A Subgrid scale model based on explicitly filtered velocity fluctuation

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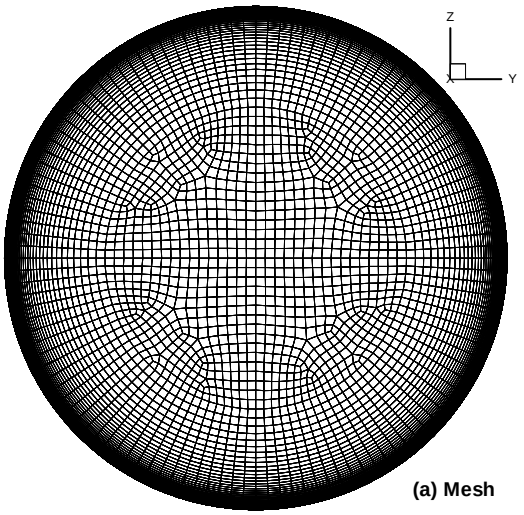
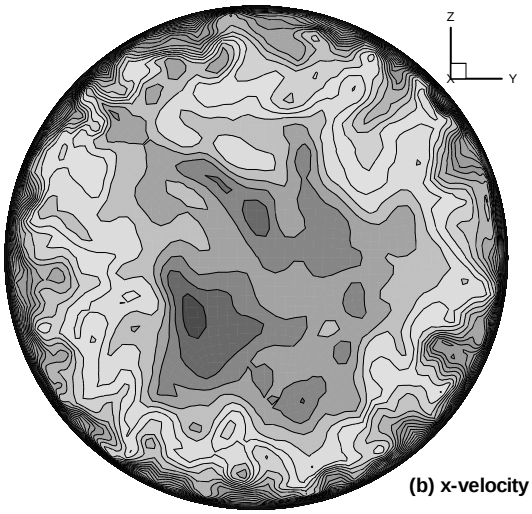
A large eddy simulation with explicit filters on unstructured mesh is presented. The flow filed is semi-implicitly marched by a fractional step method. Spatial discretization of the solver is designed to guarantee the second order accuracy. An isotropic explicit filter is adopted for measuring the level of subgrid scale velocity fluctuation. The filter is linearity-preserving and has second order commutation error. The developed subgrid scale model is basically eddy viscosity model which depends on the explicitly filtered fields and needs no additional ad hoc wall treatment, such as van Driest damping function. For the validation, the flows in a channel and a pipe are calculated and compared to experimental data and numerical results in the literature.



(a) Mesh



(b) x-velocity