Analytical and numerical modeling of groundwater flow and Riverbank filtration problems

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The workshop/training programme aims to systematically prepare participants for analytical and numerical modeling of groundwater problems, with a particular focus on riverbank filtration (RBF). The first part of the programme will include a lecture introducing the fundamental development of mathematical models for groundwater systems. These foundational concepts will then be used to present analytical solutions, with an emphasis on understanding their scope and limitations. Next, numerical methods for groundwater flow—specifically the finite difference method (FDM)—will be introduced through practical exercises using MODFLOW and MODPATH. Participants will work on synthetic problems to understand the implementation of different boundary conditions and the importance of model orientation in 2D flow simulations, especially in the context of RBF settings. In addition, the workshop will introduce the Analytical Element Method (AEM)–based RBF modeling tool **RBFsim**, highlighting the advantages this approach offers in simulating groundwater flow.

The workshop is particularly designed for advanced MSc students, new PhD researchers, and professionals from consulting and government agencies who wish to begin working in groundwater flow modeling. Prior knowledge of modeling tools such as MODFLOW/MODPATH or programming is *not* required. However, participants are expected to have a background in advanced mathematics.

Participants should have access to an individual laptop or PC.

About the Presenter (lead PI)

Dr. Prabhas K Yadav is a senior research associate at the department of geosciences at the University of Tübingen (UT). Dr. Yadav has been particularly involved in the development of models fitting to the early stages of contaminant site management. These include models for identifying potentially contaminated sites and establishing contaminated sites. Most of Dr. Yadav has been derived from his works as a research associate at Technical University of Dresden (TUD) and in collaboration with IIT Delhi, Uni-Texas, Austin, USA and Uni-Waterloo, Canada. Dr. completed his PhD from TUD (Prof. R. Liedl) and was a Post-Doc at Uni-Illinois (Prof. Werth) and currently holds an independent position supported by German Research Foundation (DFG) at UT. Dr. Yadav works in collaboration with his colleagues and students can be found in several leading publications.

Acknowledgement