

Background

Project FRIEND has established close links with WMO's Commission for Hydrology programme on disaster mitigation on floods. This will be a contribution to the joint UNESCO-WMO-IAHS International Flood Initiative (IFI).

Mapping FRIEND flood activities will help in identifying the action points within IFI.

FRIEND has eight regional groups: Northern Europe, Alpine and Mediterranean-AMHY, Latin America and Caribbean-AMIGO, Southern Africa, West and Central Africa-AOC, Asian Pacific, Hindu Kush Himalayas and the Nile basin group.

Among these, six groups deal with flood issues: Northern Europe, Alpine and Mediterranean-AMHY, Latin America and Caribbean-AMIGO, Asian Pacific, Hindu Kush Himalayas and Nile basin group

Northern Europe – FRIEND

Within Northern Europe FRIEND there are five research groups. One group works in the field of flood. The name of the research project is: ‘Techniques for extreme rainfall and flood runoff estimation’.

Coordinator: Blazkova Sarka, Czech Republic, blazkova@vuv.cz

Objectives:

- Real-time forecasting and simulation of flood-runoff
- Frequency estimation of peak flows and flood inundation
- Understanding of runoff generation process.

A central objective is an effort to estimate uncertainty in predictions.

Scope: All Europe

Expected outcomes:

1. Real-time forecasting and simulation of flood-runoff

- Flood inundation models
 - Models for estimation of snow-covered area SCA
 - Models for spatial distribution of snow water equivalent SWE
 - Guidelines on sensitivity analysis of flood inundation models
 - Guidelines on uncertainty analysis of flood inundation models (uncertainty to the upstream boundary conditions and to the model structure).

2. Frequency estimation of peak flows and flood inundation

- Guidelines on how to use flood frequency computation for prediction of peak flow.

Time schedules: Not as yet defined

Methodologies adopted:

1. Real-time forecasting and simulation of flood-runoff

- Calibration and validation of flood inundation models
 - Choice of model structure
 - Numerical approximations in solution of equations defined in model structure
 - Definition of boundary conditions including data input
 - Choice of effective parameter values.

- Assimilating satellite-derived snow-covered area in hydrological models.
 - Applying rainfall-runoff model to capture the dynamics of snowmelt with a good estimate of snow reservoir and its coverage as well as a reliable forecast of precipitation.
 - Modeling the spatial distribution of snow water equivalent as a two-parameter gamma distribution with the parameters dependent on the number of accumulations and ablations.
 - Applying the algorithm which relates accumulated or ablated snow to changes in the snow-covered area of catchments
 - Forecasts of precipitation.

2. Frequency estimation of peak flows and flood inundation

- Continuous simulation on hourly time-steps. 100 year simulations
- Performing simulations with behavioural parameters set to 10,000 years
- Computing uncertainty of boundary conditions
- Prediction of peak flows using cumulative distribution of values
- Model evaluation by fuzzy set theory.

3. Understanding of runoff generation process

- Rainfall simulator which produces precipitation events moving across catchments
- Agreement of results of precipitation simulator using Probable Maximum Precipitation
 - Mapping saturated areas during wet and dry events on catchments
 - Predictions of local water table levels using global catchments parameters.

Partners involved: Please complete

Related events:

| | |
|----------------------------|--------------|
| Bern, Switzerland | March 2002 |
| Nice, France | April 2002 |
| Rotterdam, The Netherlands | March 2003 |
| Nice, France | April 2004 |
| London, UK | July 2004 |
| Tromso, Norway | October 2005 |
| Vienna, Austria | April 2006 |

Alpine and Mediterranean-AMHY

Within FRIEND-AMHY there are eight research groups. One group works in the field of floods. The name of the research project is: 'Extreme events'.

Coordinator: E.Ferrari, University of Calabria, Cosenza, Italy.

The main AMHY-FRIEND activities in 2006 and 2007 for "Extreme events" topic was the organization of two international workshops on Hydrological extremes, held at the University of Calabria, in Cosenza (Italy), the first one on 2-4 May 2006 and the second one on 6-7 June 2007.

Objectives:

- To identify features responsible for heavy rains and rare floods over areas at different spatial scales.
- To understand hydrological variability and similarity across time and space.
- To compare the rainfall-runoff dynamics of extreme events in drainage basins with different climatic and morphological features.
- Education and dissemination program on heavy rainfalls modelling

Scope: Mediterranean countries

Expected outcomes:

- Scientific reports on the most disastrous (recent) hydrological events, analyzed from both hydrological and meteorological points of view, aiming at a better comprehensive explanation of hydrological extreme events in Mediterranean areas.
- Software packages on frequency analysis of hydrological extremes, based on different statistic and stochastic approaches.
- web page on "Extreme events" topics, spreading scientific information on working groups of AMHY-FRIEND, a multi-media data base, selected references about the topic, scientific appointments, software & tools, and links to related activities).
- Setup of a network of experimental basins of AMHY countries for comparison of rainfall-runoff dynamics.
- Annual workshop on Hydrological extremes to better reach objectives of "Extreme events" topic.
- Short courses on statistic and stochastic modeling of extreme floods and rainfalls.

Time schedules:

As ongoing proposals risen from the two International Workshop on "Hydrological extremes", attention of researchers involved in "Extreme events" topic in the next years (2007-08) will be focused on:

- the completion of the web page on "Extreme events" topic *end 2007*
- a final report on recent disastrous hydrological events *summer 2008*
- release of software packages on different aspects of frequency analysis of hydrological extremes *summer 2008*

- Setup of a network of experimental basins and rainfall-runoff analysis *end 2008*
- Annual workshop on Hydrological extremes *annual appointments*
- Short courses on statistic and stochastic modeling of extreme floods and rainfalls (*yet to be implemented*)

Methodologies adopted:

- Analysis of meteorological and hydrological conditions causing extreme rainfall and flood events.
- Statistical and stochastic modeling of heavy precipitation at different time scale (monthly, daily, hourly).
- Regional frequency analysis referred to annual maxima of floods and hourly/daily rainfalls.
- Distributed rainfall-runoff models for flood estimation in ungauged basins.
- comparison of the rainfall-runoff dynamics of concurrent rainfall and flood events in experimental basins of AMHY countries

Partners involved:

- University Departments / Scientific Institutions of national coordinators
- National Institutes for Hydrological/Meteorological Researches
- Civil Protection Divisions

Related events:

| | |
|---|----------------|
| Lyon (France), SHF conference | 28–29 Jan 2004 |
| Koblenz (Germany), <i>International Workshop on Hydrological Extremes</i> | 5–8 July 2004 |
| Montpellier (France), HydroSciences, <i>International Seminar on Climatic and anthropogenic impacts on the variability of water resources</i> | 22-24 Nov 2005 |
| Ohrid (Macedonia), Balwois Conference | 23-26 May 2006 |
| Cosenza (Italy), <i>1st International Workshop on Hydrological Extremes: “Observing and modeling exceptional floods and rainfalls”</i> | 3–4 May 2006 |
| Cosenza (Italy), <i>2nd International Workshop on Hydrological Extremes: “Variability in space and time of extreme rainfalls, floods and droughts”</i> | 6–8 June 2007 |

Latin America and Caribbean-AMIGO

Within FRIEND-AMIGO there are five research groups. One group works in the field of flood. The name of the research project is: 'Floods'.

Objectives:

- To establish through the internet a service of probabilistic evaluation of maximum hydrological variables
- To support the work of meteorological and hydrological services in extreme hydrological situations
- To improve the knowledge of the hydrological processes linked with heavy rains
- To develop the appropriate method for analysis of extreme hydrological phenomena
- To create a hydrological and physiographic database which permits:
 - Regional and singular analysis of the maximum extreme values of precipitation
 - Vulnerability and risk analysis
 - Digital maps of precipitation and flow index
 - Quality control of the available information.
- To contribute to the environmental education of politicians, decision –makers and the population in general.

Scope: Latin America and Caribbean

Expected outcomes:

An internet-based service of probabilistic evaluation of maximum hydrological variables.

Time schedules: Not as yet defined

Methodologies adopted:

To be defined, not visible from the document.

Partners involved:

Related events:

No events related to flood.

Hindu Kush Himalayas-HKH

Within FRIEND-HKH there are six research groups. One group works in the field of flood. The name of the research project is: 'Floods.

Coordinator: Thapa, Khadga B., Nepal

Objectives:

- To carry out flood studies in order to mitigate flood damage
- To develop regional design procedures for estimating floods at gauged and non-gauged sites in the HKH region
- To develop rainfall-runoff models for the region which will contribute to flood forecasting activities
- To investigate impact of land-use change upon downstream river flow regimes.

Scope: Bangladesh, Bhutan, China, Nepal and Pakistan

Expected outcomes:

- Flood risk maps
- Vulnerability maps
- Guidelines on flood disaster mitigation
- Publications on the institutional set-ups in the watershed
- Rainfall-runoff models for flood forecasting
- Water resource schemes.

Time schedules: Not as yet defined

Methodologies adopted:

- Using GIS and remote sensing data to map flood risk vulnerability
- Hydraulic model based on detailed topographic
- Hydrologic Engineering Center's River Analysis System (NEC-RAC) model
- A detailed socio-economic survey
- Exchange of real-time hydrological data from pilot stations
- Interpolation of missing data
- Seminars on flood disaster mitigation
- Structural and non structural measures for flood disaster mitigation
- High level meetings and national consultations

Partners involved: please complete

Related events:

Nepal, regional seminar

January 2004

Nile-FRIEND

Within Nile-FRIEND there are five research groups. One group works in the field of flood. The name of research project is: 'Flood frequency analysis'.

Coordinator: Motaleb, M. A. Water resources research institute, Egypt,
Motaleb@wrrisnet.com

Objectives:

- To develop regional frequency curves for estimation of flood magnitude
- To develop GIS tools which can be used to extract catchment physiographic characteristics such as land cover and slope.

Scope: Sudan, Tanzania, Kenya, Ethiopia

Expected outcomes:

- Regional flood frequency curves
- Publications about the impact of physiographic characteristics of catchment on the flood frequency curves

Time schedules: Not as yet defined

Methodologies adopted:

- Calibration of separate distribution for two sub-populations: non-flood and flood
- A regionally calibrated relation between mean Annual Flood (MAF) and the catchment characteristics (area, average slope and average annual rainfall).
 - Multiple linear regression
 - GIS tools.

Partners involved: please complete

Related events:

| | |
|------------------------|----------------------|
| Cairo, Egypt | 1–3 April 2003 |
| Sharm El-Sheikh, Egypt | 29 Nov – 2 Dec. 2003 |
| Borg El Arab, Egypt | 19–24 June 2004 |
| Nairobi, Kenya | 26–29 Nov.2004 |
| Khartoum, Sudan | 25–30 July 2005 |

Asian Pacific-FRIEND

Within Asian Pacific-FRIEND there are four research groups. One group works in the field of flood. The name of research project is: 'Hydrological problems from urbanization'

Objectives:

- To define the relation between land use change including increase of urbanized area and flood risk
- To evaluate impact of urbanization on the hydrological cycle.

Scope: Malaysia, China, Japan

Expected outcomes:

- Publications on flood forecasting problems due to rapid urbanization
- Urban storm water manual incorporating both water quality and water quantity management strategies.

Time schedules: Not as yet defined

Methodologies adopted:

- Rainfall- runoff models with parameters related to impermeable areas
- Flood frequency analysis

Partners involved: please complete

Related events:

Kuala Lumpur, Malaysia

6-7 June 2005