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## **Activities Report: 1 July 1995 - 30 June 1996**

### **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 Impacts of Global Climate Change

**Personnel**

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

Mr. David Jackson, Manager, Finance & Administration

Ms. Corinne Rice, Administrative Assistant/Executive Secretary (as of 3/15/96)

Dr. Alexandre K. Guetter, Postdoctoral Research Associate

Dr. Dimitris Tsintikidis, Postdoctoral Research Associate

Mr. Jason A. Sperflage, Programmer/Analyst I

## **Projects Funded**

National Science Foundation: *Hydroclimatology of the Continental U.S. Boundary Outflow*

National Science Foundation: *Measurement and Predictability of Local Convective Rainfall*

National Science Foundation: *California Flash Floods of Winter 1995*

National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Office of Hydrology: *Hydrologic Modeling*

National Aeronautics and Space Administration (NASA): *Stochastic-Dynamical Modeling of Space-Time Rainfall*

Food and Agriculture Organization (FAO) of the United Nations, Rome: *Monitoring, Forecasting and Simulation of the River Nile in Egypt*

University Corporation for Atmospheric Research (UCAR) COMET Program: *Improvement of the Hydrologic Model Forecasts Using a Real-Time Updating Technique*

University of California, San Diego: *Interaction of Tropical Evaporation and Convection*

Istituto Paranaense De Desenvolvimento Economico Social - IPARDES, Curitiba, Brazil: *GIS Applications for the Mitigation of Natural Disasters, Technology Transfer (Seminar)*

National Science Foundation: *IAI Workshop: Inter-American Institute for Global Change Start-Up Grants, Phase I*

## **Publications and Presentations**

Copies of the publications listed may be obtained by writing to: Director, Hydrologic Research Center, 12780 High Bluff Drive, Suite 260, San Diego, CA 92130.

### ***Research Papers in Journals***

Apostolopoulos, T.K., and K.P. Georgakakos, "Parallel Computation for Streamflow Prediction with Distributed Hydrologic Models," J. of Hydrology, 1996 (accepted).

- Georgakakos, K.P., and W.F. Krajewski, "Statistical-Microphysical Causes of Rainfall Variability in the Tropics," J. Geophysical Research - Atmospheres, 1996 (accepted).
- Georgakakos, K.P., "On the Establishment of a U.S. National Center for Hydrologic Research and Technology Transfer," J. of Hydrology, 172, 15-21, 1995.
- Georgakakos, K.P., and O.W. Baumer, "Measurement and Analysis of On-site Soil Moisture Data," J. of Hydrology, October 1996 (in press).
- Guetter, A.K., and K.P. Georgakakos, and A.A. Tsonis, "Hydrologic Applications of Satellite Data: Part 2. Flow simulation and Soil Water Estimates", J. of Geophysical Research-Atmospheres, 1996 (accepted).
- Guetter, A.K., and K.P. Georgakakos, "Large-Scale Properties of Soil-Water Variability", J. of Geophysical Research-Atmospheres, 101, D3, 7175-7183, 1996
- Guetter, A.K. and K.P. Georgakakos, "Are the El Niño and La Niña Predictors of the Iowa River Seasonal Flow?" J. of Applied Meteorology, 35, 690-705, 1996.
- Haferman, J.L., E. Anagnostou, D. Tsintikidis, W.F. Krajewski, and T.F. Smith, "Physically Based Satellite Retrieval of Precipitation using a 3D Passive Microwave Radiative Transfer Algorithm", J. of Atmospheric and Oceanic Technology, 13, 832-850, 1996.
- Huang, J., van den Dool, H.M., and K.P. Georgakakos, "Analysis of Model-Calculated Soil Moisture over the U.S. (1931-93) and Applications in Long-Range Temperature Forecasts," J. of Climate, June 1996 (in press).
- Lee, T.H., and K.P. Georgakakos, "Operational Rainfall Prediction on Meso- $\gamma$  Scales for Hydrologic Applications," Water Resources Research, 32(4), 987-1003, 1996.
- Tsintikidis, D., D.A. Gurnett, W.S. Kurth, and L.J. Granroth: Micron-Sized Particles Detected in the Vicinity of Jupiter by the Voyager Plasma Wave Instruments. Geophysical Research Letters, 1996 (in press).
- Tsonis, A.A., Triantafyllou, G.N., and K.P. Georgakakos, "Hydrological Applications of Satellite Data, 1, Rainfall Estimation," J. Geophysical Research - Atmospheres, 1996 (accepted).

### ***Book Reviews and Editorials***

- Georgakakos, K.P., ed., Special Issue on Soil Moisture in Journal of Hydrology, October 1996 (in press).

### *Contributions to Books*

Georgakakos, K.P., Bae, D.-H., Mullusky, M.G., and A.P. Georgakakos, "Hydrologic Variability in Midwestern Drainage Basins: Diagnosis, Prediction and Control," Chapter II- 2 in Preparing for Global Change, A Midwestern Perspective, Carmichael, G.R., Folk, E., and J.L. Schnoor, eds., SPB Academic Publishing bv, Amsterdam, The Netherlands, 61- 90, 1995. (Refereed publication.)

Georgakakos, K.P., Sharifi, M.B., and Sturdevant, P.L., "Analysis of Fine Increment Point Rainfall," in New Uncertainty Concepts in Hydrology and Water Resources, ed. Z. W. Kundzewicz, Cambridge University Press, New York, 18 pages, 1995. (Refereed publication.)

Georgakakos, K.P., "Coupled Rainfall-Flow Forecasting Models," Hydrological Applications of Weather Radars, B. Braga, (ed.), 1996 (in press). (Refereed publication.)

### *Preprints and Conference Proceedings*

Georgakakos, A.P., and K.P. Georgakakos, "Impacts of Climate Variability on the Management of Midwestern Water Resources Systems," Second International Scientific Conference on the Global Energy and Water Cycle, 17-21 June 1996, Washington, D.C., 1996 (poster).

Georgakakos, A.P., Georgakakos, K.P., Yao, H., and M.G. Mullusky, "Forecast Control Schemes for Reservoir Management," Proceedings of the Fifth Water Resources Operations Management Workshop, 4-6 March 1996, Arlington, Virginia, 185-195, 1996.

Georgakakos, K.P., "Real-Time Flood Prediction for Warning and Water Resources Management," Preprints U.S.-Italy Research Workshop on the Hydrometeorology, Impacts, and Management of Extreme Floods, 13-17 November 1995, Perugia, Italy, 1995.

Georgakakos, K.P., J.A. Sperflage, and A.K. Guetter, "Operational GIS-Based Models for NEXRAD Data in the US," International Conference on Water Resources and Environmental Research: Towards the 21st Century, October 29-31, 1996, Kyoto, Japan, 1996.

Georgakakos, K.P., A.K. Guetter, and J.A. Sperflage, "Estimation of Flash Flood Potential for large Areas," Destructive Water Conference, North American Water and Environment Congress 96, June 24-28, 1996, Anaheim, California, 1996.

Georgakakos, K.P., A.K. Guetter, and D. R. Cayan, "Soil Water-Atmosphere Interactions in Northern California," 1995 AGU Fall Meeting, San Francisco, December 10-15, 1995, EOS Supplement, 76, p. F280, 1995.

- Georgakakos, K.P., A.K. Guetter, and J. A. Sperflage, "Systems for Forecasting Flows and Their Uncertainty," ASCE North American Water and Environment Congress, 22-28 June 1996, Anaheim, CA, Special Session: Uncertainties in Flow Forecasting and Prediction, 1996.
- Guetter, A.K., and K. P. Georgakakos, "ENSO-Driven Streamflow Forecasts for the Midwestern U.S." Western Pacific Geophysics Meeting, AGU, July 23-27, 1996, Brisbane, Australia, 1996 (accepted).
- Guetter, A. K, K.P. Georgakakos, and D.R. Cayan, "Continental-Scale Interactions of Runoff and Soil Water with Atmospheric Forcing," Second International Scientific Conference on the Global Energy and Water Cycle, 17-21 June 1996, Washington, D.C., 1996 (poster).
- Guetter, A. K., J. A. Sperflage, and K. P. Georgakakos, "Estimation of Flash Flood for Large Areas," 1995 AGU Fall Meeting, San Francisco, December 10-15, 1995, EOS Supplement, 76, p. F57, 1995.
- Miller, N. L., A. K. Guetter, and K. P. Georgakakos, "Intercomparison of Streamflow Prediction for the Russian River During the Winter 1995 California Flood," 1995 AGU Fall Meeting, San Francisco, December 10-15, 1995, EOS Supplement, 76, p. F280, 1995.
- Tsintikidis, D., G.J. Ciach, W.F. Krajewski, and E. Anagnostou, "Radar Anomalous Echo Detection using Neural Nets," III International Symposium on Hydrological Applications of Weather Radars, August 20-23, 1995, Sao Paulo, Brazil, 1995.
- Tsintikidis, D., D.A. Gurnett, W.S. Kurth, and L.J. Granroth, "Overview of the Dust Findings Near the G-Ring by the Voyager 2 Plasma Wave Instrument," Proceedings for the Cassini Ring Hazard Workshop, January 25-26, 1996, Ames Research Center, NASA, Moffett Field, California, 1996.
- Tsintikidis, D., and K.P. Georgakakos, "Spatiotemporal Variability in Tropical Rainfields," International Conference on Water Resources & Environmental Research: Towards the 21st Century, October 29-31, 1996, Kyoto, Japan, 1996.
- Tsintikidis, D., "Micron-Sized Particles Detected in the Vicinity of Jupiter by the Voyager Plasma Wave Instruments," Presented at the American Geophysical Union Meeting, December 11, 1995, San Francisco, California, 1995.
- Tsintikidis, D., "Dust Findings at Saturn Using the Voyager 1 & 2 Plasma Wave Instruments," Presented at the Cassini Ring Hazard Workshop, January 25-26, 1996, Ames Research Center, NASA, Moffett Field, California, 1996.

***HRC Technical Reports***

- Georgakakos, K.P., "Blue Nile Forecast Uncertainty," HRC Progress Report No.1, Hydrologic Research Center, San Diego, California, 27 pp., April 1996
- Guetter, A.K., and K.P. Georgakakos, "GIS Applications for the Mitigation of Natural Hazards - Flood Warning and Control System for the State of Parana," HRC Technology Transfer Document, Hydrologic Research Center, San Diego, California, 15 pp., April 1996 (in color, in Portuguese).
- Guetter, A.K. and K.P. Georgakakos, "Flood Warning System for the State of Parana, Brazil" HRC Technology Transfer Document, Hydrologic Research Center, San Diego, California, 25 pp., August 1995 (in color, in Portuguese).
- Hydrologic Research Center and Georgia Institute of Technology, "Advances in the Operational Management of Reservoir Hydrosystems," HRC Technology Transfer Document, Hydrologic Research Center, San Diego, California, 60 pp., June 1996 (in color).
- Sperflage, J.A. and K.P. Georgakakos, "Operational Implementation of the Hydrologic Forecast System (HFS) Operation as part of the National Weather Service River Forecast System NWSRFS)," HRC Technical Report No. 1. Hydrologic Research Center, San Diego, California, 213 pp., June 1996.
- Sperflage, J.A., "*threshR*: A Gridded Threshold Runoff Computation System," HRC Technical Note No. 2. Hydrologic Research Center, San Diego, California, 20 pp., February 1996 (in color).
- Sperflage, J.A. and K.P. Georgakakos, "Improvement of Hydrologic Model Forecasts Using a Real Time Updating Technique," HRC Technical Note No. 3. Hydrologic Research Center, San Diego, California, 12 pp., May 1996.

## **Educational and Technology Transfer Activities**

More than 100 reprints of published and in-press articles were sent out by HRC Staff in response to requests.

HRC Staff members served as Reviewers for NSF, NOAA and NASA 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.

As part of a UCAR/COMET partnership project, the Hydrologic Forecast System (HFS) was installed at the National Weather Service California - Nevada River Forecast Center (CNRFC) in Sacramento, California. Training of CNRFC personnel at HRC (10/30/95 - 11/03/95) and at CNRFC (4/15/96) took place.

As part of a cooperative agreement with the Office of Hydrology, National Weather Service, HRC sustained support of the implementation of the threshold runoff software (*threshR*) during the current year. Revisions were produced and installed at the Tulsa, Oklahoma, the Salt Lake City, Utah, the Chanhassen, Minnesota, and the Sacramento, California RFCs, and at the Office of Hydrology (*thresh R* version 1.3.0).

Technology transfer seminars on distributed hydrologic modeling were offered at: the Office of Hydrology, National Weather Service; the CNRFC in Sacramento, California; the MNRFC in Chanhassen, Minnesota; the CBRFC in Salt Lake City, Utah; the Federal University of Parana, Brazil; the COPEL and CEMIG Utilities in Southern Brazil; and IPARDES in Parana, Brazil.

An educational seminar on "The Role of Soil Water in Hydrometeorology" was offered by Dr. K.P. Georgakakos at the Global Hydrology and Climate Center of the University of Alabama at Huntsville.

A copy of the HRC software HFS was requested and was sent to the Australian Bureau of Meteorology, Department of the Environment, Sport and Territories, Hydrology Section, as part of HRC's technology transfer program.

As part of an educational exchange program between the Hydrologic Research Center and the Georgia Institute of Technology, Department of Civil and Environmental Engineering, Dr. A.K. Guetter of HRC taught a 2.5-month graduate level course on "Hydroclimatology and Applications" at Georgia Tech.

An HRC World Wide Web page is under construction. Current version may be found at: <http://hrc.ucsd.edu>

## **Visitors**

Dr. Zuohao Cao, University of Toronto, Ontario, Canada

Mr. Alin Carsteanu, University of Minnesota, Minnesota

Dr. Dan Cayan, Scripps Institution of Oceanography, UCSD, California

Mr. James Cramer, The University of Iowa, Iowa

Professor Hector Bravo, University of Wisconsin-Milwaukee, Wisconsin

Mr. Rob Doornbos, California-Nevada River Forecast Center, Sacramento, California

Mr. Todd Elvins, San Diego Supercomputing Center, California

Professor Dara Entekhabi, Massachusetts Institute of Technology, Massachusetts



Dr. Alexander Gershunov, University of California Santa Barbara (UCSB), California

Dr. Jeffrey L. Haferman, Goddard Space Flight Center, Greenbelt, Maryland

Dr. Robert Hartman, California-Nevada River Forecast Center, NWS-NOAA, California

Mr. Noah Knowles, Scripps Institution of Oceanography, UCSD, California

Professor Witold Krajewski, University of Iowa, Iowa

Dr. Richard Marciano, San Diego Supercomputing Center, California

Dr. Norm Miller, Lawrence Livermore National Laboratory, California

Dr. Vincent Neary, Philip Williams and Associates, Ltd., San Francisco, California

Professor Victor Ponce, San Diego State University, California

Dr. Mike Smith, Office of Hydrology, NWS-NOAA, Maryland

Dr. Guang Zhang, Scripps Institution of Oceanography-UCSD, California