



CONFEDERACIÓN  
HIDROGRÁFICA  
**EBRO**

# Water-ForCE Project Copernicus applications at CHE



GOBIERNO  
DE ESPAÑA

MINISTERIO  
PARA LA TRANSICIÓN ECOLÓGICA  
Y EL RETO DEMOGRÁFICO



CONFEDERACIÓN  
HIDROGRÁFICA  
DEL EBRO

*María Luisa Moreno Santaengracia ([mlmoreno@chebro.es](mailto:mlmoreno@chebro.es))  
José Ángel Losada García ([jlosada@chebro.es](mailto:jlosada@chebro.es))*

# Ebro River Basin Authority as a Copernicus user

- I. Activation of Copernicus EMS for monitoring and follow-up of flood episodes (Since 2013)
- II. Partner of European Flood Alert System (EFAS) (Since 2006)
- III. Participation in Diana H2020 for improvement in knowledge of irrigated surfaces (Completed in 2019)
- IV. Use of Copernicus HUB for monitoring the Ebro Delta after the storm "Gloria" (Since 2020)

# TERRITORIAL SCOPE EBRO RIVER BASIN

## Administrative and population data

### Territories of 9 autonomous communities

- 18 provinces
- 1.715 municipalities
- 5.423 locations
- Total area: 85.534 km<sup>2</sup>
- More than 3 million inhabitants



Hydrographic areas in Spain



# I. Copernicus EMS activation experiences at CHE

Servicio de gestión de emergenci Copernicus Emergency Manager

emergency.copernicus.eu/mapping/#zoom=2&lat=35.95444&lon=48.58186&layers=0BT00

**COPERNICUS**  
Emergency Management Service - Mapping

Copernicus EMS » Mapping

Home | What is Copernicus | EMS | Mapping | Linking with Early Warning Systems | News

EVENT	AREA	CODE Activation	SATELLITES
2013 (January)	Middle Ebro (Pradilla - Alcalá de Ebro)	EMSR-028	COSMO-SkyMed
2015 (February)	Upper course Ebro (Trespaderne) and Middle Ebro	EMSR118	Sentinel-1A
2018 (April)	Upper course Ebro (Zadorra, Arga-Ega) and Middle Ebro	EMSR279	Sentinel2A/B, Radarsat2, COSMO-SkyMed
2019 (October)	Segre (Lleida area)	EMSR397	Sentinel2A/B, Sentinel1A/B, SPOT 6

**LATEST**

**EMS - MA**

- Service
- Who can
- How to
- Portfolio
- Portfolio
- Quality control / Feedback
- User Guide

**RAPID MAPPING**

- List of Activations
- Map of Activations
- GeoRSS Feed
- Online Manual

**RISK AND RECOVERY**

- List of Activations

# I. Copernicus EMS activation experiences at CHE

Discharge real time data in flood events 2013, 2015, 2018 and 2019.  
Showing in this table 5 gauging stations in upper, medium and low Ebro river and upper Segre river



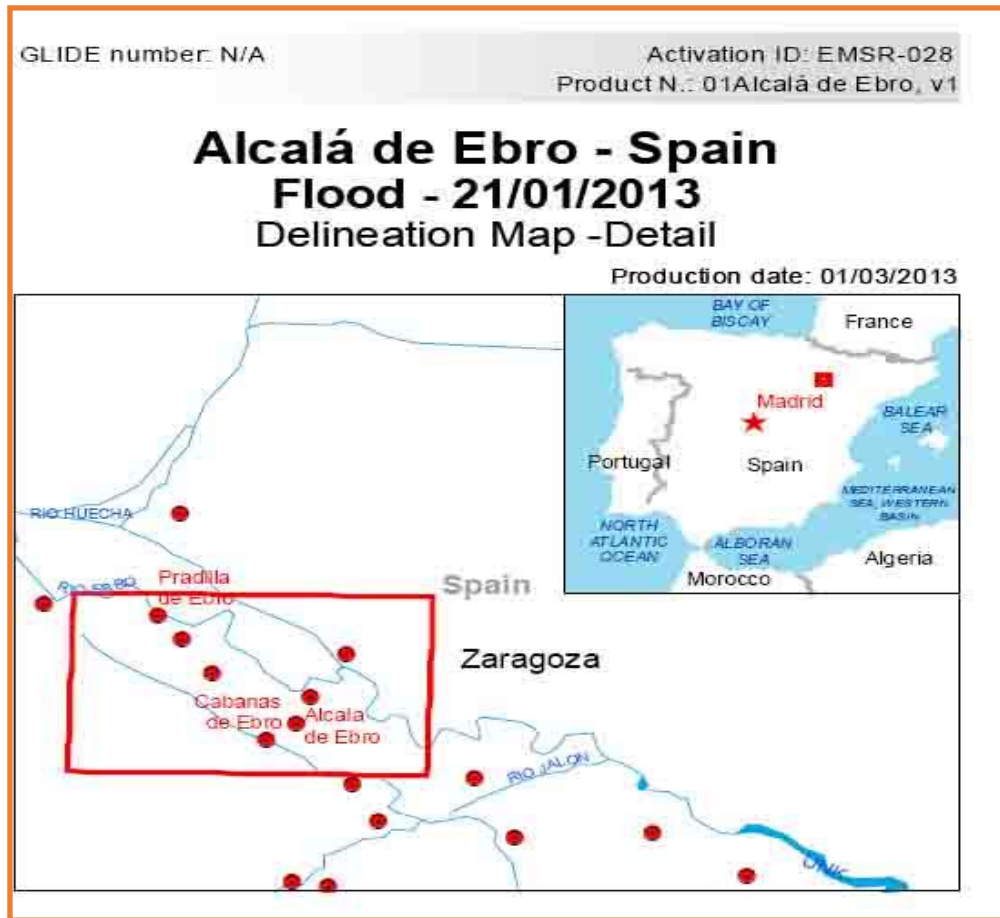
**SAIH Ebro**  
Sistema Automático  
de Información  
Hidrológica

9001 Ebro en Miranda	
Fecha	Q. Max. Ints. m³/s
20/01/2013	578
31/01/2015	1025
12/04/2018	374
25/01/2019	936
9002 Ebro en Castejón	
Fecha	Q. Max. Ints.m³/s
20/01/2013	2113
01/02/2015	2307
13/04/2018	2682
26/01/2019	1911
9311 Ebro en Zaragoza Expo	
Fecha	Q. Max. Ints. m³/s
23/01/2013	1689
02/03/2015	2500
15/04/2018	2041
28/01/2019	1481
9027 Ebro en Tortosa	
Fecha	Q. Max. Ints.m³/s
21/06/2013	1514
09/03/2015	1795
18/04/2018	1835
20/12/2019	1020
9023 Segre en Seu de Urgell	
Fecha	Q. Max. Ints.m³/s
30/04/2013	99
03/11/2015	202
15/10/2018	190
23/10/2019	168

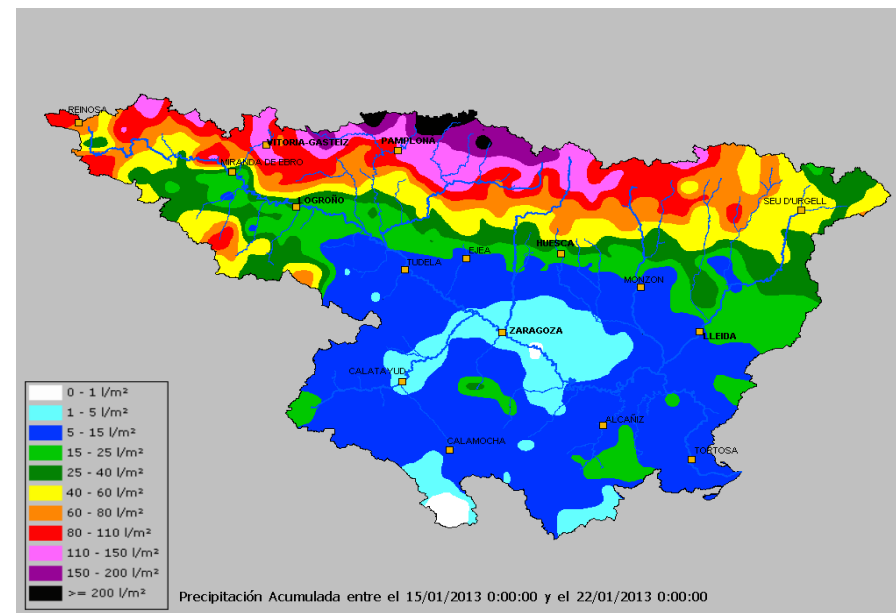
## I. Copernicus EMS activation experiences at CHE

## 1. Extraordinary flood on January 2013

## Techniques applied in the CHE:



- Vertical and oblique aerial photographs (and restitution as a GIS layer in SITEbro)
- Remote sensing (**Copernicus satellites**)



## Accumulated rainfall



# I. Copernicus EMS activations experiences at CHE

## 1. Extraordinary flood on January 2013



Alcalá de Ebro  
25/01/2013  
Vertical aerial photographs



# I. Copernicus EMS activation experiences at CHE

## 1. Extraordinary flood on January 2013

Cabañas de Ebro

25/01/2013

Oblique aerial photographs





# I. Copernicus EMS activation experiences at CHE

## 1. Extraordinary flood on January 2013



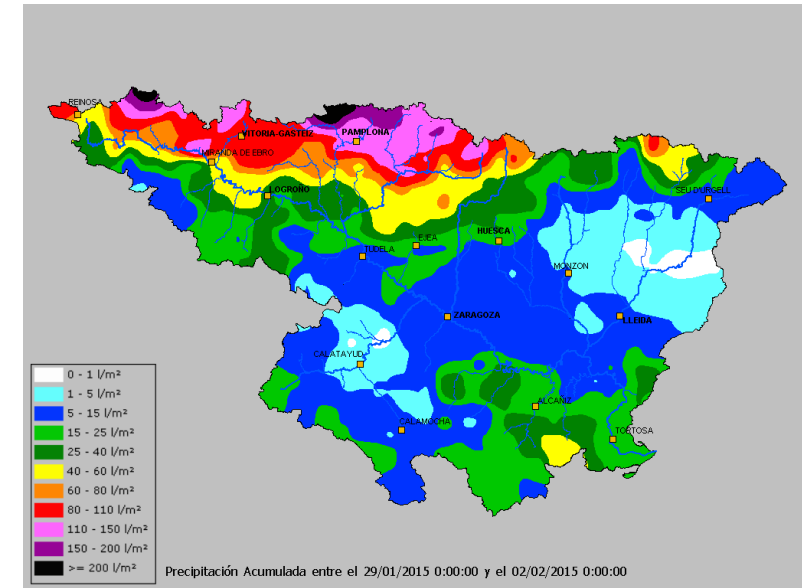
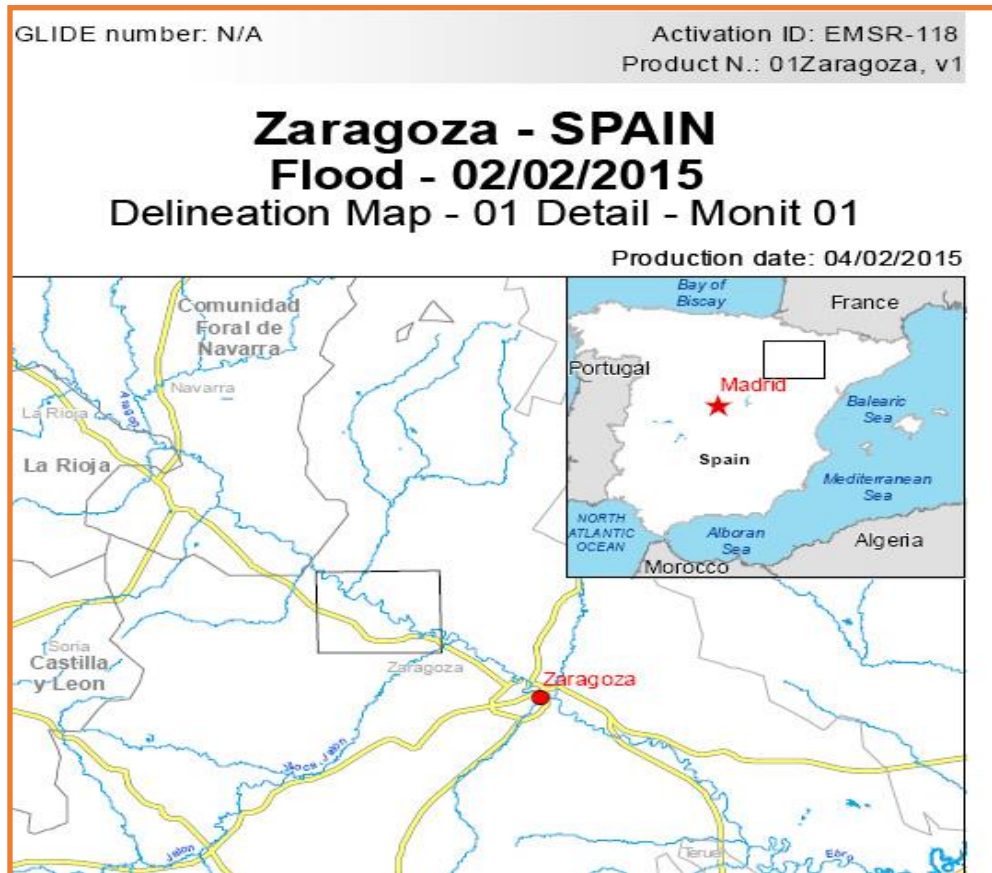


# I. Copernicus EMS activation experiences at CHE

## 2. Extraordinary flood on February-March 2015

Techniques applied in the CHE:

- Vertical and oblique aerial photographs (and restitution as a GIS layer in SITEbro) and drones (locally)
- Remote sensing (Deimos1, Deimos2 and Copernicus satellites)



Accumulated rainfall



# I. Copernicus EMS activation experiences at CHE

## 1&2. Extraordinary floods on 2013 (January) and 2015 (February-March)

### Main results and conclusions:


- The thematic cartographies made from Copernicus EMS offers a synthesis panorama on a regional scale, but they fall far below the spatial resolution required by this CHE, which is assimilated to a “cadastral plot scale” (cartography to plot scale: on the aerial image the rural and urban plots affected by the flood must be perfectly identified; this resolution is essential for the correct planning of the post-flood actions that CHE must execute and for the processing of files of affection for damages).
- It has also been possible to show an inaccurate classification of the "flood" category in the thematic compositions from the satellite images processed by Copernicus. For this, control points have been established on said thematic compositions, in order to compare points and known sections with the visual information provided by the drones on the same dates and similar times. Thus, flooded areas according to the photographs obtained from drones (“ground truth”) have not registered any flooding according to the satellite images processed and provided by Copernicus.

# I. Copernicus EMS activation experiences at CHE

## 1&2. Extraordinary floods on 2013 (January) and 2015 (February-March)

- However, overall the experience gained with the activation of the Copernicus EMS protocol has been very positive; in the future, it will be necessary to be aware of the technological and methodological improvements that are incorporated into this European Emergency Management Service; specifically, with regard to the incorporation of satellites and sensors with higher spatial and temporal resolution.

Copernicus EMS – Mapping  
Rush Mode (EndU-FF)



	Yes	No	Not applic.
<b>With the product(s) I was able to</b> <i>(several answers possible)</i>			
Get a faster overview of the situation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set better priorities on operations	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have new information that I did not have previously	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Please specify any additional capabilities of the products	<input type="text"/>		
<b>How have you used the products?</b> <i>(Please describe your usage of products and their contribution to the work you are responsible for)</i>	It provides an overview of flooding areas, but unfortunately Sentinel images lacks the resolution we need in management operations		
<b>Overall, the service provided a benefit to my work</b> in terms of reactivity and content of information	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No, I recommend the following improvements:  In our opinion, Copernicus protocol should be activated with other satellites (like Deimos-2), with higher spatial resolution, plus Sentinel	



# I. Co

## 1&2. Ext



### M3 INTERVIEW

Users' Feedback

Valuation of the  
analysis of the

Interview temp  
EMSV014. Valu



According to data provided by the CHE, the flood peak arrived Zaragoza city on 04/02/2015 around 04:00 local time (03:00 UTC). Thus, both, Sentinel 1A image and the aerial photography taken from the drone correspond to images after the flood peak. Considering that the Sentinel 1A image was acquired almost seven hours after the oblique photo, it could be deduced that water was disappeared from the surface in that time. However, rest of flooding is not seen in the area when watching the satellite image.



**Figure 8.** Example of discrepancies between the flooded area delineated by the Copernicus-EMS map (transparent light blue areas) and the ground-truth data taken from a drone (oblique photography in the upper right corner of the map). Source: Confederación Hidrográfica del Ebro (CHE).

Some differences were found between the flooded area layer of a product of the Copernicus-EMS Mapping service (P8) and the one created by the EMS-Validation service. It is believed that these discordances can be due to the use of different polarization of the radar (Sentinel-1A) image.



# I. Copernicus EMS activation experiences at CHE

## 1&2. Extraordinary floods on 2013 (January) and 2015 (February-March)



GMES Initial Op  
Mapping Valida  
Framework Service Contra

### M3 INTERVIEW QUESTION

Users' Feedback:

Valuation of the Copernicus-EMS  
analysis of the floods in Spain

Interview template for Users  
EMSV014. Valuation of EMSR120



Some areas identified as “flooded areas” in the Copernicus-EMS maps are not real flooded areas. As it is shown in Figure 5 some areas identified as “flooded areas” in the Copernicus-EMS are not real flooded areas; some of them are far away from the river.



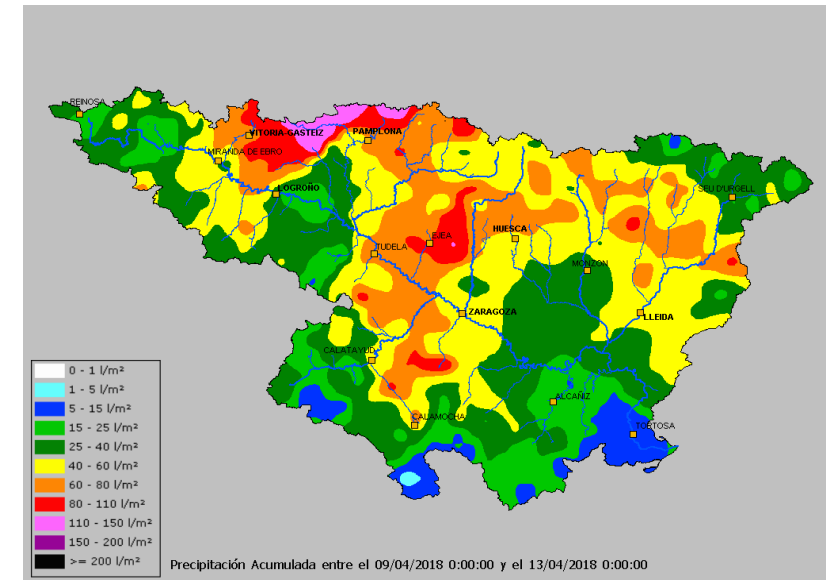
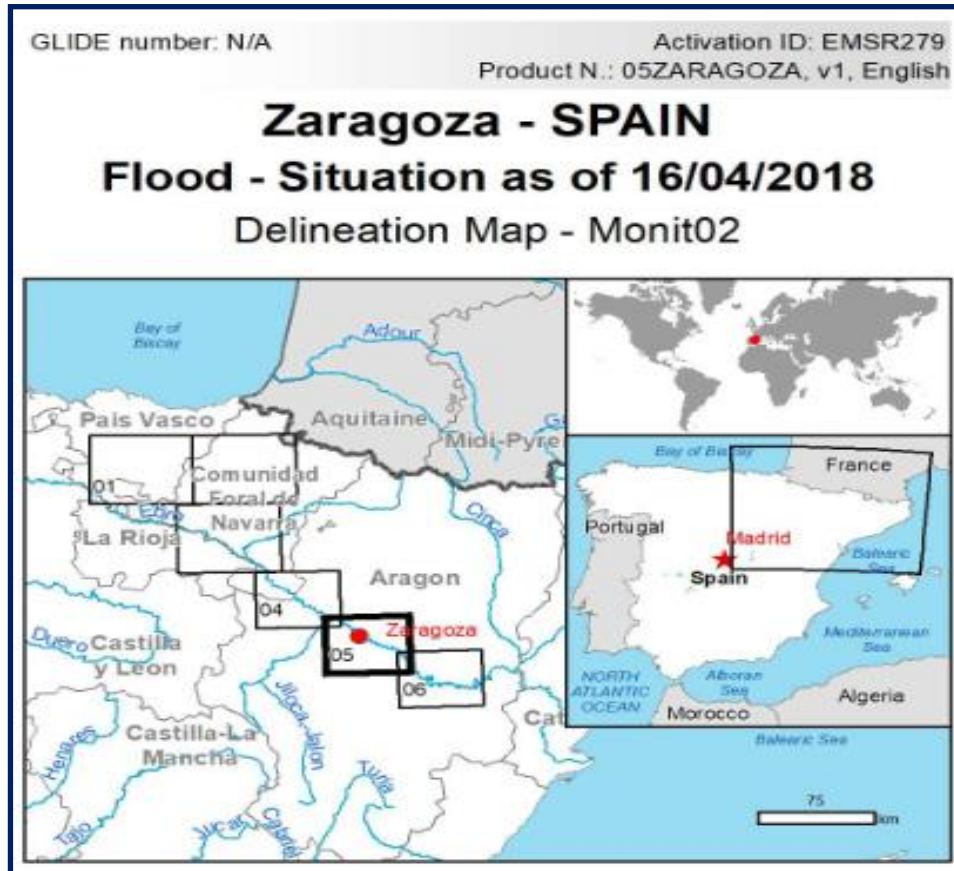


# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

Techniques applied in the CHE:

- Vertical and oblique aerial photographs and video (and restitution as a GIS layer in SITEbro)
- Remote sensing (Deimos1, Deimos2 and Copernicus satellites)



Accumulated rainfall

# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

### Main results and conclusions:

**Deliveries : 15 “Delineation Maps” and 2 “Grading Maps”:** These products have two components: “raster” information (thematic maps in PDF, JPG and TIFF formats at different resolution) and “vector” information (SHP of planimetry and with the delimitation of the event: flood spot):

The screenshot shows the Copernicus Emergency Management Service (EMS) website interface. The top navigation bar includes the European Commission logo and the text "Emergency Management Service". Below this, there are links for "Home", "What is Copernicus", "EMS - Mapping", "EMS - Early Warning System", and "News". The main content area is titled "EMS279: Flood in the Ebro river basin, Spain". It provides details about the event, including the event time (UTC and LOC), event type (Flood (Riverine flood)), activation time (UTC), reference maps produced (0), delineation maps produced (15), grading maps produced (2), and activation status (Open). It also lists the affected countries/territories (Kingdom of Spain) and the authorized user (Spain/Centro de Coordinación Operativa (CECOP) de la Dirección General de Protección Civil y Emergencias). The activation reason is described as an extraordinary flood event in the Ebro basin due to melting snow in the Pyrenees. A relevant news item is listed: "The Copernicus Emergency Management Service Monitors Flood in Ebro River Basin, Spain". On the right, there are two maps: a map of the Ebro river basin showing the flood extent and a map of the Ebro river basin showing the flood extent. Below the maps, there are filters for map type (ALL, DELINEATION, GRADING) and product (ALL, Alcalá de Ebro [08], Alfaro [03], Alfaro [07], Caspe [06], Gandesa [10], Pamplona [02], Seros [09], Tortosa [11], Tudela [04], Vitoria-Gasteiz [01], Zaragoza [05]). The bottom of the page shows the system tray with the date and time (12:19 03/05/2018).

# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

### 2. Uso del producto

- Capacidad de los productos para asistirle en el trabajo :

*Definiciones:*

Muy útil: Producto clave para optimizar mi trabajo.

Útil: Producto relevante para apoyar mi trabajo.

Necesidad de mejora: Producto óptimo pero necesita mejorar para un mejor uso.

No pertinente: No aporta ninguna mejora en mi trabajo, incluso disminuye la eficiencia de éste.

Tipo de producto	Muy útil	útil	Necesidad de mejora	No pertinente	No requerido	Debido a (por favor, justifique su elección si el producto no fue útil)
Mapa de Referencia	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
Mapa de Delineación de las zonas afectadas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
Mapa de Categorización de Daños	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>

Copernicus EMS Rapid Mapping  
Usuario (Final) Asociado  
Formulario de Evaluación (EndU-FF)





# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

	Sí	No	No aplicable
<b>• Con el producto(s) fui capaz de</b> <i>(Múltiples respuestas permitidas)</i>			
Tener un rápido resumen de la situación	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establecer mejor las prioridades en las operaciones	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tener nueva información que no tenía previamente	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Por favor especificar características adicionales de los productos	<input type="text"/>		
<b>• ¿Cómo ha usado los productos?</b> <i>(Por favor describa su uso del producto y su contribución al trabajo del cual es responsable)</i>	copernicus ems ha sido uno más de los dispositivos activados con motivo de las inundaciones en el eje del ebro en abril de 2018; sus productos son complementarios a los obtenidos a través de vuelos aéreos tripulados, reconocimiento directo en campo y drones.		
<b>• En general, el servicio ha proporcionado un beneficio en mi trabajo</b>	<input checked="" type="checkbox"/> Sí	<input type="checkbox"/> No, propongo las siguientes mejoras: <input type="text"/>	

□

# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018



### 5. Comentarios y recomendaciones

Use este espacio para sus comentarios, elaboración de respuestas anteriores y/o recomendaciones para mejora.

En general, nuestro grado de satisfacción en la activación Copernicus EMSR279 puede calificarse como medio-alto. En este sentido, quisiéramos transmitir al equipo técnico EMS RAPID MAPPING nuestro agradecimiento y felicitaciones: hemos percibido una notable mejora en la estimación de las superficies inundadas en comparación con la anterior activación de Copernicus EMS, realizada para esta misma zona en febrero de 2015. En aquel evento, a la hora de valorar los productos cartográficos, comentamos que, si bien nos sirvieron para disponer de una imagen global del evento, no tenían la precisión (debido, fundamentalmente, a la resolución espacial de las imágenes Sentinel) que necesitamos para una mejor gestión y seguimiento del episodio de inundación, tanto para una mejor estimación de daños en las obras hidráulicas como para la tramitación de expedientes de los afectados requerimos una cartografía a escala de parcela catastral. La delimitación de las zonas inundadas (capas vectoriales "observed event") presentaba muchas discontinuidades; en comparación con las imágenes obtenidas desde drones para las mismas áreas y fechas-hora se pudo ver que Copernicus estaba subestimando claramente la superficie realmente inundada. Ahora, en 2018, todo esto parece haber sido recalibrado y los resultados son mucho más satisfactorios (por reales) que los obtenidos entonces.





# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

### Map Information

Since 12th April 2018, an extraordinary flood event is occurring in the Ebro basin due to the combined effects of rainfall that is exacerbating snowmelt in the Pyrenees. The first flooded areas were reported on 12th April, followed by a significant increase in the flooded area on 15th April and a further increase on 16th April.

The present layer has been created by CHE. The estimate of the background is based on the Copernicus EMS data.

Event
Activation

### Data Sources

Pre-event information is based on the Copernicus EMS data, approx. 0% of the area is flooded and ESA. Post-event information is based on the Copernicus EMS data, Ltd. (2018) (the mark of the Union and ESA). COSMO-SkyMed 05:52 UTC, rights reserved.

Base vector

GeoNames 2015, refined by the producer.

Inset maps: JRC 2013, © EuroGeographics, Natural Earth 2012, CCM River DB © EUJRC2007, GeoNames 2013.

Population data: GHS Population Grid © European Commission, 2015  
[http://data.europa.eu/89h/jrc-ghsl-ghs\\_pop\\_gpw4\\_globe\\_r2015a](http://data.europa.eu/89h/jrc-ghsl-ghs_pop_gpw4_globe_r2015a).  
Digital Elevation Model: EU-DEM (25 m)

### Legend

Consequences within the AOI				
		Unit of measurement	Affected	Total in AOI
Flooded area		ha	3274.4	
Estimated population		Number of inhabitants	928	111336
Settlements	Residential	ha	45.8	5487.5
Transportation	Helipad	No.	0	1
	Highway	km	0	231.6
	Primary Road	km	6.5	265.0
	Secondary Road	km	2.98	130.0
	Local Road	km	113	1629.0
	Long-distance railway	km	0	274.3
Facilities	Construction for mining or extraction	ha	5.2	215.6
Land use	Arable land	ha	13036.4	133014.3
	Permanent crops	ha	17.3	4355.3
	Pastures	ha	0.0	50952.4
	Heterogeneous agricultural areas	ha	23.4	12634.2
	Forests	ha	899.7	12634.2
	Shrub and/or herbaceous vegetation association	ha	54.5	18086.1
	Open spaces with little or no vegetation	ha	40.5	7646.8
	Inland wetlands	ha	0.0	807.6

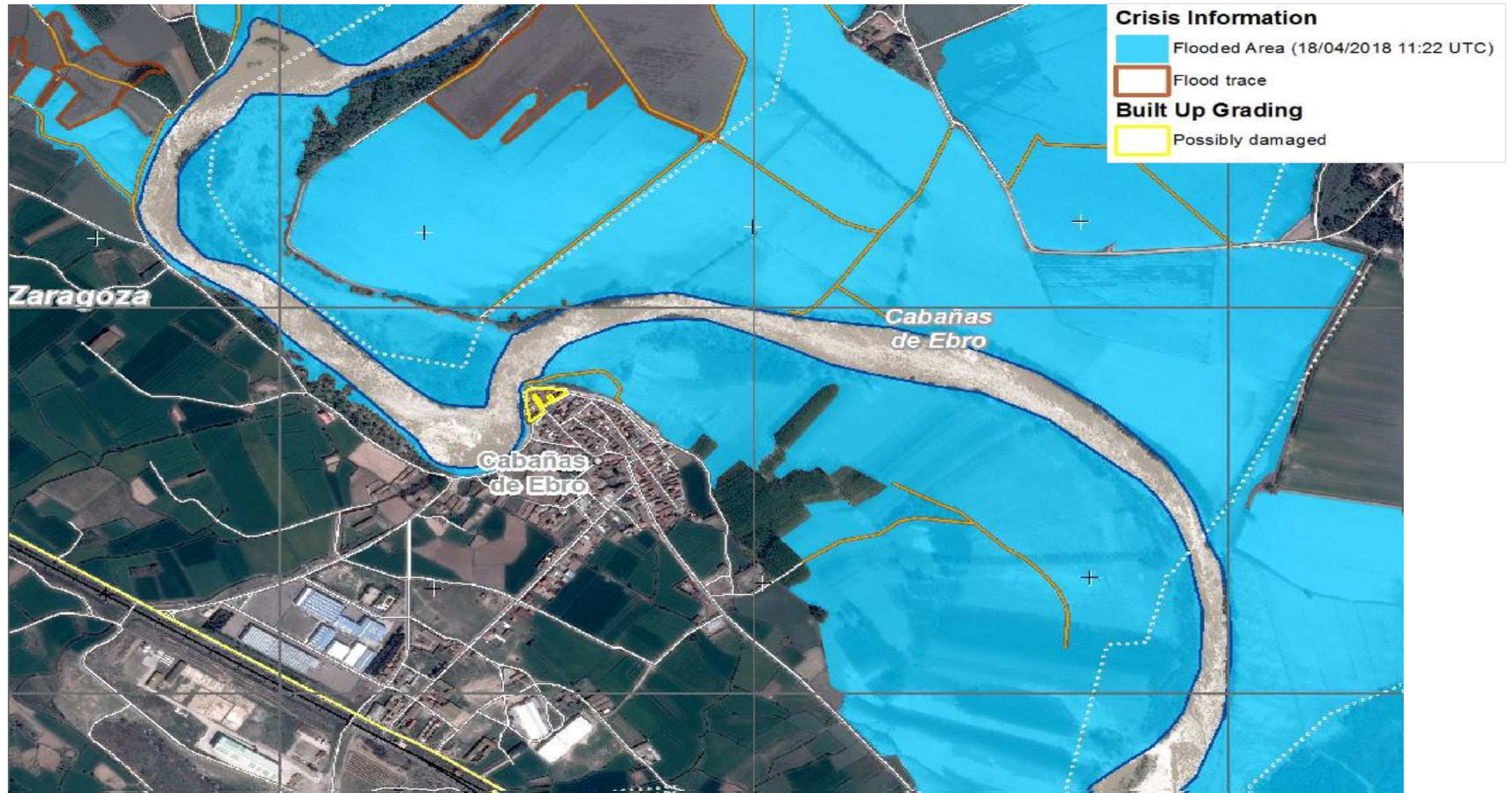




# I. Copernicus EMS activation experiences at CHE

## 3. Extraordinary flood on April 2018

**GRADINGS MAPS**  
(damage categorization)

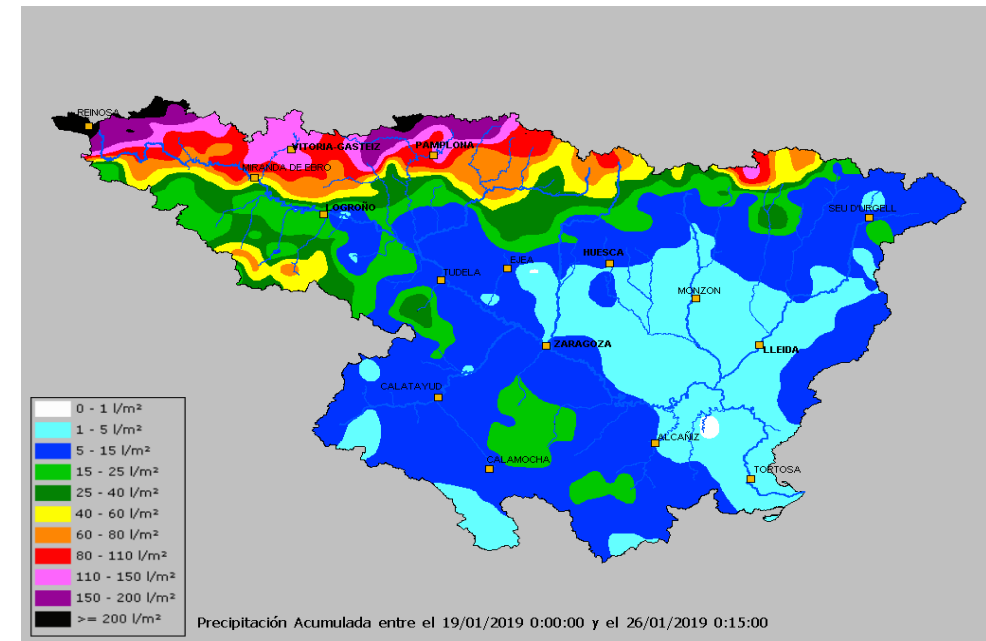
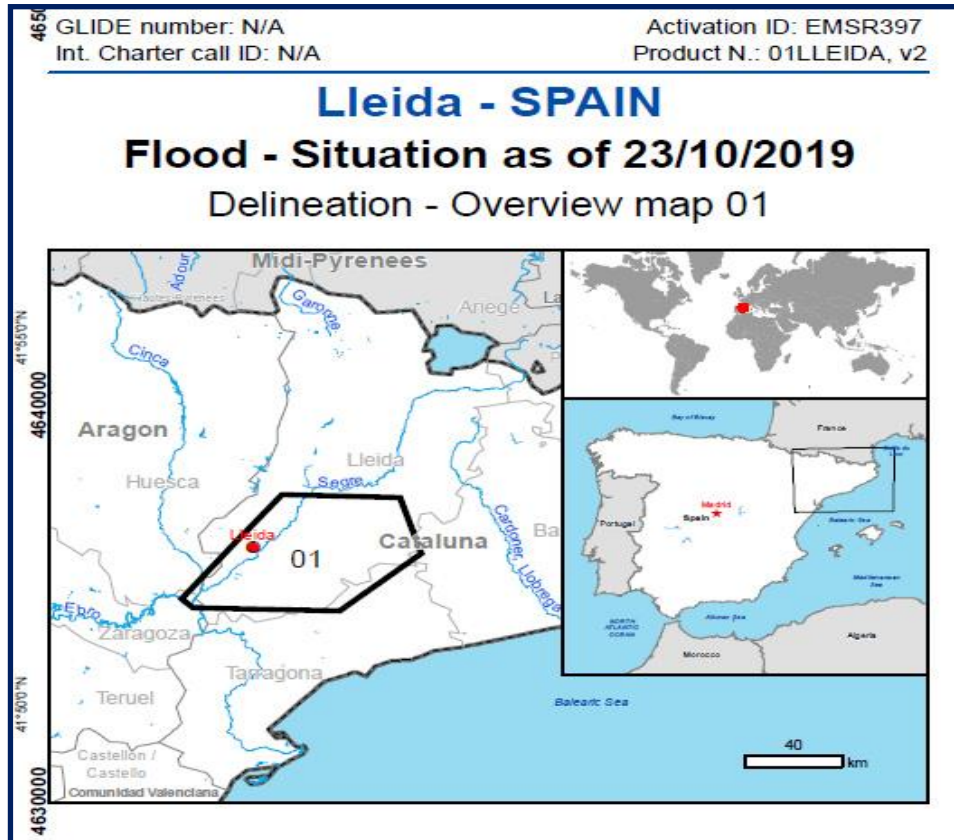


# I. Copernicus EMS activation experiences at CHE

## 4. Extraordinary flood on October 2019

Techniques applied in the CHE:

- Remote sensing (Copernicus satellites)

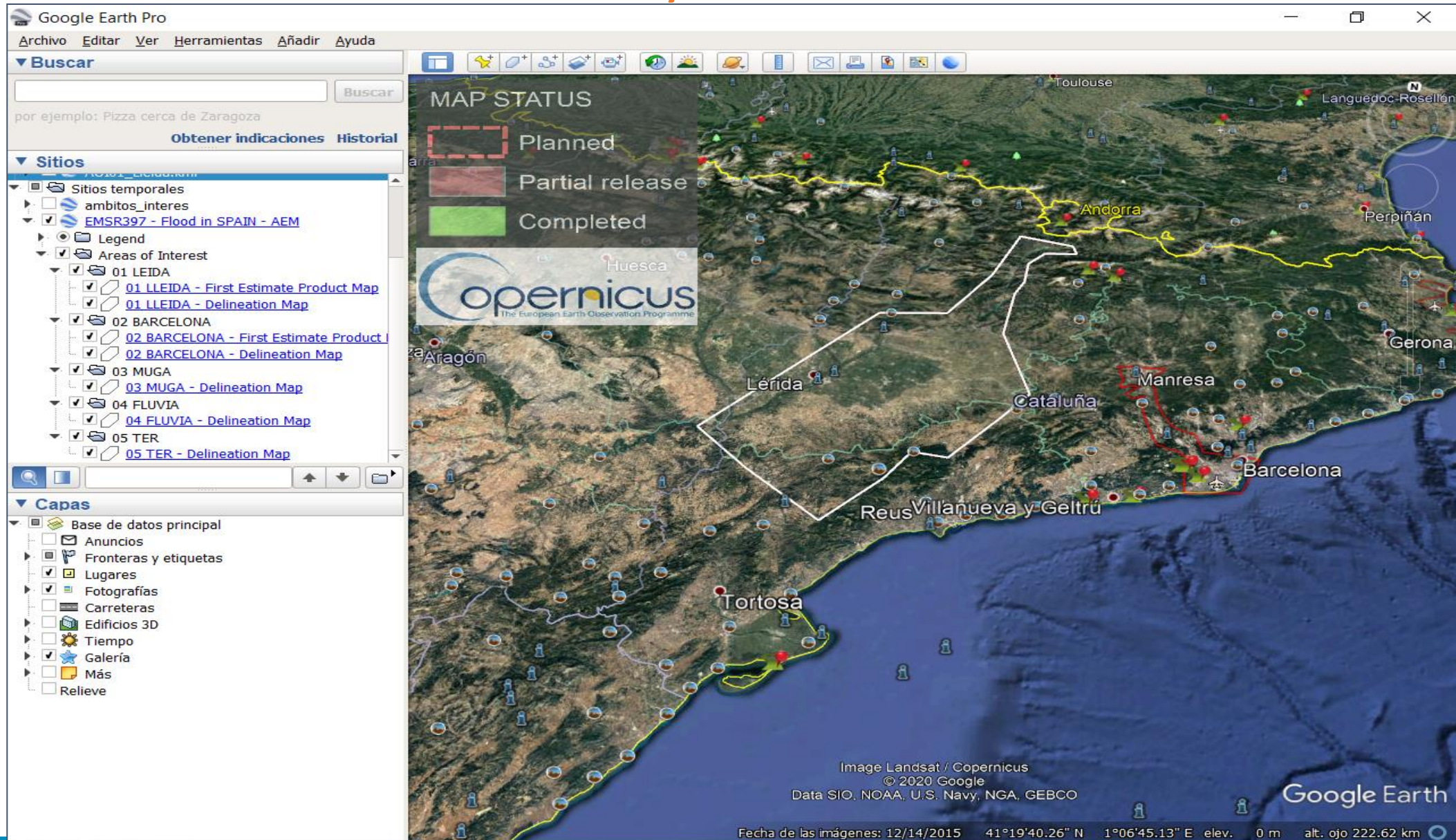


Accumulated rainfall



# I. Copernicus EMS activation experiences at CHE

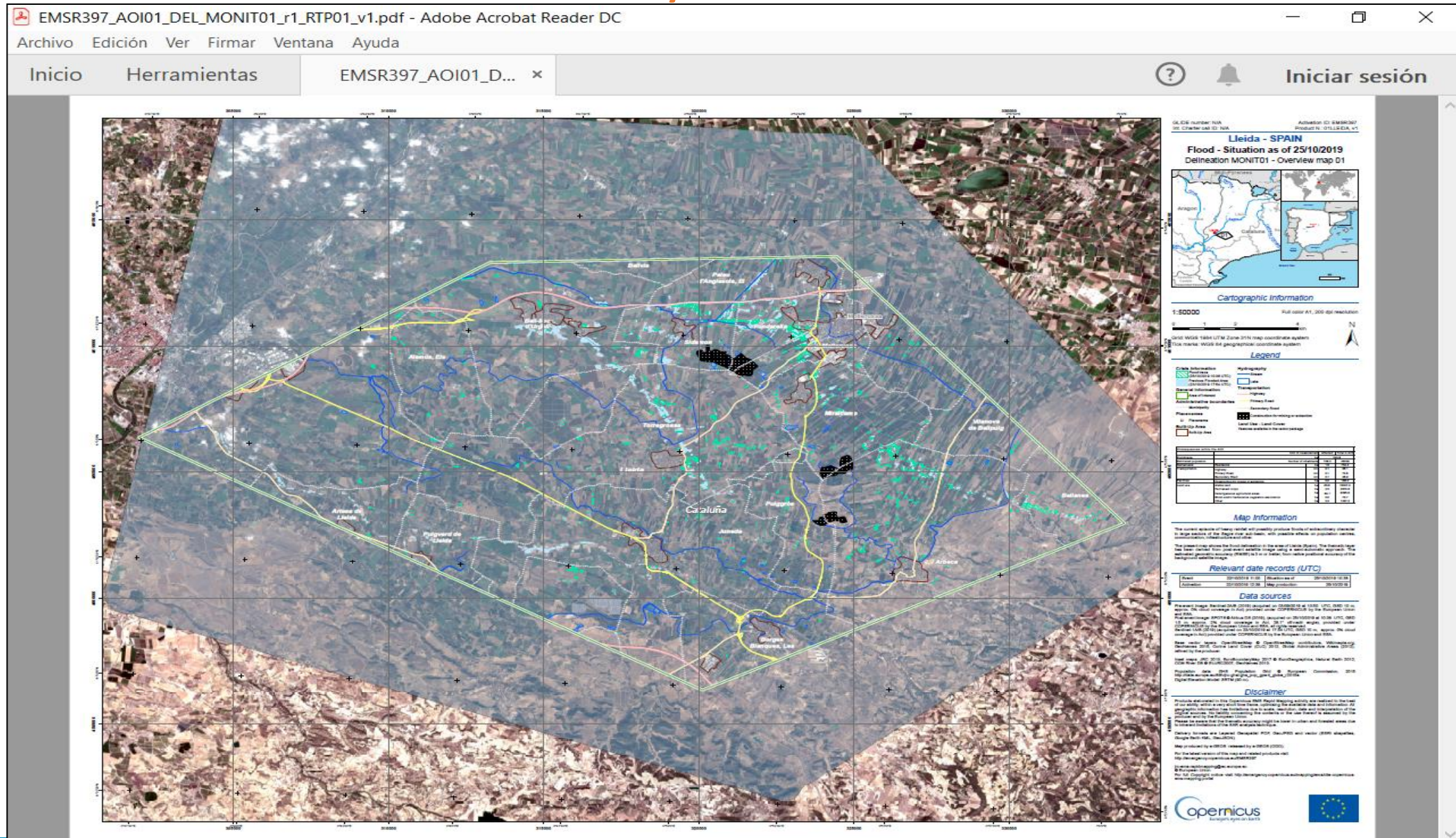
## 4. Extraordinary flood on October 2019





# I. Copernicus EMS activation experiences at CHE

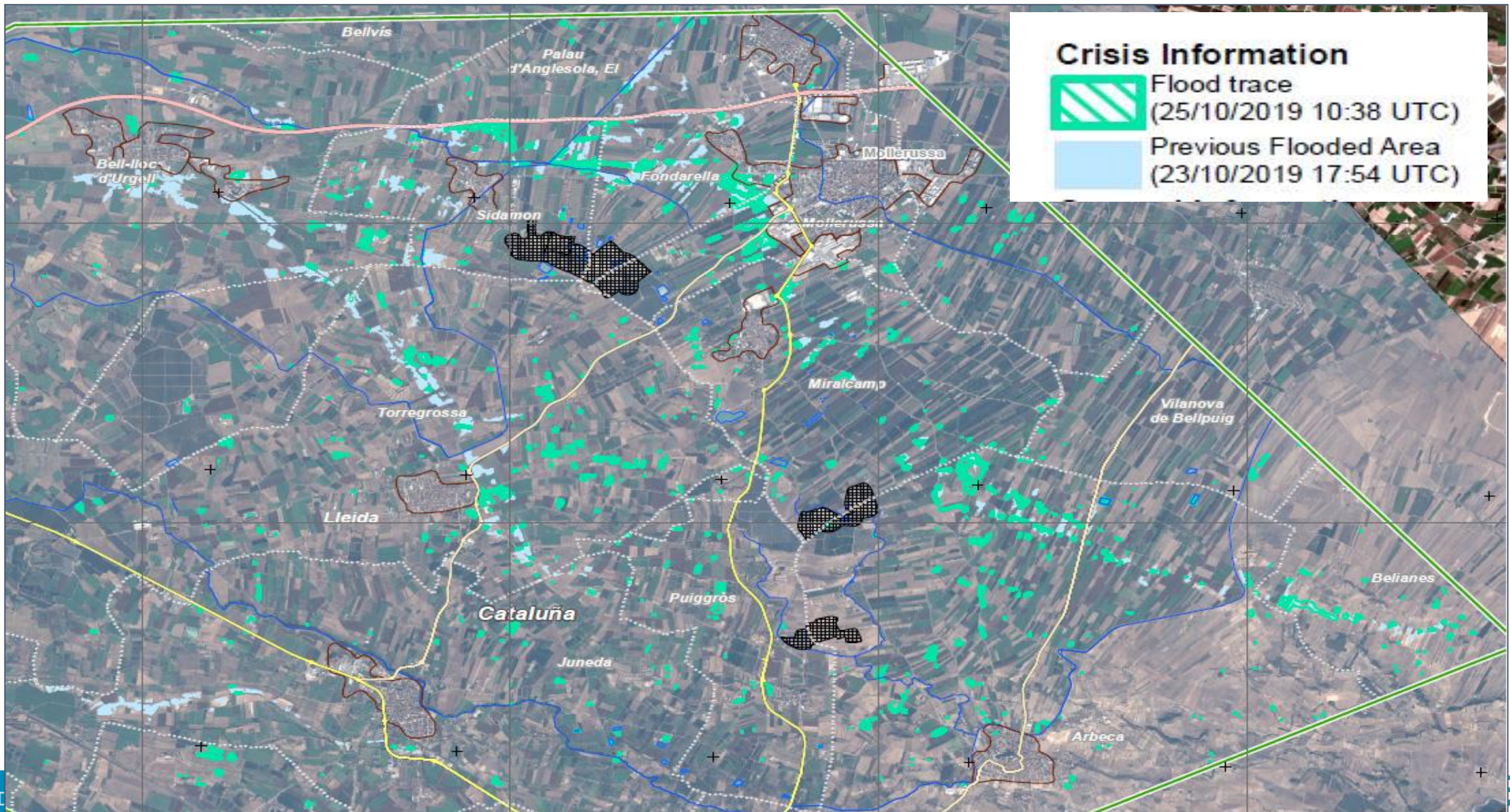
## 4. Extraordinary flood on October 2019





# I. Copernicus EMS activation experiences at CHE

## 4. Extraordinary flood on October 2019





# I. Copernicus EMS activation experiences at CHE

## 4. Extraordinary flood on October 2019

- Capacidad de los productos para asistirle en el trabajo :

Definiciones:

Muy útil: Producto clave para optimizar mi trabajo.

Útil: Producto relevante para apoyar mi trabajo.

Necesidad de mejora: Producto óptimo pero necesita mejorar para un mejor uso.

No pertinente: No aporta ninguna mejora en mi trabajo, incluso disminuye la eficiencia de éste.

Tipo de producto	Muy útil	Útil	Necesidad de mejora	No pertinente	No requerido	Debido a (por favor, justifique su elección si el producto no fue útil)
Referencia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Primera estimación	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Delineación de las zonas afectadas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Categorización de Daños	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Finalmente no fue entregado (el evento fue de menor intensidad que lo que la predicción inicial estimaba)

- Con el producto(s) fui capaz de (Múltiples respuestas permitidas)


	Sí	No	No aplicable
Tener un rápido resumen de la situación	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establecer mejor las prioridades en las operaciones	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tener nueva información que no tenía previamente	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Por favor especificar características adicionales de los productos			

- ¿Cómo ha usado los productos?  
(Por favor describa su uso del producto y su contribución al trabajo del cual es responsable)

Las distintas versiones de "Delineación de las zonas afectadas" (Delineation Product) y "Seguimiento" (Monitoring) han contribuido a estimar las superficies anegadas por el episodio de inundación, a programar las visitas de campo para verificar los terrenos afectados y a analizar el funcionamiento de los cauces actuales y paleocauces y barrancos que se han reactivado como consecuencia del episodio de DANA que afectó al cuadrante NE de España.

- En general, el servicio ha proporcionado un beneficio en mi trabajo

☒ Sí ☐ No, propongo las siguientes mejoras:



European Commission

**Copernicus EMS  
Rapid Mapping**

FF)

cción electrónica: [JRC-EMS-](#)

adaciones de información

**Código de activación: 397**

o usuarios (p. a ellos.

s, por favor



# COPERNICUS EMS MAIN CONCLUSIONS

- The technological improvements that have taken place since the first Copernicus activation in 2013 are very appreciable. In this sense, already in the 2018 activation a spatial resolution was achieved at the cadastral parcel scale.
- The activation of Copernicus EMS is improved with the hydro-meteorological predictive models (EFAS, Decision Support System: SAD Ebro) that determine where and when extraordinary floods will occur in the basin.
- The discrepancies between the flooded surfaces from Copernicus and from other aerial devices (images) have decreased considerably.
- Copernicus Rapid Mapping enables better calibration of Floods Directive hazard maps (National Mapping System for Flood prone areas, SNCZI).
- This information is essential for making past event layers (maximum flooded area coverages) that complement hazard maps of low, medium and high frequency published in the SITEbro (CHE official map viewer: free access by the general public).
- For all these reasons, the Ebro Hydrographic Confederation values the Copernicus Project very positively and we will count on this technology and emergency activations for flood events in the future.

## II. Partner of EFAS



The screenshot displays the Emergency Management Service website. At the top left is the logo for the Emergency Management Service, featuring a stylized orange 'A' with a person inside. To its right is the text 'Emergency Management Service'. A search bar with the placeholder text 'Search' and a 'Search' button is located to the right of the logo. Below the header is a navigation menu with the following items: Home, About, Products, Data access, Collaborate, News and events, Resources, Training, and EFAS Wiki. The main banner features a background image of a bridge over a river with the text 'European Flood Awareness System' in large white letters. Below the banner are three sections: 'Latest events' with a satellite image of a river and the text 'Global to local hydrological modelling and forecasting - virtual event'; 'Access the map viewer' with a screenshot of a map viewer interface and the text 'Live map'; and 'Latest news' with a map of Europe and the text 'New EFAS partner (Portuguese Environment Agency)'.

Emergency Management Service

Search

Home About Products Data access Collaborate News and events Resources Training EFAS Wiki

# European Flood Awareness System

### Latest events

Global to local hydrological modelling and forecasting - virtual event

### Access the map viewer

Live map

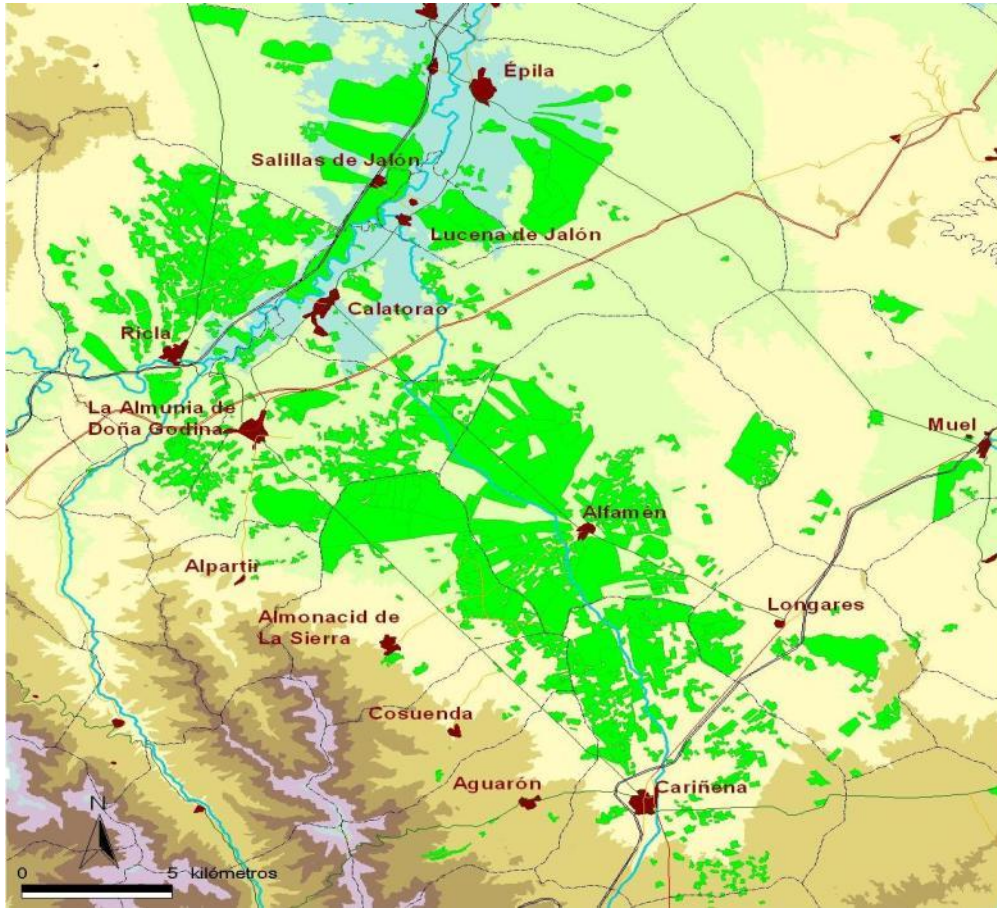
### Latest news

New EFAS partner (Portuguese Environment Agency)



# III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces

## INITIAL SITUATION



Expedientes digitalizados

- Dominant crops: Vineyard (3,656 ha), Fruit trees (4,309 ha), Cereal (2,611), orchard (1,567 ha), olive tree (914 ha)
- Modern high-efficiency irrigation systems (drip and sprinkler).
- The real surface area under groundwater irrigation is 4% higher than the registered surface

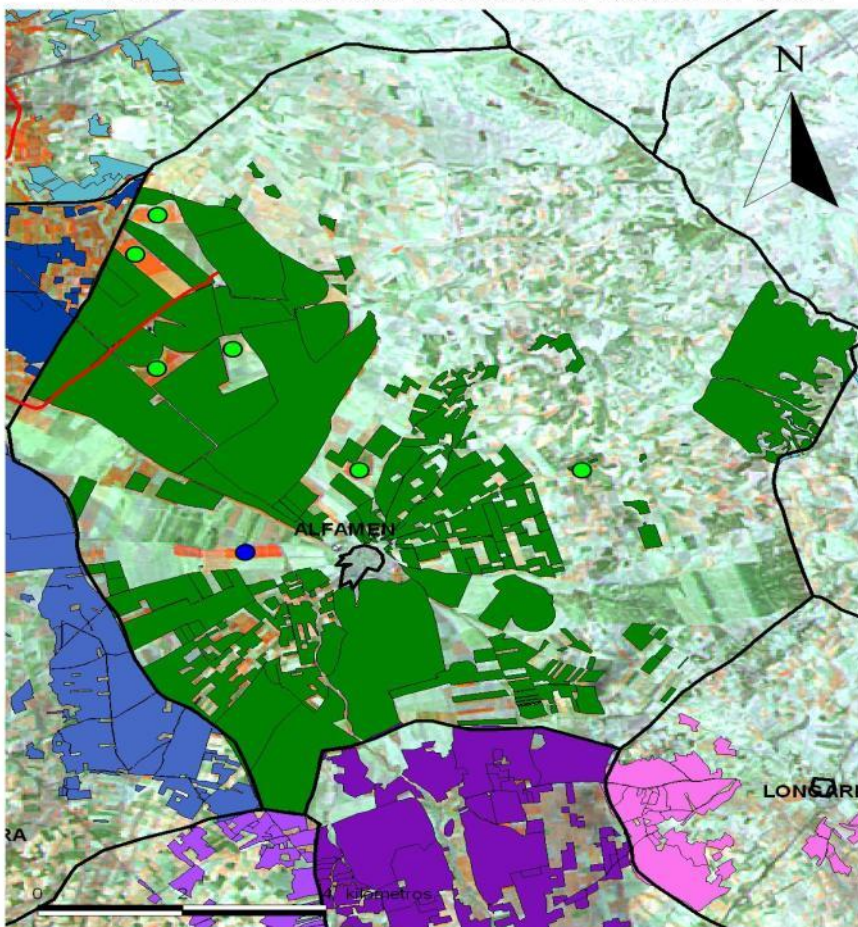


# III.Participation in Diana H2020: improvement in knowledge of irrigated surfaces

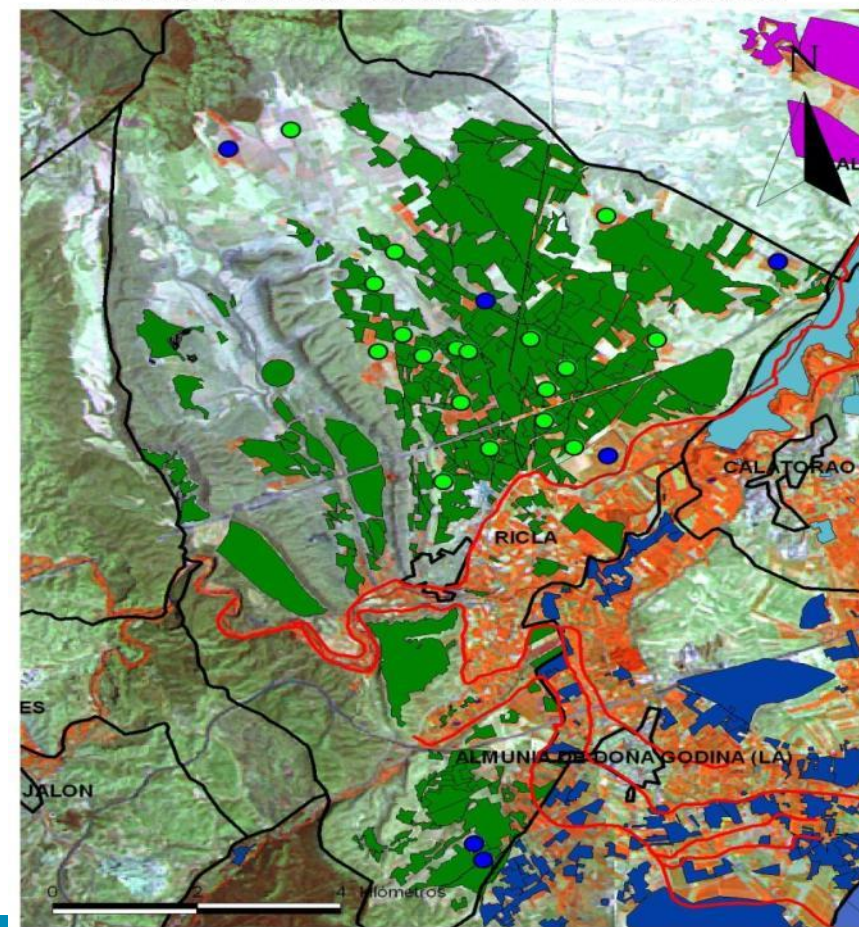
## INITIAL SITUATION

Check: comparison of groundwater harvesting files with the 2004 Landsat image

SUPERPOSICIÓN EXPEDIENTES DIGITALIZADOS  
EN ALFAMEN SOBRE LA IMAGEN LANDSAT 2004

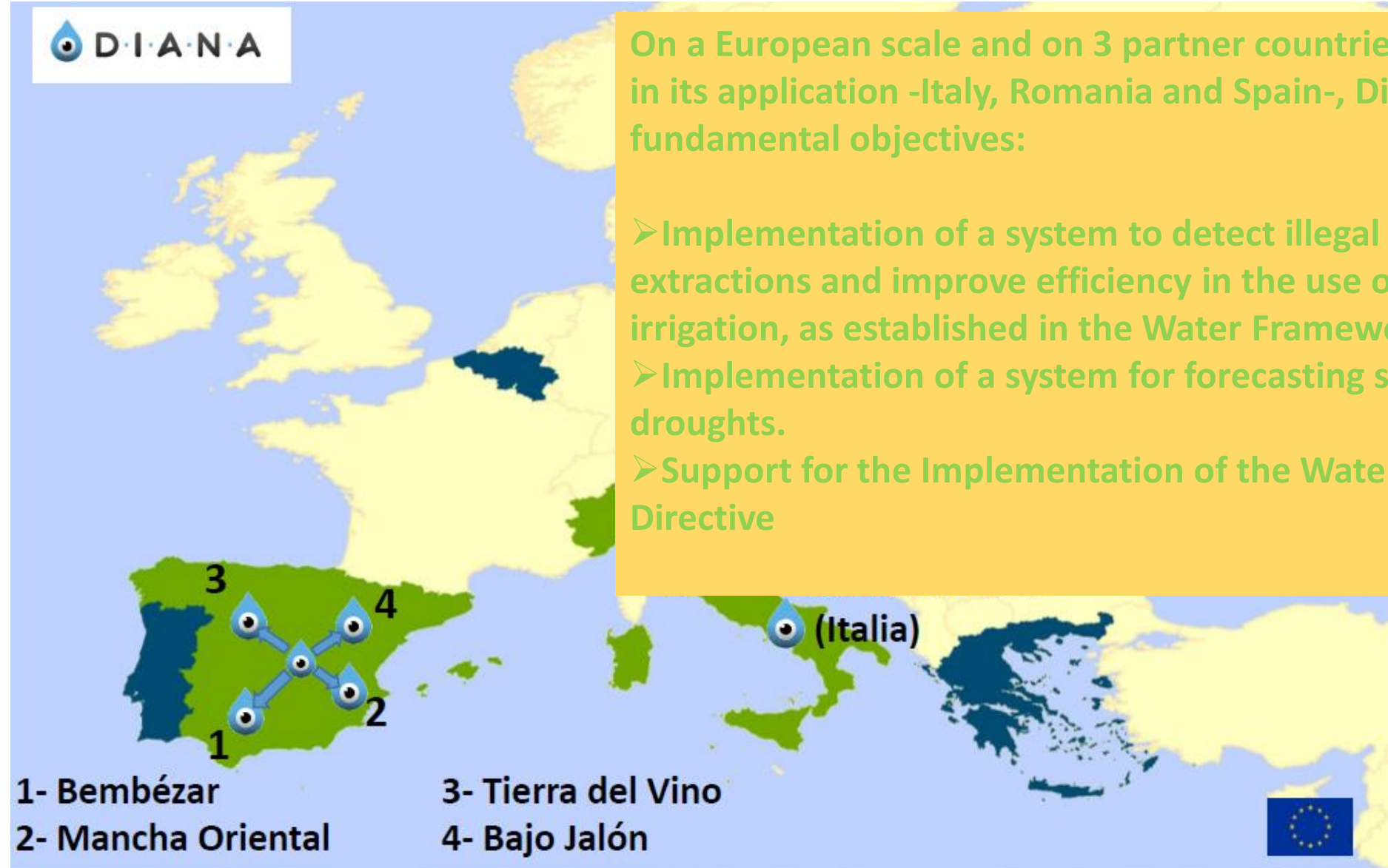


SUPERPOSICIÓN EXPEDIENTES DIGITALIZADOS  
EN RICLA SOBRE LA IMAGEN LANDSAT 2004





### III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces



### III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces



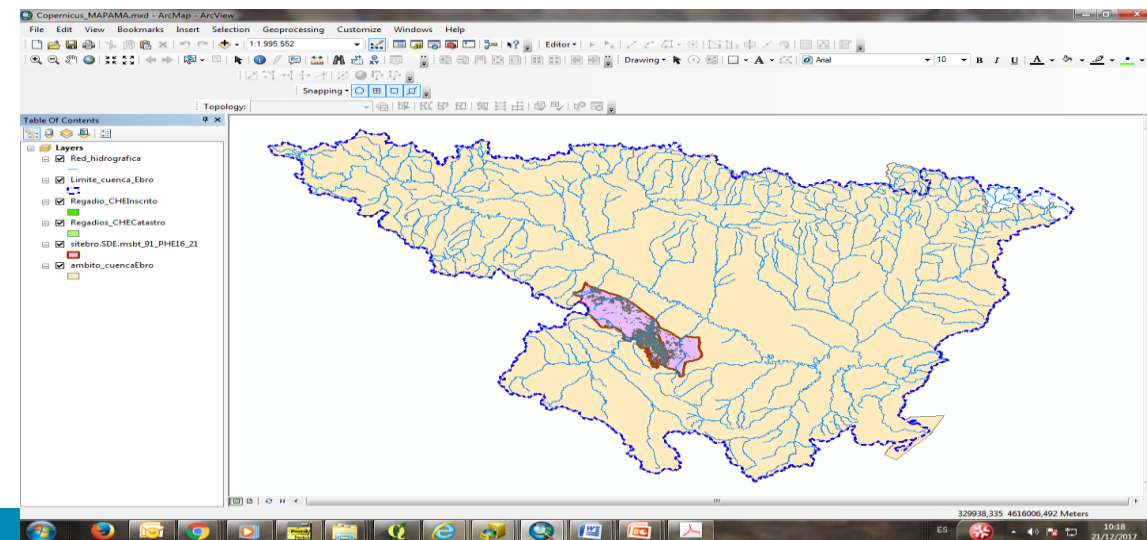
In Spain, 4 pilot areas (diverse and contrasted from an agroclimatic and hydrological point of view) have been selected for the implementation of Diana:  
**Tierra del Vino** (Duero), **Bembézar** (Guadalquivir), **Mancha Oriental** (Júcar) and **Bajo Jalón** (Ebro).



# III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces

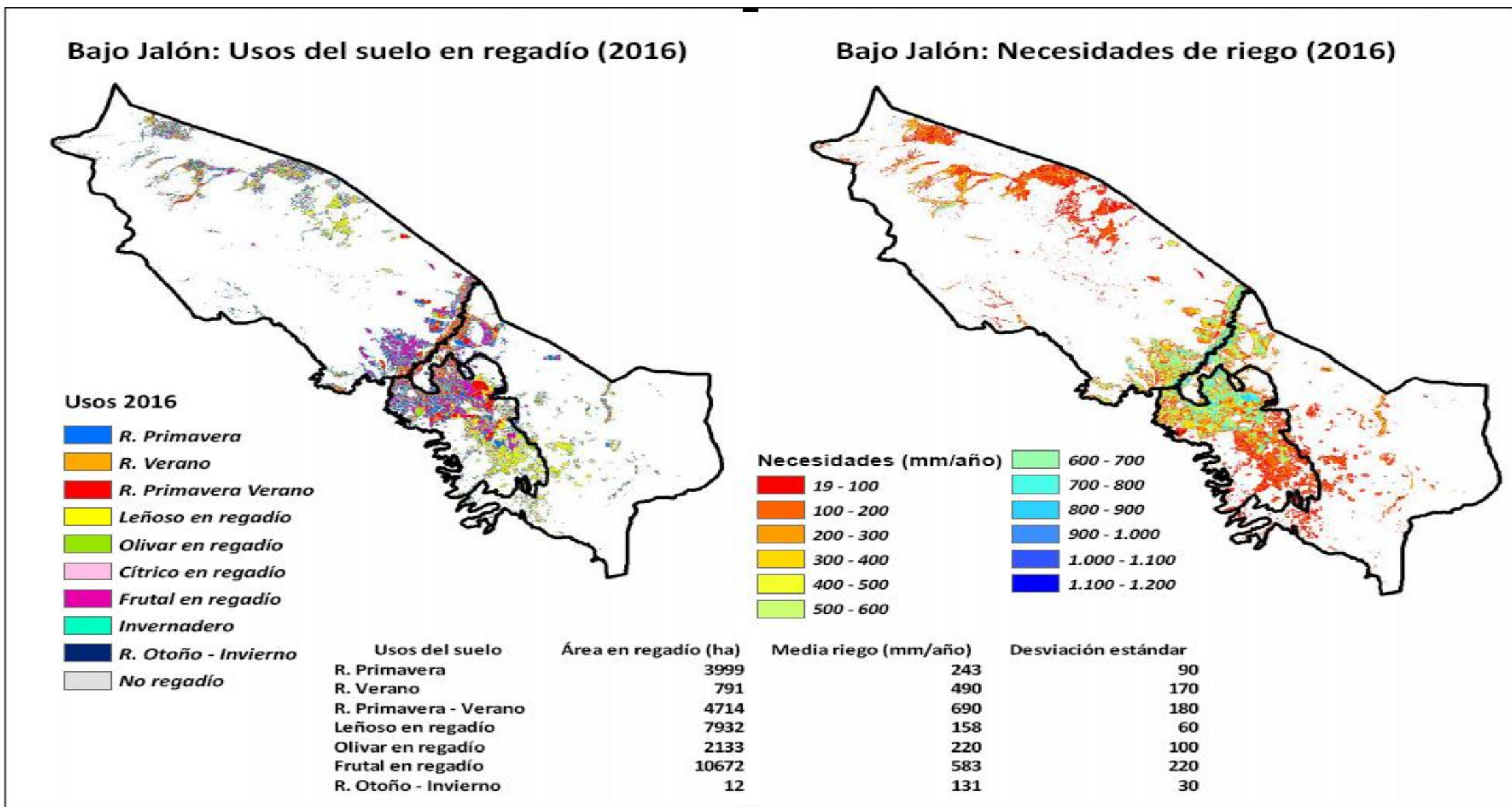
The specific interest of the Ebro Hydrographic Confederation (C.H.E.) in Diana H2020 is:

- ✓ Improve knowledge of the irrigated area of the basin at the cadastral parcel scale using high resolution satellite images from the Copernicus Program, because after more than 20 years of experience in integrating multiple graphic and alphanumeric sources of information - concessional irrigation coverage, agricultural census, remote sensing, cadastre... -, the quantification of irrigated areas continues to present uncertainties.
- ✓ Apply this improved knowledge on a pilot area - “Bajo Jalón” - with mainly groundwater uses and for which there is good starting information (records of the concession of its uses for irrigation, monitoring data on the quantitative status of their bodies of groundwater: piezometers, flowmeters, field information ...).



# III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces

Global results map (2016) Diana H2020: irrigated land uses and irrigation needs

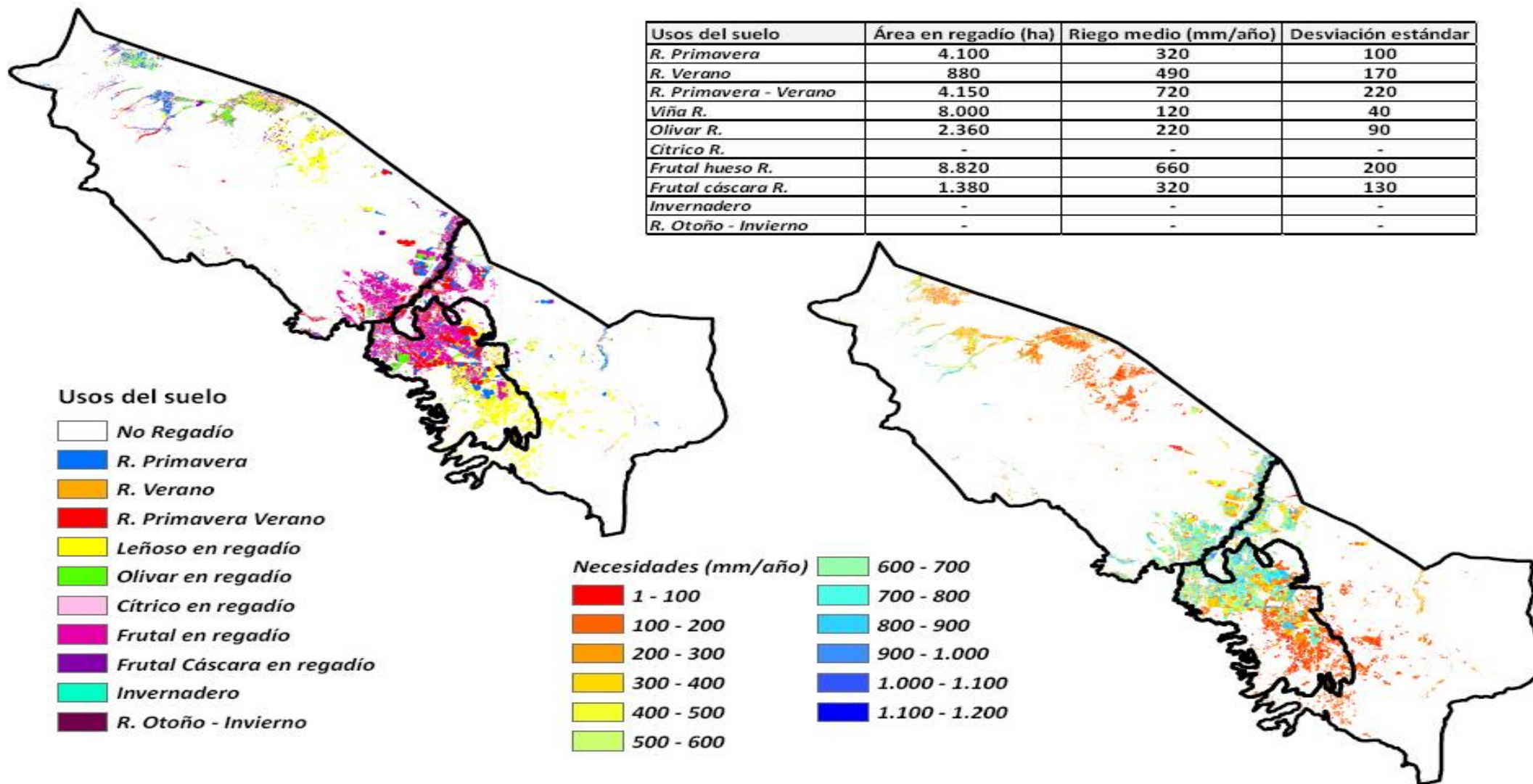




# III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces

## Global results map (2017) Diana H2020: irrigated land uses and irrigation needs

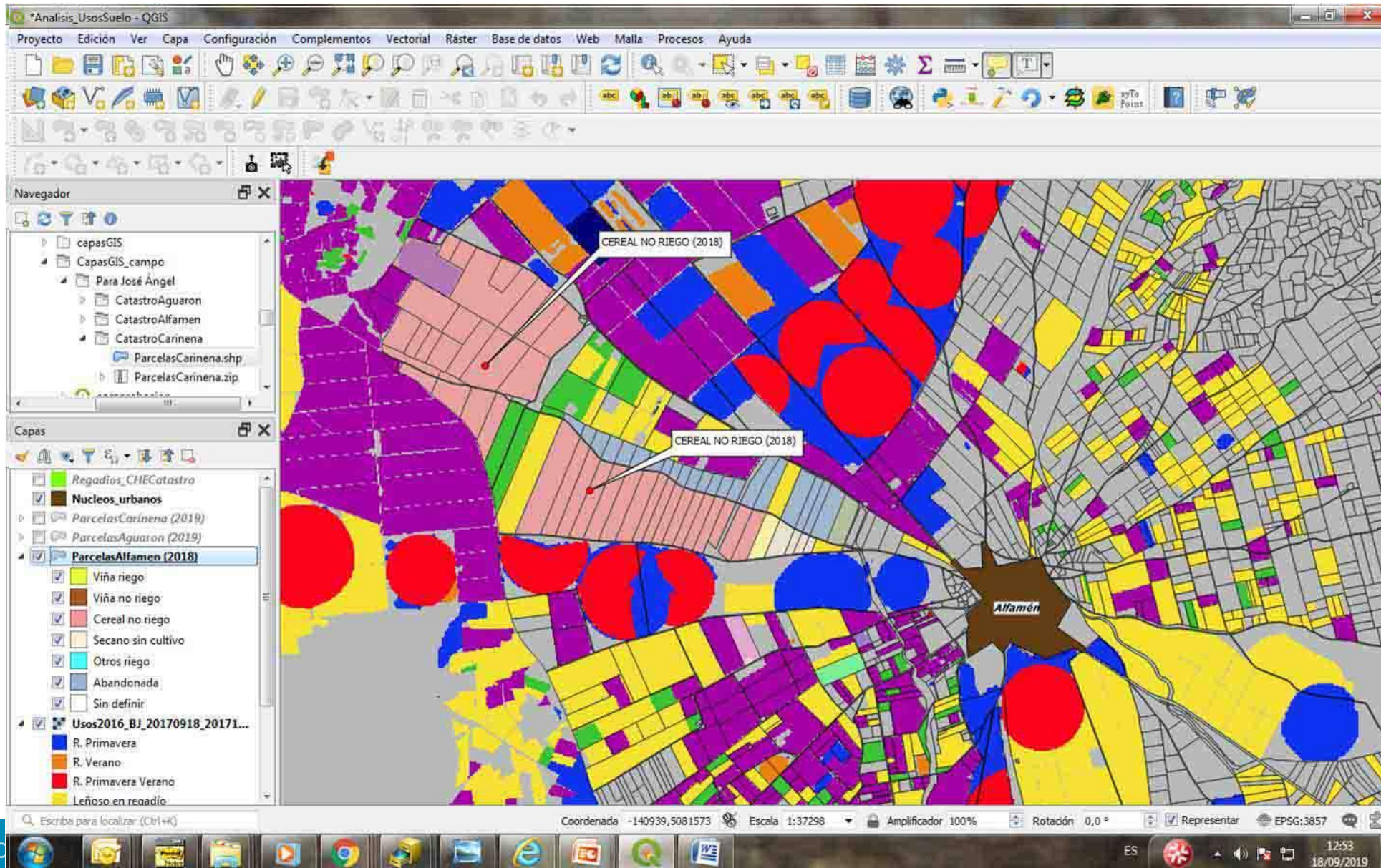
Bajo Jalón: Usos del suelo en regadío y promedio anual de las necesidades netas de riego (2017)





# III. Participation in Diana H2020: improvement in knowledge of irrigated surfaces

GIS analysis results validation: uses of the ground in 2016 versus Cadastral plots with "ground truth"



It is observed how the non-irrigated plots according to Diana H2020 correspond to non-irrigated plots verified in the field



## DIANA H2020 MAIN RESULTS

All the information and final products generated for the 4 pilot areas have been served in a WebGIS platform designed and developed for the occasion, which allows the consultation / analysis of information related to the surfaces and demands of water for irrigation in recent years (2016 - 2018):

- Detailed mapping of irrigated areas.
- Cartography of "land uses" (typology of irrigated crops).
- Map of water needs
- Map of volumes of water consumed.

All this facilitates the spatio-temporal monitoring (on an annual and monthly scale) of the irrigated land in each of the pilot areas.

<https://diana-h2020.eu/es/>

## IV. Monitoring the Ebro Delta after the storm "Gloria"

It is a multi-temporal analysis of the Ebro Delta: change and resilience against storms and floods.

Prepared with material and human resources from the Office of Hydrological Planning of C.H.E

Sentinel 2 Image Download (Frequency: Once per Month) from Copernicus OPEN HUB  
(<https://scihub.copernicus.eu/dhus/#/home>).

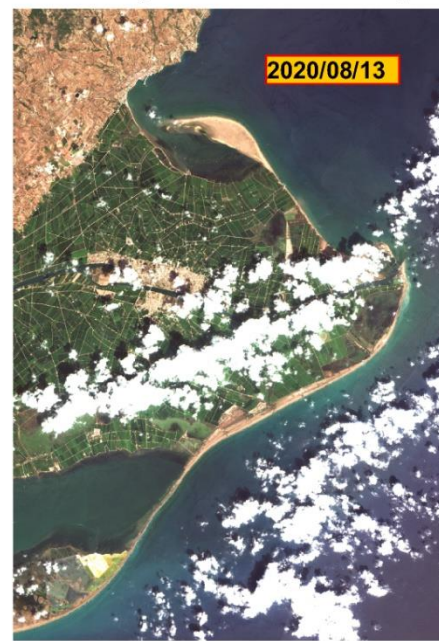
Combined use of QGIS software (+ Semi-Automatic Classification Plugin, SCP, developed by Luca Congedo) and SNAP (ESA) software to produce:

- An RGB image of the Ebro Delta (10 m spatial resolution).
- An NDWI ("*Normalized Difference Water Index*") image of the Ebro Delta (10 m spatial resolution).

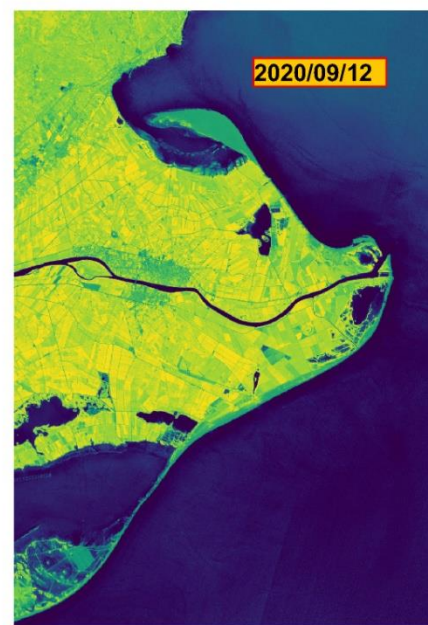
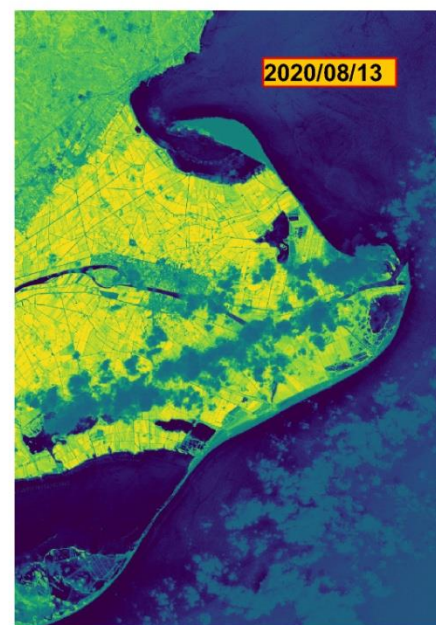
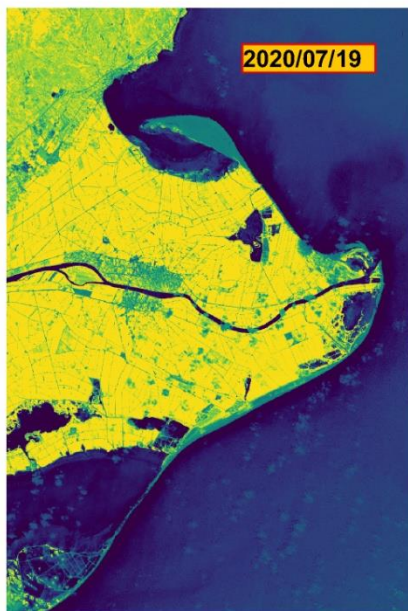
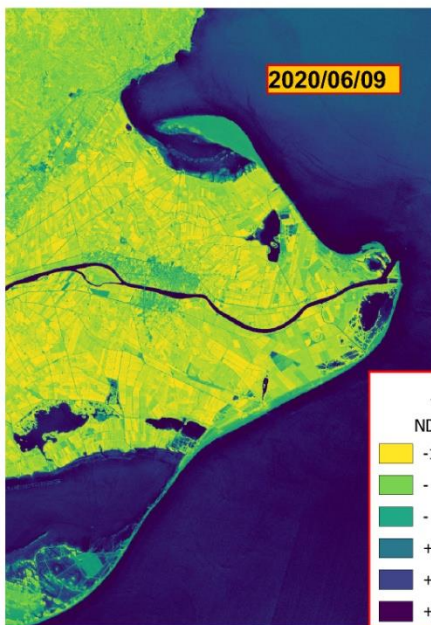
This facilitates the spatial and temporal monitoring (on an monthly scale) in relation the presence of water in the Ebro delta and its coastal arrows.



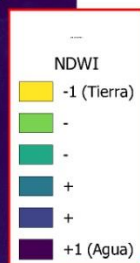
**Imágenes Sentinel-2 (Copernicus Hub <https://scihub.copernicus.eu>)**



**Falso Color Natural  
(RGB)**



**Normalized Difference Water Index  
(NDWI)**

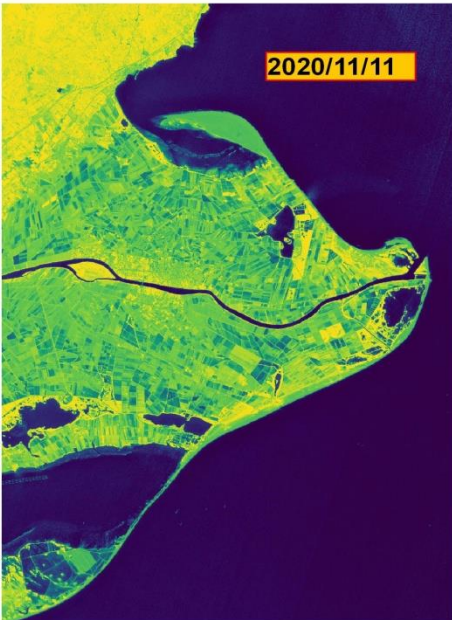
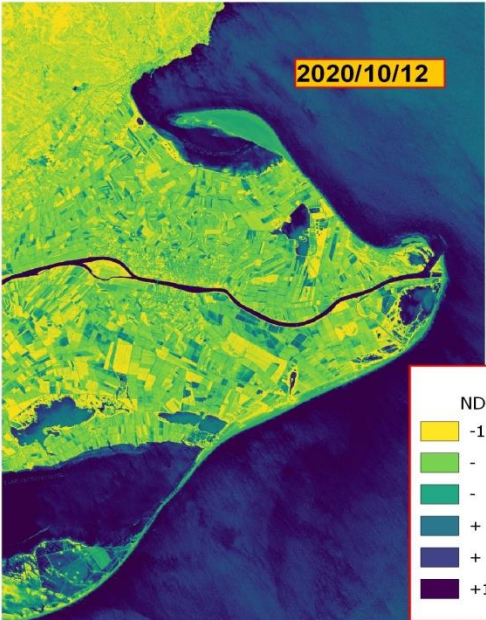




Imágenes Sentinel-2 (Copernicus Hub <https://scihub.copernicus.eu>)



Falso Color Natural  
(RGB)



Normalized Difference Water Index  
(NDWI)



The background image is a scenic view of a river. In the center, a tall, slender water tower stands in the water, its reflection visible below. To the right, a bright sunburst effect emanates from behind a line of trees on the far bank. The foreground shows a calm river surface reflecting the sky and the distant shore, with some dark, leafy branches in the lower right corner.

# Thank you!

**che**  
CONFEDERACIÓN  
HIDROGRÁFICA  
EBRO