

The RBF-FD method applied to two problems: Groundwater Flow Modelling and Solving PDEs on Arbitrary Surfaces.

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This talk will focus on two very different problems to which the RBF-FD method is applied: Aquifer heterogeneity is notoriously challenging to numerically resolve. Failing to correctly model this feature can lead to flawed groundwater flow forecasting. Yet, each of the most commonly used methods (FD, FEM, and AEM) present fundamental issues that prevent them from tackling this problem efficiently. We are thus proposing a new RBF-FD-based method to better represent heterogeneities, in particular, in the presence of wells.

Solving PDEs on arbitrary surfaces is the second problem considered. The RBF-based Orthogonal Gradients Method (OGr) allows us to compute differential operators restricted to general surfaces in \mathbb{R}^3 by means of point clouds only. It benefits from RBFs' strengths: simplicity, high accuracy and also from its meshfree character, which gives the flexibility to represent the most complex geometries. We are introducing a fast version of the OGr algorithm, which makes use of the RBF-FD method.