GEORGE BWALYA MATANGA Ph.D., P.E.

Dr. Matanga received B.S., M.S. and Ph.D. degrees in Civil Engineering from**,** respectively, California State University at Sacramento, University of California at Berkeley and University of California at Davis. He undertook post-doctoral research in numerical modeling of groundwater flow and transport in Department of Earth Sciences, University of Waterloo, Canada. He developed and applied numerical models in analysis of water flow and chemical migration in an aquifer underlying an irrigated land in Southern Alberta, Canada. He evaluated, on behalf of Atomic Energy of Canada, saturated-unsaturated numerical models for possible application in studies of migration of low-level nuclear contaminants in aquifers. He was also involved in development and application of numerical models based on the theory of dual application hydraulic head and stream functions in analysis of water flow and solute migration in groundwater systems. He has continued research in application of stream functions in analysis of flow and transport processes in groundwater flow systems. He has developed theory of stream and pseudopotential functions in 3D anisotropic aquifers. Pseudopotential and stream functions are valuable in visualization of flow and transport processes in the 3D flow systems. Based on this work, he developed a visualization code, visualFAT and a 3D groundwater flow and transport code, flowTrans.

Dr. Matanga has more than twenty years of experience in consulting firms in United States, Canada and Germany. He undertook task leadership in groundwater modeling for numerous projects, supervised and mentored technical staff in application of numerical models for analyses of groundwater flow and transport processes in various aquifers in California, Texas, Alabama, Alaska and Oklahoma, applied numerical models to design groundwater-remediation systems, and evaluated impact of groundwater pumping on surface water in various watersheds. He also provided modeling expertise to project managers, and displayed extensive experience in modification and application of existing numerical models and development of state-of-the-art models. He performed modeling procedures such as: data evaluation, development of conceptual models, model selection, model calibration, sensitivity analyses, and reporting of model results and recommendations.

As a consultant to UNICEF, Dr. Matanga provided advice to UNICEF (South Africa) on use of groundwater resources in water supply and sanitation, and training in groundwater hydrology and numerical modeling to South African professionals from government, industry, and academia. In addition, he provided technical presentations and advice to South African Department of Water Affairs and Forestry, and National Community Water Supply and Sanitation Training Institute.

Dr Matanga has taught graduate courses in advanced groundwater hydrology and 3D finite-element modeling in Department of Civil and Environmental Engineering, University of California, Davis (UCD) and Department of Biological & Ecological Engineering, Oregon State University, Corvallis. He is regularly invited by Department of Land, Air and Water Resources at UCD to give talks to graduate students on on-going HydroGeoSphere enhancements and applications in California's Central Valley. He has published more than fifteen technical papers in peer-reviewed scientific and engineering journals.

Under his duties, Dr. Matanga is a leader of a U.S. Bureau of Reclamation (Reclamation) group responsible for hydrologic analysis and integrated surface/subsurface numerical modeling mainly in the Central Valley of California. In addition to this responsibility, he coordinates Reclamation's Science & Technology Program (S&TP) in Mid-Pacific Region of Reclamation. Development and enhancements of HydroGeoSphere have been possible through funding from S&TP and Reclamation Projects. The HydroGeoSphere team is led by Dr. Matanga and consists of professionals from Reclamation, California Department of Water Resources, HydroGeologic (Virginia, USA), University of Waterloo (Canada) and Laval University (Canada). Most of the science and technology upon which HydroGeoSphere is based has mainly been developed at the two Canadian universities. This is a good example of government, industry and academia working together to transfer science and technology for application by government in optimal management of water resources for water supply, water quality and ecosystem health. Interest and application of HydroGeoSphere is spreading through North America, Europe and South-East Asia.

To facilitate application of HydroGeoSphere to solution of various hydrological and ecological problems, the HydroGeoSphere team is undertaking model enhancements for the purpose of incorporating nutrient and heat transport in coupled surface and subsurface water systems, and sediment transport in surface water systems. Future enhancements will include incorporation of parallel processing and decomposition of a watershed into sub-basins. This will facilitate mode applicationl to large watersheds and long simulation times. Furthermore, HydroGeoSphere is being linked to a water-allocation model based on meteorological data, such as temperature and precipitation, for study of climate-change impact on water resources in a watershed.

Current applications of HydroGeoSphere in California's Central Valley include evaluation of impact of groundwater pumping on surface water for assessing issues related to management of water supply, capability of drainage-water reuse systems in the San Joaquin Valley to control drainage water and salinity in arid agricultural lands, issues related to integrated management of water supply, water quality and ecosystem health for wetlands located on the west side of the San Joaquin Valley, and hydrological and ecological processes in management of San Joaquin River Restoration Program.

World-wide, there is emphasis on management of watersheds in the context of water supply, water quality and ecosystem health in an integrated manner. To facilitate this trend, there is a need for numerical models that account for integrated hydrological and ecological processes in fully-coupled hydrologic-cycle and ecosystem components. HydroGeoSphere is a valuable numerical tool in integrated analysis of hydrological and ecological processes for management of water resources in a watershed. Success of applying HydroGeoSphere or any other model depends on good modeling approach that includes: evaluation of modeling objectives, collection and analyses of hydrological and ecological data, development of conceptual model, selection of development of a numerical model, model calibration and sensitivity analyses, and evaluation and report of model results