Acceptable solutions to uncertain subsurface flow equations:  
Algebraic Dynamic Multilevel Multiscale (ADM) Method

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Abstract:

The increasing demand for accurate and efficient simulation of flow in subsurface formations motivates the development of advanced numerical methods. The non-linear, heterogeneous, uncertain, dynamic and coupled nature of the mathematical formulations --describing flow and transport in these formations-- make the development of these advanced methods quite challenging, yet possible if a multiscale methodology is followed. The multiscale methodology allows for a physics-algebraic-based dynamic multilevel description of the highly-detailed discrete equations; at the same time, allows for crossing up and down between any resolutions, and also systematic error reduction to any desired level (compared with the finest-scale reference solution). In this talk, I will discuss how such a dynamic multilevel multiscale formulation can be formulated, efficiently being implemented and benchmarked, and also extended to include complex fluid and rock physics. Current and future challenges in this research field will be also addressed, with the aim to initiate synergies between researchers at University of Swansea and Delft Advanced Reservoir Simulation (DARSim) research group at TU Delft. The talk is aimed to be understandable for graduate students familiar with numerical simulation.

References:
