



HYDROLOGY DAYS AWARD

GEORGE F. PINDER

University of Vermont

In recognition of outstanding contributions to hydrologic science in the areas of computational subsurface flow hydrology, analysis of groundwater contamination by non-aqueous-phase-liquids, and implementation of optimization methods for groundwater design and clean-up problems

HYDROLOGY DAYS 2009

RECOGNITION AND AWARDS

- RCA Professor of Energy Resources, 1975-1989 (Princeton University)
- Horton Award, presented by the American Geophysical Union for an outstanding paper on hydrology (1969)
- O.E. Meinzer Award, presented by the Geological Society of America for an outstanding contribution to the field of hydrogeology (1975)
- The Eminent Scientists Award medal for 'Recognition for ...outstanding contributions in the field of water resources' (1992)
- Fellow, American Geophysical Union (1993)
- University of Vermont University Scholar '...in recognition of contributions to research and scholarship' (1993).
- Julian Hinds Medal of the American Society of Civil Engineers for advancing '... engineering in the field of planning, development, and management of water resources' (2002).
- Fellow of Wessex Institute (2004)
- University of Vermont College Distinguished Professor (2005).

AUTHORSHIP

- Author and co-author of more than 120 publications in refereed journals.
- Author and co-author of 93 papers in Conference Proceedings and 30 reports.
- Author and co-author of more than 20 chapters in books and author/editor of more than 20 books.

SOCIETY MEMBERSHIP

- Society of Sigma Xi,
- Phi Kappa Phi
- American Society of Civil Engineers
- Society of Petroleum Engineers of AIME
- American Geophysical Union
- Society for Industrial and Applied Mathematics
- American Institute of Hydrology

OPTIMAL SEARCH STRATEGY FOR THE DEFINITION OF A DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) SOURCE

HYDROLOGY DAYS AWARD LECTURE

COLORADO STATE UNIVERSITY

MARCH 26, 2009

GEORGE F. PINDER

Professor of Civil and Environmental Engineering

Professor of Mathematics and Statistics

Director, Research Center for Groundwater Remediation Design

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OPTIMAL SEARCH STRATEGY FOR THE DEFINITION OF A DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) SOURCE

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Abstract. The overall goal of the research presented here is to develop, test and evaluate a computer assisted analysis algorithm that defines how to achieve an acceptable level of DNAPL source-location accuracy using the least possible number of water quality samples. The search strategy includes a stochastic groundwater flow and transport model that is used to calculate the concentration random field and its associated uncertainty. The model assumes a finite number of potential source locations. Each potential source location is associated with a weight determined using a discrete Choquet Integral that reflects our confidence that it is the true source location. After a water quality sample is selected, an optimization algorithm is employed that finds the optimal set of magnitudes that corresponds to the set of potential source locations. The simulated concentration field is updated using the real data and a Kalman filter. The updated plume is compared to the individual plumes (that are calculated using the groundwater flow and transport simulator considering only one source at a time) employing a fuzzy logic related strategy. The comparison provides new weights for each potential source location. These weights define how the concentration realizations calculated by the stochastic groundwater flow and transport model will be combined. The higher the weight for a specific source location, the more concentration realizations generated by this source will be included in the calculation of the mean concentration field. The steps described above are repeated until the weights stabilize and the optimal source location is determined. The algorithm has been successfully tested using various synthetic example problems and at the Anniston Army Depot (ANAD) in Alabama. The contaminant of interest at the site is trichloroethene (TCE).

EDUCATION

- Ph.D. University of Illinois, June 1968
- B.Sc. (Honors) University of Western Ontario, June 1965

PROFESSIONAL RECORD

- March 2001-present Professor of Computer Science
- July 1993-present Director, Research Center for Groundwater Remediation Design
- July 1992-June 1996 Dean, Division of Engineering, Mathematics and Business Administration
- July 1989-June 1996 Dean, College of Engineering and Mathematics, University of Vermont, Burlington, Vermont 05405
- July 1989-present Professor of Civil and Environmental Engineering
- July 1990-present Professor of Mathematics and Statistics
- July 1980-June 1989 Chairman, Department of Civil Engineering, Princeton University, Princeton, New Jersey 08544
- Sept. 1977-July 1980 Professor of Civil Engineering, Princeton University, Director, Water Resources Program
- Sept. 1972-Sept. 1977 Associate Professor of Civil Engineering, Princeton University, Director, Water Resources Program
- Dec. 1968-Sept. 1972 Research Hydrologist, U.S. Geological Survey, Water Resources Division, Atlantic Coast Region, Arlington, Virginia
- June 1968-Dec. 1968 Nova Scotia Department of Mines, Nova Scotia, Canada

LEADERSHIP POSITIONS

- President, Hydrology Section of American Geophysical Union.
- President, International Society for Computational Methods in Engineering.
- Chairman, Groundwater Management Committee, American Society of Civil Engineers
- Chairman, Groundwater Council, Environmental and Water Resources Institute, American Society of Civil Engineers.

EDITORIAL BOARDS

- Applied Mathematics Modelling
- Numerical Methods in Fluids
- Applied Numerical Mathematics
- Communications in Applied Analysis
- International Journal of Computational and Numerical Analysis and Applications
- International Journal of Pure and Applied Mathematics

EDITOR-IN-CHIEF

- Numerical Methods for Partial Differential Equations

FOUNDING EDITOR

- Advances in Water Resources
- Numerical Methods for Partial Differential Equations

PROFESSIONAL BOARDS

- Board of Advisors, Wessex Institute of Technology, Ashurst, England
- External Advisory Committee, Water: Systems, Science and Society, Tufts University