Title:

Multiscale Modelling of Flow and Solute Transport in the Piceance Basin: Development of Efficient Techniques for Representing Rate-Limited Mobilization of Potential Groundwater Contaminants

Abstract: (Your abstract must use 10pt Arial font and must not be longer than this box)

The Piceance Basin of northwestern Colorado contains rich deposits of oil shale in sedimentary rocks. All of the proposed in situ extraction technologies will require the evaluation of environmental impact.

The ultimate goal of this study is to represent the physical process involved in the dissolution, mobilization, and precipitation of possible contaminants in the oil shale rocks in an accurate yet computationally efficient manner. This goal requires the representation of subgrid phenomena in both the flow and transport models. While the subgrid scale influences on flow can be represented using traditional upscaling techniques, the transport requires a different approach. Here the dissolution and mobilization of possible contaminants are rate-limited due to low permeability of the organic-rich rocks. A generalized multi-porosity method is used represent this behaviour.

Using log or similar data, a conceptual model of heterogeneity based on hierarchical transition probability was set up. Random realizations of saturated hydraulic conductivity fields were created at the kilometer scale surrounding the extraction zone. Flow and transport are solved using FEHM, a control volume finite element general purpose simulation code. Flow upscaling led to the definition of effective hydraulic conductivity values for each stratigraphic unit; these were calibrated against data generated with a high resolution (synthetic) model. Transport upscaling was achieved using the sub-grid generalized dual-porosity capability of FEHM. First-order rate coefficients were defined to quantify mass exchange by diffusion with low-permeability zones, whereas upscaled dispersivities accounted for macroscale differential advective processes. Uncertainty on hydraulic conductivity, rate coefficients and dispersivity was investigated using Monte Carlo simulations.

Finally, upscaled flow and transport parameters are incorporated into a simplified ground water model of Piceance Basin and several example simulations are presented.

Important notes:

Do **NOT** enter author and affiliation information on this document. You will be able to enter this information online when you submit the abstract.

Do **NOT** write outside the boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this document. Simply enter your title and abstract in the boxes. The document will be automatically processed – if you alter its structure your submission will not be processed correctly.