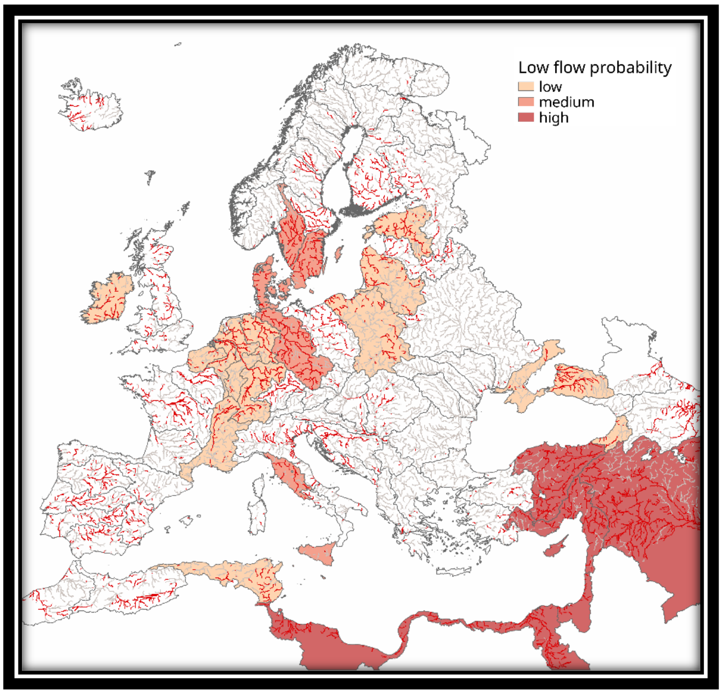
European Flood Awareness System

EFAS *Bulletin*

June – July 2018

Issue 2018(4)



NEWS

New features

The new EFAS website is currently available for testing, so please make sure that you have a look and provide feedback to make sure that the new website lives up to your expectations. You will find the new website here: http://new-efas-test.ecmwf.int

To log in and test the functionalities please use:

User: demouser10
Password: efasdemo

The test session will be open until **15 September**, and the final release of the new website is later this year.

New partner

We gladly welcome The National Environmental Agency of Georgia as a new EFAS partner.

RESULTS

Summary of EFAS Flood and Flash Flood Notifications

The 12 formal and 16 informal EFAS flood notifications issued in June-July 2018 are summarised in Table 1. The locations of all notifications are shown in Figure 29 and Figure 31 in the appendix.

6 flash flood notifications were issued from June to July 2018, summarised in Table 1. The locations are shown in Figure 30 and Figure 32 in the appendix.

Meteorological situation

by EFAS Meteorological Data Collection Centre

June 2018

In the beginning of June strong low-pressure systems influenced the weather conditions in many parts of Europe and some heavy thunderstorms hit southern Germany, Spain, France and Bulgaria. Extreme rainfall caused severe flooding in Valencia, Albacete and Murcia, Spain, on the 2-3 June. The highest precipitation sum was measured in Albacete with up to 180 mm within 24 hours. During this event 20 people had to be rescued and around 100 buildings were damaged. During the night to the 4 June a storm hit Brittany and caused flooding in the departments of Finistère, Côtes-d'Armor and Ille-et-Vilaine. Furthermore Varna, Bulgaria, was also affected by flooding a day later. In 24 hours 71.5 mm of rain fell in this city which is much higher than the average precipitation total for this month. After the storm moved eastwards, a second major flood occurred in Normandy during the night from the 04 to the 05of June. Two fatalities were reported after cars were swept into flood water. Additional flooding has also affected southwestern France. For more about this event, see the case study on flash floods in this issue.

Mid-month

In mid-June, a slow-moving storm system brought record precipitation amounts to parts of northern France, triggering floods and a landslip near Paris which caused a train to derail. Paris recorded 78 mm of rain in 24 hours, which is a new record for a June day. Thunderstorms have also hit other parts of Europe, causing flooding in Austria, Switzerland, northern Italy and Germany, resulting in two fatalities. In some German areas around 60.0 mm of precipitation fell in just a few hours between the 12th and 13th of June.

Heavy rainfall during the next day resulted in torrential floods in Ras Baalbek in northeastern Lebanon leading to one person losing his life. Several provinces in Turkey, including Istanbul, were hit by heavy rain and flash flooding over the weekend 16-17 June. Many homes, businesses, vehicles and agricultural land were damaged. Meanwhile high-pressure systems dominated the weather conditions in central Europe and Scandinavia.

End of month

Towards the end of this month a summer storm system nicknamed “Nefeli”, led to flooding in central and northern Greece. In Bulgaria, for the second time, and in Romania and the Ukraine homes have been flooded and several roads as well as bridges closed after heavy rain caused rivers to overflow between the 27 June and 3 July. In Romania flooding was reported in northeastern areas, in the counties of Iași and Bacău. Around 400 homes were flooded, approximately 15 roads and bridges damaged and four people died during this event. In the mean-time high pressure enforced in central and North Europe.

In June precipitation amounts of up to 353.7 mm were measured in the Alps and in Romania. The higher accumulated precipitation sums correlated with the flood events during this month and indicated wetter conditions in these areas (Figure 17). In most parts of Central and North Europe as well as in Russia positive anomalies could be recognized (Figure 18).

The average temperature anomaly is positive almost everywhere in Europe, and reached values of up to 36.8°C (Figure 21 and Figure 22). Central Europe and the neighbouring countries displayed much warmer conditions than average. Only in northern Scandinavia, Russia, Portugal and parts of northern Africa the temperature anomalies were negative. Some seemingly positive or negative "hotspots" in the map are caused by station sign errors.

July 2018

In the beginning of July strong high-pressure systems dominated the weather conditions in Europe, except for parts of northeastern Europe. Some local isolated low-pressure cells occurred during July, leading to torrential rainfall with up to 130 mm in 4 hours in Trentino Province, northern Italy, on 3 July. This event caused rivers to overflow and 50 people had to be evacuated from their homes in Moena and areas near San Pellegrino. The weather situation did not change from previous month. A prevalence of high-pressure systems led to drought and low water levels in several areas. In eastern Europe, stable low-pressure systems were located until the end of July.

The second flood event occurred in northern Slovakia in the Tarta Mountain region after two days of high precipitation totals. Between 18 and 19 July some areas recorded more than 160 mm of rain within 48 hours. At the end of the month northern and eastern Germany as well as France were hit by local thunderstorms which led to flooded streets and cancelled train connections. After forest fires were raging throughout Greece, Athens was also affected by flooding.

The maximum accumulated precipitation amounts were recorded in Romania, northern Slovakia and the eastern parts of the Czech Republic with over 400 mm (Figure 19). Following the distribution of low pressure systems in the Balkans, parts of Spain, eastern Europe and some areas in northern Africa, the precipitation anomalies indicated wetter conditions there (Figure 20). Especially in the Netherlands, Scandinavia, southern Spain, Portugal, Sicily and in the countries in the south and southeast of the Mediterranean Sea conditions were significantly drier than normal.

The average temperature of July ranged from -1.2°C in mountainous regions of Iceland to a maximum of 40.6°C in Africa and countries beyond 30° east (Figure 23). In Portugal, southwestern Spain, Morocco and parts of the Balkans temperatures measured were colder than average. In all other countries, in particular in Scandinavia, positive temperatures anomalies were recorded (Figure 24).

Hydrological situation

by EFAS Hydrological Data Collection Centre

During the past two months, most of the stations that surpassed the minimum discharge and/or stage threshold levels were concentrated along the Danube basin (Romania, Lakes in southern Austria, Serbia and Bosnia and Herzegovina,), the Po river basin in Italy, across the Dniester river basin (southern-western Ukraine), and the Rhine basin in Germany (Figure 25 and Figure 27). A more dispersed distribution of stations with exceedances occurred across the Dnieper basin (Belarus and Ukraine), the Don river basin in Ukraine, Rhine river basin (western Austria and Switzerland), Neman river Basin in Belarus, Rhone basin (Austria and Switzerland), Elbe basin in Germany, Vistula river basin (Slovakia and Ukraine), Jostedola river basin in Norway and Llobregat and Minho river basins in Spain.

Most of stations that registered discharge values above the 90% quantile were located across the Danube river basin (Serbia, Romania and Bulgaria) and Ebro river basins in northern Spain (Figure 26 and Figure 28). This occurred less frequently for stations located on Rhine river basin in Germany, Guadalquivir, Minho and Llobregat river basins in Spain, across England and the Oder river basin Poland, Maritsa in Bulgaria, Kemijoki in Finland, Jostedola in Norway, Garonne in France, Dniester in Ukraine, Daugava in Belarus and Danube in Austria, Germany and Hungary).

Stations that did not surpass the 10% quantile for discharge values were mainly located across Scandinavia, the western Danube river basin, the Rhine river basin in Germany, Switzerland and Austria, the Elbe river basins in Germany, and the Czech Republic, the Oder basin in Poland and Germany and the Vistula river basin in Poland. This occurred less frequently for basins in England and Ireland as well as for some isolated stations along the Ebro and Mihno river basins in Spain, the Po river basin in Switzerland, the Seine river basin in France, the Dnieper river basin in Ukraine and the Scheldt river basin in Belgium.

Verification

Figure 1 and Figure 2 shows the EFAS headline score, the Continuous Ranked Probability Skill Score (CRPSS) for lead times 3 and 7 days for the June to July period across the EFAS domain for catchments larger than 2000km^2. 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.

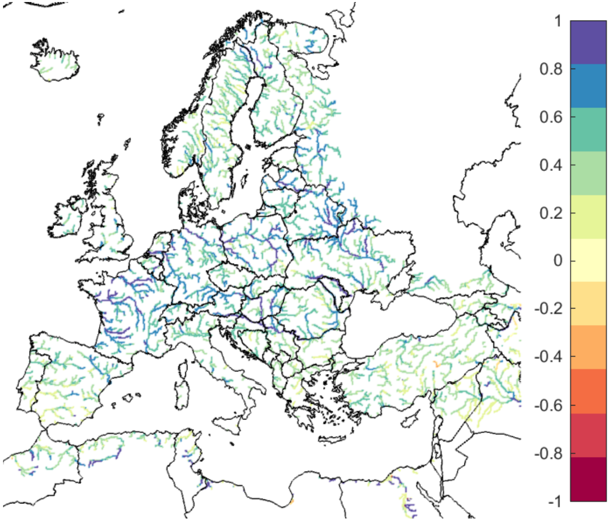


Figure 1. EFAS CRPSS at lead-time 3 days for the June-July 2018 period, for catchments >2000km2. The reference score is persistence of using previous day's forecast.

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.

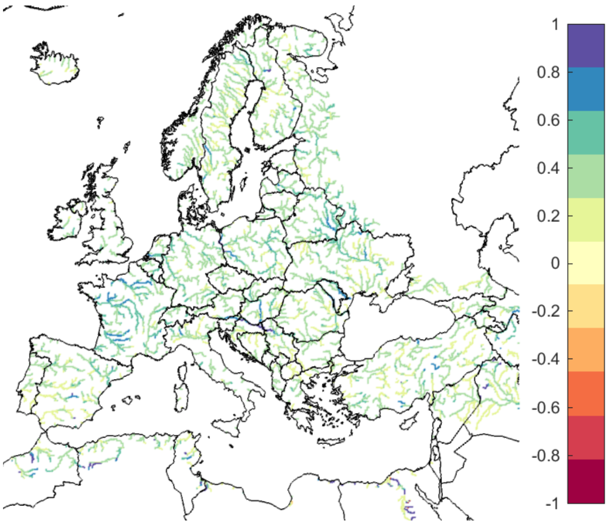


Figure 2. EFAS CRPSS at lead-time 7 days for the June-July 2018 period, for catchments >2000km2. The reference score is persistence of using previous day's forecast.

The skill is higher in central Europe than in southern and northern for this period, however the sample is still too small to draw any general conclusions. The forecasts are also over an unusually warm and dry period for Europe, but it is difficult to state how this may affect the scores. We will during the following months run more runs to create a database over past performance to create more robust verification scores.

Publications

Wetterhall, F. and Di Giuseppe, F.: The benefit of seamless forecasts for hydrological predictions over Europe, Hydrol. Earth Syst. Sci., 22, 3409-3420, https://doi.org/10.5194/hess-22-3409-2018, 2018.

Summary of feedback on notifications sent during the May 2018-April 2018

by Elinor Andersson, EFAS Dissemination Centre

This summary is based on feedback collected during specific contract 3, May 2018 - April 2018. A total of 147 formal notifications were sent out during that period, and 109 event reports were received which accounts for 74% of all issued formal notifications. This is an increase since last specific contract when 71% of the formal flood notifications were reviewed. This is notable since there were only 52 notifications issued for SC2. It is important to note that the following summary is based on the feedback given by EFAS partners. Because of different ways to interpret the questions some graphs may appear contradictory.

The big flooding event in France at the end of 2018 and the beginning of 2018 produced a lot of notifications, and we received the feedback in spreadsheet form. Since not all questions were answered there will only be information from SCAPI about the return period of the event. Because of that, the other metrics will be compared against the total amount of complete feedback received where a flood event was observed (59 feedback submissions).

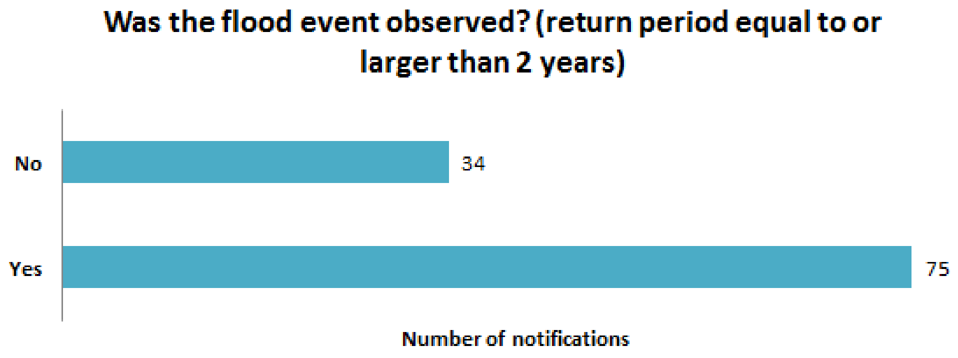


Figure 3 *Was the flood event observed?*

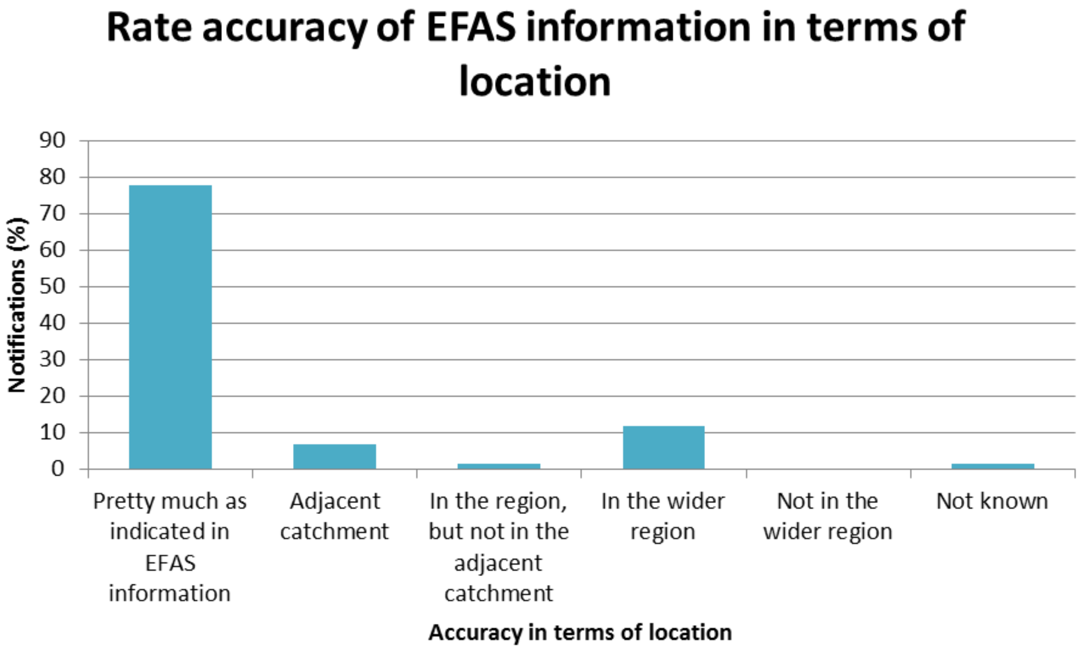


Figure 4. *Rate accuracy of EFAS information in terms of location.*

The initial question in the feedback form is whether a flood event was observed regarding the notification (Figure 5). New for this specific contract that the definition for a flood event was included in the question (return period equal to or larger than 2 years) to help partners assess the event. We chose to differentiate between true false alarms and flooding events that happened but did not reach the 5-year return period threshold.

75 out of 109 (approximate 69%) respondents answered that the flood event was observed after a notification had been sent out. Note that a "yes" doesn't guarantee that the flood event exceeded the 5-year return period threshold.

Notification sent where a flooding event was observed

Most of those who answered that the flooding event had occurred (46/59, or 78%) rated the accuracy of EFAS information in terms of location as "Pretty much as indicated in EFAS information" (Figure 6).

29% of those who answered that the flooding event had occurred stated that the flooding event happened on the day predicted by EFAS (Figure 5). Almost half of the respondents reported that the event happened later than predicted (44%).

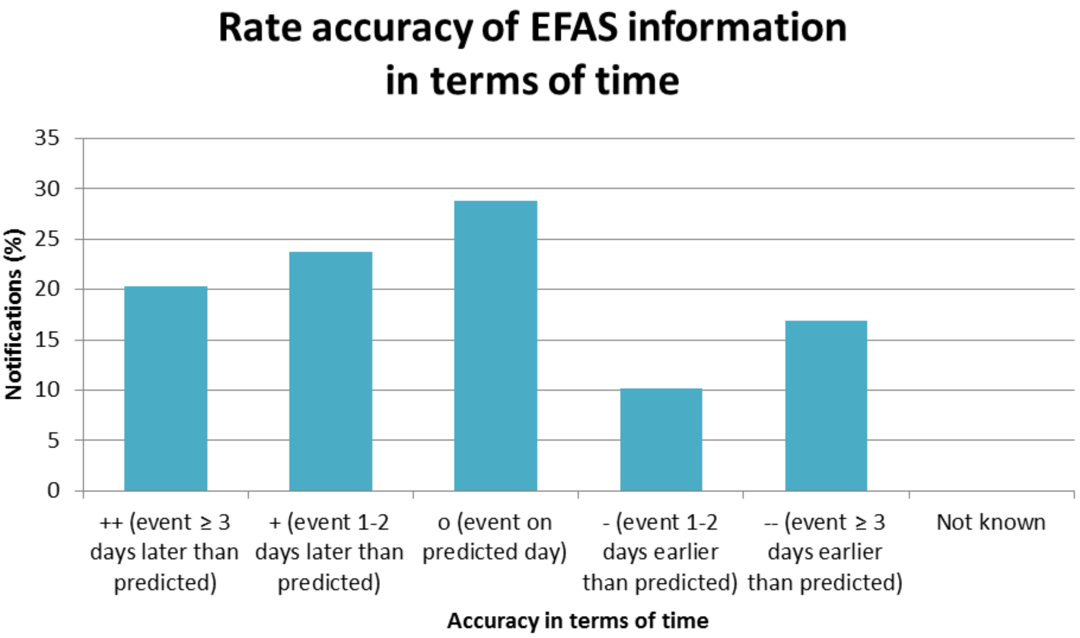


Figure 5. *Rate accuracy of EFAS information in terms of time.*

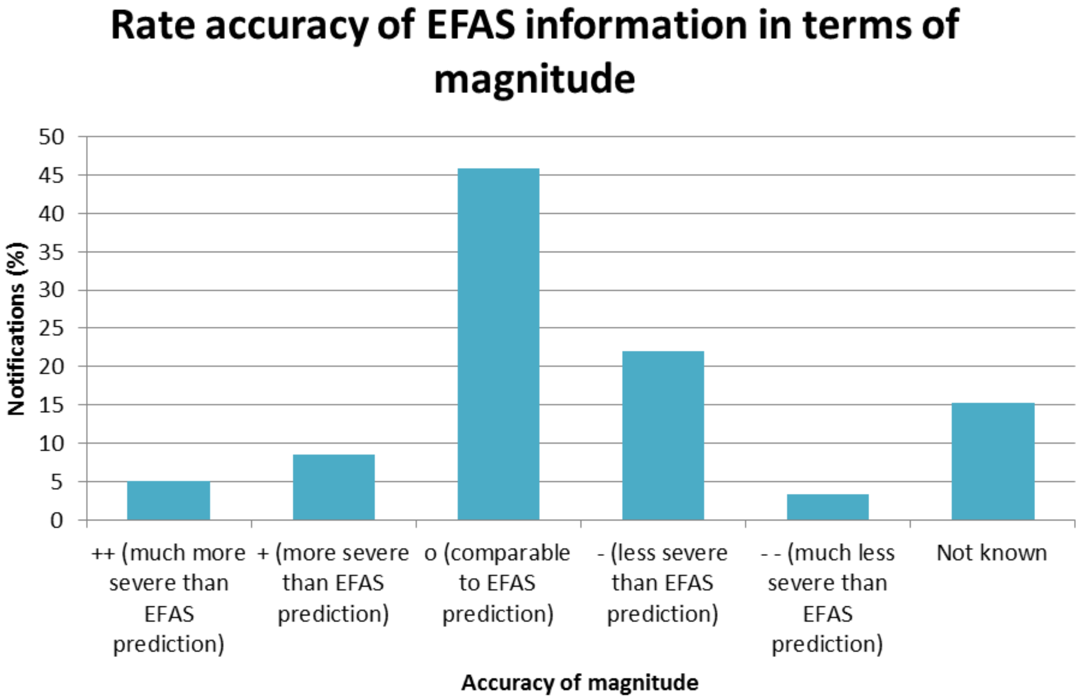


Figure 6. *Rate accuracy of EFAS information in terms of magnitude.*

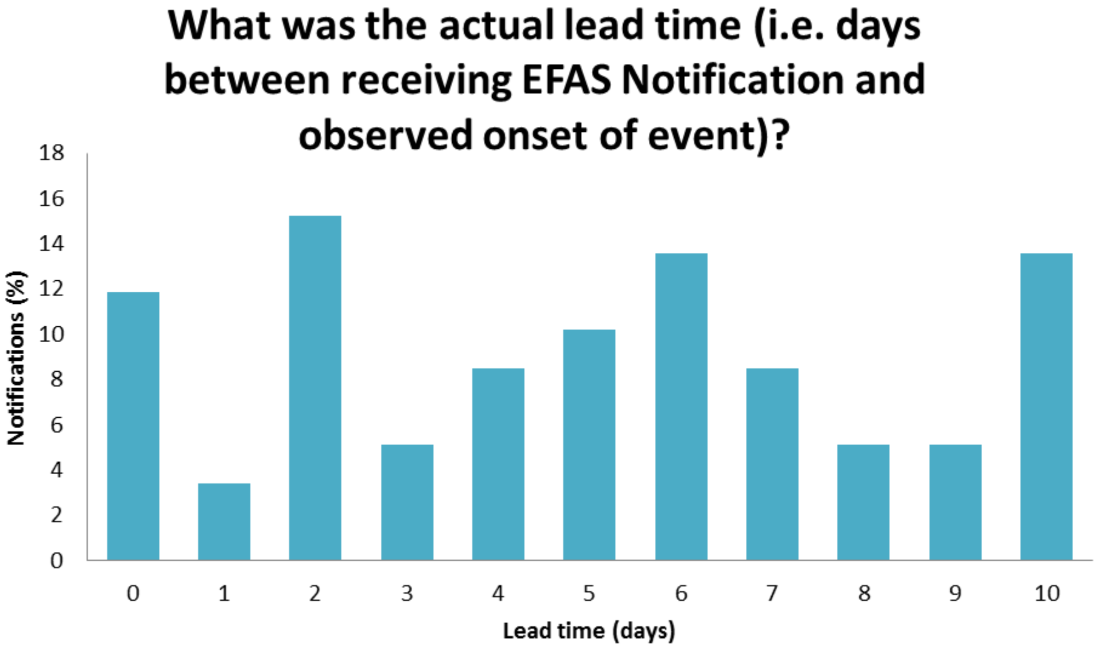


Figure 7. *What was the actual lead time (i.e. days between receiving EFAS notification and observed onset of event)?*

Almost half (46%) of those who had stated that the flooding event occurred reported that the flooding was comparable to the EFAS prediction (Figure 6). 25% answered that the magnitude was less or much less severe than the EFAS prediction and only 13% stated that the flooding was more or much more severe than the EFAS prediction. 15% did not know the magnitude compared to the EFAS notification. The lead time varied greatly between the different flood events (Figure 7). The mean and median lead time was 5 days. It is notable that so many events had zero days between the notification and start of the event.

39% of the respondents who reported that the flooding event had occurred stated that the return period of the observed flood event was less than a 5-year return period (Figure 8). Since the criteria for sending out a formal notification is a 5-year return period discharge, it is interesting that so many events were less severe than that. We don't know which time periods the partners' use to calculate their return periods. The 5-year return period in EFAS is for example often much lower than the 5-year return period threshold that Sweden uses, probably because of the different time periods used in the calculation. In EFAS, return periods are based on simulated discharges, whereas the EFAS partners base their thresholds on observations. It would maybe be easier for the partners to evaluate the notifications if we asked them to compare the EFAS simulated discharge with their own observed discharge.

More than a third (42%) of those who had stated that the flooding event had occurred reported the main cause to be snow melt (Figure 9). The second most common cause was extreme rainfall and the third most common was long-term rainfall. If no alternative was suitable to describe the cause, the partners were asked to submit it. The most common answer was that the event was caused by overfull lakes, which forced the release of water downstream.

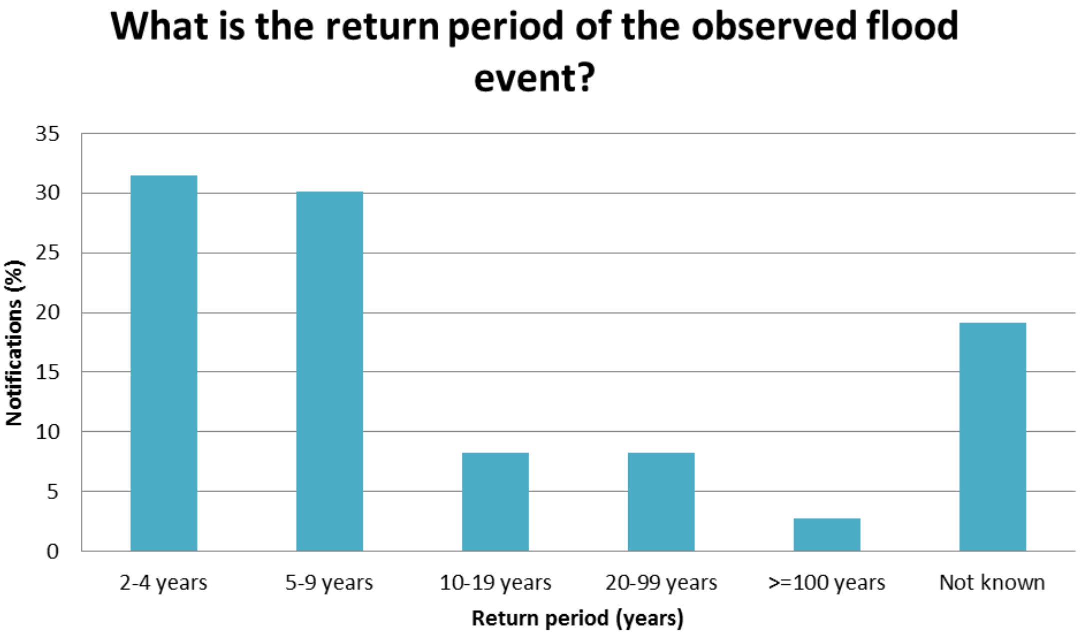


Figure 8. ***What is the return period of the observed flood event?***

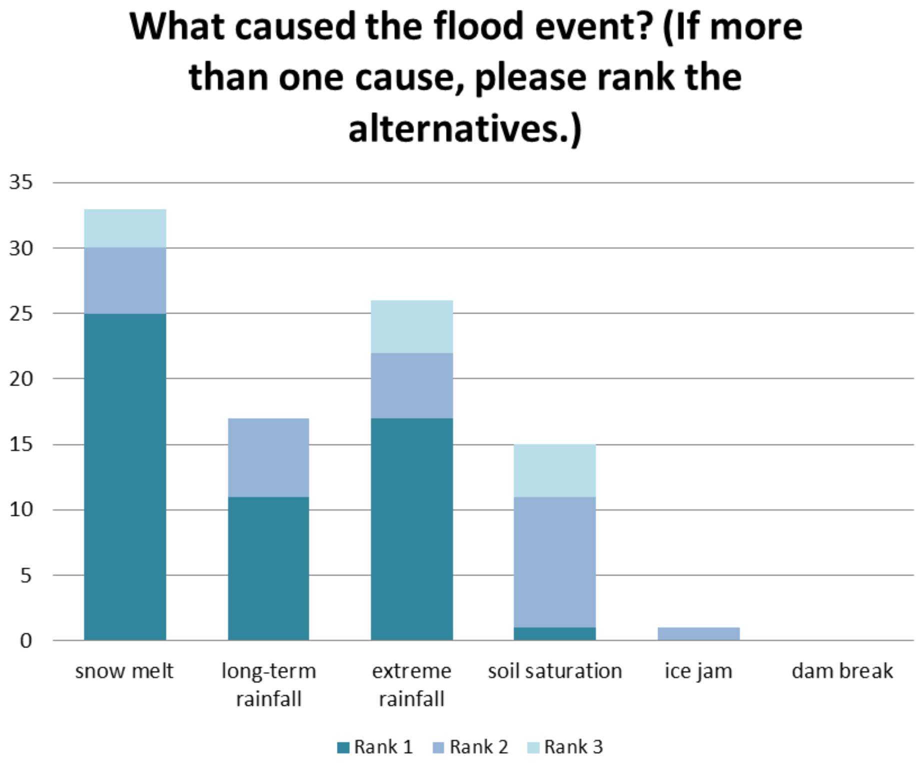


Figure 9. *What caused the flood event? If more than one cause, the alternatives are ranked from 1 to 3 (graph shows number of each cause and rank).*

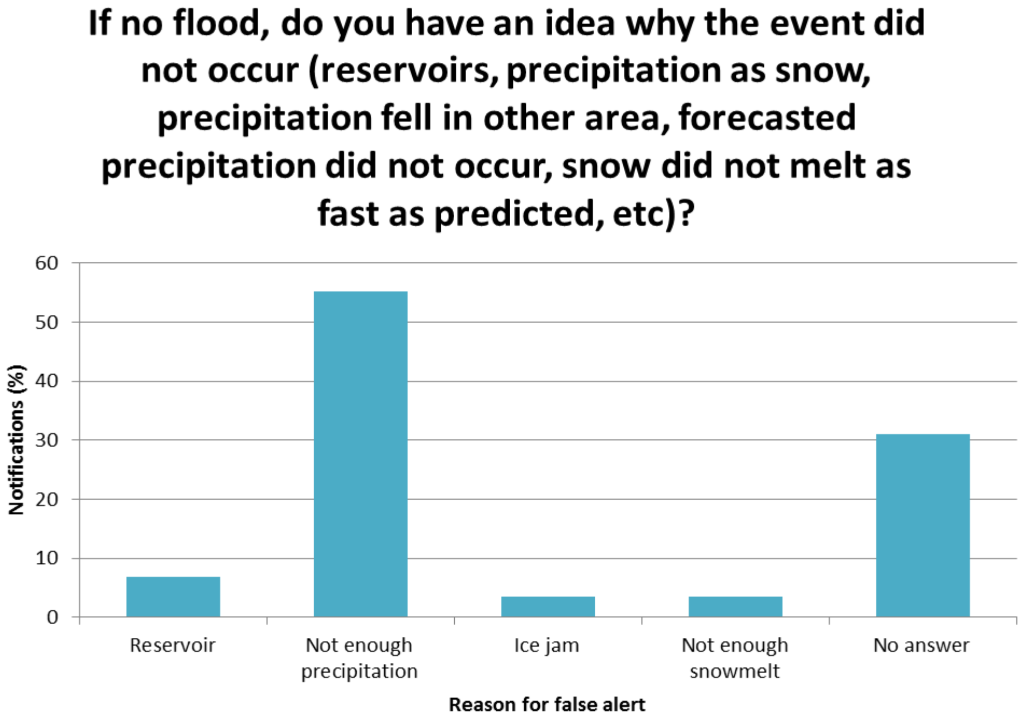


Figure 10. *If no flood, do you have an idea why the event did not occur (reservoirs, precipitation as snow, precipitation fell in other area, forecasted precipitation did not occur, snow did not melt as fast as predicted, etc.)?*

Notification sent but no observed flooding event

The survey recipients were asked if they had any ideas why the event did not occur e.g.: reservoirs, precipitation as snow, precipitation fell in other area, forecasted precipitation did not occur, snow did not melt as fast as predicted. The most common answer was that there wasn't enough precipitation (Figure 10). Nine feedback reports didn't explain why the false alarm happened, which may be because they themselves don't know.

Conclusions

- Most of the survey recipients reported an observed flooding event tied to the sent notification.
- It was much more common that the flood notification indicated a more severe flooding compared to observations than a less severe flooding compared to observations.
- The notifications had good accuracy in terms of location and magnitude. The accuracy in terms of time could be improved. A significant portion of the sent overviews were for ongoing events, which should be investigated. It could be that some of the feedbacks interpret the start of the event differently than the definition of the notifications. Last specific contract, we tried to improve this by adding the definition in the question.
- A majority stated that the return period of the observed flood event was less than five. It would maybe be of use to define the actual discharge value to be evaluated to the partner, so avoid the use of different return period thresholds (see report for more details).
- The most common cause of the flooding events was snow melt.
- The main reason for no observed flooding was believed to be overestimated precipitation.

Case study I: reviewing the EFAS seasonal outlook for the summer 2018 low river flows in Europe:

by Louise Arnal and Shaun Harrigan, ECC

Over the late spring and early summer, the central and northern parts of Europe experienced persistent dry conditions with record-breaking temperatures. This led to extensive and wildfires in the UK, Sweden, Greece, Spain, Portugal, Latvia and Germany as well as very dry conditions. The cause of this was a very northerly path of the jet-stream with led to very stable anticyclonic conditions over norther Europe. Here, we look back at how the hydro-meteorological anomalies developed over the summer to see how well the EFAS seasonal outlook captured the low river flow conditions in Europe.

EFAS seasonal outlook for the summer 2018

It is clear from the EFAS hydrological simulation that rivers were experiencing dry conditions across Europe since the start of the summer (Figure 11). On June 11, 12.4% of the river network was in a low flow anomaly (i.e. below the 10th percentile of climatology). On July 11, the low-flow anomaly extended to 25.2% of the river network and by August 11 covered over one third (35.1%) of Europe. Although the spatial patterns of the low flow signal were not perfectly captured by the EFAS seasonal outlook it did forecast an intensifying low flow signal throughout the summer, with a lead time of several weeks in some cases.

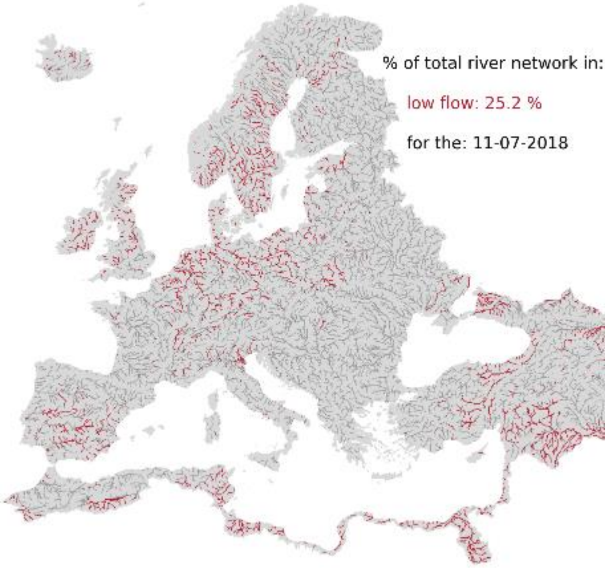


Figure 11. Hydrological situation from the EFAS run driven by observations August 11, 2018. Red river pixels mean that the modelled discharge for that pixel was below the 10th percentile of the climatology.

June 2018

Most of the low flows mid-June where primarily located around southern Sweden and northern Africa (Fig. 3). These were however not picked up very well by the EFAS seasonal outlook produced in May.

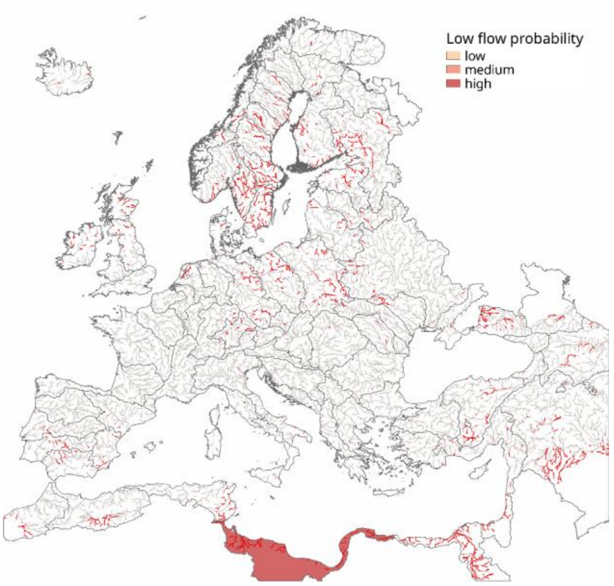


Figure 12. The shaded basins are drawn from the EFAS seasonal forecast from May for mid-June 2018. They show the low flow probability, from low to high probabilities (probabilities given by the portion of the ensemble forecast being below the 10th percentile of the EFAS weekly climatology, with low: 50-75% and high: >90% - this is similar to what is shown on the online EFAS seasonal outlook, but for one specific week of the forecast). The 'actual' situation for 11 June 2018 (as a proxy for mid-June) is also shown.

July 2018

By mid-July, the low flows had extended to most of the British-Irish Isles, larger parts of Sweden and southern Norway, central Europe (around the Rhine, Po and Elbe river basins), the southern Iberian Peninsula and eastern Europe (East of the Black Sea; Fig. 4). The EFAS seasonal outlook from June valid for mid-July provided an early warning of low-flows in North Africa, Ireland and Denmark, but the signal was not well predicted for most regions six weeks ahead.

August 2018

By mid-August, the lows flows had extended to cover most of Finland and western Europe (including most of the Iberian Peninsula and France; Fig. 7). This was well predicted by the EFAS seasonal outlook made from July valid for mid-August with a lead time of six weeks. The forecast signal was however quite weak because of the forecast's inherently growing uncertainty with lead time and missed most of western Europe. The performance of the EFAS seasonal outlook can here again be partly attributed to the SEAS5 forecast anomalies for August, which were weaker and shifted eastwards in the July forecast compared to the August forecast.

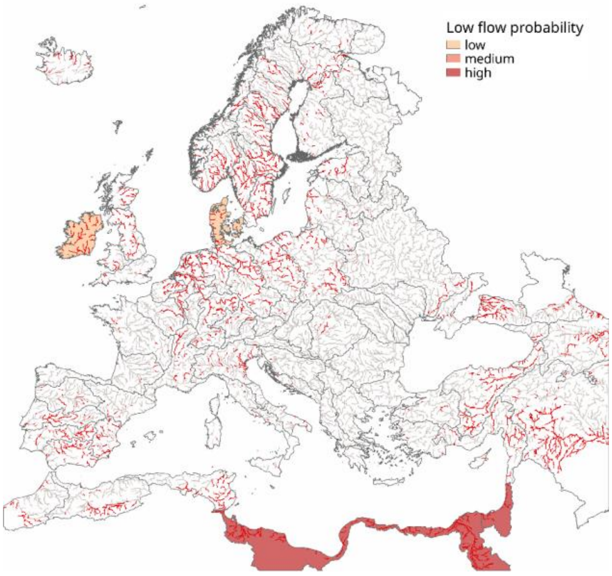


Figure 13. EFAS seasonal forecast made on 1st June for mid-July 2018. The 'actual' situation for 11th July 2018 (as a proxy for mid-July) is also shown.

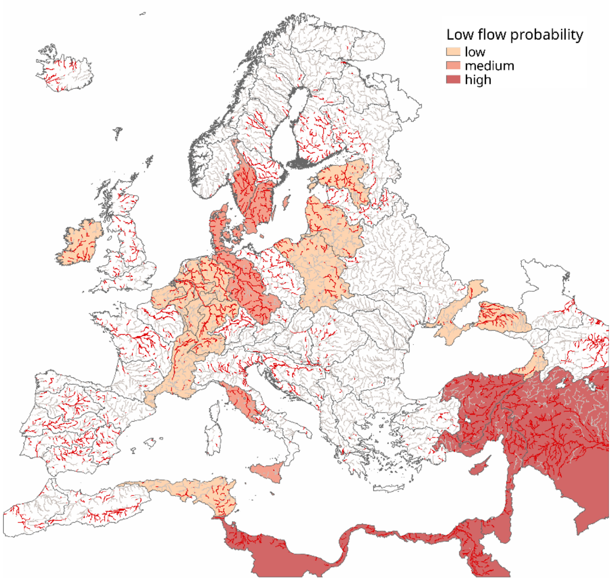


Figure 14. 1July 2018 EFAS seasonal forecast for mid-August 2018. The 'actual' situation on 11th August 2018 (as a proxy for mid-August 2018) is also shown.

Overall, the EFAS seasonal outlook did manage to predict the summer 2018 low flow conditions more than a month ahead in parts of Europe (noticeably the July forecast). The weak anomaly signals in the SEAS5 forecasts made on 1 June (July) for July (August) likely contributed to the lack of hydrological predictability in many regions more than a month ahead. Much of the predictability of EFAS-Seasonal in summer can be contributed to initial hydrological conditions. Looking back at this event and similar ones should help us understand the EFAS seasonal outlook's predictability and uncertainty sources and help improve the forecasts to better capture future events.

Case study II: Storms and Flash Floods in Europe, June 2018

by Richard Davies, FloodList

The spate of severe storms that hit parts of Europe during late May (as reported in the last bulletin) continued throughout much of June, again bringing dramatic lightning strikes, strong winds and intense rainfall. The rain, sometimes at record breaking levels, caused countless flood events in several countries, including France, Spain, Bulgaria, Switzerland, Italy and Germany.

On 3 June the Brittany town of Morlaix was devastated by flooding after 52 mm of rain fell in under 1 hour according to local observers (La Chaîne Météo). The Jarlot river that runs through Morlaix jumped to its highest ever level in just a few hours.

Also on 3 June, Valencia in Spain recorded 116.8 mm of rain in 24 hours, according to Aemet. Roads and tunnels were flooded and transport severely disrupted. In Alginet, Valencia Province, local firefighters were called on to carry out dramatic flood rescues when a car carrying 3 people was trapped in rising flood water. The next day a man died when his car was swept into flood water in Piseux, Eure department in northern France, after 70 mm of rain fell during the night 4 to 5 June. Flooding caused severe damage in several municipalities across Eure department.

Figure 15. Flooding in Seine-et-Marne, France, 12 June 2018. Credit: Franck Desprez.

Flooding in Bulgaria

The severe weather also affected areas further east, with 71.5 mm of rain fell in 24 hours between 04 and early 05 June in Varna on Bulgaria's Black Sea coast, flooding streets and causing severe traffic disruption. According to WMO figures, the city would normally see 46 mm of rain during the whole of June.

Northern France and Spain

From 5 June, more heavy rain affected parts of France and Spain. In the Nouvelle-Aquitaine region of France, Deux-Sèvres recorded 83 mm of rain and Charentes 70 mm of rain between 05 and 06 June. Two fatalities were reported, one in Casseneuil, Lot-et-Garonne department, and another in the La Queugne river in Epineuil-le-Fleuriel, Cher department.

Heavy rain between 5 and 6 June caused further flooding in parts of Spain, in particular in El Garraf comarca (county) in the province of Barcelona, Catalonia. Servei Meteorològic de Catalunya said that 78.6 mm of rain fell in 24 hours in Sant Pere de Ribes, about 3 km inland from the resort town of Sitges.

Switzerland

After a few day's respite, severe weather struck once again, this time in Switzerland. A record downpour during the evening of 11 June caused flash flooding in Lausanne and other parts of the Lake Geneva region. Swiss public broadcaster SFR Meteo said a record 41.1mm of rain fell in Lausanne in a ten-minute period at around 23:00.

The next day, a short period of torrential rain turned roads into rivers in Rosta, east of Turin, Italy, on Tuesday, 12 June. Other areas also recorded heavy rain. Arpa Piedmont said Vialfrè, north of Turin, recorded 60 mm of rain in 1 hour.

In Germany, a man died when he was swept away by the flood water of the overflowing Partnach river in Garmisch-Partenkirchen, Bavaria, on 12 June, 2018. DWD said 60 mm of rain fell in many areas in just a few hours between 12 and 13 June. Vilgertshofen-Pflugdorf, Bavaria, recorded 52 mm in just 1 hour.

Paris and Northern France

Meanwhile in France, Paris and northern parts of the country recorded rainfall between 11 to 12 June.A landslide caused a train to derail outside Paris, leaving 7 people injured. The heavy rain caused flooding in southern suburbs of the city and in Seine-et-Marne department, where around 100 houses were flooded in Chambry. Outside Paris, floods caused severe damage in parts of Ardennes department, with the town of Sedan particularly badly hit, and evacuations were carried out in Yvelines department, Île-de-France and Orne department in Normandy.

Figure 16. Flooding in Sedan, Ardennes department, France, 11 June 2018. Credit: Philippe Lenoble (used with permission)

Rainfall records tumbled. Meteo France said that Paris recorded 78 mm of rain in 24 hours, a record for a June day beating the previous high of 58 mm set in June 1960. Orly recorded 75mm in 24 hours, its highest ever daily rainfall total. Torcy, to the east of the city, recorded 108 mm in 24 hours to 12 June, also its highest ever amount for one day.

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: EFAS Seasonal forecasts of for mid-August from the forecast issued in July. Produced by EFAS CC.

Appendix - figures

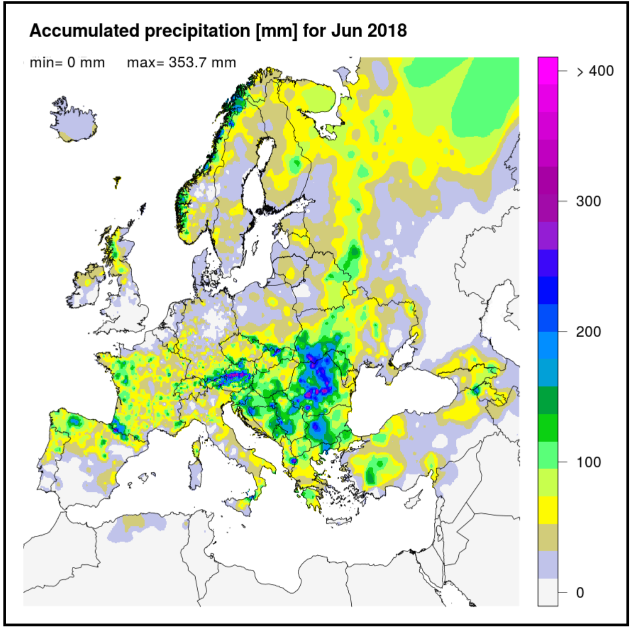


Figure 17. Accumulated precipitation [mm] for June 2018.

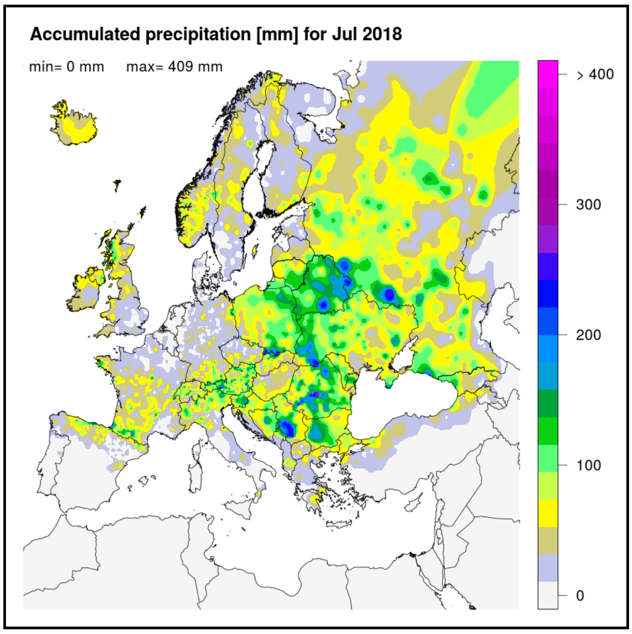


Figure 19. Accumulated precipitation [mm] for July 2018.

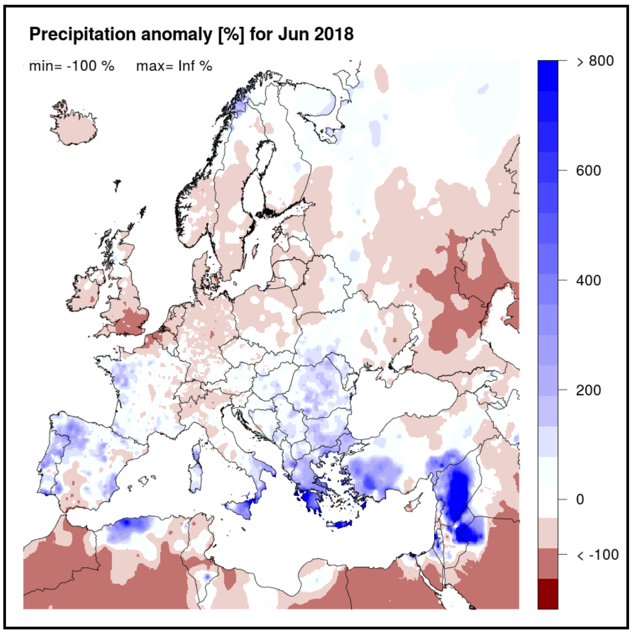


Figure 18. Precipitation anomaly [%] for June 2018, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

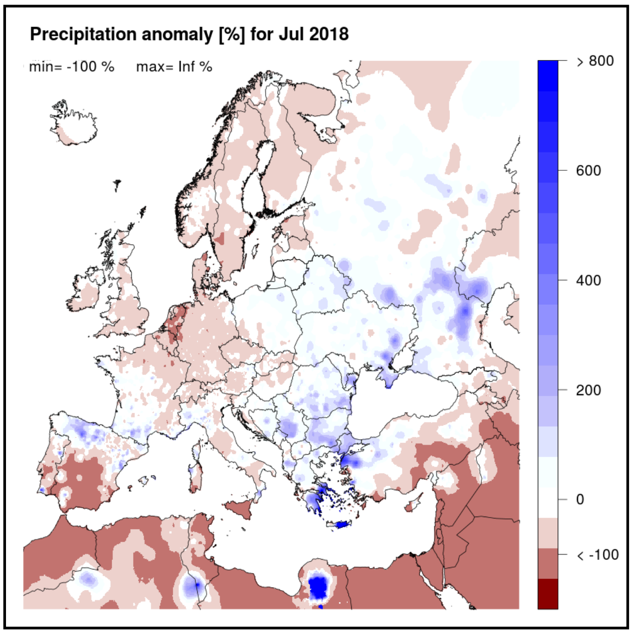


Figure 20. Precipitation anomaly [%] for July 2018, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

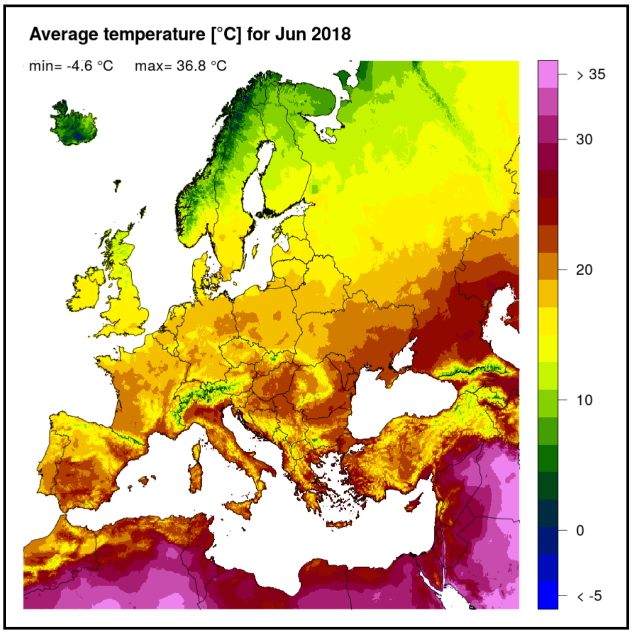


Figure 21. Mean temperature [°C] for June 2018.

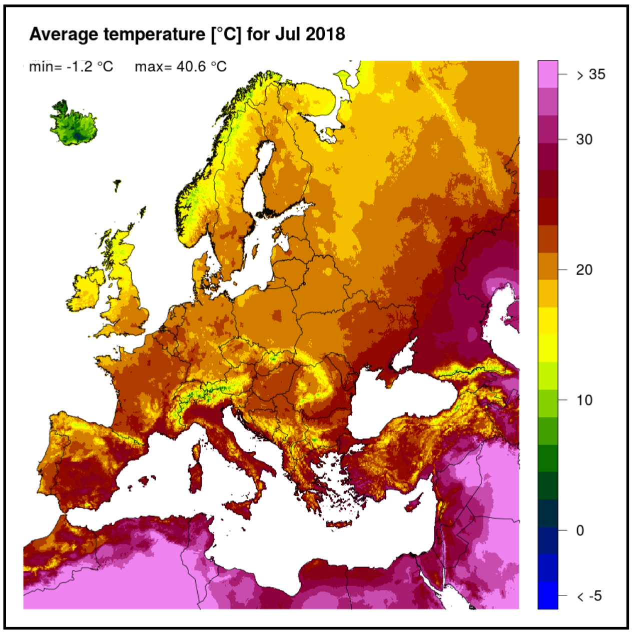


Figure 23. Mean temperature [°C] for July 2018.

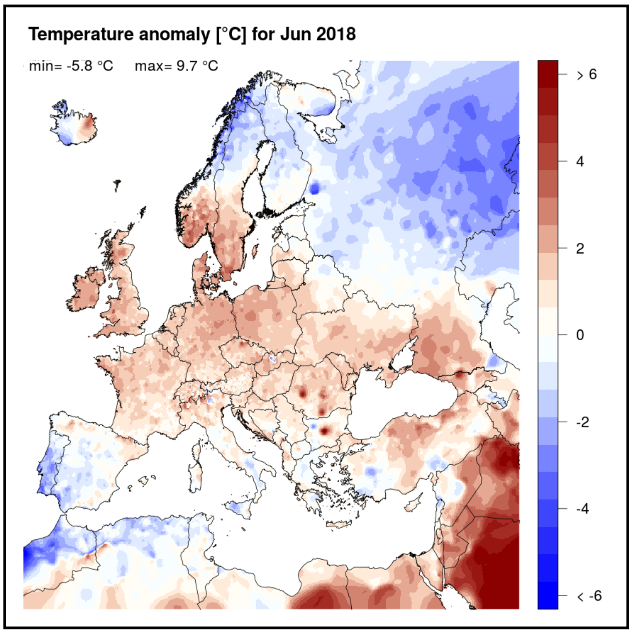


Figure 22. Temperature anomaly [°C] for June 2018, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

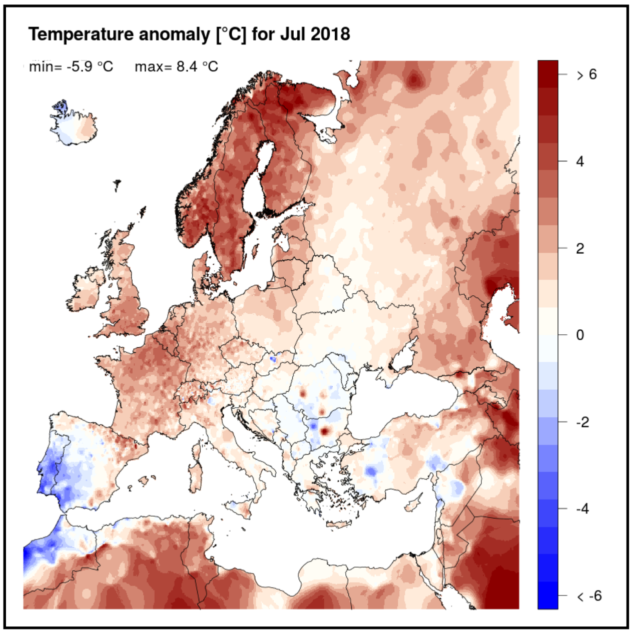


Figure 24. Temperature anomaly [°C] for July 2018, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

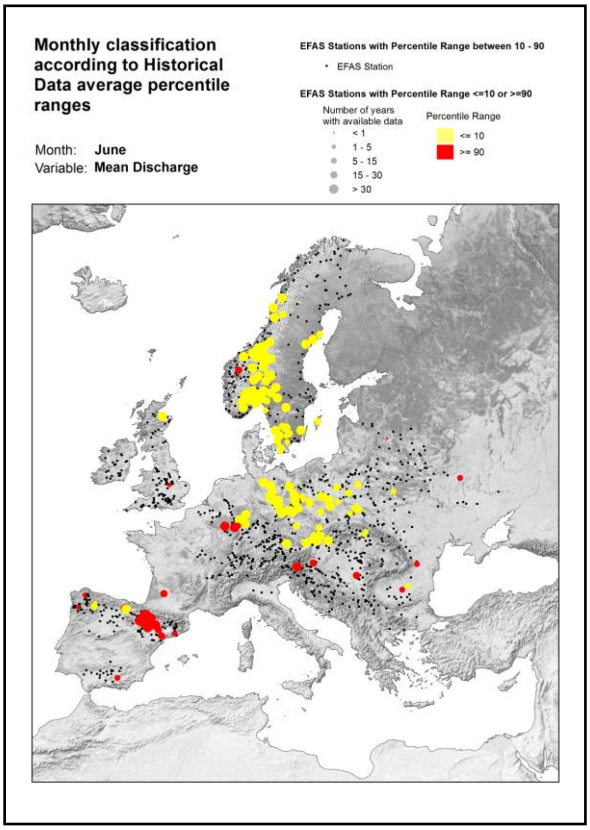


Figure 25. Monthly discharge anomalies June 2018.

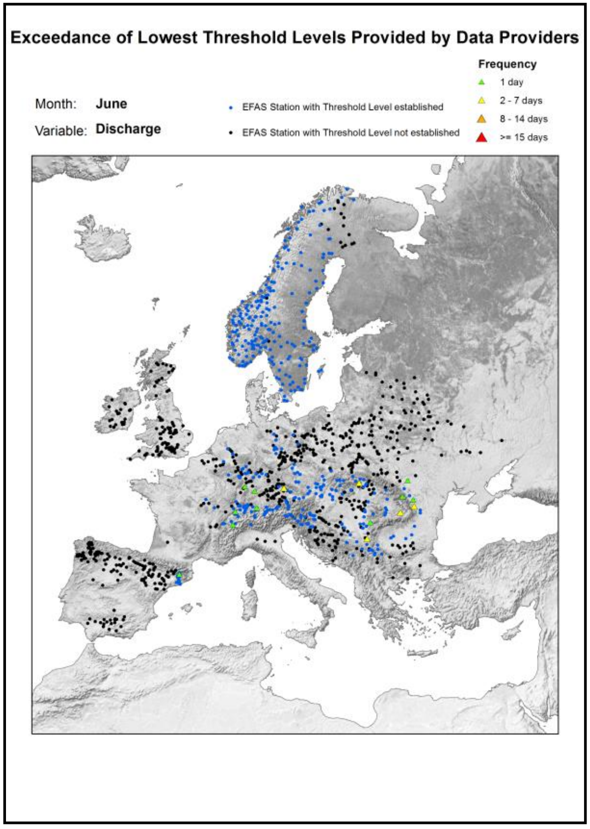


Figure 26. Lowest alert level exceedance for June 2018.

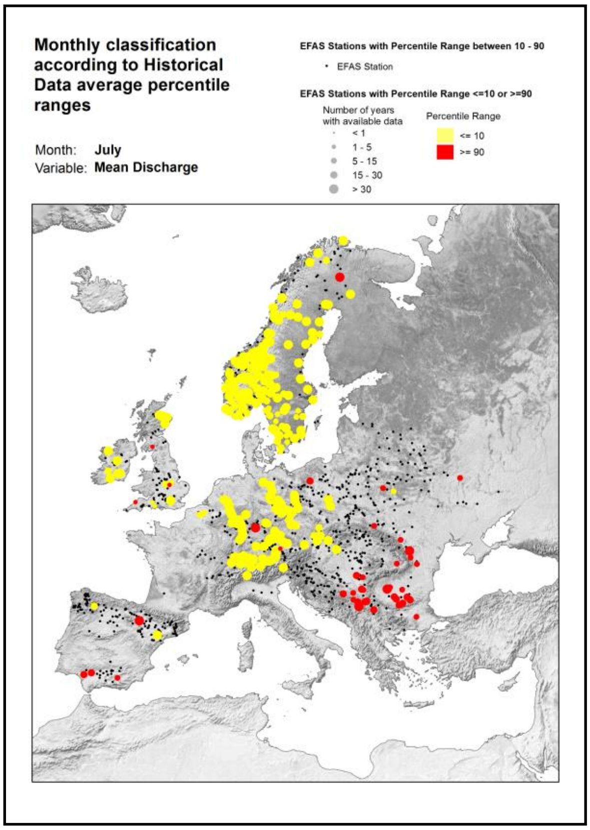


Figure 27. Monthly discharge anomalies July 2018.

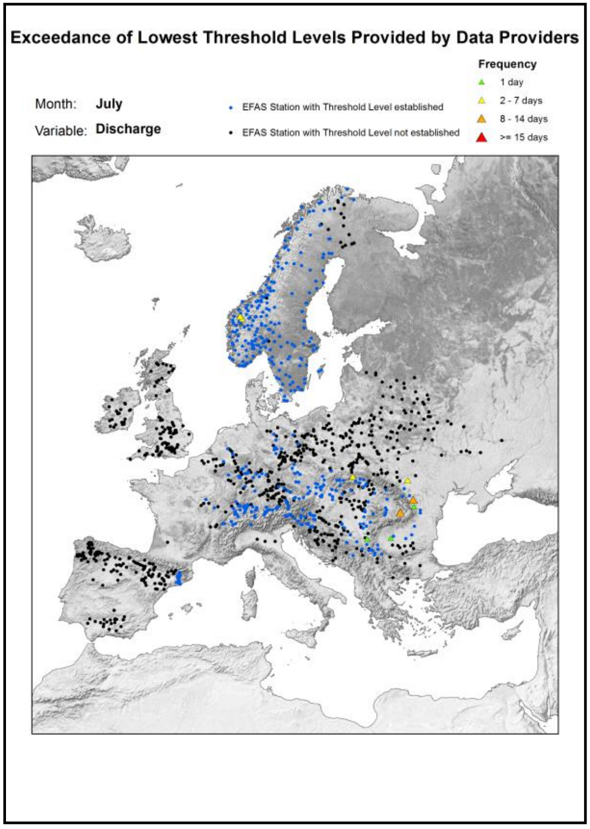


Figure 28. Lowest alert level exceedance for July 2018.

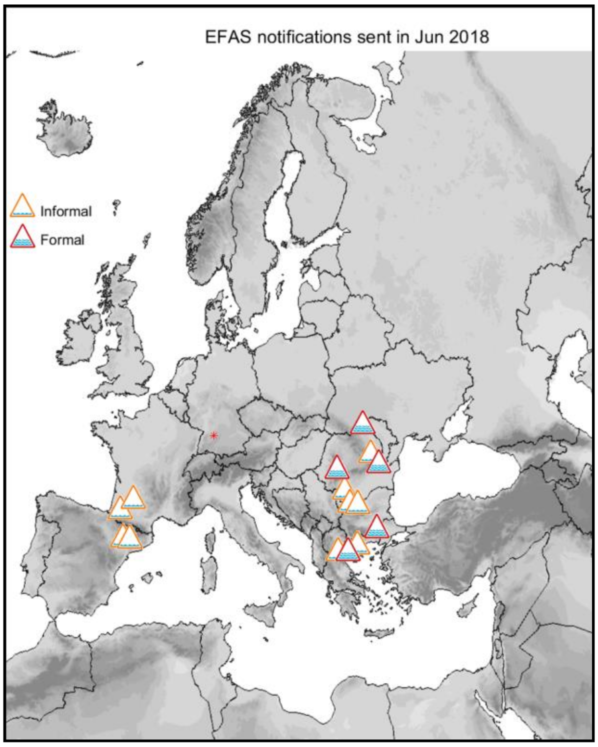


Figure 29. EFAS flood notifications sent for June 2018.

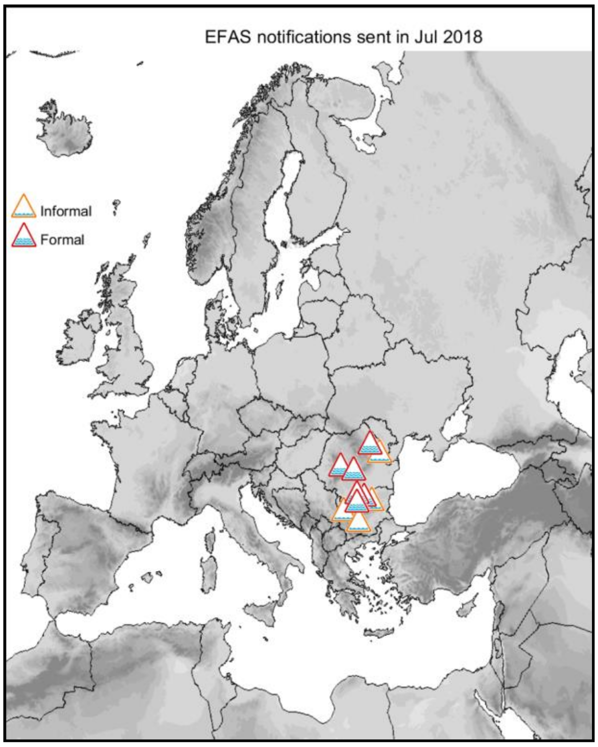


Figure 31. EFAS flood notifications sent for July 2018.

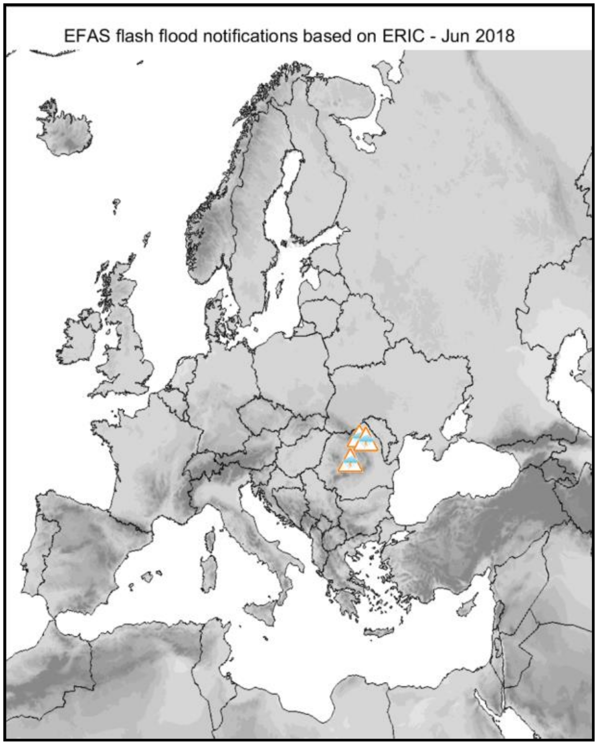


Figure 30. Flash flood notifications sent for June 2018.

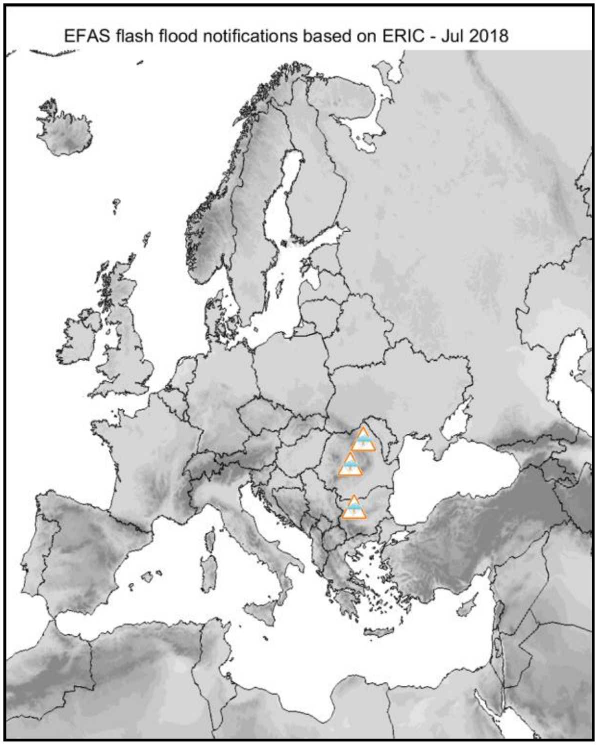


Figure 32. Flash flood notifications sent for July 2018.

Appendix - tables

Table 1. EFAS flood notifications sent in June - July.

Type	Forecast date	Issue date	Lead time*	River/Region	Country
Informal	08/06/2018 12UTC	09/06/2018	0	Segre	Spain
Informal	08/06/2018 12UTC	09/06/2018	0	Cinca	Spain
Informal	09/06/2018 12UTC	10/06/2018	3	Gave	France
Informal	09/06/2018 12UTC	10/06/2018	2	Garonne, section Tarn - Lot	France
Informal	11/06/2018 00UTC	11/06/2018	0	Neckar	Germany
Formal	21/06/2018 12UTC	22/06/2018	8	Mures, below Tirnava	Romania
Formal	24/06/2018 12UTC	25/06/2018	3	Coastal catchment	Greece
Informal	24/06/2018 12UTC	25/06/2018	2	Alikamonas sub-catchment	Greece
Formal	25/06/2018 12UTC	26/06/2018	4	Mures, below Tirnava	Romania
Formal	26/06/2018 00UTC	26/06/2018	2	Maritsa (Evros=	Greece
Informal	26/06/2018 00UTC	26/06/2018	2	Jiu	Romania
Formal	26/06/2018 12UTC	27/06/2018	7	Siret	Romania
Informal	27/06/2018 00UTC	27/06/2018	1	Strimonas	Greece
Informal	27/06/2018 00UTC	27/06/2018	2	Cinca	Spain
Informal	28/06/2018 12UTC	29/06/2018	1	Trotus	Romania
Informal	28/06/2018 12UTC	29/06/2018	2	Iskar	Bulgaria
Formal	29/06/2018 00UTC	29/06/2018	3	Prut	Romania
Informal	29/06/2018 00UTC	29/06/2018	1	Ogosta	Bulgaria
Formal	04/07/2018 00UTC	04/07/2018	3	Olt	Romania
Formal	06/07/2018 12UTC	07/07/2018	0	Olt	Romania
Informal	07/07/2018 00UTC	07/07/2018	1	Iskar	Bulgaria
Informal	07/07/2018 00UTC	07/07/2018	0	Maritsa (Evros)	Bulgaria
Informal	09/07/2018 00UTC	09/07/2018	1	Vedea	Romania
Formal	20/07/2018 00UTC	20/07/2018	2	Mures, below Tirnava	Romania
Formal	25/07/2018 00UTC	25/07/2018	4	Siret	Romania
Informal	25/07/2018 12UTC	26/07/2018	3	Trotus	Romania
Formal	28/07/2018 12UTC	29/07/2018	4	Olt	Romania
Formal	31/07/2018 00UTC	31/07/2018	2	Siret	Romania

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

Table 2. EFAS flash flood notifications sent in June - July.

Type	Forecast date	Issue date	Lead time*	River/Region	Country
Flash Flood	27/06/2018 12UTC	28/06/2018	66	Bistrita	Romania
Flash Flood	28/06/2018 12UTC	29/06/2018	54	Olt	Romania
Flash Flood	28/06/2018 12UTC	29/06/2018	42	Bistrita	Romania
Flash Flood	06/07/2018 12UTC	07/07/2018	66	Olt	Romania
Flash Flood	07/07/2018 12UTC	08/07/2018	24	Iskar	Bulgaria
Flash Flood	30/07/2018 12UTC	31/07/2018	42	Bistrita	Romania

* 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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