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TURBULENCE MODELING APPROACH FOR EXACTLY MASS-CONSERVING FINITE ELEMENT METHODS

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New discretization methods provide many physical and structure-preserving properties, which may be advantageous for resolving computationally intensive incompressible turbulent structures. Therefore, several different modeling concepts for (highly) under-resolved turbulence problems have been performed with an exactly divergence-free discontinuous Galerkin method. The difficulty of Large-Eddy Simulation (LES) is the correct contribution of the subscale turbulent motions to the resolved larger structures. In general, such modern discretization techniques successfully compensate the absence of small-scale motions without the need of an explicit turbulence model. So called implicit LES shows convincing results in under-resolved scenarios. However, for more complex high Reynolds number flows, an additional variational multiscale method (VMS) can be of advantage and increases the accuracy of the solution. Furthermore, in the concept of discontinuous finite element methods, a completely new wall-model approach has been developed and tested for wall-bounded turbulent flow problems.