A Wiki-Based Tool for Comparing Conceptual Models of Deep Geologic Carbon Sequestration

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Numerical simulation of deep geologic carbon sequestration reservoirs is key to the selection and design of potential repositories and assessment of their long-term performance and associated risks. Some of the greatest sources of uncertainty in these numerical models are the conceptual and conceptualmathematical models on which they are based. There are few methods or standards available for systematically developing and/ or comparing conceptual models. Instead, they are often developed in an ad hoc way, based on common sense, subjective opinion, and experience making it difficult to directly compare alternative conceptual models for a given problem.

Building on systematic methodologies applied to performance assessments of radioactive waste disposal, we have created a wiki-based tool for capturing and comparing the major attributes of conceptual models and the conceptual-mathematical representations used for carbon dioxide disposal. The focus of this current version is on development/comparison of conceptual models used to numerically simulate the performance of a CO_2 reservoir, and its near-field surroundings. It is not directed at the analysis of risk associated with possible leakage from that reservoir, nor the effects of external factors (such as earthquakes) acting on the subsurface environment.

This wiki-based tool provides a graphical user interface to lead the conceptual-model developer through a system-level analysis of the major components of the repository system that can influence the behavior of carbon dioxide injected into the subsurface. This tool captures the features and processes selected for inclusion in the conceptual model as well as the conceptualmathematical representations of these factors. With this information now stored in a content-management system integrated with the wiki environment, it provides an effective (and auditable) means to document the completeness of the conceptual model(s) and to identify the differences between alternate conceptual and conceptual-mathematical models.