THE UNIVERSITY OF ARIZONA
Mel & Enid Zuckerman College of Public Health

Environmental and Occupational Health Seminar

From Distribution System Water Quality to Real-Time Modeling and Back Again

February 6, 2019 ~ 12:00 PM to 12:50 PM ~ Drachman A118

Community, Environment & Policy Department Presents:

Dominic Boccelli, PhD
Department Head
Civil & Architectural Engineering & Mechanics
The University of Arizona

Dominic recently joined the University of Arizona as an Associate Professor and Department Head of Civil and Architectural Engineering and Mechanics. Prior to joining UA, Dominic was on the faculty at the University of Cincinnati, and, before that, spent two years as an environmental engineer with the National Homeland Security Research Center within the US Environmental Protection Agency. He has a PhD in Civil and Environmental Engineering from Carnegie Mellon University. His research interests are broadly in the area of urban water infrastructure with a primary focus on water distribution systems associated with real-time modeling, security applications, and water quality issues. His research incorporates computational as well as laboratory- and field-scale experimental studies. He currently serves as an Associate Editor for the Journal of Hydroinformatics and is a member of the Journal American Water Works Association editorial board.

Drinking water distribution systems (DWDS) are the last step in delivering potable water to end-users. In order to provide adequate potable water there are multiple hydraulic and water quality objectives that must be satisfied. Over the years, the research within our group has generally focused on DWDS water quality issues associated with disinfectant and by-product dynamics and contamination warning systems. Through both laboratory and field-scale studies, we have been successful in representing observed DWDS water quality dynamics through the use of complex water quality simulations. However, there have also been discrepancies that, in part, result from inaccurate representation of the underlying hydraulics that define transport characteristics, such as residence time and travel paths. These results, which have been supported by tracer studies, have moved our research into improving end-user demand estimates, which drive the underlying hydraulics, to improve our capabilities for water quality research.

Our move into demand estimation has been focused on the development of a real-time demand estimation and forecasting algorithm using the hydraulic information (i.e., flows, pressures) available from utilities. Using our framework, we have been able to estimate demands for both synthetic and real-world systems that adequately represent the observed hydraulic information, but have also uncovered additional challenges. The first of these is that the approach(es) used to aggregate demands – to ensure a feasible estimation problem - and the relative location of the existing measurements can have significant impacts on the demand estimation problem. The second challenge, as we circle back to our water quality interests, is that by simply matching the observable hydraulics, we are not guaranteed improvements in the system-wide transport characteristics. This presentation will summarize our past water quality successes and challenges, our current research in the real-time demand estimation area, and provide current thoughts on the future challenges associated with real-time and water quality modeling.

For more information, please contact Karen O'Shaughnessy at 520-626-4912 or email: koshaughnessy@email.arizona.edu