# Adaptive Modeling, Simulation and Optimization of Complex Water and Gas Flow in Supply Networks

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## ABSTRACT

In this talk, I will summarize our recent activities in the field of a posteriori error estimation and model adaptation for the numerical simulation and optimization of transport processes through water and gas supply networks. Those networks mainly consist of pipes as well as other components like valves, tanks and compressor/pumping stations. Gas or water, which is fed in by multiple suppliers, has to be routed through the network to meet the consumers' demands. At the same time, the operational costs of the network like energy consumption of compressor and pumping stations or contractual penalties have to be minimized. So the flow through networked pipelines is of particular interest not only in the engineering community but also for the network operators in the real market.

The concept of goal-oriented adaptivity is used to control discretization errors and a hierarchy of models during the simulation and optimization [1, 2, 3]. Beside refinement in space and variable time stepping, we want to use simplified models in regions with low activity, while sophisticated models are used in regions, where the dynamical behavior has to be resolved in detail. We introduce error estimators for the discretization and the model errors using adjoint techniques and present a strategy to automatically balance those errors with respect to a given tolerance. I will show numerical experiments for the simulation algorithm as well as the applicability in an optimization framework for real-life applications.

## REFERENCES

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