Abstract Submitted
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Modeling the effects of system rotation on the turbulent heat fluxes BASSAM YOUNIS, University of California - Davis — A new model is proposed for accounting for the effects of system rotation on the turbulent scalar fluxes. The model is based on extension to rotating frames of an explicit, algebraic model derived using tensor representation theory. The outcome is a rational model which allows for the turbulent scalar fluxes to depend on the details of the turbulence field and on the gradients of both the mean velocity and temperature. Such dependence, which is absent from conventional gradient-transport models, is required by the exact equations governing the transport of the heat fluxes. An a priori assessment of the model is performed using results from Direct Numerical Simulations of heated flows in channels rotated about their streamwise, spanwise and wall-normal axes. The results are generally in close agreement with the DNS but some important differences remain. The reasons for these are discussed. Further assessment is carried out by actual computations of heated flow in a channel rotated about a spanwise axis with suction through one wall and blowing through the opposite wall. Comparisons are made with experimental data and with results from a complete scalar-flux transport model. Conclusions are drawn from these results, and from a variety of other flows with system rotation, streamline curvature and swirl.

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