
Activities Report: 1 July 2000 - 30 June 2001

General Description of HRC

The Hydrologic Research Center (HRC) is a publicly-supported non-profit research and technology-cooperation 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 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 cooperation.

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 Hyd. 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 and Manager, Climate Applications

Mr. David Jackson, Manager, Finance & Administration (through May 12, 2001)

Ms. Debra Lavack, HRC Senior Accountant Activities (as of May 10, 2001)

Ms. Corinne Rice, Administrative Associate

Ms. Theresa Carpenter, Hydrologic Engineer

Mr. Jason A. Sperflage, Programmer/Analyst

Mr. Steven Taylor, Ph.D. Candidate and Hydrologic Scientist

Projects Funded

ACP, Autoridad Del Canal De Panama: *Maintenance and Support Services for PANMAP Software.*

ACP, Autoridad Del Canal De Panama: *Hands-on Training Course: Rainfall Forecasting Model Performance Evaluation.*

ACP, Autoridad Del Canal De Panama: *Maintenance Services for Radar Orientation Adjustment in PANMAP Software.*

Bureau of Reclamation (Addendum): *Develop, Implement, and Update Current Implementation of the SS-SAC Operation of the US National Weather Service River Forecast System.*

Food and Agriculture Organization (FAO): Phase III: Enhancing Effectiveness of the MFS of the Nile River.

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

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

NOAA, Office of Global Programs: *Understanding and Predicting Decadal Variations in ENSO Impacts.*

NOAA, Office of Global Programs: *Ensemble Simulations of Observed Climatic Variability: Verification Methods and Forecast Applications.*

NOAA, National Weather Service: *Assessing the Effects of Scale in Operational Hydrologic Modeling.*

NOAA, Office of Global Programs: Provide Training and Technical and Scientific Guidance for the Regional Workshop on Climate Variability and Change and Their Health Effects in Small Island Countries: Apia, Samoa.

SENAMHI, Servicio Nacional De Meteorologia E Hidrologia, Peru: Consultation and Support for Statistical Climate Modeling and Prediction.

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

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

Carpenter, T.M., and K.P. Georgakakos, "Distributed Hydrological Modeling Using Radar Precipitation." In Remote Sensing and Hydrology 2000, M. Owe, K. Brubaker, J. Richtie and A. Rango, eds., IAHS Publ. No. 267, Wallingford, UK, 5pp, 2001, *in press*.

Georgakakos, K.P., "Real Time Hydrometeorological Forecasting," in Advances in Hydrological Modeling of Small Watersheds, V.P. Singh, ed., Water Resources Publications, Colorado Springs, Colorado, 81pp, 2001, *in press*.

Georgakakos, K.P., D. Tsintikidis, B. Attia and J. Roskar, "Estimation of Pixel-Scale Daily Rainfall over the Nile River Catchment Using Multi-Spectral METEOSAT Data." In Remote Sensing and Hydrology 2000, M. Owe, K. Brubaker, J. Richtie and A. Rango, eds., IAHS Publ. No. 267, Wallingford, UK, 9pp, 2001, *in press*.

Georgakakos, K.P., and R. Krzysztofowicz, ed., "Probabilistic and Ensemble Forecasting." *Special Issue of J. of Hydrology*, 249, 1-196, 2001.

Poveda, Germán, N.E. Graham, P.R. Epstein, W. Rojas, M.L. Quinones and I.D. Vélez, and W.J.M. Martens, "Climate and ENSO Variability Associated with Vector-Borne Diseases in Colombia." In 2000: El Nino and the Southern Oscillation, Multiscale Variability and Global and Regional Impacts, Cambridge University Press, Diaz, H.F. and V. Markgraf, eds., 183-204, 2000.

Research Papers in Journals

Carpenter, T.M., K.P. Georgakakos, and J.A. Sperflage, "On the Parametric and Nexrad-Radar Sensitivities of a Distributed Hydrologic Model Suitable for Operational Use," Journal of Hydrology, 2001, *in press*.

Georgakakos, K.P., and D.E. Smith, "Soil Moisture Tendencies into the Next Century for the Conterminous United States," Journal of Geophysical Research - Atmospheres, 2001, *in press*.

Tsintikidis, D., Georgakakos, K.P., Sperflage, J.A., Smith, D.E., and T.M. Carpenter, "Precipitation Uncertainty and Raingauge Network Design within the Folsom Lake Watershed," ASCE Journal of Hydrologic Engineering, 2001, *in press*.

Carpenter, T.M., and K.P. Georgakakos, "Assessment of Folsom Lake Response to Historical and Potential Future Climate Scenarios, 1. Forecasting," Journal of Hydrology, 249, 148-175, 2001.

Graham, N.E., and H.F. Diaz, "Evidence for Intensification of North Pacific Winter Cyclones since 1948," Bulletin of the American Meteorological Society, 82(9), 1869-1893, 2001.

Georgakakos, K.P., N.E. Graham and A.P. Georgakakos, "Can Forecasts Accrue Benefits for Reservoir Management?" The Climate Report, 1(4), 7-10, 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., D.R. Cayan, M.D. Dettinger, and K. Georgakakos, "A Hybrid Orographic plus Statistical Model for Downscaling Daily Precipitation in Northern California," J. of Hydrometeorology, 1, 491-506, 2000.

Schwartz, S. S., "Multiobjective Management of Potomac River Consumptive Use," Journal of Water Resources Planning and Management, 126(5), 277-287, 2000.

Preprints and Conference Proceedings

- Carpenter, T.M, K.P. Georgakakos, and J.A. Sperflage, "Application of a Distributed Hydrologic Model to Watersheds in the Central U.S.," AGU 2001 Spring Meeting, Boston, Massachusetts, 29 May – 1 June 2001.
- Georgakakos, K.P., T.M. Carpenter, and J. A. Sperflage, "Design and Validation of Real-Time Hydrologic Forecasts for the Folsom Lake Watershed," 2001 California Weather Symposium, Sierra College, Rockland, California, 22 June 2001.
- Georgakakos, K.P., "An Engineering Solution to Flash Flood Forecasting with Global Applicability," in Proceedings of Korean Water Resources Association Meeting, Korean Water Resources Association, Toeuju, Korea, 5 December 2001.
- Graham, N.E., "Further Efforts to Relate the Huascaran and Quellcaya Ice Core Records to Climate Data: A Robust Decadal Signal through 1200 Years." Workshop on Climate Change at High Elevation Sites: Emerging Impacts, Davos, Switzerland, June 2001.
- Georgakakos, K.P., "Technology Transfer in Hydrometeorology," Keynote Lecture – HydroInformatics 2000, IIHR, Iowa City, Iowa, 23-27 July 2000.
- Sperflage, J.A., Georgakakos, K.P., W.F. Krajewski and A. Kruger, "Design and Implementation of the Panama Mean Areal Precipitation (PANMAP) Forecast System," HydroInformatics 2000, IIHR, Iowa City, Iowa, 23-27 July 2000.
- Graham, N.E., "Using Climate Prediction Information with Hydrologic Modeling and a Decision Support System at a Large California Reservoir." Workshop on "Climatic Change: Implications for the Hydrological Cycle and for Water Management, Wengen, Switzerland, Sept. 2000.
- Brumbelow, K., A.P. Georgakakos, and K.P. Georgakakos, "Assessment of Irrigation Needs and Crop Yield for the U.S. under Potential Climate Changes." Proceedings of the International Forum on Climate Prediction, Agriculture, and Development, April 26-28, 2000. International Research Institute for Climate Prediction, Palisades, New York, 209-212, November 2000.
- Georgakakos, K.P., N.E. Graham, and A.P. Georgakakos, "Assessment of the Value of Probabilistic Seasonal Climate Forecasts for a Large California Reservoir using Ensemble Streamflow Prediction and a Decision Support System," AGU 2000 Fall Meeting, San Francisco, California, 15-19 December, 2000.

Graham, N.E., and H. Diaz, "Evidence for Intensification of North Pacific Winter Cyclones since 1950." AGU Winter Meeting, San Francisco, Dec. 2000.

HRC Technical Reports

Georgakakos, K.P., T.M. Carpenter, and J.A. Sperflage, "Training and Technology Transfer for Adjusting Parameter Values for the Hydrologic Models of the NFS," HRC Technical Note No. 14, Hydrologic Research Center, San Diego, California, 33pp, 28 February 2001.

Graham, N.E., S.V. Taylor, J.A. Sperflage, T.M. Carpenter and K.P. Georgakakos, "Training and Technology Transfer for Enhancing the Spatial Variability of Historical Raingauge Precipitation Fields for ESP Analysis with the NFS," HRC Technical Note No. 15, Hydrologic Research Center, San Diego, California, 48pp, 7 March 2001.

Metzger, L.A., T.M. Carpenter, and K.P. Georgakakos, "Reliability Analysis of Discharge and Volume Forecasts for the Rio Rimac Basin in Peru," HRC Technical Note No.16, Hydrologic Research Center, San Diego, California, 50pp, 19 April 2001.

Carpenter, T.M., and K.P. Georgakakos, "Validation of Folsom SS-SAC Forecasts," HRC Technical Note No. 17, Hydrologic Research Center, San Diego, California, 18pp, 7 May 2001.

Georgakakos, K.P., A.P. Georgakakos, and N.E. Graham, "Improvement to Water Resources Management due to Climate Forecasts," HRC/GWRI Final Performance Report, NOAA Award No. NA76GP0352, Hydrologic Research Center, San Diego, California, 27 pp, 1 June 2001

Carpenter, T.M., and K.P. Georgakakos, "Assessment of Folsom Lake Watershed Response to Historical and Potential Future Climate Scenarios," U.S. Department of the Interior, U.S. Geological Survey Open-File Report 00-333, Hydrologic Research Center, San Diego, California, 43pp, 20 August 2000.

Georgakakos, K.P., and D.E. Smith, "Soil Moisture Tendencies into the Next Century for the Conterminous United States," U.S. Department of the Interior, U.S. Geological Survey Open-File Report 00-335, Hydrologic Research Center, San Diego, California, 32pp, 20 August 2000.

Sperflage, J.A., "Rotation of the PANMAP Radar Clutter Map," HRC Technical Note No. 13, Hydrologic Research Center, San Diego, California, 15pp, 18 October 2000.

Educational and Technology Cooperation 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 completed 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, J. of Geophysical Research, and the Korean Society of Civil Engineering (KSCE), ASCE Journal of Civil Engineering and Science.

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.

Ms. Theresa Carpenter visited the Servicio Nacional de Meteorología e Hidrología (SENAMHI), Peru, in November of 2000, for the purpose of training SENAMHI Staff on the Calibration of the Sacramento Soil Moisture Accounting Model for hydrologic modeling. The training was to cover the calibration process and surrounding issues which include: input data issues, understanding of model components and model parameters, and a recommended strategy for interactive calibration. The training was accomplished through lectures, video segments from a U.S. National Weather Service training video produced by HRC, and “hands-on” exercises with data from a specific SENAMHI basin.

During the period 20-27 November 2000, Dr. Georgakakos visited SENAMHI in Lima, Peru. He gave lectures for SENAMHI Staff on real time hydrologic forecasting of floods and flash floods. He implemented HRC’s Hydrologic Forecast System and provided training for SENAMHI Staff on hydrologic modeling coupled with state estimators for real time updating from discharge measurements.

Dr. Nicholas Graham and Ms. Theresa Carpenter of HRC both visited the Servicio Nacional de Meteorología e Hidrología (SENAMHI), Peru, in January 2001, for the purpose of completing training of SENAMHI Staff on hydrometeorological forecasting.

A total of 8 weeks of training was provided to Nile Forecast System (NFC) Staff from January-March 2001. Two engineers received hands-on instruction on the subject of Parameter Estimation for Distributed Models, and two engineers received training in the area of Merging Satellite and Rain gauge Data. Hands-on training was completed for the Blue Nile Region in both the training areas using historical data.

A 4-month training course was held from January through April at HRC for Mr. Luis Terrazas Metzger from the Servicio Nacional de Meteorología e Hidrología (SENAMHI), Peru. The focus of his work was the validation of real-time ensemble hydrologic forecasts using probabilistic measures of reliability. Those validation methods were applied to the forecasts of the Ensemble Hydrologic Forecast model implemented by HRC at SENAMHI for the Rio Rimac Basin. Mr. Metzger co-authored HRC Technical Note No. 16: "Reliability Analysis of Discharge and Volume Forecasts for the Rio Rimac Basin in Peru."

Dr. Georgakakos participated in the development of a training video on Weather and Water by the Weather Channel targeting high school students.

Dr. Georgakakos served on the International Scientific Committee for the Fifth International Symposium on the Hydrological Applications of Weather Radar, held in Kyoto Japan.

Dr. Georgakakos served on a Review Panel for NOAA, "NOAA-OGP Regional Integrated Sciences and Assessments Programs."

During the period 14-18 May 2001, Dr. Georgakakos visited Korea where he was invited to give seminars in several cities for several agencies on issues of hydrologic forecasting and water resources planning.

HRC Staff participated in joint seminars between Scripps Institution of Oceanography and HRC on issues of climate and hydrology.

A new brochure on Research and Technology Transfer at HRC was created and is being distributed.

Visitors

Mr. Mohammed Abdel-Aty, Nile Forecast Center, Ministry of Water Resources and Irrigation, Cairo, Egypt

Dr. Bayoumi Attia, Nile Forecast Center, Ministry of Water Resources and Irrigation, Cairo, Egypt

Dr. Henry Diaz, Climate Diagnostics Center, NOAA, Boulder, Colorado

Dr. Vojin Joksimovich, Consultant/Belgrade University, Belgrade, Yugoslavia

Mr. Mamdouh Sayed, Nile Forecast Center, Ministry of Water Resources and Irrigation, Cairo, Egypt

Mr. Mohammed Ezzat El Shamy, Nile Forecast Center, Ministry of Water Resources and Irrigation, Cairo, Egypt

Mr. Mamdouh Hassan, Nile Forecast Center, Ministry of Water Resources and Irrigation, Cairo, Egypt

Professor Xu Liang, Civil and Environmental Engineering, University of California, Berkeley, California

Ms. Efrat Morin, Department of Hydrology and Water Resources, University of Arizona, Tucson, Arizona

Mr. Luis Metzger Terrazas, the Servicio Nacional de Meteorología e Hidrología, (SENAMHI), Peru

Mr. Jonathan Pundsack, NOAA-OGP

Scripps Institution of Oceanography Academic Staff (Dr. Cayan, Dr. Dettinger, Dr. Knowles, and others)