IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Computational modelling for pollutant transport through fractured and porous media

Project number: IMURA0060

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The problem

Groundwater, once believed to be the purest water source on earth, has been now contaminated as a result of rapid industrialization and other human activities in most parts of the worlds. Management of the groundwater systems requires a detailed understanding of the response of the aquifer under the imposed conditions. Due to non-linear and non-analytical nature of the pollutant transport model, numerical methods are must for solving the problem. Majority of cases, fractured media is not considered or imprecisely accounted.

Project aims

The main aim of the proposed project is to develop a set of computational schemes which will help model the flow and pollutant transfer through fractured and porous media. The objectives of research are:

1. To conduct lab experiments to study behaviour of flow and pollutant transport through fractured and porous media
2. To develop computational models of flow through fractured and porous media
3. To calibrate and validate flow models
4. To develop pollutant transport models based on the flow models suggested as above
5. To calibrate and validate these models
6. To apply these models to solve real field scale problems

If possible, the models will be implemented in GIS environment using Finite Element Modelling approach to permit close to reality type of modelling of the phenomena.

Expected outcomes

The problems associated with the aquifer reclamation and cleaning of the groundwater contamination due to hazardous waste disposal site are very complex in nature. Environmental engineers are required to analysis the problems and to propose alternatives strategies for pollution abatement in groundwater. The proposed research will help decision maker in evaluating various alternative strategies in the case of fractured aquifers or various possible combination of fractured aquifer(s) and porous aquifer(s).

Models are expected to help estimate accurate and dependable yields of fresh water from fractured aquifers, which is at present done on the empirical basis.