

Parallelization in time for inverse problems

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Algorithms for the numerical solution of optimization problems with time-dependent PDEs are computationally extremely demanding, as they require multiple PDE solves during the iterative optimization process. To reduce time-to-solution and enable realistic applications, efficient discretization and advanced parallelization strategies are essential, including parallel-in-time (PinT) methods.

In this talk we will investigate how time-parallel time-integration methods like Parareal, ParaExp, and PFASST, can be leveraged for computationally challenging inverse problems. We investigate performance for two applications: (i) bathymetry reconstruction for the shallow water equations, and (ii) estimation of the motion of contrast agents from 3d dynamic ultrasound measurements.