Politecnico di Torino
Department of Environment, Land and Infrastructure Engineering

Istituto di Geoscienze e Georisorse

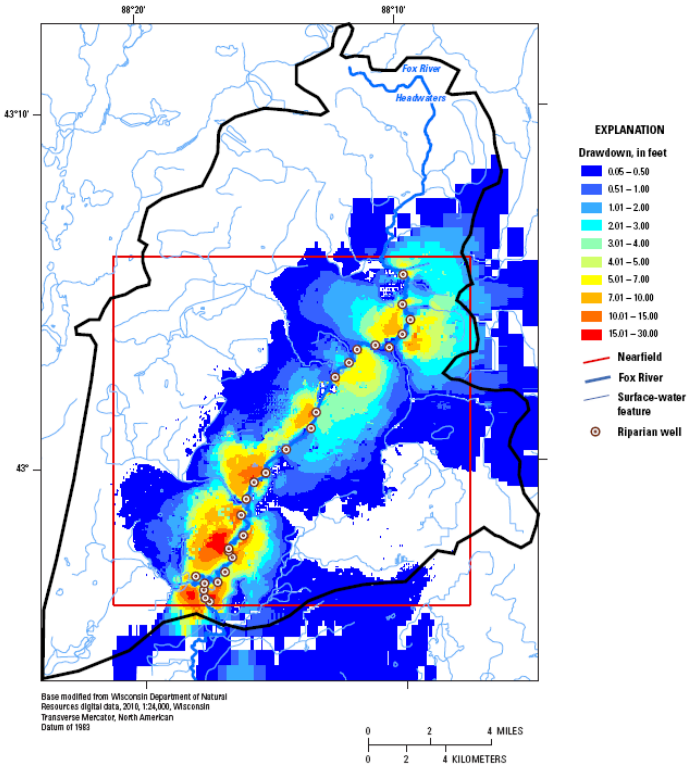
Under the patronage of:

ONE (NONSTATISTICAL) WAY TO HANDLE UNCERTAINTY: END-MEMBER VERSIONS OF A GROUNDWATER/SURFACE WATER MODEL FOR DECISION SUPPORT

MAY 8TH 2024 AT 11.30 AM | MEETING ROOM, DIATI DOOR 3, FIRTS FLOOR

ABSTRACT

Hydrological models are inherently characterised by uncertaintyrelated to input and calibration data, model structure, andparameters. This uncertainty propagates to model results and,hence, it must be assessed. In this presentation, after an overviewof the sources of uncertainty for groundwater models and a briefdiscussion of advanced statistical techniques for evaluatinguncertainty, a simpler method is presented based on end-membermodels. The core idea is to create multiple model versions byvarying the distribution of inputs whose values are both key to thedesired predictions and estimable based on available data. In thecase study presented, the model objective is to simulate theinteractions between a river and a line of shallow wells proposed forits riparian area. The MODFLOW model predicts how much water thewells would draw from the river. The key input is the connectivity ofpermeable deposits along the river - one end-member modelminimizes this connectivity whereas the second maximizes it. Thisprocedure is then evaluated in terms of the sources of uncertaintyfirst described. The talk concludes with a surprise use to which themodels were put by a regulatory agency for actual decision support.



BIO

Daniel T. Feinstein has worked in the field of quantitative hydrogeology for 30 years. He studied groundwater modeling at the New Mexico Institute of Mining and Technology and at the University of Wisconsin-Madison before working as a consultant on remediation projects for Papadopulos & Associates and Geraghty & Miller. In 1997 Dr. Feinstein joined the USGS where he specialized in interpretive studies involving regional groundwater modeling, simulation of groundwater/surface-water interactions, and contaminant transport. He recently headed up a pilot modeling study of the Lake Michigan Basin as part of a USGS program to determine the status, trends, and prospects of water availability in the United States. His current research interests include statistical models which emulate process-driven simulations of groundwater age and stream depletion by wells, and transport models which forecast heat flow under climate change. Dr. Feinstein is an adjunct professor at the Geosciences Department of the University of Wisconsin-Milwaukee and teaches modeling courses in Italy.