Title:

The Coupling of Oil Shale Extraction and Regional Hydrologic Models

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The Oil Shale resource in the Piceance Basin is the largest and richest in the world. While previous extraction work in the 1970s and 1980s focused on shallow retorting and high temperature combustion techniques, modern extraction designs in the Piceance Basin are exclusively in situ based. Though in situ techniques tend to reduce the footprint and environmental impact of the surface facilities, the potential impact on the subsurface flow system and regional water resources must be carefully evaluated. These impacts depend strongly on both the extraction process and on the flow characteristics and geochemistry of the regional aquifer. Temperature change and porosity/permeability manipulation are among the most important features of the extraction process affecting the water quality of the regional flow system. While the spatial and temporal characteristics of the groundwater flow is important, the rock mineralogy, and the distribution of dissolved solids in the aquifer layers comprising the regional flow system are also important in the design of an extraction process that minimizes the environmental impact. Temperature changes can affect the dissolution, mobilization, and precipitation of dissolved constituents and will be important in the design of the lateral and vertical extent of the extraction process model. Depending on the extent of temperature changes, and in situ stress changes caused by temperature changes, the addition of an intermediate scale heat and mass transfer model that forms the border between the very complex extraction model and the isothermal regional groundwater model may be required. We will present a general description of our oil shale extraction simulation model, an intermediate heat and mass transfer model, a simplified regional groundwater model, and a coupling strategy for the models.

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