

#### RECOGNITION AND AWARDS (CONTINUED)

- 2007 Elected Chair, Board of Directors, Consortium of Universities for the Advancement of Hydrologic Sciences
- 2007 Elected Trustee, University Corporation for Atmospheric Research
- 2005 Fellow, American Meteorological Society
- 2003 Elected Member, European Academy of Sciences
- 2002 Distinguished McKnight University Professor, University of Minnesota
- 2002 John Dalton Medal, European Geophysical Society
- 1999 Fellow, American Geophysical Union
- 1998 Fellow, Minnesota Supercomputer Institute
- 1995 Bush Sabbatical Fellow, University of Minnesota
- 1989-1994 Presidential Young Investigator Award, National Science Foundation
- 1989 Editor's Citation for Excellence in Refereeing, Water Resources Research
- 1989 Certificate of Commendation for Contributions in Water Resources National Association of Water Institute Directors and National Association of State Universities
- 1988 Travel award from NATO (to present two lectures at the NATO Advanced Study Institute on Recent Advances in the Modelling of Hydrological Systems, Sintra, Portugal)
- 1986 National Science Foundation Engineering Initiation Award
- 1974-1976 Outstanding Student Fellowship, National Technical University of Athens, Greece
- 1973 Second Honor, Nationwide Competition in Mathematics, Hellenic Mathematical Society

#### AUTHORSHIP

- Author/co-author of more than 160 publications in refereed journals.
- Author/co-author of more than 12 books, edited volumes, and National Academy NRC reports
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# CLIMATE AND HUMANS AS AMPLIFIERS OF HYDRO-ECOLOGIC CHANGE: SCIENCE AND POLICY IMPLICATIONS FOR INTENSIVELY MANAGED LANDSCAPES

HYDROLOGY DAYS AWARD LECTURE  
COLORADO STATE UNIVERSITY  
MARCH 21, 2017

EFI FOUFOULA-GEORGIU

Distinguished Professor  
Department of Civil and Environmental Engineering  
The Henry Samueli School of Engineering  
University of California, Irvine

In recognition of outstanding contributions to  
our understanding of rainfall processes over a range of space-time scales,  
basin geomorphology and river hydraulic geometry, and scaling of floods



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# CLIMATE AND HUMANS AS AMPLIFIERS OF HYDRO-ECOLOGIC CHANGE: SCIENCE AND POLICY IMPLICATIONS FOR INTENSIVELY MANAGED LANDSCAPES

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**Abstract.** Agricultural intensification and climatic trends in many intensively managed landscapes have contributed to hydrologic regime shifts and a cascade of changes to water quality and river ecosystems. Informing management and policy to mitigate undesired consequences requires a careful analysis that includes data-based inference and conceptual/physical modeling at a range of spatio-temporal scales. Here we present a comprehensive analysis of climatic, hydrologic, and ecologic trends in the Minnesota River basin, a 45,000 km<sup>2</sup> basin undergoing continuous agricultural intensification and suffering from declining water quality and aquatic biodiversity. We show that: (a) reversing environmental degradation rests on properly managing the underlying driver of change, i.e., increased streamflows and reduced water storage due to agricultural drainage practices; (b) strategic positioning of even minimal upstream water storage results in multiple non-linear improvements in downstream water quality; and (c) “optimization” between ecosystem services and economic considerations requires a systems approach that sees beyond a single stream to the whole watershed, favoring the adoption of minimal complexity rather than highly parameterized models for scenario evaluation and comparison. Science-based approaches informing management and policy are urgent in this region calling for a new era of watershed management in response to accelerating stressors at the intersection of the food-water-energy-environment nexus.

## EDUCATION

- Ph.D., University of Florida in Environmental Engineering, 1985
- M.S., University of Florida in Environmental Engineering, 1982
- Diploma in Civil Engineering, National Technical University of Athens, Greece, 1979

## POSITIONS HELD

- 2016 - Distinguished Professor, Department of Civil and Environmental Engineering University of California, Irvine
- 2016 - McKnight Distinguished Professor Emeritus, University of Minnesota
- 2008 – 2013 Director, National Center for Earth-surface Dynamics University of Minnesota, Minneapolis
- 2002 – 2008 Co-Director, National Center for Earth-surface Dynamics University of Minnesota, Minneapolis
- 1999 – 2003 Director, St. Anthony Falls Laboratory University of Minnesota, Minneapolis
- 1996 – 2016 Professor, Department of Civil Engineering St. Anthony Falls Laboratory, University of Minnesota, Minneapolis
- 1989 – 1996 Associate Professor, Department of Civil Engineering St. Anthony Falls Laboratory, University of Minnesota, Minneapolis
- 1986 – 1989 Assistant Professor, Department of Civil & Construction Engineering Iowa State University, Ames
- 1985 – 1986 Research Associate, Department of Civil and Mineral Engineering St. Anthony Falls Hydraulic Laboratory, University of Minnesota, Minneapolis

## RESEARCH INTERESTS

- Earth remote sensing
- Land-atmosphere interaction and boundary layer processes
- Dynamics of winter-time extra-tropical atmosphere and its predictability
- Data Assimilation: Techniques development and applications
- Land evaporation retrieval using multi-platform remotely sensed data
- Sensor network model-integration closed-loop control
- Surface water-groundwater interaction and hillslope hydrology

## RECOGNITION AND AWARDS

- 2017 AGU Hydrology Days Award
- 2016 Robert E. Horton Lecturer in Hydrology, American Meteorological Society
- 2014 President, Hydrology section, American Geophysical Union
- 2012 President-elect, Hydrology Section, American Geophysical Union
- 2012 Presidential Appointee to the Nuclear Waste Technical Review Board
- 2012 Kiesel Distinguished Lecturer, University of Arizona
- 2008 Joseph T. and Rose S. Ling Chair in Environmental Engineering
- 2008 Borland Distinguished Lecturer, Hydrology Days
- 2007 Hydrologic Sciences Award, American Geophysical Union
- 2007 Honorary Professor, Sichuan University, China
- 2007 Moore Distinguished Lecturer, University of Virginia