

Flood Risk Management Newsletter

October 2013 vol 7 no 1

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R&D Issue

Each year research programs hold IPRs, “In Progress Reviews,” providing every PI (principal investigator) a short time to present the year’s accomplishments to upper management. This issue of the FRM Newsletter provides a summary of the Flood and Coastal Storm Damage Reduction (FCSDR) Research program, the Coastal Field Data Collection (CFDC) Program and the Coastal and Ocean Data Systems (CODS) Program IPR presentations. The presentations are available on the web, but only to viewers on a Corps computer. FCSDR presentations are available at – <http://operations.usace.army.mil/conference.cfm?CoP=flood&Id=13augfrm&Type=Conf>
The CODS and CFDC presentations are available at – <http://operations.usace.army.mil/conference.cfm?CoP=flood&Id=13augfrm2&Type=Conf>

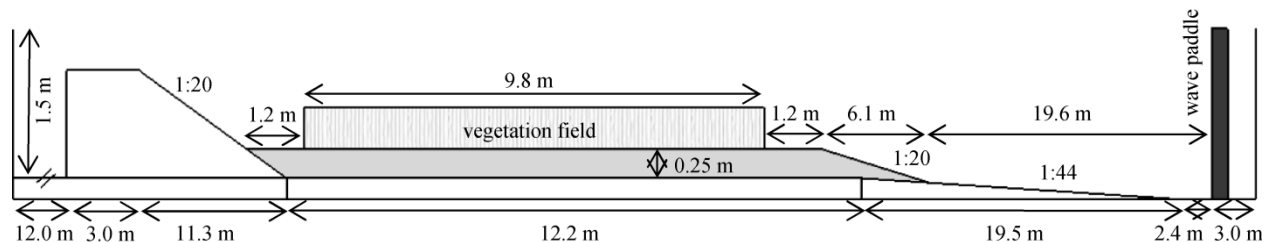
****See acronym list on last page****

Flood & Coastal IPR Overview

Coastal Systems

CSTORM-MS. This work unit seeks to tightly couple a comprehensive system of highly skilled and highly resolved numerical models used to simulate coastal storms (circulation/surge, waves, and sediments) with a powerful user-friendly interface, the Surface-water Modeling System (SMS) in order to more accurately assess risk to coastal communities. Developmental work this year focused on additional coupling scenarios within CSTORM, such as fully coupling ADCIRC, STWAVE, ADH and C2SHORE as well as on updates to the SMS interface. Other work included adding/refining inputs, improving computational efficiencies, putting in place more operational features such as using wind/pressure fields from NOAA's GFDL forecast to drive all CSTORM models. CSTORM products were used in supporting Hurricane Isaac and Hurricane Sandy studies. Training videos and PDF files as well as Wiki pages are available on the CSTORM Knowledge Hub <https://knowledge.usace.army.mil>. (POC: Chris Massey, Chris.Massey@usace.army.mil)

Wave Dissipation by Vegetation. Research is developing techniques and guidance to describe wave dissipation by natural features that complement traditional coastal protection and maximize ecological benefits. Several laboratory investigations were conducted in concert with numerical modeling efforts to define an effective numerical modeling approach for simulation of wave energy dissipation by vegetation.



Schematic of the Wave Dissipation by Vegetation Flume at ERDC

Results of this workunit will be incorporated into updated STWAVE and other software, as well as into PROSPECT classes and the Coastal Engineering Manual, EM 1110-2-1100. Several conference papers and an ERDC Technical Report, Laboratory Studies of Wave Attenuation through Artificial and Real Vegetation, <http://acwc.sdp.sirsi.net/client/search/asset/1030020>, ERDC TR-13-11, were produced this year. (POC: Jane Smith, Jane.M.Smith@usace.army.mil)

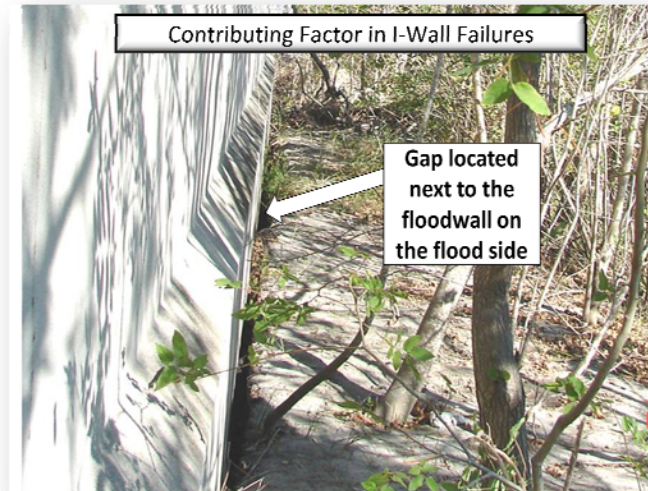
Unstructured Waves. This work seeks to upgrade the physics in STWAVE and extend these upgrades to time-stepping, unstructured models to improve the computational efficiency, accuracy and regional applications of codes. Results will be linked to CSTORM-MS, and will provide upgrades to near-coast physics, as well as be used to evaluate the efficiency and accuracy of linked wave-surge models for hurricanes. Documentation and training will be available on the Knowledge Hub <https://knowledge.usace.army.mil> and via technical reports. Fiscal year applications include participation in the FEMA Great Lakes Study and the Sandy Comprehensive Study. (POC: Jane Smith, Jane.M.Smith@usace.army.mil)

AdH (Adaptive Hydraulic Modeling). This effort will provide the USACE with high fidelity 3D circulation and sediment modeling capabilities for use in estuarine, river and littoral applications. AdH 3D shallow water hydrodynamics and shallow water salinity transport were enhanced, and other 3D features (waves, boats, structures) were added. Suspended and bed load transport are being developed and validation and verification are continuing. The 3D shallow water baroclinic model is now a part of the official AdH suite. The code was applied in the Mobile Bay, Mississippi River and Sacramento River studies, among others. (POC: Matthew.W.Farthing@usace.army.mil)

SEDLIB (Sediment Library). This work unit is developing and enhancing sediment process algorithms in SEDLIB. The SEDLIB interface is becoming more user-friendly, and test case simulations have been included in the SEDLIB technical documentation. An algorithm has been included to use the PICS camera system for direct specification of floc settling velocity. SEDLIB is a general purpose sediment library linked to AdH in 2- and 3D, and can be issued as a stand-alone library. Plans are to include algorithms that enhance modeling for wetland evolution, gravel and cobble beds, and high concentration suspensions. (POC: Gary.L.Brown@usace.army.mil)

Resilient Infrastructure

I-Wall Analysis. Critical I-Wall design deficiencies identified after the I-Wall failures in New Orleans included gap formation, which may lead to seepage and global instability under flood loading. This research seeks to develop easy-to-use, PC-based deterministic or probabilistic software for USACE District engineers involved in the design or analysis of I-Walls. Work will also complete the compilation and publication of a database of Complete Soil-Structure Interaction (SSI) analyses of I-wall movements and gap initiation/propagation analyses in various soil types. Corps I-Wall Version 1.0 applies to floodplains and coastal environments with level ground surfaces, and Corps I-Wall Version 2.0 will apply to riverbanks, levees, and coastal environments with non-level ground surfaces. (POC: Robert.M.Ebeling@usace.army.mil)



Vegetation on Levees. This research supports USACE guidance on woody vegetation on levees. Work includes collecting and analyzing USACE vegetation observations (case histories). One part of this work is to improve the method used to estimate pit dimensions from windthrown trees. Calculations of scour around trees are also being improved, through flume and field work and through the evaluation of bridge scour equations. (POC: Maureen Corcoran, Maureen.K.Corcoran@usace.army.mil)



Seepage Phenomenology. Research will expand the scientific knowledge available regarding the evaluation of internal erosion through integrated theoretical, laboratory, field, and computational investigations relevant to USACE sites. Another goal is to develop a mathematical equation to predict the crater size. Three models were run in the centrifuge. (POC: Maureen Corcoran, Maureen.K.Corcoran@usace.army.mil)

Transient Seepage Analysis. Work is concentrating on the development of best practices for use of transient seepage analysis in geotechnical engineering practice. Results of this research will inform USACE guidance documents and PROSPECT classes. Results should allow practicing engineers to develop more confidence in using transient seepage as part of their design as well as potentially save millions of dollars by avoiding over-design from using only steady-state analyses. (POC: Maureen Corcoran, Maureen.K.Corcoran@usace.army.mil)

Risk & Uncertainty/Alternatives Analysis

This focus area seeks to provide USACE district offices software that fully encompasses the Corps risk analysis (assessment) requirements and expectations. Software applications developed under FRM will attempt to address recommendations made by the National Research Council regarding the Corps risk analysis tools and methods, and carries significant and enduring implications for flood risk management in the United States.

HEC-WAT. Created to help USACE study teams conduct watershed and water resources studies in an integrated, comprehensive and systems based approaches, HEC-WAT helps a study team perform the necessary hydrologic, hydraulic, environmental, and consequence planning analyses by integrating software that is commonly applied by the multi-disciplinary study team when conducting a water resources study. HEC-WAT allows the Corps to perform a study in a systems approach and includes event-based and scenario analysis, as well as structure-by-structure, cost, non-structural, loss-of-life, and agricultural damage analyses. The development of the Flood Risk Analysis (FRA) compute option within the HEC-WAT software will allow Corps personnel to perform studies in a systems context that includes life-cycle analysis and parameter sampling. Testing on the addition of the FRA compute is still on-going; updates to the install package and the User's Manual are being finalized. Once approved by CEIWR-HEC management, the software will be posted to the HEC web page for general distribution, anticipated by December 2013. <http://www.hec.usace.army.mil/software/hec-wat/> (POC: Chris Dunn, Christopher.Dunn@usace.army.mil, or Penni Baker, Penni.R.Baker@usace.armymil)

HEC-FDA. Provides the capability to integrate the results of hydrologic engineering with an economic analysis for the formulation and evaluation of flood risk management plans. HEC-FDA is designed to assist study team members in using risk analysis procedures for formulating and evaluating flood risk management measures and analyzing the economics and performance of flood risk management projects. It computes stage-aggregated damage, expected annual damage (EAD) and equivalent annual damage and provides the annual exceedance probability (AEP) and conditional non-exceedance probability as required for levee certification. The software, 1) stores hydrologic and economic data and their uncertainties necessary for an analysis, 2) provides tools to visualize data and results, 3) computes expected annual damage (EAD) and equivalent annual damage, 4) computes annual exceedance probability (AEP), Long-Term Exceedance Probability (LTEP), and conditional non-exceedance probability as required for the evaluation of project performance and, 5) implements the risk analysis procedures described in EM 1110-2-1619. <http://www.hec.usace.army.mil/software/hec-fda/downloads.html> (POC: Chris Dunn, Christopher.Dunn@usace.army.mil, or Bob Carl, Robert.Carl@usace.army.mil)

Levee Breaching and Loss of Life. This research seeks to develop software to better evaluate the life loss potential behind levees as well as to enhance this capability in existing Corps software. HEC-FIA has been implemented on a Mamaroneck, NY study, as well as on an American River and a Belle Glade Breach study. This work received the FY13 "IWR Scientific/Technical Award of Excellence" for HEC-FIA application in the 2011 flood on the Mississippi River. Work has

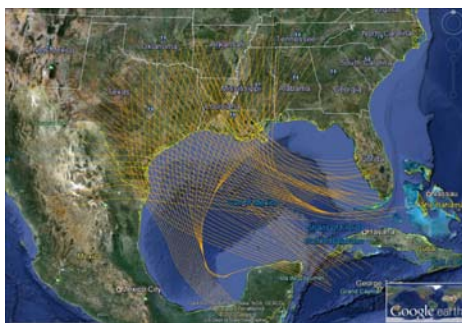
also resulted in the development of tools to quickly develop facts for real time flood operations to evaluate impacts as they occur. (POC: Will Lehman, William.P.Lehman@usace.army.mil)

HEC-HMS Watershed Uncertainty Analysis. Hydrologic simulation tools that produce probabilistic outputs are needed to support the Corps' transition to a risk-based framework for flood damage reduction project evaluation and levee safety evaluation. HEC-HMS will become more user-friendly, run faster, and have more capabilities, providing improved tools for risk communication. The RMC has committed \$50K to integrate the *Monte Carlo Analysis* with HEC-WAT FRA, and has shown interest in funding additional work for soil moisture and snowpack initial condition uncertainty. (POC: Bill Scharffenberg, William.Scharffenberg@usace.army.mil)

MICA (Mobile Information Collection Architecture). MICA received the 2013 ERDC Award for Outstanding Achievement in Tech Transfer for Hurricane Sandy Support. This work provides real-time data collection architectures for mobile devices. Android-based mobile devices for emergency management data collection have been provided. Hurricane Sandy was the largest MICA deployment ever, and other agencies are utilizing the tool. UROC Pass-off Official deployment kits built for multiple simultaneous missions are another application. UROC is now managing day-to-day operations and negotiating with COE-HQ for annual operations costs. Help manuals have been updated and published, and MICA has been added to UROC helpdesk support. Users can build custom forms and can "cut" pieces of a map for their mission. (POC: Robert Walker, Robert.S.Walker@usace.army.mil)



CSTORM-DB (CSTORM Database). This work seeks to develop coastal storm statistical analysis tools, and to develop and host a web-based coastal storm database with associated web tools. CSTORM-DB is available at <https://cstormdb.erdcdren.mil/> , with the following capabilities: national storm climatological data storage; wave, wind, water level, meteorological data, ice; storm track data; authoritative regional high-fidelity model results; synoptic storm data/model output by region, area, data type; query/sort capability; plotting; and extremal statistical analysis. Another component is StormSim, an extremal statistical analysis and storm simulation software system. (POC: Jeff Melby, Jeffrey.A.Melby@usace.army.mil)



Storm Vulnerability Protection. This work unit is focused on developing an expedient hurricane inundation prediction software system, building tools on the CSTORM-DB web tool for easy reliable access and efficiency. The efforts leverage high-fidelity modeling for regional flood mapping, and utilize surrogate modeling techniques to forecast storm response (surge, wave, wind). Surrogate modeling strategies have proven to be appropriate for the problem and successful for surge inundation. (POC: Jeff Melby, Jeffrey.A.Melby@usace.army.mil)

Coastal Damages Prevented. This work unit has developed a nationally consistent method for quantifying damages prevented by coastal projects, analogous to the Flood Damages Prevented metric that has been in use by the Corps since 1934. The new Coastal Damages Prevented metric incorporates a HAZUS-based procedure for data collection and documentation of the annual calculations. Demonstrations of the metric is underway for projects in the Jacksonville District and for Hurricane Sandy. (POC: Susan Durden, Susan.E.Durden@usace.army.mil)

H&H Model Uncertainty. H&H model uncertainty is a critical component for conducting project studies and comparing project alternatives in a risk analysis framework. This work unit is developing a suite of methods of varying fidelity with related requirements for quantifying hydrologic model uncertainty. (Brian Skahill, Brian.E.Skahill@usace.army.mil)

Watershed Management

GSSHA Snow Melt. Enhanced ability to simulate snow accumulation and melting within an integrated hydrologic context has the potential to provide greatly improved estimates of snowpack, runoff, stream discharge, and closely associated issues, such as flooding, sediment transport, pollutant transport, and mobility. This work unit has developed three new snowmelt options in GSSHA that allow better simulation of snowpack and snow related hydrology within GSSHA's physically-based modeling framework. Version 6.1 of GSSHA is downloadable from the GSSHA wiki site, http://www.gsshawiki.com/Main_Page . (POC: Chuck Downer, Charles.W.Downer@usace.army.mil)

GSSHA Scaled Model Approach. The goal is to provide the hydrologic modeling community information and guidance on simulating small scale features in a large watershed, along with some useful tools that allow the ideas to be easily implemented. Best Management Practice (BMP) models were developed and added to GSSHA. Hurricane Sandy Models tested the impact of buildings and other structures on flow patterns. Information is released via the GSSHA wiki, http://www.gsshawiki.com/Main_Page. The BMP calculator is being utilized on two studies for US Army DPW Hawaii. Also underway are development and testing on reimbursable projects in the USACE Jacksonville and St. Paul Districts. (POC: Chuck Downer, Charles.W.Downer@usace.army.mil)

GSSHA Improved Model Calibration. Four new alternate simulation modes for model calibration have been added to GSSHA to enhance efficient and effective hydrologic model calibrations. GSSHA Wiki pages, http://www.gsshawiki.com/Main_Page, implemented as means of guidance, and example problems are provided. WMS was updated to support the four new GSSHA simulation modes. (Brian Skahill, Brian.E.Skahill@usace.army.mil)

HEC-HMS Surface Erosion. Surface erosion estimates become a boundary condition to a wide variety of channel sediment studies as well as being a component in reservoir sedimentation studies of storage capacity. However, erosion estimates often include a high degree of uncertainty. Using



process-based models may result in lowered uncertainty. An algorithm from the Rangeland Hydrology and Erosion Model is being adapted to a grid cell approach for addition to HEC-HMS. A sedimentation studies chapter is being added to the HEC-HMS *Applications Guide*. (POC: Bill Scharffenberg, William.Scharffenberg@usace.army.mil)

HEC-RAS Sediment. This research focused on implementing and improving Unsteady Sediment Transport modeling techniques and on including capabilities for predicting outcomes of sustainable reservoir sediment management options (e.g. flushing, sluicing). Current model version available at <http://www.hec.usace.army.mil/software/hec-ras/>. (POC: Stan Gibson, Stanford.Gibson@usace.army.mil)

HEC-RAS Parameter Uncertainty. To perform research and development activities directed towards quantifying hydraulic model uncertainties in HEC-RAS for integrated risk based analyses, and toward improving hydraulic modeling techniques and capabilities in HEC-RAS for applications to urban areas. FY13 saw new software, documentation (User's manual, Hydraulic Reference Manual, Applications Guide), example applications, training classes, and publications. (POC: Stan Gibson, Stanford.Gibson@usace.army.mil)

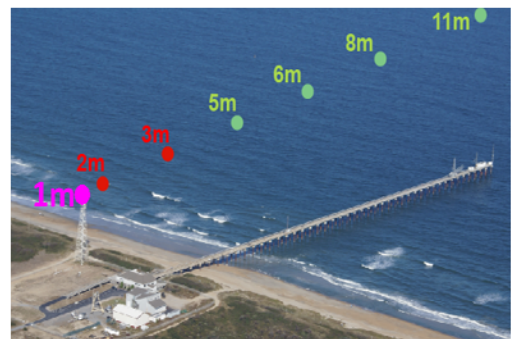


Reservoir Sedimentation. Enhance USACE modeling capabilities related to fine sediment transport processes for reservoir sedimentation analyses through the development of an interactive reservoir sediment technology database; populating the Reservoir Sedimentation Survey Database (RESSED), at <http://ida.water.usgs.gov/ressed/>; and other efforts. (POC: Loren Wehmeyer, Loren.L.Wehmeyer@usace.army.mil)

CODS & CFDC IPRs Overview

Coastal Field Data Collection Program (CFDC)

Field Research Facility (FRF). The mission of the FRF is to maintain long-term oceanographic and morphology observations as well as to tackle new challenges (e.g. real-time model assessment, climate change) through the development of cutting-edge observational tools and analyses of historical data. The FRF maintained ~50 in-situ, continuously operated coastal oceanographic sensors as well as continued the R&D of remote sensing. (POC: Jesse McNinch, Jesse.McNinch@usace.army.mil)

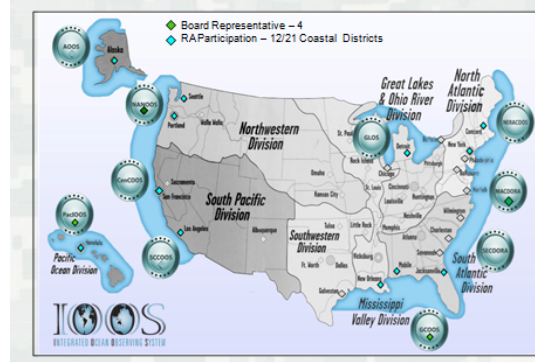


Coastal Ocean Data System (CODS)

Wave Observations. Provides high-quality wave observations for model evaluation, testing/improvements, climate variation, wave data analysis for intra-measurement evaluation, and decision tools to the Corps of Engineers and user-base community. Maintained ~50 directional wave sites (CDIP array) as well as enhanced the data archive. (POC: Dr. Robert Jensen, Robert.E.Jensen@usace.army.mil)

Integrated Ocean Observing System (IOOS). IOOS is an interagency effort to coordinate and share ocean data and tools. There are 11 Federal Agencies and 11 Regional Associations (RAs). Fosters linkages between the Corps & IOOS/RAs/other agencies to improve coordination and sharing of USACE data and capabilities, and vice versa . (POC: Linda Lillycrop, Linda.S.Lillycrop@usace.army.mil).

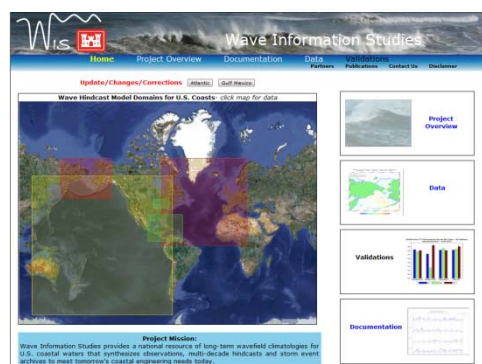
Regional Associations & District Participation



Cooperative Coastal Research Team – CDIP Beaches. This cooperation between ERDC and the Scripps Institute of Oceanography (SIO) seeks to improve and calibrate models predicting wave runup and shoreline change over a wide spectrum of physical and oceanographic conditions. Work included field observations, included renourished beach response. (POC: Jesse McNinch, Jesse.McNinch@usace.army.mil)



Wave Information Study (WIS). Provides long-term evaluated wave estimates for all US coastlines including the Great Lakes; access (discoverable) entry to those results; and offers multiple products and decision tools to the Corps and user-base community for planning and design. Analysis packages are now platform independent and long-term analysis capability was added. The Pacific Ocean and Lake Superior Hindcasts were uploaded to the web-site, <http://wis.usace.army.mil/wis.shtml> . (POC: Dr. Robert Jensen, Robert.E.Jensen@usace.army.mil)



Other Links – Information, Newsletters, Fun Stuff

The **Silver Jackets** website, with newsletters – <http://www.nfrmp.us/state/>.

CIRP Newsletters are available at <http://cirp.usace.army.mil/news/> .

The **National Ocean Council**'s portal for data, information, and tools to support people engaged in planning for the future of the ocean, our coasts, and the Great Lakes. This site could become a one-stop hub to support planners and to provide useful information to the public.

<http://www.data.gov/ocean>

Corps Guidance on Flood Control.

<http://operations.usace.army.mil/policy.cfm?CoP=flood>

Flood Risk Management Program (FRMP)

<http://www.nfrmp.us/>

Subscribe – Unsubscribe – Feedback

To subscribe/unsubscribe: <http://operations.usace.army.mil/flood.cfm>.

We would love your input – recommended article length is ½ to 1 page. Articles should be submitted to Doyle L. Jones, Canvassing Editor, Doyle.L.Jones@usace.army.mil.

We would also appreciate your feedback. Contact Dinah McComas, Managing Editor, Dinah.N.McComas@usace.army.mil or Doyle Jones.

FY14 PROSPECT COURSES

Advanced Streambank Protection	Granada, MS	31 March 2014 – 4 April 2014
Coastal Ecology	Newport, OR	16 June 2014 – 20 June 2014
Coastal Engineering	Vicksburg MS	24 February 2014 – 28 February 2014
Coastal Project Planning	Duck, NC	21 April 2014 – 25 April 2014 9 June 2014 – 13 June 2014
Consequence Estimation with HEC-FIA	Davis, CA	5 May 2014 – 9 May 2014
Dam Safety	Grenada, MS	3 February 2014 – 6 February 2014 3 March 2014 – 6 March 2014 7 April 2014 – 10 April 2014 9 June 2014 – 12 June 2014
Dam Safety	Branson, MO	5 May 2014 – 8 May 2014
Streambank Erosion and Protection	Vicksburg, MS	24 March 2014 – 28 March 2014
Risk Communication & Public Participation	Huntsville, AL	3 September 2014 – 5 September 2014
For more information: http://ulc.usace.army.mil		

FY 2014 Purple Book

<http://ulc.usace.army.mil/downloads/PurpleBook2014.pdf>

FY 2014 Projected Schedule

<http://ulc.usace.army.mil/CrsScheduleNewFY.aspx>



Conferences

This listing is for information only and is not a complete list of FRM-related meetings. These meetings are not endorsed by the Corps of Engineers unless specifically stated. If we have failed to list a conference/meeting/symposium that would be of interest to the Flood Risk Management community, please forward the conference details to us.

9-13 December 2013 – American Geophysical Union’s 46th Annual Fall Meeting – San Francisco, CA – <http://fallmeeting.agu.org/2013/>

12-14 February 2014 – National Conference on Beach Preservation Technology – Stuart, FL - <http://www.fsbpa.com/tech-conference.html>

14-16 May 2014 – 2nd International Conference on Environmental and Economic Impact on Sustainable Development – Ancona, Italy – <http://www.wessex.ac.uk/14-conferences/environmental-impact-2014.html>

1-6 June 2014 – ASFPM 38th Annual National Conference – Seattle, WA – <http://www.floods.org>

4-6 June 2014 – Risk Analysis 2014 – New Forest, UK – <http://www.wessex.ac.uk/14-conferences/risk-analysis-2014.html>

18-20 June 2014 – 4th International Conference on Flood Recovery, Innovation and Response – Poznan, Poland – <http://www.wessex.ac.uk/14-conferences/friar-2014.html>

28 July - 1 August 2014 – Conference on Ecological and Ecosystem Restoration – New Orleans, LA – www.conference.ifas.ufl.edu/CEER2014

14-19 September 2014 – Oceans 2014 MTS/IEEE – St. John’s, Newfoundland and Labrador, Canada – www.oceans14mts.ieee.stjohns.org

16-18 September 2014 – 6th International Conference on Flood Management (ICFM6), “Floods in a Changing Environment” – São Paulo, Brazil – <http://icfm6.com/index.php>

1-5 November 2014 – 7th National Conference on Coastal and Estuarine Habitat Restoration – Washington, DC – <http://www.estuaries.org/conference/>

27-28 February 2015 – 7th World Water Forum – Gyeongju, Republic of Korea – worldwaterforum7.org

Acronyms in this issue of the FRM Newsletter	
ADCIRC	ADvanced CIRCulation Model
ADH	ADaptive Hydraulic Modeling
AEP	annual exceedance probability
C2SHORE	2D coastal morphology software package
CDIP	Coastal Data Information Program
CFDC	Coastal Field Data Collection
CODS	Coastal and Ocean Data System
CSTORM-DB	Coastal Storm Database
CSTORM-MS	Coastal Storm Modeling System
EAD	Expected Annual Damage
EM	Engineering Manual
ERDC	Engineer Research and Development Center
FCSDR	Flood and Coastal Storm Damage Reduction
FRF	Field Research Facility
FRM	Flood Risk Management
GFDL	Geophysical Fluid Dynamics Laboratory
GSSHA	Gridded Surface Subsurface Hydrologic Analysis
H&H	Hydraulics and Hydrology
HAZUS	Risk assessment tool analyzing potential losses from floods, hurricane winds and earthquakes
HEC	Hydraulic Engineering Center
HEC-FDA	HEC Flood Damage Reduction Analysis
HEC-FIA	HEC Flood Impact Analysis
HEC-HMS	HEC Hydrologic Modelin System
HEC-RAS	HEC River Analysis System
HEC-WAT	HEC Watershed Analysis Tool
HEC-WAT FRA	HEC-WAT with Flood Risk Analysis
IOOS	Integrated Ocean Observing System
IPR	In Progress Review
IWR	Institute for Water Resources
LTEP	Long-Term Exceedance Probability
MICA	Mobile Information Collection Architecture
PICS	Particle Imaging Camera System
POC	Point of Contact
PROSPECT	Proponent-Sponsored Engineer Corps Training
R&D	Research & Development
RAS	Regional Associations - within IOOS
RESSED	Reservoir Sedimentation Survey Database
RMC	USACE Risk Management Center
SEDLIB	Sediment Library
SIO	Scripps Institute of Oceanography
SMS	Surface Water Modeling System
SSI	Soil-Structure Interaction
StormSim	Storm statistical analysis package
STWAVE	Steady-state spectral wave model
TR	Technical Report
UROC	USACE Reachback Operations Center
WIS	Wave Information Studies
WMS	Watershed Modeling System