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# RepoTREND: Software Tools for Robust Safety Analysis of Radioactive Waste Repositories

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RepoTREND [1], [2] is a novel simulator that has been designed to emulate the processes that occur within a radioactive waste repository in a variety of geological formations. It provides robust functionality to simulate the release and migration of contaminants from the near-field through the geosphere to the biosphere, while estimating their radiological impact on human health and the environment.

Designed with modularity in mind, RepoTREND consists of computational modules tailored to simulate the processes within each subsystem of a repository. The inherent heterogeneity of typical repository models poses significant challenges. In addition to fundamental processes such as two-phase contaminant transport, numerous specific effects (such as container corrosion or rock convergence) have to be considered in the simulation.

The structure of RepoTREND has been designed to meet a number of challenges. These include the flexible selection of models for different regions, the seamless combination of models during simulations and the easy integration of new models and effects. The RepoTREND code is a framework for the solution of a general nonlinear system of equations. Different physics are implemented as models in library form.

Each model is defined by specific equations of state and routines for handling relevant effects, organised in libraries of equations and effects. This structure simplifies the integration of new equations and effects, and allows different models to be assigned to different grid blocks. The coupling of physical models is managed implicitly. This facilitates the solution of linear couplings between variables across grid blocks within the same matrix system.

This conceptual approach ensures ease of implementation for new effects. It also maintains flexibility, transparency and reusability as the code is extended and refined.

References:
[1] Reiche, T.: RepoTREND Das Programmpaket zur integrierten Langzeit-sicherheitsanalyse von Endlagersystemen, GRS-413
[2] https://www.grs.de/en/news/projects/repotrend-repository-safety-analysis

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