

*Domain decomposition and parabolic problems – a time integrator approach*

**Eskil Hansen** (Lund University), Monika Eisenmann

Domain decomposition based schemes allow the usage of parallel and distributed hardware, making them well-suited for discretization of time dependent PDEs in general and parabolic equations in particular. In this talk, we will review the somewhat overlooked possibility of introducing the domain decomposition approach directly into the temporal discretization [2]. We will outline a convergence analysis [1] for these domain decomposition based time integrators for two standard families of nonlinear parabolic equations, namely, the parabolic  $p$ -Laplace and the porous medium type equations.

The analysis is conducted by first casting the domain decomposition procedure into a new variational framework. The time integration of a nonlinear parabolic equation can then be interpreted as an operator splitting scheme applied to an abstract evolution equation governed by a maximal dissipative vector field. By utilizing this abstract setting, we prove temporal convergence for the most common choices of domain decomposition based integrators. We conclude with a few numerical experiments.

**References**

- 1) M. Eisenmann and E. Hansen, *Convergence analysis of domain decomposition based time integrators for degenerate parabolic equations*, arXiv:1708.01479.
- 2) T.P. Mathew, P.L. Polyakov, G. Russo and J. Wang, *Domain decomposition operator splittings for the solution of parabolic equations*, SIAM J. Sci. Comput. 19 (1998) 912–932.