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Evaluation of a general hybrid RANS/LES model in smooth wall reattachment SIGFRIED HAERING, The University of Texas at Austin, ROBERT MOSER, Institute for Computational Engineering and Sciences, The University of Texas at Austin — Hybrid RANS/LES modeling approaches often exhibit deficiencies when used for common problems of engineering interest containing flow features such as unsteady smooth-wall separation and reattachment with non-trivial domains and discretization. Often, problem specific modifications and tuning must be employed rendering these models ineffective as generally predictive tools. A new broadly applicable hybrid RANS/LES modeling approach that is being developed to specifically address challenges associated with complex geometries and flows is presented. In general, the approach seeks to a balance between theoretical and actual modeled turbulent kinetic energy provided information from the underlying turbulence model, the resolved turbulence, and the available resolution. Anisotropy in the grid and resolved field are directly integrated into this balance. Here, we examine model performance with the case of a wall-mounted smooth hump of Greenblatt et.al. [1]. Excellent agreement with experimental results is attained while significantly outperforming delayed detached eddy simulation (DDES) for nearly the same computational expense and without any problem-specific modifications.

[1] D. Greenblatt, K. B. et. al., "Experimental investigation of separation control part 1: Baseline and steady suction," AIAA Journal, vol. 44, no. 12, pp. 2820–2830, 2006.

sigfried haering
The University of Texas at Austin

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