

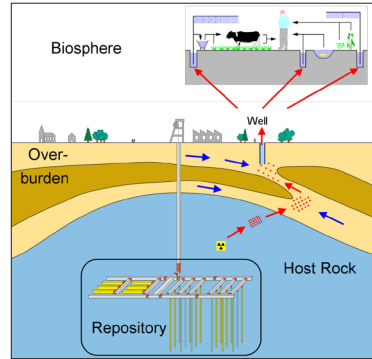
Investigation of Modern Methods of Probabilistic Sensitivity Analysis of Final Repository Performance Assessment Models

Dirk-Alexander Becker and Sabine M. Spiessl

The problem

Performance Assessment (PA) models for final repository systems include many coupled effects and can show non-linear, non-monotonic or even non-continuous behaviour and typically produce a wide and tailed, sometimes split output distribution.

- Low R^2 , even for rank-transformed output
 - Correlation-/regression-based SA not reliable
- Total variance dominated by only a few values
 - Low robustness of variance-based SA
- SA results often hard to understand or interpret



Goals of the project

- Applying SA methods to realistic repository PA models
- Identification of specific problems
- Assessment of suitability of different methods
- Appropriate adaptation of SA methods
- Providing guidance for SA in repository performance assessment

Three test models

- Repository for High-Level Waste in a clay formation
- Repository for High-Level Waste in a salt formation
- Repository for Low- and Intermediate-Level Waste in an abandoned salt mine

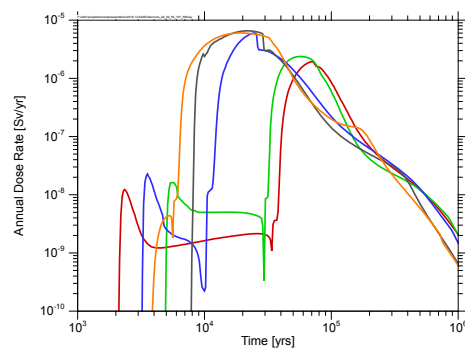
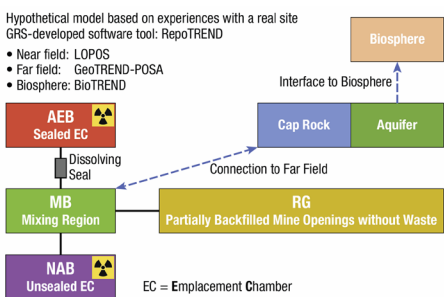
Investigations

- Robustness of time-dependent SA
- Influence of sampling schemes
- Comparison of different SA methods
- Handling of conspicuous output distributions
- Handling of parameter dependencies
- Metamodelling
- Transformation of model output

Methods considered

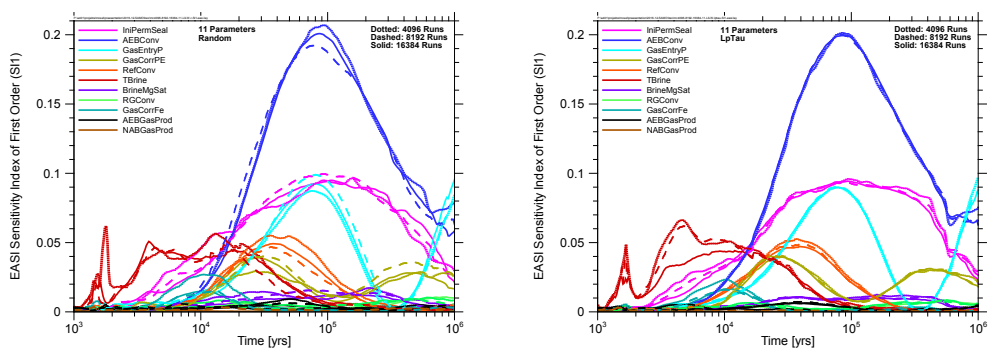
- Graphical methods
 - CSM
- Correlation-/regression-based methods
 - SRC, SRRC
- Variance-based methods
 - (E)FAST, RBD, Sobol
 - EASI
 - SDP
- Non-parametric methods
 - Smirnov-test

LILW model:

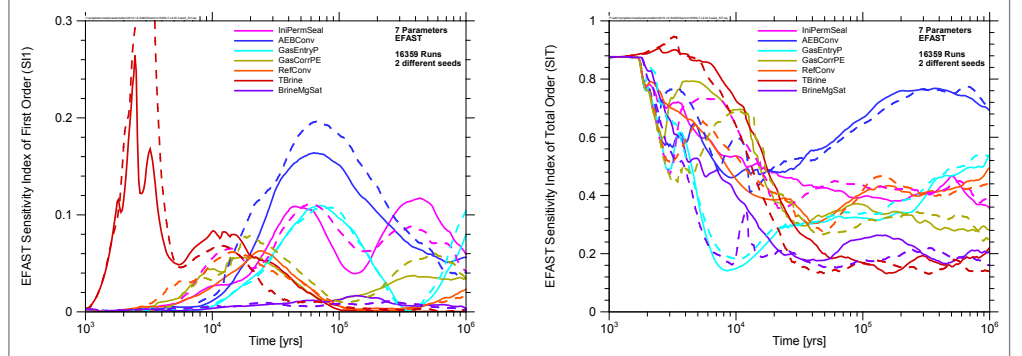


Some results

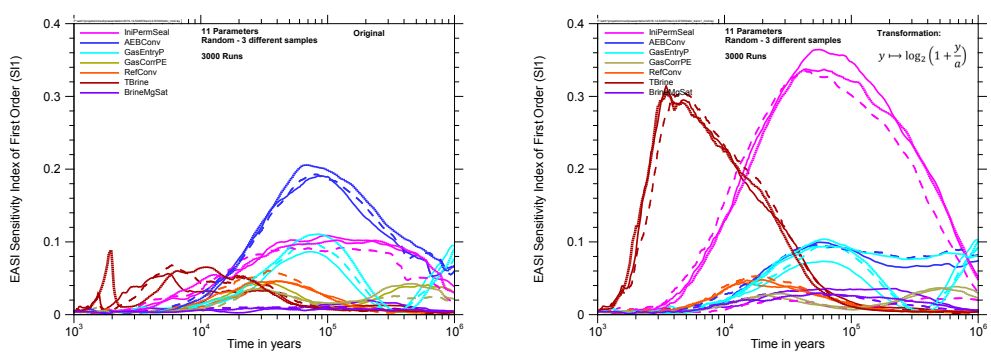
Sampling: most robust results with quasi-random scheme (LpTau)



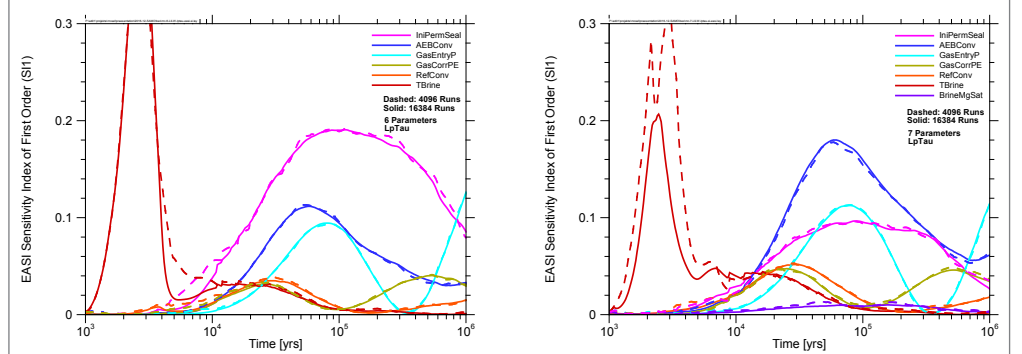
EFAST: yields total indices, but low robustness for nonlinear system



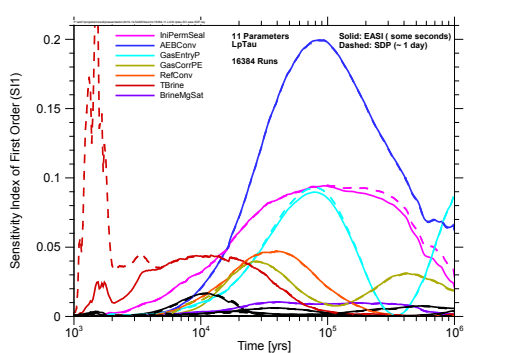
Model output transformation: increase of significance and uniqueness



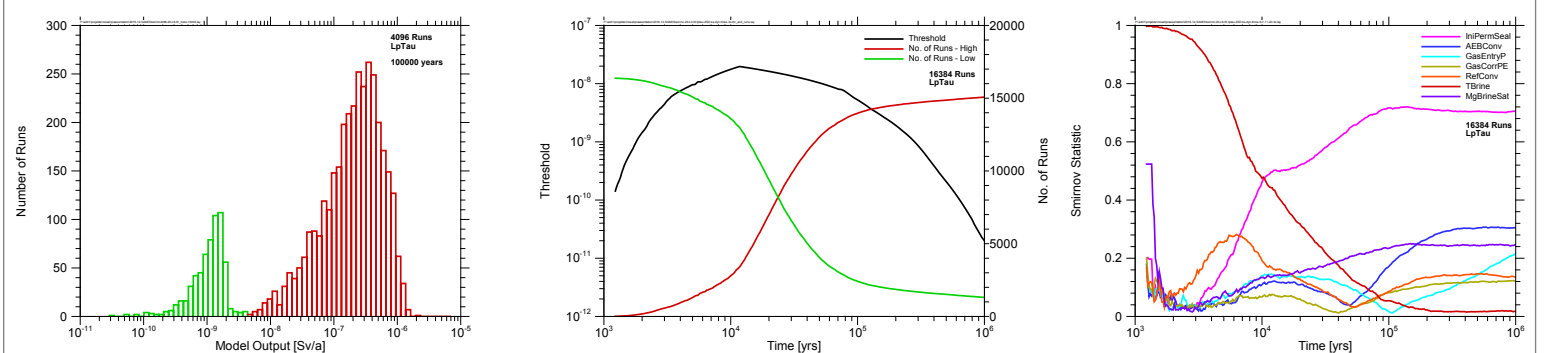
Influence of "hidden" parameter: hardly seen in sensitivity analysis



1st-order sensitivity analysis: EASI vs. SDP



Handling of two-split output: Kolmogorov-Smirnov-test with dynamic threshold



Acknowledgements: Funded by German Federal Ministry of Economic Affairs and Energy (BMWi) under sign 02E10941.