
European Flood Awareness System

EFAS *Bulletin*

October – November 2018

Issue 2018(6)



NEWS

New features

The new EFAS web interface is now in the final testing phase and is planned to be released early next year. We invite all users to have a closer look at the test version: <http://new-efas-test.efas.eu/> More information about the new functionalities will be offered soon, see also the article in this bulletin

Meetings

Global Dialogue Platform on Forecast-based Financing (FbF), Berlin

The Global Dialogue Platform on Forecast-based Financing (FbF) is organized by the German Red Cross in close cooperation with the International Federation of Red Cross and Red Crescent Societies (IFRC), the World Food Programme and the Red Cross Red Crescent Climate Centre. FbF is an innovative program with the prime goal to anticipate disasters, prevent their impact, if possible, and reduce human suffering and losses, based on credible forecasts, early preparedness and pre-planned community level actions. The Copernicus Emergency Management Service (EMS) has contributed in the past to this initiative by providing timely probabilistic GloFAS flood forecast information for individual cases such as e.g. in Uganda. The JRC gave a presentation of the products and services of the EMS as well as of GloFAS.

River Engineering Symposium 2018: Rivers Without Borders, 10-11 October 2018, Graz, Austria

The workshop was organized by the Austrian Federal Ministry of Sustainability and Tourism together with the Region Styria and the Austrian Association of Water. The workshop aimed at presenting national and international experiences, challenges and chances in trans-border flood risk management. The JRC presented the Copernicus EFAS and its future developments in the session on early warning system and emergency response planning. More info can be found [here](#).

Early warning systems expert group meeting, 29 November 2018, Brussels, Belgium

The Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO) of the European Commission organized an expert meeting on early warning systems. The purpose of the meeting

was to inform participating states of the Union Civil Protection Mechanism on latest development in the field of the Early Warning Systems according to the mandate the Commission has received. Presentations included an analysis of recent events (Tsunami in Sulawesi, Indonesia), the European Natural Hazard Scientific Partnership (ARISTOTLE-2), as well as updates on the new Global Disaster Alert and Coordination System (GDACS), European Forest Fire Information System (EFFIS), the European Drought Observatory (EDO) and EFAS.

Copernicus Users workshop, 13-14 Nov 2018, Zagreb, Croatia

The workshop was organised jointly by the Copernicus services on Atmosphere Monitoring (CAMS) and Climate Change (C3S), in collaboration with the Croatian Ministry of the Environment and the Croatian Meteorological and Hydrological service. The workshop aimed to promote the products and uses of data and information from these two Copernicus services. In addition, the Copernicus Emergency Management Service CEMS was also presented, and a panel discussion including representatives of CAMS, C3S and CEMS was held. More information can be found [here](#).

ANYWHERE workshop in Barcelona 13-14 November

The third workshop of the H2020 project ANYWHERE (<http://anywhere-h2020.eu/>) was held in Barcelona 13-14 November followed by a General Assembly for project partners on the 15-16 November. The main purpose of ANYWHERE is to act as a decision support tool for end-users (Civil Protection Agencies (CPA), businesses, public) with regards to multiple natural hazards and risks, including extreme weather, floods, flash floods, wildfire, storm surges, health and drought. EFAS delivers flood and flash flood data to the platform. The users of the pilot sites were in general happy with the platform, and the next year will be spent in further developing and tailoring the platforms to the end-user needs. Incidentally, the meeting coincided with a major flash-flood in Catalonia, which also affected Barcelona. The Civil protection agency of Catalonia were very impressed with the performance and usefulness of the Catalonian platform A4Cat during this event.

New partners

We gladly welcome Agenzia Regionale per la Protezione dell'Ambiente della Lombardia (ARPA Lombardia) as new EFAS partner.

RESULTS

Summary of EFAS Flood and Flash Flood Notifications

The 15 formal and 27 informal EFAS flood notifications issued in October-November 2018 are summarised in Table 1. The locations of all notifications are shown in Figure 21 and Figure 23 in the appendix.

155 flash flood notification were issued from October to November 2018, summarised in Table 1. The location is shown in Figure 22 and Figure 24 in the appendix.

Meteorological situation

by EFAS Meteorological Data Collection Centre

October 2018

The meteorological situation in October 2018 was characterized by recurring cut-off events of upper level low pressure systems whereas high pressure systems occurred in lower levels. On 2 October, a cut-off from a trough over Scandinavia and Central Europe caused an upper level low-pressure system in the central Mediterranean Region, causing flash floods for example in Croatia (Dubrovnik, 259mm/3h) as well as Southern Italy. A small low-pressure system moved from Scandinavia to Russia. On 6 October, another cut-off caused an upper level low pressure system over France and Spain, which brought again several heavy precipitation events in these countries. At October, an intense low-pressure system developed westward of Great Britain and Ireland and moved in the following four days to Spitsbergen, causing intense precipitation and strong winds in Great Britain, Ireland and Norway.

A low-pressure system moved from the Atlantic Ocean to the Iberian Peninsula and changed to a slowly westward moving persistent upper level low-pressure system causing again heavy precipitation events in Spain and southern Italy. At the same time, an upper level low pressure system cut-off over southern Scandinavia and moved via the Baltic Sea to the central Mediterranean region where it led to floods in Italy. Coincidentally, an intense low-pressure system in the Norwegian Sea caused strong wind and intense precipitation in Norway. A secondary depression developed over Scandinavia and moved via the Baltic Sea to Russia, the first time since days that the persistent high-pressure system there disappeared, while an intense

foehn with up to 30°C developed in northern Italy. In the last days of October, a large trough emerged over western Europe, reached northern Africa and induced a meridional flow over the central Mediterranean Region and central Europe with intense orographic precipitation in the southern parts of the Alps and corresponding floods.

Summing up, October 2018 was characterized by a persistent high-pressure bridge from the Azores to Russia forcing most of the low-pressure systems on northern tracks, intense precipitation events in the Mediterranean regions and a still ongoing drought in central Europe.

In October 2018 precipitation amounts were up to 785 mm. The highest precipitation amounts were measured at the western coasts of Norway and Scotland, but also in the western and central Mediterranean Region originating from convective precipitation events forced by the high sea surface temperatures (Figure 7 and Figure 8). Low precipitation amounts were observed in central as well as southeast Europe causing droughts there.

The most regions of Europe had positive temperature anomalies with up to +7 K (Figure 11 and Figure 12). Below normal temperatures were observed in Iceland, Great Britain, Ireland, Portugal, Spain, Sicily, Morocco, Algeria, Tunisia and western Libya and parts of France, Turkey and Scandinavia.

November 2018

The meteorological situation in November 2018 was characterized by persistent high-pressure systems over central and eastern Europe and Scandinavia, which caused low precipitation totals (large negative anomalies) in these regions. Low pressure systems from the Atlantic Ocean were blocked by these high-pressure systems and led to higher than normal precipitation amounts especially in Ireland. Furthermore, low-pressure systems brought higher than normal precipitation amounts to the Mediterranean Region and the Iberian Peninsula.

Lasting since end of October, intense precipitation occurred in the central Mediterranean region as well as heavy snow fall in the southern and western Alps in the first days of November.

In November 2018 precipitation amounts were up to 610 mm. The highest precipitation amounts were measured at the western coast of the Iberian Peninsula and the Massif Central in France (Figure 9 and Figure 10). Low precipitation amounts were observed in central and eastern Europe causing droughts there.

Most regions of Europe had positive temperature anomalies (Figure 13Figure 14). Larger regions with negative temperature anomalies were found northward of the Black Sea and the southwest of the Iberian Peninsula and northwest Africa.

Hydrological situation

by EFAS Hydrological Data Collection Centre

During the months October and November, most of the stations that surpassed the minimum discharge and/or stage threshold levels were concentrated along the basins in Norway, Po river basin in Italy, Danube river basin in Slovenia, Croatia and Austria (mainly Drava and Sava rivers), Mediterranean basins in southern Spain and Llobregat river basin in north-eastern Spain. A more dispersed distribution of stations with exceedances occurred across Minho-Sil river basin in north-western Spain, Rhine river basin in Germany and Switzerland, Neretva river basin in southern Bosnia and Herzegovina, in Danube river basin (rivers Tisza y Mures) in Hungary and Romania, in Oder and Vistula river basins in Poland, Dnieper and Don river basins in Ukraine and Shikma river basin in Israel.

Most stations that registered discharge values above the 90% quantile were located across Norway, the western Danube river basin in Austria and Spain in Llobregat, Ebro and Guadalquivir river basins. This occurred less frequently for stations located on basins in central part of England, Northern Finland, Bulgaria (river Vit in Danube river basin) and Dnieper river basin in Ukraine.

Stations that did not surpass the 10% quantile for discharge values were mainly located across Sweden and basins in Central Europe: Rhine, Oder, Elbe, western and northern Danube river basin. This occurred less frequently in Eastern Danube river basin, for basins in England and Ireland, southern Norway, Vistula river in Poland, Dnieper river basin in Ukraine as well as for some isolated stations along the Ebro river basin in

Spain, the Rhône river basin in France, and the Scheldt and Meuse river basins in Belgium.

Verification

Figure 1 and Figure 2 shows the EFAS headline score, the Continuous Ranked Probability Skill Score (CRPSS) for lead times 1 and 5 days for the October to November period 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.

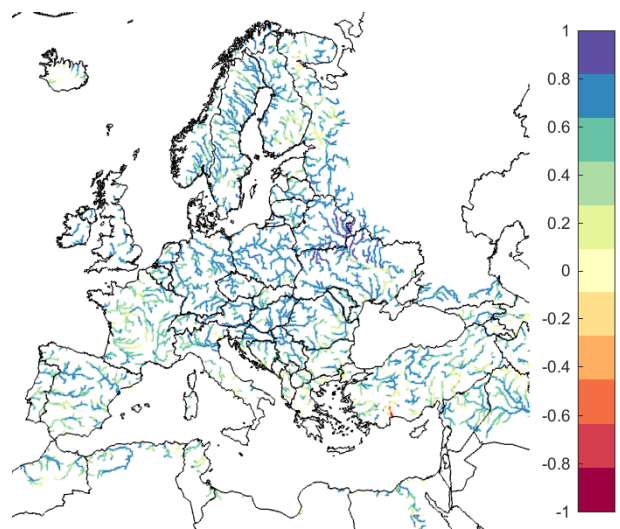


Figure 1. EFAS CRPSS at lead-time 1 days for the October-November 2018 period, for catchments >2000km². The reference score is persistence of using previous day's forecast.

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.

As previous period, the skill is higher in central Europe than in southern, but the skill is also quite high in northern Europe over this period. The extended domain has now run for quite a long time, and we will soon be able to present a more in-depth analysis of the performance.

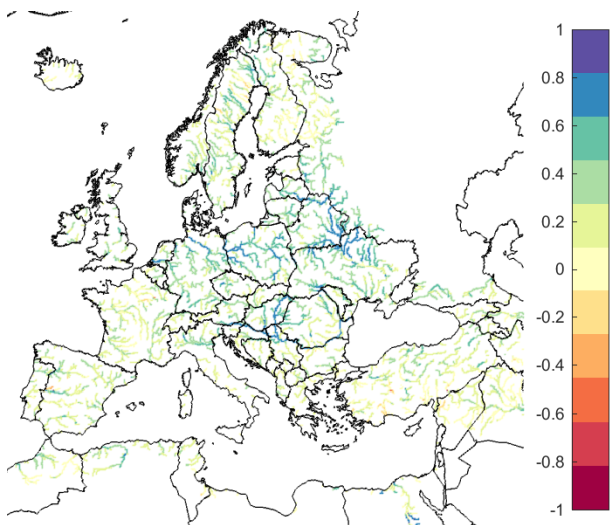


Figure 2. EFAS CRPSS at lead-time 7 days for the October-November 2018 period, for catchments >2000km². The reference score is persistence of using previous day's forecast.

FEATURES

Release of the new EFAS web interface

by EFAS COMP and DISS centers

Release of the new EFAS-IS web interface

The EFAS Computational Centre plans the release of the new EFAS-IS web interface in the beginning of 2019. This is the end of a long project with close collaboration between the developers and the users. The new web interface is modern, user-friendly and flexible and is an important step towards a more harmonized view of all Copernicus Emergency Management Service (CEMS) components. The new portal is compliant to the Copernicus services guidelines.

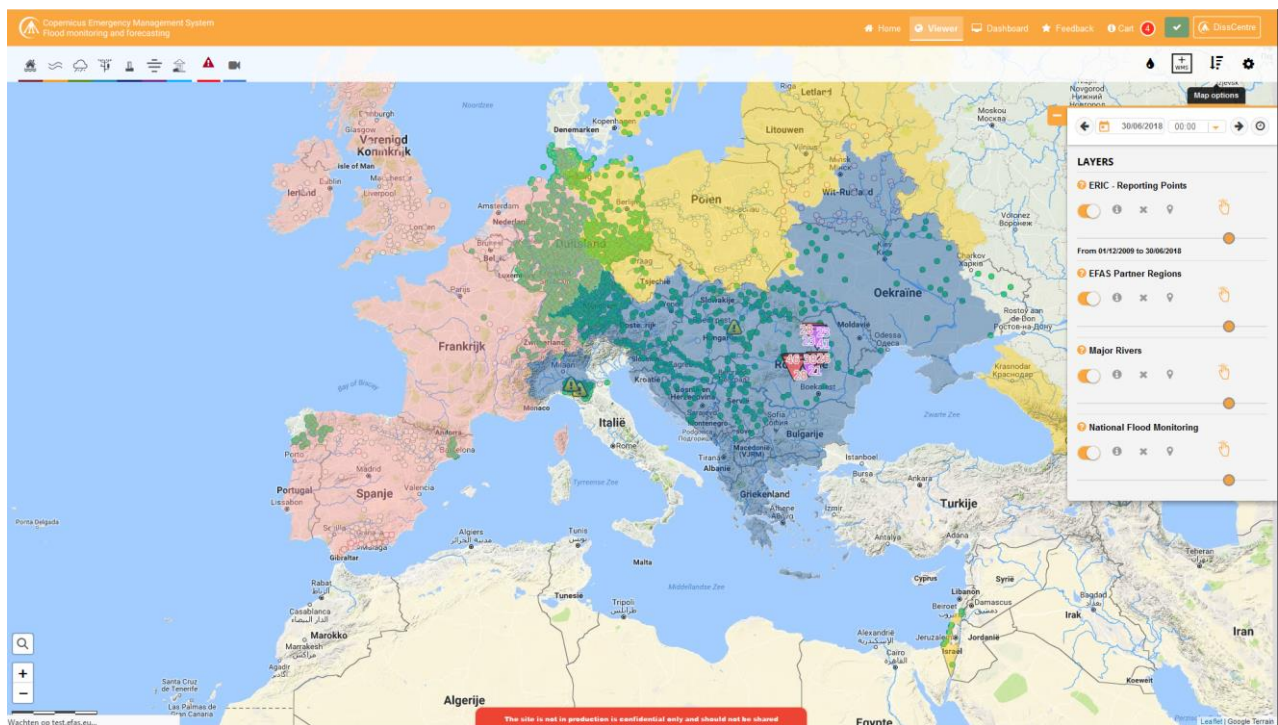


Figure 3. Screenshot of the new map viewer of the interface.

In the new web interface sections have been reorganized for easier navigation. Access to data is advanced with more interactive and queryable maps. Data is also accessible to external users with limited functionality. The interface has a faster response than the former one. The general look and feel of the web site have been revamped. The viewer of the new web interface is optimized for use on mobile devices such as tablets and smartphones.

Users can access the new interface as anonymous viewer or as an authorized user. Only authorized users can access all functionality. The functionalities available depend on your user profile: forecaster, registered user (i.e. EFAS partner with signed CoA) or common user.

In the new map viewer layers can be selected through icons in the tool bar on the top of the screen. Layers can be added intuitively to the map. When a layer is added to the map, a floating panel appears in the map, in which you can manage the selected layers. From the panel, it is possible to show, hide or rearrange the layers. Active flood notifications can be shown by clicking on the flood notifications icon. Custom Web Map services can be easily added to the interface.

One of the most interesting new features of the new web interface is the dashboard. The dashboard is your personal workspace where you can store and load pre-defined displays to show the EFAS information the way you prefer. Multiple maps and graphs can be sized and positioned within the dashboard space. You can freely move between map viewer and dashboard by clicking on the relevant buttons.

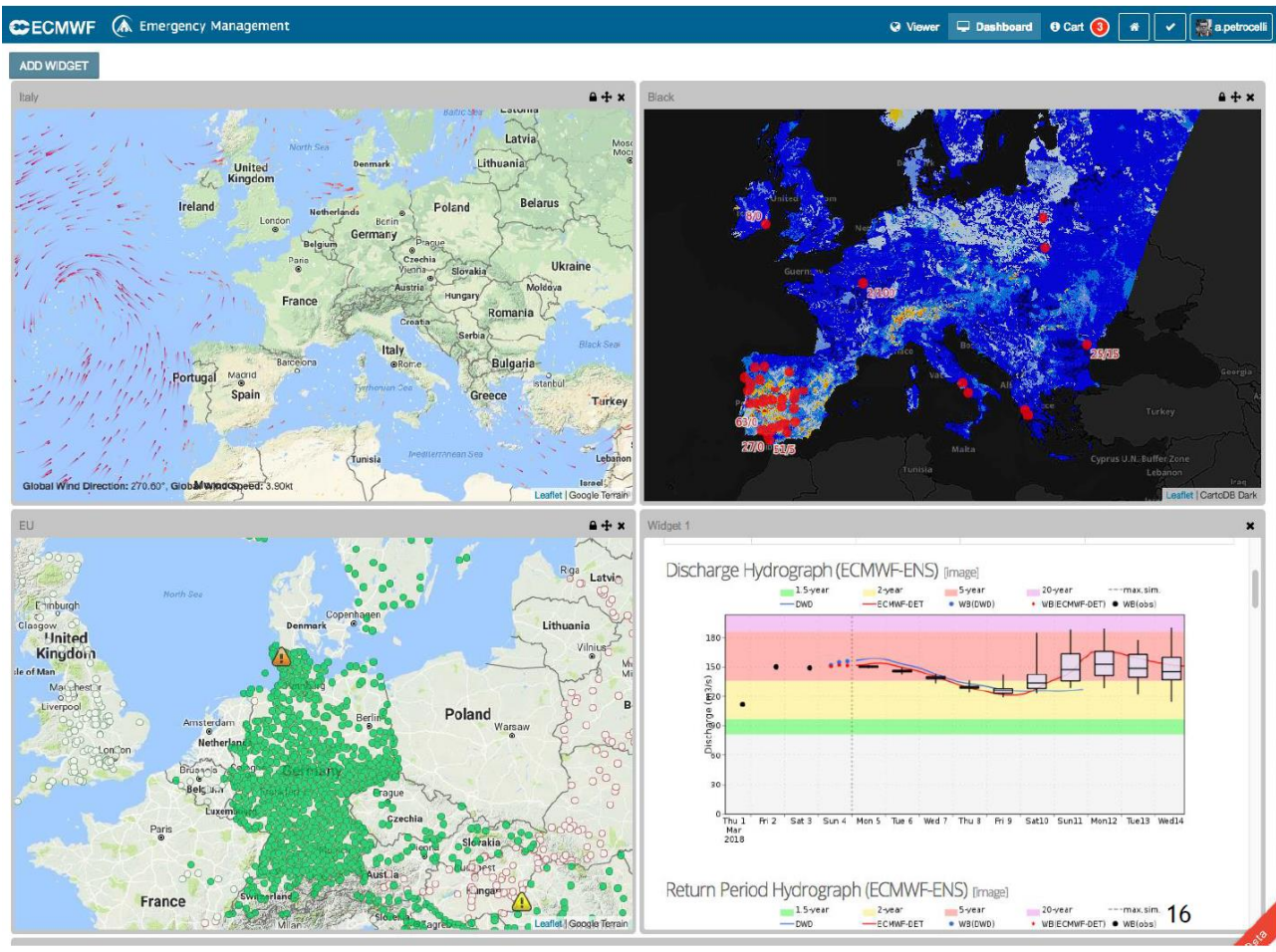


Figure 4. Screenshot of the new dashboard functionality.

A new selection icon in the tool bar of the map viewer is the Feedback icon. By clicking this button users are redirected to a page on which they can provide feedback on received Formal Flood Notifications as well as report missed flood events. Partners will still get an email with a request to fill out the feedback form for received Formal Flood Notifications.

In addition to the new look of the Map Viewer (former called "Forecasting") there is many new resources and functionalities available. For example, resources such as webinars and tutorials are available on the new webpage, online availability of summary maps and better tools to download EFAS data. These new features will be presented in more details on the new platform once it is released. To visit the test version, please go to <http://new-efas-test.efas.eu/>

Flash floods in Mallorca, October 2018

by Richard Davies (*FloodList*).

Eastern parts of Mallorca in Spain's Balearic Islands, were hit by severe flash flooding on 09 October this year. Some of the worst affected were around Sant Llorenç des Cardassar, where flooding cut road access to and from the town. Other affected areas include S'Il·lot, Artà, Son Servera, Colònia de Sant Pere, Felanitx and Alcúdia.

Schools were suspended and several roads were closed. Around 200 people were evacuated from their homes and stayed in temporary accommodation, including a local sports centre.



Figure 5. Clearing flood damage in Mallorca, Spain, October 2018 – Credit: 112 Illes Balears

The government of the Balearic Islands initially said that 9 people had died in the floods, with others still missing. During the following days, a team of over 300 emergency and rescue personnel continued to search for those still missing. By 14 October the death toll stood at 12, with fatalities reported in Artà (4), S'Il·lot (3), Son Carrió (2) and Sant Llorenç (3). On 17 October, 112 Illes Balears said they had located the final missing person, bringing the death toll to 13.

Numerous houses and roads were left severely damaged. Authorities said they removed 4.200 tons of rubble and debris, including damaged furniture, during the days after the flooding. As many as 324 vehicles were damaged by the floods.

According to Spain's Meteorological Agency (AEMET) 232.8 mm of rain fell in 24 hours on 09 October in Colònia de Sant Pere. Artà recorded 157.4 mm and Son Servera 97.2 mm during the same period. Meanwhile in the west of the island, Lluçmajor recorded a mere 25.2 mm of rain.

Characteristics of the Russian Flood Forecasting System

by EFAS DISS and HYDRO Centers

Hydrometeorological Research Centre of Russia has been an EFAS partner since 2017 and wanted to have more information about EFAS, so they requested for a workshop. (If you would like to do the same, please, use info@efas.eu).

The training took place in Moscow at the Hydrometcentre of Russia on 11-12 October 2018. It was held by Elinor Andersson and Michaela Mikuličková from the EFAS Dissemination Centre (DISS) and Mercedes García Padilla, Rafael J. García Sánchez and Clint García Alibrandi from the Hydrological Data Collection Centre (HDCC).

The objective of the mission was to:

- Introduce EFAS and train the participants in how to use EFAS-IS
- Show how to provide feedback for received notifications
- Instruct how to provide hydrological station data

This was the first mission where two EFAS Operational centres have visited a partner at the same time. Participants were hydrological forecasters, people working with hydrological data and researchers. Some of them were from the Moscow office and some of them were from other regional offices in Russia. Some of them had got experience with EFAS usage, for some it was their first meeting with the system.



Figure 6. Participants of the training.

The presentations were held in English with help from English to Russian translators for some of the sessions. After a joint introduction of the EFAS (EFAS general information, information about LISFLOOD model, probabilistic forecasting, meteorological inputs, EFAS thresholds, EFAS notifications, and flash-floods) participants were divided in two smaller groups. One of the sessions was dedicated to a run through of the operations carried out by the HDCC team and clarifications on issues concerning the establishment of data transfer protocols between the hosts of the meeting and EFAS. The second one was a “hands-on session” which described how to use EFAS-IS and what the different layers meant. The participants were encouraged to try using it in their own laptops.

EFAS DISS talked about [new EFAS products](#) (Rapid Impact Assessment and Rapid Flood Mapping) and the second day was dedicated to instructions on [how to provide feedback](#) and to a [case study of the Russian spring flood of 2018](#).

Because a large part of Russia is outside the EFAS domain, a part of the workshop was concerned with information about GloFAS: what it was, how to register and log in and how to use the forecast viewer.

The end of both days was devoted to questions from the participants. DISS answered general questions and Hydrological Data Collection centre could give answers to the more technical questions. Questions that couldn't be answered at the place were forwarded to the Computational Centre and to JRC.

The participants were satisfied with the workshop and expressed their gratitude for the training.

Acknowledgements

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

- DG GROW - 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 search and rescue in Mallorca, Spain, October 2018 - Credit: 112 Illes Balears

Appendix - figures

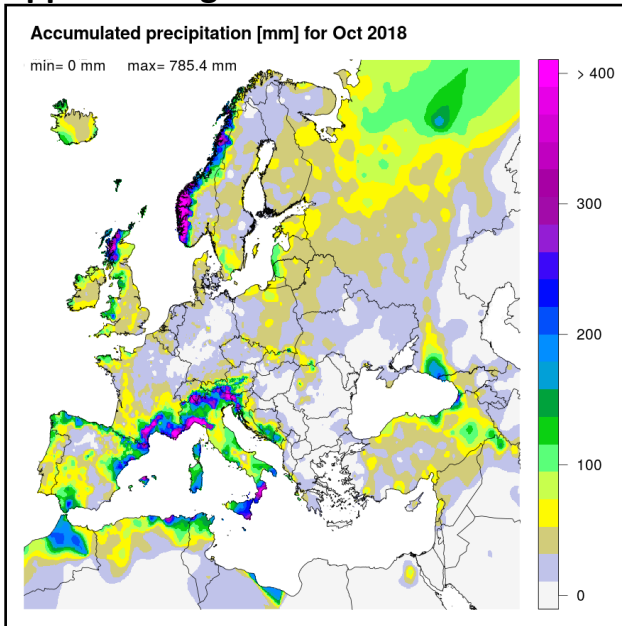


Figure 7. Accumulated precipitation [mm] for October 2018.

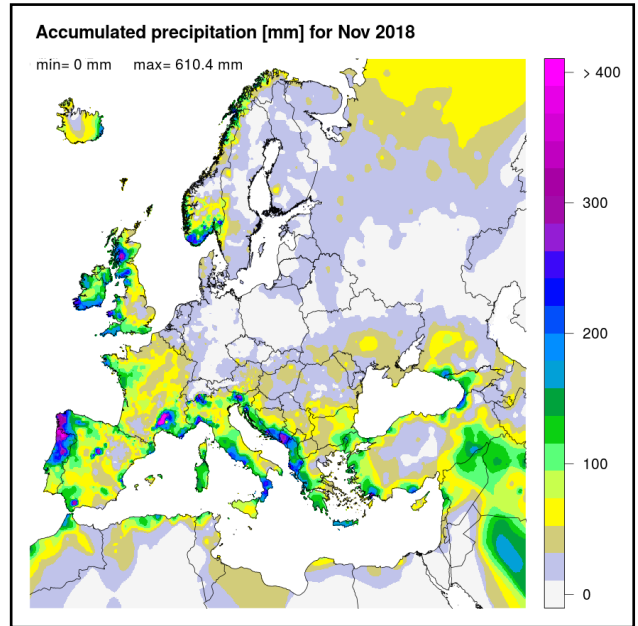


Figure 9. Accumulated precipitation [mm] for Nov. 2018.

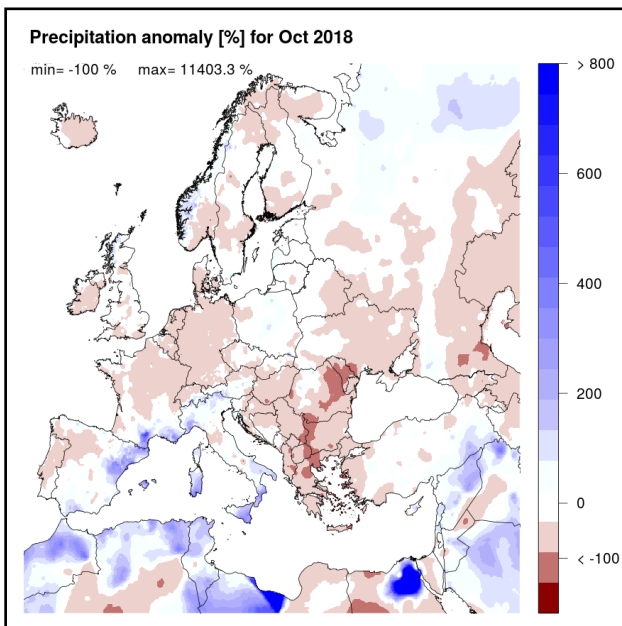


Figure 8. Precipitation anomaly [%] for October 2018, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

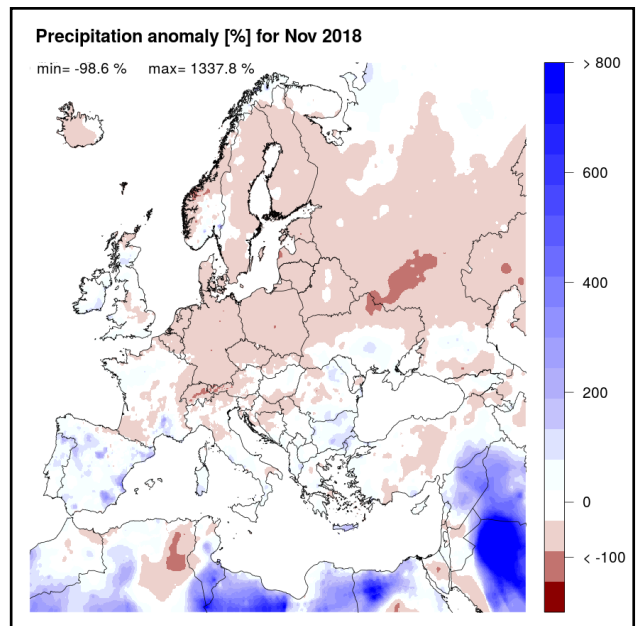


Figure 10. Precipitation anomaly [%] for November 2018, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

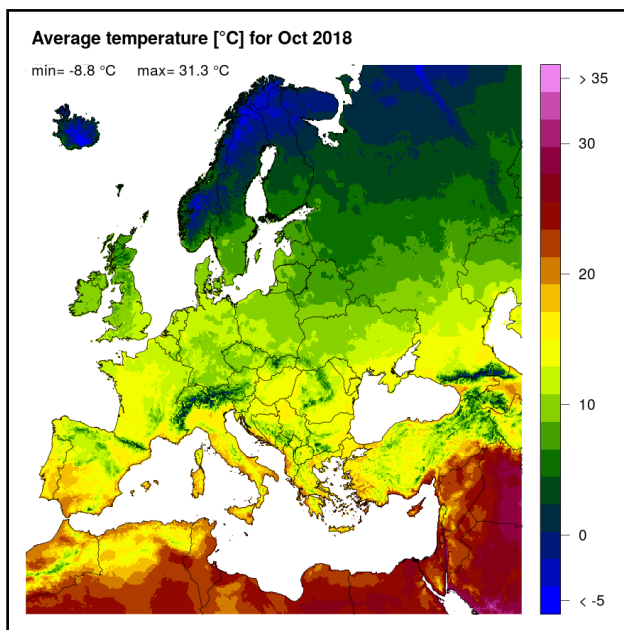


Figure 11. Mean temperature [°C] for October 2018.

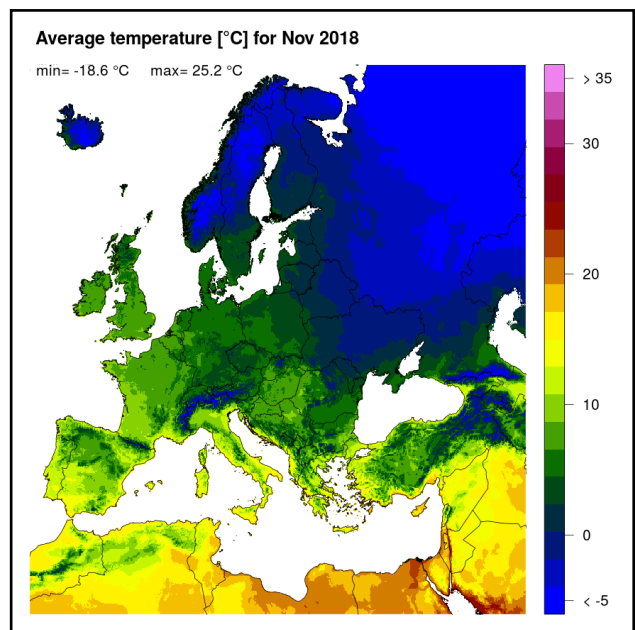


Figure 13. Mean temperature [°C] for November 2018.

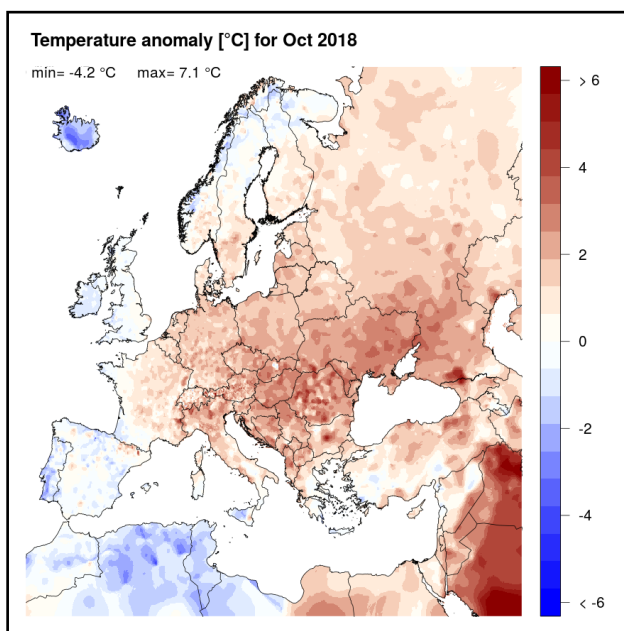


Figure 12. Temperature anomaly [°C] for October 2018, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

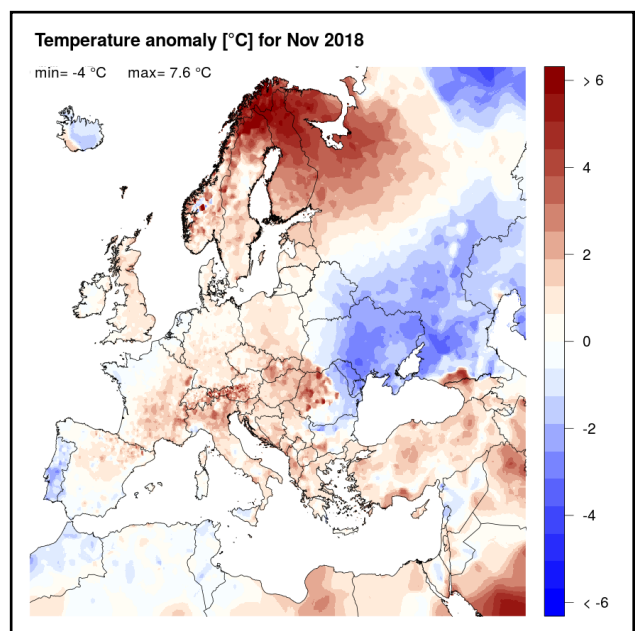


Figure 14. Temperature anomaly [°C] for November 2018, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

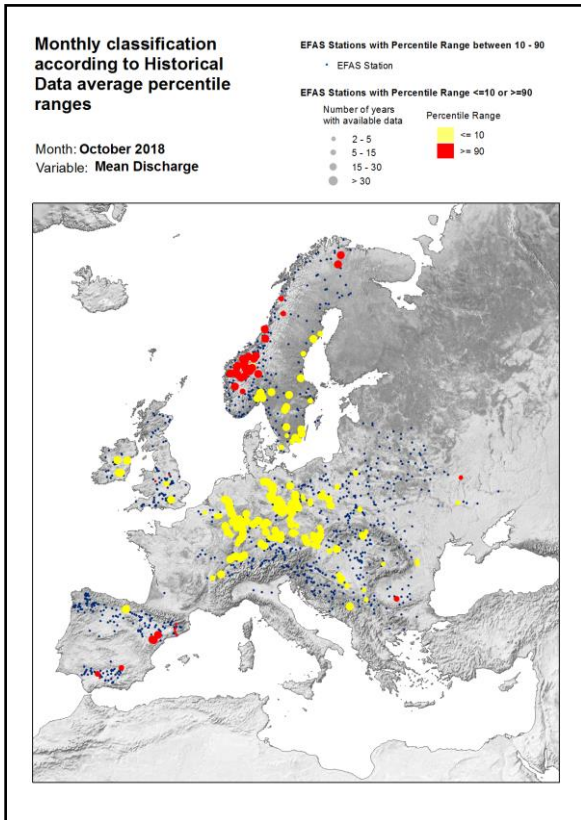


Figure 15. Monthly discharge anomalies October 2018.

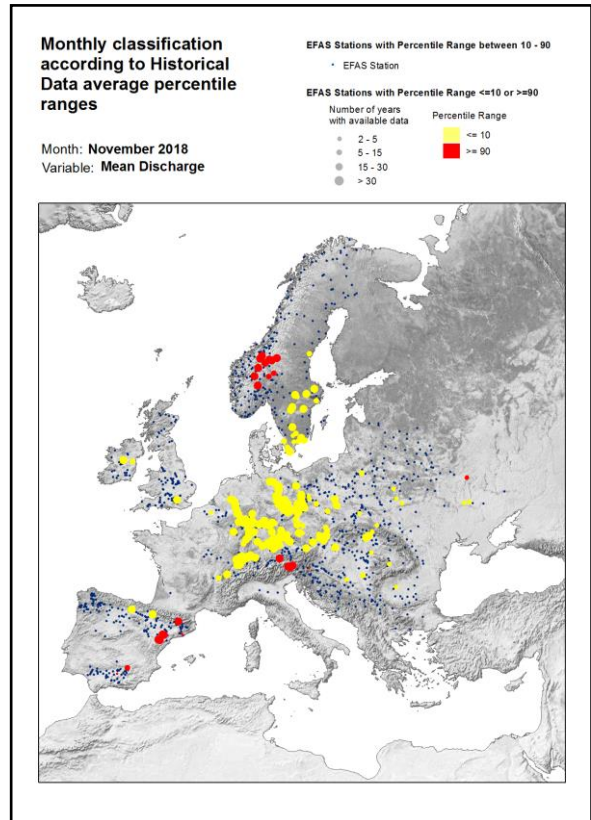


Figure 17. Monthly discharge anomalies November 2018.

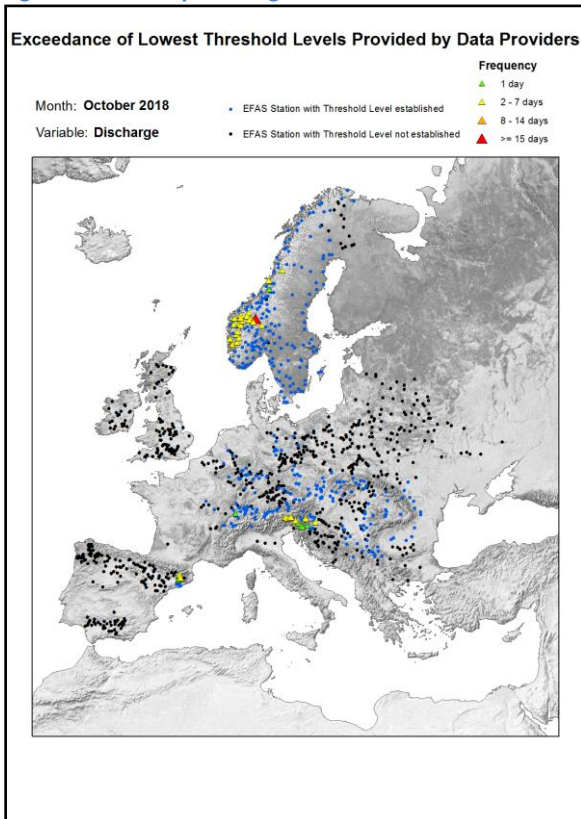


Figure 16. Lowest alert level exceedance for October 2018.

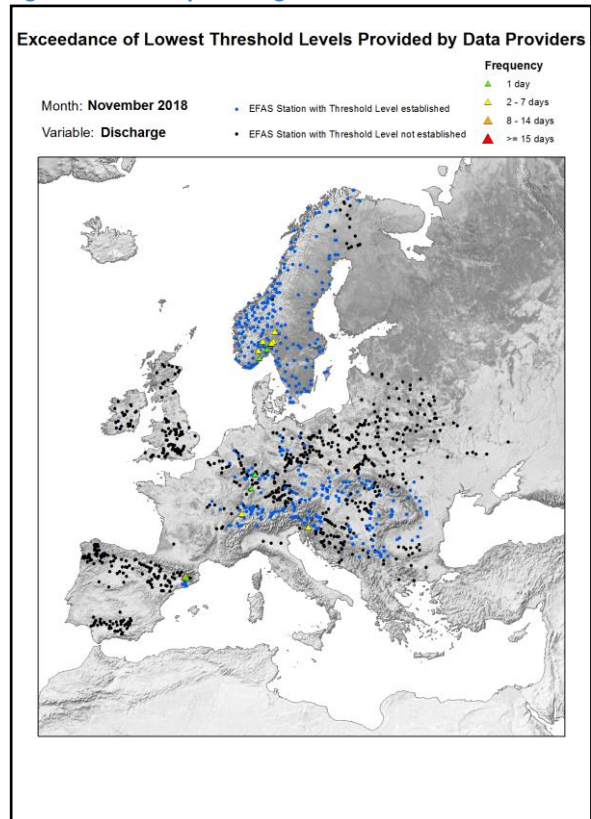


Figure 18. Lowest alert level exceedance for November 2018.

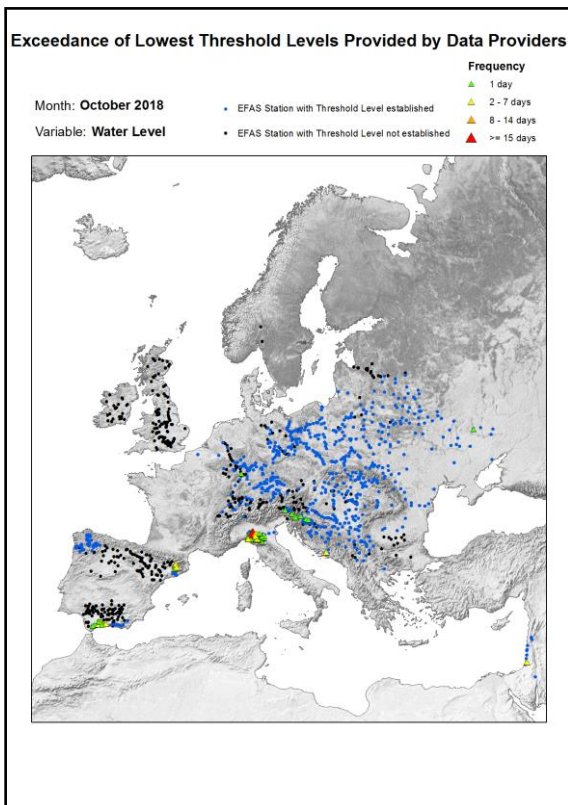


Figure 19. Lowest threshold exceedance for October 2018.

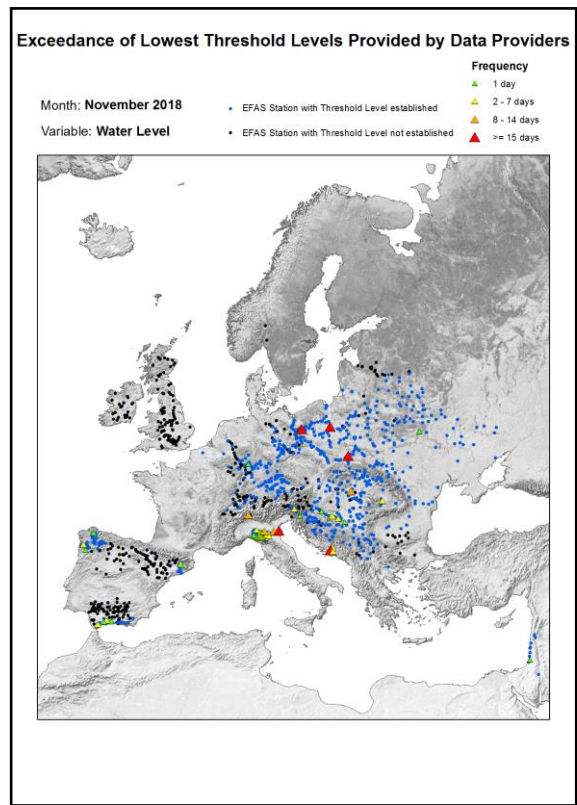


Figure 20. Lowest threshold exceedance for November 2018.

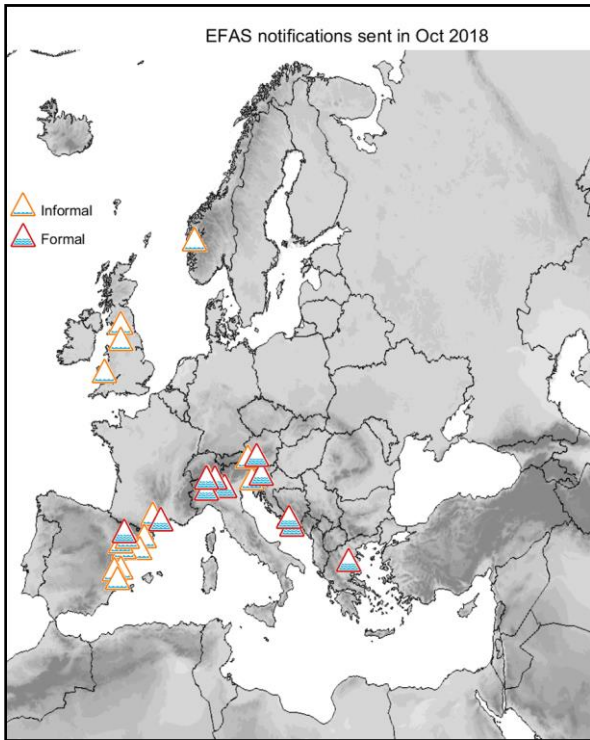


Figure 21. EFAS flood notifications sent for October 2018.

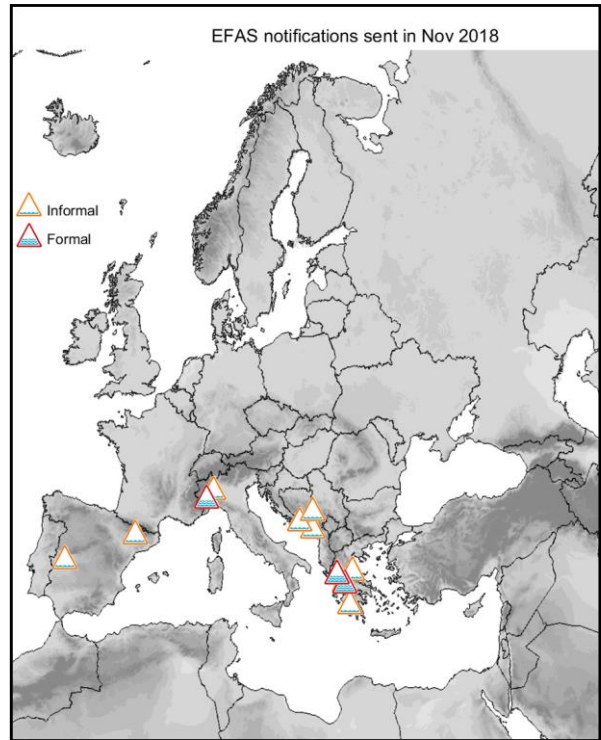


Figure 23. EFAS flood notifications sent for November 2018.

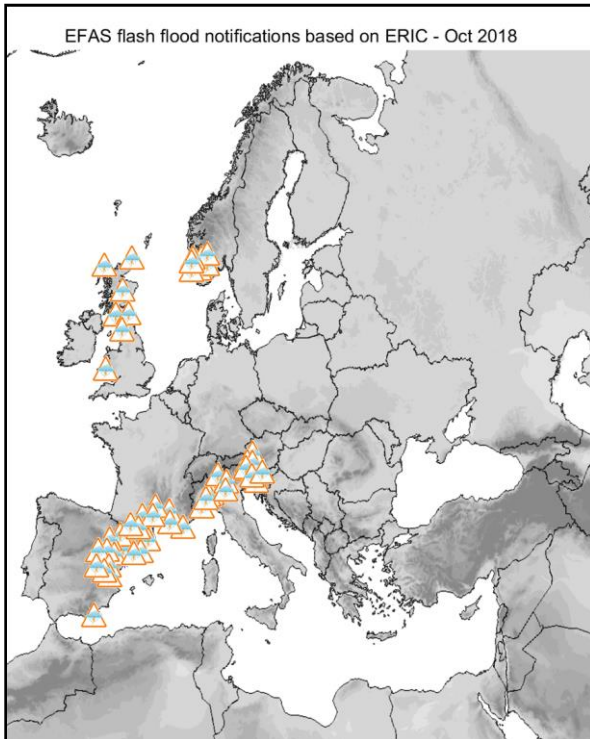


Figure 22. Flash flood notifications sent for October 2018.

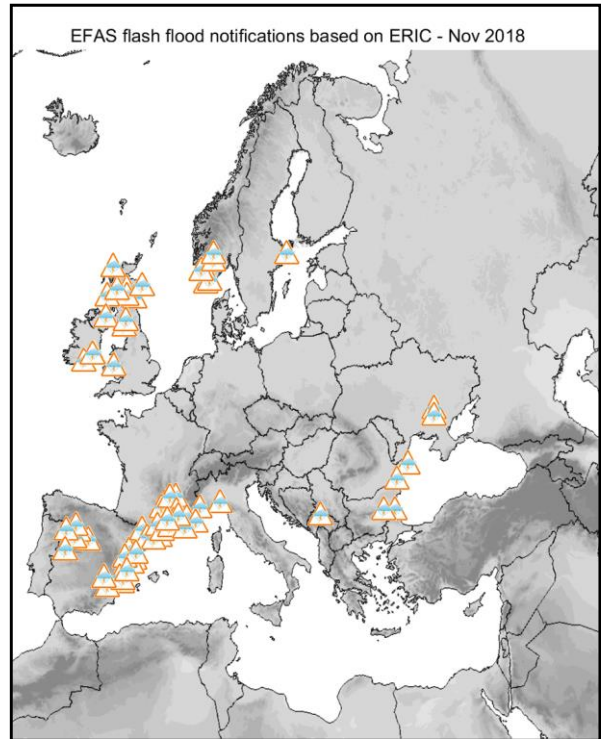


Figure 24. Flash flood notifications sent for November 2018.

Appendix - tables

Table 1. EFAS flood notifications sent in October - November.

| Type | Forecast date | Issue date | Lead time | River/Region | Country |
|----------|------------------|------------|-----------|---------------------|------------------|
| Informal | 07/10/2018 00UTC | 07/10/2018 | 3 | Coastal zone | France |
| Informal | 07/10/2018 12UTC | 08/10/2018 | 2 | Ter | Spain |
| Informal | 09/10/2018 00UTC | 09/10/2018 | 1 | Cardoner | Spain |
| Informal | 11/10/2018 00UTC | 11/10/2018 | 2 | Tywi | United Kingdom |
| Informal | 11/10/2018 00UTC | 11/10/2018 | 3 | Eden | United Kingdom |
| Informal | 11/10/2018 12UTC | 12/10/2018 | 1 | Ribble | United Kingdom |
| Informal | 13/10/2018 00UTC | 13/10/2018 | 0 | Vosso | Norway |
| Informal | 14/10/2018 12UTC | 15/10/2018 | 0 | Llobregat | Spain |
| Informal | 14/10/2018 12UTC | 15/10/2018 | 0 | Cinca | Spain |
| Informal | 14/10/2018 12UTC | 15/10/2018 | 0 | Segre | Spain |
| Informal | 16/10/2018 12UTC | 17/10/2018 | 2 | Millars | Spain |
| Informal | 16/10/2018 12UTC | 17/10/2018 | 3 | Matarana | Spain |
| Informal | 17/10/2018 00UTC | 17/10/2018 | 2 | Coastal zone | Spain |
| Informal | 18/10/2018 00UTC | 18/10/2018 | 1 | Jucar | Spain |
| Formal | 20/10/2018 00UTC | 20/10/2018 | 4 | Pineios | Greece |
| Formal | 24/10/2018 12UTC | 25/10/2018 | 3 | Mincio | Italy |
| Formal | 24/10/2018 12UTC | 25/10/2018 | 5 | Neretva | Bosnia and Her- |
| Formal | 24/10/2018 12UTC | 25/10/2018 | 5 | Coastal zone | Bosnia and Her- |
| Formal | 25/10/2018 00UTC | 25/10/2018 | 3 | Adda | Italy |
| Formal | 25/10/2018 12UTC | 26/10/2018 | 4 | Mur | Austria |
| Formal | 26/10/2018 00UTC | 26/10/2018 | 2 | Ticino | Italy |
| Informal | 26/10/2018 00UTC | 26/10/2018 | 2 | Po | Italy |
| Formal | 26/10/2018 00UTC | 26/10/2018 | 2 | Po | Italy |
| Formal | 26/10/2018 00UTC | 26/10/2018 | 3 | Sava | Slovenia |
| Informal | 26/10/2018 12UTC | 27/10/2018 | 2 | Soca | Italy |
| Informal | 26/10/2018 12UTC | 27/10/2018 | 2 | Salzach | Austria |
| Formal | 29/10/2018 00UTC | 29/10/2018 | 2 | Segre | Spain |
| Formal | 29/10/2018 00UTC | 29/10/2018 | 2 | Cinca | Spain |
| Formal | 03/11/2018 00UTC | 03/11/2018 | 3 | Po | Italy |
| Informal | 03/11/2018 12UTC | 04/11/2018 | 2 | Noguera Ribagorcana | Spain |
| Informal | 05/11/2018 00UTC | 05/11/2018 | 2 | Sesia | Italy |
| Informal | 09/11/2018 12UTC | 10/11/2018 | 2 | Tietar | Spain |
| Informal | 17/11/2018 12UTC | 18/11/2018 | 1 | Pineios | Greece |
| Informal | 19/11/2018 12UTC | 20/11/2018 | 1 | Drini | Republic of Mon- |
| Informal | 19/11/2018 12UTC | 20/11/2018 | 4 | Noguera Ribagorcana | Spain |
| Informal | 20/11/2018 00UTC | 20/11/2018 | 1 | Drina | Bosnia and Her- |
| Formal | 22/11/2018 12UTC | 23/11/2018 | 3 | Arachthos | Greece |
| Formal | 23/11/2018 00UTC | 23/11/2018 | 3 | Alfeios | Greece |
| Formal | 23/11/2018 12UTC | 24/11/2018 | 3 | Acheloos | Greece |
| Informal | 24/11/2018 12UTC | 25/11/2018 | 2 | Alfeios | Greece |
| Informal | 26/11/2018 00UTC | 26/11/2018 | 1 | Coastal zone | Bosnia and Her- |
| Informal | 27/11/2018 00UTC | 27/11/2018 | 1 | Acheloos | Greece |

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

Table 2. EFAS flash flood notifications sent in October - November.

| Type | Forecast date | Issue date | Lead time | Region | Country |
|-------------|------------------|------------|-----------|------------------------------|----------------|
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 72 | South West Wales | United Kingdom |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 72 | Dumfries & Galloway | United Kingdom |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 66 | Perth & Kinross and Stirling | United Kingdom |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 72 | Scotland | United Kingdom |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 66 | Scotland | United Kingdom |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 84 | Hordaland | Norway |
| Flash flood | 10/10/2018 12UTC | 11/10/2018 | 78 | Rogaland | Norway |
| Flash flood | 11/10/2018 12UTC | 12/10/2018 | 48 | East Cumbria | United Kingdom |
| Flash flood | 11/10/2018 12UTC | 12/10/2018 | 72 | Orkney Islands | United Kingdom |
| Flash flood | 11/10/2018 12UTC | 12/10/2018 | 48 | South Lanarkshire | United Kingdom |
| Flash flood | 12/10/2018 12UTC | 13/10/2018 | 30 | Rogaland | Norway |
| Flash flood | 13/10/2018 00UTC | 13/10/2018 | 54 | Huesca | Spain |
| Flash flood | 13/10/2018 00UTC | 13/10/2018 | 60 | Zaragoza | Spain |
| Flash flood | 13/10/2018 00UTC | 13/10/2018 | 60 | Zaragoza | Spain |
| Flash flood | 13/10/2018 00UTC | 13/10/2018 | 54 | Tarragona | Spain |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 54 | Cataluna | Spain |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 54 | Girona | Spain |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 36 | Terula | Spain |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 54 | Lleida | Spain |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 60 | Herault | France |
| Flash flood | 13/10/2018 12UTC | 14/10/2018 | 60 | Pyrenees-Orientale | France |
| Flash flood | 14/10/2018 12UTC | 15/10/2018 | 24 | Ariege | France |
| Flash flood | 14/10/2018 12UTC | 15/10/2018 | 18 | Aude | France |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 54 | Tarragona | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Castellon | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Valencia | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Guadalajara | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Terual | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Zaragoza | Spain |
| Flash flood | 16/10/2018 12UTC | 17/10/2018 | 72 | Zaragoza | Spain |
| Flash flood | 17/10/2018 00UTC | 17/10/2018 | 66 | Valencia | Spain |
| Flash flood | 18/10/2018 00UTC | 18/10/2018 | 72 | Andalucia | Spain |
| Flash flood | 18/10/2018 12UTC | 19/10/2018 | 30 | Albacete | Spain |
| Flash flood | 18/10/2018 12UTC | 19/10/2018 | 30 | Albacete | Spain |
| Flash flood | 18/10/2018 12UTC | 19/10/2018 | 30 | Cuenca | Spain |
| Flash flood | 19/10/2018 12UTC | 20/10/2018 | 96 | Aust-Agder | Norway |
| Flash flood | 19/10/2018 12UTC | 20/10/2018 | 96 | Rogaland | Norway |
| Flash flood | 19/10/2018 12UTC | 20/10/2018 | 96 | Telemark | Norway |
| Flash flood | 20/10/2018 00UTC | 20/10/2018 | 78 | Orkney Islands | United Kingdom |
| Flash flood | 20/10/2018 12UTC | 21/10/2018 | 66 | Aust-Agder | Norway |
| Flash flood | 20/10/2018 12UTC | 21/10/2018 | 72 | Rogaland | Norway |
| Flash flood | 20/10/2018 12UTC | 21/10/2018 | 72 | Vest-Agder | Norway |
| Flash flood | 21/10/2018 00UTC | 21/10/2018 | 54 | Telemark | Norway |
| Flash flood | 22/10/2018 00UTC | 22/10/2018 | 72 | Liezen | Austria |
| Flash flood | 25/10/2018 12UTC | 26/10/2018 | 78 | Lungau | Austria |
| Flash flood | 25/10/2018 12UTC | 26/10/2018 | 78 | Oberkarnten | Austria |
| Flash flood | 25/10/2018 12UTC | 26/10/2018 | 78 | Pinzgau-Pongau | Austria |
| Flash flood | 26/10/2018 00UTC | 26/10/2018 | 102 | Osttirol | Austria |

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|-------------|------------------|------------|----|------------------------------|----------------|
| Flash flood | 26/10/2018 00UTC | 26/10/2018 | 66 | Lungau | Austria |
| Flash flood | 26/10/2018 00UTC | 26/10/2018 | 66 | Oberkarnten | Austria |
| Flash flood | 26/10/2018 00UTC | 26/10/2018 | 66 | Pinzgau-Pongau | Austria |
| Flash flood | 26/10/2018 12UTC | 27/10/2018 | 48 | Verona | Italy |
| Flash flood | 26/10/2018 12UTC | 27/10/2018 | 84 | Klagenfurt-Villach | Austria |
| Flash flood | 27/10/2018 00UTC | 27/10/2018 | 72 | Westliche Obersteiermark | Austria |
| Flash flood | 27/10/2018 12UTC | 28/10/2018 | 60 | Gorenjska | Slovenia |
| Flash flood | 28/10/2018 00UTC | 28/10/2018 | 42 | Pavia | Italy |
| Flash flood | 28/10/2018 00UTC | 28/10/2018 | 42 | Verona | Italy |
| Flash flood | 28/10/2018 12UTC | 29/10/2018 | 36 | Alessandria | Italy |
| Flash flood | 28/10/2018 12UTC | 29/10/2018 | 36 | Oberkarnten | Austria |
| Flash flood | 28/10/2018 12UTC | 29/10/2018 | 42 | Osttirol | Austria |
| Flash flood | 28/10/2018 12UTC | 29/10/2018 | 78 | Cataluna | Spain |
| Flash flood | 28/10/2018 12UTC | 29/10/2018 | 78 | Tarragona | Spain |
| Flash flood | 29/10/2018 00UTC | 29/10/2018 | 18 | Brescia | Italy |
| Flash flood | 29/10/2018 12UTC | 30/10/2018 | 48 | Herault | France |
| Flash flood | 29/10/2018 12UTC | 30/10/2018 | 48 | Teruel | Spain |
| Flash flood | 30/10/2018 00UTC | 30/10/2018 | 42 | Tarragona | Spain |
| Flash flood | 30/10/2018 00UTC | 30/10/2018 | 42 | Tarragona | Spain |
| Flash flood | 30/10/2018 12UTC | 31/10/2018 | 36 | Alessandria | Italy |
| Flash flood | 30/10/2018 12UTC | 31/10/2018 | 42 | Cuneo | Italy |
| Flash flood | 30/10/2018 12UTC | 31/10/2018 | 36 | Gard | France |
| Flash flood | 30/10/2018 12UTC | 31/10/2018 | 24 | Girona | Spain |
| Flash flood | 31/10/2018 00UTC | 31/10/2018 | 90 | Eilean Siar | United Kingdom |
| Flash flood | 31/10/2018 00UTC | 31/10/2018 | 90 | Orkney Islands | United Kingdom |
| Flash flood | 31/10/2018 00UTC | 31/10/2018 | 24 | Bouches-du-Rhone | France |
| Flash flood | 31/10/2018 00UTC | 31/10/2018 | 24 | Var | France |
| Flash flood | 31/10/2018 00UTC | 31/10/2018 | 24 | Teruel | Spain |
| Flash flood | 01/11/2018 00UTC | 01/11/2018 | 66 | Eilean Siar | United Kingdom |
| Flash flood | 01/11/2018 12UTC | 02/11/2018 | 84 | Cuneo | Italy |
| Flash flood | 03/11/2018 12UTC | 04/11/2018 | 66 | Pyrenees-Orientale | France |
| Flash flood | 03/11/2018 12UTC | 04/11/2018 | 66 | Girona | Spain |
| Flash flood | 05/11/2018 00UTC | 05/11/2018 | 36 | Bouches-du-Rhone | France |
| Flash flood | 05/11/2018 00UTC | 05/11/2018 | 24 | Girona | Spain |
| Flash flood | 05/11/2018 12UTC | 06/11/2018 | 24 | Var | France |
| Flash flood | 06/11/2018 12UTC | 07/11/2018 | 72 | Bouches-du-Rhone | France |
| Flash flood | 06/11/2018 12UTC | 07/11/2018 | 72 | Gard | France |
| Flash flood | 06/11/2018 12UTC | 07/11/2018 | 30 | Lochaber, Skye & Lochalsh, | United Kingdom |
| Flash flood | 07/11/2018 00UTC | 07/11/2018 | 12 | North of Northern Ireland | United Kingdom |
| Flash flood | 07/11/2018 00UTC | 07/11/2018 | 66 | South West Wales | United Kingdom |
| Flash flood | 07/11/2018 12UTC | 08/11/2018 | 48 | Ardeche | France |
| Flash flood | 07/11/2018 12UTC | 08/11/2018 | 60 | Inverness & Nairn and | United Kingdom |
| Flash flood | 07/11/2018 12UTC | 08/11/2018 | 60 | Perth & Kinross and Stirlin | United Kingdom |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 54 | Herault | France |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 36 | Provence-Alpes-Cote | France |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 30 | Girona | Spain |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 36 | Aberdeen City and Aber- | United Kingdom |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 48 | Perth & Kinross and Stirling | United Kingdom |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 84 | Aust-Agder | Norway |
| Flash flood | 08/11/2018 00UTC | 08/11/2018 | 84 | Telemark | Norway |
| Flash flood | 08/11/2018 12UTC | 09/11/2018 | 24 | Languedoc-Roussillon | France |

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|-------------|------------------|------------|-----|----------------------------|------------------|
| Flash flood | 08/11/2018 12UTC | 09/11/2018 | 30 | Lozere | France |
| Flash flood | 08/11/2018 12UTC | 09/11/2018 | 90 | Salamanca | Spain |
| Flash flood | 08/11/2018 12UTC | 09/11/2018 | 90 | Caceres | Spain |
| Flash flood | 08/11/2018 12UTC | 09/11/2018 | 78 | Vest-Agder | Norway |
| Flash flood | 09/11/2018 00UTC | 09/11/2018 | 24 | South West Wales | United Kingdom |
| Flash flood | 10/11/2018 00UTC | 10/11/2018 | 54 | Salamanca | Spain |
| Flash flood | 10/11/2018 00UTC | 10/11/2018 | 54 | Valladolid | Spain |
| Flash flood | 10/11/2018 00UTC | 10/11/2018 | 54 | Zamora | Spain |
| Flash flood | 10/11/2018 12UTC | 11/11/2018 | 102 | Dumfries & Galloway | United Kingdom |
| Flash flood | 10/11/2018 12UTC | 11/11/2018 | 102 | Lochaber, Skye & Lochalsh, | United Kingdom |
| Flash flood | 10/11/2018 12UTC | 11/11/2018 | 102 | Scotland | United Kingdom |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Turia | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Comunidad Valenciana | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Valencia | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Tarragona | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Teruel | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 114 | Zaragoza | Spain |
| Flash flood | 11/11/2018 12UTC | 12/11/2018 | 108 | Cataluna | Spain |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 102 | Barcelona | Spain |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 102 | Cataluna | Spain |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 114 | Girona | Spain |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 102 | Aude | France |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 102 | Languedoc-Roussillon | France |
| Flash flood | 14/11/2018 12UTC | 15/11/2018 | 108 | Pyrenees-Orientale | France |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 72 | Albacete | Spain |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 66 | Comunidad Valenciana | Spain |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 66 | Valencia | Spain |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 66 | Albacete | Spain |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 66 | Tulcea | Romania |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 72 | Constanta | Romania |
| Flash flood | 17/11/2018 00UTC | 17/11/2018 | 54 | Burgas | Bulgaria |
| Flash flood | 17/11/2018 12UTC | 18/11/2018 | 42 | Tarragona | Spain |
| Flash flood | 17/11/2018 12UTC | 18/11/2018 | 42 | Castellon | Spain |
| Flash flood | 19/11/2018 12UTC | 20/11/2018 | 36 | Zlatiborski | Republic of Ser- |
| Flash flood | 20/11/2018 12UTC | 21/11/2018 | 24 | Var | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 84 | Piacenza | Italy |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 78 | Lozere | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 78 | Lozere | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 72 | Herault | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 78 | Gard | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 78 | Ardeche | France |
| Flash flood | 21/11/2018 00UTC | 21/11/2018 | 78 | Ardeche | France |
| Flash flood | 22/11/2018 00UTC | 22/11/2018 | 60 | Piacenza | Italy |
| Flash flood | 22/11/2018 00UTC | 22/11/2018 | 36 | Provence-Alpes-Cote | France |
| Flash flood | 22/11/2018 12UTC | 23/11/2018 | 36 | Bouches-du-Rhone | France |
| Flash flood | 22/11/2018 12UTC | 23/11/2018 | 36 | South-west | Ireland |
| Flash flood | 24/11/2018 12UTC | 25/11/2018 | 72 | Dnipropetrovs'k | Ukraine |
| Flash flood | 25/11/2018 00UTC | 25/11/2018 | 60 | Kherson | Ukraine |
| Flash flood | 25/11/2018 12UTC | 26/11/2018 | 48 | South-east | Ireland |
| Flash flood | 25/11/2018 12UTC | 26/11/2018 | 48 | South-east | Ireland |
| Flash flood | 27/11/2018 00UTC | 27/11/2018 | 24 | Sliven | Bulgaria |

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|-------------|------------------|------------|----|------------------|----------------|
| Flash flood | 27/11/2018 12UTC | 28/11/2018 | 54 | Vest-Agder | Norway |
| Flash flood | 27/11/2018 12UTC | 28/11/2018 | 54 | Vest-Agder | Norway |
| Flash flood | 28/11/2018 00UTC | 28/11/2018 | 30 | South West Wales | United Kingdom |
| Flash flood | 29/11/2018 00UTC | 29/11/2018 | 24 | Segovia | Spain |
| Flash flood | 29/11/2018 12UTC | 30/11/2018 | 42 | Stockholms län | Sweden |

* 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 consortium (REDIAM and 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.

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