

Activities Report: 1 July 2008 - 30 June 2009

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 realizes its purposes:

By performing basic and applied research in areas of hydrology, water resources, hydrometeorology and hydroclimatology.

By designing and implementing prototype hydrologic projects for technology transfer and science cooperation and by offering hands-on training for field personnel.

By publishing research and development results in technical reports, refereed journal papers, monographs, books, and written accounts of technical national and international meetings.

By organizing short courses, workshops, and summer schools on hydrologic topics for Government Agencies, graduate and undergraduate University students, and teachers of Science.

By providing research training for graduate and undergraduate students of collaborating Universities.

By offering post-doctoral research positions for advanced training of new Ph.D.'s.

By accepting visiting scholars, and establishing collaborative research and exchange programs with hydrologic research organizations 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-Hydrosience 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

Dr. Eylon Shamir, Hydrologic Engineer II

Mr. Cristopher Spencer, Computer Programmer/Analyst I

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

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

Projects Funded or Ongoing FY09

ACP, Autoridad del Canal de Panama: *Implementation of Orographic Precipitation Model in the PANMAP Software (MM5).*

ACP, Autoridad del Canal de Panama: *Panama Maintenance 2008 and Meteorological Model.*

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

ACP, Autoridad del Canal de Panama: *Review of the State Space Sacramento (SS-SAC) parameters of the National Weather Forecast System (NWSRFS) and Panama Forecast (PANFCST) computer model, refine the calibration and update the parametric databases, 5/09 – 8/08.*

ACP, Autoridad del Canal de Panama: *Water Resources Advisory Committee Oversight of the Flood Frequency Estimation, 7/31/09.*

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, 05/01/05 – 11/08.*

Barons Advanced Meteorological Systems, LLC (BAMS): Romania Travel / Time / Materials / FFG.

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.

Kennedy/Jenks Consultants: *Water Supply Reliability Plan Update and Optimization Model Project – Castaic Lake Water Agency*, 7/08 – 11/08.

South African Weather Service: *Development and Implementation of a Flash Flood Warning System for the Republic of South Africa*, 8/1/08 – 6/30/10.

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 – 7/31/10.

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 (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.

U.S. National Weather Service (subcontract through Riverside Technology, inc.): *Support for Early Warning System and Risk Assessment with a Multi-Hazard Approach in Central America*, 4/24/08 – 12/31/08.

U.S. National Weather Service (subcontract to UCAR): *Development of CAFFG Online Training Program*, 6/3/08 – 11/1/08.

U.S. National Weather Service (subcontract to Varone Consulting): *Support to USAID India Disaster Management Support Project, Climate Forecast System*, 7/1/07 – 6/30/09.

U.S. National Weather Service (subcontract to Varone Consulting): *Support to NWS for Development of Project Proposal for a Flash Flood Early Warning System for the Aburrá Valley Colombia*, 9/1/08 – 11/30/08.

University Corporation for Atmospheric Research (UCAR): *Analysis of Climatic Response in the Americas to Quasi-Prescribed Tropical SST Anomalies: Inferences on Late Holocene Climate Change Patterns*, 9/1/08 – 9/30/08.

University of California San Diego: *Climate Change and California Coastal Sea Level and Waves, Task 2 – Wave Projections*, 5/1/08 – extension requested. Task on hold.

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*, 6/1/03 – 12/31/09.

Waterway Research Institute, Sejong University: *Development and Application of a State Estimator for a Distributed Storage Function Hydrologic Model of the Nakdong River Basin*, 7/1/07 – 5/31/09.

World Meteorological Organization: *Development and Implementation of International Regional Flash Flood Guidance and Early Warning Systems (GFFG)*, 4/6/09 – 5/31/10 (Southern Africa). 6/1/10 – 5/31/11 (Middle East).

Publications

Research Papers in Journals

Cheng, F. and K.P. Georgakakos, 2009: “Statistical analysis of observed and simulated hourly surface wind in the vicinity of the Panama Canal,” *International Journal of Climatology*, (in review).

Georgakakos, K.P., 2008: “Analytical evaluation of the performance of threshold-based flash flood warning systems,” *Journal of Hydrometeorology*, (in review).

Graham, N. E. and K. P. Georgakakos, 2009: “Towards understanding the value of climate information for multi-objective reservoir management under present and future climate and demand scenarios,” *Journal of Applied Meteorology and Climatology*, (in review).

Kedar, S., M. Longuet-Higgins, F. Webb, N. Graham, R. Clayton, and C. Jones, 2008: “The origin of deep ocean microseisms in the North Atlantic Ocean,” *Proc. Roy. Soc.*, 777-793.

Knowles, N. and K.P. Georgakakos, 2008: “A Describing Function Approach to Aggregating High-Resolution Land-Surface Data for Macroscale Hydrology Modeling,” *Water Resources Research*, (in review).

Menéndez, M., F. J. Méndez, I. J. Losada, and N. E. Graham, 2008: “Variability of extreme wave heights in the northeast Pacific Ocean based on buoy measurements,” *Geophys. Res. Lett.*, 35, L22607.

Shamir, E., B.-J. Lee, D.-H. Bae and K.P. Georgakakos, 2009: "Flood Forecasting in Regulated Basins Using Ensemble Extended Kalman Filter with the Storage Function Method," *ASCE Journal of Hydrologic Engineering* (in review).

Trouet, V., J. Esper, N. Graham, A. Baker, J. Scourse and D. Frank, 2009: "Persistent positive North Atlantic Oscillation dominated the Medieval Climate Anomaly," *Science*, 324, 78 – 80.

Villarini, G., W.F. Krajewski, A.A. Ntelekos, K.P. Georgakakos, and J.A. Smith, 2009: "Towards probabilistic forecasting of flash floods, The combined effects of uncertainty in radar-rainfall and flash flood guidance," *Journal of Hydrology*, (in review).

Abstracts, Presentations and Conference Proceedings

Carpenter, T.M., and K.P. Georgakakos, 2008: "Simulation of Orographically-Driven Precipitation in Southern California," Poster Presentation, Poster #H21D-0912, *AGU Fall Meeting*, December 2008.

Carpenter, T.M. and K.P. Georgakakos, 2008: "Towards the Characterization of the Frequency of Flash Flood Occurrence Through Hydrologic Modeling for Southern California," Poster Presentation, Poster # H13D-0961, *AGU Fall Meeting*, December 2008.

Cheng, F., 2008: "Evaluation of rainfall prediction for the Panama Canal Watershed," Poster Presentation, *AGU Fall Meeting*, December 2008.

Georgakakos, K.P., 2008: "Demonstrating science benefits of water resource prediction for water management," *NSF EPSCoR Water Workshop: Water Dynamics*, National Science Foundation, hosted by VT EPSCoR, Burlington, Vermont, 9-12 November 2008 (Invited Keynote)

Georgakakos, K.P., N.E. Graham, T.M. Carpenter, A.P. Georgakakos, H. Yao, and M. Kistenmacher, 2008: "Using the INFORM System to Identify Effective Adaptation to Climatic Variability and Change: Design of Experiments and Early Results," Poster, *Annual California Climate Change Conference*, California Energy Commission, Sacramento, California 8-10 September 2008.

Georgakakos, K.P., N.E. Graham, A.P. Georgakakos, and H. Yao, 2008: "Demonstrating integrated forecast and reservoir management for Northern California in an operational environment," University of California, Davis, California, 6 November 2008 (Invited Seminar)

Georgakakos, K.P., 2009: "Science-based water management, Prediction and decision support under climate variability and change," *Water Resources Research Center Annual Conference on Global Environmental Challenges, Science, Policy, and Politics (TEI Environmental Lecture Series)*, University of Massachusetts, Amherst, Massachusetts, 7-8 April 2009 (Invited Keynote)

Graham, N. and C. Ammann, 2008: "Proxy Surrogate Reconstruction (PSR) - A Method for Blending Multiple Proxy Records with Climate Model Output," *AGU Fall Meeting*,

San Francisco, December 2008. (Invited)

Graham, N., 2009: "Proxy Surrogate Reconstruction," *3rd Milestone Meeting of the Millennium Project*, Mallorca, Spain, March 2009. Keynote

Graham, N., 2009: "Practical experience using speleothem data in multi-proxy climate reconstructions," *EGU Fall Meeting*, Vienna, April 2009. (Invited)

Graham, N., C. Ammann, and D. Fleitmann, 2009: "Beyond the tropical Pacific: Medieval climate dynamics and the role of Indian Ocean SSTs," *EGU Fall Meeting*, Vienna, April 2009.

Graham, N., 2009: "Untangling the MCA-LIA transition: The role of climate models," *European Science Foundation Workshop on Synoptic-scale Climate Dynamics During the Past Millenium*, Kippel, Switzerland, May 2009. (Keynote)

Graham, N., 2009: "Tropical Ocean – Mid-latitude Teleconnections and Related Climate Patterns over Past Centuries," *8th NCCR Climate Summer School*, Grindlewald, CH Aug-Sept. 2009.

Jubach, R. worked with the Mekong River Commission to develop and present a video on the Lower Mekong Basin FFG implementation. This presentation was at the 7th Annual Mekong Flood Forum in Bangkok.

Jubach, R. presented a one day workshop for USAID in New Delhi, India overviewing the accomplishments of the hydrometeorological aspects of the disaster management program and discussing the improved capacity of Indian hydrometeorological agencies with regards to tropical cyclone and rainfall forecasting.

Jubach, R. made a presentation of HRC programs at the Downtown San Diego Rotary. This led to the San Diego Rotaract Club having a fundraiser to support HRC initiatives. Mr. Jubach made several presentations at Rotaract meetings to get commitments for the fundraiser and coordinated the event with the Club including publicity.

HRC Technical Reports

Shamir, E. and K.P. Georgakakos, 2008: "Implementation of a System for Flood Forecasting in Korea based on the Storage Function Method and Distributed Filtering Techniques." *Hydrologic Technical Note No. 37*, Hydrologic Research Center, San Diego, California, revised March 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.

- Dr. Georgakakos received the John W. Olver Leadership Award from the Water Resources Research Center at the University of Massachusetts and offered the 2008 Environmental Lecture Series Keynote.
- Dr. Georgakakos and Mr. Jubach offered a series of seminars for the Mexican Weather Service Staff on flash flood guidance, Mexico City, Mexico, 8-11 December 2008.
- Dr. 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.
- HRC staff worked with visitor trainees from Romania and Southeast Asia on hands-on training for the operational HRC Flash Flood Guidance system, May - July 2009.
- HRC signed a Memorandum of Understanding with NOAA, WMO, and USAID for the development and implementation of the Global Flash Flood Guidance System, February 2009.
- Mr. Jubach organized and presented a workshop on the application of an FFG system for flash flood warnings in the Aburra Valley in September 2008 in Medellin, Colombia.
- Mr. Jubach coordinated and directed a two week study tour for improvement of rainfall forecasting capacity in India for Indian scientists and USAID in July 2008.
- Mr. Jubach, Dr. Shamir and Mr. Sperflage organized and presented a workshop for Asia Flood Network USAID/OFDA Flood Mitigation and Preparedness Program in Asia. Vientiane, Lao PDR 17-19 February 2009.
- Dr. Shamir provided training for NWSRFS Interactive Calibration Program (ICP) in Asheville North Carolina for BAMS and INGHA scientists 8-12 December 2008.
- Dr. Shamir participated together with HRC colleagues in the training for ROFFG and MRCFFG conducted in HRC.
- Dr. Shamir was a member of the Advisory Council for the Elementary Institute of Science, Commission on Science That Matters the 2008 Water Initiative.
- Dr. Shamir participated in several Technical Advisory Committee (TAC) meeting for the development of Hydromodification Management Plan (HMP) for the San Diego County.
- Dr. Shamir provided consultation to Groundwork San Diego Chollas Creek regarding development of Chollas Creek Enhancement Program.
- Dr. Shamir conducted a Peer Review of more than eight journal manuscripts and two grant proposals.

Visitors

Dr. Eric Wilcox, NASA Goddard Space Flight Center, 8 July 2008

Mr. Jeff O'Hara, Chicago Climate Exchange, Inc., 25 July 2008

Mr. Takaichi, Kennedy-Jenks, 29 July 2008

Sara Agahi, County of San Diego, Watershed Protection Program, Eric Mosolgo and Nancy Gardiner from Brown & Caldwell, consultation regarding the development of the San Diego County Hydromodification Management Plan, 14 August 2008.

Jessica Lundquist, University of Washington, 21 September 2008.

Attendees from MRC in Vientiane: Te Navuth, From MRC in Phnom Penh: Truong Hong Tien, Niccolas Bakker, An Pich Hatda, Bob Pengel, Janejira Tospornsampan, 26-28 November 2008.

Andrea Yoder and her students from the Elementary Institute of Science Commission on Science That Matters, San Diego, 15 December 2008.

Hassan Sachedina, Ph.D, MSc, Project Concern International, 14 January 2009

Byong-Ju, Lee, Ph.D. student, Water Resource & GIS Lab, Civil and Environmental Engineering, Sejong University, Seoul, Korea, 24-31 March 2009

Dr. Mark Askelson, University of North Dakota "Pavement Precipitation Accumulation Estimation System: measurement and estimation of winter precipitation" presentation to HRC staff, 21 April 2009

Mr. Elena Anghel and Mr. Stefan Dumitru, Bucharest, Romania, FFG Training, 27 April – 5 June 2009

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), Katty Phung (Phnom Penh, Cambodia), 8 June - 17 July 2009