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A-posteriori tests of one-equation subgrid models for the LES of rotating turbulence HAO LU, CHRISTOPHER RUTLAND, Department of Mechanical Engineering, University of Wisconsin - Madison, LESLIE SMITH, Department of Mathematics, University of Wisconsin - Madison — In rotating turbulence, a successful subgrid-scale (SGS) model should be able to capture partial transfer of energy from small to large scales and the formation of cyclonic vortical columns, both of which are observed in experiments and direct numerical simulation (DNS). The challenge is to simultaneously reflect the (anisotropic) 3D nature of the small scales and the primarily 2D nature of larger scales. To this end, we develop two consistent one-equation models using a dynamic procedure and an equation for the subgrid-scale kinetic energy. These models satisfy the constraint of material frame indifference and they do not assume that the principal axes of the strain rate tensor are aligned with those of the SGS tensor. At the a-posteriori test level, we assess various subgrid models using three flow configurations: (i) homogeneous decaying turbulence subjected to uniform background rotation; (ii) rotating turbulence forced at large scales; (iii) rotating turbulence forced at small scales. Compared to other existing models, the new models are better able to capture essential features of rotational flows.

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