
Activities Report: 1 July 1997 - 30 June 1998

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. Its 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 is HRC's Cognizant Agency.

HRC realizes its purposes:

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 (formerly with the Iowa Institute of Hydraulic Research, The University of Iowa).

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 Geosciences, 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. Stuart S. Schwartz, Associate Hydrologic Engineer

Mr. David Jackson, Manager, Finance & Administration

Ms. Corinne Rice, Administrative Associate

Dr. Guleid Artan, Postdoctoral Research Associate

Dr. Dimitris Tsintikidis, Remote Sensing Specialist I

Mr. Jason A. Sperfslage, Systems Administrator/Programmer

Mr. Michael J. Burin, Research Assistant Scientist

Projects Funded

Bureau of Reclamation: *Hydrologic Forecasts and Uncertainty of Folsom Lake Inflows.*

Chevron Pipeline Co.: *San Antonio Reservoir Source Water Protection.*

Food and Agriculture Organization (FAO), through a subcontract from Georgia Institute of Technology: *A Decision Support System for Lake Victoria.*

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

NOAA, National Weather Service, Office of Hydrology: *Distributed Hydrologic Model Sensitivities.*

NOAA, National Weather Service, Office of Hydrology: *Improvements in Threshold Runoff Estimates for National Implementation.*

NOAA, National Weather Service, Office of Hydrology: *Sacramento Calibration Technology Transfer, Phase I.*

NOAA, National Weather Service, Office of Hydrology: *Sacramento Calibration Technology Transfer, Phase II.*

NOAA, National Weather Service, Office of Hydrology: *IHFS Implementation and Testing for a Watershed in Panama.*

NOAA, National Weather Service, Office of Hydrology: *Mexico Water Resources.*

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

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

NASA, National Aeronautics and Space Administration: *Stochastic-Dynamical Modeling of Space-Time Rainfall.*

NASA/NSF: *Fourth International Symposium on Hydrologic Applications of Weather Radar.*

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.

Research Papers in Journals

Apostolopoulos, T. K. and K.P. Georgakakos, "Parallel computation for streamflow prediction with distributed hydrologic models," Journal of Hydrology, (194) 1-24, 1997.

Artan, G.A., C.M.U. Neale, D.G. Tarboton and C.L. Hanson, "A distributed two-layer heat and moisture flux model 2. Model evaluation and the spatial distribution of fluxes," Water Resources Research, 1998, in review.

Artan, G.A., C.M.U. Neale and D.G. Tarboton, "A distributed two layer heat and moisture flux model 1. Model development and sensitivity analysis," Water Resources Research, 1998, in rev.

Artan, G.A., C.M.U. Neale and D.G. Tarboton, "Effects of input data aggregation on a distributed energy balance model, submitted, Journal of the American Water Resour. Association, 1998, in review.

Georgakakos, A. P., M.G. Mullusky and K.P. Georgakakos, "Impacts of climate variability on the operational forecast and management of the upper Des Moines River basin," Water Resources Research, (34) 799-821, April 1998.

Kim, J., N.L. Miller, A.K. Guetter, and K.P. Georgakakos, "River Flow Response to Precipitation and Snow Budget in California During the 1994-1995 Winter," Journal of Climate, 11, 1998, in press.

Schwartz, S.S. and D.Q. Naiman, "Planning Level Estimates of Contaminant Loads: Bias and Confidence," Water Resources Research, 1998, under revision.

Tsintikidis, D., K.P. Georgakakos, G.A. Artan and A.A. Tsonis, "Mean Areal Rainfall Estimation and Hydrologic Response using METEOSAT Data over the Blue Nile Region," Journal Hydrology, 1998, in review.

Tsintikidis, D. and K.P. Georgakakos, "Microphysical and Large- Scale Dependencies of Temporal Rainfall Variability over a Tropical Ocean," J. of the Atmos. Sciences, 1998, accepted.

Tsintikidis, D., J.L. Haferman, E.N. Anagnostou, W.F. Krajewski and T.F. Smith, "A neural network approach to estimating rainfall from spaceborne microwave data," Geoscience and Remote Sensing, 35(5), 1079-1093, 1997.

Tsintikidis, D., and G.J. Zhang, "A Numerical Study on the Coupling between Sea Surface Temperature and Surface Evaporation," Journal of Geophysical Research- Atmospheres, 1998, accepted.

Books and Special Issues

Georgakakos, K.P., Guetter, A.K., and J.A. Sperflage, Estimation of Flash Flood Potential for Large Areas. Destructive Water: Water-Caused Natural Disasters, their Abatement and Control. G.H. Leavesley, H.F. Lins, F. Nobilis, R.S. Parker, V.R. Schneider, and F.H.M.van de Von (eds.), IAHS Publ. No. 239, IAHS Press, Wallingford, UK, 87-93, 1997.

Georgakakos, K.P., and W.F. Krajewski, (eds.), Abstracts of Fourth International Symposium on Hydrologic Application of Weather Radar, HRC San Diego, California, 5-9 April, 1998, Hydrologic Research Center, San Diego, California, 130pp, 1998.

Georgakakos, K.P., Coupled Rainfall-Flow Forecasting Models, in Weather Radar Technology for Water Res. Mngmt, B. Braga, (ed.), UNESCO Press, Montevideo Uruguay, 221-237, 1997.

Abstracts

Artan, G.A., K.P. Georgakakos and J.Sperflage, "Sensitivity of Physically-Based Distributed Hydrologic Models to Rainfall and Model Parameters Estimated Uncertainty." Abstracts of Fourth International Symposium on Hydrologic Applications of Weather Radar, San Diego, CA, 5-9 April 1998, Hydrologic Research Center, San Diego, CA, 61-62, 1998.

Artan, G.A., D. Tsintikidis and K. P. Georgakakos, "Snow Melt Response of the American River Basin: Spatially Distributed Modeling," American Geophysical Union Meeting, December 8, 1997, Baltimore Maryland.

- Artan, G.A., D. Tsintikidis and K. P. Georgakakos, "Snow Melt Response of the American River Basin: Spatially Distributed Modeling," Fall Meeting of American Geophysical Union, EOS Supplement, December 1997.
- French, M., Andrieu, H., Georgakakos, K.P., and W.K. Krajewski, "A Stochastic Rainfall Simulation Model Based on a Simplified Dynamical Approach." Abstracts Fourth International Symposium on Hydrologic Applications of Weather Radar, San Diego, CA, 5-9 April 1998, Hydrologic Research Center, San Diego, CA, 43, 1998.
- Georgakakos, K.P., and J.A. Sperflage, "Applications of Weather Radar to Operational Flash Flood Prediction." Abstracts Fourth International Symposium on Hydrologic Applications of Weather Radar, 82-84, 1998.
- Greco, M., Krajewski, W.F., and K.P. Georgakakos, "A Stochastic Dynamic Framework for Real-Time Radar Rainfall Estimation." Abstracts Fourth International Symposium on Hydrologic Applications of Weather Radar, San Diego, CA, 5-9 April 1998, Hydrologic Research Center, San Diego, CA, 15-16, 1998.
- Markstrom, E.J., S. S. Schwartz, R.G. Steger, L.E. Brazil, and G.N. Day, "Probabilistic Forecasts in Multiobjective Analysis for Reservoir Operations; First Federal Interagency Hydrologic Modeling Conference," April 19-23, 1998, Las Vegas, Nevada.
- Schwartz, S.S., "Planning Level Estimates of Pollutant Loads: Bias and Confidence," EOS Vol. 79, No. 17, p. S141, April 28, 1998 Supplement.
- Schwartz, S.S., "Risk Management, Firm Yield, and Water Supply Reliability," submitted for presentation at the Annual Meeting, Virginia Section, American Water Works Association; October 1998, (pending acceptance).
- Schwartz, S.S., "Spatial Coherence of Hydrologic Extremes," EOS Vol. 79, No. 17, p. S149 April 28, 1998 Supplement.
- Tsintikidis, D. and K.P. Georgakakos, "Spatiotemporal Rainfall Variability using a Stochastic-Dynamical model: Development and Application," First International Pacific Rim Hydroclimate Workshop, August 26, 1997, UCLA, Los Angeles, California.
- Tsintikidis, D and K. P. Georgakakos, "Spatiotemporal Rainfall Variability using a Stochastic Dynamical Model and TOGA COARE radar observations," Abstracts Fourth International Symposium on Hydrologic Applications of Weather Radar, San Diego, CA, 5-9 April 1998, Hydrologic Research Center San Diego, CA, 54-55, 1998.

Tsintikidis, D., J. L. Haferman, E. N. Anagnostou, W.F. Krajewski, and T. F. Smith, "Rainfall Estimation from Spaceborne Microwave Data Using Neural Nets," Abstracts, 7th International Meeting on Statistical Climatology, Whistler, BC, Canada, 25-29 May 1998, 122, 1998.

Preprints and Conference Proceedings

Artan, G.A., Tsintikidis, D., and K.P. Georgakakos, "Effects of rainfall variability on land-surface fluxes and state variability: 2. Land surface processes, Preprints AMS Symposium on Hydrology, Phoenix, AZ, 11-16 January 1998, AMS, Boston, Massachusetts, 154-155, 1998.

Georgakakos, A.P., and K.P. Georgakakos, "Utilization of Ensemble Flow Forecasts for Real-Time Reservoir Management." Preprints of the AMS Symposium on Hydrology, Phoenix, AZ, 11-16 January, 1998, AMS, Boston, Massachusetts, J18, 1998.

Georgakakos, K.P., Duan, J., Miller, N., and D.R. Cayan, "Upscaling Subsurface Flow in a Physically-Based Spatially Distributed Watershed Model." Preprints of the AMS Symposium on Hydrology, Phoenix, AZ, 11-16 January, 1998, AMS, Boston, Massachusetts, 323-325, 1998.

Schwartz, S.S., E. Markstrom, and R. Steger, "Risk-Based Reservoir Operation Using Probabilistic Inflow Forecasts," Proceedings of the 25th Annual Conference on Water Resources Planning and Management; June 7-10, 1998, Chicago Ill.

Schwartz, S.S., "Cost Effective Watershed-Scale Nutrient Reduction Strategies for the Potomac River Basin," Proceedings of the 25th Annual Conference on Water Resources Planning and Management; June 7-10, 1998, Chicago Ill.

Schwartz, S.S., "Potomac River Risk-Based Water Supply Management," Proceedings of the 25th Annual Conference on Water Resources Planning and Management; June 7-10, 1998, Chicago Ill.

Tsintikidis, D, K. P. Georgakakos and G. A. Artan, "Effects of Rainfall Variability on Land-Surface Fluxes and State Variability: 1. Synthesis of Spatiotemporal Rainrates," Preprints of the AMS Symposium on Hydrology, Phoenix, AZ, 11-16 January 1998, AMS, Boston, Massachusetts, 156, 1998.

HRC Technical Reports

Artan, Guleid A., J.A. Sperfslage and K.P. Georgakakos, "Distributed Hydrologic Modeling of the Lake Vicotria Drainage Basin: Design and Initial Calibration," Technical Note No. 7 San Diego, California, 43pp, May 1998.

- Bruessner, B., R. Mandel, D. Caraco, M. Pierce, and S. S. Schwartz, "Chemical Contaminant Loads in Urban Stormwater Runoff from the Chesapeake Bay Basin," *ICPRB Technical Report 98-2*, May 1998.
- Georgakakos, K.P., D. Tsintikidis and S. Schwartz, in collaboration with A.A. Tsonis and S. Nickovic, "Calibration of Bispectral Satellite Rainfall Estimation Algorithm and Implementation of ETA Model Over the Blue Nile Region," *Technical Note No.6*, Hydrologic Research Center, San Diego, California, 70pp, April 1998.
- Georgakakos, K.P. and D. Tsintikidis, "Enhancing Effectiveness of the Nile Monitoring, Forecasting, and Simulation (MFS)," *Second Progress Report*, Hydrologic Research Center, San Diego, California, 22pp, January 1998.
- Georgakakos, K.P. and D. Tsintikidis, "Enhancing Effectiveness of the Nile Monitoring, Forecasting and Simulation (MFS) 1. Effects of Using Satellite Rainfall Estimates on Hydrologic Response," *Technical Note No. 5*, San Diego, California, 35pp, August 1997.
- Georgakakos, K., "Operational Estimates of Rainfall by Radar for Water Resources Applications in Mexico," *Limited Distribution Report No. 6*, Hydrologic Research Center, San Diego, California, 90pp, September 1997.

HRC Video

- "WMO/NOAA Sacramento Model Calibration, Part I." HRC VHS Video Series. Hydrologic Research Center, San Diego, California, 2:15 hours, November 1997.

Educational and Technology Transfer Activities

More than 40 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 Res. Research*, *J. Applied Meteorology*, *J. Climate*, *J. Hydrology*, *ASCE J. Hyd. Engineering*, and *J. of Geophysical Research*.

As part of a cooperative agreement with the Office of Hydrology, National Weather Service, HRC has produced the first part of a training video series for the World Meteorological Organization (WMO). The second and last part is under production. The focus of the video series is the Calibration of the Sacramento soil moisture accounting model. Dr. Dan Fread and Dr. Eric Anderson of the Office of Hydrology, NWS, and Dr.

Konstantine Georgakakos of HRC are lecturers. Mr. Jason Sperflage of HRC prepared and edited the graphics for the video. The video will be disseminated world wide.

Dr. K.P. Georgakakos and Mr. J.A. Sperflage visited CNRFC in Sacramento to attend a meeting sponsored jointly by the Bureau of Reclamation and NWS for presentation and review of research results and activities pertaining to the operational implementation of the Sacramento model State-Space form (SS-SAC). Dr. Georgakakos and Mr. Sperflage also attended a separate meeting with CNRFC personnel to design SS-SAC implementation for Lake Folsom.

Mr. J.A. Sperflage visited CNRFC/NWS in Sacramento to install and troubleshoot Folsom Lake SS-SAC implementations and to meet with NWS personnel concerning final design and implementation issues.

As part of a FAO Agreement HRC implemented satellite rainfall estimation system at the Nile Forecast Center in Cairo. The system is used by NFC Engineers to rainfall estimates for the Blue Nile. Dr. Georgakakos, Dr. Tsintikidis and Mr. Sperflage visited NFC, Cairo for installation and training of HRC SAT V.I.O. Software.

Two NFC Engineers were trained at HRC in operational rainfall estimation and flood prediction, supported by a FAO traineeship.

Two Scientists from the Panama Canal Commission were trained in rainfall estimation and prediction, and in the basics of HP-UNIX Operating System by Dr. Georgakakos and Mr. Sperflage.

In collaboration with the Iowa Institute of Hydraulic Research in San Diego, California, in April 1998, HRC organized and hosted the Fourth International Symposium on Hydrologic Applications of Weather Radar. More than 100 scientists and engineers attended from 13 countries. Dr. Georgakakos moderated the Meeting Sessions.

The HRC World Wide Web page is in the process of being updated. The page may be found at: <http://hrc.ucsd.edu>.

Visitors

Dr. Emmanouil Anagnostou, Goddard Space Flight Center, Greenbelt, Maryland

Dr. Herve Andrieu, Laboratoire Central des Ponts et Chaussées, Bouguenais, France

Mr. Mamdouh Antar, Department of Civil Works and Water Resources, Cairo, Egypt

Dr. Bayoumi Attia, Department of Civil Works and Water Resources, Cairo, Egypt

Professor Deg-Hyo Bae, Changwon National University, Korea

Mr. Curtis Barrett, National Weather Service, Office of Hydrology, Silver Spring, Maryland

Dr. Bernstein, President, SEASPACE, San Diego, California

Ms. Theresa Carpenter, US Army Corps of Engineers, Rock Island, Illinois

Ms. Maritza Chandeck-Montez, Panama Canal Commission, Panama City, Panama

Dr. Jun-Seok Chung, METRI/KMA, Korea

Dr. Guy Delrieu, Laboratoire d'étude des Transferts en Hydrologie et Environnement, Grenoble, France

Mr. Leslie Dolcine, Laboratoire Central des Ponts et Chaussées, Bouguenais, France

Mr. Jorge Espinosa, Panama Canal Commission, Panama City, Panama

Mr. Bassem Fahmy, Department of Civil Works and Water Resources, Cairo, Egypt

Professor Mark French, University of Louisville, Louisville, KY

Mr. Armando Garza, National Weather Service Forecast Office, San Diego, California

Professor Vijay Gupta, University of Colorado, Boulder, Colorado

Dr. Robert Jubach, National Weather Service, Office of Hydrology, Silver Spring, Maryland

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

Dr. Jinwon Kim, Lawrence Berkeley National Laboratory, Berkeley, California

Dr. Victor Koren, National Weather Service, Silver Spring, Maryland

Mr. Mike Landerdale, National Weather Service, San Diego, CA

Mr. Wayne Martin, National Weather Service, San Diego, CA

Mr. John Meyers, National Weather Service, San Diego, California

Dr. Norman Miller, Lawrence Berkeley National Laboratory, Berkeley, California

Ms. Efrat Morin, Hebrew University, Israel

Mr. Keith Nordstrom, University of Colorado, Boulder, Colorado

Dr. Jai-Ho Oh, METRI/KMA, Korea

Dr. Fred Ogden, University of Connecticut, Storrs, Connecticut

Dr. Jozef Roskar, FAO, Cairo, Egypt

Mr. Sharikia U.S. Senrath, University of Connecticut, Storrs, CT

Mr. Soumia Serrar, Laboratoire d'étude des Transferts en Hydrologie et Environnement, Grenoble, France

Dr. Uri Shamir, Water Resources Center, Jerusalem, Israel

Professor Anastasios Tsonis, University of Wisconsin, Milwaukee, Wisconsin

Dr. Remko Uijlenhoet, Laboratoire d'étude des Transferts en Hydrologie et Environnement, Grenoble, France

Mr. Carlos Vargas, Panama Canal Commission, Panama City, Panama

Dr. Huaming Yao, Georgia Institute of Technology, Atlanta, Georgia