

Application of an immersed boundary method to turbulent flows along porous beds.

Wim-Paul Breugem¹

¹ Delft University of Technology, Laboratory for Aero and Hydrodynamics
Leeghwaterstraat 21, 2628 CA Delft, The Netherlands
w.p.breugem@wbmt.tudelft.nl

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ABSTRACT

In recent studies [1,2] a second-order accurate and highly efficient immersed boundary method was developed for simulating flows along rectangular objects. In this method a rectangular object is placed on a staggered Cartesian grid such that its boundary coincides with grid points for the boundary–normal velocity component. By imposing forces at the grid points nearest to and on the boundary, the no–slip condition for the boundary–parallel velocity components is satisfied exactly, while the no–penetration condition for the boundary–normal velocity component is satisfied to a very good approximation. It is shown both theoretically and numerically that the effect of this immersed boundary method on the numerical stability is negligible. The method was successfully applied in a simulation of turbulent flow along a rigid porous bed composed of 5400 cubes [2]. For the future it is planned to explore the use of the immersed boundary method for bed erosion problems in which by the action of hydrodynamic forces the bed particles are allowed to move freely across the flow domain.

REFERENCES

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