



Vortrag



Physically Consistent Dynamic and Hybrid LES Methods

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We may expect that hybrid dynamic large eddy simulation (LES) methods, which combine LES with Reynolds-averaged Navier-Stokes (RANS) methods, will play a dominant role in future simulations of realistic turbulent flows. Compared to RANS methods, for example, the significant advantage of hybrid RANS-LES is given by the capability to validate and improve simulation results obtained on coarse grids. However, many dynamic and hybrid LES methods suffer from inconsistencies that may cause numerical instability and the well known gray area problem of hybrid RANS-LES. The talk describes how these problems can be addressed. In particular, novel realizable dynamic unified RANS-LES, which are derived from stochastic analysis and honor realizability constraints, are presented. The first part of the talk explains the methodological basis of the approach applied. The second part presents applications to turbulent flow simulations with special emphasis on periodic hill flow simulations including separation, involving comparisons with pure dynamic LES and other hybrid RANS-LES methods. The third part of the talk discusses the relationship of realizability and numerical stability of dynamic LES. The status of these methods and remaining challenges are finally summarized.

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