MULTI-OBJECTIVE OPTIMIZATION FOR MONTHLY WATER RESOURCES ALLOCATION FROM MULTIPLE SUPPLY SOURCES

***Hui Wang**, Tirusew Asefa, Solomon Erkyihun*
Tampa Bay Water, Clearwater, FL, USA

Complexity of considering tradeoffs among various objectives often limits water managers to explicitly incorporate multi-objectives in decision-making processes. This study presents a framework for determining monthly resource allocation from multiple supply sources that considers multiple objectives, including deviation from fiscal year budget, under or over-utilization of a given portfolio of resources, and total cost of water production. This framework is comprised of a simulation model, the production allocation model (PAM), and a multi-objective evolution algorithm (MOEA). The MOEA is used to search for Pareto optimum solutions across different objectives and the PAM uses MOEA output and considers operational constraints to achieve preferential operations within a given objective function. Stochastic demand and supply realizations were generated to capture a wide range of uncertainties which were then sampled by a Latin Hyper Cube to make the computation tractable. A parallel computing environment was used to implement this near real-time decision support tool, allowing the generation of timely guidance for water resource managers. Application of the proposed framework is demonstrated for a regional wholesale water supply utility, Tampa Bay Water, on the west coast of Florida in the United States. The framework can be applied to other regions with similar challenges in water resources management.

PRESENTER BIO: Dr. Wang is a lead water resources system engineer with more than 15 years of experience studying, simulating, and planning projects for water resources planning and management. He has extensive experience with decision support tools for decision-making at multiple time scales in the field of water resources engineering.