EGU22-10575
https://doi.org/10.5194/egusphere-egu22-10575
EGU General Assembly 2022


# An open-source framework for nearly exact solutions to complex geoscience interactions (AEM)

**David R. Steward**
North Dakota State University, Department of Civil and Environmental Engineering, Fargo, United States of America (david.steward@ndsu.edu)

An open-source framework is presented to support geoscientific investigations of flow, conduction, and wave propagation. The Analytic Element Method (AEM) provides nearly exact solutions to complicated boundary and interface problems, typically with 6-8 significant digits. Examples are presented for seepage of water through soil and aquifers including fractured flow, groundwater/surface water interactions through stream beds, and ecological interactions of plant water uptake. Related applications include waves near coastal features and propagation of tsunamis through bathymetric shoals. This presentation overviews the concise AEM representation from Steward (2020), "Analytic Element Method: Complex Interactions of Boundaries and Interfaces", where solutions discretize the domain into features, develop mathematical representations of interactions, and develop coupled systems of equations to solve boundary conditions. The companion site at Oxford University Press contains a wide range of open-source solutions to these problems and related applications across the geosciences.