Coupling SEAWAT and TOUGH2 Models to Protect Regional Groundwater Quality

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ABSTRACT

The Mt. Simon Formation, the basal sandstone reservoir in the Illinois Basin, is the storage reservoir for a geologic carbon sequestration (GCS) project in central Illinois (USA). The Mt. Simon is a highly saline reservoir at the injection location, but it is a source of drinking water in Wisconsin. In the current study, we seek to couple two codes to improve our understanding of the competing effects of GCS in the south and groundwater pumping in the north. TOUGH2 is suitable for simulating multiphase and multi-density flow problems such as GCS, while SEAWAT is suitable for variable density, groundwater flow problems. Rather than using a single TOUGH2 model, coupling SEAWAT and TOUGH2 lowers the computational cost of modeling this system, allowing the impacts of the GCS project (increasing formation pressure) and groundwater pumping (reducing formation pressure) to be analyzed more efficiently. The use of the SEAWAT model also allows us to incorporate current and projected freshwater pumping data developed for a calibrated MODFLOW model. The migration of native brine and its impact on freshwater drinking sources will be investigated by passing pressure and salt concentration data between the models at specific time steps.