The European Flood Alert System (EFAS) & The need for INSPIRE

Ad de Roo (EC-JRC)
Is climate change causing increased flooding?

Germany, 2002

Austria, 2005

Romania, 2005

Germany, 2006

UK, 2007
Focus:
- Primary focus: transboundary river systems
- Forecasts beyond 48 hours (early warning) (typically 4-6 days)
- Probabilistic approach
  • Complimentary to NHS systems
- Rivers with catchment areas > 4000km² (NEW!)

Dissemination:
- National and Regional Hydrological Services (NHS)
  • Responsible for national flood warning and triggering Civil Protection
    - EFAS is used here to alert competent staff of NHS
- MIC (simplified info on extreme floods only)
  • Preparation of aid operations
  • Only in case of extreme disasters where MS request assistance
    - EFAS can be used here to make first preparations of aid operations, to be able to respond faster to MS requests during the crisis
European Flood Alert System

Hydro & Meteo Data

- EU Flood GIS
  - Realtime H-Q data

- Historical Data
- Static Data

- Europ. Data Layers

- Meteo - Data
- Expert Knowledge of Member States

LISFLOOD hydrological model

Flood Simulations

Currently 25 National Organisations informed

EFAS online website
European Flood Alert System (EFAS) Complementing Member States

- extend warning time > 3 days by using multiple weather forecasts including weather ensembles (EPS):
  - 1 ECMWF deterministic 15 days
  - 51 ECMWF ensembles 15 days
  - 1 DWD deterministic 7 days
  - 15 COSMO-LEPS ensembles 5 days
- forecasting for entire river basins and the whole of Europe
- information exchange platform for operational services:
  - Training on new methodologies
Every pixel has its individual alarm-discharge thresholds but classification remains the same.

- **low**
  - River discharges increased, no flood hazard expected.

- **medium**
  - Significantly increased river discharges, no flood hazard expected.

- **high**
  - Seriously increased river discharges with high possibility of reaching or exceeding bankful rivers.

- **severe**
  - Very high possibility of flooding.

Temporal evolution of flood threshold exceedance:

<table>
<thead>
<tr>
<th>Country:</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>River:</td>
<td>Isar</td>
</tr>
<tr>
<td>Basin:</td>
<td>Danube, upper</td>
</tr>
<tr>
<td>Upstream Area:</td>
<td>9475</td>
</tr>
<tr>
<td>Date of this report:</td>
<td>2005081612</td>
</tr>
</tbody>
</table>

Forecast Day | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
DWD | | | | | | | | | | |
ECMWF | | | | | | | | | | |
EPS > HAL | | | | | | | | | | |
EPS > SAL | | | | | | | | | | |
An on-line system that gives an overview where floods are predicted in the next days. Accessible 24/7.
Users can click on a location of interest, to see for which day the flood is predicted and how severe it might be.

In this example, forecast made on 25 February, a small flood is predicted for 2/3 March.
August 2005 flood, CH/AT/DE
Po flood 2009 (28-29 April)
Country: Italy
MoU Status: MoU_Status
River: Po Basin: Po_Tartaro
Upstream Area: 36725
Probability Tendency: 
Probability value: 91
PointID: 1008 Lat: 0 Long: 0
Note: COSMO-LEPS are available only for the 12:00 forecast

Date of this report:
EUE: Number of members out of 51; COS: Number of members out of 16;
Forecast Day
23 24 25 26 27 28 29 30 1 2
DWD
ECMWF
EUE > HAL
4 38 43 27 10
EUE > SAL

Graph showing discharge (m^3/s) vs time (days) with various overlays for different models and precipitation data.
EFAS statistics 2008

- External Alerts: 13
- Informal Alerts: 10
- Hit: 15
- False Alarm: 4
- Status not known: 4
Example Danube I: 24 hour flood forecast Vienna

A few upstream AT river flow measurements are sufficient
Example Danube II: 48 hour flood forecast Vienna

upstream DE & AT river flow measurements needed: bilateral data exchange
Example Danube III:
6 day early flood warning for Budapest

upstream DE, AT, CH, SZ, SK river flow measurements needed to update forecast model
Observed & forecasted weather to estimate/forecast river flow

Historic data to calibrate the forecast model
Two data collection projects for EFAS

**ETN-R (GRDC, WMO)**
- Discharge station meta data
- Data collection system
- Real-time discharge data
- Historic data for RT stations

**EU-FLOOD-GIS (Atkins)**
**EU PARLIAMENT**
- Metadata catalogue for hydrological and meteorological data
- Database-GIS system
- Real-time hydrological and meteorological data
EU-FLOOD-GIS >> data feeding EFAS

Climate Change impact studies
EFAS Metadata Catalogue

The EFAS Metadata Catalogue Website is being used to assist in the creation of the European Flood Alert System (EFAS) for the European Commission Joint Research Centre.

Aims:
1. Manage increased number of floods.
2. Increase prediction time.

Following the disastrous floods in the Elbe and Danube river basins in August 2002, the European Commission announced in the communication (COM(2002)493) the development of a European Flood Alert System (EFAS). EFAS - developed within the ARDIS project - will be capable of providing medium-range flood simulations across Europe with a lead-time between 3 to 10 days.

The benefit of EFAS is two-fold. First, EFAS should provide the European Commission with useful information for the preparation and management of aid during a flood crisis. Second, National Water Authorities should benefit from additional medium-range flood information that might contribute to increased preparedness in an upcoming flood event. EFAS is aimed at complementing national flood forecasting systems, not to replace them. The European Flood Alert System (EFAS) activity is at present in a development and testing phase at the European Commission Joint Research Centre.

Since the beginning of 2003 the European Commission DG Joint Research Centre (JRC) is developing a prototype of EFAS in close collaboration with
<table>
<thead>
<tr>
<th>Name of country in which gauge is located</th>
<th>Name of catchment in which station is located (not correlated to EU Flood GIS)</th>
<th>A unique number in the range 1-129 based on the river section codes</th>
<th>Station Name</th>
<th>Station Type</th>
<th>Latitude of station in decimal degrees</th>
<th>Longitude of station in decimal degrees</th>
<th>Northing</th>
<th>Easting</th>
<th>Altitude of station above mean sea level or national reference (in metres)</th>
<th>What recording mechanism is used at this station? (data logger, chart, telemetry only)</th>
<th>Year, month and day that the station began operation (if the station is now closed, include)</th>
<th>Earliest year, month and day from which digital records (if a catalogue) are available</th>
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EUROPEAN COMMISSION

EU-FLOOD-GIS CATALOGUE KEY FEATURES

- “inspired” by Inspire (Infrastructure for spatial information in Europe)
- allows data providers view their own metadata in INSPIRE format
- edit, add and delete content
- spatial intersection of stations with EFAS catchments.
- Automatic synchronisation with EU-FLOOD-GIS database
1. EU-Synop
2. DE - DWD+Ecomet+AMDA
3. EU- Meteo Consult
4. CH-MeteoSwiss
5. IT-ARPA-Emiglia Romana
6. ES-SAIH-Ebro
7. CZ-CHMI
8. SK-Met. Service SK
9. HU-Met. Service HU
10. AT-ZAMG (INKA grids)
11. SI-Met. Service SI
12. NO-Met. Service NO

Meteo data currently supplied in NRT (< 24h)
Under negotiation/investigation

- SE - SMHI (to be followed up)
- F - Schapi data exchange (technical DB issues)
- UK – Env. Agency
- FI – Finnish Env. Agency

-No response received

-RO – Romanian meteorological services

Services still to be contacted

- Serbia, Croatia, Moldovia, Ukraine, Ireland, …
River gauging Data

- Operation in near real-time
- Automated **downloading, processing and harmonising**
- Basic **quality checking**
- Automated **delivery** to EFAS thru EU-FLOOD-GIS database

**ETN-R**

- Download newest data files
- Convert data files into GRDC-format
- Harmonise, Check 1 & Import
- Check 2 & Delivery every 12 hours
Near-Realtime discharge >> data feeding EFAS: ETN-R (status May 2009)
EU-FLOOD-GIS is a unique system

- Collects pan-European meteorological and hydrological data in real time together with storing historic data
- Provides a pan-European metadata catalogue of available hydro- and meteo data
- Combines time series, grids, shapes and other information on hydro & meteo data for Europe
Key challenges related to data needed for transboundary flood studies

- hydro-meteorological data collection on European scale is facing several difficulties having great impact on the data collection process:
  - how to know which data are available, whom to contact, and how to establish contact?
    - Although an increasing number of providers start documenting their station networks on their internet sites, these documentations are often in the national language only; INSPIRE metadata standards help here
  - negotiations for data access
    - The European National meteorological services have created in 1995 an Economic Interest Group (ECOMET) to promote the free and unrestricted exchange of meteorological information between the National Meteorological Services
      - A similar initiative does not exist for hydrological services. This is perhaps due to the fact that there is very limited exchange of hydrological data on regional and global level (Grabs, 2004), leaving data access largely up to bilateral negotiation.
  - the data collection itself
    - The general situation on spatial information in Europe is one of fragmentation of datasets and sources, gaps in availability, lack of harmonisation between datasets at different geographical scales and duplication of information collection and insufficient metadata to understand the data themselves.
Welcome to Floods Portal

The European Floods Portal brings together information on river floods and flood risk in Europe, resulting from ongoing research within the “Floods” Action at the Joint Research Centre (JRC) of the European Commission, as well as from public available information from EU countries.

Ongoing floods

Based on a close collaboration with European Hydrological Services and the Global Runoff Data Centre (GRDC) in Koblenz, Germany, an overview of the current floods in Europe is made through the European Terrestrial Network for River Discharge (ETN-R).

The map is based on near-realtime river measurements, automatically transfered by the National Hydrological Centres, via the GRDC, to the JRC. The map shows the locations, where river levels exceed critical thresholds.

Read more here

EFAS flood forecasts

The European Floods Alert System (EFAS) is an early flood warning system complimentary to national and regional systems. It provides the national institutes and the European Commission with information on possible river flooding to occur within the next 3 or more days. Since flood warning is a Member State responsibility, only archived flood warnings can be made publically available. The realtime warnings are made available to the national partner institutes only.

Read more here

Current news on Floods (In preparation)

A selection of news from the press on floods in Europe is presented here, which is updated daily.
EFAS Flood forecasts

EFAS in a nutshell

EFAS forecasts available from **2008-01-09** to **2009-04-30**

Realtime information is available by clicking here (EFAS members only)
Thank you!

http://floods.jrc.ec.europa.eu
http://efas-is.jrc.ec.europa.eu
ad.de-roo@jrc.ec.europa.eu