FLASH FLOOD GUIDANCE GAZETTE

Flash Flood Guidance (FFG) Gazette, a bi-annual newsletter bringing users of FFG products all the latest news – operational information, technical advances, case studies and soon introducing the new e-learning environment for the flash flood community.

Hydrologic Research Center ~ Linking Science and Society

Hydrologic Research Center Flash Flood Guidance Training Program

This past year the Hydrologic Research Center (HRC) staff has focused much of their time on training our partners on the use of their countries' flash flood guidance (FFG) systems. We have had trainees from Vietnam, Mekong River Commission (MRC), South Africa, Malawi, Zambia, Turkey, Bulgaria, Georgia and Pakistan. The flash flood guidance education program at HRC is an intensive 4-week program with the goal to train the trainers for each country. The material covers a broad range of topics all focused on producing confident flash flood forecasters for their respective countries. Specifically the material covered includes:

- Design fundamentals of operational flash flood warning systems.
- Flash flood guidance system development and theoretical background.
- Soil moisture modeling and FFG models - Evapotranspiration modeling.
- Use of remote sensing of precipitation – bias adjustment, errors and climatological and dynamic.
- Model calibration and validation of soil and snow water components.
- Discussion of existing and planned CONOPS and coordination with Disaster Management.
- Description of the FFG Products and their application in coordination with other tools forecasters use in real-time.
- Introduction to QGIS and its application in forecasting flash floods.
- Probability and Uncertainty in Flash Flood Forecasting.
- Flash Flood alerts, watches and warnings.

All theoretical material is covered over the first seven to ten days. The remaining time focuses on the application of the knowledge. Trainees provide daily weather briefings and discussions for their countries -

looking at both historical and current examples of flash floods and the conditions – both meteorological and hydrological – that lead to flash flood events. A report is done for each case study discussed. Additionally, trainees practice their GIS skills and work with HRC staff to develop the course specific climatological bias adjustment factors for satellite and/or radar based rainfall estimates.

For many new to flash flood forecasting the hydrological components – soil moisture, threshold runoff, basin delineation, stream flow and bankfull flow are the biggest challenge. But there is always that moment during training when the relationships between the hydrological and meteorological factors that contribute to flash floods become clear.

We dedicate this issue of the Flash Flood Guidance Gazette to all the new trainees and provide them with the opportunity to share their knowledge and experience. The following pages present excerpts of their comments on the training program.

Contributor Dr Rochelle Graham
Hydrologic Research Center

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Mekong River Commission Flash Flood Guidance (MRCFFG) System
(Cambodia, Lao, Thailand, Vietnam)

Flash Flood and the Application of the Flash Flood Guidance (FFG) System for Flash Flood Warnings in Vietnam

Vietnam is located in the area of tropical monsoon climate. Most of boundaries of the territory are contiguous to the East Sea. Flash flooding in Vietnam is primarily due to the combination of natural conditions and human activities in the basin. Mountainous regions usually have greater rainfall than the delta because of topography features such as steep mountain sides. These areas are also more prone to landslides in addition to flash floods. Therefore, weather forecasting and flash floods warning become more important and more urgent in the prevention and mitigation of these natural disasters.

The National Center for Hydro-Meteorological Forecasting (NCHMF) has used and monitored FFG systems products since 2009 and utilizes this key tool to identify potential flash floods in particular and flood forecasting in general.

Some experiences with the MRCFFG:

- FFG system is only a tool for reference before issuing the flash flood warnings and this tool cannot replace the forecasters.
- FFG system product is available in 2 image formats and it is very convenient for the user. Digital products can be downloaded and edited by the user.
- The FFG system identifies basins with the potential for flash flooding and permits the forecaster to overview the information and, possibly, issue warnings for the area or region.
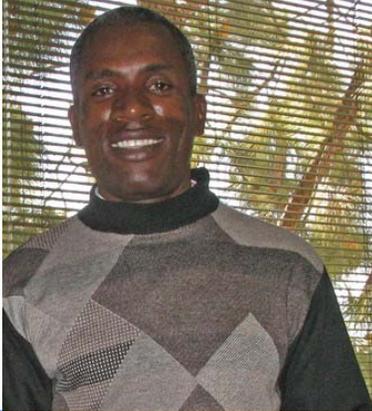

Contributor Mr Vu Duc Long, Meteorologist
National Center for Hydro-Meteorological Forecasting (NCHMF), Hydro-meteorological Service of Vietnam (HMF), Ministry of Natural Resources and Environment (MONRE).

In Conclusion

- Our results indicate that the FFG system is an important component of Vietnam's flash floods warning and forecasting operations.
- The FFG system is state-of-the-art and convenient technology to use, it saves time and has good support for the forecasters in flash flood warning and monitoring.
- This new approach is the development trend of warning and forecasting flash floods in the world in general and Vietnam in particular.

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Southern Africa Regional Flash Flood Guidance (SARFFG) System
(Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia, Zimbabwe)

Southern Africa Flash Flood Guidance (SARFFG) System Brings Hope to Flood Prone Communities in Malawi

Contributor Mr Charles Langton Vanya, Meteorologist,
Department of Climate Change and Meteorological Services, Malawi

Flash Flood threat in Karonga area on 11th March 2013 from SARFFG system.

Very few countries in Southern Africa excluding Malawi have Flash Flood Guidance (FFG) systems. To enhance its preparedness against flash flood disasters, I represented Malawi at the training in San Diego, California where we underwent a four weeks training in application of Southern Africa Flash Flood Guidance (SARFFG) system.

The training provided useful information that can support early preparedness for flash flood. Since the SARFFG system has ability to provide an early indication of small river basins which are more vulnerable, forecasters would be able to monitor the developing of potential dangerous conditions in a specific basin and this would be useful to disaster managers. We were trained on how to make user friendly visual tools such as FFG, Average Soil Moisture (ASM), Imminent Flash Flood Guidance (IFFG) maps that help to isolate and display flood prone areas.

Upon returning to Malawi, I made a presentation to members of staff in my Department, and World Bank officials (Malawi). The SARFFG system impressed everybody and I was encouraged to present this to other stakeholders. Members also saw the need for SARFFG system use to help in disaster management activity. It was suggested that stakeholder's workshop could facilitate such an activity. Further the system also raises hope by supporting forecasters and disaster managers to identify small river basins in danger of flash flooding through its timely ability to identify and highlight imminent flash flood zones.

I demonstrated how the model could pick a flood event through a case study of 11 March 2013 in the northern part of Malawi. The system works well where there is coordination between forecasters and others stakeholders who could provide feedback of what is happening in real time.
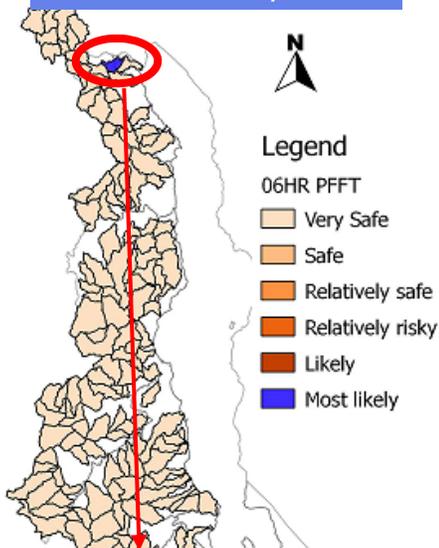
Karonga floods: Picture taken by Victor Phiri (Forecaster- Malawi) on 11th March, 2013

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Black Sea Middle East Flash Flood Guidance (BSMEFFG) System
(Armenia, Azerbaijan, Bulgaria, Georgia, Iraq, Lebanon, Syria, Turkey)

I am Ayhan Sayin from Turkish Meteorological Service. I have been working with HRC from the start of Black Sea and Middle East Flash Flood Guidance Project (BSMEFFG). I am very pleased with not only the works done by HRC but also excellent personalities of HRC staff. BSMEFFG training was quite in line with its purposes.

Contributor Mr Ayhan Sayin,
Research Division Turkish State Meteorological Service

The Turkish Meteorological Service staff is grateful to all HRC staff who were involved in the training. We all have learned a lot about the operational usage of the FFG system with deep and extensive discussions about products and case studies. All participants were very eager to learn and to contribute. I wish that all FFG participating countries will be a big global family with more interactions and communications. I would like to take this opportunity to express my deep appreciation and personnel thanks to Dr Sezin Tokar of OFDA, we all very lucky that she is in charge of such important project.

Ertan Turgu,
Marina Kordzakhia,
Ayhan Sayin,
Snezhanka Balabanova,
Yusuf Ulupinar.

FLASH FLOOD GUIDANCE GAZETTE

Black Sea Middle East Flash Flood Guidance (BSMEFFG) System
(Armenia, Azerbaijan, Bulgaria, Georgia, Iraq, Lebanon, Syria, Turkey)

I would like to thank HRC staff for providing us with a great opportunity to learn new skills. We were presented with good quality materials such as papers, presentations and documents relating to the Black Sea and Middle East Flash Flood Guidance System (BSME-FFGS) Operations Training at HRC, California, USA.

What we have learned and what we have gained during HRC training are outlined below as some important points:

- The Flash Flood Guidance (FFG) is a diagnostic tool which is used by trained forecasters of National Meteorological and Hydrologic Services to analyze weather-related events that can initiate flash floods and then to make a rapid evaluation of the potential for a flash flood at any given location.

- FFG system provides valuable and readily accessible information to give early warning of flash flood by using inputs from radar, satellite, gauge and weather model. Local information is an important component for the forecaster to the decision to issue flash flood watches or warnings.

- Monitoring weather conditions from weather maps in real time and making use of synoptic analysis by forecasters also aids in making decisions to issue flash flood watches or warnings.

Contributor Mr Ertan Turgu,
Research Division Turkish State
Meteorological Service

- FFG is not based on a single disciplinary process, but rather a multi-disciplinary process which includes such topics as hydrology, statistics, geomorphology and meteorology to name a few.

- Cooperation between overlapping responsibilities of Hydrometeorological Forecasters and Information Technology staff is essential to operational sustainability.

- Forecasters must apply product quality control considerations to the input data and products and determine whether or nor any perceived problems are result of a parametric shortcoming, a failure in one of the FFGS models, or if it might relate to the quality or availability of the real-time input data that drives the system.

- FFG depends on factors such as the catchment and drainage network characteristics and soil water deficit determined by antecedent rainfall, evapotranspiration and groundwater loss.

After corroboration with local data, FFG product is appropriate to use in real time with nowcasts or forecasts of rainfall and other local information to estimate the risk of flash flooding in the catchments.

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Black Sea Middle East Flash Flood Guidance (BSMEFFG) System
(Armenia, Azerbaijan, Bulgaria, Georgia, Iraq, Lebanon, Syria, Turkey)

The physic-geographical conditions, the characteristics of the soil and vegetation cover, the intensive anthropogenic activities favour the flash floods in Bulgaria.

- In recent years due to of increasingly changing climate, the number of extreme events such as a heavy rains and subsequent flash flooding and flooding in the country is increasing.
- The phenomenon of the flash flood is one of the most difficult natural hazards to predict in terms of time and place of occurrence.
- Bulgaria currently does not have enough reliable information to predict and assess these torrential flash floods. The number, location and type of meteorological and hydrometric stations is not sufficient for such an assessment.
- The BSMEFFG system provides a solution to this issue by the collection of real-time data products that support the operational forecasters in combination with their local experience to forecast the occurrence of flash flood events in small watersheds.
- During the course at HRC, the products available in the BSMEFFG System were described in details. The applications of FFG system were discussed in great details. This contributed to a better understanding and proper use of the results and data from the system.
- The overview of recent case studies, discussions of real-time and historical flood events using the BSMEFFG system, contributed to the development of knowledge and experience.
- Significant contributions to the system were made by integrated parameters estimated from local data for soils and bankfull discharges. The synoptic stations, which transmit data to the system were separated according to their belonging to the main climatic zones in the country. This was done in order to take into account the influence of the specific conditions on the formation of the meteorological and hydrological processes and to improve the results of the FFGS.
- The great benefit of the training at HRC is how to use this system together with local information for heavy rains provided by national weather forecast service and local hydrological experience, as a tool to improve flash flood warning and alerts.

The training contributed to the development, issue and dissemination procedures and protocols for warning population at risk in order to reduce the vulnerability of the affected population.

Contributor Dr Snezhanka Balabanova, Hydrologist
National institute of Hydrology and Meteorology (NIHM), Bulgaria

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Black Sea Middle East Flash Flood Guidance (BSMEFFG) System
(Armenia, Azerbaijan, Bulgaria, Georgia, Iraq, Lebanon, Syria, Turkey)

The weather conditions, which causes the flash flood events on the territory of Georgia is linked to the large-scale circulation processes and local orographic conditions .The geographical location and complicated relief of Georgia promote sharpening of these global atmospheric circulation processes. Scientific studies found that during recent decades the frequency and intensity of the hydrometeorological and geological disasters, specifically flash floods, debris and mud flows has significantly increased.

A large number of rivers originating in the Caucasus Ridge are nourished by the glaciers and snow pack, and are characterized by the Spring/early Summer and Autumn flood/flash flooding caused by the snow rapid melting, temperature rise and heavy rain. Due to a lack of atmospheric and ground based monitoring system (radars and real-time weather stations) in the National Hydrometeorological Service (NHMS) of Georgia forecasters prepare the 1-3 days weather and hydrological forecast for main towns and rivers, with catchment >1000km^2 of Georgia.

With the addition of BSMEFFG system nowcasting and the identification of potential flash floods can be done for medium size river basins (25-700km^2) to manage the disaster risks in emergency situations.
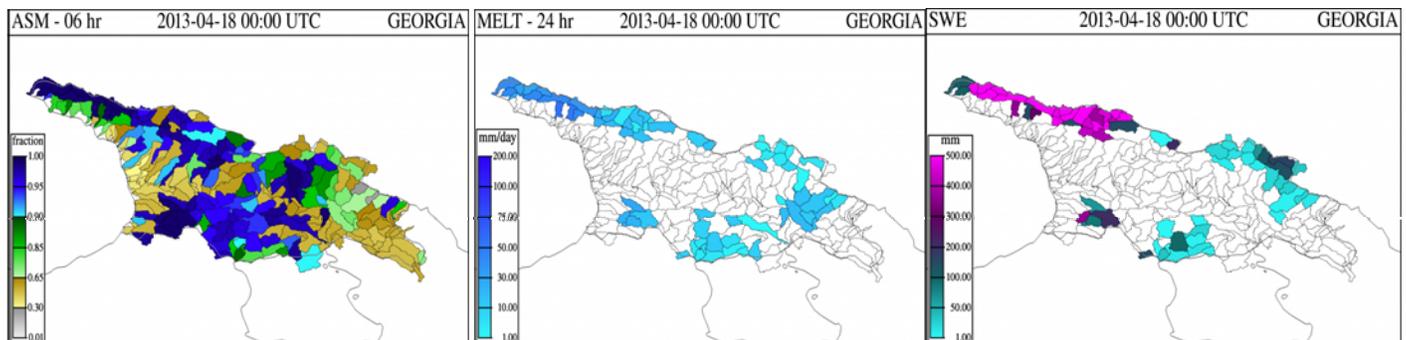
The Flash Flood Guidance System will be used also for the short 1-3 days Flood forecasting. Currently the main parameter - snow water equivalent (right above), melt products (center above) and soil moisture (left above) are determined for the big rivers catchment area at the end of March and by the weather forecast - Precipitation Amount, Temperature. The BSMEFFG gives the opportunity estimate/assess above mentioned parameters for medium size river basins.

Contributor Dr Marina Kordzakhia,
Deputy Head, National Environmental Agency of the Ministry of Environment (MoE) of Georgia, Hydrometerological Department, Hydrometeorological Forecast Models Adaptation and Implementation Division

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Pakistan Flash Flood Guidance (PAKFFG) System

I certainly learnt a lot from this training which was really very appropriate, excellent, tailored to our requirements, and covered all we needed to know about the Flash Flood Guidance System. The overall approach was brilliant with clear and concise presentations based on excellent knowledge that met my aims and objectives. All areas were well presented and explained in detail by the trainers. It was a great pleasure for me to attend and learn from this training which was very useful to enhance my confidence level about the flash flood predictions.

Many thanks, appreciating the enthusiasm and experience of all trainers. The days went quick and I did not get bored due to relaxed learning environment provided by HRC.

Contributor Dr Muhammad Hanif, Director
National Weather Forecasting Center, Pakistan Meteorological Department, Islamabad, Pakistan

We would like to ask you to share your suggestions, stories, pictures, and experiences relating to flash floods and flash flood guidance systems. Please send your information to Dr R. Graham (editor) at rgraham@hrc.lab.org