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SEMINAR OF NUMERICAL ANALYSIS

➤ **TUESDAY 17 OCTOBER 2017 - ROOM GR A3 32 - 16:15**

Dr Per PETTERSSON (University of Brgen, NOR) will present a seminar entitled:

**«Data-driven uncertainty quantification for transport problems
in structured porous media»**

Abstract:

Numerical simulation of transport in subsurface porous media is prone to uncertainty due to lack of reliable data, model error, and infeasibility of exact mathematical representation. This pertains to a range of applications, covering CO₂ storage to reduce greenhouse gas emission, optimization of the production of an oil field, and energy production in geothermal flow. Efficient uncertainty quantification for these transport problems is challenging, mainly due to multiple sources of uncertainty and non-smooth dependence of quantities of interest on input parameters.

A challenging problem in flow and transport simulations arises in reservoirs that contain channels or other features where the permeability varies discontinuously between channels and surrounding matrix. Traditional two-point statistics methods like Karhunen-Loeve expansions perform poorly in representing these features, but multiple-point statistics methods can be used to represent channels within a stochastic framework. In this work we use a kernel transformation to create an efficient stochastic parameterization of heterogeneous permeability fields, honoring multiple-point statistics.

We then perform forward uncertainty quantification for transport problems using wavelets based on data, combined with stochastic model reduction using analysis of variance (ANOVA) decomposition. The proposed methodology is tested on a problem setup that is representative for reservoirs employed in off-shore CO₂ storage outside the west coast of Norway.

Lausanne, 8 September 2017/FN/rb