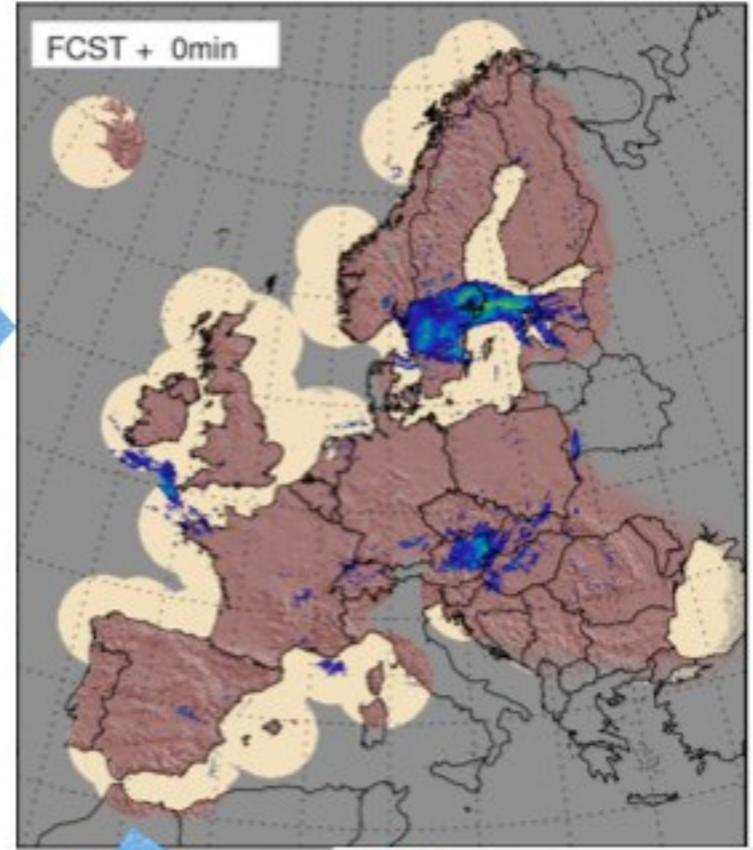
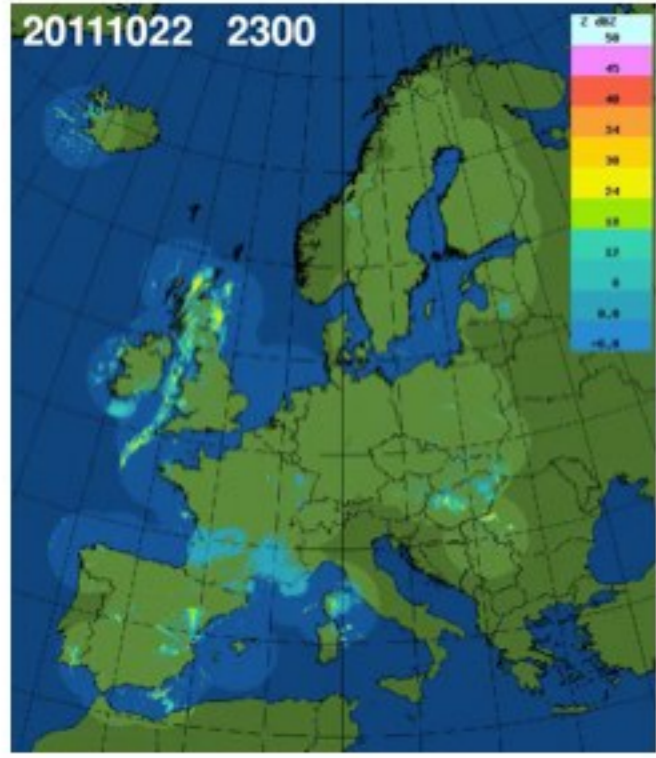


3-h fcst



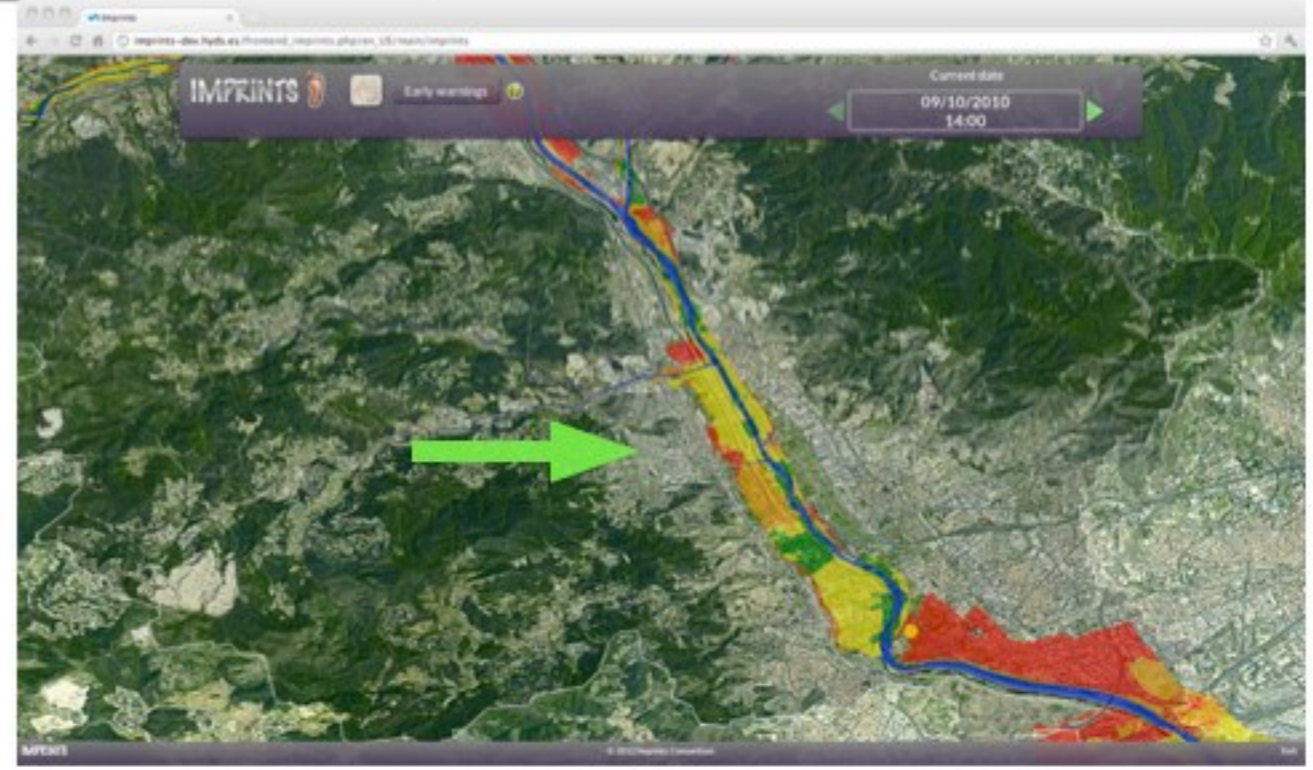
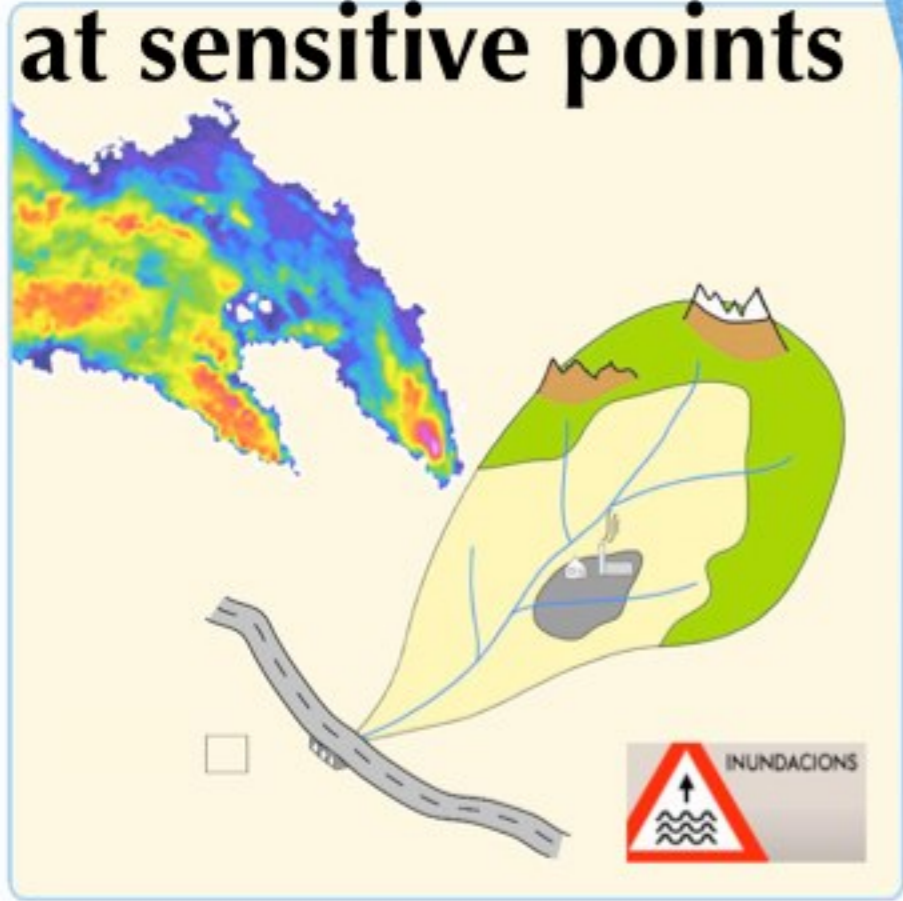
Hourly accumulation updated every 15min

# From observations



**High resolution  
rainfall nowcastings  
over Europe  
@2km every  
15 minutes**

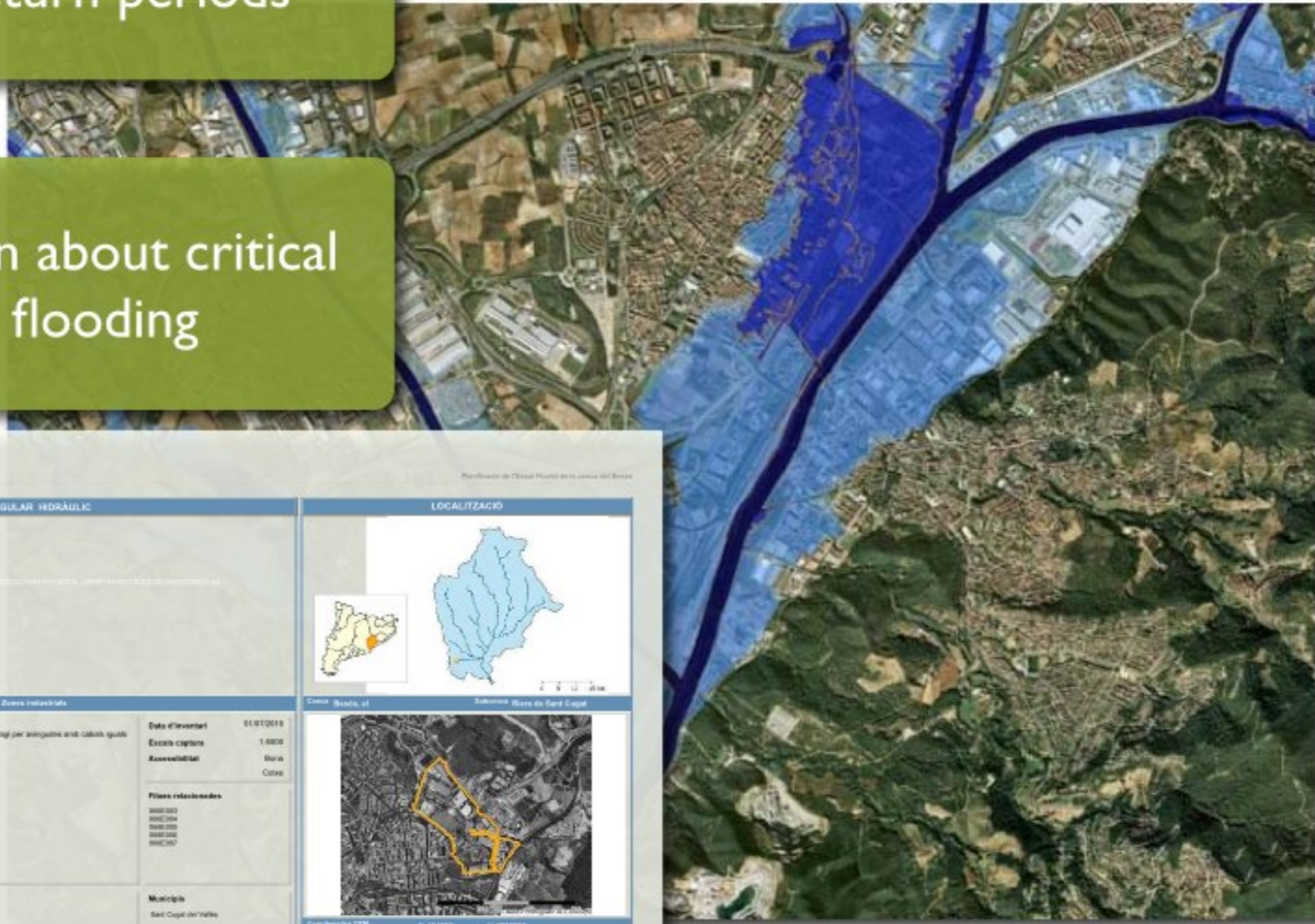
# Hazard anticipation at sensitive points



**Cross them with  
vulnerability maps**

- Detailed information about flooded areas for different return periods

- Detailed information about critical points and impact of flooding



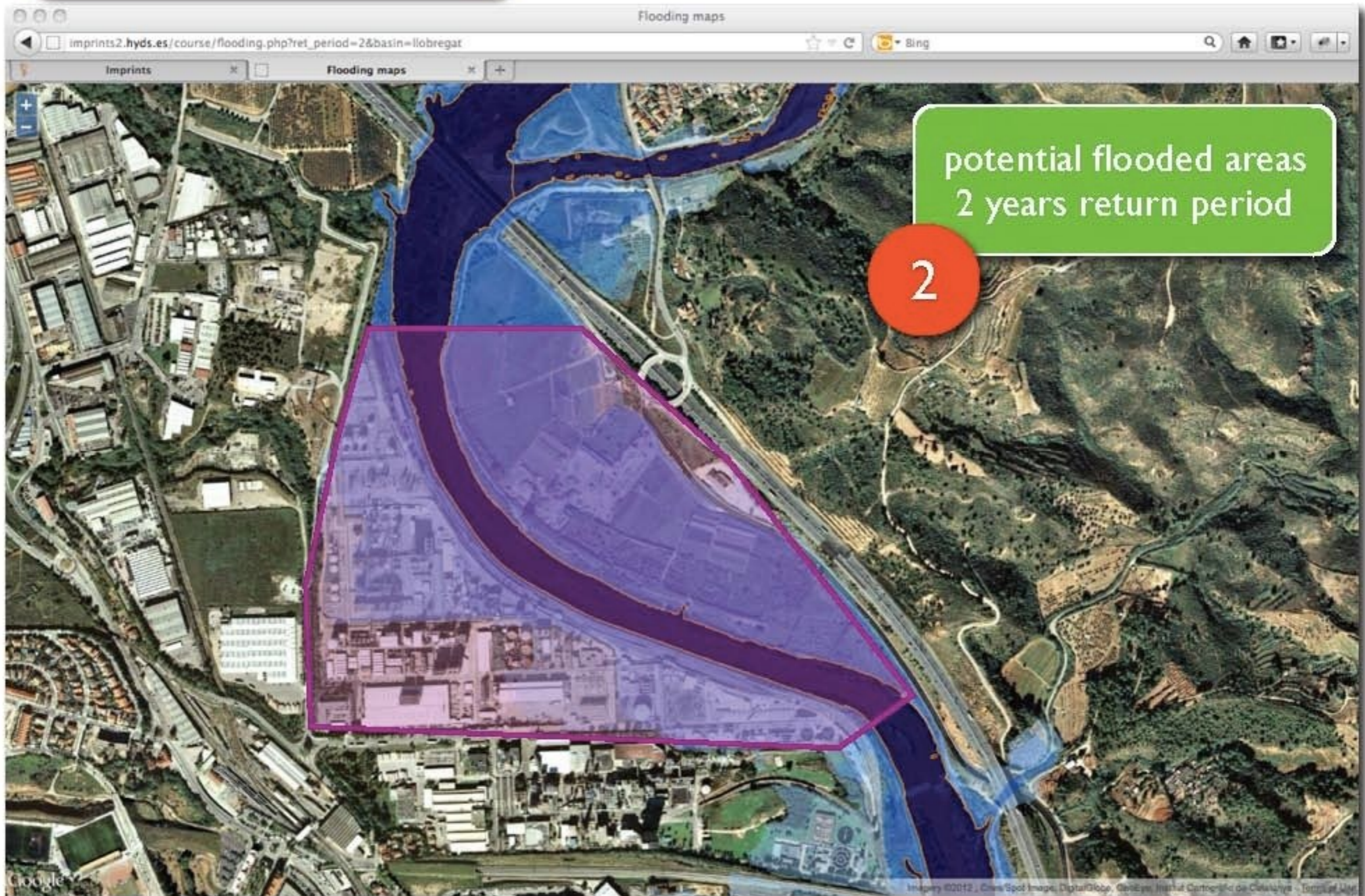
Agència Catalana de l'Aigua

Planificació de l'Eix de l'Albufera de Sant Cugat de la zona del Eix

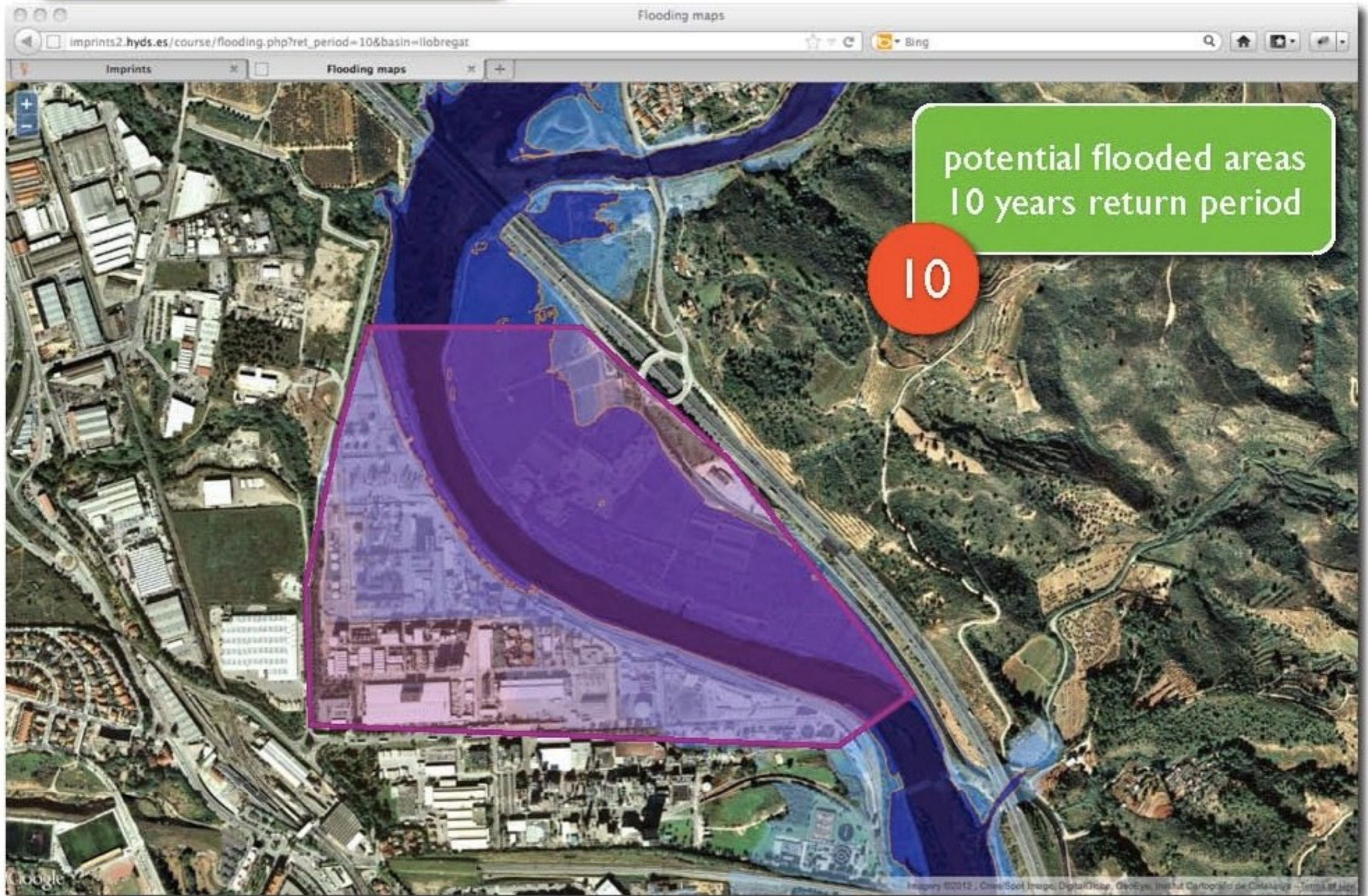
PUNT SINGULAR HIDRÀULIC		LOCALITZACIÓ	
<p><b>NÚMERO:</b> Zona Industrial</p> <p><b>Descripció:</b> Posició afectat a alguns sots del polígon industrial de Can Magí per inundats amb cabals iguals a superiors a 127,7 m<sup>3</sup>/s, en condicions d'inestabilitat greu.</p> <p><b>Data d'inventari:</b> 01/07/2018</p> <p><b>Excepció capçalera:</b> 1.000</p> <p><b>Asseriment:</b> Mura Cotxa</p> <p><b>Files relacionades:</b>            9997302            9997304            9997305            9997306            9997307</p> <p><b>Observacions:</b></p> <p><b>Municipi:</b> Sant Cugat de Valles</p> <p><b>Grau d'afectació:</b> Mig</p>		<p><b>Coordenades UTM:</b> X: 424433 Y: 454285</p> <p><b>Nom:</b> Riera de Sant Cugat</p> <p><b>Localitat:</b> Polígon industrial de Can Magí.</p> <p>Punt singular Hidràulic: 999902</p>	

3.4.5. Vista de punts singulars hidràulics

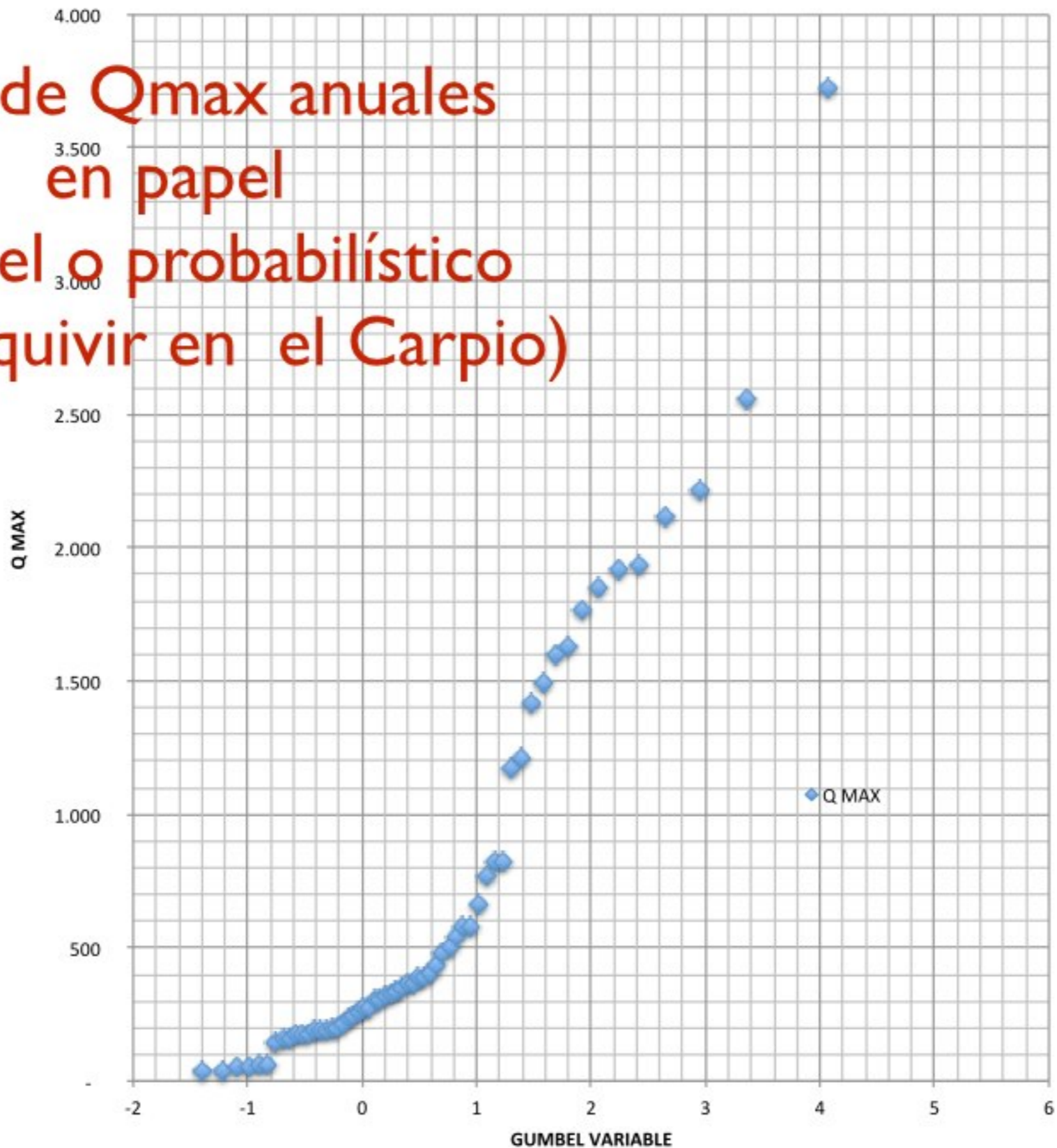
# Critical points



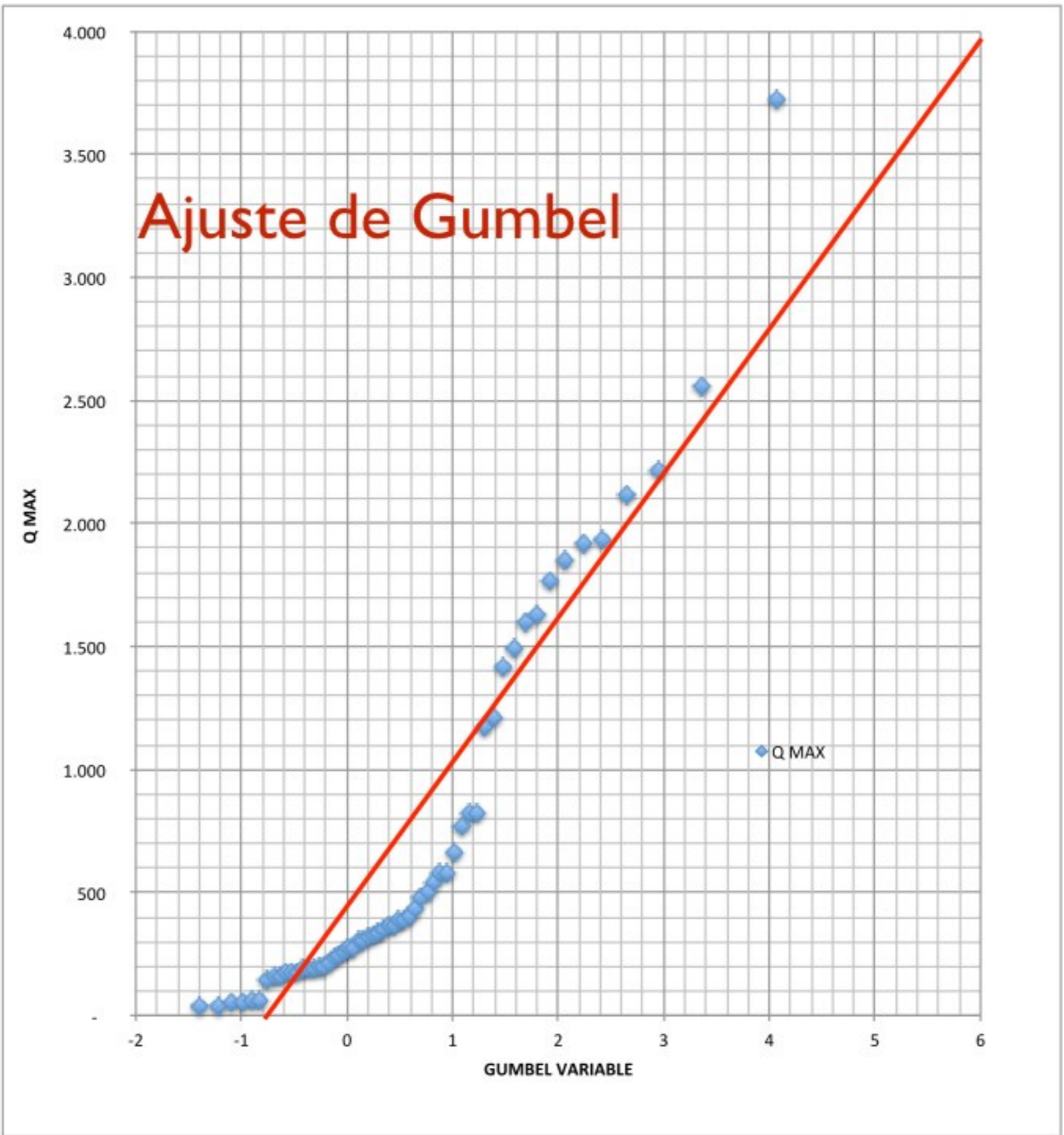
# Critical points



# Serie de $Q_{max}$ anuales en papel Gumbel o probabilístico (Guadalquivir en el Carpio)

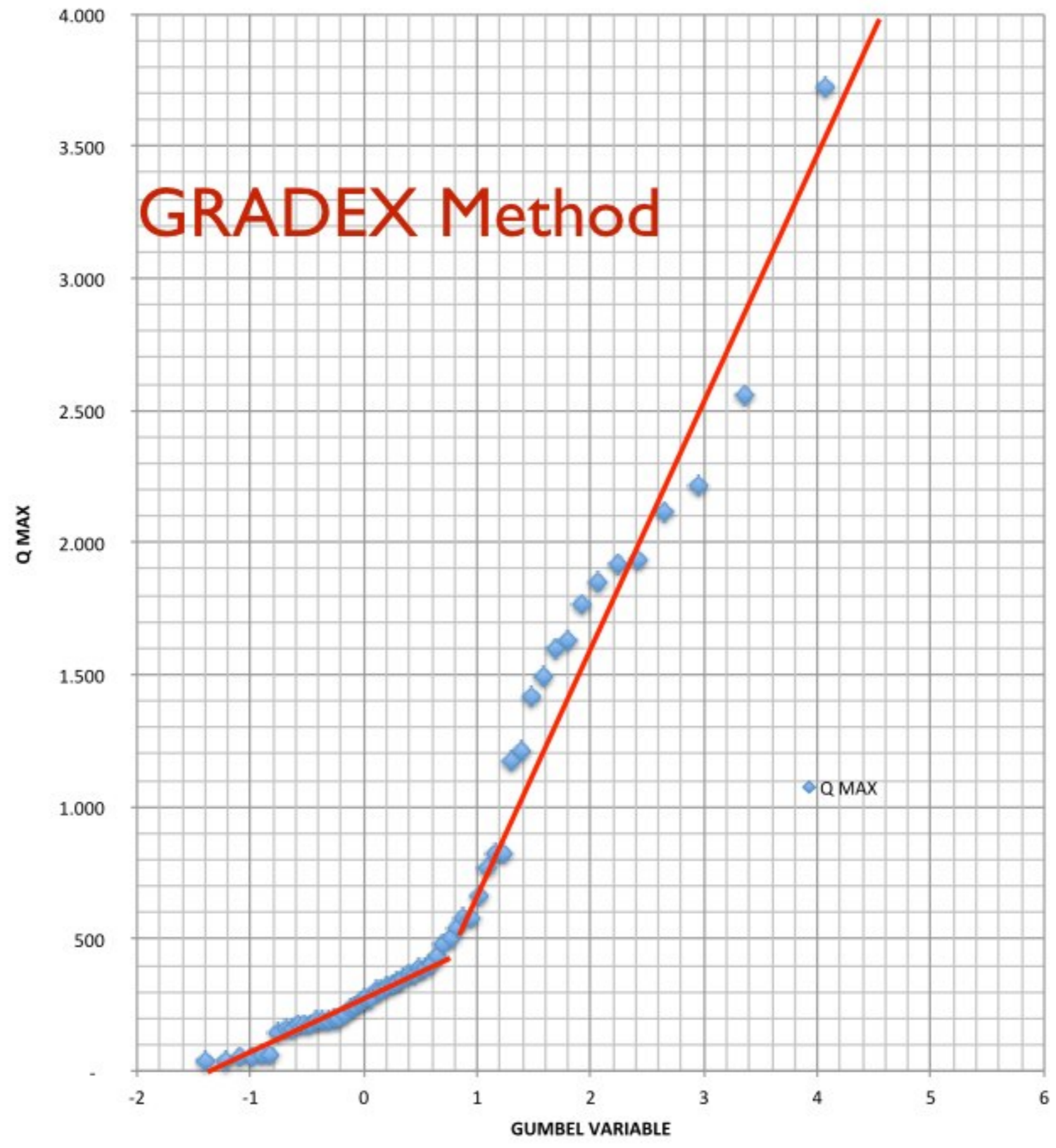


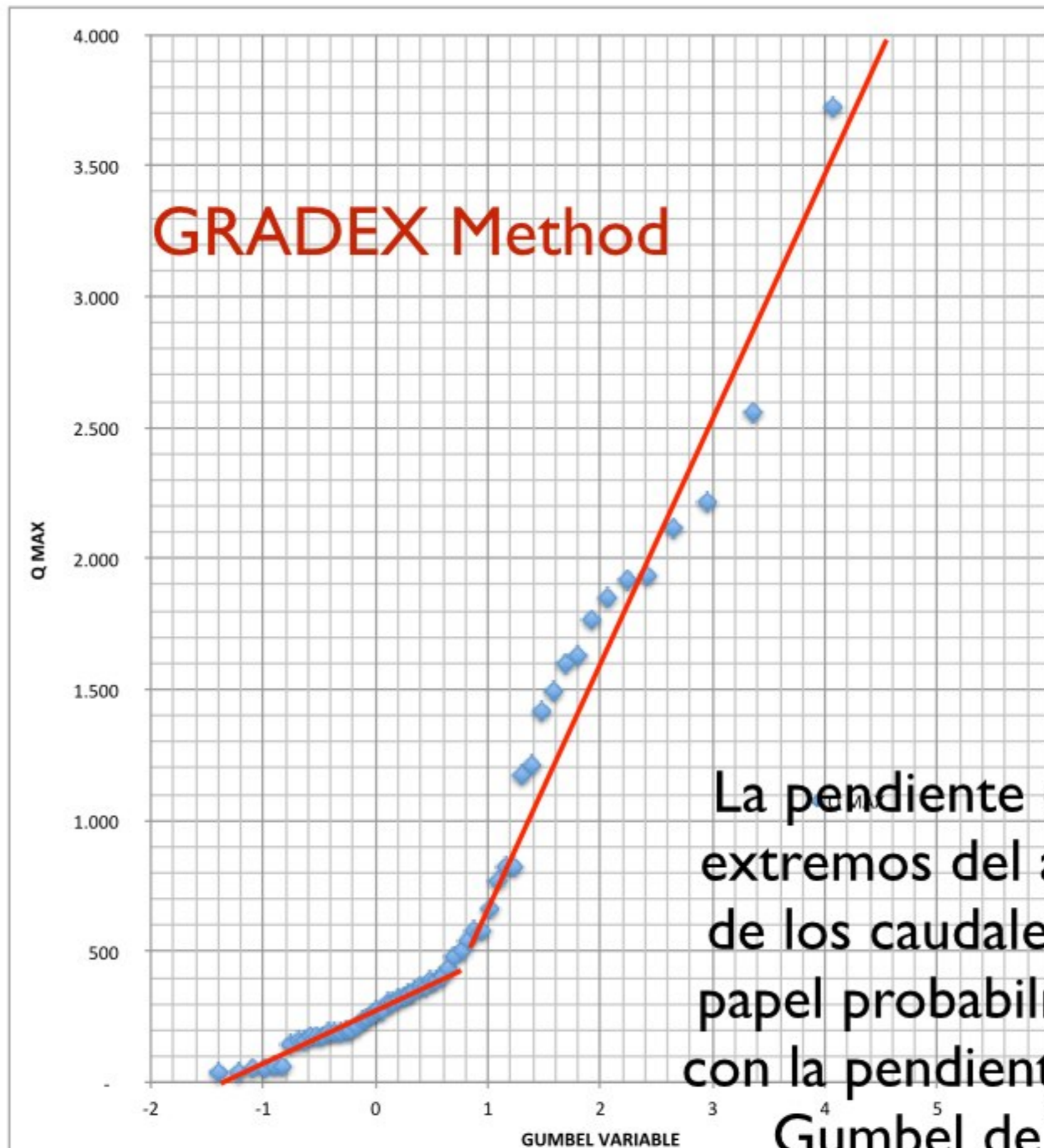
# Ajuste de Gumbel





# GRADEX Method





La pendiente de los valores extremos del ajuste Gumbel de los caudales máximos en papel probabilístico, coincide con la pendiente del ajuste de Gumbel de los valores extremos de las lluvias

# EDHIT Training Workshop

Training Workshop for Civil Protection officers,  
Meteorological and Hydrological forecasters  
(from NHMS)

**Brussels**

**June 2015**



International workshop on Forecasting  
Rainfall and lightning induced Hazards at European Scale

Brussels, 25th June, 2015



Main | Program | Location | EDHIT Platform | EDHIT Webpage | Webinar | EDHIT Training



#### OPENING/THE RELEVANCE OF THE COOPERATION AT EUROPEAN LEVEL



##### Chapters

OPENING/THE RELEVANCE OF THE  
COOPERATION AT EUROPEAN LEVEL

THE CHALLENGE OF SHORT-TERM HIGH-  
RESOLUTION RAINFALL NOWCASTING

VERIFICATION TESTS AND REAL  
APPLICATION CASE STUDIES

ROUND TABLE AND OPEN DEBATE

International Workshop on  
**Forecasting Rainfall and Lightning Induced  
Hazards at European Scale**

Emergency Response Coordination Centre of the EU Civil Protection  
Brussels 25 June 2015



#### AGENDA INTERNATIONAL WORKSHOP

##### OBJECTIVES OF EDHIT PROJECT

###### OPENING

The Challenge of facing weather-induced hazards at  
European Scale in the XXI century.

Juha Auvinen (DG ECHO), Michael Staudinger (Director of  
ZAMG), Taito Vainio (DRS Finnish Met), Dick Blaauboer  
(EUMETNET) Philippe Quevauviller (DG HOME), Luca Rossi  
(UN ISDR)

###### THE RELEVANCE OF THE COOPERATION AT EUROPEAN LEVEL

Chairperson: Daniel Sempere-Torres (Universitat Politècnica de  
Catalunya)

The Sendai Framework for Disaster Risk Reduction 2015-2030

webinar at  
<http://www.edhit.eu/workshop/>

Write your question here

Name \*

Enter your name and surname

Email Address \*

Enter a valid email address

Clear Send

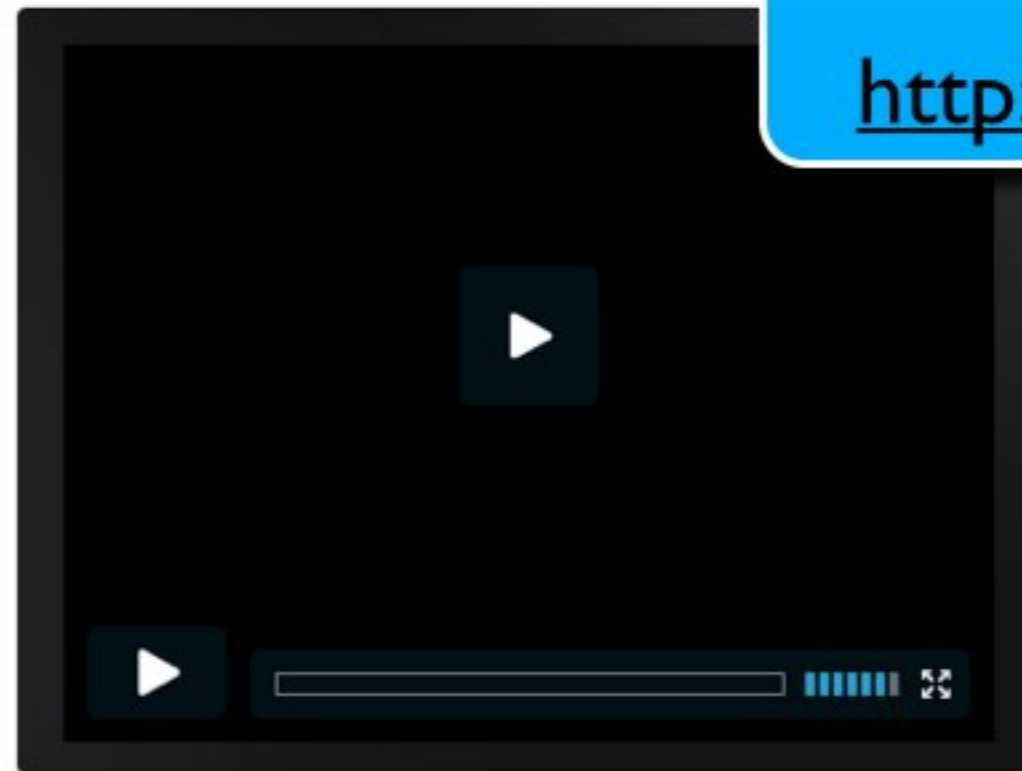
# EDHIT



- Home
- Overview
- WorkPlan
- Partner Area
- News
- Video
- Materials
- EDHIT Workshop
- Webinar
- EDHIT Training

EDHIT Poster  
Flash Floods GENOA  
EDHIT Video

## Edhit Video



video at  
<http://www.edhit.eu>

### Download video [ENGLISH]

NOTE: To download video, right-click on 'Download video' under each video and depending on your browser, select 'Save link as' or 'Save as'.



European Civil Protection



FINNISH METEOROLOGICAL INSTITUTE



ZAMG



PORTUGAL CIVIL PROTECTION



SSÄMINISTERIO  
YMPÄRISTÖMINISTERIÖ



SMHI

European Demonstration of an enhanced rainfall and lightning induced Hazard Identification nowcasting Tool  
-EDHIT-

Contact us



✓ Suscrito ⚙️

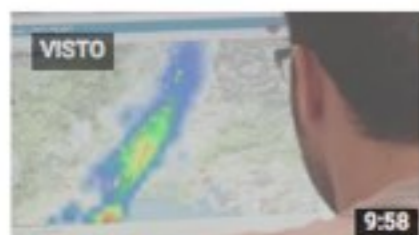
## CRAHI UPC

Inicio **Videos** Listas de reproducción Canales Comentarios Más información 🔍

Videos subidos ▾

Fecha (de más recientes a más antiguos) ▾

Lista ▾



### Forecasting rainfall and lightning induced hazards in Europe

Hace 3 meses • 44 visualizaciones

Heavy rainfalls and lightning are the triggering agents of a number of natural hazards affecting our society through their impacts over the outdoor exposed activities and assets....



### Do you want to know if it will rain in a few hours?

Hace 1 año • 232 visualizaciones

Heavy rainfalls are the cause of a number of hazi impacts over the outdoor exposed activities and



### Flash Floods Early Warnings: The IMPRIN

Hace 2 años • 71 visualizaciones

Flash Floods and Debris Flow are a major hazard flood emergency event the tools developed unde



### Flash Flood Early Warnings: What can we do?

Hace 2 años • 1.470 visualizaciones

Flash Floods and Debris Flow are a major hazard in Europe and worldwide and Early Warning Systems are the best way to increase preparedness and suport efficient operational risk...

Forecasting rainfall and lightning induced hazards in Europe at CRAHI UPC channel at YouTube  
<http://www.edhit.eu/video/>



# Centre de Recerca Aplicada en Hidrometeorologia

UNIVERSITAT POLITÈCNICA DE CATALUNYA



**GRACIAS!**

**TECNIO**  
Be tech. Be competitive