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RepoTREND –A Program Package for Safety Analysis of a Final Repository for Radioactive Waste

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RepoTREND ([1],[2]) is a new simulator designed to model the processes in a final repository for radioactive waste in different geological formations. RepoTREND provides functionalities for simulating the release of contaminants and their migration through the near-field and far-field to the biosphere, including the estimation of the radiological consequences for a human and the environment. RepoTREND is modularly designed and provides computational modules for the simulation of the processes in each subsystem of a final repository.

For a typical repository model the model area is extremely heterogeneous. During a simulation of the processes in a repository for radioactive waste, numerous different effects have to be considered additionally to the basic process (two phase contaminant transport). Various physical models that use different equations and variables have to be implemented. Specific challenges in developing the structure of a simulator program are to enable a flexible choice of models for different regions of the modeled area, their combination during a simulation and an easy way to extend the program by new models and effects. The program code of RepoTREND is designed as a framework for solving a general nonlinear equation set. Different physics are realized as models in a library form.

Therefore, a model is defined by certain equation(s) of state and certain routines for taking account of the relevant effects, organized as a library of equations and a library of effects. This code structure makes it easy to incorporate new equations and effects.

Different models can be assigned to different grid blocks. Any grid block is defined by its own set of equations. The coupling of physical models is described in implicit manner: directly solve the linear couplings between variables by including all equations (block rows prepared for any grid block) in the same matrix system.

This concept ensures:

- the implementation of new effects in an easy way according to the predefined pattern,
- flexibility, transparency and reusability in extending and developing the program code.

Participation

In-Person

References

- [1] Reiche, T. RepoTREND - Das Programmpaket zur integrierten Langzeitsicherheitsanalyse von Endlager-systemen, Report GRS-413, GRS Braunschweig, (2016) (<https://www.grs.de/publikation/grs-413>)
- [2] Homepage RepoTREND: <https://www.grs.de/en/research-development/waste-management-repotrend>

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