EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for the Protection and the Security of the Citizen
Global Security and Crisis Management (GlobeSec)

Ispra, 21 March 2011

International Workshop on Global Flood Monitoring and Forecasting

1. OBJECTIVES

The principle objective of the workshop is to bring all scientists working on global flood monitoring as well as the user community together and gain a **common understanding of the state of the art**.

A second objective is to identify if and how the various **existing prototype, pre-operational or operational systems can be conceptually and practically integrated** to provide systems-of-systems with added value. There are several pre-operational satellite-based flood monitoring systems that can benefit from integration. There are currently no pre-operational global hydro-meteorological forecasting systems to our knowledge, but research is on-going. Systems target different phases of the flood disaster cycle, have different temporal or spatial resolution, provide different forecasting lead times and have different strengths and draw-backs. The workshop aims at identifying how the various existing systems can be integrated (e.g. chaining systems in a workflow, using one system to trigger actions in another system, or combining information products into a new product). Discussions will also touch on standards for information outputs.

A third objective is to discuss the possibility to set up a **joint validation study** in one or more study areas over a longer period. Measuring the quality of flood monitoring systems is notoriously difficult since little validation data is available. Various systems measure different quantities (stage, discharge, flooded area, rain rate, rain accumulation, etc.) which cannot directly be compared. Flood attributes such as starting date and duration are ill defined and ambiguous at best. In the workshop, we will discuss a methodology to collect data from various systems during a given period to create a data body for later analysis.

2. LOCATION

The workshop is held at the Joint Research Centre of the European Commission, Building 26a, Room Raffaelo.

4. DRAFT AGENDA

Tuesday 22 March: Global flood monitoring using satellite-based techniques

9:00	Introduction: Tom De Groeve (JRC), Welcome and introduction
	Discussion: Actors and responsibilities in global flood management
10:00	Talk: G. Robert Brakenridge (Colorado University)
10:45	Talk: Fritz Policelli (NASA/Goddard Space Flight Centre)
11:30	Discussion: Flood disaster cycle and timing aspects
12:00	Lunch break
14:00	Talk: Adriana Albanese, Franca Disabato, Andrea Ajmar (Ithaca), ITHACA global flood monitoring systems
14:45	Talk: Robert Adler (Maryland University), Status and plans for global flood calculations based on satellite rainfall and hydrological models
15:30	Coffee break
15:45	Talk: Tom De Groeve et al. (JRC, GlobeSec), Global Flood Detection System
16:15	Discussion: From proof of concept to global output
17:00	Taxis to hotel
19:00	Dinner: Pizza Damino

Wednesday 23 March: Global flood forecasting using weather-based techniques

9:00	Talk: Ad de Roo et al. (JRC, Natural Hazards), European, African and Global Flood Alert System
9:45	Talk: Florian Pappenberger (European Centre for Medium Range Weather Forecasts), Seamless global extreme weather forecasting at ECMWF
10:30	Coffee break
10:45	Talk: Ulrich Looser (Global Runoff Data Center)
11:30	Discussion: Local, national, international perspectives
12:00	Lunch break
13:30	Visit to the crisis room
14:00	Talk: Nathalie Voisin (Pacific Northwest National Laboratory)
14:45	Talk: Marco Kleuskens (Deltares, Netherlands)
15:30	Coffee break
15:45	Talk: Chris Chiesa (Pacific Disaster Centre)
16:30	Discussion: Interoperability
17:00	Taxis to hotel
19:00	Dinner: Ristorante Il Pavone

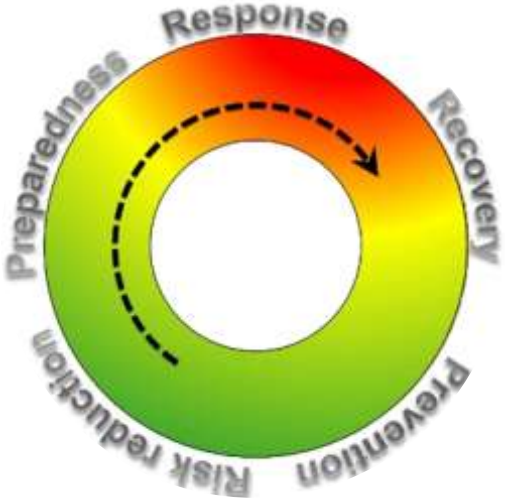
Thursday 24 March: Towards an integrated flood monitoring information system

9:00	Talk: Frederic Zanetta (International Federation of Red Cross and Red Crescent Societies)
9:30	Talk: Jens Mehlhorn (Swiss Re)
10:00	Talk: Thomas Peter (United Nations Office for Coordination of Humanitarian Affairs)
10:30	Coffee break
10:45	Talk: Olimpia Imperiali (European Commission Humanitarian Aid & Civil Protection (Monitoring and Information Centre))
11:15	Talk: Lara Prades, Etienne Labande (World Food Program)
11:45	Talk: Timothy Fewtrell (Willis)
12:15	Lunch break
14:00	Discussion: Validation study, mapping of various systems, gap analysis, priority countries
15:30	Conclusion and way forward
16:30	Closure of workshop

5. DISCUSSION TOPICS

5.1. Actors and responsibilities in global flood management

Disaster management is a cycle. Response during actual disaster is preceded by preparedness and mitigation measures and followed by recovery and reconstruction. During "peace time", the focus is on efforts on risk reduction and prevention.



Many organisations play a role in flood disasters. Later, we'll discuss the vertical aspects (from local to national to international). Here, we look at the horizontal aspects. Different organisation types involved include:

- Development agencies: prevention, risk reduction and mitigation (e.g. EU or South African Development Community)

- Hydro-meteorological agencies: early warning for floods: national, basin-wide (e.g. Zambezi River Authority) and international (WMO)

- Civil protection agencies: typical in charge of response measures (from national to international, like ECHO/MIC)

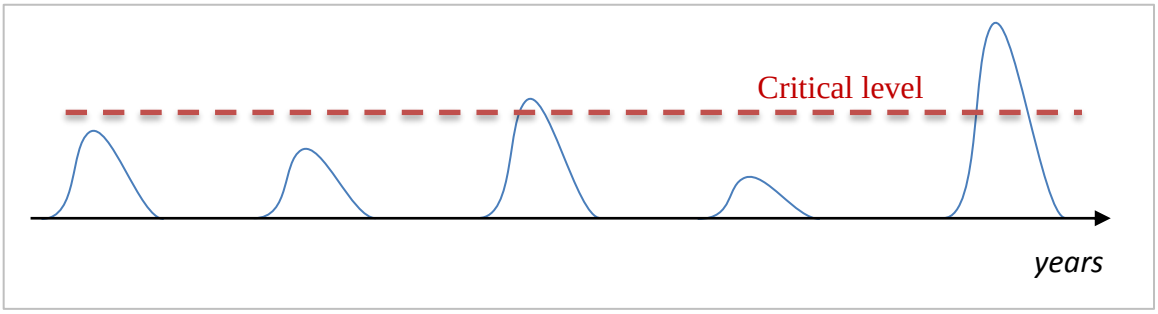
- International humanitarian assistance: relief and funding

- Post Disaster Needs Assessment: assessment of damage, losses and recovery needs (UN, World Bank, European Commission): field missions, satellite mapping

- Rapid mapping: time-critical acquisition of satellite imagery and fast processing (e.g. Flood Observatory, Charter, UNOSAT, SAFER, Sentinel Asia)

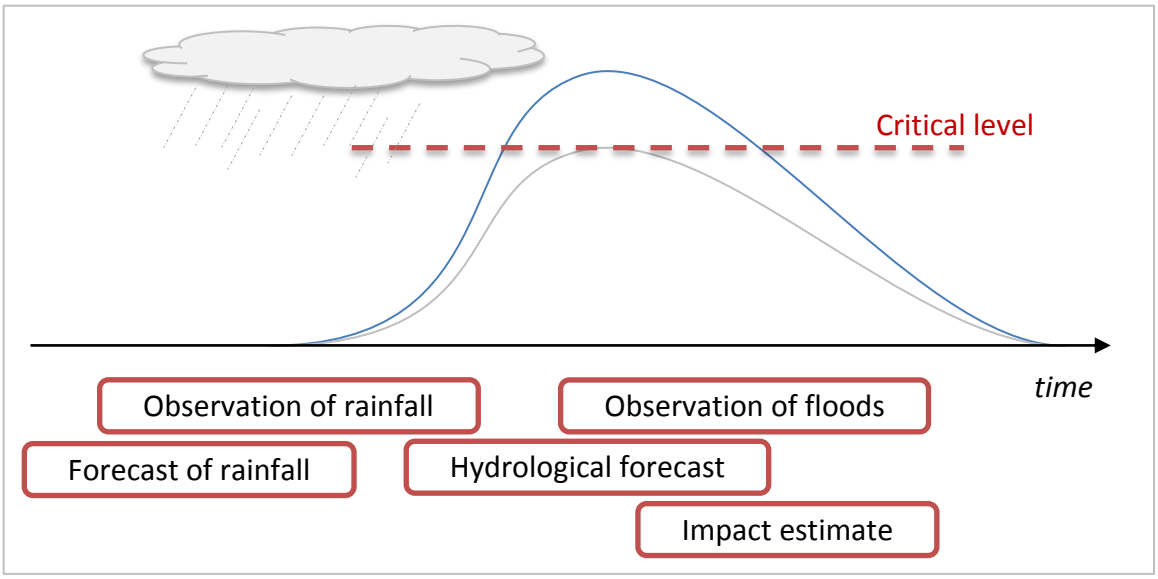
5.2. Flood disaster cycle and timing aspects

More than in other disaster types, the temporal scale of floods is very relevant. For one, floods are recurrent events that can be described statistically with properties like return periods. This is important for preparedness, for designing flood defences and for comparing flood events over the years. Historical floods can be used as impact scenarios for on-going or future floods.



Second, floods have spatio-temporal dynamics that can vary significantly (from hour-long, localised flash-floods to month-long seasonal floods affecting several countries). Some of the dynamics can be modelled accurately with hydro-meteorological models, measured with in-situ gauging or observed via satellite systems. The different dynamics are important for designing early warning and response to floods: lead times can vary from hours to weeks; inundations can last hours to weeks, affecting response and relief needs. They are also limiting factors for flood monitoring systems: orbital or aerial remote sensing is not feasible for short floods; alert chains cannot be moderated for flash floods.

Question: in which phase of the flood does your system provide unique information?



5.3. From proof of concept to global output

Flood systems create added value information based on processing of observations or model results. Development of global systems from proof-of-concepts (maybe developed in a particular geographic area or making non-universal assumptions) to useful systems must overcome different bottlenecks. Systems "could" work globally, provided some conditions are met. These bottlenecks can be methodological (e.g. needs lengthy calibration for each flood basin), IT related (e.g. need of massive disk space or CPU), cost (e.g. need of commercial satellite imagery) or model related (e.g. unstable solution). Most bottlenecks are related to data: global output depends on the availability of, for instance, high resolution elevation data, real-time rain data, accurate river data, in-situ gauging time series, seasonally adjusted average rain values, knowledge on location and type of flood defences, etc.

Some of these data sources can be of use to more than one system. Some of the data sources are maybe created by an existing system. Some data sources may exist, but the uncertainty, spatial resolution, temporal resolution or precision might not be sufficient.

Question: what are key datasets for your system that currently limit its global applicability or could improve drastically the performance?

5.4. Local, national, international perspectives

The larger a flood disaster is the more levels of government are involved. Different levels have different responsibilities and resulting information needs. This drives the fit-for-use analysis of flood monitoring and forecasting systems.

Some characteristics of different management levels are:

- Local: implementation role. Most early warning and response decisions are made locally, as are design choices for preparedness and mitigation. The "last mile" of alert chains and evacuation orders come from local authorities, using systems adapted to local context and culture.

- National: coordination and funding role. Legislation and funding for floods preparedness, mitigation, response and relief is mostly decided nationally. For large floods, response and relief coordination can be national too. Flood information systems are often nationally implemented (e.g. in hydrological or meteorological ministries), but they provide information to local authorities for action.

- International: supporting role. When flood disasters exceed the national coping capacity, bilateral or multilateral international assistance can play a role, mostly through coordination of response (e.g. OCHA), funding (e.g. ECHO), damage assessment campaigns (e.g. World Bank). In addition, some flood monitoring systems are more effective at continental or global scale (e.g. satellite monitoring and meteorological forecasts) and can provide information to national or local levels.

Question: for which level is your system most useful?

5.5. Interoperability

It is unlikely that a single method or system can provide all the required information for use by the heterogeneous flood disaster user community. More likely, coupling or integration of different systems in one way or another will provide better results. A system of systems can also grow more easily and can take advantage of advances in particular fields by replacing old system components by new ones.

Essential for integrating systems (whether tightly or loosely) is system interoperability. Since flood monitoring is by nature very interdisciplinary (with each discipline using different standards), interoperability is a challenge. Some standards used are:

- Open Geospatial Consortium
    - WMS: web mapping
    - WFS, KML: geospatial features
    - Sensor Web Enabling: sensor time series (query, task, discover)
    - WPS: web processing service
- GRIB: multi-dimensional dataset, mostly used for meteorological data
- HDF: multi-dimensional dataset, mostly used for remote sensing
- Web services or API (XML or json)

Question: what interoperability standards are supported by your system?

6. PARTICIPANTS (TENTATIVE LIST)

Scientific community (11)

- G. Robert Brakenridge, Colorado University, Director of Flood Observatory, G.Robert.Brakenridge@Dartmouth.EDU
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- Chris Chiesa, Deputy Executive Director and Chief Information Officer, Pacific Disaster Centre, Hawaii, USA, cchiesa@pdc.org
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User group (7)

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