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PROCEEDINGS

Towards High Reynolds Number Flows by a High-Order SPH Method

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ABSTRACT

DNS simulations on incompressible flows with high Reynolds number using meshfree methods remain an enduring challenge to be addressed. In the present work, we attempt to use a high-order SPH scheme (TENO-SPH) to make DNS simulations on high Reynolds number flows. To investigate this, several spatial reconstructions are applied under the Riemann-ALE-SPH framework, and their performances are compared. Particularly, the accuracy of SPH is significantly enhanced by WENO and TENO reconstructions. For free surface flows, we implement a Lagrangian TENO-SPH to reproduce these flows at different Reynolds numbers. More importantly, to make DNS simulations, the real kinematic viscosity of water of 8.9×10^{-7} m^2s^{-1} is considered in several cases. For confined flows, we also develop an Eulerian TENO-SPH, and especially, a DNS simulation on a high Reynolds number flow (Re=10000) around an inclined NACA-0010 foil is compared with *k-ε* and *k-ω-SST* turbulence models, providing an alternative particle perspective on this problem.

KEYWORDS

Incompressible flows; free surface flows; DNS simulations; SPH; high-order

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