



Evaluation of modeling approaches to simulate contaminant transport in a fractured limestone aquifer

Mosthaf, Klaus; Fjordbøge, Annika Sidelmann; Broholm, Mette Martina; Bjerg, Poul Løgstrup; Rohde, Magnus Marius; Overheu, Niels D.; Binning, Philip John

Publication date:
2015

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Mosthaf, K., Fjordbøge, A. S., Broholm, M. M., Bjerg, P. L., Rohde, M. M., Overheu, N. D., & Binning, P. J. (2015). Evaluation of modeling approaches to simulate contaminant transport in a fractured limestone aquifer. Abstract from 2015 NGWA Conference on Groundwater in Fractured Rock, Burlington, Vermont, United States.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

2015 NGWA Conference on Groundwater in Fractured Rock September 28 - 29, 2015

Evaluation of Modeling Approaches to Simulate Contaminant Transport in a Fractured Limestone Aquifer

Monday, September 28, 2015: 2:00 p.m.

Klaus Mosthaf , Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Annika S. Fjordbøge , Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Mette M. Broholm , Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Poul L. Bjerg , Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Magnus M. Rohde , GEO, Kgs. Lyngby, Denmark

Niels D. Overheu , Regional Development Center - Groundwater Unit, Capital Region of Denmark, Hillerød, Denmark

Philip J. Binning , Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Understanding the fate and transport of contaminants in limestone aquifers is important because they are a major drinking water resource. This is challenging because they are often heavily fractured and contain chert layers and nodules. Several modeling approaches have been developed to describe contaminant transport in fractured media, such as discrete fracture, equivalent porous media, and dual continuum models. However, these modeling concepts are not well tested for real limestone geologies. Our goal is therefore to develop, evaluate, and compare approaches for modeling transport of contaminants in fractured limestone aquifers.

The model comparison is conducted for a contaminated site in Denmark, where a plume of dissolved PCE has migrated through a fractured limestone aquifer. Field data includes information on spill history, distribution of the contaminant (multilevel sampling), geology, and hydrogeology. To describe the geology and fracture system, data from borehole logs and cores was combined with an analysis of heterogeneities and fractures from a nearby excavation and pump test data. We present how field data is integrated into the different model concepts. A challenge in the use of field data is the determination of relevant hydraulic properties and interpretation of aqueous and solid phase contaminant concentration sampling data. Traditional water sampling has a bias towards fracture sampling; however, concentrations in the limestone matrix are needed for assessing contaminant rebound and remediation strategies.

Each model is compared with field data, considering both model fit and model suitability. Results show a considerable difference between the approaches, and that it is important to select the right one for the actual modeling purpose. The comparison with data showed how much information is required to discriminate between models, and recommendations on how to identify the best modeling approach are made.