

ACTIVITIES REPORT: 1 JULY 2009 - 30 JUNE 2010

General Description of HRC

The Hydrologic Research Center (HRC) is a publicly-supported non-profit research corporation. HRC was established in July of 1993 in San Diego, California. In October 1998, the Internal Revenue Service affirmed the non-profit status of HRC beyond the advanced ruling period of 5 years. HRC's purpose is to advance the science and engineering of hydrology through research and science cooperation, and to provide technology transfer and hydrologic training services. The National Science Foundation and the National Oceanic and Atmospheric Administration have served as HRC's Oversight Agencies.

HRC utilized the following methods of performing its mission:

- Publishing research and development results in technical reports, refereed journal papers, monographs, books, and written accounts of technical national and international meetings, and through the internet.
- Developing and participating in demonstration projects concerning science-based prototype observation and prediction systems in collaboration with universities, government agencies, and private industry.
- Organizing short courses and workshops on hydrologic and meteorological topics for government agencies, graduate and undergraduate university students and teachers of science.
- Providing research training for graduate and undergraduate students of collaborating universities.
- Offering post-doctoral research positions for advanced training of new Ph.D.s.
- Accepting visiting scholars from U.S. institutions and other countries, and establishing collaborative research and exchange programs with research institutions in the U.S. and abroad.

HRC's Board of Directors:

Dr. Konstantine P. Georgakakos	HRC and Scripps Institution of Oceanography, University of California, San Diego
Mr. Richard Kennedy, PMP	RJK Consulting Berlin, MA
Professor Witold F. Krajewski	Department of Civil and Environmental Engineering and IIHR-Hydroscience and Engineering, The University of Iowa.
Professor Anastasios A. Tsonis	Department of Mathematical Sciences, University of Wisconsin - Milwaukee

HRC's Officers of the Board:

Mr. Jason Sperflage, Treasurer

Mr. Robert Jubach, Secretary

Dr. Konstantine P. Georgakakos, President

Areas of research, development, and technology transfer include:

Hydrologic Science and Engineering

- (a) Floods, Flood Warning and Flood Control
- (b) Droughts
- (c) Processes of the Global Hydrologic Cycle
- (d) Remote Sensing of Hydrologic State Variables and Fluxes
- (e) Hydrology of Environmental Pollution and Restoration
- (f) Energy Production by Hydrologic Systems
- (g) Hydrologic Applications of Artificial Intelligence

Hydrometeorology

- (h) Precipitation and Surface-Runoff Processes

Hydroclimatology

- (i) Land-Surface/Atmospheric Interactions
- (j) Hydrology of the Interaction of Land and Ocean
- (k) Hydrologic and Water Resources Impacts of Climate Variability and Change

Disaster Management Protocols

Ocean Wave Modeling and Prediction Systems

Personnel

Dr. Konstantine P. Georgakakos, Director and Senior Research Scientist

Mr. Robert Jubach, General Manager

Ms. Theresa Carpenter, PhD Candidate and Hydrologic Engineer II

Dr. Fang-Yi Cheng, Postdoctoral Associate

Dr. Nicholas E. Graham, Climate Applications Manager, and Senior Research Scientist

Ms. Barbara Hansen, Administrative Associate

Ms. Neha Madurai, Computer Programmer/Analyst I

Mr. Michael Murphy, Jr., Assistant Project Scientist

Dr. Eylon Shamir, Hydrologic Engineer II

Mr. Cristopher Spencer, Computer Programmer/Analyst I

Mr. Jason A. Sperflage, Computer Programmer/Analyst II

Dr. Rochelle Campbell, Meteorologist II – Temporary Employee (March-December 2010)

Ms. Sheila Ragan, Ocean Point Financial Systems, HRC Senior Accountant (contractor) beginning 10/3/06.

Projects Funded or Ongoing FY10

ACP, Autoridad del Canal de Panama, *Panama Maintenance 2009*.

ACP, Autoridad del Canal de Panama, *Panama Maintenance 2010*.

ACP, Autoridad del Canal de Panama, *PMF Gatun Inflow*, 3/19/10.

ACP, Autoridad del Canal de Panama, *Projections of Extreme Storm Events for the Panama Canal Watershed*, 11/25/09 – 8/18/10.

ACP, Autoridad del Canal de Panama, *Risk Study 2010*, 1/2010 – 8/31/10.

ACP, Autoridad del Canal de Panama, *Risk Study II*, 6/8/10 – 9/30/10.

ACP, Autoridad del Canal de Panama, *Water Resources Advisory Committee Oversight of the Flood Frequency Estimation*, 5/10/07 – 5/14/10.

Barons Advanced Meteorological Services, LLC (BAMS) (subcontract from Lockheed Martin Corporation), *Support to the Romania DESWAT Project, Flash Flood Guidance Task, Revised FFP*, 5/05 – 11/08.

Barons Advanced Meteorological Systems, LLC (BAMS) / Lockheed Martin, *Destructive Waters (DESWAT) – Hydrological Model Calibration and Validation for Romania*, 5/01/05 – 11/08.

Barons Advanced Meteorological Systems, LLC (BAMS), Romania Travel / Time / Materials / FFG, 5/1/05 – 8/15/10.

California Energy Commission, *Implications of Climate Changes for Northern California Water Resources Management for the Later Part of the 21st Century*, 12/4/07 – 12/4/09.

California Energy Commission, *INFORM II*, 5/25/09 – 8/31/12.

California Institute for Energy and Environment (CIEE), *Climate Change and California Coastal Sea Level Rise: Vulnerability and Adaptation Study for California*, 6/15/10 – 12/31/11.

Jet Propulsion Laboratory, *Algorithm Improvement and Computation of Ocean Wave-Wave Interactions*, 2/1/10 – 7/31/10.

South African Weather Service, *Development and Implementation of a Flash Flood Warning System for the Republic of South Africa*, 8/1/08 – 9/30/10.

U.S. Israel Binational Science Foundation, *Predicting Flash Floods and their Risk in a Dry Climate*, with Hebrew University – Jerusalem, 10/1/09 – 9/30/10.

U.S. National Oceanic and Atmospheric Administration, Climate Program Office, *Constraining the Tropical Pacific's Role in Low-Frequency Climate Change of the Last Millennium*, 5/31/06 – 11/30/09.

U.S. National Oceanic and Atmospheric Administration, *Operational Multiscale Forecast and Reservoir Management in Northern California*, 9/1/07 – 8/31/10.

U.S. National Oceanic and Atmospheric Administration, *The Paleoclimate Reconstruction (PR) Challenge: A community program to benchmark methods used to reconstruct the last 1-2000 years*, 7/1/08 – 6/30/11.

U.S. National Oceanic and Atmospheric Administration, *Characterizing Uncertainty in Upstream Regulation Actions for Operational Ensemble Streamflow Prediction*, 4/1/08 – 5/31/10.

U.S. National Weather Service (NWS), subcontract through LEN Technologies, *Application of Flash Flood Guidance in Haiti*, 5/18/10 12 months.

U.S. National Weather Service (subcontract through Riverside Technology, inc.), *Asia Flood Net Flash Flood Warning System for the Mekong River Basin, Phase 3*, 8/22/07 – 2/20/10.

U.S. National Weather Service (subcontract through Riverside Technology, inc.), *Riverside SE Asia FFG Enhancement*, 5/7/08 – 2/20/10.

University Joseph Fourier, Grenoble, France, *Global Wave Modeling for Simulating Microseism Generation by Wave-Wave Interaction*, 5/3/10 – 2/15/12.

University of California San Diego, *Climate Change and California Coastal Sea Level and Waves*, 2/1/08 – 10/31/09.

University of California San Diego, *Evaluation of an Operational Regional Wave Model for the Southern California Bight*, 10/1/06 – 10/31/09.

University of California San Diego – NOAA/JIMO, California Applications Project (CAP), *Northern California Regional Water Resource Prediction Management*, 6/1/09 – 6/30/10.

World Meteorological Organization, *Development and Implementation of International Regional Flash Flood Guidance and Early Warning Systems (GFFG)*.

Publications

Research Papers in Journals

Cheng, Fang-Yi, and Konstantine P. Georgakakos, 2010: “Statistical analysis of observed and simulated hourly surface wind in the vicinity of the Panama Canal,” *International Journal of Climatology*. Article first published online: 23 MAR 2010, DOI: 10.1002/joc.2123.

Cheng, Fang-Yi, and Konstantine P. Georgakakos, 2010: “Wind speed interpolation in the vicinity of the Panama Canal,” *Meteorological Applications*, 17, DOI: 10.1002/met.237 (in press).

Graham, N. E., C. M. Ammann, D. Fleitmann, K. M. Cobb, and J. Luterbacher, 2010: “Support for global climate reorganization during the Medieval Climate Anomaly,” *Climate Dynamics* (submitted).

Graham, Nicholas E., Konstantine P. Georgakakos, 2010: “Toward Understanding the Value of Climate Information for Multiobjective Reservoir Management under Present and Future Climate and Demand Scenarios,” *J. Appl. Meteor. Climatology*, 49, 557-573

Meixner T., E. Shamir, and J. Duan, 2009: “Surface Flow, Sediment Transport, and Water Quality Connections in the Lower Santa Cruz River, Arizona,” *Journal of American Water Resources Association* (submitted).

Shamir, E, B-J. Lee, D-H, Bae, and K. P. Georgakakos, 2010: “Flood Forecasting in Regulated Basins using the Ensemble Extended Kalman Filter with the Storage Function Method,” *Journal of Hydrologic Engineering*, ASCE (in press).

Abstracts, Presentations and Conference Proceedings

- Carpenter, T.M., and K.P. Georgakakos, 2010: "Orographic precipitation and flash flood occurrence frequency in Southern California," American Meteorological Society Annual Meeting, Seattle, Washington, 23-27 January 2011.
- Carpenter, T.M., and K.P. Georgakakos, 2010: "Toward the estimation of flash flood threat For Southern California: An interdisciplinary modeling approach." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.
- Carpenter, T.M., and K.P. Georgakakos, 2010: "Climatic changes in flash flood occurrence frequency for Southern California." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.
- Georgakakos, K.P., N.E. Graham, and A.P. Georgakakos, 2010: "The use of real-time GFS and CFS data to improve water resources management in Northern California." Seminar w/Abstract, National Centers of Environmental Prediction, NOAA, 25 February 2010.
- Georgakakos, K.P., A.P. Georgakakos, and H. Yao, 2010: "Characterizing uncertainty in upstream regulation actions for operational ensemble streamflow predictions." Seminar, Hydrology Laboratory, OHD, National Weather Service, NOAA, 21 July 2010.
- Georgakakos, K.P., J.A. Sperflage, C. Spencer, T.M. Carpenter, E. Shamir, R. Jubach, 2010: "Building Human Forecaster Capacity for Generating Flash Flood Warnings and Communicating with Disaster Managers Worldwide." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.
- Georgakakos, K.P., N.E. Graham, F.-Y. Cheng, C. Spencer, A.P. Georgakakos, H. Yao, M. Kistenmacher, 2010: "Climate change impact assessment for Northern California Water Resources, The value of adaptive management based on hydroclimatic information." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.
- Georgakakos, K.P., 2010: "Global flash flood guidance systems," World Bank, Washington, DC, 22 July 2010.
- Graham, N. E., C. M. Ammann, D. Fleitmann, K. M. Cobb, and J. Luterbacher, 2010: "Evidence for global climate reorganization during medieval times," European Geophysical Union Annual Meeting, Vienna, April 2010.
- Murphy, M.J., J. Wang and K.P. Georgakakos, 2010: "Extreme precipitation in the Panama Canal region under present and predicted future climates." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.
- Shamir, E. and K.P. Georgakakos, 2010: "Sensitivities of hydrologic simulation of small tropical ungauged basins." Hydrology Conference 2010, San Diego, CA, 10-13 October 2010.

HRC Technical Reports

Georgakakos, A.P., H. Yao and K.P. Georgakakos, 2010: “*Upstream Regulation Adjustments To Ensemble Streamflow Predictions*,” HRC Technical Report No. 7, Hydrologic Research Center, San Diego, California.

Georgakakos, K.P., T.M. Carpenter, and N.E. Graham, 2009: “Operational Multiscale Forecast and Reservoir Management in Northern California: Second Year Progress Report,” *HRC Technical Note No. 40*, Hydrologic Research Center, San Diego, California.

Georgakakos, K.P., 2010: “Derivation of Approximate Probable Maximum Flood Inflow Hydrographs for Gatun Lake,” *HRC Technical Correspondence No. PANPMF20100319*, Hydrologic Research Center, San Diego, California.

Sperflslage, J., C. Spencer, and K.P. Georgakakos, 2009: “Mekong River Commission Flash Flood Guidance System (MRCFFG) User’s Guide, *HRC Limited Distribution Report No. 31*, Hydrologic Research Center, San Diego, California.

Sperflslage, J., C. Spencer, and K.P. Georgakakos, 2010: “Romania Flash Flood Guidance System (ROFFG) User’s Guide, *HRC Limited Distribution Report No. 30*, Hydrologic Research Center, San Diego, California.

Others

Meixner T., E. Shamir, and J. Duan, 2009: “Surface Flow, Sediment Transport and water quality connections in the Lower Santa Cruz River, Arizona.” Report prepared for U.S EPA region IX October 2009.

Educational, Science Cooperation and Technology Transfer Activities

- Ms. Theresa Carpenter continued the research work for her PhD Degree at the Scripps Institution of Oceanography, UCSD.
- K.P. Georgakakos serves on the Water Resources Section Oversight Committee for the Panama Canal Commission.
- K.P. Georgakakos continues to serve as an Editor-in-Chief of the Journal of Hydrology and as a member of the Climate Change Technical Advisory Group of the California Department of Water Resources.
- R. Jubach and K.P. Georgakakos - Comision Nacional del Agua (Mexico), Flash Flood Guidance System Overview Workshop, Tuxtla Gutierrez, Mexico, 7-11 December 2009, Attendees from CONAGUA, Disaster Management, Universities.
- R. Jubach - World Meteorological Organization, Southern Africa FFG Operations Kickoff Workshop, Pretoria, South Africa, 27-30 July 2009, Attendees from all seven countries involved with the SARFFG.
- R. Jubach - Mekong River Commission, MRCFFG Training Workshop, Siem Reap, Cambodia, 18-21 October 2009, Attendees from all four countries involved with the MRCFFG.

- R. Jubach met with Robert Masters, Director – Development and Regional Activities Department of the WMO, at the AMS Conference in Atlanta with a proposal to start a WMO Volunteer Network to assist at-need NMHSs throughout the world. This idea has been taken up by WMO which has formed an “unofficial committee” to develop a concept to discuss at the next WMO Congress.
- R. Jubach, K.P. Georgakakos, E. Shamir, C. Spencer, K.P. Georgakakos, J. Sperflage, and T. Carpenter provided training to the South African Weather Service, SAFFG Operations Training at HRC, 1 March- 23 April 2010. Two meteorologists from SAWS attended.
- R. Jubach met with WMO, USAID/OFDA, and NWS to discuss and develop an integrated training program concept for the Global FFG program. All parties agreed to the concept of a four step certification process focused specifically on flash flood issues and flash flood guidance.
- R. Jubach and K.P. Georgakakos - World Meteorological Organization, Black Sea Middle East FFG Initial Workshop, Istanbul, Turkey, 28 March-1 April 2010, Attendees from eight countries potentially involved with the BSMEFFG.
- E. Shamir traveled to Namibia, Zambia and Malawi to present and support the SARFFG.
- E. Shamir traveled to Israel to collaborate and coordinate the BSF project.
- C. Spencer installed the MRCFFG System in Phnom Penh, Cambodia and trained RFMMC technical administration and forecasting staff.
- J. Sperflage continued design and implementation, testing and onsite training activities with SAWS staff at HRC.
- J. Sperflage traveled to INHGA offices in Romania in June 2010 for onsite implementation, validation testing and end-user acceptance of ROFFG system.

Community Outreach Activity

- E. Shamir conducted a Peer Review of more than eight journal manuscripts.
- E. Shamir participated in the Transboundary Aquifer Assessment Program Arizona/Sonora (TAAP-A/S) workshop. Tucson Arizona, November 3-4, 2009.
- E. Shamir was a member of the Data Committee, National Hydrologic Warning Council.
- E. Shamir was a member of the bi-yearly organization committee of the National Hydrologic Warning Council. The conference will be held in San Diego in May 2011.
- E. Shamir participated in several Technical Advisory Committee (TAC) meetings for the development of Hydromodification Management Plan (HMP) for San Diego County.

Visitors

MRC FFG Training, Tong Seng (Phnom Penh, Cambodia), Vinliam Bounlom (Vientiane, Lao PDR), Ruangwit Ngaosusit (Bangkok, Thailand), Phung Tien Dung (Hanoi, Vietnam), Janejira Tospornsampan (Phnom Penh, Cambodia), Kattray Phung (Phnom Penh, Cambodia),
8 June - 17 July 2009

Mr. Eugene Poolman, South African Weather Service, 20-24 July 2009

Dr. Ana Nunes, Scripps Institution of Oceanography, University of California, San Diego
3 August 2009

Dr. Eric Wilcox, NASA Goddard Space Flight Center, 17 August 2009

Mr. Abelardo V. Bal Renau, Panama Canal Authority and Mr. Forrest Holly, Consultant,
10-11 September 2009

Mr. Bob Kuligowski, NOAA, 17 September 2009

Mr. Raúl Tejada, Panama Canal Authority, 6 October 2009

Mohamed Habib, IIHR University and Mohamed S. Gadalrab, Ain Shams University, Cairo,
Egypt, 22 Oct 2009

Ilya Zaslavski, UCSD Super Computer, 20 November 2009

Dr. Fang-Yi Cheng, National Central University, Taiwan, 28 January and 3-5 February 2010

South African Weather Service FFG Training, Elke Brouwers, Vanetia Magane, Eugene Poolman,
1 March – 23 April 2010

Mike Knight, Curtis Barrett, Chris Goode, Jim Menard, Allyson Turnbull, Enterprise Electronics,
22 March 2010

Dr. Ram Ray, San Diego State University, 27 May 2010

Amanda Scott, 9 June 2010