



Early warning Demonstration of pan-European
rainfall-induced impact forecasts



Co-funded by
the European Union

EDERA Training Workshop

Loulé & Quarteira, 21st to 22nd November 2023

(Departamento de Meteorología e Geofísica,
DMG)



Centre de Recerca Aplicada
en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA



ECMWF



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE



Agencia de Medio Ambiente y Agua
de Andalucía
Consejería de Agricultura, Pesca, Agua y
Desarrollo Rural
Consejería de Sostenibilidad,
Medio Ambiente y Economía Azul



GOBIERNO
DE ESPAÑA

MINISTERIO
DEL INTERIOR



DIRECCIÓN GENERAL
DE PROTECCIÓN CIVIL Y EMERGENCIAS

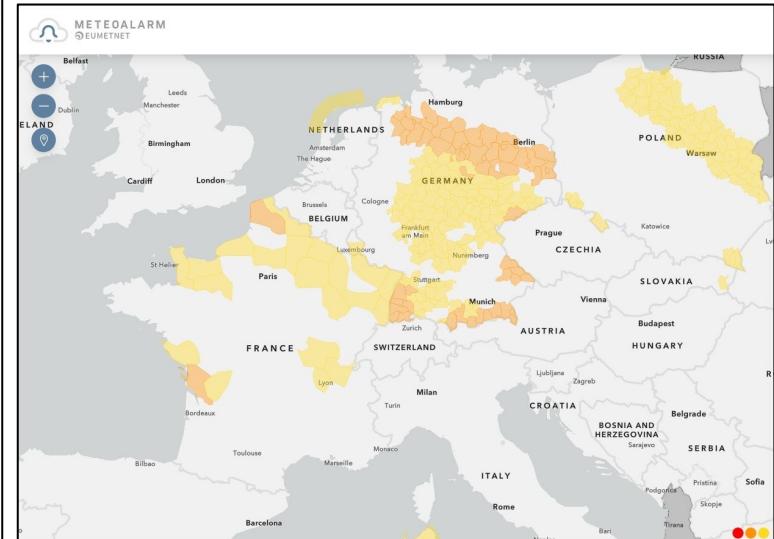


IPMA – Introduction



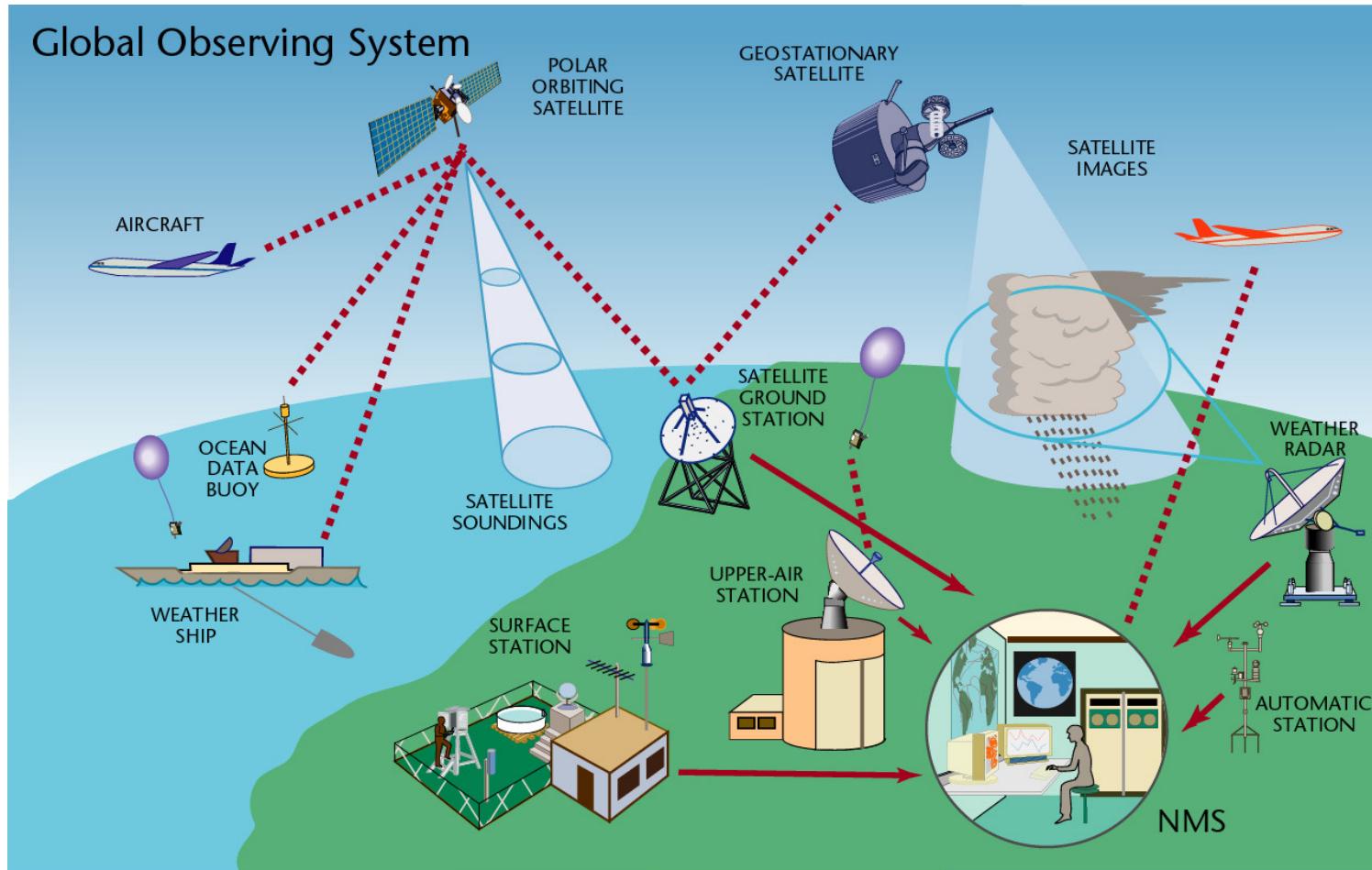
www.ipma.pt

[meteoalarm.org \(EUMETNET\)](http://meteoalarm.org)



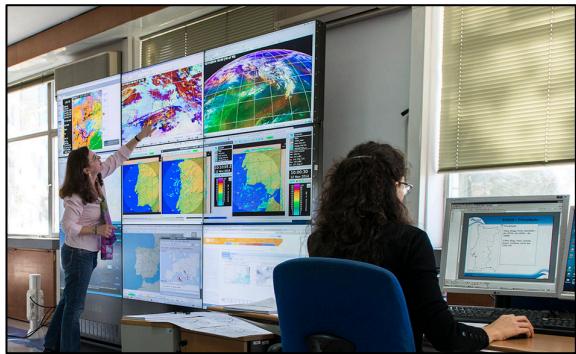
- Portuguese Institute for the Ocean and Atmosphere (IPMA) is the **national authority for meteorology**,
- IPMA has therefore the responsibility to guarantee a **weather watch service**,
- The weather watch service is put into practice through the **national Weather Warnings System** platform (SAM – “Sistema de Avisos Meteorológicos”) and cooperation with MeteoAlarm.

Global Observing System (GOS)



<https://www.wmo.int/pages/prog/www/OSY/GOS.html>

IPMA – Weather Forecasting and Surveillance Center, Lisbon



- 1) **Weather forecast** » short term (< 5 days), medium range (up to 10/15 days), extended range (up to 4/6 weeks) using as a base numerical models of weather forecast – ECMWF.
- 2) **Weather watch** » nowcasting (hours), using as means of observation: RADAR and lightning networks, satellite imagery (EUMETSAT), soundings and meteorological weather stations.
- 3) **Action** » communication with the public (social media / social networks / web) and official entities (such as National Emergency and Civil Protection Authority).



Issuance of Meteorological Warnings!

IPMA – Weather Warnings

Cinzeno (grey)	Information to be updated.
Verde (green)	No Risk related to weather.
Amarelo (yellow)	Risk for activities that are weather dependent » Follow weather forecasts
Laranja (orange)	Moderate/High Risk » Follow weather forecasts and civil protection guidance
Vermelho (red)	Extreme Risk » Regularly follow weather forecasts and civil protection guidance.

Criteria for Portugal Mainland						
Warning	Parameter	Yellow	Orange	Red	Units	Notes
Wind	Maximum Gust	70 to 90	91 to 130	> 130	km/h	
		90 to 110	111 to 130	> 130	km/h	In the highlands
Rainfall	Rain/Shower	10 to 20	21 to 40	> 40	mm/1h	Millimeters in 1 hour
		30 to 40	41 to 60	> 60	mm/6h	Millimeters in 6 hours
Snow	Snowfall with accumulation	1 to 5	6 to 15	> 15	cm	Quota below 1000 m
		1 to 10	11 to 30	> 30	cm	Quota between 1000 and 1600 m
		5 to 25	26 to 50	> 50	cm	Quota above 1600 m
Thunderstorm	Electric Discharges	a)	b)	c)		a) Frequent and scattered. b) Frequent and close together. c) Very frequent and excessively close together.
Fog	Visibility	$\geq 48h$	$\geq 72h$	$\geq 96h$		* - duration
High Temperature	Maximum Temperature	# to # *	# to # *	> # *	°C	* - duration ≥ 48 horas
Low Temperature	Minimum Temperature	# to # *	# to # *	< # *	°C	* - duration ≥ 48 horas
Coastal Event	Significant Wave Height	4 to 5	5 to 7	> 7	m	
		2 to 3	3 to 5	> 5	m	With swell from Southwest off the southern Algarve coast

Thresholds
12h / 24h
Warnings!

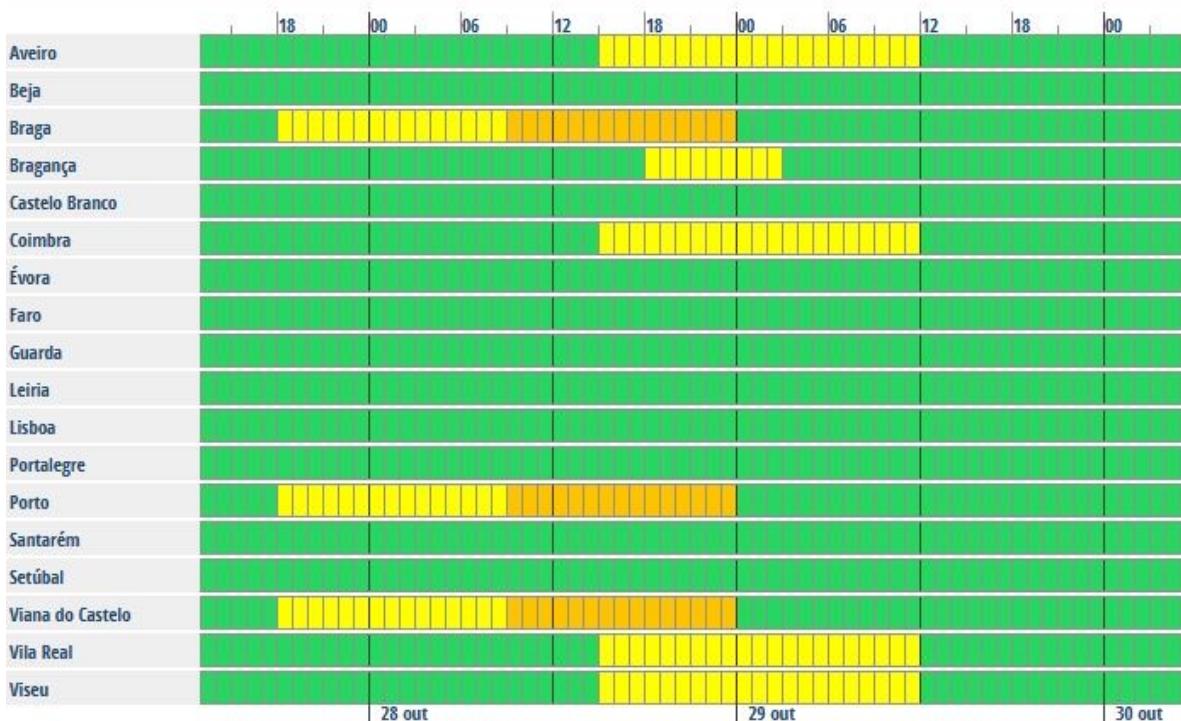
IPMA – Weather Warnings

Tempo Mar Sismos Clima Bivalves Pescas e aquacultura Aeronáutica Agricultura Saúde Navios Espaço Fogos Rurais

IPMA > Tempo > Avisos Meteorológicos

Avisos meteorológicos de Precipitação

Portugal Continental



Weather Warnings by Districts
Example: 27th October 2023

Visualizar Avisos por:

Distrito/Região

► Tipo de Aviso

Seleccione tipo de aviso

	<u>Trovoadas</u>		Verde
	<u>Agitação Marítima</u>		Laranja
	<u>Precipitação</u>		Laranja
	<u>Vento</u>		Verde
	<u>Neve</u>		Verde
	<u>Tempo Frio</u>		Verde
	<u>Tempo Quente</u>		Verde
	<u>Nevoeiro</u>		Verde

Informação relacionada

[Critérios de emissão](#)

[Guia de utilização](#)

[Avisos meteorológicos Meteoalarm](#)

Several precipitation events in October 2023!



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IPMA – Weather Warnings

Dynamic time range » according to warning colour:

Yellow Warning

can be issued up to **72** hours before the start of the event

Orange Warning

can be issued up to **48** hours before the start of the event

Red Warning

can be issued up to **24** hours before the start of the event

Limitations:

- Warnings by districts,
- IPMA does not issue “**impacts oriented**” warnings (with the exception of snow warnings),
- Further updating of weather warnings regarding impacts is under evaluation (precipitation, fog,...).

IPMA – Severe Weather Group / Flooding

**ARISTOTLE-eENHSP
MULTI-HAZARD IMPACT ORIENTED BRIEF**

Date: October 13, 2023
Report Secretary: INGOE, Roberto Isaias, aristotle.ingve@ingv.it

HEADLINES

- Earthquakes in Afghanistan
- Numerous ongoing fires in western Madeira. National aid requested, Portugal

SUMMARY



Based on the Decision Matrix, the 18 events in this report are grouped as follows:

Likelihood	High	Monitor	Prepare	Act
Medium	Nil	Monitor	Prepare	Nil
Low	Nil	Nil	Monitor	
Decision Matrix	Sub-national	National Resources	International Resources	

Estimated Resources

1 "Act" (red) - 4 "Prepare" (orange)
9 "Monitor" (yellow) - 4 "Nil" (green)

➤ Impact Matrix » Likelihood (low/medium/high vs resources) » European Civil Protection activation » ERCC.

<http://aristotle.ingv.it/tiki-index.php>

<https://erccportal.jrc.ec.europa.eu/>

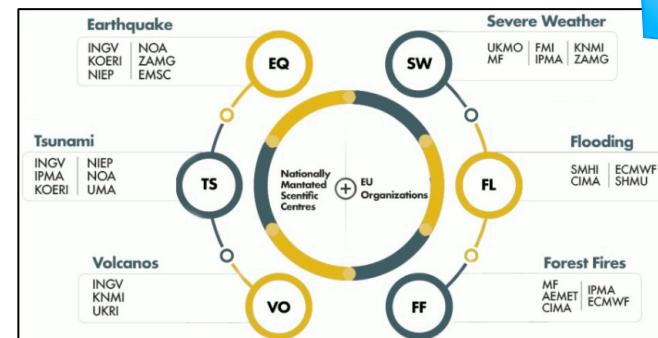
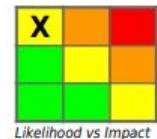
3: Heavy rain and thunderstorms - Western Iberia

Description

Showers, thunderstorms or longer periods of rain will affect this region at times through the next week. Up to 75-100 mm of rain could fall in 24 hours (especially early next week), with accumulations by next Thursday across the region of 50-100 mm and locally as high as 150-200 mm (especially in the northwest of the region). The average October rainfall ranges from 50 mm in the south to 200 mm in the north. Strong winds are also expected for a time on Monday and Tuesday, especially in the north of the region, perhaps with gusts reaching 70 km/h for a time.

Impacts

Flash flooding and landslides seem likely, especially early next week. Disruption from wind possible in the north.



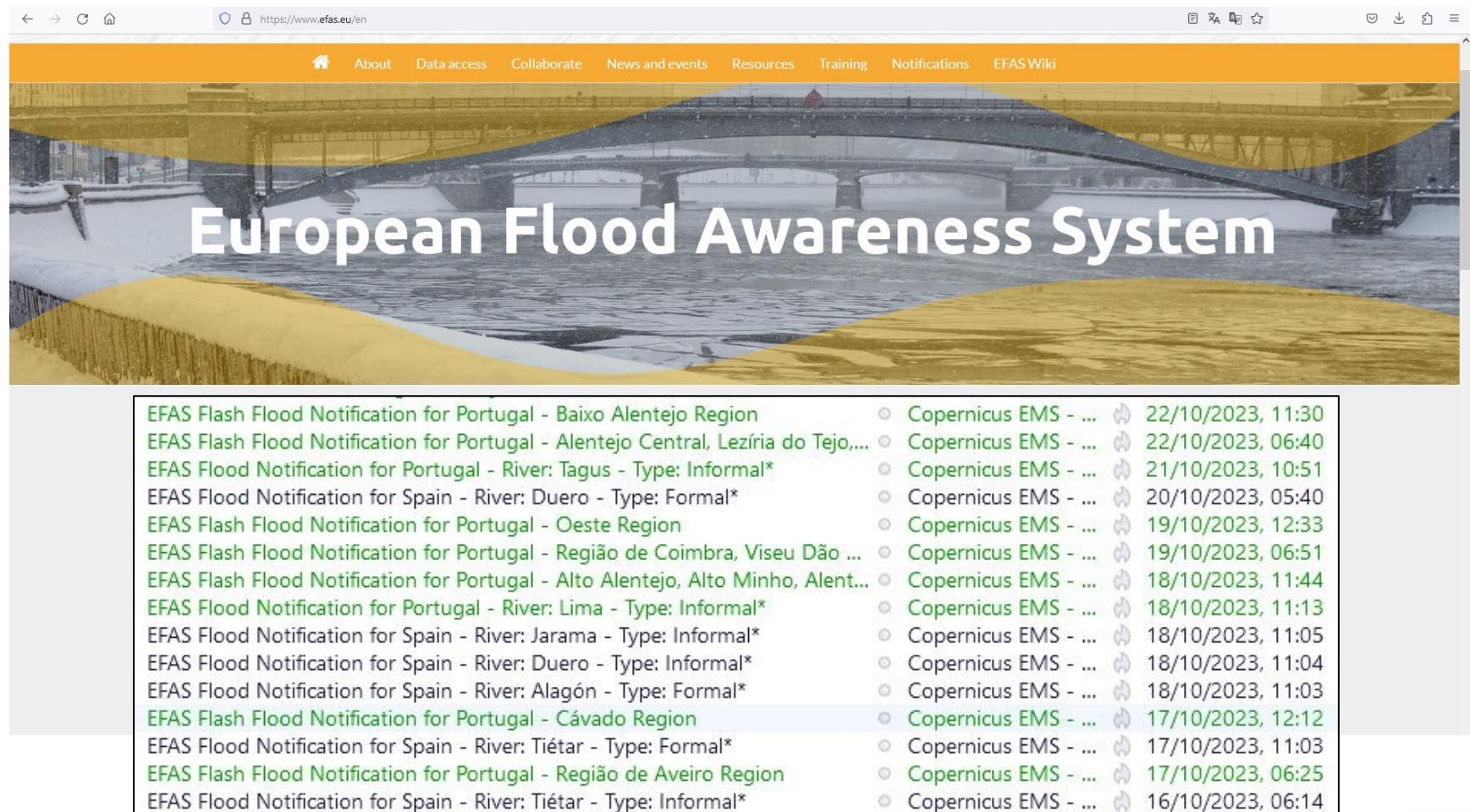
Working Groups
»
Hazard Leaders



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European Flood Awareness System (EFAS)

Flood monitoring



The screenshot shows the EFAS website with a banner featuring a bridge over a flooded river. The main title 'European Flood Awareness System' is displayed prominently. Below the banner, a list of flood notifications is shown in a table format.

EFAS Flash Flood Notification for Portugal - Baixo Alentejo Region	Copernicus EMS - ...	22/10/2023, 11:30
EFAS Flash Flood Notification for Portugal - Alentejo Central, Lezíria do Tejo,...	Copernicus EMS - ...	22/10/2023, 06:40
EFAS Flood Notification for Portugal - River: Tagus - Type: Informal*	Copernicus EMS - ...	21/10/2023, 10:51
EFAS Flood Notification for Spain - River: Duero - Type: Formal*	Copernicus EMS - ...	20/10/2023, 05:40
EFAS Flash Flood Notification for Portugal - Oeste Region	Copernicus EMS - ...	19/10/2023, 12:33
EFAS Flash Flood Notification for Portugal - Região de Coimbra, Viseu Dão ...	Copernicus EMS - ...	19/10/2023, 06:51
EFAS Flash Flood Notification for Portugal - Alto Alentejo, Alto Minho, Arent...	Copernicus EMS - ...	18/10/2023, 11:44
EFAS Flood Notification for Portugal - River: Lima - Type: Informal*	Copernicus EMS - ...	18/10/2023, 11:13
EFAS Flood Notification for Spain - River: Jarama - Type: Informal*	Copernicus EMS - ...	18/10/2023, 11:05
EFAS Flood Notification for Spain - River: Duero - Type: Informal*	Copernicus EMS - ...	18/10/2023, 11:04
EFAS Flood Notification for Spain - River: Alagón - Type: Formal*	Copernicus EMS - ...	18/10/2023, 11:03
EFAS Flash Flood Notification for Portugal - Cávado Region	Copernicus EMS - ...	17/10/2023, 12:12
EFAS Flood Notification for Spain - River: Tíetar - Type: Formal*	Copernicus EMS - ...	17/10/2023, 11:03
EFAS Flash Flood Notification for Portugal - Região de Aveiro Region	Copernicus EMS - ...	17/10/2023, 06:25
EFAS Flood Notification for Spain - River: Tíetar - Type: Informal*	Copernicus EMS - ...	16/10/2023, 06:14

ECMWF products

Charts

Our Integrated Forecasting System (IFS) provides forecasts and associated verification at different resolutions and for multiple time ranges. The verification provides essential feedback on the [quality of the forecasting system](#).

Medium range

Extended range

Long range

<https://www.ecmwf.int/>

- Medium range (up to 10/15 days),
- Extended range (up to 28/42/46 days, 4/6 weeks),
- Long range (seasonal).

ECMWF – global model

- Determinist – 9 km,
- ENS medium range – 18 » 9 km, 50 » 100 members, 2x week » daily updates (June, 2023).

PRODUCTS – Precipitation

Total Accumulations (1h, 3h, 6h, 12h, 24h)

Meteograms (10/15 days, with climate)

Weekly Anomalies (2 weeks)

Probabilities (EPS)

EFI – Extreme Forecast Index

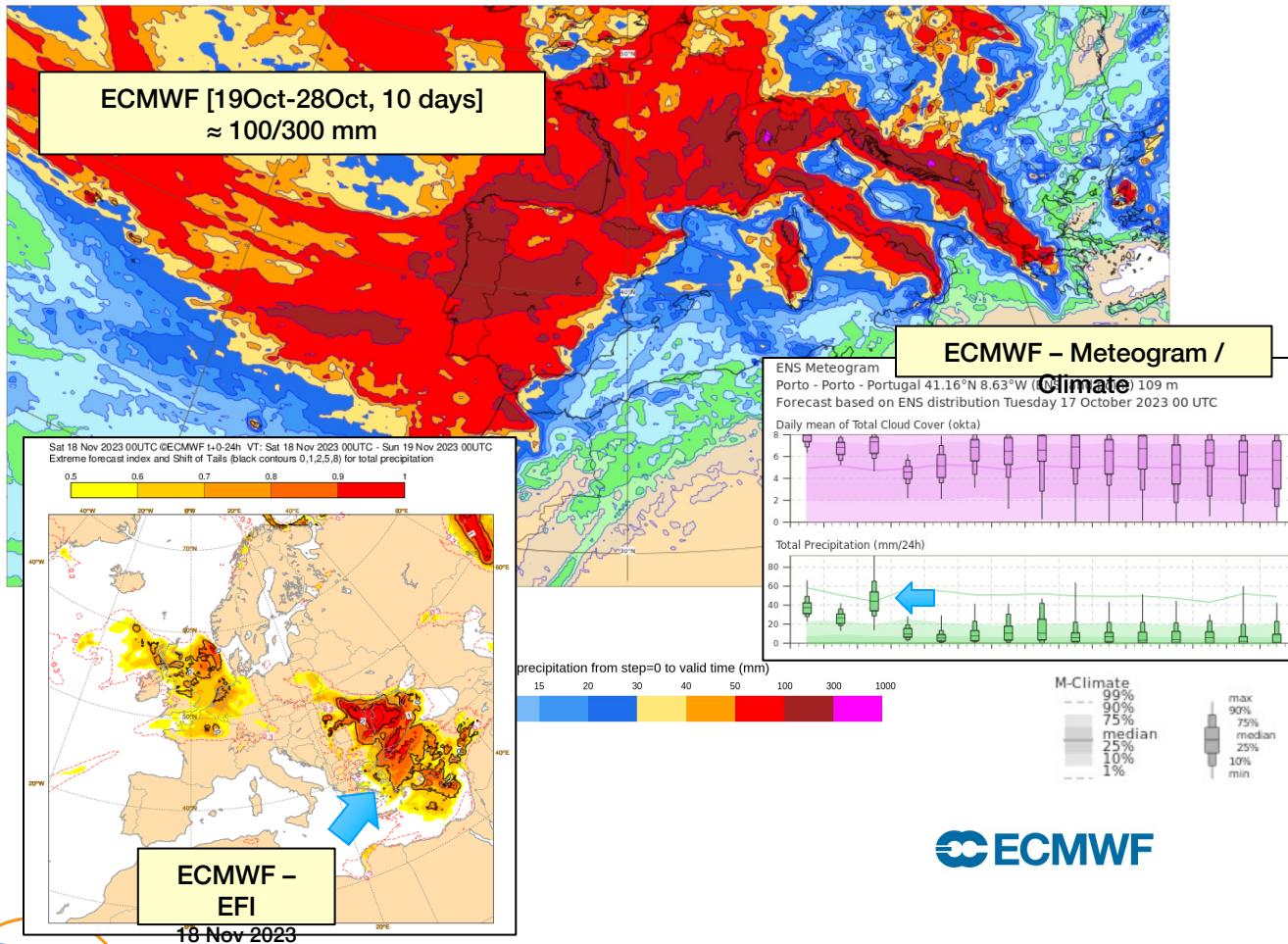
[AROME – regional model (2,5 km)]

ECMWF products – Forecasting

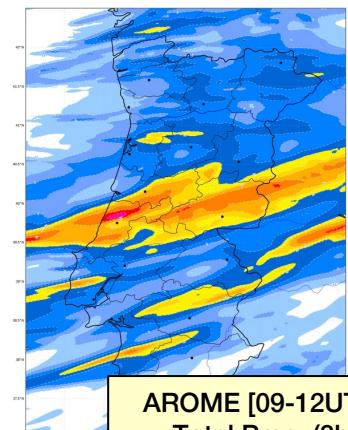
Total accumulated precipitation

Base time: Thu 19 Oct 2023 00 UTC Valid time: Sun 29 Oct 2023 00 UTC (+240h) Area : South West Europe

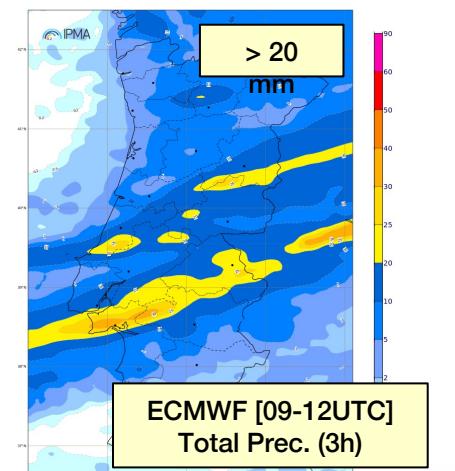
Example:
19th October



AROME: Precipitação total acumulada (mm) nas últimas 3 horas
Thu 19 Oct 2023 00 UTC Previsão H+12 para Thu 19 Oct 2023 12 UTC



ECMWF: Precipitação total - líquida e sólida - acumulada em 3 horas (mm)
Thu 19-Oct-23 00UTC Previsão H+12 para Thu 19-Oct-23 12UTC

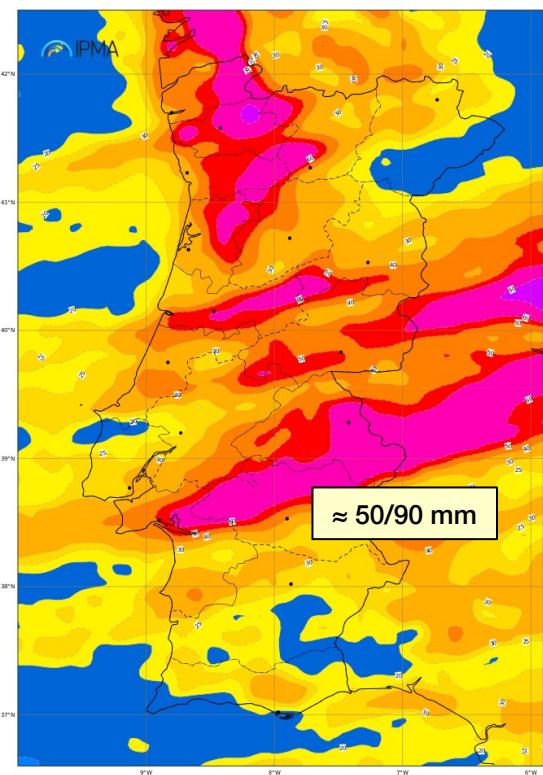


ECMWF products – Forecasting

ECMWF [19th Oct] – Total Prec. (24h)

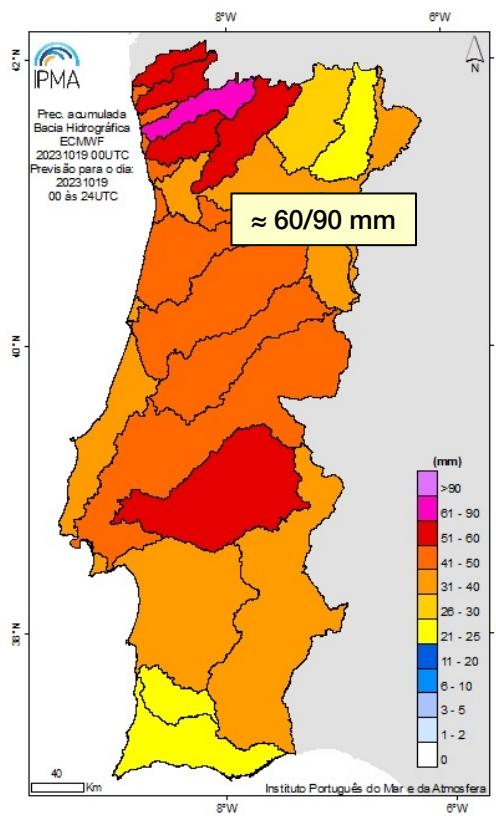
ECMWF: Precipitação total - líquida e sólida - acumulada em 24 horas (mm)

Thu 19-Oct-23 00UTC Previsão H+24 para Fri 20-Oct-23 00UTC

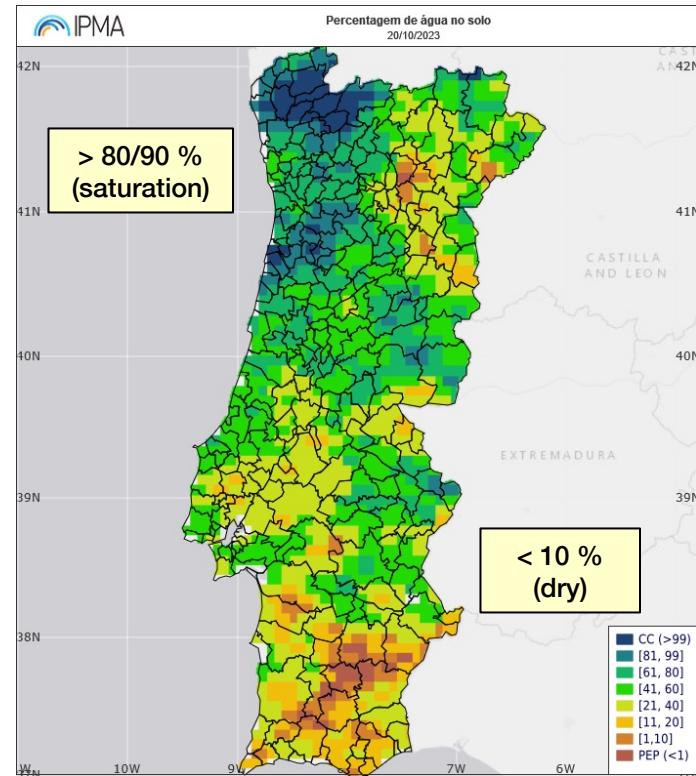


Example: 19th October

ECMWF [19th Oct] River Basin / Watershed



ECMWF [19th Oct] – Soil moisture

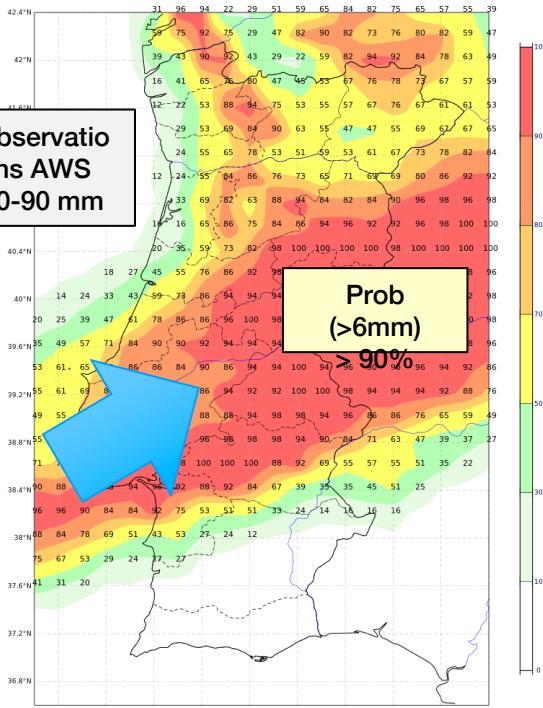


ECMWF products – Forecasting

Example: 19th October

ECMWF [19th Oct]
Prob. Total Prec. > 6 mm (3h)

FCST ENS ECMWF Variable: PROB TOTAL_PRECIP >=6.0 [%] 3h
Run: 2023101900 Step: 12 Valid/Period: 2023101909 - 2023101912

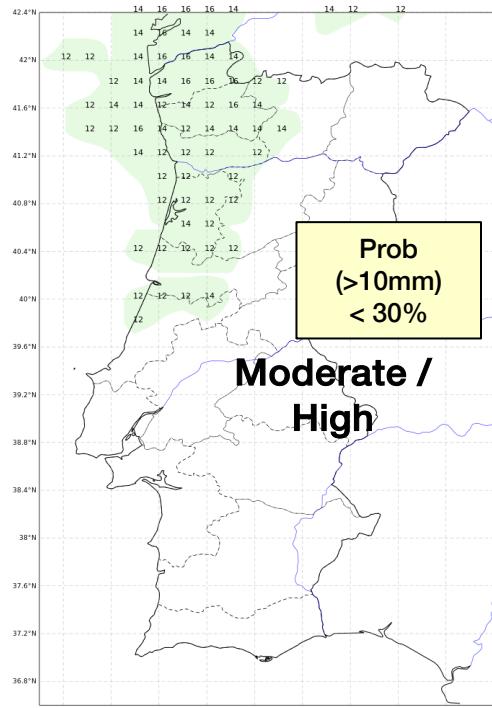


Example: forecast for 27th

November

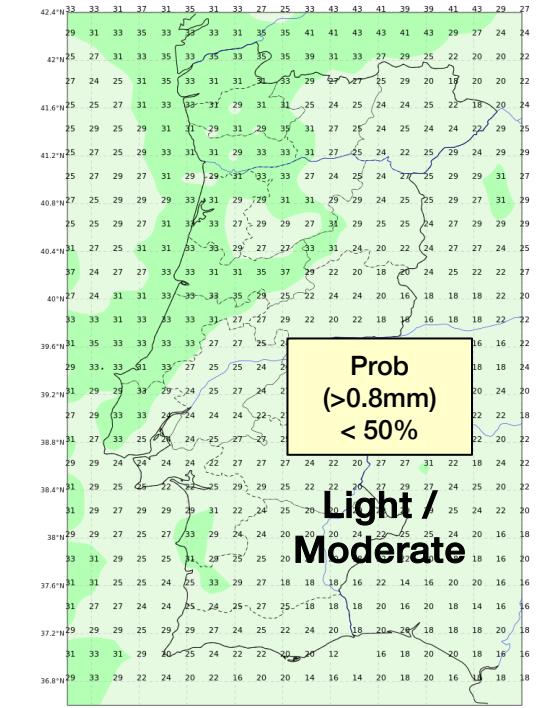
ECMWF [20th Nov]
Prob. Total Prec. > 10 mm (24h)

FCST ENS ECMWF Variable: PROB TOTAL_PRECIP >=10.0 [%] 24h
Run: 2023112000 Step: 192 Valid/Period: 2023112700 - 2023112800

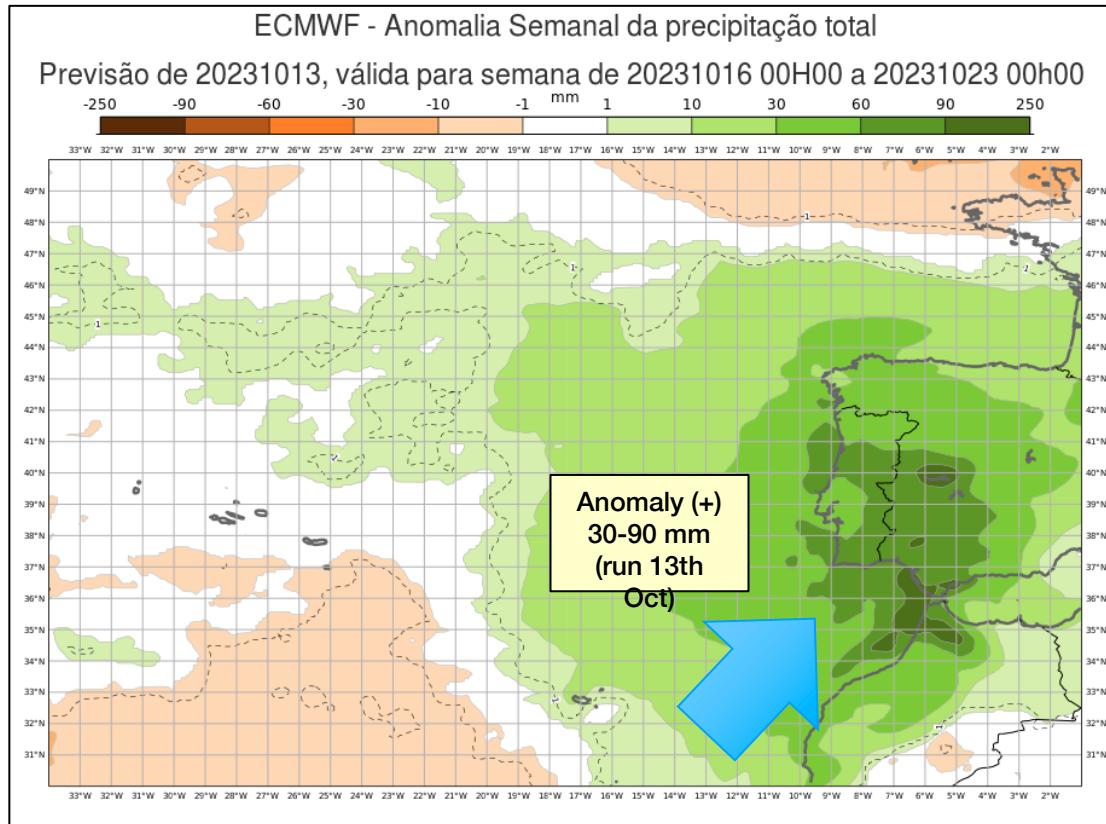


ECMWF [2th 0Nov]
Prob. Total Prec. > 0.8 mm (24h)

FCST ENS ECMWF Variable: PROB TOTAL_PRECIP >=0.8 [%] 24h
Run: 2023112000 Step: 192 Valid/Period: 2023112700 - 2023112800

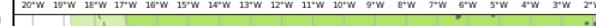


ECMWF products – Forecasting



Total Precipitation
Weekly Anomalies
(16th-23rd Oct 2023)

Anomalia Semanal da precipitação total
semana de 20231016 00H00 a 20231023 00h00



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Thank for your attention!