

Abstract Submitted
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A dynamic wall model constrained by external Reynolds stress¹

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— We propose a new approach of incorporating RANS constraints into SGS models, and discuss the corresponding dynamic wall model. Unlike conventional approaches, given Reynolds stresses are not imposed as the solution, but are used as constraints on the mean SGS stress so that the given Reynolds stress closely matches the computed stress only in the mean sense. Also, since LES in general outperforms RANS even at coarse resolution except very near the wall, RANS constraints are limited to the points where the LES solution is expected to be erroneous. We use the Germano–identity error as an indicator of LES quality so that the RANS constraints are activated only where the Germano–identity error exceeds a certain bound. The proposed model is applied to LES of turbulent channel flow at various Reynolds numbers and grid resolutions to obtain significant improvement over the dynamic Smagorinsky model, especially at coarse resolutions.

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