

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 the new e-learning environment for the flash flood community.

Hydrologic Research Center

FFGS SIMULATOR

As part of its training program, the Hydrologic Research Center (HRC) is working toward the development of an on-line simulator appropriate for hands-on training of operational forecasters responsible for the diagnosis and prediction of flash floods. The simulator is appropriate for use by operational forecasters that have completed the on-line courses offered by HRC in the hydrology and meteorology of flash floods, and associated themes (e.g., remote sensing, GIS analysis, etc.). The simulator will provide a computational interactive environment in which the forecaster-trainee can better understand the use of the flash flood guidance system to estimate the potential of flash flooding in small basins.

The simulator and its database will be based on data from historical flash flood events from various regions of the world. The trainees will be able to initiate and study the sensitivity of the system assessments for specific events with respect to precipitation uncertainties, soil parameter uncertainties and pre-event soil water uncertainties. Information for the actual event will also be available to compare and understand the forecast-process uncertainties when using the Flash Flood Guidance System (FFGS) in real time.

HRC is requesting information from all the active regional centers worldwide pertaining to actual historical events that were confirmed in order to establish the simulator database. The information needed is: (a) the date and hour of the beginning and end of the event; (b) the FFGS basin ID in which it occurred and/or the coordinates of the flash flood event location; (c) information (may be pictures) of the flash flood event evolution and potential

damage that it caused; (d) any information on nearby measured or reported precipitation rates or totals during the event; and (e) short description of the event including the synoptic or meteorological causes. An example is indicated on the last page of this Gazette Issue.

We would be grateful to receive the aforementioned information for events that occurred later than the dates shown below for each of the operational regional systems. Please send the information to:

KGeorgakakos@hrc-lab.org.

Thank you for your data support for this important new development!

Initial Dates for Simulator Events by Regional System

BSMEFFG: May 2012

MRCFFG: April 2009

CAFFG: August 2011

PAKFFG: January 2009

HDRFFG: May 2006

SARFFG: January 2009

SEEFFG: May 2012

Contributor Dr Konstantine Georgakakos
Hydrologic Research Center

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Regional Black Sea and Middle East Flash Flood Guidance Workshop

Turkey State Meteorological Service (TSMS), the Regional Center for the Black Sea and Middle East Flash Flood Guidance (BSMEFFG) system, organized a workshop for trainees from the Hydrometeorological Services of Bulgaria, Georgia, Azerbaijan, Armenia and Turkey. Training took place on 3-5 December 2013 at the Alanya WMO Regional Training Center, Antalya, Turkey. Tommaso Abrate from the World Meteorological Organization and Theresa Modrick and Eylon Shamir from the Hydrologic Research Center assisted the Turkish Hydrometeorological Services with training. The purpose of the workshop was twofold; **first** to inform the forecasters about the operational BSMEFFG System products and their use in combination with available meteorological data and local information; and **second** to train the trainers who would provide similar training to forecasters in their respective countries.

The content of the workshop included:

- Overview of Global Flash Flood Guidance Program
- Design fundamentals of operational flash flood warning systems.
- Flash flood guidance system development and theoretical background.
- Soil moisture modeling and FFG models.
- Model calibration and validation of soil and snow water components.
- Description of the FFG Products and their application in coordination with other tools forecasters use in real-time.
- Flash Flood alerts, watches and warnings.



In addition TSMS staff presented case studies of past flash floods, highlighting their use of the system to date and re-affirmed their commitment to work with participating countries to train their forecasters in the use of the BSMEFFG system.

Contributor Mr. Ayhan Sayin, Research Division Turkish State Meteorological Service

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

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Assessment of new satellite products for incorporation in the regional flash flood guidance system.

The Hydrologic Research Center (HRC) recently completed a 1-year study sponsored by the U.S. National Aeronautics and Space Administration (NASA) Natural Disasters Program to assess the feasibility of incorporating real-time satellite information to improve the FFG system products. HRC carried out two studies looking at data retrieved from the Moderate Resolution Imaging Spectroradiometer (MODIS) on board the Aqua and Terra polar-orbiter satellites.

The first study was conducted using the SE Asia FFG (MRCFFG) system in collaboration with the Mekong River Commission. In this study we assessed the capability of MODIS Flood Mapping product to adjust soil moisture estimates. Standing water is not unusual in the lowlands of Cambodia, Vietnam and Thailand at the second half of the wet season due to large-river backwater effects and regional groundwater flows. These processes are not modelled by the FFG system and therefore cause overestimation of FFG values. The NASA inundation maps are used to adjust the soil water deficit estimates to conform to the field situation of soil saturation during inundation periods.

MODIS Inundation Mapping

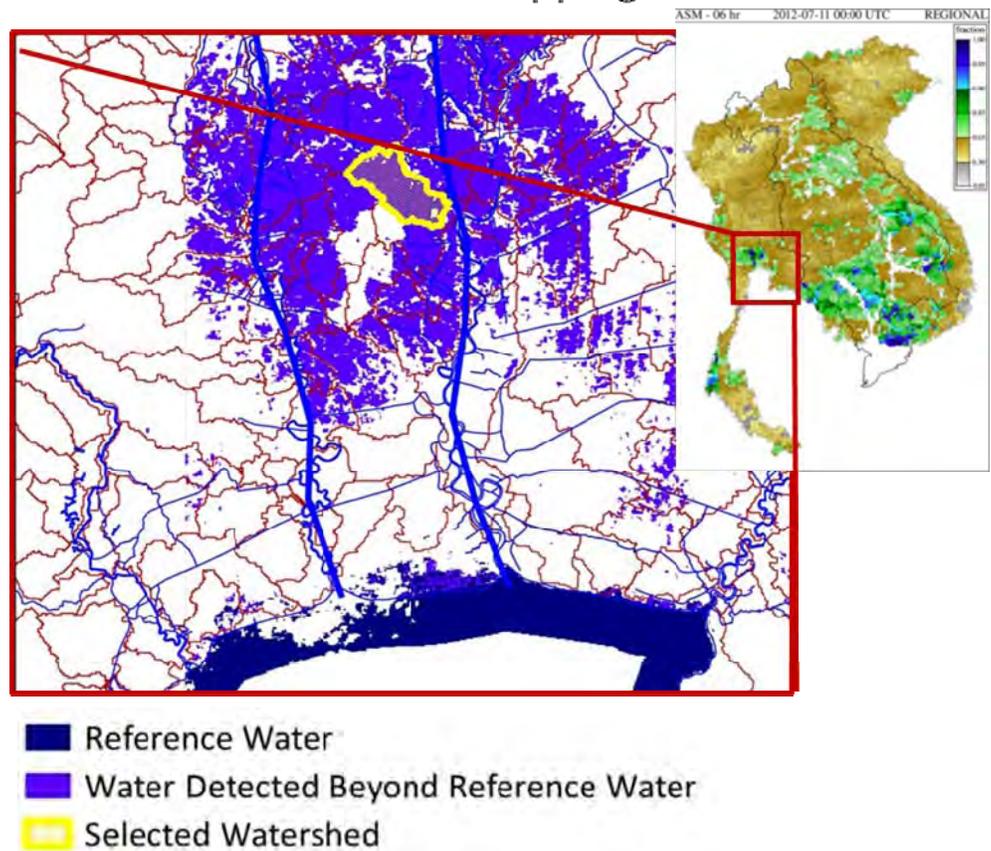


Figure 1. An example of FFG basins in Thailand that were indicated by MODIS to experience large inundation extent. In these basins the FFG soil moisture model, with absence of rainfall, will show a drying trend while the soil is likely to remain saturated.

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The second study was conducted using the Black Sea and Middle East FFG system in collaboration with The Turkish State Meteorological Service (TSMS). In this study we assessed the use of MODIS Land Surface Temperature (LST) to improve simulation of the snow pack. Lack of data for mountainous regions in mid-latitudes is a common circumstance that creates large uncertainties for the snow line at the latter part of the snow season when flash floods may be generated from intense rain over bare ground in the mountains. The MODIS LST product can potentially be used to estimate the Mean Areal Temperature (MAT) forcing required for the snow model and overcome the lack of real-time meteorological observations and improve simulation of the snowpack properties.

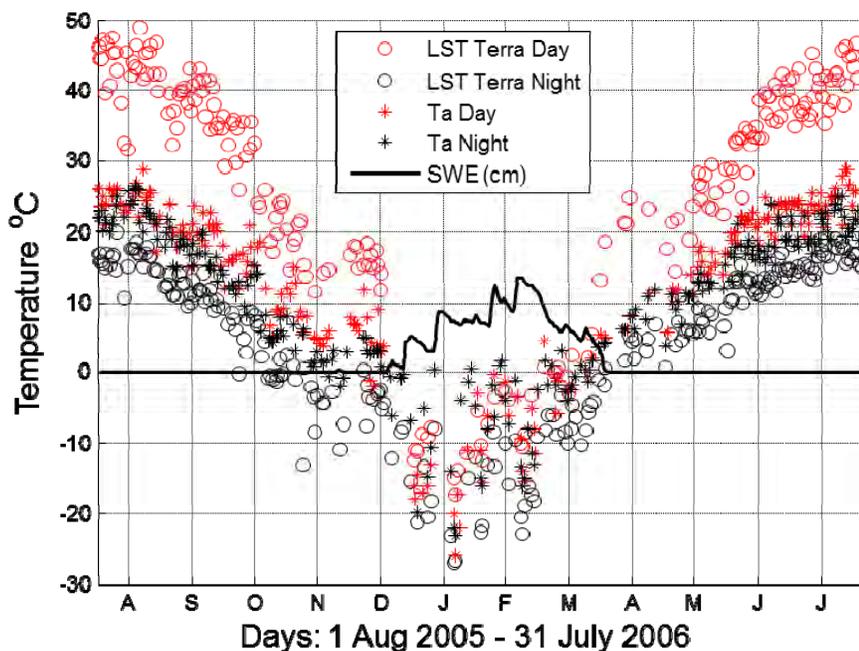


Figure 2. A comparison between MODIS Land Surface Temperature (LST) from Terra and Air surface Temperature (Ta) from a gauge in the high mountains of South East Turkey. During no snow periods LST is warmer [colder] during the day [night]. During snow periods LST and Ta amplitudes are comparable. It can be seen that during winter LST was below zero while Ta occasionally rises above zero.

For the interested readers detail information on these studies can be found in:

Posner, A., K.P Georgakakos and E. Shamir 2013. A method for the assimilation of standing water estimates from satellite earth observations into the flash flood guidance system soil water model. Technical Note # 53, Hydrologic Research Center, San Diego CA. (http://www.hrc-lab.org/projects/projectpdfs/HRCTN53_Inundation_20130807.pdf)

Shamir E., and K.P. Georgakakos. 2013. Incorporating MODIS Land Surface Temperature in operational snow accumulation model. Hydrologic Research Center Technical Note # 55, Hydrologic Research Center, San Diego CA (http://www.hrc-lab.org/projects/projectpdfs/HRCTN55_LST_20131111.pdf)

Contributors Drs. Eylon Shamir and Ari Posner, Hydrologic Research Center

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Regional Forecasters discuss CAFFG Operations

A regional operations workshop for the Central America Flash Flood Guidance (CAFFG) system was held in San Jose, Costa Rica in November 2013. The workshop was organized after suggestion by leadership at the regional center, Instituto Meteorológico Nacional (IMN) of Costa Rica and with the support of the US Agency for International Development (USAID) and the University Corporation for Atmospheric Research (UCAR). Ms. Rosario Alfaro of UCAR and NOAA facilitated the organization and direction of the workshop. The welcoming session featured Mr. Juan Carlos Fallas, director of IMN and regional representative to the World Meteorological Organization, along with Mr. Tim Callahan of the U.S. Agency for International Development (USAID). The workshop was attended by 16 regional representatives from each of the 7 participating countries (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama). Also in attendance were Mr. Federico Gómez Delgado, regional representative to WMO, Mr. Fernando Calderón Fuentes of OFDA-USAID-Costa Rica, Dr. Theresa Modrick of HRC, and Mr. Warner Rivera Estevez of Dominican Republic Meteorological Service (as an observer after recent introduction to the Haiti-Dominican Republic FFG system). During the workshop, representatives from each of the CAFFG countries had the opportunity to show case studies of flash flood events in their countries and how they utilize the CAFFG system to support their operational duties.

The CAFFG system was launched for the first time in 2004 and it was updated in 2011 as a result of recommendations provided after use of the system to support flash flood warnings in the region. New features of the system include (a) Quantitative Precipitation Forecasts (QPFs) at 4 km resolution over the region provided by the mesoscale model known as WRF (Weather Research and Forecasting) and (b) additional products to evaluate flash flood threat. An operations workshop was held in the fall of 2011 to introduce system enhancements to the national meteorological and hydrologic services of the participating countries.



WELCOME AND OPENING OF WORKSHOP – with Tim Callahan (USAID), Juan Carlos Fallas (Director, IMN) and Rosario Alfaro-Ocampo (UCAR, NOAA).

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Regional Forecasters discuss CAFFG Operations

One focus of the workshop was the importance of real-time precipitation data. Such real-time data is vital for weather forecasters in conjunction with the FFG products for the timely issuing of flash flood warnings. Most Hydrometeorological Weather Services of Central America began receiving rain gauge data transmitted by satellite every 3 hours just before CAFFG was launched. The initial network installed was scarce and sparse. GOES satellite data every half hour was the main data source of the weather monitoring system of the region. In recent years, all countries have been working to improve their rain gauge network by acquiring new equipment and technology to have precipitation data more frequently in order to have timelier flash flood warnings. From the approximately 65 automatic rain gauge stations initially installed, there are planned a total of approximately 450 similar stations in the near future. The stations will transmit by satellite or using cellular communication every hour or even shorter periods of time. In addition, Belize and El Salvador have already installed radars and some other countries are planning to do the same. All this information, in addition of being very useful for weather forecasters on duty in charge of issuing flash flood warnings, can be very useful to improve the satellite bias correction used by the CAFFG system for better input to the soil moisture model and therefore, to improve CAFFG products.

Among the most relevant recommendations as the result of this workshop are:

- **Identified** need to gather precipitation information to update the bias correction factor and improve the satellite precipitation estimates which serve as input to the system;
- **Ensure** all real-time precipitation data is made available to system for real-time corrections in satellite precipitation (this may be done in coordination with HRC);
- **Identify** communities at risk of flash floods using historical data to promote planned installment of real time rain gauges in those basins to support timelier flash flood warnings for these communities;
- **Develop** an educational program for communities at risk of flash floods to aid in response and also to provide valuable in situ information and feedback to weather forecaster in charge of issuing flash flood warnings;
- **Develop** systematic analyses of products (such as QPF) to gain understanding to be used in issuing products and as an avenue to continuously improve the CAFFG system.



Contributor Rosario Alfaro (UCAR, NOAA) and Dr. Theresa Modrick (HRC)

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Turkish Meteorological Service observations of flash floods for the 2013

The Turkish State Meteorological Service (TSMS) has started the process of collecting case studies of past flash floods events. This information includes date of events, geographic region (latitude and longitude), whether there was a bulletin issued, inundated streams, any verification of the event, total precipitation measured at the closest station, and additional remarks. By collecting this information the TSMS is able to validate the BSMEFFG system for Turkey and build confidence and expertise with the forecasters responsible for issuing warning, watches and alerts.

For example, 16th to 18th March, 2013,

Geographic region: Lat. 37.75; Long. 41.64

Dates: 16.03.2013 /16:30 - 18.03.2013 /06:05

Location: Muş province

Total precipitation from closest stream: 45.8mm

Verification: Rainfall in the center of Muş province and Bulanık, Korkut towns started at 16:30pm on 16.03.2013 and it continued until 06:05am on 18.03.2013. Total precipitation amount recorded for

this period is of 45.8 mm. It was reported that one stream in the region was inundated. Residential and agricultural areas were under water. Roads were destroyed.



TSMS FEVK OBSERVATIONS REPORTED
FLASH FLOODS IN 2013

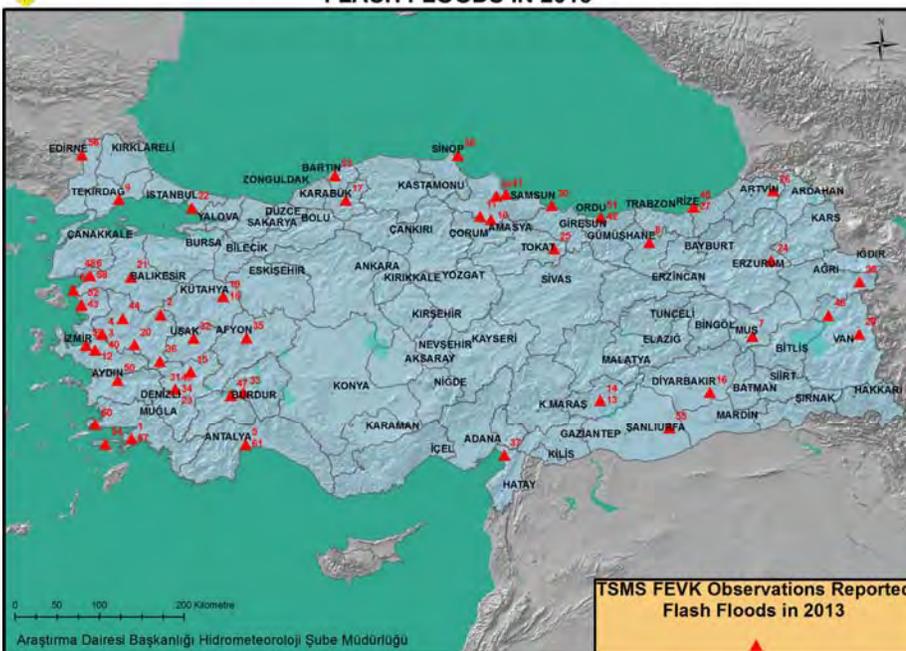


Figure 3. Map of Turkish State Meteorological Service observed and reported flash floods for 2013.

Validation and verification of a country or region's flash flood guidance system is of serious concern for many forecasters — as we move forward this year we will address further these concerns and look forward to hearing from other FFGG users how they validate and verify flash flood events.

Contributor Mr. Ayhan Sayin, Research Division Turkish State Meteorological Service