
Activities Report: 1 July 1999 - 30 June 2000

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 development work, and to provide technology transfer and hydrologic training services. The National Science Foundation and the National Oceanic and Atmospheric Administration are 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.

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 summer 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 both in the U.S. and abroad.

HRC's Board of Directors consists of:

Dr. Konstantine P. Georgakakos
Scripps Institution of Oceanography, University of California, San Diego

Professor Witold F. Krajewski
Department of Civil and Environmental Engineering and Iowa Institute of
Hydraulic Research, The University of Iowa

Professor Anastasios A. Tsonis
Department of Mathematical Sciences, University of Wisconsin-Milwaukee

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

Personnel

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

Dr. Nicholas E. Graham, Senior Research Scientist / Technology Transfer (as of January 2000)

Mr. David Jackson, Manager, Finance & Administration

Ms. Corinne Rice, Administrative Associate

Ms. Theresa Carpenter, Hydrologic Engineer

Dr. Dimitris Tsintikidis, Postdoctoral Research Associate (through March 2000)

Ms. Diane Smith, Hydrologic Scientist (through February 2000)

Mr. Jason A. Sperflage, Programmer/Analyst

Mr. Steven Taylor, PhD Candidate and Hydrologic Scientist (as of March 2000)

Projects Funded

Bureau of Reclamation (Addendum): *Real-Time Operations Model for Folsom Dam.*

Food and Agriculture Organization (FAO): Phase II: Enhancing Effectiveness of the MFS through Improved Satellite Rainfall Estimates.

Georgia Institute of Technology (GIT): *Climate and Hydrologic Forecasts for Operational Water Resources Management: A Demonstration Project.*

Institute of International Education (IIE): *Satellite Hydrology Technology Training Seminar.*

NASA/NSF, w/U of Iowa & U. of Louisville: *Short-Term Quantitative Precipitation Forecasting Using Multi-Sensor Remote Sensing and ETA Data Assimilation.*

NOAA, National Weather Service, Office of Hydrology: *Selection of Raingauge Locations for Radar Rainfall Estimates in a Mexican Catchment.*

NOAA, National Weather Service, Office of Hydrology: *Weather Radar Data Analysis for Hydrologic Applications in Mexico.*

NOAA, Office of Global Programs, with GIT and SIO/UCSD: *Improvements to Water Resources Management due to Climate Forecasts.*

NOAA, Office of Global Programs, with GIT: *Improvements to Water Resources Management due to Climate Forecasts.*

NOAA, Office of Global Programs: *Support Toward the Development of Flash Flood Potential Maps Due to Excessive Surface Runoff in the Mozambique and Zimbabwe Region of Recent Floods.*

NOAA, Climate Diagnostics Center: *Low Frequency Variability in the Frequency and Intensity of North Pacific Cyclones 1948-97.*

PCA, Panama Canal Authority: *Training of PCC Personnel in the Software and Methods of Rainfall and Flow Forecasting for the Panama Canal Watershed.*

US/Israel Binational Science Foundation, w/Hebrew University: *Temporal and Spatial Aggregation of Meteorological Radar Data, A New Approach in Flood Prediction and Basin Hydrology.*

UCSD Subcontract/NOAA: *California Applications Project: Folsom Lake.*

UCSD Subcontract/NOAA: *California Applications Project: Folsom Lake.*

USGS/GA Tech: *Water Resources Sector National Assessment of the Potential Consequences of Climate Variability and Change for the United States.*

USBR: *Improvements on Forecasting Folsom Lake Inflows, Phase III.*

Proposals Pending

Food and Agriculture Organization (FAO): *Enhancing the effectiveness of the MFS of the Nile River.*

PCA, Panama Canal Authority: *Software Enhancements and Maintenance for PANMAP Software.*

NOAA/NWS/HRL: *Assessing the Effects of Scale in Operational Hydrologic Modeling.*

NOAA/OGP: *Understanding and Predicting Decadal Variations in ENSO Impacts.*

NOAA/OGP-USAID: *Areal Flash Flood Guidance for Central America.*

Publications and Presentations

Copies of the publications listed may be obtained by writing to: Director, Hydrologic Research Center, 12780 High Bluff Drive, Suite 250, San Diego, CA 92130.

Contributions in Books and Special Issues

Georgakakos, K.P., and W.F. Krajewski, (eds.) "Hydrologic Applications of Weather Radar," Journal of Geophysical Research - Atmospheres, Vol. 105, Number D2, 2213-2280, January 27, 2000.

Georgakakos, K.P., "Real Time Hydrometeorological Forecasting," in Advances in Hydrological Modeling, V.P. Singh (Ed.), 2000, *submitted*.

Research Papers in Journals

Carpenter, T.M, J.A. Sperflage, K.P. Georgakakos, T. Sweeney and D.L. Fread, "National Threshold Runoff Estimation Utilizing GIS in Support of Operational Flash Flood Warning Systems," Journal of Hydrology, Vol. 224, 21-44, July 1999.

Tsintikidis, D., Georgakakos, K.P., Artan, G.A., and A.A. Tsonis, "A Feasibility Study on Mean Areal Rainfall Estimation and Hydrologic Response in the Blue Nile Region Using METEOSAT Images," Journal of Hydrology, Vol. 221, 97-116, June 1999.

Schwartz, Stuart S, "Multiobjective Management of Potomac River Consumptive Use," J. of Water Resources Planning and Management, 277-287, September/October 2000.

Georgakakos, K.P., "Covariance Propagation and Updating in the Context of Real-Time Radar Data Assimilation by Quantitative Precipitation Forecast Models," Journal of Hydrology, 239, 115-129, 2000.

Pandey, G.R., Cayan, D.R., Dettinger, M.D., and K.P. Georgakakos, "A Hybrid Model for Interpolating Daily Precipitation in the Mountainous Regions of California During Winter," Journal of Hydrometeorology, 2000, *accepted*.

Graham, N.E., and H.F. Diaz, "Intensification of North Pacific Winter Cyclones since 1948," Bulletin of the American Meteorological Society, 2000, *in revision*.

Georgakakos, K.P., and D.E. Smith, "Soil Moisture Tendencies into the Next Century for the Conterminous United States," Journal of Geophysical Research - Atmospheres, 2000, *in revision*.

Carpenter, T.M., and K.P. Georgakakos, "Assessment of Folsom Lake Response to Historical and Potential Future Climate Change Scenarios, 1, Forecasting," Journal of Hydrology, 2000, *in review*.

Tsintikidis, D., Georgakakos, K.P., Sperflage, J.S., Smith, D.E., and T.M. Carpenter, "Precipitation Uncertainty and Raingauge Network Design within the Folsom Lake Watershed," ASCE Journal of Hydrologic Engineering, 2000, *in review*.

Preprints and Conference Proceedings

Brumbelow, Kelly, A. P. Georgakakos, and K. P. Georgakakos, "Assessment of Irrigation Needs and Crop Yield for the U.S. Under Potential Climate Changes," IRI International Forum on Climate Prediction, Agriculture and Development, Columbia University, New York, 26-28 April 2000.

Carpenter, Theresa M., and K.P. Georgakakos, "Distributed Hydrologic Modeling Using Radar Precipitation," Remote Sensing and Hydrology 2000, IAHS, Santa Fe, New Mexico, 2-7 April 2000.

French, Mark, L. Dolcine, K. Georgakakos, and W. Krajewski, "Quantitative Precipitation Forecasting (HydroQPF) for Hydrologic Applications Using Radar Remote Sensing and ETA Model Forecasts," Second USWRP Science Symposium, Boulder, Colorado, 27-28 March 2000.

French, Mark, R. Burt, M. Crume, L. Dolcine, K. Georgakakos, and W. Krajewski, "Rain Storm Spatial Structure Derived from Radar Observations of Vertically Integrated Liquid Water," Second USWRP Science Symposium, Boulder, Colorado, 27-28 March 2000.

Georgakakos, Konstantine, "Distributed Operational Hydrologic Modeling Under Parametric and Input Uncertainty," WMO Commission for Hydrology Working Group on Applications, Session II, Geneva, Switzerland, 6-10 December 1999.

Georgakakos, Konstantine P., D. Tsintikidis, B. Attia, and J. Roskar, "Estimation of Pixel-Scale Daily Rainfall over the Nile River Catchment Using Multi-Spectral METEOSAT Data," Remote Sensing and Hydrology 2000, IAHS, Santa Fe, New Mexico, 2-7 April 2000.

Georgakakos, Konstantine, "Estimation of Small Scale Rainfall in Africa Using Meteosat Data and Sparse Raingauge Networks," Symposium on Hydrologic Modeling of Diverse Regions with Sparse and Uncertain Data, Vicksburg, Mississippi, 8-9 November 1999.

Georgakakos, Konstantine, "Flash Flood Warnings with Remotely-Sensed Data and GIS," WMO Commission for Hydrology Working Group on Applications, Session II, Geneva, Switzerland, 6-10 December 1999.

Georgakakos, K.P., "Technology Transfer in Hydrometeorology," Keynote Lecture – HydroInformatics 2000, IIHR, Iowa City, IA, 23-27 July 2000.

HRC Technical Reports

Carpenter, Theresa M, K.P. Georgakakos, and J.A. Sperflage, “Distributed Hydrologic Modeling for Operational Use,” HRC Technical Report No. 3, Hydrologic Research Center, San Diego, California, 224pp, 20 August 1999.

Georgakakos, Konstantine P., “Enhancing the Effectiveness of the MFS of the Nile River: Satellite Rainfall Estimation,” HRC Final Report EGY 99, 4pp, 24 January 2000.

Georgakakos, Konstantine P., J.A. Sperflage, W.F. Krajewski, and W. Kruger, “Oregon Radar Analysis with Selection of Raingauge Sites for Improved Observation of Rainfall Over the Rio Yaqui Basin,” HRC Final Report MX-99.1, Hydrologic Research Center, San Diego, California, 38pp, 30 November 1999.

Georgakakos, Konstantine P., “Estimation of Sacramento Model Percolation Parameters as Functions of Soil Properties,” HRC Technical Note No. 11, 5 pp, 24 September 1999.

Georgakakos, Konstantine P., “A State Estimation Algorithm for Spatially Distributed Operational Precipitation Forecasting Models,” HRC Technical Note No. 10, Hydrologic Research Center, San Diego, California, 34pp, 12 August 1999.

Georgakakos, Konstantine P., T.M. Carpenter, D.E. Smith, and J.A. Sperflage, “Hydrologic Modeling of Lake Victoria Drainage,” HRC Limited Distribution Report No. 11, Hydrologic Research Center, San Diego, California, 74pp, 9 July 1999.

Georgakakos, Konstantine P., and A.A. Tsonis, “On the Observation of Extremes in the Lorenz System,” HRC Technical Note No. 9, Hydrologic Research Center, San Diego, California, 20pp, 15 July 1999.

HRC Staff, “HRCSAT Version 2: A User’s Manual,” HRC Technical Note No. 12, 21 December 1999.

Sperflage, Jason A., K.P. Georgakakos, D. Tsintikidis, A. Kruger, and W. Krajewski, “PANMAP v.1.0.1 User’s Guide,” HRC Limited Distribution Report No. 10, Hydrologic Research Center, San Diego, California, 69pp, July 1999.

Educational and Technology Transfer Activities

More than 30 reprints of published and in-press articles were sent out by HRC Staff in response to requests. Mailing of remaining copies of past Activities Reports and Reprints of HRC Staff articles was also complete during this year.

HRC Staff members served as Reviewers for NASA, NOAA, NSF and DOD proposals, and for research papers submitted to Water Resources Research, J. Applied Meteorology, J. Climate, J. Hydrology, ASCE J. Hydrologic Engineering, and J. of Geophysical Research.

HRC has developed the concept for a global flash flood warning system. The system was presented in several national and international meetings and was adopted by the WMO Commission on Hydrology (CHy) Working Group on Applications as one of their proposed activities. Information about this system may be found at the HRC web page, http://www.hrc-web.org/Whats_New/. Results of application for Mozambique, Honduras, and Venezuela may also be found in that web site.

HRC Staff cooperated with Staff from the Bureau of Reclamation and from the NOAA Office of Global Programs to develop a demonstration site in Northern California for assessing the utility of climate information for water resources management. Use of theory and techniques developed by HRC in collaboration with the Georgia Water Resources Institute (GWRI) would be made in this technology transfer program.

A 4-week training course was held at HRC to train selected staff from the Ministry of Public Works and Water Resources (MPWWR) of Egypt to better understand and utilize satellite images and hydrological and meteorological processes in order to more accurately forecast Nile River flows.

HRC's computer network was upgraded together with the existing World Wide Web page. The current page may be found at: <http://www.hrc-web.org>.

HRC participated in the National Weather Service River Forecast System Workshop held in Silver Spring, Maryland, October 25 – 27, 1999, with the talk: Distributed Hydrologic Models.

HRC participated in a workshop entitled, "Climate Forecasts and Applications for Central America: Moving into the Next Century Model," in Belize City, Belize, on May 22, 2000, and presented the Prospectus for an HRC Flash Flood Initiative.

Visitors

Ms. Marina Bondar, University of Louisville, Louisville, Kentucky

Dr. James L. Buizer, NOAA OGP

Dr. Jim Cramer, University of Iowa

Dr. Henry Diaz, NOAA, Boulder

Dr. David L. Evans, NOAA-Oceanic and Atmospheric Research

Professor Mark French, University of Louisville, Louisville, Kentucky

Professor Aris Georgakakos, Georgia Institute of Technology

Dr. Nicolas Graham, International Research Institute, Columbia University – UCSD

Dr. Michael Hall, NOAA OGP

Mr. Mamdouh Ismail, Ministry of Public Works & Water Resources, Egypt

Mr. Amgad Khorshid, Ministry of Public Works & Water Resources, Egypt

Professor Witek Krajewski, University of Iowa, Iowa City, Iowa

Mr. Nader El Masri, Ministry of Public Works & Water Resources, Egypt

Mr. Ron Milligen, Bureau of Reclamation

Mr. Ibrahim Morsy, Ministry of Public Works & Water Resources, Egypt

Dr. Claudia Nierenberg, NOAA OGP

Dr. V.C. Patel, Iowa Institute of Hydraulic Research, The University of Iowa

Ms. Kerry Rae, Bureau of Reclamation

Mr. Mohamed Sayed Mohamed, Ministry of Public Works & Water Resources, Egypt

Dr. Kelly Sponberg, NOAA OGP

Dr. David Tarboton, University of Utah

Mr. Martin Teal, West Consultants, San Diego

Professor Anastasios Tsonis, University of Wisconsin, Milwaukee, Wisconsin

Dr. David Williams, West Consultants, San Diego

Mr. Mohamed Zein, Ministry of Public Works & Water Resources, Egypt