

Seminar by, Dr. David Steward

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Exploring Geosciences with AEM using Open-source, Nearly Exact Solutions

Abstract: Solution methods are introduced for problems of interest to the southern Texas landscape across the geosciences and civil engineering. Hydrogeology examples include groundwater/surface water interactions through streambeds, interactions of pumping in well fields, and heterogeneous flow of groundwater and soil water through features with different hydraulic conductivity than their surrounding (faults and inhomogeneities). Ecohydrology problems include groundwater uptake by plants, and the complex interactions of capture zone topology to delineate the source of water withdrawn by fields of phreatophytes. This formulation is developed using the Analytic Element Method, and an overview of the methods is presented using Steward (2020), "Analytic Element Method: Complex Interactions of Boundaries and Interfaces". Solutions demonstrate the nearly exact representation of complicated interactions of closely spaced hydrogeologic features, typically with 6-8 significant digits. A companion site at Oxford University Press contains examples and open-source solutions. Interdisciplinary applications exist in related studies of heat conduction, electrical conduction, elastic deformations, and wave propagation.

Biosketch: Prof. Steward completed a BSCE degree and then worked for six years as a system programmer at Unisys, in the areas of B1 security testing and design of executive software for IP/memory hardware fault control for mainframe computers. He returned to the University of Minnesota to pursue studies of groundwater flow and engineering mathematics and remained at the University of Minnesota as a post-doctoral research associate before moving to the University of Maine as a post-doc in coastal engineering. Professor Steward joined Kansas State University in the department of civil engineering, where he led interdisciplinary teams to study water resources, and taught courses in groundwater flow and analysis, hydraulics, engineering mathematics, and water-and-society. He joined North Dakota State University as the chair of the Department of Civil and Environmental Engineering and is now also chair of the Department of Construction Management and Engineering, where he leads an outstanding team of faculty and staff towards preparing the next generation of engineers for the challenges, they will face in designing infrastructure for society and designing solutions to promote human and environmental health.

Date: Friday January 28th, 2022

Time: 4:00 – 4:50 PM

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