



European Flood Awareness System

EFAS *Bulletin*

August – September 2023

Issue 2023(5)

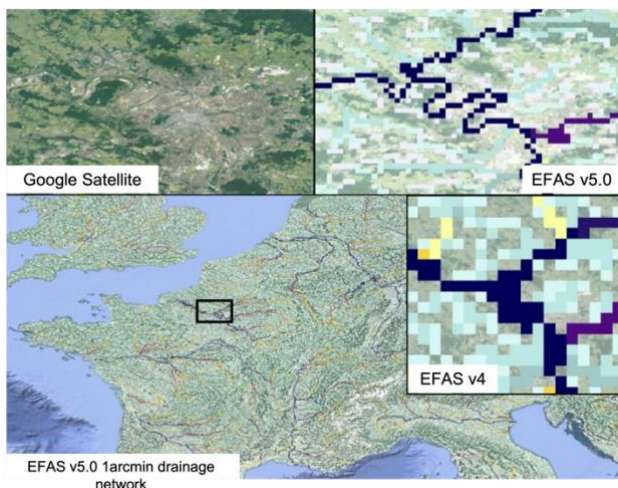


NEWS

EFAS News

Launch of EFAS version 5.0 – 20th September

EFAS released a new major version of the system on 20 September 2023.



EFAS v5.0 introduces several major changes to the system, including:

- A **higher spatial resolution**. EFAS v5.0 has a 1 arcmin / **0.0167 degrees resolution** (~1.4km), as opposed to the 5-km resolution of all the previous EFAS versions.
- A different projection system, now based on EPSG:4326 instead of ETRS89 Lambert Azimuthal Equal Area Coordinate Reference System (ETRS-LAEA) for previous versions.
- A **larger** modelling domain whose extension has been enlarged to match the river catchments.
- An entirely new set of **0.0167 degrees resolution input maps** produced using the most recent research findings, remote sensing, and in-situ datasets.
- Major improvements to the open-source hydrological model [LISFLOOD](#).
- A new **calibration** at **1903** in-situ gauging stations. Furthermore, a parameter regionalisation was performed to estimate the parameters of catchments for which in situ discharge observations were not available.
- New **return period thresholds** and **snow water/soil moisture anomaly** maps based on a climatology from 1992-2022. The EFAS v5

river discharge climatology is available at the [C3S Climate Data Store](#).

- Updated EFAS **Seasonal** and **Sub-seasonal** forecasts using the newly calibrated, higher resolution hydrological model.
- New **flood hazard** maps generated using LISFLOOD-FP at 90m resolution.

This upgrade of EFAS has large impacts on the EFAS modelling results.

For more information about the [latest operational EFAS release](#) and [previous versions](#) of EFAS, we refer users to the dedicated wiki pages. Data will be accessible following the operational release and information will be provided through our dedicated wiki page on [data access](#).

As always, we invite your feedback on the pre-release of EFASv5.0. Questions and feedback can be addressed to the CEMS Floods team via the [EFAS contact form](#).

18th EFAS Annual Meeting – September 2023



The 18th EFAS Annual Meeting was held on 28-29 September 2023 in at Germany's National Meteorological Centre (DWD) in Offenbach am Main. A short summary of the event can be viewed in the Articles section of this Bulletin. For a full analysis of the event, including presentations, posters and workshop materials can be viewed on the EFAS website: <https://www.efas.eu/en/news/18th-efas-annual-meeting>

New features

Frequently Asked Questions on EFAS website



A list of Frequently Asked Questions (FAQs) has been added to the EFAS website. The information covered by these FAQs cover general topics, how does EFAS work, and information of how EFAS Notifications work. The list of FAQs can be viewed on the EFAS website at this link: <https://www.efas.eu/en/faq>

RESULTS

Summary of EFAS Flood and Flash Flood Notifications

The 67 formal and 63 informal EFAS flood notifications issued in August – September 2023 are summarised in Table 1. The locations of all notifications are shown in Figure 22 and Figure 24 in the appendix.

168 flash flood notifications were issued in August – September 2023. They are summarised in Table 2. The locations of all notifications are shown in Figure 23 and Figure 25 in the appendix.

Meteorological situation

As of August 2022, reporting of the meteorological situation by the Meteorological Data Collection Centre (MDCC) will no longer be published in the EFAS bulletin. Instead, the state of recent meteorology will be conducted by the Copernicus Climate Change Service (C3S) and published as monthly [Climate Bulletins](#).

Hydrological situation

by EFAS Hydrological Data Collection Centre

August

During the month of August, there were 288 stations with exceedances, five times that of the previous month. Most of the stations are located in Slovenia (83 stations), related to both types of variables (water level and discharge). In Austria, there are 47 stations with exceedances. In Norway and Germany, there are 38 and 37 stations respectively.

In addition, there are 24 stations in Italy and 21 in Croatia. The following countries have recorded ten or less stations with exceedances this month: Switzerland (10), Sweden (9), Hungary (7), Slovakia (6), Poland (3), Spain (2) and Serbia (1).

As for the river basins, the main river basin with values above the threshold is again the Danube, with 184 stations in eight different countries, with Slovenia standing out with 71 exceedances. The Po River in Italy is the next river basin with the highest number of stations (23), followed by the Glomma River and the Rhine River, both with 13 stations showing exceedances. A total of 38 different river basins have exceedances in August.

In August 326 stations recorded values of mean discharge above the 90% quantile. Slovenia was the country with the most stations in this situation with 112 presented. The countries with the next highest number of stations in this situation are Norway (48), Croatia, and Germany (25 each). The Slovenian stations are distributed in ten different basins, highlighting the Danube River, with 82 stations exceeding this quantile. In Norway, there are 14 basins affected while in Germany and Croatia, we find three basins on each country. In Sweden, 21 stations have values above this quantile. In Spain, 17 stations exceed this cliff. Other stations exceed the 90% quantile value in up to 18 countries.

By river basin, the Danube River stands out with 144 stations above the 90% quantile. The Soca-Isonzo river basin (Slovenia) is the second with the highest number of stations over this cliff, showing 19 stations in this situation, followed by the Rhine river basin with 18. A total of 74 different river basins have exceedances over the 90% quantile in August.

Finally, and according to the number of stations recording mean values below the 10% quantile in August, there were 71 stations with average values below this cliff in 14 different countries.

This month, Spain is the country with most of the stations (28), followed by Poland with 12 stations. France has 11 stations with values below this threshold. With five stations we find Romania, Iceland, and Norway with three each. Ukraine has two stations with mean values lower than this cliff and another seven countries show one station each in this situation.

In terms of river basin, this month the Ebro River is the one with the highest number of cases, with 11 stations with an average discharge below the 10% quantile. The Danube River has nine stations, and the Vistula, the Loire, and the Guadalquivir rivers have seven stations each in the same situation. In total, as many as twenty-five different basins have values below this limit in Europe.

September

During the month of September, there were 80 stations with exceedances, almost four times less than the previous month. Most of them are located in Italy (31 stations), related to the water level variable. In Norway, there are 18 stations with exceedances and in Spain and Germany, there are eight stations each.

In addition, there are four stations in Austria and Croatia and three in Slovenia. The following countries have recorded one station with exceedances this month: Switzerland, Belgium, Hungary, and Iceland.

As for the river basins, the main river basin with values above the threshold this month is the Po River, with 32 stations in two different countries, with Italia standing out. The Danube River in five countries is the next river basin with the highest number of stations (18), followed by the Glomma River basin with 3 stations showing exceedances. A total of 26 different river basins have exceedances in September.

In terms of stations that recorded values of mean discharge above the 90% quantile, 114 exceeded this threshold this month. In September, Spain was the country with the most stations in this situation: 36. Norway, with 20 stations, and the United Kingdom with 17, are the countries with the next highest number of stations in this situation. The Spanish stations are distributed in ten different river basins, highlighting the Ebro River with 18 stations exceeding this quantile. In Norway, there are seven basins affected while in the United Kingdom, we find five basins affected. In Ireland, nine stations have values above this quantile.

In Finland, seven stations exceed this cliff. Other stations exceed the 90% quantile value in up to 17 countries.

By river basin, the aforementioned Ebro River stands out with 18 stations above the 90% quantile. The Thames River basin (United Kingdom) is the second with the highest number of stations over this cliff, showing 12 stations in this situation and followed by the Glomma river basin (Norway) with 10. A total of 49 different river basins have exceedances over the 90% quantile in September.

Finally, and according to the number of stations recording mean values below the 10% quantile, in September, there were 71 stations with average values below this cliff in 13 different countries.

This month, France is the country with most of the stations (25), followed by Spain with 16 stations and Poland with 15 stations. Germany and Ukraine have three stations with values below this threshold. With two stations we find Romania and Bulgaria. Another five countries show one station each in this situation.

In terms of river basin, this month the Rhine River is the one with the highest number of cases, with 11 stations with an average discharge below the 10% quantile. The Loire River has 9 stations, and the Vistula and Ebro rivers have nine stations each in the same situation. In total, as many as 18 different basins have values below this limit in Europe.

Verification

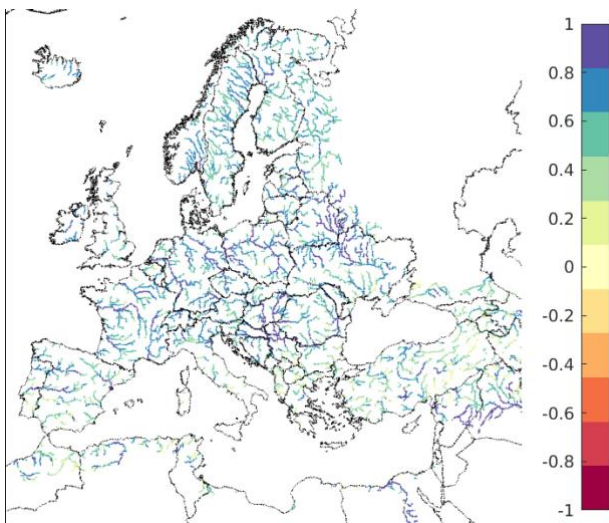


Figure 1: EFAS CRPSS at lead-time 1 day for August – September, for catchments >2000km². The reference score is persistence of using previous day’s forecast.

Error! Reference source not found. and **Error! Reference source not found.** shows the EFAS headline score, the continuous ranked probability skill score (CRPSS) for lead times 1 and 5 days for August - September across the EFAS domain for catchments larger than 2000km². A CRPSS of 1 indicates perfect skill, 0 indicates that the performance is equal to that of the reference, and any value <0 (shown in orange-red on the maps) indicates the skill is worse than the reference. The reference score is using yesterday’s forecast as today’s forecast, which is slightly different than we used previously and very difficult to beat.

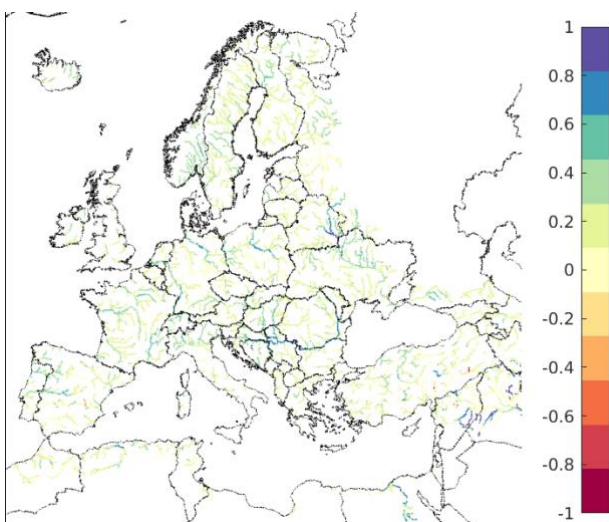


Figure 2: EFAS CRPSS at lead-time 5 days for August-September for catchments >2000km². The reference score is persistence of using previous day’s forecast.

These maps indicate that across much of Europe for forecasts are more skilful than persistence at both lead times. Regions shown in blue are those where EFAS forecasts are more skilful than persistence, with darker shading indicating better performance.

The skill of the forecast was quite good over the period, and similar to the same period last year (**Error! Reference source not found.**). An inter-annual variability of the scores is to be expected. The long-term trend is neutral over the first two years since the domain was extended, but there is an indication of increase in skill with EFAS 4.0, especially for the areas with generally lower skill.

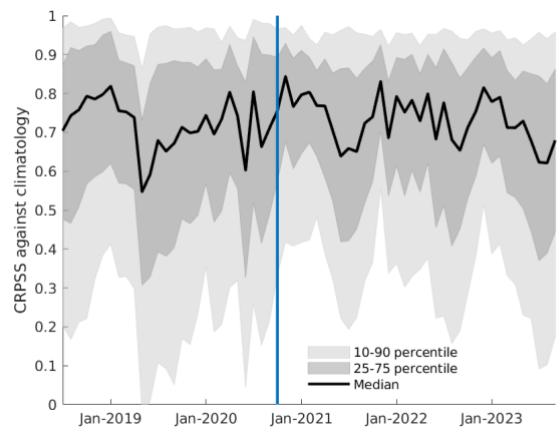


Figure 3: Monthly means of CRPSS the for lead-time 5 days for all the major river points in Europe with ECMWF ENS as forcing. Reference forecast was climatology. The skill is largest during the winter months, when there is less variation in the flow in large parts of Europe. The blue line indicates the release of EFAS version 4.0.

For this reporting period, the verification is based on previous EFAS system simulations, version 4.0, despite the current operational system now being EFAS version 5.0. As the launch of EFAS v5.0 occurred on 20 September 2023, it was appropriate to perform verification using v4.0 for the period of August-September 2023. In the next issue of the EFAS Bulletin we will present the first operational skill scores of EFAS version 5.0.

ARTICLES

Flooding in Slovenia – August 2023
by Richard Davies, [floodlist](#)



Figure 4: Flood damage in Carinthia, Slovenia, 09 August 2023. Photo credit: Slovenia Red Cross

In early August 2023, Slovenia was gripped by a catastrophic weather event that unleashed heavy rain, severe flooding and landslides across several regions of the country. The disaster, considered the largest in the nation's history, had far-reaching and devastating consequences for approximately two-thirds of the country's territory.



Figure 5: Floods in the Municipality of Laško, Savinja Region, Slovenia, 06 August 2023. Photo credit: Slovenia Red Cross

Relentless rainfall fell across the country from 03 to 06 August. According to a report from the Slovenian Environment Agency (ARSO) the typical amount of precipitation for the whole of August fell in just a few

hours at some stations. Record or near-record daily rainfall totals were measured at several sites on 04 August.

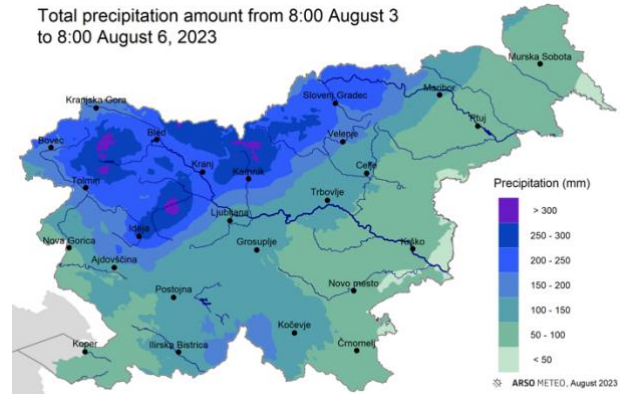


Figure 6: 72-hour precipitation amount from 03 August to 06 August, measured by automatic weather. Image: ARSO

ARSO reported extensive flooding along the Drava, Savinja, Kamniška Bistrica, Sora, Sava, Mura, and Ljubljana river basins. High water thresholds were exceeded at 122 gauging stations on 74 rivers. Record discharges were measured at 31 gauging stations, a majority of them reaching 100 or higher return period.

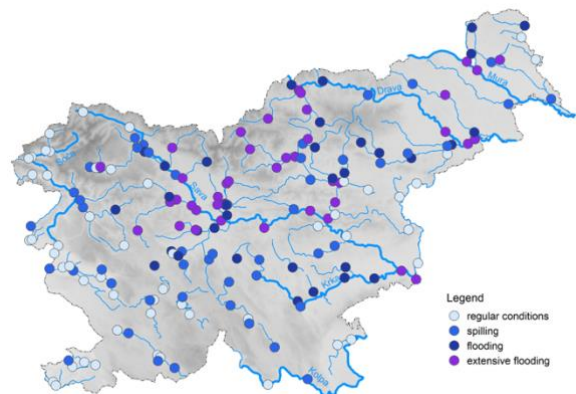


Figure 7: Exceeded high water discharge or water stage thresholds at the gauging stations in Slovenia during the flood event between 04 and 08 August 2023. Image: ARSO

The resulting flooding and landslides rendered areas completely inaccessible and caused massive damage to buildings and infrastructure. The scale of the disaster is unprecedented in Slovenia's history, with approximately two-thirds of the country's territory affected.

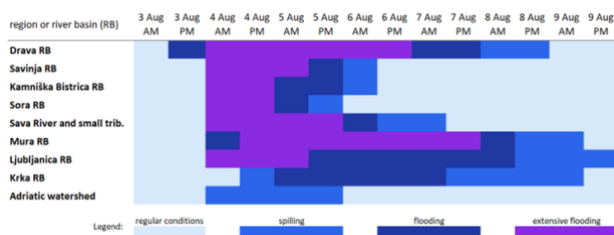


Figure 8: Temporal review of the flooding conditions in Slovenia between 09 and 09 August by affected region or river basin at 12-hour intervals. Image: ARSO

In a report on 17 August, the [International Federation of Red Cross And Red Crescent Societies \(IFRC\) reported](#) 400 buildings destroyed, 8,000 people evacuated, 1,500,000 people affected, 6 fatalities, 30km of roads damaged, 70 bridges destroyed or severely damaged, and 750 hectares of land flooded. According to IFRC, the Upper Carniola, Central Slovenia, Koroška, and Savinjska regions were the hardest hit.

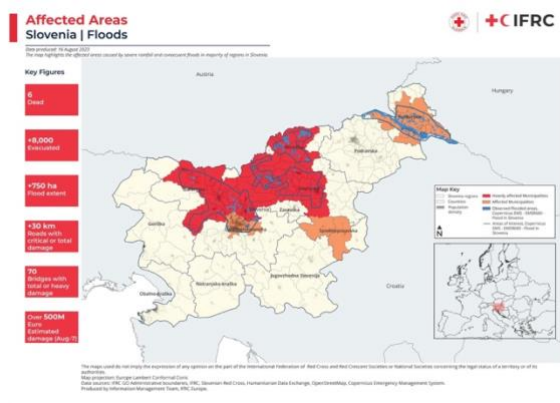


Figure 9: Map of areas impacted by floods in Slovenia. Image: IFRC

[Copernicus EMS Rapid Mapping](#) was activated on 04 August.

Storm Daniel affects Greece, Bulgaria, and Türkiye - September 2023

by Richard Davies, [floodlist](#)

Very heavy rainfall rain from Storm Daniel caused extensive flooding in parts of Greece, Bulgaria, and Türkiye in early September 2023.



Figure 10: Flood damage in Volos, Greece, following Storm Daniel in September 2023. Credit: Greek Red Cross

Greece

In Greece, rainfall from the storm began on 04 September and continued for several days after.

Climate Crisis and Civil Protection Minister [Vassilis Kikilias said](#) the storm dumped 645 mm of rain in a few hours on 05 September in Zagora in Magnesia, Thessaly. Over a period from 04 to 07 September, Zagora recorded 1,095.6 mm of rain.

The rain resulted in catastrophic flooding in multiple locations in central Greece, in particular in the Thessaly Region. The Greek Fire Service received thousands of calls for assistance, mostly in Magnesia and the city of Volos, as well as Sporades, Evia, Karditsa, Trikala, and Skiathos regional units.

In a press conference on 06 September, the Climate Crisis and Civil Protection Minister Vassilis Kikilias said flooding from Storm Daniel had caused enormous destruction to infrastructure, homes, and businesses.

“I know the word unprecedented has been used many times and it may not make an impression. But here even this word does not convey the severity of the phenomenon. We are talking about unimaginable amounts of water,” Minister Vassilis Kikilias said.



Figure 11: Flood rescue in Greece, September 2023. Credit: Greek Fire Service

Boats and helicopters were used to rescue hundreds of those trapped in the floods. As of 11 September, the Greek Fire Service reported 4,506 rescues or evacuations. Multiple fatalities and missing persons were reported in the days following the storm. As of 16 September, at least 17 fatalities had been confirmed.

On 11 September, Greek [Prime Minister Kyriakos Mitsotakis said](#) initial estimates showed the storm caused financial damages of up to €2.5 billion.

Agriculture in the Thessaly Region was severely impacted. Hundreds of thousands of livestock were destroyed along with wide areas of crops and farmland.

[Copernicus said](#) Storm Daniel and the consequent floods caused damage to over 700 km² in Greece's central agricultural belt.



Figure 12: This image, captured on 10 September by one of the Copernicus Sentinel-2 satellites, shows the area of Larissa, which continues to be heavily affected by the flooding caused by the overflow of the Pinios River. Credit: European Union, Copernicus Sentinel-2 imagery

The [Copernicus Rapid Mapping Service was activated](#) on 05 September and provided maps and analysis of flooding in Magnesia, Palamas, Larissa, Stefanovikio, Karditsa, Keramidi and Kalamaki.

In early October, the Greek government said it had inspected over 22,000 homes impacted by the severe weather across 250 communities in the Thessaly and Central Greece Regions.

Bulgaria

Heavy rain from Storm Daniel triggered severe flooding in Burgas Province on Bulgaria's southern Black Sea coast.

The Ministry of the Interior said the villages of Rezovo, Kosti, Arapya and Lozenets and the towns of Tsarevo, Ahtopol and Varvara in Tsarevo municipality were severely impacted. Municipal officials declared a state of emergency.

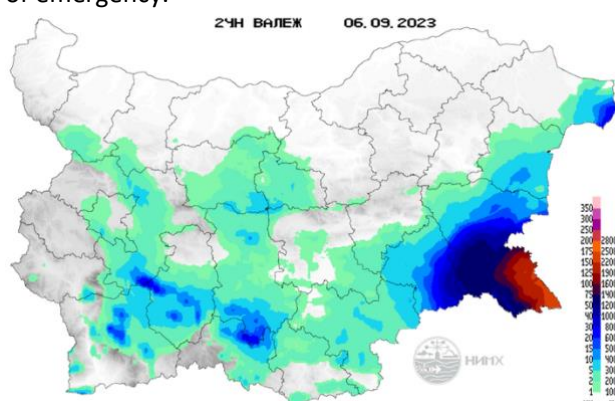


Figure 13: Map showing areas of heavy rainfall in Bulgaria 05 to 06 September 2032. Credit: National Institute of Meteorology and Hydrology Bulgaria

Multiple rivers in the area burst their banks. A number of roads and bridges were damaged and two bridges were completely destroyed in the floods. Tourism Minister Zaritsa Dinkova said about 4,000 people including locals and tourists were affected by the disaster. Local hotels were housing more than 400 people who have been left stranded by the floods.

On 07 September, the Ministry of the Interior confirmed that 4 people had lost their lives in the floods in Tsarevo municipality.

Bulgaria’s National Institute of Meteorology and Hydrology reported Kosti village in Tsarevo Municipality recorded 311 mm of rain in around 14 hours to 05 September. This is about 4 times the amount normally seen for the whole of September.



Figure 14: Flood damage in Tsarevo, Bulgaria, following Storm Daniel in September 2023. Credit: Municipality of Tsarevo

Türkiye

In Turkey, flash floods struck northern districts of Istanbul on 05 September, in particular, Ikitelli, Arnavutköy, Başakşehir, and Küçükçekmece. Authorities reported widespread damage to buildings and roads and at least 2 fatalities. Dozens of people were injured and around 1,700 buildings were damaged.

Meanwhile in Kırklareli Province in northwestern Turkey, 12 people were reported swept away by flash floods in areas of a national park in Iğneada in the Demirköy district. Emergency teams carried out extensive search and rescue operations. As of 05 September, Turkey’s Disaster and Emergency Management Authority (AFAD) reported that 6 people were rescued, but the bodies of two of the victims

were found with 4 people still missing. By 06 September, AFAD reported 2 further fatalities.

18th EFAS Annual Meeting

by Stefania Grimaldi, JRC

The 18th EFAS Annual Meeting was held as a hybrid meeting on 28-29 September 2023. The meeting was organized by the Joint Research Centre (JRC) with the support of all CEMS Flood centres and was hosted at the Germany’s National Meteorological Service (DWD) in Offenbach Am Main (Germany). 70 participants from the EFAS partners/third parties, and operational centres joined the meeting in person, 35 followed online.

EFAS Annual Meetings have the purpose to bring together the community of EFAS partners/third parties and service providers to communicate and discuss evolutions to the systems, issues, and opportunities for improvement. The 18th EFAS Annual Meeting included plenary sessions with presentations by EFAS service providers and EFAS partners/third parties, workshops for detailed discussions about technical topics, and a novel marketplace activity to engage in lively conversations about several aspects of the EFAS service.



Figure 15: Participants of the 18th EFAS Annual Meeting hosted at the DWD (Offenbach am Main, Germany)

The 18th EFAS Annual Meeting was chaired by Peter Salamon (EC JRC, coordinator of the Copernicus Emergency Service European Flood Awareness System - CEMS EFAS). The opening ceremony included the welcome messages by Christina Koppe (DWD), Attilio Gambardella (DG DEFIS), Olimpia Imperiali (DG ECHO).

Each of the 4 EFAS Centres (HDCC, MDCC, COMP, and DISS) and the Global Flood Monitoring teams introduced their operational tasks as part of the EFAS consortium and their achievements over the last year. Plenary presentations covered a variety of aspects of EFAS including the workflow of the EU Civil Protection Mechanism by ERCC, everything you need to know about EFAS version 5.0, facilitating EFAS communication, ongoing and upcoming developments in EFAS, EFAS notifications and feedback collection for 2023, reservoir data collection, alongside the EFAS Partners and third party contributions. A full analysis of the Annual meeting, along with presentations, posters and workshop materials can be viewed on the EFAS website: <https://www.efas.eu/en/news/18th-efas-annual-meeting>

Acknowledgements

The following partner institutes and contributors are gratefully acknowledged for their contribution:

- DG DEFIS - Copernicus and DG ECHO for funding the EFAS Project
- All data providers including meteorological data providers, hydrological services & weather forecasting centres
- The EFAS Operational Centres
- Richard Davies, Floodlist.com

Cover image: Flood damage in Carinthia, Slovenia, 09 August 2023. Photo credit: Slovenia Red Cross

Appendix – figures

Reporting of the meteorological situation by the Meteorological Data Collection Centre (MDCC) is **no longer** published in the EFAS bulletin. Instead, the state of recent meteorology will be conducted by the Copernicus Climate Change Service (C3S) and published as monthly [Climate Bulletins](#).

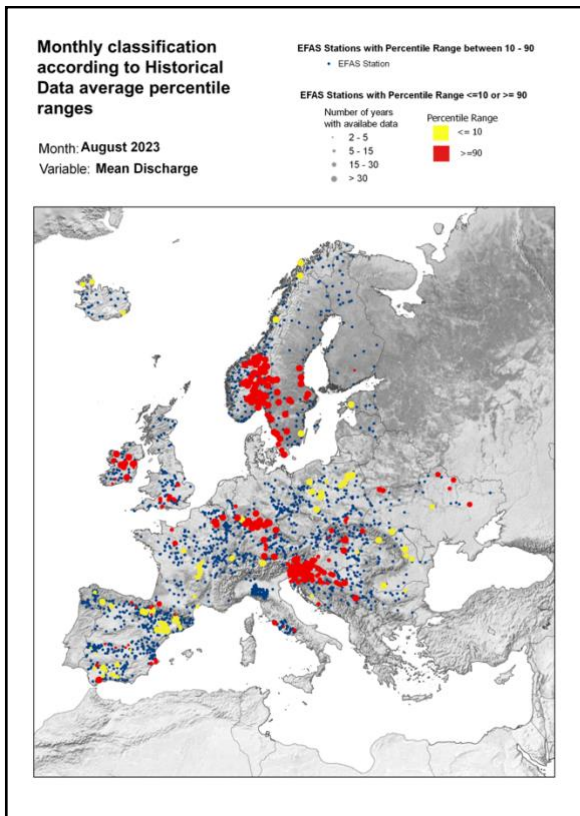


Figure 16: Monthly discharge anomalies August 2023.

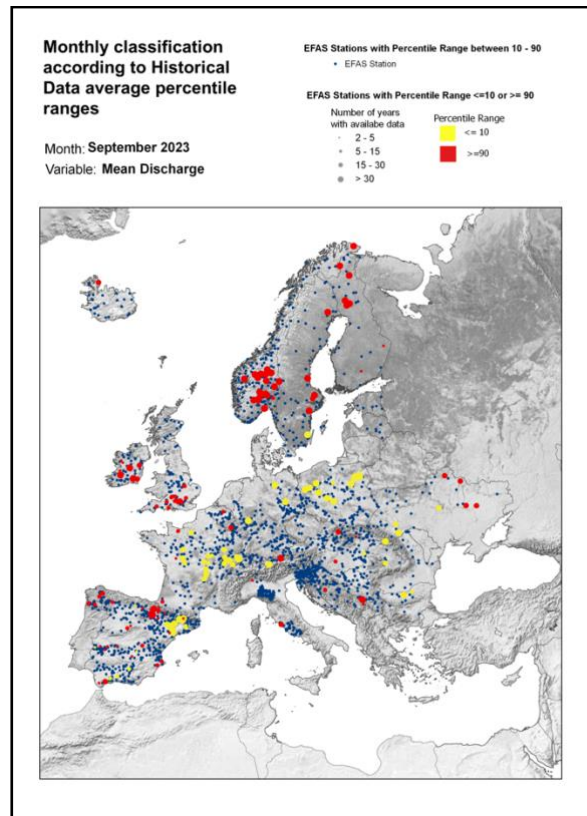


Figure 18: Monthly discharge anomalies September 2023.

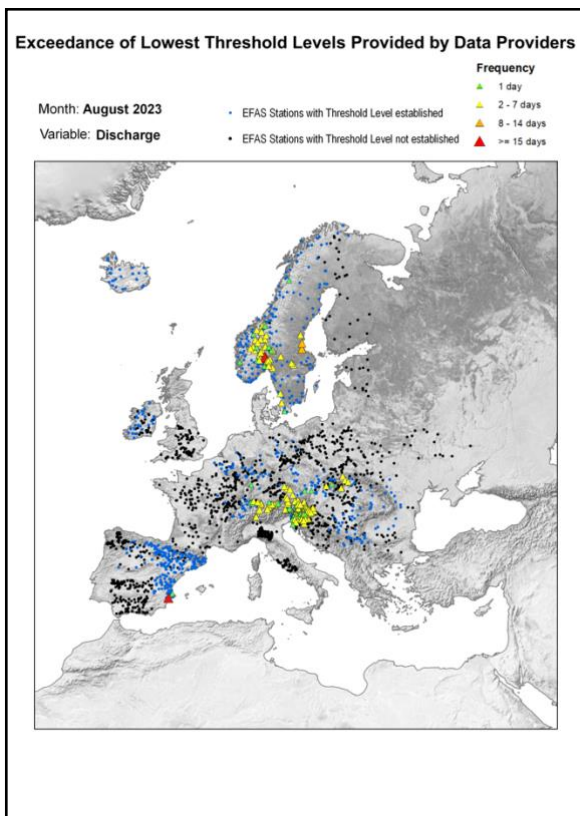


Figure 17: Lowest alert level exceedance for August 2023.

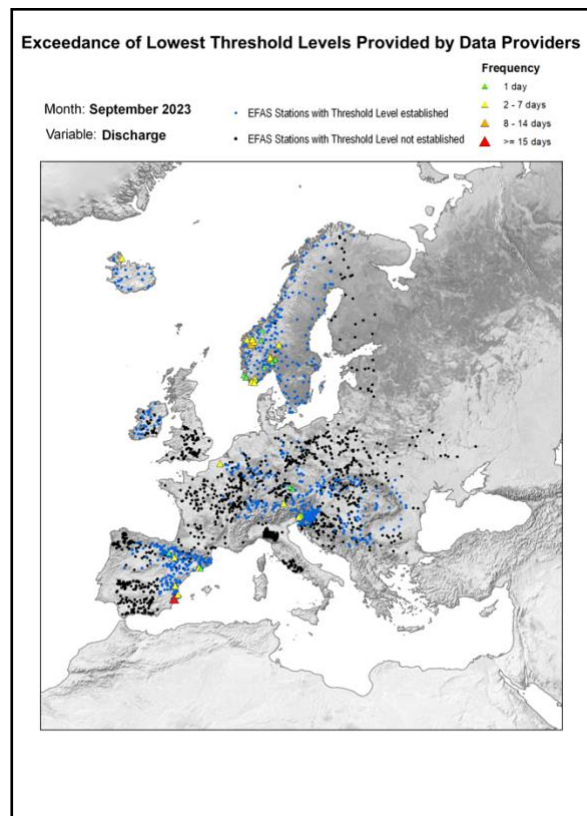


Figure 19: Lowest alert level exceedance for September 2023.

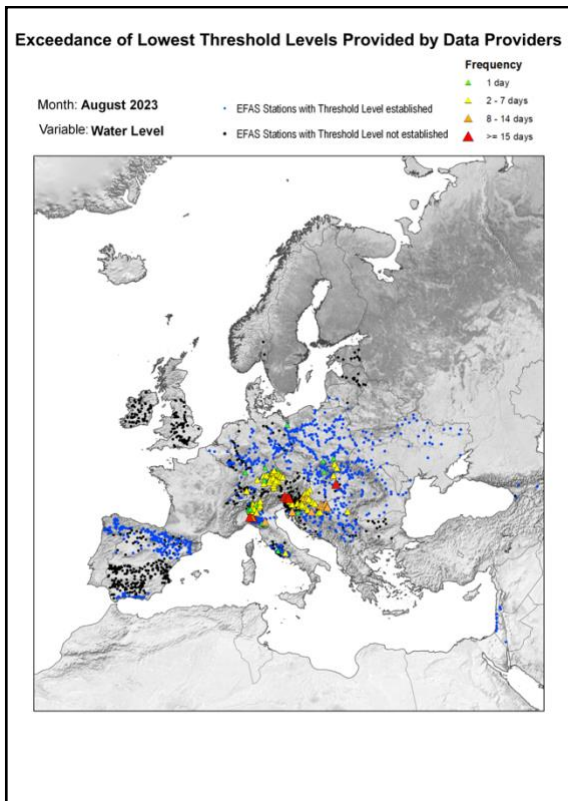


Figure 20: Lowest threshold exceedance for August 2023.

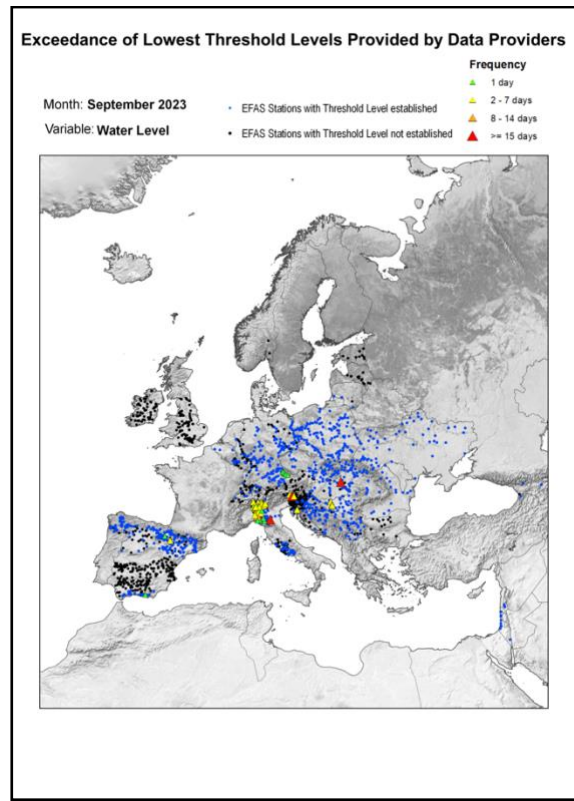


Figure 21: Lowest threshold exceedance for September 2023.

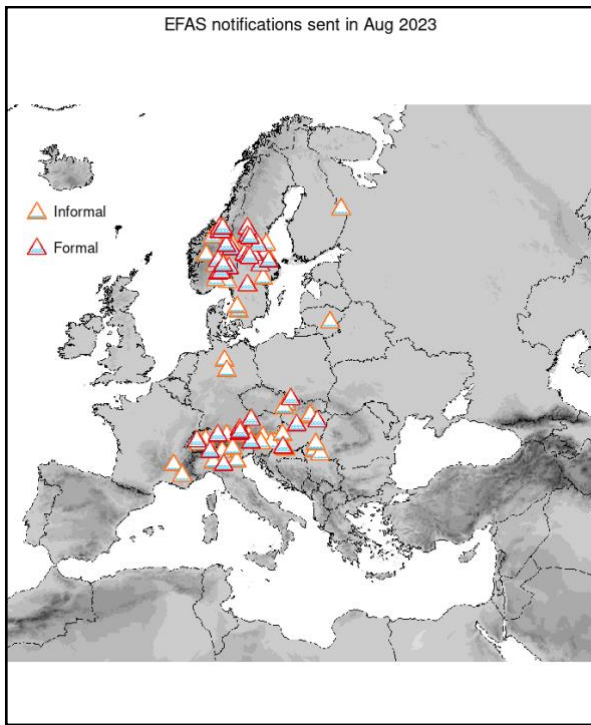


Figure 22: EFAS flood notifications sent for August 2023

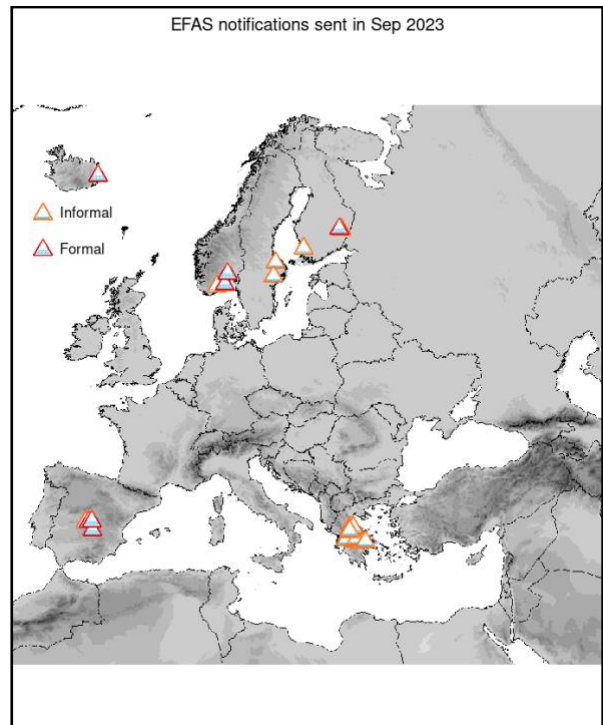


Figure 24: EFAS flood notifications sent for September 2023.

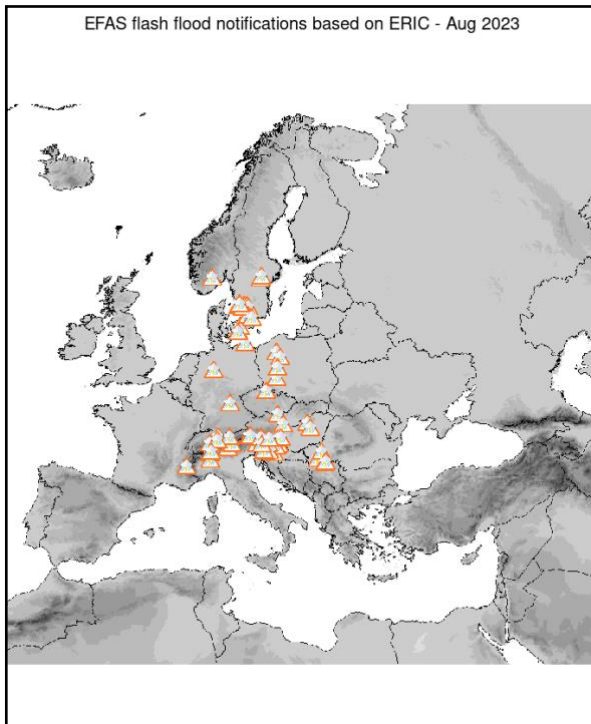


Figure 23: Flash notifications sent for August 2023

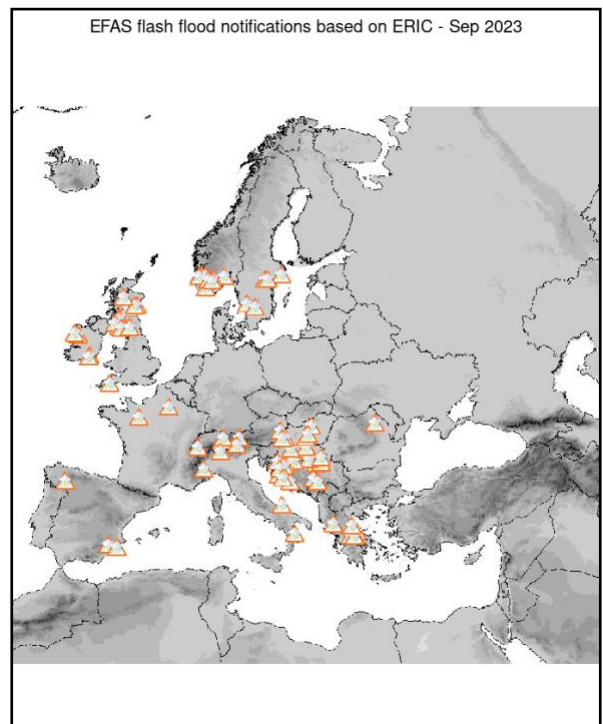


Figure 25: Flash notifications sent for September 2023.

Appendix - tables

Table 1: EFAS flood notifications sent in August – September 2023

Type	Forecast Date	Issue Date	Lead Time	River	Country
Informal	31/07/2023 12 UTC	01/08/2023	36	Gurk	Austria
Formal	03/08/2023 00 UTC	03/08/2023	102	Ljungan	Sweden
Formal	03/08/2023 00 UTC	03/08/2023	102	Dalälven	Sweden
Formal	03/08/2023 00 UTC	03/08/2023	108	GAULA	Norway
Informal	03/08/2023 00 UTC	03/08/2023	72	Mures, below Tirnava	Hungary
Formal	03/08/2023 00 UTC	03/08/2023	108	Gaula	Norway
Informal	03/08/2023 00 UTC	03/08/2023	30	Slana	Slovakia
Informal	03/08/2023 00 UTC	03/08/2023	30	Muráň	Slovakia
Formal	03/08/2023 00 UTC	03/08/2023	60	Drava	Croatia
Formal	03/08/2023 00 UTC	03/08/2023	60	Drava	Hungary
Formal	02/08/2023 12 UTC	03/08/2023	72	Hornad	Hungary
Informal	04/08/2023 00 UTC	04/08/2023	18	Mur	Slovenia
Informal	04/08/2023 00 UTC	04/08/2023	18	Mur	Austria
Informal	04/08/2023 00 UTC	04/08/2023	24	Raba	Hungary
Formal	04/08/2023 00 UTC	04/08/2023	54	Hron	Slovakia
Formal	04/08/2023 00 UTC	04/08/2023	96	Dalälven	Sweden
Formal	04/08/2023 00 UTC	04/08/2023	102	Ljusnan	Sweden
Formal	04/08/2023 00 UTC	04/08/2023	72	Gota alv	Sweden
Formal	04/08/2023 00 UTC	04/08/2023	84	Dokka	Norway
Formal	04/08/2023 00 UTC	04/08/2023	90	Glomma	Norway
Formal	04/08/2023 00 UTC	04/08/2023	48	Oder	Poland
Formal	04/08/2023 00 UTC	04/08/2023	84	Orkla	Norway
Formal	04/08/2023 00 UTC	04/08/2023	84	Gaula (Melhus)	Norway
Formal	04/08/2023 00 UTC	04/08/2023	90	Orkla	Norway
Formal	04/08/2023 00 UTC	04/08/2023	84	Indalsälven	Sweden
Formal	04/08/2023 00 UTC	04/08/2023	54	Oder	Czechia
Formal	04/08/2023 00 UTC	04/08/2023	84	Ljungan	Sweden
Informal	04/08/2023 12 UTC	05/08/2023	18	Saalach	Austria
Informal	04/08/2023 12 UTC	05/08/2023	30	Tisza, section Mures - Tamis	Serbia
Informal	04/08/2023 12 UTC	05/08/2023	30	Tamis	Serbia
Formal	04/08/2023 12 UTC	05/08/2023	60	Dramselva	Norway
Informal	04/08/2023 12 UTC	05/08/2023	36	Becva	Czechia
Informal	04/08/2023 12 UTC	05/08/2023	42	Morava	Czechia
Informal	06/08/2023 00 UTC	06/08/2023	54	Hallingdalselva	Norway
Formal	06/08/2023 00 UTC	06/08/2023	48	Lagen	Norway
Informal	06/08/2023 00 UTC	06/08/2023	36	Coastal zone	Norway
Informal	06/08/2023 12 UTC	07/08/2023	36	Tinne	Norway
Informal	06/08/2023 12 UTC	07/08/2023	42	Driva	Norway
Informal	09/08/2023 00 UTC	09/08/2023	6	Vuoksi	Finland
Informal	09/08/2023 00 UTC	09/08/2023	0	Sventoji	Lithuania
Informal	10/08/2023 00 UTC	10/08/2023	0	Ätran	Sweden
Informal	10/08/2023 00 UTC	10/08/2023	0	Viskan	Sweden
Informal	10/08/2023 00 UTC	10/08/2023	12	Mellan Gnarpsån och Harmångersån	Sweden
Formal	11/08/2023 00 UTC	11/08/2023	90	Dalaelven	Sweden

Informal	11/08/2023 00 UTC	11/08/2023	0	Ljusnan	Sweden
Informal	11/08/2023 00 UTC	11/08/2023	0	Mellan Glomma och Haldenvassdraget	Norway
Informal	13/08/2023 00 UTC	13/08/2023	0	Gota alv	Sweden
Informal	13/08/2023 00 UTC	13/08/2023	6	Norrström	Sweden
Formal	18/08/2023 00 UTC	18/08/2023	48	Begna	Norway
Formal	18/08/2023 00 UTC	18/08/2023	54	Dokka	Norway
Informal	18/08/2023 00 UTC	18/08/2023	0	ILMENAU	Germany
Informal	18/08/2023 00 UTC	18/08/2023	0	Aller	Germany
Informal	19/08/2023 12 UTC	20/08/2023	18	Begna	Norway
Informal	20/08/2023 12 UTC	21/08/2023	0	Dokka	Norway
Formal	20/08/2023 12 UTC	21/08/2023	96	Dalälven	Sweden
Formal	21/08/2023 12 UTC	22/08/2023	102	Dalälven	Sweden
Formal	23/08/2023 00 UTC	23/08/2023	96	Ljungan	Sweden
Informal	22/08/2023 12 UTC	23/08/2023	66	Dokka	Norway
Formal	22/08/2023 12 UTC	23/08/2023	60	Begna	Norway
Formal	22/08/2023 12 UTC	23/08/2023	84	Dalälven	Sweden
Formal	22/08/2023 12 UTC	23/08/2023	60	Dalälven	Sweden
Formal	22/08/2023 12 UTC	23/08/2023	78	Dalälven	Sweden
Informal	22/08/2023 12 UTC	23/08/2023	84	Gota alv	Norway
Formal	23/08/2023 12 UTC	24/08/2023	78	Gota alv	Norway
Formal	25/08/2023 00 UTC	25/08/2023	72	Drave	Austria
Formal	25/08/2023 00 UTC	25/08/2023	66	Inn	Austria
Formal	25/08/2023 00 UTC	25/08/2023	66	Inn	Germany
Formal	24/08/2023 12 UTC	25/08/2023	60	Lago Maggiore	Switzerland
Formal	24/08/2023 12 UTC	25/08/2023	66	Rhine	Switzerland
Formal	24/08/2023 12 UTC	25/08/2023	66	Rhine	Austria
Formal	26/08/2023 00 UTC	26/08/2023	60	Danube	Austria
Informal	26/08/2023 00 UTC	26/08/2023	30	Lech	Austria
Formal	26/08/2023 00 UTC	26/08/2023	66	Oglio	Italy
Formal	26/08/2023 00 UTC	26/08/2023	60	Glomma	Norway
Informal	26/08/2023 00 UTC	26/08/2023	30	Isere	France
Informal	26/08/2023 00 UTC	26/08/2023	42	Durance	France
Informal	25/08/2023 12 UTC	26/08/2023	36	ADIGE	Italy
Formal	25/08/2023 12 UTC	26/08/2023	54	Inn	Germany
Informal	27/08/2023 00 UTC	27/08/2023	12	Adda	Italy
Informal	27/08/2023 00 UTC	27/08/2023	30	Reuss	Switzerland
Informal	26/08/2023 12 UTC	27/08/2023	48	Aare	Switzerland
Informal	26/08/2023 12 UTC	27/08/2023	42	Saalach	Austria
Informal	26/08/2023 12 UTC	27/08/2023	12	Po, section Ticino - Adda	Italy
Formal	27/08/2023 12 UTC	28/08/2023	36	Aare	Switzerland
Informal	27/08/2023 12 UTC	28/08/2023	24	Brenta	Italy
Informal	27/08/2023 12 UTC	28/08/2023	30	Mur	Austria
Informal	30/08/2023 00 UTC	30/08/2023	12	Drava	Croatia
Informal	01/09/2023 00 UTC	01/09/2023	60	Tejo, section Jamara - Alberche	Spain
Formal	01/09/2023 00 UTC	01/09/2023	60	Henares	Spain
Informal	31/08/2023 12 UTC	01/09/2023	12	KOKEMAENJOKI	Finland
Informal	02/09/2023 00 UTC	02/09/2023	66	Kalentzis	Greece
Formal	02/09/2023 00 UTC	02/09/2023	42	Tajo	Spain
Formal	01/09/2023 12 UTC	02/09/2023	48	Ciguela/Giguela	Spain

Informal	03/09/2023 00 UTC	03/09/2023	0	Norrström	Sweden
Informal	03/09/2023 00 UTC	03/09/2023	42	Akheloos	Greece
Informal	03/09/2023 00 UTC	03/09/2023	42	Spercheios	Greece
Informal	02/09/2023 12 UTC	03/09/2023	54	Kifisos	Greece
Informal	02/09/2023 12 UTC	03/09/2023	48	Enipefs	Greece
Informal	02/09/2023 12 UTC	03/09/2023	54	Pineios	Greece
Informal	04/09/2023 00 UTC	04/09/2023	18	Kifisos	Greece
Informal	03/09/2023 12 UTC	04/09/2023	0	Dalaelven	Sweden
Informal	04/09/2023 12 UTC	05/09/2023	18	Pinios	Greece
Formal	12/09/2023 12 UTC	13/09/2023	36	Vuoksa, section Orivesti catchment	Finland
Formal	15/09/2023 12 UTC	16/09/2023	84	Jokusla a Bru	Iceland
Informal	17/09/2023 00 UTC	17/09/2023	66	Vuoksi	Finland
Informal	18/09/2023 00 UTC	18/09/2023	18	Nidelva	Norway
Informal	18/09/2023 00 UTC	18/09/2023	24	Skien	Norway
Formal	19/09/2023 00 UTC	19/09/2023	6	Drammenselva	Norway
Formal	19/09/2023 12 UTC	20/09/2023	60	Skien	Norway
Informal	24/09/2023 00 UTC	24/09/2023	42	Πηνειός/Θεσσαλία	Greece
Informal	25/09/2023 00 UTC	25/09/2023	6	Κηφισός	Greece
Informal	25/09/2023 00 UTC	25/09/2023	6	Κηφισός	Greece
Informal	24/09/2023 12 UTC	25/09/2023	42	Ionian Sea	Greece
Informal	24/09/2023 12 UTC	25/09/2023	42	Akheloos	Greece

* Lead time [days] to the first forecasted exceedance of the 5-year simulated discharge threshold.

Table 2: EFAS Flash notifications sent in August – September 2023

Type	Forecast Date	Issue Date	Lead Time	Region	Country
Flash Flood	31/07/2023 12 UTC	01/08/2023	30	Danube	Hungary
Flash Flood	31/07/2023 12 UTC	01/08/2023	30	Danube	Austria
Flash Flood	03/08/2023 00 UTC	03/08/2023	48	Danube	Slovenia
Flash Flood	03/08/2023 00 UTC	03/08/2023	48	Danube	Hungary
Flash Flood	03/08/2023 00 UTC	03/08/2023	48	Danube	Austria
Flash Flood	03/08/2023 00 UTC	03/08/2023	42	Danube	Austria
Flash Flood	02/08/2023 12 UTC	03/08/2023	48	Danube	Austria
Flash Flood	04/08/2023 00 UTC	04/08/2023	48	Danube	Serbia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Croatia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Croatia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	04/08/2023 00 UTC	04/08/2023	24	Danube	Slovenia
Flash Flood	03/08/2023 12 UTC	04/08/2023	42	Danube	Slovenia
Flash Flood	05/08/2023 00 UTC	05/08/2023	24	Danube	Serbia
Flash Flood	05/08/2023 00 UTC	05/08/2023	30	Danube	Hungary
Flash Flood	05/08/2023 00 UTC	05/08/2023	36	Oder	Poland
Flash Flood	05/08/2023 00 UTC	05/08/2023	36	Oder	Poland
Flash Flood	05/08/2023 00 UTC	05/08/2023	48	Sweden	Sweden

Flash Flood	05/08/2023 00 UTC	05/08/2023	48	Sweden	Sweden
Flash Flood	05/08/2023 00 UTC	05/08/2023	48	Sweden	Sweden
Flash Flood	05/08/2023 00 UTC	05/08/2023	48	Sweden	Sweden
Flash Flood	05/08/2023 00 UTC	05/08/2023	48	Helge	Sweden
Flash Flood	04/08/2023 12 UTC	05/08/2023	24	Danube	Czechia
Flash Flood	04/08/2023 12 UTC	05/08/2023	18	Danube	Austria
Flash Flood	04/08/2023 12 UTC	05/08/2023	30	Danube	Austria
Flash Flood	04/08/2023 12 UTC	05/08/2023	36	Danube	Romania
Flash Flood	04/08/2023 12 UTC	05/08/2023	36	Danube	Serbia
Flash Flood	06/08/2023 00 UTC	06/08/2023	24	Danube	Hungary
Flash Flood	05/08/2023 12 UTC	06/08/2023	30	Oder	Poland
Flash Flood	05/08/2023 12 UTC	06/08/2023	30	Oder	Poland
Flash Flood	05/08/2023 12 UTC	06/08/2023	30	Oder	Poland
Flash Flood	05/08/2023 12 UTC	06/08/2023	48	Denmark	Denmark
Flash Flood	05/08/2023 12 UTC	06/08/2023	48	Baltic Sea Coast (West)	Germany
Flash Flood	05/08/2023 12 UTC	06/08/2023	48	Denmark	Denmark
Flash Flood	05/08/2023 12 UTC	06/08/2023	48	Sweden	Sweden
Flash Flood	05/08/2023 12 UTC	06/08/2023	24	Danube	Austria
Flash Flood	07/08/2023 00 UTC	07/08/2023	48	Moel	Norway
Flash Flood	12/08/2023 00 UTC	12/08/2023	30	Sweden	Sweden
Flash Flood	12/08/2023 00 UTC	12/08/2023	24	Sweden	Sweden
Flash Flood	12/08/2023 00 UTC	12/08/2023	24	Sweden	Sweden
Flash Flood	13/08/2023 00 UTC	13/08/2023	6	Sweden	Sweden
Flash Flood	13/08/2023 00 UTC	13/08/2023	6	Sweden	Sweden
Flash Flood	12/08/2023 12 UTC	13/08/2023	12	Sweden	Sweden
Flash Flood	12/08/2023 12 UTC	13/08/2023	12	Sweden	Sweden
Flash Flood	16/08/2023 12 UTC	17/08/2023	24	Weser	Germany
Flash Flood	23/08/2023 12 UTC	24/08/2023	48	Sweden	Sweden
Flash Flood	25/08/2023 00 UTC	25/08/2023	12	Sweden	Sweden
Flash Flood	24/08/2023 12 UTC	25/08/2023	42	Rhine	Germany
Flash Flood	26/08/2023 00 UTC	26/08/2023	48	Rhine	Switzerland
Flash Flood	26/08/2023 00 UTC	26/08/2023	36	Rhone	France
Flash Flood	25/08/2023 12 UTC	26/08/2023	48	Po	Switzerland
Flash Flood	27/08/2023 00 UTC	27/08/2023	42	Adige	Italy
Flash Flood	27/08/2023 00 UTC	27/08/2023	42	Adige	Italy
Flash Flood	27/08/2023 00 UTC	27/08/2023	42	Po	Italy
Flash Flood	26/08/2023 12 UTC	27/08/2023	42	Rhine	Austria
Flash Flood	26/08/2023 12 UTC	27/08/2023	42	Rhine	Switzerland
Flash Flood	26/08/2023 12 UTC	27/08/2023	48	Danube	Austria
Flash Flood	26/08/2023 12 UTC	27/08/2023	48	Po	Italy
Flash Flood	28/08/2023 00 UTC	28/08/2023	30	Elbe	Czechia
Flash Flood	27/08/2023 12 UTC	28/08/2023	42	Danube	Austria
Flash Flood	27/08/2023 12 UTC	28/08/2023	42	Danube	Austria
Flash Flood	27/08/2023 12 UTC	28/08/2023	30	Danube	Austria
Flash Flood	01/09/2023 00 UTC	01/09/2023	24	Sweden	Sweden
Flash Flood	31/08/2023 12 UTC	01/09/2023	24	Sweden	Sweden
Flash Flood	31/08/2023 12 UTC	01/09/2023	42	Sweden	Sweden
Flash Flood	31/08/2023 12 UTC	01/09/2023	42	Sweden	Sweden
Flash Flood	02/09/2023 00 UTC	02/09/2023	30	Segura	Spain
Flash Flood	02/09/2023 00 UTC	02/09/2023	30	Spain (South-East Coast)	Spain
Flash Flood	02/09/2023 12 UTC	03/09/2023	48	Danube	Romania

Flash Flood	03/09/2023 12 UTC	04/09/2023	48	Greece (North)	Greece
Flash Flood	04/09/2023 12 UTC	05/09/2023	42	Aoos / Vjose	Greece
Flash Flood	04/09/2023 12 UTC	05/09/2023	48	Spercheios	Greece
Flash Flood	13/09/2023 00 UTC	13/09/2023	24	Danube	Austria
Flash Flood	12/09/2023 12 UTC	13/09/2023	42	Danube	Hungary
Flash Flood	12/09/2023 12 UTC	13/09/2023	36	Danube	Austria
Flash Flood	17/09/2023 00 UTC	17/09/2023	48	Norway	Norway
Flash Flood	18/09/2023 00 UTC	18/09/2023	36	Norway	Norway
Flash Flood	19/09/2023 00 UTC	19/09/2023	30	Sweden	Sweden
Flash Flood	20/09/2023 00 UTC	20/09/2023	48	Rhone	Switzerland
Flash Flood	20/09/2023 00 UTC	20/09/2023	36	Seine	France
Flash Flood	19/09/2023 12 UTC	20/09/2023	12	Ness	United Kingdom
Flash Flood	19/09/2023 12 UTC	20/09/2023	18	Esk	United Kingdom
Flash Flood	19/09/2023 12 UTC	20/09/2023	24	Coastal	United Kingdom
Flash Flood	19/09/2023 12 UTC	20/09/2023	42	Loire	France
Flash Flood	19/09/2023 12 UTC	20/09/2023	42	Mino/Minho	Spain
Flash Flood	19/09/2023 12 UTC	20/09/2023	42	Coastal	Norway
Flash Flood	19/09/2023 12 UTC	20/09/2023	36	Po	Italy
Flash Flood	21/09/2023 00 UTC	21/09/2023	36	Adige	Italy
Flash Flood	21/09/2023 00 UTC	21/09/2023	30	Maas/Meuse	Austria
Flash Flood	20/09/2023 12 UTC	21/09/2023	48	Po	Italy
Flash Flood	20/09/2023 12 UTC	21/09/2023	24	Etneelva	Norway
Flash Flood	20/09/2023 12 UTC	21/09/2023	24	Norwegian Sea	Norway
Flash Flood	20/09/2023 12 UTC	21/09/2023	24	Norwegian Sea	Norway
Flash Flood	20/09/2023 12 UTC	21/09/2023	24	Skien	Norway
Flash Flood	22/09/2023 00 UTC	22/09/2023	48	Danube	Croatia
Flash Flood	22/09/2023 00 UTC	22/09/2023	48	Adriatic Sea	Croatia
Flash Flood	22/09/2023 00 UTC	22/09/2023	18	Danube	Austria
Flash Flood	21/09/2023 12 UTC	22/09/2023	18	Maas/Meuse	Switzerland
Flash Flood	21/09/2023 12 UTC	22/09/2023	18	Lagen	Norway
Flash Flood	21/09/2023 12 UTC	22/09/2023	48	Danube	Bosnia and Herzegovina
Flash Flood	21/09/2023 12 UTC	22/09/2023	48	Danube	Bosnia and Herzegovina
Flash Flood	21/09/2023 12 UTC	22/09/2023	48	Adriatic Sea	Croatia
Flash Flood	21/09/2023 12 UTC	22/09/2023	48	Krka	Croatia
Flash Flood	23/09/2023 00 UTC	23/09/2023	42	Coastal	United Kingdom
Flash Flood	23/09/2023 00 UTC	23/09/2023	42	Coastal	United Kingdom
Flash Flood	23/09/2023 00 UTC	23/09/2023	42	Coastal	Ireland
Flash Flood	23/09/2023 00 UTC	23/09/2023	24	Danube	Hungary
Flash Flood	23/09/2023 00 UTC	23/09/2023	18	Danube	Hungary
Flash Flood	23/09/2023 00 UTC	23/09/2023	18	Danube	Hungary
Flash Flood	23/09/2023 00 UTC	23/09/2023	12	Zrmanja	Croatia
Flash Flood	22/09/2023 12 UTC	23/09/2023	36	Danube	Croatia
Flash Flood	22/09/2023 12 UTC	23/09/2023	30	Danube	Croatia
Flash Flood	24/09/2023 00 UTC	24/09/2023	30	Danube	Serbia
Flash Flood	24/09/2023 00 UTC	24/09/2023	24	Danube	Serbia
Flash Flood	24/09/2023 00 UTC	24/09/2023	30	Danube	Serbia
Flash Flood	24/09/2023 00 UTC	24/09/2023	30	Danube	Bosnia and Herzegovina
Flash Flood	24/09/2023 00 UTC	24/09/2023	30	Danube	Croatia

Flash Flood	24/09/2023 00 UTC	24/09/2023	30	Danube	Hungary
Flash Flood	23/09/2023 12 UTC	24/09/2023	42	Danube	Serbia
Flash Flood	23/09/2023 12 UTC	24/09/2023	42	Danube	Serbia
Flash Flood	23/09/2023 12 UTC	24/09/2023	36	Coastal	Italy
Flash Flood	23/09/2023 12 UTC	24/09/2023	30	R. Irvine	United Kingdom
Flash Flood	23/09/2023 12 UTC	24/09/2023	30	Coastal	United Kingdom
Flash Flood	25/09/2023 00 UTC	25/09/2023	36	Coastal	Greece
Flash Flood	24/09/2023 12 UTC	25/09/2023	48	Coastal	Italy
Flash Flood	26/09/2023 00 UTC	26/09/2023	48	North Sea	United Kingdom
Flash Flood	26/09/2023 00 UTC	26/09/2023	36	Barrow	Ireland
Flash Flood	25/09/2023 12 UTC	26/09/2023	48	Ireland	Ireland
Flash Flood	25/09/2023 12 UTC	26/09/2023	48	Coastal	Greece
Flash Flood	27/09/2023 00 UTC	27/09/2023	24	Scotland	United Kingdom
Flash Flood	27/09/2023 00 UTC	27/09/2023	24	Tay	United Kingdom
Flash Flood	27/09/2023 00 UTC	27/09/2023	24	North Atlantic	United Kingdom
Flash Flood	26/09/2023 12 UTC	27/09/2023	36	Coastal	United Kingdom
Flash Flood	26/09/2023 12 UTC	27/09/2023	24	Corrib	Ireland
Flash Flood	27/09/2023 12 UTC	28/09/2023	24	Aegean Sea	Greece

* Lead time [hours] to the forecasted peak of the event

The European Flood Awareness System (EFAS) produces European overviews of ongoing and forecasted floods up to 10 days in advance and contributes to better protection of the European citizens, the environment, properties and cultural heritage. It has been developed at the European Commission's in-house science service, the Joint Research Centre (JRC), in close collaboration with national hydrological and meteorological services and policy DG's of the European Commission.

EFAS has been transferred to operations under the European Commission's COPERNICUS Emergency Management Service led by DG GROW in direct support to the EU's Emergency Response Coordination Centre (ERCC) of DG ECHO and the hydrological services in the Member States.

ECMWF has been awarded the contract for the EFAS Computational centre. It is responsible for providing daily operational EFAS forecasts and 24/7 support to the technical system.

A consortium of Swedish Meteorological and Hydrological Institute (SMHI), Rijkswaterstaat (RWS) and Slovak Hydro-Meteorological Institute (SHMU) has been awarded the contract for the EFAS Dissemination centre. They are responsible for analysing EFAS output and disseminating information to the partners and the ERCC.

A Spanish contractor, Ghenova Digital (formerly Soologic), has been awarded the contract for the EFAS Hydrological data collection centre. They are responsible for collecting discharge and water level data across Europe.

A German consortium (KISTERS and DWD) has been awarded the contract for the EFAS Meteorological data collection centre. They are responsible for collecting the meteorological data needed to run EFAS over Europe.

Finally, the JRC is responsible for the overall project management related to EFAS and further development of the system.

Contact details:

European Centre for Medium-Range Weather Forecasts (ECMWF)
Shinfield Park, Reading,
RG2 9AX, UK

Tel: +44-118-9499-303

Fax: +44-118-9869-450

Email: comp@efas.eu

www.efas.eu

www.ecmwf.int