

## **Variational methods for coupled Navier-Stokes problems**

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When proving existence of weak solutions to problems involving dissipative fluid-dynamics, the usual method of proof involves a Galerkin-approximation, commonly in conjunction with a fixed-point argument. However when the fluid equations are additionally coupled with other systems/boundary conditions in a highly non-linear, non-convex way, such an approximation is generally only possible by heavily exploiting the specifics of the problem. In contrast to this, we present a two-level variational time-stepping scheme that allows us to approximate weak solutions to quite a general class of problems without generating error-terms in the approximation.

We illustrate this method at the example of bulk fluid-structure interaction problems, both in the case of compressible and incompressible fluids. This is based on joint works with B.Benešová, D.Breit and S.Schwarzacher.