





European Flood Awareness System

EFAS Bulletin

October – November 2019 Issue 2019(6)













NEWS

New features

EFAS-MDCC integrated Swedish meteorological station data from SMHI

In October 2019, the EFAS-MDCC team integrated the meteorological station data from Sweden into the operational processing routines. SMHI station data are downloaded every hour from the SMHI Open Data portal. In total, data for 1671 stations have been loaded into the EFAS-MDCC database for the period 1970 to present. Available data for precipitation, temperature, wind, relative humidity, solar radiation, sunshine duration, dew-point temperature and cloud cover are processed. Precipitation data for more than 400 stations are included into the gridded precipitation fields produced every day in the early morning as input for the EFAS forecasts. For the other parameters used by LISVAP and LISFLOOD, the number of stations is somewhat smaller.

EFAS-MDCC would like to thank SMHI very much for providing their data through the Open Data portal and for providing very helpful and responsive support to their data users.

EFAS version 3.4 released

EFAS version 3.4 was released in production on 10 October. This release contained several new products as well as upgrades of existing ones. Here is a short summary:

- New product: Sub-seasonal hydrological outlook. The new layer is similar to the seasonal outlook, but it is based on the extended range forecast of ECMWF which is issued twice weekly. For more detail please see <u>Sub-sea-sonal outlook</u>
- New layer: National Flood Links; layer showing links to the national web-pages. The layer has an icon on each capitol in Europe with links to national authorities.
- Upgraded calculation of climatology in the Seasonal outlook, using more years (1991-2018) and a time window of 30 days
- Upgraded ERICHA methodology. See <u>ERICHA</u> for more detail
- Upgrade in the visualisation of the ERIC layer to make its interpretation easier by enlarging only one triangle per administration region

- Upgraded EFAS-SOS service, see <u>EFAS SOS</u> -<u>Sensor Observation Service</u> for more detail.
- Revised website with more accessible training material, see Training for more detail.
- Update EFAS product generation: dynamic points too close to static points (5 pixels buffer) are now removed from the list of reporting points

For more information of this and earlier releases, all this information can be found on our <u>EFAS wiki</u>.

Meetings

ANYWHERE final conference

The final conference of the ANYWHERE project was held in Brussels 29-30 October 2019. At the conference, the main results of the project were presented to an audience of scientists, practitioners, media and politicians. EFAS products were a big part of the project throughout, and EFAS also had a live demonstration of the products at the conference.

Report from the H SAF and HEPEX joint workshop

The joint workshop of the H SAF and HEPEX communities called "Satellite inspired hydrology in an uncertain future: an H SAF and HEPEX workshop" was held at ECMWF 25-28 November 2019. The main objectives of the workshop were to present the latest advancements in satellite products for hydrology and how data assimilation of satellite and other data is used in hydrological modelling. Fredrik Wetterhall from ECMWF and the EFAS computational centre gave a talk on the challenges for the HEPEX community in the coming years in terms of satellite data using EFAS as an example.



Figure 1. Participants of the joint H SAF HEPEX workshop at ECMWF in November 2019

Upcoming events

EFAS Annual Meeting 2020, first announcement

On behalf of the operational EFAS I would like to inform, and later formally invite all EFAS Partners, including EFAS Third Party affiliates, about the 15th EFAS annual meeting 2020, which will take place at the premises of the German Weather Service (DWD) in Offenbach (Germany) on 9-10 June 2020. The official invitation with detailed information about the event, registration form, reimbursement information, accommodation and travelling will be sent beginning of next year.

The meeting will be organized by the EFAS Dissemination Centre (RWS, SMHI and SHMÚ). It will start on Tuesday morning (9 June) and end on Wednesday afternoon (10 June). At the annual meeting we will offer workshops and trainings that will address different EFAS-related interests.



Figure 2. DWD Offenbach (Germany)

Reimbursement of travel and accommodation costs is available for one expert per EFAS partner organisation that has signed the EFAS Conditions of Access with the Dissemination Centre. Reimbursement for potential future EFAS partners not having signed the EFAS Conditions of Access yet and other third parties cannot be guaranteed and will be decided on a case by case basis.

We would also like to encourage you to start thinking about possible contributions you would like to make, e.g. presentations or posters about new developments within your institute/agency or a noteworthy flood (flash or riverine) event that has taken place in the past year.

If you have any questions, please contact the technical and local organizers:

Eric Sprokkereef (RWS): eric.sprokkereef@rws.nl Markus Ziese (DWD): markus.ziese@dwd.de

Job opportunity - Post-doc hydrological model developer

The Joint Research Center of the European Commission is responsible for managing and further evolving EFAS and GloFAS as part of the Copernicus Emergency Management Service.

We are looking for a **hydrological model developer** (post-doc or 3 years' experience after University degree) to further improve the open-source hydrological model LISFLOOD used in EFAS and GloFAS.

Find out more about the job description and how to apply here (Code: 2019-IPR-E1-FGIV-013311 - ISPRA) : https://recruitment.jrc.ec.eu-ropa.eu/?type=AX&site=IPR

Application deadline: 10 January 2020 Join the EFAS & GloFAS team!

New partner

We gladly welcome the *Civil Protection Agency of the Lazio region, Italy* as new EFAS partner.

New publications

Sutanto, S.J., H.A. Van Lanen, F. Wetterhall, and X. Llort, 0: Potential of pan-European seasonal hydro-meteorological drought forecasts obtained from a Multi-Hazard Early Warning System. *Bull. Amer. Meteor. Soc.*, 0, https://doi.org/10.1175/BAMS-D-18-0196.1

Jurlina, T, Baugh, C, Pappenberger, F, Prudhomme, C. Flood hazard risk forecasting index (FHRFI) for urban areas: The Hurricane Harvey case study. *Meteorol Appl*. 2019; 1–10. https://doi.org/10.1002/met.1845

RESULTS

Summary of EFAS Flood and Flash flood Notifications

The 54 formal and 39 informal EFAS flood notifications issued in October-November 2019 are summarised in Table 1. The locations of all notifications are shown in Figure 30 and Figure 32 in the appendix.

587 Flash flood notification were issued in October - November 2019. They are summarised in Table 2. The locations of all notifications are shown in Figure 31 and Figure 33 in the appendix.

Meteorological situation

by EFAS Meteorological Data Collection Centre

October 2019

The meteorological situation in October 2019 was characterised by a lower than normal monthly mean surface pressure in most parts of the EFAS domain reflecting the recurring occurrence of low-pressure systems, whereas it was higher than normal in the northwest of the EFAS domain. Monthly precipitation totals were below normal in the southwest and southeast of the EFAS domain as well as in the north. The monthly mean air temperatures were above normal in most parts of the EFAS domain.

Floods in Great Britain in the first days of October were caused by heavy precipitation that fell mainly in the last days of September. At the beginning of October, a low-pressure system formed over Scandinavia and a secondary low-pressure system was situated over western Great Britain and Ireland, while the Mediterranean region was influenced by a high-pressure system. As the secondary low-pressure system moved to the eastern Alps, it initiated a flow of cold air at the upper levels, which initiated heavy precipitation events mainly over the Balkans. Precipitation amounts to above 70 mm in twelve hours were reported. Simultaneously, hurricane Lorenzo, which developed in the last decade of September, moved across the Azores and British-Irish Isles to central Europe and disappeared. On its way it caused destruction in the Azores (mainly due to strong wind) and floods in Ireland. Later, a low-pressure system developed over western Russia and moved northward to the Arctic.

Yet another low-pressure system developed next to Newfoundland and moved fast over the Atlantic Ocean. It slowed down between Iceland and British-Irish Isles and later became stationary over the Norwegian Sea. At the same time, a low-pressure system developed below an upper level trough over western Russia. Both troughs merged, and the later low-pressure system moved via eastern Scandinavia to the Arctic. By mid-October, a low-pressure system developed between Greenland and Iceland and moved in a long bow over the Atlantic to the British-Irish Isles. The corresponding trough extended southward to the Iberian Peninsula including cold air at the upper levels.

This initiated the development of an upper-level lowpressure system, which moved around the Iberian Peninsula and later to the central Mediterranean region. It caused high precipitation amounts especially in southern France and northern Italy with more than 70 mm in three hours, but also at the southern coast of the Mediterranean Sea. During the same days, a low-pressure system moved from Newfoundland to the Norwegian Sea and brought large-scale precipitation to Great Britain, causing again floods by the end of the month. In the last days of October, a high-pressure system developed over the Atlantic Ocean and moved to eastern and central Europe. Together with the eastward shifted Azores high it caused steady weather conditions to nearly the whole EFAS domain, while weak low-pressure systems occurred over northern Scandinavia and Russia.

In October 2019, the highest precipitation totals were observed in the southern parts of France Italy, but also in other coastal regions at the Atlantic Ocean, North Sea, Mediterranean Sea and Black Sea as well as in Russia (Figure 16). No or nearly no precipitation fell in parts of northwest Africa and south of the Caucasus Mountains. More than normal precipitation was observed in central and western Europe, southern Scandinavia and large parts of Russia (Figure 17). Less than normal precipitation fell in the southwest and southeast of the EAFS domain as well as in the northern parts.

The monthly mean air temperature ranged from -8.9°C to 32.4°C with the highest values in the southern parts and lowest in the northern and mountainous parts of the EFAS domain (Figure 20). Air temperature anomalies ranged from -5.8°C to 8.6°C (Figure 21). Monthly mean temperature values were above the long-term

mean over almost the whole EFAS domain except for Scandinavia and northwest Russia, Great Britain and Ireland, Iceland, Portugal and some regions in northwest Africa.

November 2019

The meteorological situation in November 2019 was characterised by a lower than normal monthly mean surface pressure in the central and southern parts of the EFAS domain reflecting the recurring occurrence of low-pressure systems, whereas it was higher than normal in the north of the EFAS domain. Monthly precipitation totals were below normal in the southeast and African parts of the EFAS domain as well as in the northwest and a band from southern Germany to Estonia. The highest positive monthly precipitation anomalies were observed in the central Mediterranean region. Monthly mean air temperatures were below normal in the western and eastern parts of the EFAS domain and above normal in between.

As in October, floods in Great Britain in the first days of November were the result of heavy precipitation in the last days of October and first days of November from a low-pressure system over Great Britain and Ireland. France and the northern parts of the Iberian Peninsula received also large precipitation amounts. In addition, heavy precipitation occurred in the northern central Mediterranean region in these days. Another low-pressure system moved over the Barents Sea eastward, but brought no significant precipitation amounts. Later, a low-pressure system moved from Greenland to the English Channel initiating a flow of cold air to the Iberian Peninsula and western Mediterranean region and led to snowfall in the northern mountains at the Iberian Peninsula as well as at the Balearic Islands. This low-pressure system moved eastward and dissipated.

At the western edge of the corresponding upper-level through cold air moved again to the western Mediterranean region and initiated the formation of a low-pressure system. This low-pressure system brought rain and snowfall to France, Italy, Tunisia and Algeria. While continuing its path to the Eastern Alps, it caused intense precipitation along its track. At the same time, a high-pressure system was in Eastern Europe and a low-pressure system moved from Greenland to the North Sea. Another low-pressure system moved from the same region to France and dissipated there. Cold air thus moved to the central Mediterranean region which led to intense convective precipitation and the

formation of several low-pressure systems in the central Mediterranean region. In addition, intense snowfall occurred in the southern Alpine region (Switzerland, Austria and Slovenia). Persistent southeasterly winds from these low-pressure systems along the Adriatic Sea in conjunction with spring tides caused several "aqua alta" events in Venice. As another lowpressure system moved from Greenland via the Bay of Biscay to the central Mediterranean region and dissipated there, a high-pressure system over eastern Europe started to move eastward. The low-pressure system caused not only large precipitation amounts in the central Mediterranean region but also at the Iberian Peninsula and around the Aegean Sea. In the last days of November one more low-pressure system moved from Newfoundland via the North Sea to northern Scandinavia and caused moderate precipitation amounts along its track. The African part of the EFAS domain was influenced by the eastward shifted Azores high-pressure system.

In November 2019, the highest precipitation totals were observed at the western and northern coasts in the central Mediterranean region as well as around the Bay of Biscay and the northern and western coast of the Iberian Peninsula (Figure 18). No or only very little precipitation fell in parts of northern Africa and north of the Caspian Sea. More than normal precipitation was observed in many parts of southern and western Europe, southern Scandinavia and the coastal regions of northern Africa (Figure 19). Less than normal precipitation fell in Iceland, the Scandinavian mountains, a band from southern Germany to Estonia and the eastern parts of the EFAS domain.

The monthly mean air temperature ranged from -19.3°C to 26.2°C with the highest values in the southern parts and lowest in the northern and mountainous parts of the EFAS domain (Figure 22). Air temperature anomalies ranged from -8.3°C to 7.9°C (Figure 23). Monthly mean air temperature values were above the long-term mean in a band from the eastern half of northern Africa northward over eastern Europe up to the White Sea. eastward and westward of this band the monthly mean air temperatures were below the long term means.

Hydrological situation

by EFAS Hydrological Data Collection Centre

October 2019

For October, the highest concentration of stations that exceeded their lowest threshold level was in the Po river basin in northern Italy, Rhine river basin in Switzerland and southern Sweden. In the rest of Europe, exceedances occurred in isolated stations in southern Norway, Danube river basin in Hungary, the Oder river basin in western Poland, Elbe river basin in western Germany, the Hiyon river basin in Israel and Guadalhorce river basin in southern Spain.

Stations that registered discharge values above the 90% quantile are mostly located in Great Britain and Ireland. In the rest of Europe, only isolated stations fulfil this condition: Danube river basin (Austria, Germany and Romania), Guadalquivir river basin in southern Spain, Loire river basin in France, Rhine river basin in Germany and France, Lotan river basin in Sweden and Glomma river basin in Norway.

Stations registering values below the 10% quantile were mainly in Poland (Oder and Vistula river basins), in eastern Germany (Oder river basin) and Danube river basin (southern Austria, Serbia, Romania, Germany, Slovakia, south-western Ukraine). A lower concentration of stations is found in Dniester river basins in Ukraine, Ebro river basin in Spain, south-eastern Sweden, Rhine and Elbe river basins in Germany, and Glomma and Beiarelva river basins in Norway. Finally, Maritsa river basin in Bulgaria and Loire river basin have only one station with this condition.

November 2019

For November, all stations that surpassed the lowest threshold level were in the Danube river basin, namely Slovenia (Sava and Drava basins), Slovakia (Vah Basin) and, to a lesser extent, Romania in lower Danube.

Stations in the Elbe river basin in Germany, together with those located in the Oder and Vistula basins (western Czech Republic and Poland), the Dnieper, Dniester and Vistula basins (Ukraine), Norway and the Danube river basin (in Serbia, Romania, Germany, Czech Republic and Austria), are the stations that mainly registered values below the 10% quantile. In addition, other isolated stations in the Rhine and Ebro

basins (in Germany and Spain, respectively) also showed values lower than the 10% quantile.

Contrastingly, stations that recorded discharge values above the 90% quantile are mostly located in the Danube river basin in Slovenia, Slovakia, Austria and, to a minor extent, in southeastern Germany, Romania, Hungary and Ukraine. Together with the stations listed above, several stations in Norway, Great Britain, Ireland and Spain also showed values larger than the 90% quantile. Values above 90% quantile were also registered in isolation at stations in northern Finland, northeastern Sweden, the Rhine river basin (Germany) and Dnieper river basin in Ukraine.

Verification

Figure 3 and Figure 4 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 orangered on the maps) indicates the skill is worse than the reference. The reference score is using yesterday's forecast as today's forecast.

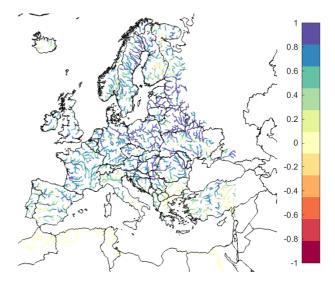


Figure 3. EFAS CRPSS at lead-time 1 day for the October-November 2019 period, for catchments >2000km2. The reference score is persistence of using previous day's forecast.

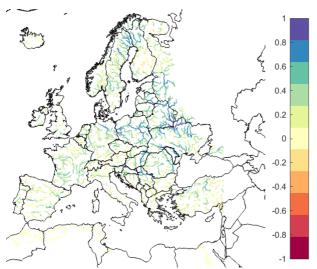


Figure 4. EFAS CRPSS at lead-time 5 days for the October-November 2019 period, for catchments >2000km2. The reference score is persistence of using previous day's forecast.

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.

The skill of the forecast was quite good, although the skill is still lower than for the same period last year (Figure 5). The scores for this year are more as expected, whereas the unusual dry summer last year affected the results and gave very positive scores. An interannual variability of the scores is to be expected.

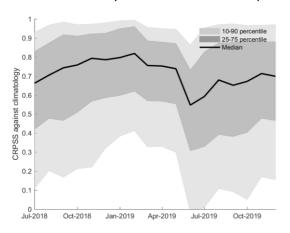


Figure 5. Monthly means of CRPSS the for lead-time 5 days for all the major river points in Europe with ECMWF ENS as forcing. Reference forecast was climatology. The skill is largest during the winter months, when there is less variation in the flow in large parts of Europe.

ARTICLES

Feedback on notifications sent May 2018 - April 2019

by Bettina Matti, EFAS Dissemination Centre

Summary

- Roughly half of the survey recipients reported an observed flooding event tied to the sent notification. The percentage of received feedback is slightly lower compared to previous years.
- It was much more common that the flood notification indicated a more severe flooding compared to the observations than a less severe flooding compared to the observations.
- The notifications had good accuracy in terms of magnitude. The accuracy in terms of time and location could be improved.
- The majority stated that the return period of the observed flood event was less than 5-years. It would maybe be of use to define the actual discharge value to be evaluated by the partner, and hence avoid the use of different return period thresholds.
- The most common cause of the 2018 flooding events was extreme rainfall and snowmelt.
- The main reason for no observed flooding is expected to be precipitation that happened in a different region and subsequently the flood event potentially happened in another region.

Overall response

This report is based on feedback on formal notifications collected from EFAS partners during between May 2018 - April 2019. A total of 68 formal notifications were sent out during that period, and 44 event reports were received which accounts for 65% of all issued formal notifications. This is a decrease compared to last specific contract for which 74% of the formal flood notifications were reviewed (Figure 6).

Formal notifications issued vs. feedback received

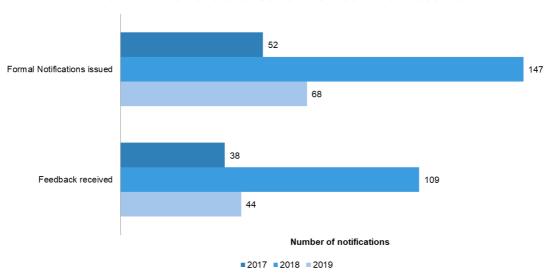


Figure 6. Issued EFAS Formal Flood Notifications during the period compared to feedback reports received.

Was the flood event observed? (Return period equal to or larger than 2 years)

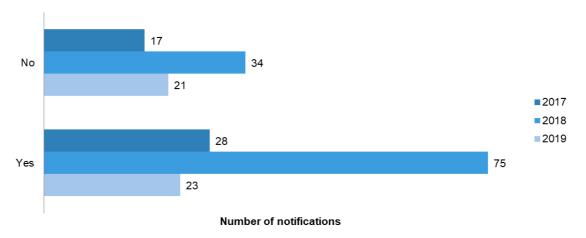


Figure 7. Partners' response to the question "Was the flood event observed?" of the feedback survey.

The initial question in the feedback form is whether a flood event was observed with respect to the issued notification or not (Figure 7). The definition of a flood event is included in the question (return period equal to or larger than 2 years) to help partners assessing the event. The 2-year return period was chosen as flood definition for this question since this allows the differentiation between correct rejections and flood events that happened but not reached the 5-year return period.

23 out of 44 respondents (52%) answered that the flood event was observed after a notification had been sent out. Note that a "yes" does not guarantee that the flood event exceeded the 5-year return period threshold (Figure 12). This is a much higher percentage of "no" floods during the SC4 compared to previous years.

Accuracy of notifications for observed events

Most of those who answered that the flooding event had indeed occurred (13 out of 23, or 57%) rated the accuracy of EFAS information in terms of location as "Pretty much as indicated in EFAS information" (Figure 8). The largest difference compared to previous years with regards to the accuracy in terms of location is a decrease of answers "pretty much as indicated" and an increase in "in the wider region".

In total, 39% of those who answered that the flooding event had indeed occurred stated that the flood event happened on the day predicted by EFAS (Figure 9). There was more spread in the other answers with slightly more events that happened earlier than predicted (35%) than later than predicted (22%). Compared to previous years this is an improvement in accuracy in terms of time concurrent with a shift from later than predicted to earlier than predicted.

Rate accuracy of EFAS information in terms of location

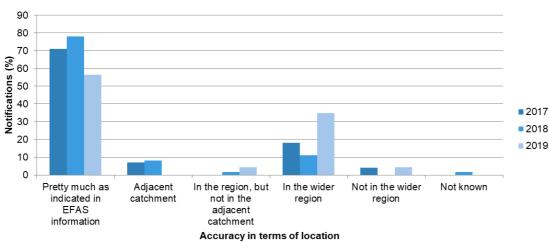


Figure 8. EFAS performance in terms of accurately predicting the location of the event.

Rate accuracy of EFAS information in terms of time 45 40 35 € 30 Notifications 25 20 15 2017 2018 2019 10 5 0 ++ (event ≥ 3 + (event 1-2 days o (event on - (event 1-2 days --(event ≥ 3 days Not known later than earlier than days later than predicted day) earlier than predicted) predicted) predicted) predicted) Accuracy in terms of time

Figure 9. EFAS performance in terms of accurately predicting the time of the event.

Rate accuracy of EFAS information in terms of magnitude 60 50 € 40 Notifications (9 **2017** 2018 2019 10 0 ++ (much more + (more severe o (comparable to - (less severe - - (much less Not known severe than than EFAS EFAS prediction) than EFAS severe than EFAS prediction) prediction) prediction) EFAS prediction)

Accuracy in terms of magnitude

Figure 10. EFAS performance in terms of accurately predicting the magnitude of the event.

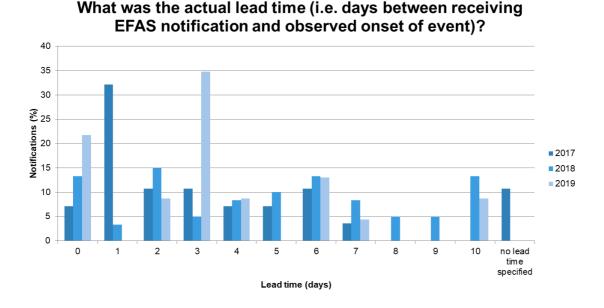


Figure 11. Partners' response to the question "What was the actual lead time (i.e. days between receiving EFAS notification and observed onset of event)?" of the feedback survey.

In terms of the magnitude of the predicted event, 35% reported that the flood was comparable to the EFAS prediction (Figure 10). 30% answered that the magnitude was less or much less severe than the EFAS prediction and only 8% stated that the flooding was more or much more severe than the EFAS prediction. Finally, 26% of the respondents were not aware of the magnitude compared to the EFAS notification.

Lead time and return period of notifications for observed events

The lead time varied greatly between the different flood events with most events (35%) having three days lead time (Figure 11). The mean and median lead time was 2 days. It is also notable that many events (5 respondents or 21%) had zero days between the notification and start of the event. This is a value higher than in previous years.

48% of the respondents who reported that the flooding event had indeed occurred stated that the return period of the observed flood event was less than a 5-year return period (Figure 12). 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. The time periods that partners' use to calculate their return periods is not known. The 5-year return period in EFAS is, for example, often much lower than the 5-year return period threshold that is used in Sweden by the Swedish Meteorological

and Hydrological Institute, probably because of the different time periods used in the calculation. In addition, EFAS-based return periods are calculated simulated discharges, whereas the EFAS partners base their thresholds on discharge observations. Calculating return periods from simulated discharges leads to a systematic bias between observed and calculated discharge for certain places. It would maybe be easier for the partners to evaluate the notifications including also a comparison of the EFAS simulated discharge with observed discharge recorded by the partners.

What was the return period of the observed flood event? 60 50 2017 2018 2019 10 0 2-4 years 5-9 years 10-19 years 20-99 years >= 100 years not known Return period (years)

Figure 12. Partners' response to the question "What is the return period of the observed flood event?" of the feedback survey.

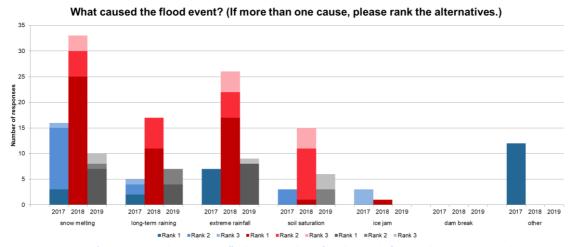


Figure 13. Partners' response to the question "What caused the flood event? If more than one cause, the alternatives are ranked from 1 to 3 (graph shows number of each cause and rank)." of the feedback survey.

This year's causes for flood events were more spread than in previous years with extreme rainfall (8 reports), snowmelt (7 reports) and long-term raining (4 reports) being ranked as first priority cause most often. Overall, snowmelt (10 reports) and extreme rainfall (9 reports) were the main drivers for flood events (Figure 13).

Notification sent but no observed flooding event

The survey recipients were asked if they had any ideas why the event did not occur; for instance, due to reservoir operation, precipitation accumulated 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 "other" (Figure 14). In this category the most often named cause was that the

precipitation fell in another region than the flood notification was issued for. Six feedback reports did not explain why the false alarm happened, which may be because they themselves do not know. This question has been added duringin recent years and therefore no data is available for 2017.

If no flood, do you have an idea why the event did not occur? 60 50 € 40 Notifications 30 2018 2019 10 0 reservoir not enough ice jam not enough other no answer precipitation snowmelt

Figure 14. Partners' response to the questions "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.)?" of the feedback survey.

Southern Europe, October to November floods 2019

by Richard Davies (FloodList) and Fredrik Wetterhall, EFAS Computational Centre

October-November 2019 were the worst months in terms of number of notifications issued since the beginning of EFAS in 2012. There were in total 54 formal, 39 informal and 587 flash flood notifications issued during the period, most of them in November. This article focuses on southern Europe, which were hit by a series of storms and floods during the period October to November 2019, with Italy, southern Spain and southern France particularly badly affected.

Mid October

Torrential rain from 21 October triggered flooding in Italy, southern Spain and southern France. In Italy, one person died, and many were evacuated after flooding in Alessandria Province, Piedmont. Piedmont Regional Agency for Environmental Protection (ARPA) reported 253mm of rain fell in 12 hours in Casaleggio Boiro on 22 October. The Bormida river in Alessandria jumped from 1.2m on 20 October to over 7.5m on 22 October.

During the same period at least 3 people died in flooding in Catalonia, Spain. Emergency services received hundreds of calls for assistance and over 50 sections of roads were blocked. Prades in Baix Camp, recorded 287.4mm of rain in 24 hours on 23 October, according to Servei Meteorològic de Catalunya (Meteocat). Meanwhile in France severe flooding hit Hérault department. Firefighters said they rescued 1,000 people from floods on 23 October. Meteo France reported 243mm of rain in a 24-hour period to 23 October at Béziers-Courtade. Three weather-related fatalities were reported by France's Interior Ministry.



Figure 15. Flood damage in Catalonia, 23 October 2019. Credit: Civil Protection, Catalonia

Early to Mid-November

Into early November and heavy rain from "Storm Amelie" triggered flooding from the Vara and Petronio rivers in Liguria in Italy. In France, a woman died in a landslide that struck near her home in southern Nice on O3 November. A week later and severe weather hit

Italy again, with firefighters responding to wind damage, landslides and floods in Calabria, Sicilia, Puglia and Basilicata from 11 to 13 November.

Flooding in Venice received widespread media attention after a high tide of 1.87 metres on 11 November - the highest in 50 years - left wide areas of the historic city underwater. Further high tides meant the flooding continued for several days after.

Days later and more heavy rain in northern Italy caused the Idice River to break its banks in the municipality of Budrio, Bologna Province, on 17 November. Around 300 people were evacuated.

Late November

In France at least 4 people died, and hundreds evacuated after flooding in Var and Alpes-Maritimes departments from 23 November. Emergency services carried out more than 2,300 interventions. The town of Roquebrune-sur-Argens in Var Department was only accessible by boat or helicopter after levels of the Argens river jumped from around 3 metres to 7.12 metres on 23 November.

In Italy heavy rain triggered a landslide near Savona in Liguria Region on 24 November, demolishing part of a motorway viaduct. In Piedmont Region, one person died after a vehicle was swept away by flood waters from the overflowing Bormida River in Sezzadio Municipality, Alessandria Province. In the Lombardy Region, the River Ticino burst its banks causing flooding in the of Pavia, prompting flood rescues.

Social media links

France

https://twitter.com/SDIS34/status/1187040871499423751 https://twitter.com/sdis_06/status/1191066698188804097 https://twitter.com/CCastaner/status/1198618428036268032 https://twitter.com/SecCivileFrance/status/1198505273004109825

Italy

https://twitter.com/emergenzavvf/status/1186382501264183296 https://twitter.com/LuigiBrugnaro/status/1194391002087337986 https://twitter.com/emergenzavvf/status/1198604767905361921 https://twitter.com/emergenzavvf/status/1198908809000955904

Spain

https://twitter.com/emergenciescat/status/1186940442203570176

Acknowledgements

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- 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: Floods in Hérault, France October 2019. Credit: Pompiers 34 Hérault

Appendix - figures

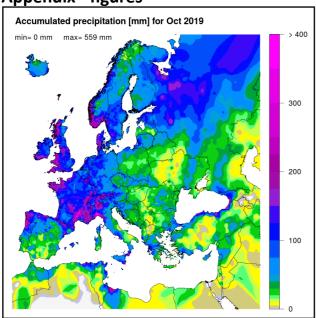


Figure 16. Accumulated precipitation [mm] for October 2019.

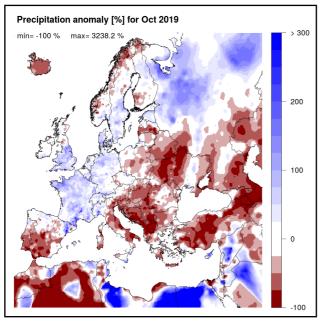


Figure 17. Precipitation anomaly [%] for October 2019, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

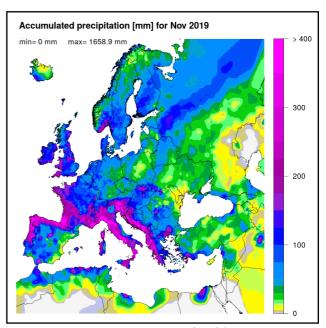


Figure 18. Accumulated precipitation [mm] for November 2019.

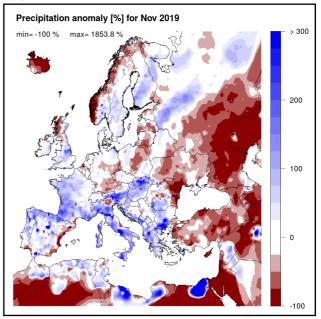


Figure 19. Precipitation anomaly [%] for November 2019, relative to a long-term average (1990-2013). Blue (red) denotes wetter (drier) conditions than normal.

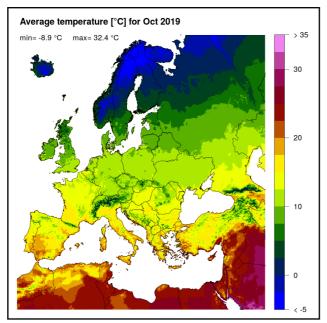


Figure 20. Mean temperature [°C] for October 2019.

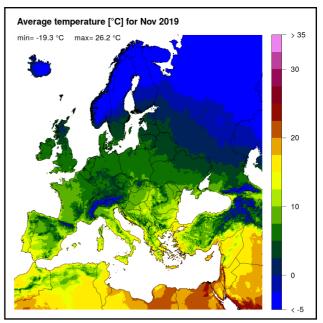


Figure 22. Mean temperature [°C] for November 2019.

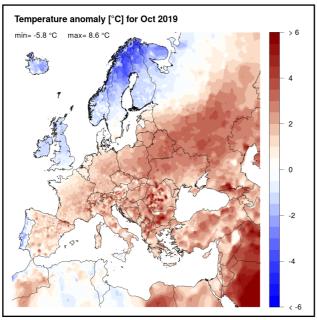


Figure 21. Temperature anomaly [°C] for October 2019, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

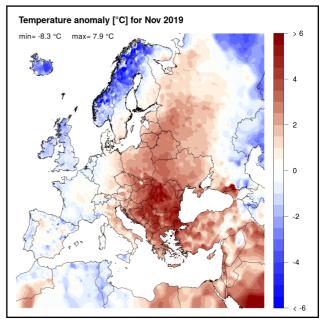


Figure 23. Temperature anomaly [°C] for November 2019, relative to a long-term average (1990-2013). Blue (red) denotes colder (warmer) temperatures than normal.

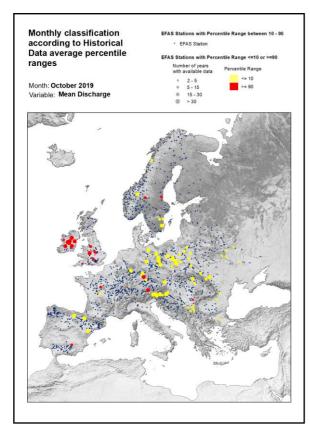


Figure 24. Monthly discharge anomalies October 2019.

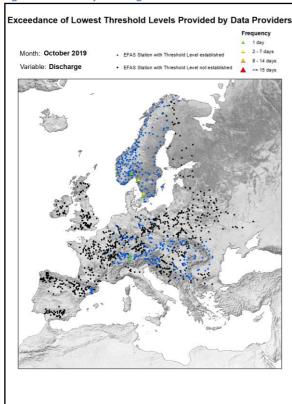


Figure 25. Lowest alert level exceedance for October 2019.

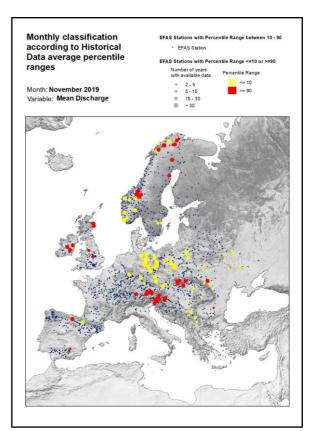


Figure 26. Monthly discharge anomalies November 2019.

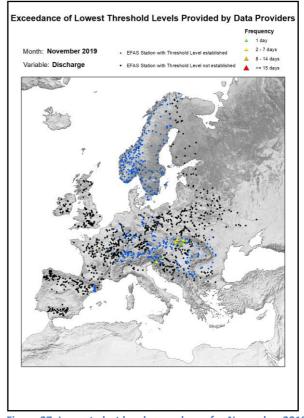
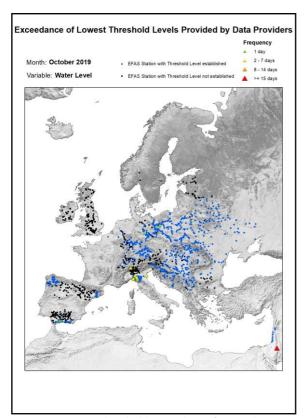


Figure 27. Lowest alert level exceedance for November 2019.





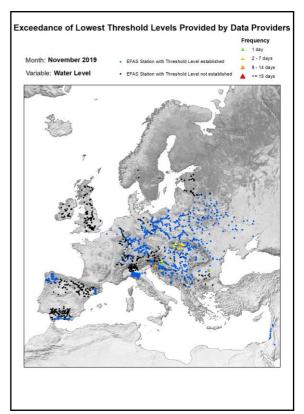


Figure 29. Lowest threshold exceedance for November 2019.

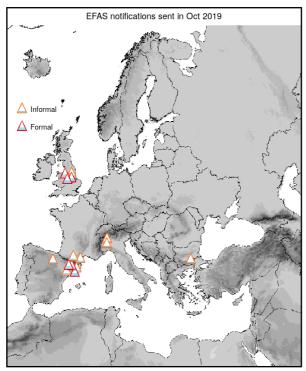
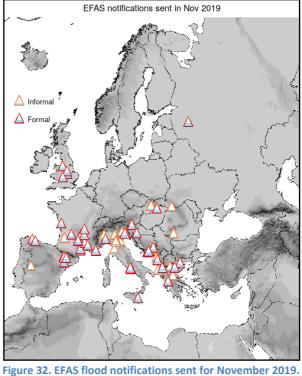


Figure 30. EFAS flood notifications sent for October 2019.



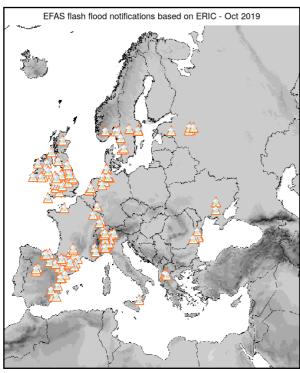


Figure 31. Flash flood notifications sent for October 2019.

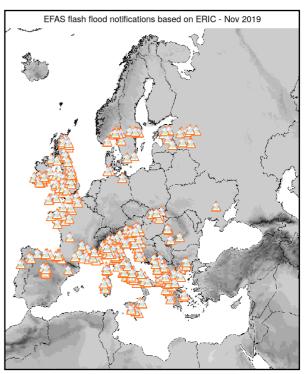


Figure 33. Flash flood notifications sent for November 2019.

Appendix - tables

Table 1. EFAS flood notifications sent in October - November 2019

Туре	Forecast date	Issue date	Lead time	River	Country
Informal	02/10/2019 00UTC	02/10/2019	3	Evros / Maritsa	Bulgaria
Informal	04/10/2019 12UTC	05/10/2019	2	Mersey	United Kingdom
ormal	05/10/2019 00UTC	05/10/2019	2	Trent	United Kingdom
nformal	05/10/2019 00UTC	05/10/2019	1	Swale, Ouse	United Kingdom
nformal	09/10/2019 12UTC	10/10/2019	2	Derwent on Trent	United Kingdom
Informal	10/10/2019 00UTC	10/10/2019	1	Mersey	United Kingdom
Informal	17/10/2019 12UTC	18/10/2019	5	Ter	Spain
Formal	17/10/2019 12UTC	18/10/2019	4	Llobregat	Spain
Informal	18/10/2019 00UTC	18/10/2019	3	Toce	Italy
Formal	18/10/2019 00UTC	18/10/2019	4	Llobregat	Spain
Formal	18/10/2019 12UTC	19/10/2019	3	Noguera Ribagor-	Spain
Formal	18/10/2019 12UTC	19/10/2019	4	Segre	Spain
Informal	19/10/2019 12UTC	20/10/2019	1	Sesia	Italy
Informal	20/10/2019 12UTC	21/10/2019	2	Segre	Spain
Informal	20/10/2019 12UTC	21/10/2019	2	Aude	France
Informal	21/10/2019 00UTC	21/10/2019	0	Sesia	Italy
Informal	21/10/2019 12UTC	22/10/2019	2	Najerilla	Spain
Informal	21/10/2019 12UTC	22/10/2019	1	Ariege	France
Formal	23/10/2019 00UTC	23/10/2019	3	Mersey	United Kingdom
Formal	24/10/2019 00UTC	24/10/2019	2	Trent	United Kingdom
Formal	01/11/2019 00UTC	01/11/2019	5	Trebizat	Bosnia and Herzegovina
Formal	01/11/2019 00UTC	01/11/2019	3	Vezere	France
Formal	01/11/2019 00UTC	01/11/2019	2	Volturno	Italy
Formal	01/11/2019 00UTC	01/11/2019	3	Buna	Republic Of Montenegro
Formal	01/11/2019 00UTC	01/11/2019	3	Buna	Republic of Montenegro
Formal	31/10/2019 12UTC	01/11/2019	1	Mersey	United Kingdom
Formal	31/10/2019 12UTC	01/11/2019	3	Coastal zone	Italy
Formal	01/11/2019 12UTC	02/11/2019	2	Svre niortaise	France
Formal	02/11/2019 00UTC	02/11/2019	4	Neretva	Croatia
Informal	02/11/2019 12UTC	03/11/2019	0	Mincio	Italy
Formal	02/11/2019 12UTC	03/11/2019	1	Lower Neretva	Bosnia and Herzegovina
Informal	03/11/2019 12UTC	04/11/2019	0	Dropt	France
Formal	04/11/2019 00UTC	04/11/2019	2	Drina	Bosnia and Herzegovina
nformal	04/11/2019 00UTC	04/11/2019	2	Tisza	Ukraine
Informal	04/11/2019 12UTC	05/11/2019	1	Sajo	Hungary
Informal	04/11/2019 12UTC	05/11/2019	1	Slana	Slovakia
Formal	05/11/2019 12UTC	06/11/2019	1	Pola	Russian Federation
Informal	06/11/2019 00UTC	06/11/2019	0	Tara	Republic of Montenegro
Formal	08/11/2019 12UTC	09/11/2019	3	Volturno	Italy
Formal	08/11/2019 12UTC	09/11/2019	3	Coastal zone	Italy
Formal	09/11/2019 00UTC	09/11/2019	4	Coastal zone	Italy
Formal	09/11/2019 00UTC	09/11/2019	-97	Trent	, United Kingdom
Formal	09/11/2019 12UTC	10/11/2019	2	Simeto	Italy
Formal	10/11/2019 00UTC	10/11/2019	3	Arachthos	Greece
Informal	10/11/2019 12UTC	11/11/2019	4	Navia	Spain
Informal	10/11/2019 12UTC	11/11/2019	2	Narcea	Spain

Formal	10/11/2010 12UTC	11/11/2010	0	Caio	Hungani
Formal	10/11/2019 12UTC 10/11/2019 12UTC	11/11/2019 11/11/2019	0 0	Sajo Devoll	Hungary Albania
Formal Informal	10/11/2019 12UTC	11/11/2019	0	Slana	Slovakia
Formal	10/11/2019 12UTC	11/11/2019	2	Aliakmonas	Greece
Informal	11/11/2019 1201C 11/11/2019 00UTC	11/11/2019	2		
	11/11/2019 000TC 11/11/2019 00UTC	11/11/2019	2	Moraca Trebizat	Republic of Montenegro
Formal			4		Bosnia and Herzegovina
Formal	11/11/2019 00UTC 11/11/2019 12UTC	11/11/2019 12/11/2019	4	Navia	Spain
Formal Informal				Drau (Drava)	Austria Albania
	11/11/2019 12UTC	12/11/2019	1 2	Vjose	
Formal	11/11/2019 12UTC	12/11/2019		Strimonas	Greece Slovakia
Informal	12/11/2019 12UTC	13/11/2019	1	Hron	
Informal	12/11/2019 12UTC	13/11/2019	1	Moraca	Republic of Montenegro
Formal	13/11/2019 00UTC	13/11/2019	0	Narcea	Spain
Formal	13/11/2019 00UTC	13/11/2019	1	Trent	United Kingdom
Formal	13/11/2019 12UTC	14/11/2019	3	Tagliamento	Italy
Formal	14/11/2019 00UTC	14/11/2019	2	Kupa	Croatia
Formal	14/11/2019 12UTC	15/11/2019	1	Avon of Tewkesbury	United Kingdom
Formal	15/11/2019 12UTC	16/11/2019	1	Livenza	Italy
Informal	15/11/2019 12UTC	16/11/2019	1	Reno	Italy
Informal	16/11/2019 00UTC	16/11/2019	1	Po, below Oglio	Italy
Informal	16/11/2019 00UTC	16/11/2019	0	Secchia	Italy
Informal	16/11/2019 12UTC	17/11/2019	0	Piave	Italy
Informal	17/11/2019 12UTC	18/11/2019	1	Arno	Italy
Formal	19/11/2019 00UTC	19/11/2019	3	Cinca	Spain
Formal	19/11/2019 12UTC	20/11/2019	4	Herault	France
Informal	19/11/2019 12UTC	20/11/2019	2	Jiu	Romania
Formal	19/11/2019 12UTC	20/11/2019	3	Cinca	Spain
Formal	19/11/2019 12UTC	20/11/2019	3	Cinca	Spain
Formal	19/11/2019 12UTC	20/11/2019	3	Noguera Ribagor-	Spain
Formal	19/11/2019 12UTC	20/11/2019	3	Herault	France
Formal	19/11/2019 12UTC	20/11/2019	4	Ardeche	France
Formal	20/11/2019 00UTC	20/11/2019	3	Loire	France
Informal	20/11/2019 00UTC	20/11/2019	0	Arachthos	Greece
Formal	20/11/2019 00UTC	20/11/2019	3	Tanaro	Italy
Formal	20/11/2019 00UTC	20/11/2019	3	Argens	France
Formal	20/11/2019 00UTC	20/11/2019	3	Allier	France
Informal	21/11/2019 00UTC	21/11/2019	0	Strimonas	Greece
Formal	21/11/2019 00UTC	21/11/2019	3	Loire	France
Formal	21/11/2019 00UTC	21/11/2019	3	Lot	France
Formal	22/11/2019 00UTC	22/11/2019	1	Sorgue	France
Formal	22/11/2019 12UTC	23/11/2019	2	Aliakmonas	Greece
Informal	23/11/2019 12UTC	24/11/2019	1	Sesia	Italy
Informal	23/11/2019 12UTC	24/11/2019	1	Loudias	Greece
Informal	25/11/2019 12UTC	26/11/2019	0	Pineios	Greece
Formal	27/11/2019 00UTC	27/11/2019	0	Argens	France
Informal	27/11/2019 12UTC	28/11/2019	0	Secchia	Italy
Informal	29/11/2019 00UTC	29/11/2019	2	Alagon	Spain

^{*} 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 2019

Туре	Forecast date	Issue date	Lead time	Region	Country
Flash Flood	30/09/2019 12UTC	01/10/2019	36	Groot-Rijnmond	Netherlands
Flash Flood	01/10/2019 00UTC	01/10/2019	24	Groot-Amsterdam	Netherlands
Flash Flood	01/10/2019 00UTC	01/10/2019	72	Novgorod	Russian Federation
Flash Flood	02/10/2019 00UTC	02/10/2019	60	Florina	Greece
Flash Flood	02/10/2019 00UTC	02/10/2019	54	Jugozapaden	Rep. North Macedonia
Flash Flood	02/10/2019 00UTC	02/10/2019	60	Pelagoniski	Rep. North Macedonia
Flash Flood	03/10/2019 00UTC	03/10/2019	60	Ialomita	Romania
Flash Flood	03/10/2019 00UTC	03/10/2019	66	Kherson	Ukraine
Flash Flood	03/10/2019 00UTC	03/10/2019	66	Dnipropetrovs'k	Ukraine
Flash Flood	03/10/2019 00UTC	03/10/2019	60	Constanta	Romania
Flash Flood	03/10/2019 00UTC	03/10/2019	60	Tulcea	Romania
Flash Flood	03/10/2019 12UTC	04/10/2019	48	Odessa	Ukraine
Flash Flood	03/10/2019 12UTC	04/10/2019	36	Calarasi	Romania
Flash Flood	04/10/2019 12UTC	05/10/2019	48	North Yorkshire CC	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	36	Lincolnshire	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	30	Warrington	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	30	East Merseyside	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	30	Cheshire West and	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	42	East Riding of Yorkshire	United Kingdom
Flash Flood	05/10/2019 00UTC	05/10/2019	36	North and North East	United Kingdom
Flash Flood	09/10/2019 12UTC	10/10/2019	60	None	Germany
Flash Flood	09/10/2019 12UTC	10/10/2019	60	None	Germany
Flash Flood	10/10/2019 00UTC	10/10/2019	36	None	United Kingdom
Flash Flood	10/10/2019 12UTC	11/10/2019	36	None	Germany
Flash Flood	10/10/2019 12UTC	11/10/2019	30	Cheshire East	United Kingdom
Flash Flood	11/10/2019 12UTC	12/10/2019	24	Novgorod	Russian Federation
Flash Flood	11/10/2019 12UTC	12/10/2019	24	Novgorod	Russian Federation
Flash Flood	12/10/2019 00UTC	12/10/2019	60	Stockholms lan	Sweden
Flash Flood	12/10/2019 00UTC	12/10/2019	66	Stockholms lan	Sweden
Flash Flood	12/10/2019 00UTC	12/10/2019	60	Stockholms lan	Sweden
Flash Flood	12/10/2019 12UTC	13/10/2019	84	Telemark	Norway
Flash Flood	13/10/2019 00UTC	13/10/2019	48	Border	Ireland
Flash Flood	13/10/2019 00UTC	13/10/2019	60	Cheshire West and	United Kingdom
Flash Flood	13/10/2019 00UTC	13/10/2019	42	Lochaber, Skye & Loch-	United Kingdom
Flash Flood	13/10/2019 12UTC	14/10/2019	36	North Yorkshire CC	United Kingdom
Flash Flood	13/10/2019 12UTC	14/10/2019	36	West	Ireland
Flash Flood	14/10/2019 00UTC	14/10/2019	18	Somerset	United Kingdom
Flash Flood	14/10/2019 00UTC	14/10/2019	18	Staffordshire CC	United Kingdom
Flash Flood	14/10/2019 00UTC	14/10/2019	24	South and West Derby-	United Kingdom
Flash Flood	14/10/2019 00UTC	14/10/2019	24	Barnsley, Doncaster	United Kingdom
Flash Flood	14/10/2019 00UTC	14/10/2019	18	Leicestershire CC and	United Kingdom
Flash Flood	14/10/2019 12UTC	15/10/2019	36	Leer	Germany
Flash Flood	14/10/2019 12UTC	15/10/2019	42	Friesland (DE)	Germany
Flash Flood	14/10/2019 12UTC	15/10/2019	36	Wesermarsch	Germany
Flash Flood	14/10/2019 12UTC	15/10/2019	36	Emsland	Germany
Flash Flood	15/10/2019 120TC 15/10/2019 00UTC	15/10/2019	30	Stade	Germany
Flash Flood	15/10/2019 000TC 15/10/2019 00UTC	15/10/2019	30 18	Luzern	Switzerland
Flash Flood	15/10/2019 000TC 15/10/2019 00UTC	16/10/2019	30	Cuxhaven	
riasii Fiuud	13/10/2013 00010	10/10/2019	50	Cuxilavell	Germany

Flash Flood	15/10/2019 12UTC	16/10/2019	66	Scotland	United Kingdom
Flash Flood	16/10/2019 12UTC	17/10/2019	48	Gwynedd	United Kingdom
Flash Flood	17/10/2019 00UTC	17/10/2019	60	Inverness & Nairn and	United Kingdom
Flash Flood	17/10/2019 00UTC	17/10/2019	42	None	United Kingdom
Flash Flood	18/10/2019 00UTC	18/10/2019	36	Telemark	Norway
Flash Flood	18/10/2019 12UTC	19/10/2019	66	Manche	France
Flash Flood	18/10/2019 12UTC	19/10/2019	36	Bas-Rhin	France
Flash Flood	18/10/2019 12UTC	19/10/2019	78	Hautes-Alpes	France
Flash Flood	19/10/2019 00UTC	19/10/2019	42	Stockholms lan	Sweden
Flash Flood	19/10/2019 00UTC	19/10/2019	24	Haut-Rhin	France
Flash Flood	19/10/2019 00UTC	19/10/2019	60	Como	Italy
Flash Flood	19/10/2019 00UTC	19/10/2019	60	Graubunden	Switzerland
Flash Flood	19/10/2019 00UTC	19/10/2019	60	Ticino	Switzerland
Flash Flood	19/10/2019 00UTC	19/10/2019	60	Sondrio	Italy
Flash Flood	19/10/2019 00UTC	20/10/2019	48	Meurthe-et-Moselle	France
Flash Flood	19/10/2019 00UTC	20/10/2019	48	Eifelkreis Bitburg-Prum	Germany
Flash Flood	19/10/2019 12UTC	20/10/2019	48	Bolzano-Bozen	Italy
Flash Flood	19/10/2019 12UTC	20/10/2019	48	Pavia	Italy
Flash Flood	19/10/2019 12UTC	20/10/2019	54	Alessandria	Italy
Flash Flood	19/10/2019 12UTC	20/10/2019	48	Vercelli	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	72	Valencia	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	42	Varese	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	42	Verbano-Cusio-Ossola	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	42	Milano	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	36	Bergamo	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	42	Lodi	Italy
Flash Flood	20/10/2019 00UTC	20/10/2019	72 72	Albacete	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	72 78	Hautes-Pyrenees	France
Flash Flood	20/10/2019 00UTC	20/10/2019	66	Alicante / Alacant	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	72	Teruel	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	72 78	Zaragoza	Spain
Flash Flood	20/10/2019 000TC 20/10/2019 00UTC	20/10/2019	78 78	Huesca	•
Flash Flood		20/10/2019	78 78	Lleida	Spain
Flash Flood	20/10/2019 00UTC 20/10/2019 00UTC				Spain
		20/10/2019	78 CC	Tarragona	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	66 72	Murcia	Spain
Flash Flood	20/10/2019 00UTC	20/10/2019	72	Castellon / Castello	Spain
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Aude	France
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Avila	Spain
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Tarn	France
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Aveyron	France
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Lot	France
Flash Flood	20/10/2019 12UTC	21/10/2019	36	Valais	Switzerland
Flash Flood	20/10/2019 12UTC	21/10/2019	66	Pyrenees-Orientales	France
Flash Flood	20/10/2019 12UTC	21/10/2019	78	Tarn-et-Garonne	France
Flash Flood	21/10/2019 00UTC	21/10/2019	24	Uri	Switzerland
Flash Flood	21/10/2019 00UTC	21/10/2019	72	La Rioja	Spain
Flash Flood	21/10/2019 12UTC	22/10/2019	48	Girona	Spain
Flash Flood	21/10/2019 12UTC	22/10/2019	48	Navarra	Spain
Flash Flood	21/10/2019 12UTC	22/10/2019	66	Alpes-de-Haute-Pro-	France
Flash Flood	21/10/2019 12UTC	22/10/2019	66	Bizkaia	Spain
Flash Flood	21/10/2019 12UTC	22/10/2019	36	Castellon/Castello	Spain

Flash Flood	22/10/2019 00UTC	22/10/2019	36	Pyronoos Atlantiques	France
Flash Flood	22/10/2019 00UTC 22/10/2019 00UTC	22/10/2019	30	Pyrenees-Atlantiques	France
Flash Flood	22/10/2019 00UTC 22/10/2019 00UTC	22/10/2019	30	Ariege	
				Hautes-Pyrenees	France
Flash Flood Flash Flood	22/10/2019 00UTC	22/10/2019	60 5.4	Burgos	Spain
	22/10/2019 00UTC	22/10/2019	54	Cantabria	Spain
Flash Flood	22/10/2019 12UTC	23/10/2019	60	Alessandria	Italy
Flash Flood	23/10/2019 00UTC	23/10/2019	24	Valladolid	Spain
Flash Flood	23/10/2019 00UTC	23/10/2019	24	Salamanca	Spain
Flash Flood	23/10/2019 12UTC	24/10/2019	36	Alessandria	Italy
Flash Flood	24/10/2019 00UTC	24/10/2019	54	South West Wales	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Powys	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Herefordshire, County	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	54	Gloucestershire	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	66	Leicestershire CC and	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Shropshire CC	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	North Nottinghamshire	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Barnsley, Doncaster	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Cheshire West and	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	North Yorkshire CC	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Lincolnshire	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	East Riding of Yorkshire	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	54	South-West (IE)	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Midland	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	54	South-East (IE)	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	54	South-East (IE)	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Mid-East	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Dublin	Ireland
Flash Flood	24/10/2019 00UTC	24/10/2019	60	North and North East	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Durham CC	United Kingdom
Flash Flood	24/10/2019 00UTC	24/10/2019	60	Gwynedd	United Kingdom
Flash Flood	24/10/2019 12UTC	25/10/2019	42	Ostfold	Norway
Flash Flood	24/10/2019 12UTC	25/10/2019	42	Vastra Gotalands lan	Sweden
Flash Flood	24/10/2019 12UTC	25/10/2019	42	Varmlands lan	Sweden
Flash Flood	24/10/2019 12UTC	25/10/2019	42	Hallands lan	Sweden
Flash Flood	24/10/2019 12UTC	25/10/2019	30	Messina	Italy
Flash Flood	25/10/2019 00UTC	25/10/2019	60	Novgorod	Russian Federation
Flash Flood	25/10/2019 00UTC	25/10/2019	48	Jonkopings lan	Sweden
Flash Flood	25/10/2019 12UTC	26/10/2019	48	Novgorod	Russian Federation
Flash Flood	25/10/2019 12UTC	26/10/2019	54	Tver'	Russian Federation
Flash Flood	25/10/2019 12UTC	26/10/2019	24	Orebro lan	Sweden
Flash Flood	25/10/2019 12UTC	26/10/2019	36	Stockholms lan	Sweden
Flash Flood	26/10/2019 12UTC	27/10/2019	24	Louna-Eesti	Estonia
Flash Flood	29/10/2019 120TC 29/10/2019 00UTC	29/10/2019	42	Cornwall and Isles of	United Kingdom
Flash Flood	01/11/2019 00UTC	01/11/2019	96	Stockholms lan	Sweden
Flash Flood	01/11/2019 000TC 01/11/2019 00UTC	01/11/2019	90	Vastra Gotalands lan	Sweden
Flash Flood	01/11/2019 00UTC	01/11/2019	102	Kesk-Eesti	Estonia
Flash Flood	01/11/2019 00UTC	01/11/2019	102	Laane-Eesti	Estonia
Flash Flood	01/11/2019 00UTC	01/11/2019	102	Louna-Eesti	Estonia
Flash Flood	31/10/2019 12UTC	01/11/2019	60	Devon CC	United Kingdom
Flash Flood	31/10/2019 12UTC	01/11/2019	60	South West Wales	United Kingdom
Flash Flood	31/10/2019 12UTC	01/11/2019	54	Mid-West	Ireland

Flash Flood	31/10/2019 12UTC	01/11/2019	54	Cardiff and Vale of Gla-	United Kingdom
Flash Flood	31/10/2019 12UTC	01/11/2019	54	South-West (IE)	Ireland
Flash Flood	31/10/2019 12UTC	01/11/2019	66	Gloucestershire	United Kingdom
Flash Flood	31/10/2019 12UTC	01/11/2019	60	Scotland	United Kingdom
Flash Flood	01/11/2019 12UTC	02/11/2019	60	Ille-et-Vilaine	France
Flash Flood	01/11/2019 12UTC	02/11/2019	60	Napoli	Italy
Flash Flood	01/11/2019 12UTC	02/11/2019	84	Tver'	Russian Federation
Flash Flood	01/11/2019 12UTC	02/11/2019	96	Pskov	Russian Federation
Flash Flood	01/11/2019 12UTC	02/11/2019	96	Novgorod	Russian Federation
Flash Flood	02/11/2019 00UTC	02/11/2019	36	Charente	France
Flash Flood	02/11/2019 00UTC	02/11/2019	30	Mayenne	France
Flash Flood	02/11/2019 00UTC	02/11/2019	30	Manche	France
Flash Flood	02/11/2019 12UTC	03/11/2019	60	Skane lan	Sweden
Flash Flood	02/11/2019 12UTC	03/11/2019	24	Hautes-Alpes	France
Flash Flood	02/11/2019 12UTC	03/11/2019	42	Bolzano-Bozen	Italy
Flash Flood	02/11/2019 12UTC	03/11/2019	24	Genova	Italy
Flash Flood	02/11/2019 12UTC	03/11/2019	66	Kronobergs lan	Sweden
Flash Flood	02/11/2019 12UTC	03/11/2019	30	Cremona	Italy
Flash Flood	03/11/2019 00UTC	03/11/2019	24	Sondrio	Italy
Flash Flood	03/11/2019 00UTC	03/11/2019	36	Fier	Albania
Flash Flood	03/11/2019 00UTC	03/11/2019	48	None	Germany
Flash Flood	03/11/2019 00UTC	03/11/2019	48	Flensburg, Kreisfreie	Germany
Flash Flood	03/11/2019 00UTC	03/11/2019	54	Landkreis Rostock	Germany
Flash Flood	03/11/2019 00UTC	03/11/2019	18	Trento	Italy
Flash Flood	03/11/2019 12UTC	04/11/2019	42	Scotland	United Kingdom
Flash Flood	03/11/2019 12UTC	04/11/2019	30	Aitoloakarnania	Greece
Flash Flood	03/11/2019 12UTC	04/11/2019	48	Vidzeme	Latvia
Flash Flood	03/11/2019 12UTC	04/11/2019	12	Benevento	Italy
Flash Flood	03/11/2019 12UTC	04/11/2019	42	Northumberland	United Kingdom
Flash Flood	03/11/2019 12UTC	04/11/2019	42	Scottish Borders	United Kingdom
Flash Flood	03/11/2019 12UTC	04/11/2019	42	Edinburgh, City Of	United Kingdom
Flash Flood	03/11/2019 12UTC	04/11/2019	66	Caserta	Italy
Flash Flood	04/11/2019 12UTC	05/11/2019	24	Goriska	Slovenia
Flash Flood	04/11/2019 12UTC	05/11/2019	24	Latgale	Latvia
Flash Flood	04/11/2019 12UTC	05/11/2019	60	Crna Gora	Rep. of Montenegro
Flash Flood	04/11/2019 12UTC	05/11/2019	60	Ulcinj	Rep. of Montenegro
Flash Flood	05/11/2019 00UTC	05/11/2019	24	Novgorod	Russian Federation
Flash Flood	05/11/2019 00UTC	05/11/2019	36	Bihor	Romania
Flash Flood	05/11/2019 00UTC	05/11/2019	24	Pskov	Russian Federation
Flash Flood	05/11/2019 00UTC	05/11/2019	54	Zlatiborski	Republic of Serbia
Flash Flood	05/11/2019 00UTC	05/11/2019	48	Shkoder	Albania
Flash Flood	05/11/2019 00UTC	05/11/2019	36	Pyrenees-Atlantiques	France
Flash Flood	05/11/2019 00UTC	05/11/2019	24	Cantabria	Spain
Flash Flood	05/11/2019 00UTC	05/11/2019	30	Sibensko-Kninska	Croatia
Flash Flood	05/11/2019 00UTC	05/11/2019	24	Tver'	Russian Federation
Flash Flood	05/11/2019 12UTC	06/11/2019	66	Korce	Albania
Flash Flood	05/11/2019 12UTC	06/11/2019	60	Prizren	Rep. Kosovo
Flash Flood	05/11/2019 12UTC	06/11/2019	60	Jugozapaden	Rep. North Macedonia
Flash Flood	05/11/2019 12UTC	06/11/2019	60	Poloski	Rep. North Macedonia
Flash Flood	05/11/2019 12UTC	06/11/2019	42	Tirane	Albania
Flash Flood	05/11/2019 12UTC	06/11/2019	48	England	United Kingdom

Flash Flood	05/11/2019 12UTC	06/11/2019	60	Gloucestershire	United Kingdom
Flash Flood	05/11/2019 12UTC	06/11/2019	54	Manche	France
Flash Flood	05/11/2019 12UTC	06/11/2019	54	Fier	Albania
Flash Flood	06/11/2019 00UTC	06/11/2019	54	Elbasan	Albania
Flash Flood	06/11/2019 00UTC	06/11/2019	48	Vlore	Albania
Flash Flood	06/11/2019 00UTC	06/11/2019	42	Durres	Albania
Flash Flood	06/11/2019 00UTC	06/11/2019	48	Gjirokaster	Albania
Flash Flood	06/11/2019 00UTC	06/11/2019	48	Oxfordshire	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	42	East Kent	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	48	Wiltshire CC	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	42	Barnsley, Doncaster	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	48	South and West Derby-	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	36	Aberdeen City and Ab-	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	48	Flintshire and Wrexham	United Kingdom
Flash Flood	06/11/2019 00UTC	06/11/2019	54	Sunderland	United Kingdom
Flash Flood	06/11/2019 12UTC	07/11/2019	36	Isle of Anglesey	United Kingdom
Flash Flood	06/11/2019 12UTC	07/11/2019	48	Landes	France
Flash Flood	06/11/2019 12UTC	07/11/2019	30	Mid-East	Ireland
Flash Flood	06/11/2019 12UTC	07/11/2019	42	Pelagoniski	Rep. North Macedonia
Flash Flood	06/11/2019 12UTC	07/11/2019	42	England	United Kingdom
Flash Flood	07/11/2019 00UTC	07/11/2019	36	Ioannina	Greece
Flash Flood	07/11/2019 12UTC	08/11/2019	30	Lucca	Italy
Flash Flood	07/11/2019 12UTC	08/11/2019	30	Pistoia	Italy
Flash Flood	07/11/2019 12UTC	08/11/2019	54	Tver'	Russian Federation
Flash Flood	07/11/2019 12UTC	08/11/2019	36	Zadarska Zupanija	Croatia
Flash Flood	07/11/2019 12UTC	08/11/2019	66	Stockholms lan	Sweden
Flash Flood	07/11/2019 12UTC	08/11/2019	60	Skane lan	Sweden
Flash Flood	07/11/2019 12UTC	08/11/2019	78	Cantabria	Spain
Flash Flood	08/11/2019 00UTC	08/11/2019	66	Asturias	Spain
Flash Flood	08/11/2019 00UTC	08/11/2019	66	Gipuzkoa	Spain
Flash Flood	08/11/2019 12UTC	09/11/2019	42	Uppsala lan	Sweden
Flash Flood	08/11/2019 12UTC	09/11/2019	42	Sodermanlands lan	Sweden
Flash Flood	08/11/2019 12UTC	09/11/2019	54	Segovia	Spain
Flash Flood	08/11/2019 12UTC	09/11/2019	36	None	Italy
Flash Flood	08/11/2019 12UTC	09/11/2019	42	Worcestershire	United Kingdom
Flash Flood	09/11/2019 00UTC	09/11/2019	30	Leicestershire CC and	United Kingdom
Flash Flood	09/11/2019 00UTC	09/11/2019	30	Lincolnshire	United Kingdom
Flash Flood	09/11/2019 00UTC	09/11/2019	30	Staffordshire CC	United Kingdom
Flash Flood	09/11/2019 00UTC	09/11/2019	18	Mayenne	France
Flash Flood	09/11/2019 00UTC	09/11/2019	18	Basse-Normandie	France
Flash Flood	09/11/2019 00UTC	09/11/2019	36	Presovsky kraj	Slovakia
Flash Flood	09/11/2019 00UTC	09/11/2019	66	Novgorod	Russian Federation
Flash Flood	09/11/2019 12UTC	10/11/2019	54	South Ayrshire	United Kingdom
Flash Flood	09/11/2019 12UTC	10/11/2019	78	North of Northern Ire-	United Kingdom
Flash Flood	10/11/2019 00UTC	10/11/2019	66	Conwy and Denbigh-	United Kingdom
Flash Flood	10/11/2019 00UTC	10/11/2019	60	Messina	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	48	Cheshire East	United Kingdom
Flash Flood	10/11/2019 00UTC	10/11/2019	132	Alessandria	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	60	Taranto	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	54	Bari	Italy
Flash Flood	10/11/2019 000TC 10/11/2019 00UTC	10/11/2019	60	Barletta-Andria-Trani	Italy
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Flash Flood	10/11/2019 00UTC	10/11/2019	60	Foggia	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	48	Sicily	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	60	Ragusa	Italy
Flash Flood	10/11/2019 00UTC	10/11/2019	66	Reggio di Calabria	Italy
Flash Flood	10/11/2019 12UTC	11/11/2019	48	Inverness & Nairn and	United Kingdom
Flash Flood	10/11/2019 12UTC	11/11/2019	42	Matera	Italy
Flash Flood	10/11/2019 12UTC	11/11/2019	30	Pskov	Russian Federation
Flash Flood	10/11/2019 12UTC	11/11/2019	30	Tver'	Russian Federation
Flash Flood	10/11/2019 12UTC	11/11/2019	60	Olbia-Tempio	Italy
Flash Flood	10/11/2019 12UTC	11/11/2019	60	Sardegna	Italy
Flash Flood	10/11/2019 12UTC	11/11/2019	60	Oristano	Italy
Flash Flood	10/11/2019 12UTC	11/11/2019	72	Madrid	Spain
Flash Flood	10/11/2019 12UTC	11/11/2019	60	Sassari	Italy
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Korce	Albania
Flash Flood	11/11/2019 00UTC	11/11/2019	48	Crna Gora	Rep. of Montenegro
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Veneto	Italy
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Haute-Corse	France
Flash Flood	11/11/2019 00UTC	11/11/2019	42	Eure	France
Flash Flood	11/11/2019 00UTC	11/11/2019	72	Hunedoara	Romania
Flash Flood	11/11/2019 00UTC	11/11/2019	36	Licko-Senjska Zupanija	Croatia
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Kastoria	Greece
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Karditsa, Trikala	Greece
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Berat	Albania
Flash Flood	11/11/2019 00UTC	11/11/2019	60	Poloski	Rep. North Macedonia
Flash Flood	11/11/2019 00UTC	11/11/2019	54	Elbasan	Albania
Flash Flood	11/11/2019 00UTC	11/11/2019	60	Prizren	Republic of Kosovo
Flash Flood	11/11/2019 12UTC	12/11/2019	42	Valladolid	Spain
Flash Flood	11/11/2019 12UTC	12/11/2019	54	Ditiki Attiki	Greece
Flash Flood	11/11/2019 12UTC	12/11/2019	96	Corse-du-Sud	France
Flash Flood	11/11/2019 12UTC	12/11/2019	78	Landes	France
Flash Flood	11/11/2019 12UTC	12/11/2019	48	Kosicky kraj	Slovakia
Flash Flood	11/11/2019 12UTC	12/11/2019	42	Guadalajara	Spain
Flash Flood	11/11/2019 12UTC	12/11/2019	48	Banskobystricky kraj	Slovakia
Flash Flood	11/11/2019 12UTC	12/11/2019	48	Zilinsky kraj	Slovakia
Flash Flood	11/11/2019 12UTC	12/11/2019	48	Borsod-Abauj-Zemplen	Hungary
Flash Flood	11/11/2019 12UTC	12/11/2019	48	Mantova	Italy
Flash Flood	11/11/2019 12UTC	12/11/2019	54	Brescia	Italy
Flash Flood	12/11/2019 00UTC	12/11/2019	24	Lugo	Spain
Flash Flood	12/11/2019 00UTC	12/11/2019	24	South West Wales	United Kingdom
Flash Flood	12/11/2019 00UTC	12/11/2019	42	Sudburgenland	Austria
Flash Flood	12/11/2019 00UTC	12/11/2019	66	Gloucestershire	United Kingdom
Flash Flood	12/11/2019 00UTC	12/11/2019	66	Oxfordshire	United Kingdom
Flash Flood	12/11/2019 00UTC	12/11/2019	18	Republika Srpska	B & H,Rep. Montenegro
Flash Flood	12/11/2019 00UTC	12/11/2019	42	Ostliche Obersteier-	Austria
Flash Flood	12/11/2019 00UTC	12/11/2019	48	West- und Sudsteier-	Austria
Flash Flood	12/11/2019 00UTC	12/11/2019	30	Treviso	Italy
Flash Flood	12/11/2019 00UTC	12/11/2019	36	Friuli-Venezia Giulia	Italy
Flash Flood	12/11/2019 00UTC	12/11/2019	36	Udine	Italy
Flash Flood	12/11/2019 00UTC	12/11/2019	36	Presovsky kraj	Slovakia
Flash Flood	12/11/2019 00UTC	12/11/2019	66	Worcestershire	United Kingdom
Flash Flood	12/11/2019 00UTC	12/11/2019	24	Ourense	Spain
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Flash Flood	12/11/2019 12UTC	13/11/2019	36	South-East (IE)	Ireland
Flash Flood	12/11/2019 12UTC	13/11/2019	24	Attica	Greece
Flash Flood	12/11/2019 12UTC	13/11/2019	30	Oststeiermark	Austria
Flash Flood	13/11/2019 00UTC	13/11/2019	66	Sassari	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	60	Sardegna	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	54	None	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	66	North Yorkshire CC	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	18	Ulcinj	Rep. of Montenegro
Flash Flood	13/11/2019 00UTC	13/11/2019	78	East Kent	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	42	Warwickshire	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	66	Oristano	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	24	South-East (IE)	Ireland
Flash Flood	13/11/2019 00UTC	13/11/2019	18	Crna Gora	Rep. of Montenegro
Flash Flood	13/11/2019 00UTC	13/11/2019	42	England	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	42	Stockholms lan	Sweden
Flash Flood	13/11/2019 00UTC	13/11/2019	54	Hartlepool and Stock-	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	66	Lucca	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	66	Pisa	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	60	Haute-Corse	France
Flash Flood	13/11/2019 00UTC	13/11/2019	48	Alessandria	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	48	Pavia	Italy
Flash Flood	13/11/2019 00UTC	13/11/2019	48	Lincolnshire	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	48	Staffordshire CC	United Kingdom
Flash Flood	13/11/2019 00UTC	13/11/2019	66	Firenze	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	36	Alpes-de-Haute-Pro-	France
Flash Flood	13/11/2019 12UTC	14/11/2019	96	Klagenfurt-Villach	Austria
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Unterkarnten	Austria
Flash Flood	13/11/2019 12UTC	14/11/2019	30	Powys	United Kingdom
Flash Flood	13/11/2019 12UTC	14/11/2019	42	Reggio Nell'Emilia	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	48	Modena	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Udine	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Perugia	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Livorno	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	48	Bologna	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	78	Osrednjeslovenska	Slovenia
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Pistoia	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	72	Frosinone	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	72	Lazio	Italy
Flash Flood	13/11/2019 12UTC	14/11/2019	36	Alpes-Maritimes	France
Flash Flood	13/11/2019 12UTC	14/11/2019	60	Primorsko-notranjska	Slovenia
Flash Flood	14/11/2019 00UTC	14/11/2019	24	Liguria	Italy
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Zadarska Zupanija	Croatia
Flash Flood	14/11/2019 00UTC	14/11/2019	24	Savona	Italy
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Jugovzhodna Slovenija	Croatia, Slovenia
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Posavska	Slovenia
Flash Flood	14/11/2019 00UTC	14/11/2019	48	Veneto	Italy
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Karlovacka Zupanija	Croatia
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Zagrebacka Zupanija	Croatia
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Bizkaia	Spain
Flash Flood	14/11/2019 00UTC	14/11/2019	60	Bretagne	France
Flash Flood	14/11/2019 00UTC	14/11/2019	66	Benevento	Italy

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66
Flash Flood
             14/11/2019 00UTC
                                     14/11/2019
                                                           Caserta
                                                                                    Italy
Flash Flood
             14/11/2019 00UTC
                                                     60
                                                           Latina
                                                                                    Italy
                                     14/11/2019
Flash Flood
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Flash Flood
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Flash Flood
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                                                           Licko-Senjska Zupanija
                                                                                    Croatia
Flash Flood
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                                                                                    Croatia
                                                           None
Flash Flood
             14/11/2019 00UTC
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                                                     66
                                                           Karlovacka Zupanija
                                                                                    Croatia
Flash Flood
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             14/11/2019 00UTC
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Flash Flood
             14/11/2019 00UTC
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                                                           Pyrenees-Atlantiques
                                                                                    France
Flash Flood
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                                                           Sisacko-Moslavacka
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Flash Flood
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                                                           Federacija Bosna i Her-
                                                                                    Bosnia and Herzegovina
Flash Flood
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             14/11/2019 12UTC
                                     15/11/2019
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Flash Flood
             14/11/2019 12UTC
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                                                     54
                                                           Krapinsko-Zagorska
                                                                                    Croatia
                                                                                    Italy
Flash Flood
             14/11/2019 12UTC
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                                                     60
                                                           Roma
Flash Flood
             15/11/2019 00UTC
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                                                           Mantova
                                                                                    Italy
Flash Flood
             15/11/2019 00UTC
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                                                           Ferrara
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Flash Flood
             15/11/2019 00UTC
                                     15/11/2019
                                                           Prato
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Flash Flood
             15/11/2019 00UTC
                                     15/11/2019
                                                     42
                                                           Primorsko-Goranska
                                                                                    Croatia
Flash Flood
                                     16/11/2019
                                                     18
                                                           Campobasso
             15/11/2019 12UTC
                                                                                    Italy
Flash Flood
             15/11/2019 12UTC
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                                                           Bologna
                                                                                    Italy
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                                                           Pinzgau-Pongau
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
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Flash Flood
             15/11/2019 12UTC
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                                                     48
                                                           Perugia
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             15/11/2019 12UTC
Flash Flood
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                                                           Ravenna
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Flash Flood
             15/11/2019 12UTC
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Flash Flood
             15/11/2019 12UTC
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                                                           Pisa
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Flash Flood
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                                                           Firenze
Flash Flood
             15/11/2019 12UTC
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                                                           Westliche Obersteier-
                                                                                    Austria
Flash Flood
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             15/11/2019 12UTC
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                                                           Prato
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Flash Flood
             15/11/2019 12UTC
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                                                           Veneto
                                                                                    Italy
                                                     54
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
                                                           Oberkarnten
                                                                                    Austria
Flash Flood
             15/11/2019 12UTC
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                                                           Pistoia
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                                                     36
                                                           Parma
Flash Flood
             15/11/2019 12UTC
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                                                     48
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
                                                           Treviso
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Flash Flood
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                                                     54
                                                           Klagenfurt-Villach
                                                                                    Austria
             15/11/2019 12UTC
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
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                                                           Reggio Nell'Emilia
                                                                                    Italy
Flash Flood
                                                     60
                                                           Sibensko-Kninska
             15/11/2019 12UTC
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                                                                                    Croatia
Flash Flood
             15/11/2019 12UTC
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                                                     54
                                                           Udine
                                                                                    Italy
                                                     36
                                                           Varmlands lan
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
                                                                                    Sweden
Flash Flood
                                                     18
             15/11/2019 12UTC
                                     16/11/2019
                                                           Napoli
                                                                                    Italy
Flash Flood
             15/11/2019 12UTC
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                                                           Vastra Gotalands lan
                                                                                    Sweden
Flash Flood
             15/11/2019 12UTC
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                                                           Sardegna
                                                                                    Italy
Flash Flood
             15/11/2019 12UTC
                                     16/11/2019
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                                                           Sassari
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Flash Flood
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                                                           L'Aquila
             15/11/2019 12UTC
                                     16/11/2019
                                                                                    Italy
Flash Flood
                                     16/11/2019
                                                           Segovia
             15/11/2019 12UTC
                                                     66
                                                                                    Spain
Flash Flood
             16/11/2019 00UTC
                                     16/11/2019
                                                     24
                                                           Ostfold
                                                                                    Norway
Flash Flood
             16/11/2019 00UTC
                                     16/11/2019
                                                     42
                                                           Gorenjska
                                                                                    Slovenia
             16/11/2019 00UTC
Flash Flood
                                     16/11/2019
                                                     30
                                                           Orebro lan
                                                                                    Sweden
Flash Flood
             16/11/2019 00UTC
                                     16/11/2019
                                                     36
                                                           Oristano
                                                                                    Italy
Flash Flood
                                                           Pordenone
                                                                                    Italy
             16/11/2019 00UTC
                                     16/11/2019
                                                     36
Flash Flood
             16/11/2019 00UTC
                                     16/11/2019
                                                     48
                                                           Unterkarnten
                                                                                    Austria
Flash Flood
             16/11/2019 00UTC
                                     16/11/2019
                                                     30
                                                           Rovigo
                                                                                    Italy
```

Flash Flood	16/11/2019 00UTC	16/11/2019	36	Livorno	Italy
Flash Flood	16/11/2019 00UTC	16/11/2019	36	Alessandria	Italy
Flash Flood	16/11/2019 00UTC	16/11/2019	30	Modena	Italy
Flash Flood	16/11/2019 12UTC	17/11/2019	36	West- und Sudsteier-	Austria
Flash Flood	16/11/2019 12UTC	17/11/2019	24	Grosseto	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	54	Savona	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	48	Parma	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Sassari	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	54	Vercelli	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	54	Cuneo	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Ostfold	Norway
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Oristano	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Alessandria	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	60	Roma	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Vestfold	Norway
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Aust-Agder	Norway
Flash Flood	17/11/2019 12UTC	18/11/2019	48	Pavia	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	60	Firenze	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	60	Pistoia	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	54	Liguria	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	54	Bergamo	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	48	Genova	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	42	Sardegna	Italy
Flash Flood	17/11/2019 12UTC	18/11/2019	48	Piacenza	-
Flash Flood			60	Milano	Italy
	17/11/2019 12UTC	18/11/2019			Italy
Flash Flood	18/11/2019 00UTC	18/11/2019	60	Elbasan	Albania
Flash Flood	18/11/2019 00UTC	18/11/2019	42	Torino	Italy
Flash Flood	18/11/2019 00UTC	18/11/2019	48	Treviso	Italy
Flash Flood	18/11/2019 00UTC	18/11/2019	54	Vlore	Albania
Flash Flood	18/11/2019 00UTC	18/11/2019	60	Korce	Albania
Flash Flood	18/11/2019 00UTC	18/11/2019	54	Venezia	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	30	Friuli-Venezia Giulia	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	48	Arta, Prebeza	Greece
Flash Flood	18/11/2019 12UTC	19/11/2019	24	Lucca	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	24	Varmlands lan	Sweden
Flash Flood	18/11/2019 12UTC	19/11/2019	24	Massa-Carrara	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	48	Gjirokaster	Albania
Flash Flood	18/11/2019 12UTC	19/11/2019	24	Akershus	Norway
Flash Flood	18/11/2019 12UTC	19/11/2019	48	Berat	Albania
Flash Flood	18/11/2019 12UTC	19/11/2019	48	Kastoria	Greece
Flash Flood	18/11/2019 12UTC	19/11/2019	30	Asti	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	30	Udine	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	30	Veneto	Italy
Flash Flood	18/11/2019 12UTC	19/11/2019	54	Aitoloakarnania	Greece
Flash Flood	19/11/2019 00UTC	19/11/2019	36	Ioannina	Greece
Flash Flood	19/11/2019 00UTC	19/11/2019	36	Epirus and Western	Greece
Flash Flood	19/11/2019 00UTC	19/11/2019	42	Axala	Greece
Flash Flood	19/11/2019 00UTC	19/11/2019	48	Ileia	Greece
Flash Flood	19/11/2019 00UTC	19/11/2019	30	Arta, Prebeza	Greece
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-West (IE)	Ireland

Flash Flood	20/11/2019 00UTC	20/11/2019	36	Waterford	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	36	Mid-West	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-West (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-West (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-West (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	42	Arges	Romania
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-West (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	30	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 000TC 20/11/2019 00UTC	20/11/2019	36	South-East (IE)	Ireland
Flash Flood	20/11/2019 000TC 20/11/2019 12UTC	21/11/2019	78	Var	France
Flash Flood		21/11/2019	78 48	Madrid	
	20/11/2019 12UTC				Spain
Flash Flood	20/11/2019 12UTC	21/11/2019	78 5.4	Gard	France
Flash Flood	20/11/2019 12UTC	21/11/2019	54	Guadalajara	Spain
Flash Flood	20/11/2019 12UTC	21/11/2019	60	Lleida	Spain
Flash Flood	20/11/2019 12UTC	21/11/2019	60	Vestfold	Norway
Flash Flood	20/11/2019 12UTC	21/11/2019	42	Area Metropolitana do	Portugal
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Aveyron	France
Flash Flood	20/11/2019 12UTC	21/11/2019	60	Valladolid	Spain
Flash Flood	20/11/2019 12UTC	21/11/2019	72	Worcestershire	United Kingdom
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Herault	France
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Alpes-Maritimes	France
Flash Flood	20/11/2019 12UTC	21/11/2019	66	Cornwall and Isles of	United Kingdom
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Bouches-du-Rhone	France
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Alpes-de-Haute-Pro-	France
Flash Flood	20/11/2019 12UTC	21/11/2019	84	North Yorkshire CC	United Kingdom
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Tarn	France
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Ardeche	France
Flash Flood	20/11/2019 12UTC	21/11/2019	66	England	United Kingdom
Flash Flood	20/11/2019 12UTC	21/11/2019	78	Haute-Loire	France
Flash Flood	20/11/2019 12UTC	21/11/2019	72	Powys	United Kingdom
Flash Flood	21/11/2019 00UTC	21/11/2019	84	Scotland	United Kingdom
Flash Flood	21/11/2019 00UTC	21/11/2019	72	Torino	Italy
Flash Flood	21/11/2019 00UTC	21/11/2019	42	Genova	Italy
Flash Flood	21/11/2019 00UTC	21/11/2019	30	Drama	Greece
Flash Flood	21/11/2019 00UTC	21/11/2019	66	East Riding of Yorkshire	United Kingdom
Flash Flood	21/11/2019 00UTC	21/11/2019	78	Scotland	United Kingdom
Flash Flood	21/11/2019 00UTC	21/11/2019	78	Aberdeen City and Ab-	United Kingdom
Flash Flood	21/11/2019 00UTC	21/11/2019	72	Savona	Italy
Flash Flood	21/11/2019 00UTC	21/11/2019	72	Alessandria	Italy
Flash Flood	21/11/2019 00UTC	21/11/2019	54	Pavia	Italy
Flash Flood	21/11/2019 000TC 21/11/2019 00UTC	21/11/2019	30	Smolyan	Bulgaria
Flash Flood	21/11/2019 000TC 21/11/2019 00UTC	21/11/2019	78	Cuneo	-
					Italy Eranco
Flash Flood	21/11/2019 12UTC	22/11/2019	54 66	Corse-du-Sud	France
Flash Flood	21/11/2019 12UTC	22/11/2019	66	Oristano	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	60	Vercelli	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	60	Vercelli	Italy

Flash Flood	21/11/2019 12UTC	22/11/2019	66	Caltanissetta	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	60	Vercelli	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	66	Enna	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	66	Asti	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	78	Ragusa	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	30	Aust-Agder	Norway
Flash Flood	21/11/2019 12UTC	22/11/2019	66	Sassari	Italy
Flash Flood	21/11/2019 12UTC	22/11/2019	66	Reggio di Calabria	Italy
Flash Flood	22/11/2019 00UTC	22/11/2019	54	Frosinone	Italy
Flash Flood	22/11/2019 00UTC	22/11/2019	48	Hautes-Alpes	France
Flash Flood	22/11/2019 00UTC	22/11/2019	54	Benevento	Italy
Flash Flood	22/11/2019 00UTC	22/11/2019	54	Caserta	Italy
Flash Flood	22/11/2019 00UTC	22/11/2019	54	Viterbo	Italy
Flash Flood	22/11/2019 00UTC	22/11/2019	66	Taranto	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	42	Roma	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	36	Cantabria	Spain
Flash Flood	22/11/2019 12UTC	23/11/2019	72	Ascoli Piceno	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	42	None	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	54	Agrigento	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	36	Parma	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	54	Apulia	Italy
Flash Flood	22/11/2019 12UTC	23/11/2019	78	Pieria	Greece
Flash Flood	22/11/2019 12UTC	23/11/2019	66	Karditsa, Trikala	Greece
Flash Flood	23/11/2019 00UTC	23/11/2019	72	Kilkis	Greece
Flash Flood	23/11/2019 00UTC	23/11/2019	72	Pella	Greece
Flash Flood	23/11/2019 00UTC	23/11/2019	72	Jugoistocen	Rep. North Macedonia
Flash Flood	23/11/2019 00UTC	23/11/2019	72	Thessaloniki	Greece
Flash Flood	23/11/2019 00UTC	23/11/2019	72	Serres	Greece
Flash Flood	23/11/2019 00UTC	23/11/2019	12	Pyrenees-Atlantiques	France
Flash Flood	23/11/2019 12UTC	24/11/2019	60	Xalkidiki	Greece
Flash Flood	23/11/2019 12UTC	24/11/2019	72	Plovdiv	Bulgaria
Flash Flood	23/11/2019 12UTC	24/11/2019	42	Attica	Greece
Flash Flood	23/11/2019 12UTC	24/11/2019	36	L'Aquila	Italy
Flash Flood	24/11/2019 00UTC	24/11/2019	36	Grebena, Kozani	Greece
Flash Flood	24/11/2019 00UTC	24/11/2019	42	Kastoria	Greece
Flash Flood	24/11/2019 00UTC	24/11/2019	42	Ioannina	Greece
Flash Flood	24/11/2019 12UTC	25/11/2019	30	Korce	Albania
Flash Flood	24/11/2019 12UTC	25/11/2019	48	Kardzhali	Bulgaria
Flash Flood	24/11/2019 12UTC	25/11/2019	24	Alessandria	Italy
Flash Flood	24/11/2019 12UTC	25/11/2019	48	Haskovo	Bulgaria
Flash Flood	25/11/2019 00UTC	25/11/2019	30	Xalkidiki	Greece
Flash Flood	25/11/2019 00UTC	25/11/2019	30	Thessaloniki	Greece
Flash Flood	25/11/2019 00UTC	25/11/2019	12	Larisa	Greece
Flash Flood	25/11/2019 00UTC	25/11/2019	72	North Yorkshire CC	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	48	Manche	France
Flash Flood	25/11/2019 00UTC	25/11/2019	60	East Riding of Yorkshire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	60	Lincolnshire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	66	Peterborough	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	42	Morbihan	France
Flash Flood	25/11/2019 00UTC	25/11/2019	66	North Nottinghamshire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	72	Shropshire CC	United Kingdom
				•	<u> </u>

Flash Flood	25/11/2019 00UTC	25/11/2019	54	Gloucestershire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	66	Oxfordshire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	66	Leicestershire CC and	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	66	East Kent	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	48	Ille-et-Vilaine	France
Flash Flood	25/11/2019 00UTC	25/11/2019	60	Worcestershire	United Kingdom
Flash Flood	25/11/2019 00UTC	25/11/2019	66	West Sussex (South	United Kingdom
Flash Flood	25/11/2019 12UTC	26/11/2019	72	East Lothian and Midlo-	United Kingdom
Flash Flood	25/11/2019 12UTC	26/11/2019	54	Genova	Italy
Flash Flood	25/11/2019 12UTC	26/11/2019	66	Northumberland	United Kingdom
Flash Flood	25/11/2019 12UTC	26/11/2019	36	Loire-Atlantique	France
Flash Flood	25/11/2019 12UTC	26/11/2019	66	None	United Kingdom
Flash Flood	26/11/2019 00UTC	26/11/2019	24	Sarthe	France
Flash Flood	26/11/2019 12UTC	27/11/2019	48	Pas-de-Calais	France
Flash Flood	26/11/2019 12UTC	27/11/2019	42	Aberdeen City and Ab-	United Kingdom
Flash Flood	26/11/2019 12UTC	27/11/2019	24	Pavia	Italy
Flash Flood	27/11/2019 00UTC	27/11/2019	48	Stockholms lan	Sweden
Flash Flood	27/11/2019 00UTC	27/11/2019	66	Bihor	Romania
Flash Flood	27/11/2019 00UTC	27/11/2019	42	None	France
Flash Flood	27/11/2019 00UTC	27/11/2019	30	Manche	France
Flash Flood	27/11/2019 12UTC	28/11/2019	24	Varmlands lan	Sweden
Flash Flood	27/11/2019 12UTC	28/11/2019	24	Ostfold	Norway
Flash Flood	28/11/2019 00UTC	28/11/2019	24	Sodermanlands lan	Sweden
Flash Flood	28/11/2019 00UTC	28/11/2019	60	Finistere	France
Flash Flood	28/11/2019 12UTC	29/11/2019	72	Soria	Spain
Flash Flood	28/11/2019 12UTC	29/11/2019	42	Dnipropetrovs'k	Ukraine
Flash Flood	28/11/2019 12UTC	29/11/2019	54	Cornwall and Isles of	United Kingdom
Flash Flood	28/11/2019 12UTC	29/11/2019	72	Segovia	Spain
Flash Flood	29/11/2019 00UTC	29/11/2019	42	Bretagne	France
				-	

^{*} 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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www.efas.eu www.ecmwf.int