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ON THE DEVELOPMENT OF A DISCONTINUOUS GALERKIN SOLVER FOR THE COMPOSITE RANS-(I)LES

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In recent years, there has been a growing interest in the development of composite RANS-LES models for the simulation of high Reynolds number turbulent flows. Composite approaches aim to overcome the limitations of RANS when applied to separated flows by confining their use close to the wall and relying on a scale-resolving LES-like model in the rest of the domain. This class of models also allows to dramatically reduce the computational cost of simulations when compared to DNS and LES, which are today too demanding for an industrial routinely use. In this contribution, the progress in the implementation and assessment of hybrid approaches in an implicit high-order discontinuous Galerkin (DG) solver will be reported. As underlying model the Extra-large Eddy Simulation (X-LES) of Kok et al. is considered [1], where the k-ω turbulence model is hybridized with a k-equation-based LES subgrid-scale model. To mitigate the well-known limitations of DES-like approaches, the shielding function proposed in [2, 3] has been added to X-LES. An alternative formulation based on the hybridization of k-ω with an Implicit-LES (no-model) approach will be also considered. In this case, the scale-resolving part of the model will take advantage of the good dissipation and dispersion properties of the DG method. The performance of the hybrid RANS-(I)LES approaches will be assessed by computing canonical test-cases, *e.g.*, channel flow, backward facing step, and by presenting preliminary results for an adverse pressure gradient flow problem part of the test case suite of the HORIZON2020 HiFi-TURB project (GA 814837).

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