A porous media model for simulating fixed nets by immersed boundary method

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ABSTRACT

This study proposes a porous media model combining the immersed boundary method for simulating fixed nets. The model solves the flow field around thin and large porosity structures with complex geometries. The presence of nets is considered by adding a source term to the Navier-Stokes equation. The immersed boundary method defines the porous media region, and the scalar field is constructed to correct the porous media coefficients at the boundary. Compared with previous methods, this model reduces the mesh refinement problem for complex structures, ensures solution accuracy, and improves computational efficiency. This study describes the model in detail and validates it with published experiments. Also, the effects of different netting solidity, attack angle, inflow velocities, and the number of nets on the flow attenuation in wake and the forces on the nets are considered. The study results show that the present model's numerical results agree with the published experimental data.

Keywords: net, immersed boundary method, CFD, flow field