

**American Water Resources Association**  
**2009 ANNUAL WATER RESOURCES CONFERENCE**  
**November 9-12, 2009**  
Seattle, WA

**Wednesday, Nov. 11**

**1:30 PM – 3:00 PM**

**SESSION 47: Flood Forecasting and Protection**

**Short Range Operational Streamflow Forecasting in Western Washington State, USA - Matthew Wiley, 3TIER, Inc., Seattle, WA (co-authors: Andy Wood, Pascal Storck, Bart Nijssen)**

In 2006, 2007 and 2009, large floods in western Washington caused severe infrastructure damage and transportation interruptions, with costs in the millions of dollars. Reservoir operators depend at such times on flood forecasts with lead times of up to one week as a key input for managing their storage facilities and preventing downstream flooding. We describe and present results from a short-range hydrologic prediction system for small watersheds in western Washington. The system provides hourly-timestep weather and streamflow forecasts that update 4 times daily to several reservoir-managing utilities in the region. The forecasts use mesoscale atmospheric model downscaling of Global Forecast System predictions to generate the temperature and precipitation inputs for a distributed hydrologic prediction system that represents each watershed at a spatial resolution of 150 meters. Model outputs are then statistically adjusted to reduce systematic biases and estimate prediction intervals. We evaluate the performance of the streamflow forecast system during recent significant flooding events.

**Hydraulic Boundary Conditions for the Ihnc Storm Surge Barrier - Mathijs Van Ledden, Haskoning, Inc. Metairie, LA (co-authors: Jena Gilman, Scotty Emmons)**

The IHNC project will seal off New Orleans' Inner Harbor Navigation Canal from any powerful Gulf of Mexico storm surge in the event of future hurricanes – two navigation gates along the 3km floodwall can be closed to prevent water surging up the canal. This barrier is one piece of the new Hurricane Storm and Damage Risk Reduction System that is being built after Hurricane Katrina in 2005. When Katrina hit the city in 2005, the levees failed due to a complex combination of technical and political factors, causing flooding for three weeks. On the city's eastside, the 4m to 6m-high levees were no match for the 5m+ surge produced by Katrina – floodwalls were overtopped and the city inundated. The much needed IHNC barrier will greatly reduce the risk of flooding for hundreds of thousands of residents in the St. Bernard, New Orleans East, Ninth Ward and Gentilly areas. The objective of this paper is to discuss in-depth the methodology to derive the hydraulic boundary conditions for the IHNC storm surge barrier. This information determines the final height and also the forces at the structure. The storm surge levels were derived using ADCIRC modeling results from a suite of storms and a probabilistic analysis based on this set of storms. The wave models STWAVE and SWAN were applied to compute the nearshore wave climate near the barrier. Finally, Boussinesq runs were performed to focus specifically to local wave processes such as reflection and refraction close to the barrier. Strengths and weaknesses of the entire methodology are discussed as well.

**Assessment of Satellite-Based Rainfall Observations for Urban Flood Modeling - Steve Burian, University of Utah, Salt Lake City, UT (co-authors: Woo Suk Han, J. Marshall Shepherd)**

Rainfall data is a key input for urban flood modeling and forecasting. Satellite rainfall data has recently emerged as a viable data source for flood modeling applications. Satellite data is needed for macro and global scale applications, especially for international river basins and in data poor regions. Recent studies have validated the accuracy of satellite precipitation data for a range of applications, including global flood modeling. NASA currently supports flood forecasting based on the Tropical Rainfall Measurement Mission (TRMM) satellite-based rainfall data products. With the newness of the use of satellite rainfall data in flood modeling, a critical area of need that has emerged is the potential application of satellite data for flood modeling in urban areas. Specifically, there is a need to quantify the uncertainty of the satellite-

based rainfall data acquired for urban areas compared to adjacent rural areas, to assess the possible ways to incorporate satellite-based rainfall data into urban flood modeling, and to improve the representation of urban areas in global flood models using satellite data. The research presented herein addresses these needs. The presentation will focus primarily on the differences of the satellite-based rainfall data compared to rain gage data in urban and non-urban areas. The NASA Multi-satellite Precipitation Analysis (MPA) blends TRMM, geosynchronous infrared, and other datasets to produce a three-hourly, ~25 km-resolution, quasi-global product (TRMM 3B42). The investigation tested the accuracy of the TRMM MPA to rain gage data for six case study areas in the U.S. (in humid and arid climates). Our study led to three conclusions: (1) in general rainfall measured by the satellite-based product is larger than that measured by rain gage, (2) for large storm events consistent with flood magnitude, the differences between satellite observations and rain gage observations is smaller, and (3) the differences between the TRMM MPA satellite data and rain gage data is larger in urbanized watersheds than non-urbanized watersheds.

**Probabilistic Modelling of Flood Flow Frequencies of the Rivers of Bangladesh - Sushanta Das Gupta, M.ASCE, London, United Kingdom**

A statistical package comprising five different probability distributions used for flood frequency analysis was applied to annual flood peak series with at least 25 observations for five unregulated streams in Bangladesh. The parameters of those distributions were estimated by using a software named EasyFit developed by MathWave Technologies. The EasyFit software is tested for the River Thames data by comparing the parameters of the two distributions; one is Generalized Logistic Distribution and other is Gumbel Distribution. When the test is found successful, the parameters of the distributions Wakeby Distribution( five parameters), Burr Distribution( four parameters), Log Pearson3(three parameters), Generalized Logistic(three parameters) and Gumbel Distribution (two parameters) are calculated from the software. Cumulative Distribution Function of the fitted distribution helps to compute the annual exceedance probability .The reciprocal of the exceedance probability gives the return period of the particular event. Based on the probability density graphs, it is found that the five-parametric Wakeby Distribution is most appropriate to fit the best in Bangladesh river flow data. The Kolmogorv-Smirnon goodness of fit test ranks five-parametric Wakeby Distribution in the top at the four out of five gauging stations. The probability-probability plot, quantile-quantile plot and probability difference graph also confirm that findings.