Development of a Reliable Hydraulic Conductivity Upscaling Tool for High Dimensional Groundwater Flow Models

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Abstract

Porous media in nature exhibit complex and irregular geometry, and understanding of the underlying heterogeneity is key to the accurate description of groundwater flow and transport processes. Specifically, the appropriate representation of hydraulic conductivity at different scales is the first step for constructing a numerical groundwater model for use in field applications. In this presentation, we revisit the hydraulic conductivity upscaling approach of Kitanids [1990], which is valid under gradually varying flow assumption, and develop an efficient open-source computational tool to provide field practitioners upscaled hydraulic conductivity fields, in a tensor form that accounts for anisotropy, of any arbitrary size from fine resolution ones. We test our tool with high dimensional 3D fine scale model upscaling examples and compare fine-scale head fluctuations with coarse scale counterparts. We also investigate how robust our proposed tool can work for cases with rapidly changing flow conditions.

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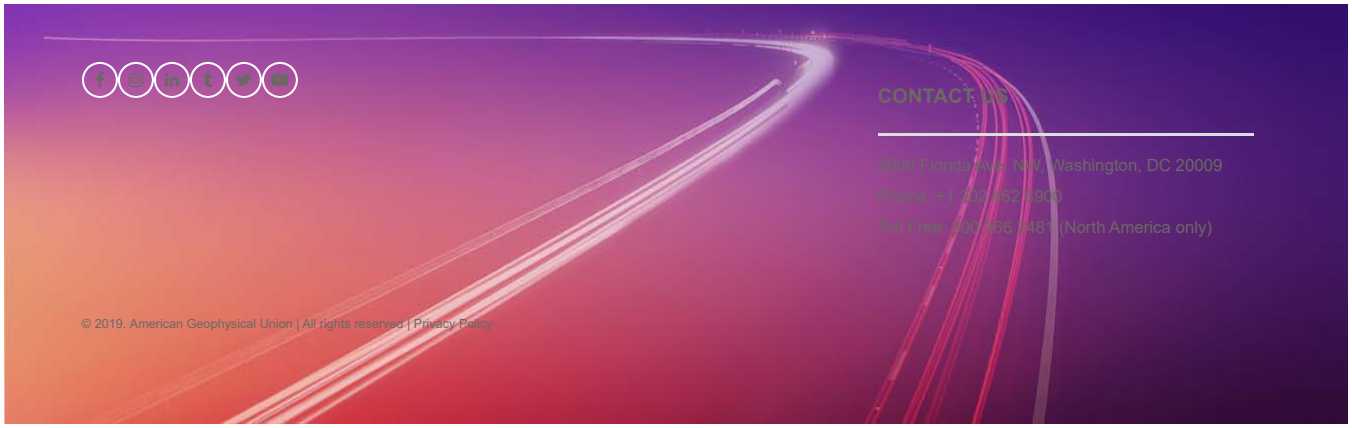

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