European Flood Awareness System

EFAS *Bulletin*

December 2013– January 2014

Issue 2014(1)

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), since 2002, in close collaboration with national hydrological and meteorological services, the Monitoring and Information Centre (MIC) of the European Civil Protection Mechanism, and other research institutes.

Since 2011, EFAS is part of the initial operations of the Copernicus (formerly GMES) Emergency Management Service, (GIO EMS) and was transferred to operational service in 2012 through public tender procurement.

As a result of the procurement procedure,

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 MIC.

A Spanish consortium (REDIAM and ELIMCO) has been awarded the contract for the EFAS Hydrological data collection centre. They are responsible for collecting discharge and water level data across Europe.

The work related to the EFAS Meteorological data collection centre has been outsourced but onsite the JRC. Finally, the JRC is responsible for the overall project management related to EFAS and further development.

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Cover image: Inondation de Paris - Janvier 1910 - Quai des Grands-Augustins.

EFAS news

New features/model updates

A major update of EFAS was released on Wednesday 22nd January 2014 which contains the following new features:

- New calibrated LISFLOOD model setup for Europe.
- Updated EFAS alert threshold maps, for different return periods.
- Updated post-processing for real time hydrographs.
- Improved meteorological forcing used to update initial model conditions.
- Visualization of initial conditions and anomaly maps.
- Update of EFAS partners and network map.
- Changes in the EFAS alerting procedure for the Danube River basin.
- Other minor changes

More details are described in the document "Major update of the European Flood Awareness System – Executive Summary", which can be found online at http://www.efas.eu/download/home/major_update_01-14.pdf

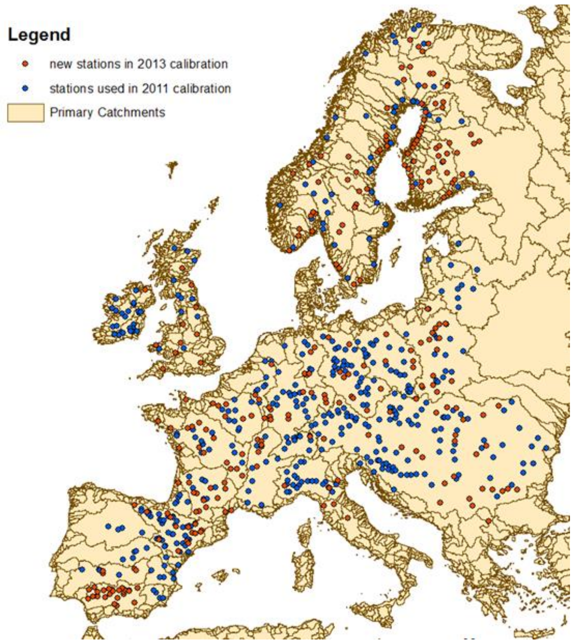

Figure 1: 693 stations where the Lisflood hydrological model was calibrated for the latest EFAS release.

EFAS Annual Meeting

The 9th EFAS Annual Meeting will take place in Lelystad, Netherlands, on Tuesday 8 and Wednesday 9 April 2014. This year the meeting will be kindly hosted by Rijkswaterstaat – the Water Management Centre for the Netherlands.

All EFAS partners and prospective partner institutions are invited to attend the meeting. We look forward to your feedback on EFAS forecasts, on recent floods, and to a fruitful discussion to address the future developments of EFAS.

More information and the meeting program will be posted soon on the home page of the EFAS website (http://www.efas.eu/home.html).

EFAS results

Meteorological situation for December 2013 - January 2014

From this issue of the EFAS Bulletin, accumulated monthly precipitation and anomaly maps are derived from the new meteorological dataset which became operational in EFAS hydrological forecasts since the recent update in January 2014 (see EFAS News above). New maps of meteorological observations include a significant increase in the number of stations reporting data.

In December 2013, highest precipitation depths above 300 mm were recorded in SW Norway, NW Italy and in the northern and western part of UK (see Figure 4), inducing a generalized positive anomaly in northern and eastern areas of Europe (Figure 5). On the other hand, a large portion of southern and eastern Europe received little or no precipitation in the same month, causing strong negative anomalies.

January 2014 was on average wetter than normal in large parts of Europe especially in northern Italy, Spain, western France and the UK, with the strongest anomalies occurring in Italy and Spain (Figure 7). Recorded accumulations of precipitation (Figure 6) were mostly below 300 mm, with rather small areas exceeding it in Slovenia, Italy, Portugal, N Spain, and Wales (UK). Locally, monthly accumulations reached exceptional values above 900 mm along the Apennine Mountains in the north of Italy.

Summary of EFAS flood alerts for December 2013 - January 2014

EFAS Flood Alerts and Flood Watches sent in December 2013 - January 2014 are summarized in Table 1 and their location is shown in Figure 8 and Figure 9.

Summary of flash flood watches for December 2013- January 2014

In December 2013, 352 flash flood reporting points were detected by EPIC (Figure 10), having probability higher than 60% of exceeding the high threshold (5-year return period). The forecast lead time of the predicted storm peaks is in the range 6 - 108 hours, with average lead time of 40 hours. Catchment size of flash flood alerts is in the range 51 - 4993 km2, with average size of 1115 km2.

In January 2014, 41 flash flood reporting points were detected by EPIC (Figure 11), having probability higher than 60% of exceeding the high threshold (5-year return period). The forecast lead time of the predicted storm peaks is in the range 18 - 48 hours, with average lead time of 31 hours. Catchment size of flash flood alerts is in the range 57 - 4376 km2, with average size of 1051 km2.

Based on these points EFAS Flash Flood watches have been sent to the corresponding EFAS partners as summarized in Table 2.

Table 1: EFAS flood alerts sent in December 2013 - January 2014

Type	Forecast date	Issue date	Lead time*	River	Country
Alert	18/12/2012 00 UTC	18/12/2012	3	Trent	United Kingdom
Watch	18/12/2012 12 UTC	19/12/2012	1	Thames, above Lea	United Kingdom
Watch	18/12/2012 12 UTC	19/12/2012	2	R. Stour	United Kingdom
Alert	18/12/2012 12 UTC	19/12/2012	3	Great Ouse	United Kingdom
Watch	20/12/2012 00 UTC	20/12/2012	3	Risle	France
Watch	19/12/2012 12 UTC	20/12/2012	3	Saone, below Doubs	France
Watch	21/12/2012 00 UTC	21/12/2012	2	Avon	United Kingdom
Watch	21/12/2012 00 UTC	21/12/2012	1	Great Ouse	United Kingdom
Watch	21/12/2012 00 UTC	21/12/2012	1	Avon	United Kingdom
Watch	20/12/2012 12 UTC	21/12/2012	2	Neckar	Germany
Watch	25/12/2012 12 UTC	26/12/2012	3	Ribble	United Kingdom
Watch	22/12/2013 00 UTC	22/12/2013	1	Avon	United Kingdom
Watch	22/12/2013 00 UTC	22/12/2013	1	Avon	United Kingdom
Alert	21/12/2013 12 UTC	22/12/2013	3	Tietar	Spain
Watch	25/12/2013 00 UTC	25/12/2013	0	Avon	United Kingdom
Watch	25/12/2013 00 UTC	25/12/2013	0	Medway	United Kingdom
Watch	25/12/2013 00 UTC	25/12/2013	0	Thames, above Lea	United Kingdom
Watch	26/12/2013 00 UTC	26/12/2013	0	Po, section Ticino - Adda	Italy
Alert	30/12/2013 12 UTC	31/12/2013	2	Shannon	Irish Republic
Alert	01/01/2014 12 UTC	02/01/2014	2	Tejo, above Henares	Spain
Watch	12/01/2014 00 UTC	12/01/2014	0	Thames, above Lea	United Kingdom
Watch	17/01/2014 12 UTC	18/01/2014	1	Po, below Oglio	Italy
Watch	27/01/2014 12 UTC	28/01/2014	2	Guadiana, above Zujar	Spain

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

Table 2: EFAS flash flood watches sent in December 2013 - January 2014

Type	Forecast date	Issue date	Lead time*	River	Country
FF Watch	19/12/2013 00 UTC	19/12/2013	36	-	France
FF Watch	19/12/2013 00 UTC	19/12/2013	36	-	France
FF Watch	19/12/2013 00 UTC	19/12/2013	36	France - costal zone	France
FF Watch	19/12/2013 00 UTC	19/12/2013	36	France - costal zone	France
FF Watch	19/12/2013 00 UTC	19/12/2013	36	France - Arc	France
FF Watch	19/12/2013 00 UTC	19/12/2013	36	France - Durance	France
FF Watch	19/12/2013 12 UTC	20/12/2013	18	-	France
FF Watch	19/12/2013 12 UTC	20/12/2013	18	-	France
FF Watch	19/12/2013 12 UTC	20/12/2013	18	France - costal zone	France
FF Watch	22/12/2013 00 UTC	22/12/2013	54	-	United Kingdom
FF Watch	22/12/2013 00 UTC	22/12/2013	54	United Kingdom - Thames,	United Kingdom
FF Watch	22/12/2013 00 UTC	22/12/2013	102	France - costal zone	France
FF Watch	22/12/2013 00 UTC	22/12/2013	90	France - Durance	France
FF Watch	22/12/2013 00 UTC	22/12/2013	96	Italy - Ticino	Italy
FF Watch	22/12/2013 00 UTC	22/12/2013	96	Italy - Adda	Italy
FF Watch	22/12/2013 00 UTC	22/12/2013	108	Austria - Drau (Drava)	Austria
FF Watch	21/12/2013 12 UTC	22/12/2013	72	France - Vilaine	France
FF Watch	21/12/2013 12 UTC	22/12/2013	72	France - costal zone	France
FF Watch	23/12/2013 00 UTC	23/12/2013	24	France - Aulne	France
FF Watch	23/12/2013 00 UTC	23/12/2013	42	Spain - Esla, below Orbigo	Spain
FF Watch	22/12/2013 12 UTC	23/12/2013	42	France - costal zone	France
FF Watch	24/12/2013 00 UTC	24/12/2013	30	Spain - Cinca	Spain
FF Watch	24/12/2013 00 UTC	24/12/2013	36	Spain - Guadiana Menor	Spain
FF Watch	25/12/2013 00 UTC	25/12/2013	12	-	Spain
FF Watch	25/12/2013 00 UTC	25/12/2013	12	Spain - Genil	Spain
FF Watch	25/12/2013 00 UTC	25/12/2013	12	Spain - Guadalete	Spain
FF Watch	25/12/2013 00 UTC	25/12/2013	36	Italy - Po, below Oglio	Italy
FF Watch	25/12/2013 00 UTC	25/12/2013	36	Italy - Po, below Oglio	Italy
FF Watch	24/12/2013 12 UTC	25/12/2013	48	Italy - Po, below Oglio	Italy
FF Watch	03/01/2014 12 UTC	04/01/2014	42	Italy - Po, below Oglio	Italy
FF Watch	16/01/2014 12 UTC	17/01/2014	24	-	France
FF Watch	24/01/2014 00 UTC	24/01/2014	36	France - Gave	France
FF Watch	23/01/2014 12 UTC	24/01/2014	48	France - Ariege	France
FF Watch	30/01/2014 00 UTC	30/01/2014	36	Italy - Po, below Oglio	Italy
FF Watch	30/01/2014 12 UTC	31/01/2014	24	Austria - Drau (Drava)	Austria
FF Watch	30/01/2014 12 UTC	31/01/2014	24	Austria - Drau (Drava)	Austria

* Lead time [hours] to the forecasted peak of the rain storm.

Forecast verification

In this issue of the EFAS Bulletin we focus once again on the bias of ensemble streamflow predictions (ESP). For easier comparison among points with different runoff regimes, results are computed and shown by rescaling the bias of ESP by the long term average discharge of each location (Pbias). Average scores over the past 365 days ending on the 1st February 2014 are plotted in Figure 2 and Figure 3.

Figure 2 shows the trend of the Pbias over the fore-cast range. A solid line indicates the mean value among all grid points, while grey shades denote the 5%-95% (light grey) and the 25%-75% (dark grey) of

their distribution. On average the spread of the Pbias increases with the lead time, while the mean takes on modest negative values, in the order of 2-4%.
Figure 3 shows the dependence between the Pbias and the upstream area of each grid point, for 5-day forecast lead time. In addition, the median and the inter-quartile range of the distribution (25%-75%) are drawn with light grey and dark grey lines, respectively. In Figure 3, one can note some peculiar features. First, most of the distribution of Pbias lies between +10% and -20%. Second, Pbias values tend to approach the zero-line as the upstream area increases. Third, the median value of the Pbias visibly deteriorates in catchments smaller than about 300 km^2. The latter feature is visible for all forecast lead times and is mostly concentrated in mountainous regions (i.e., Alps, Pyrenees, Scotland, Balkans, Norway), where the runoff is on average underestimated.
It is worth noting that the x-axis in Figure 3 is in logarithmic scale. Indeed one can see, on the left side, the model grid resolution as limit, with catchments area being always a multiple of 25 km^2. On the opposite side, largest values correspond to the lower part of the Danube River, with upstream area up to about 800,000 km^2.

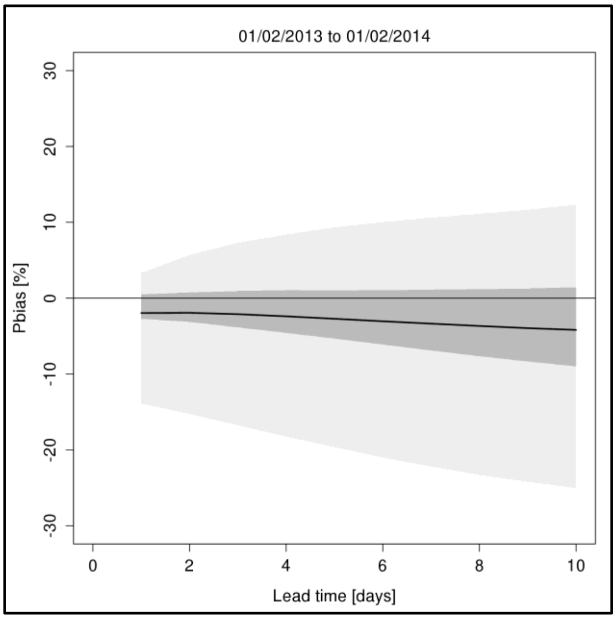

Figure 2: Percentage bias of ensemble streamflow predictions vs. lead time.

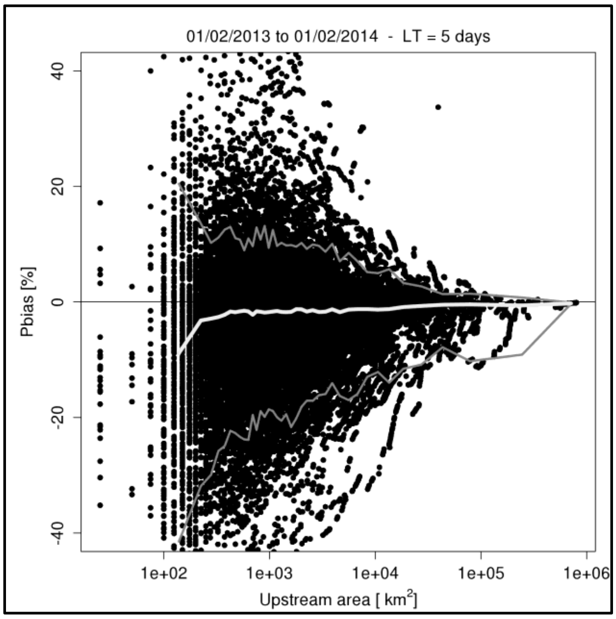

Figure 3: Percentage bias of ensemble streamflow predictions vs. upstream area, 5-day lead time.

Recent team publications

Dutra, E., Wetterhall, F., Di Giuseppe, F., Naumann, G., Barbosa, P., Vogt, J., Pozzi, W. and Pappenberger, F.: Global meteorological drought - Part 1: Probabilistic monitoring, Hydrol. Earth Syst. Sci. Discuss., 11(1), 889–917, doi:10.5194/hessd-11-889-2014, 2014.

Dutra, E., Pozzi, W., Wetterhall, F., Di Giuseppe, F., Magnusson, L., Naumann, G., Barbosa, P., Vogt, J. and Pappenberger, F.: Global meteorological drought - Part 2: Seasonal forecasts, Hydrol. Earth Syst. Sci. Discuss., 11(1), 919–944, doi:10.5194/hessd-11-919-2014, 2014.

Appendix - figures

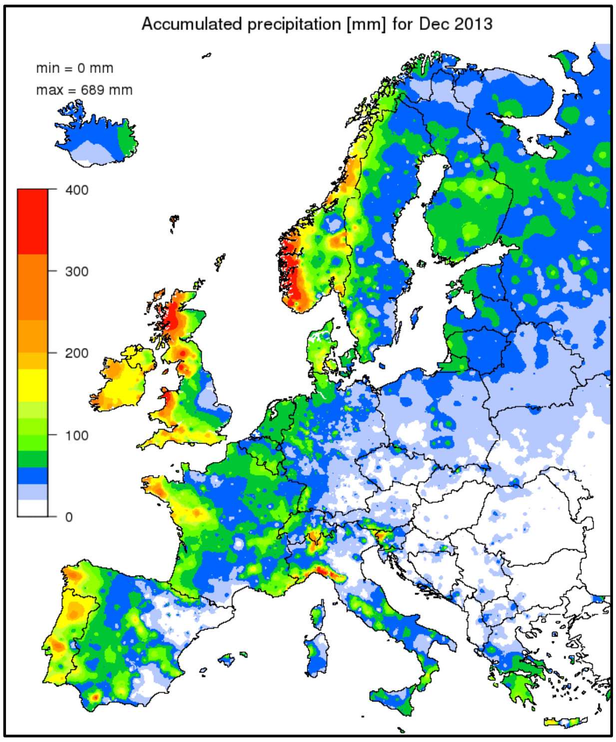

Figure 4: Accumulated precipitation [mm] for December 2013.

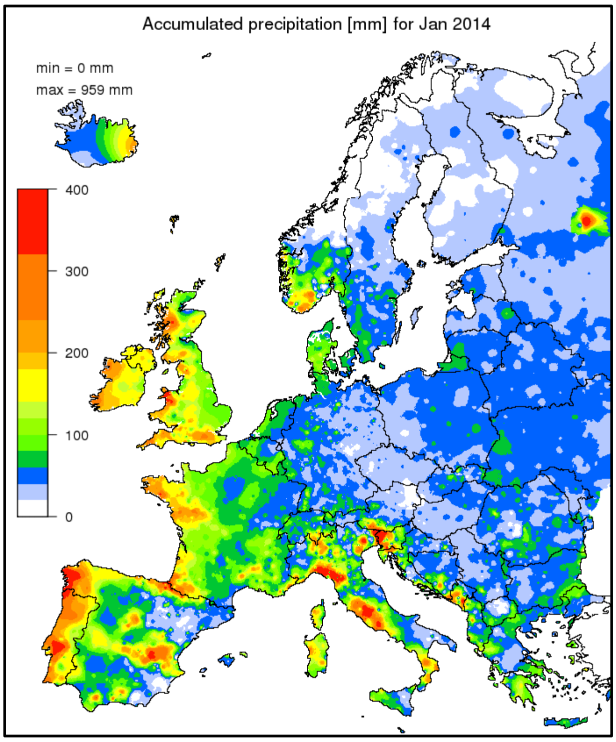

Figure 6: Accumulated precipitation [mm] for January 2014.

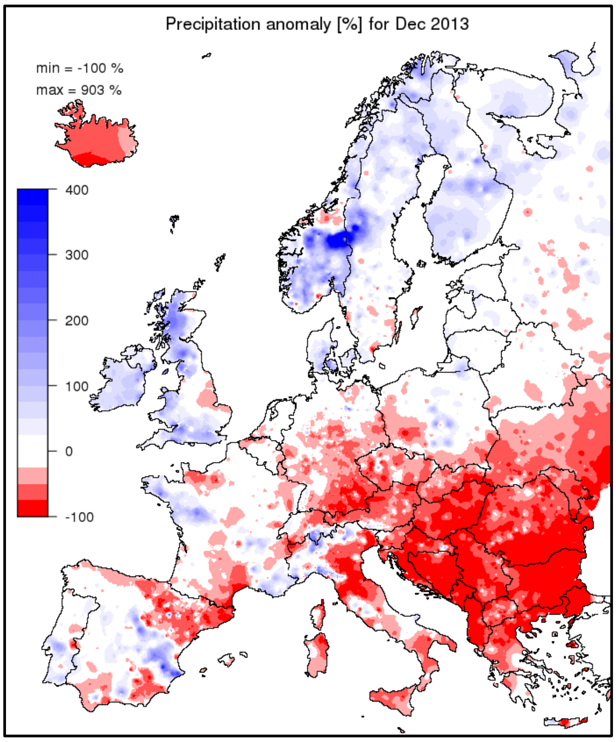

Figure 5: Precipitation anomaly [%] for December 2013, relatively to a long term average (1990-2011).

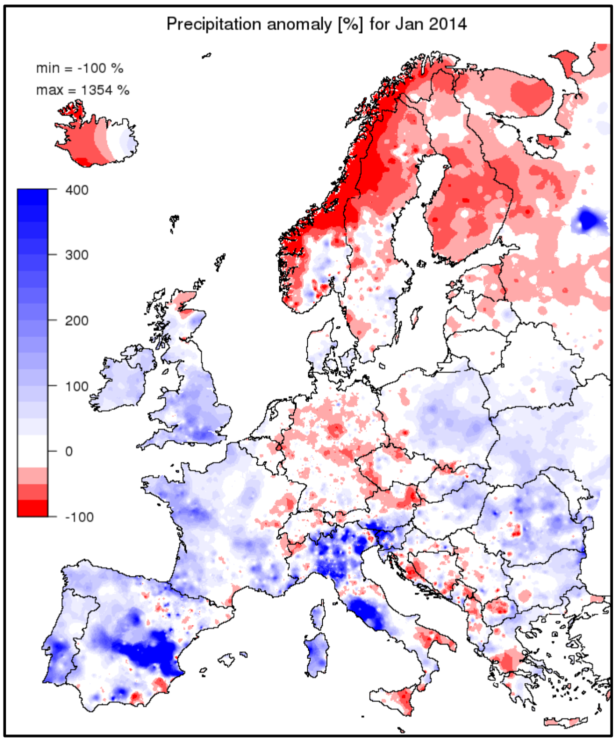

Figure 7: Precipitation anomaly [%] for January 2014, relatively to a long term average (1990-2011).

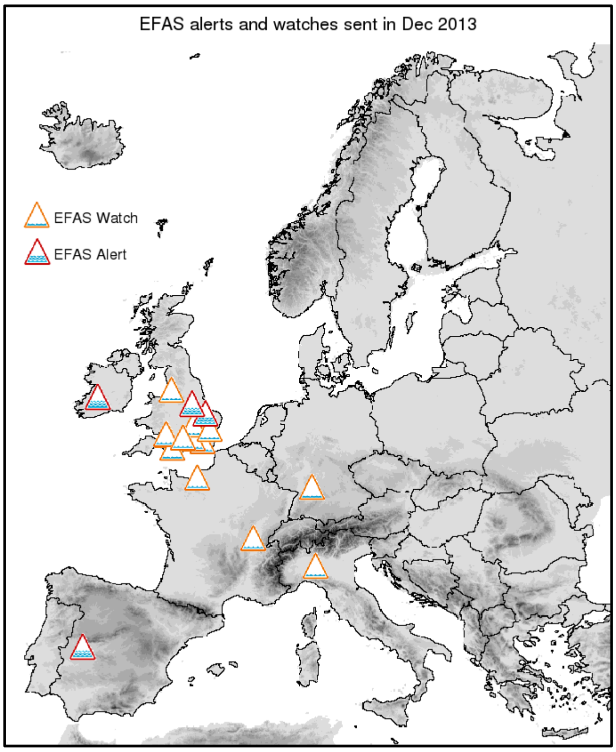

Figure 8: EFAS flood alerts and watches for December 2013.

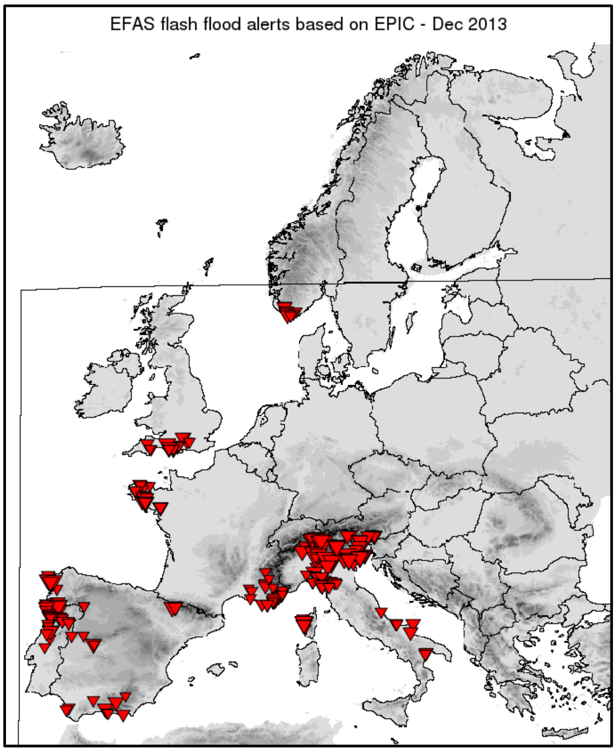

Figure 10: Flash flood reporting points for December 2013.

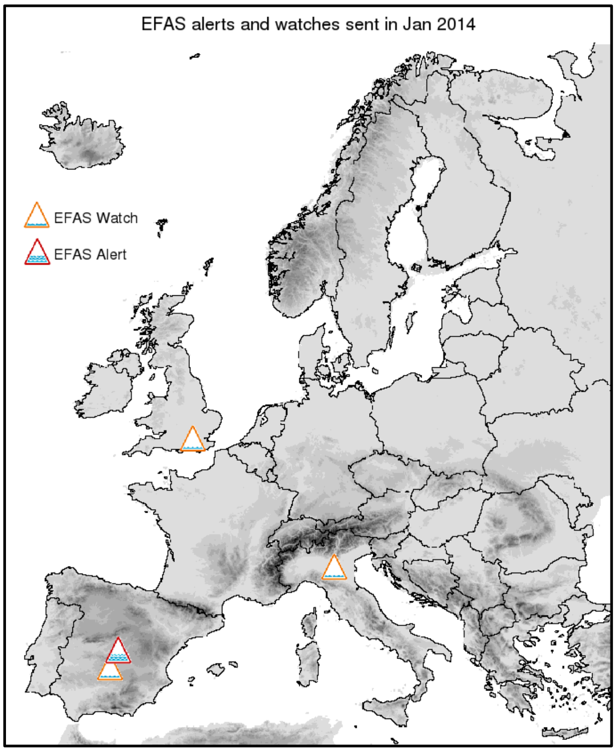

Figure 9: EFAS flood alerts and watches for January 2014.

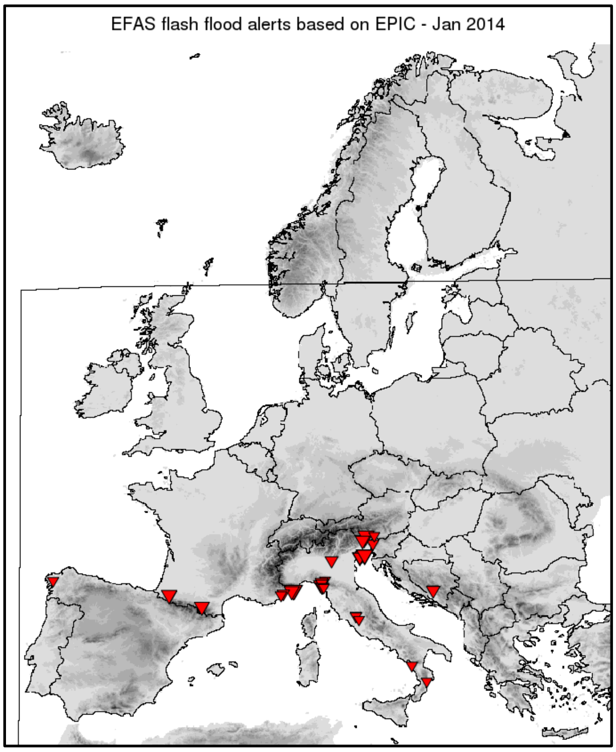

Figure 11: Flash flood reporting points for January 2014.

Acknowledgements

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- DG Enterprise - Copernicus and DG ECHO for funding the EFAS Project.
- All data providers, including meteorological data providers, hydrological services and weather forecasting centres.
- The EFAS Operational Centres.
- The Hydrological Ensemble Prediction Experiment (HEPEX) community for providing inspiration and scientific support.