Efficient solution techniques for nonstationary flow problems exploiting space-time concurrency

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ABSTRACT

The aim of this minisymposium is to discuss and to share recent ideas on flow solvers for nonstationary fluids that utilize the time horizon for improved parallelization and/or scaling capabilities. Besides special meshing and discretization techniques in space and time for fully nonstationary problems, the presented approaches shall also address new developments of parallel-in-time or simultaneous-in-time solution algorithms for the efficient treatment of large-scale problems on modern High Performance Computing platforms. Corresponding hardware architectures might be in the peta- or exascale range and include massively parallel, heterogeneous architectures. Since additionally special accelerator hardware like GPUs, TPUs, and FPGAs has to be taken into account, the design of tailor-made numerical algorithms exploiting involved reduced arithmetic precision is a further challenging task from a mathematical and algorithmic point of view. The minisymposium will concentrate on corresponding methods and their foundations, such as advanced discretization techniques and efficient parallel solution algorithms, and will highlight the interplay of these aspects with computational and algorithmic tools and particularly their realization in software and application onto (prototypical) “real life” CFD applications.

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