

# THREE-DIMENSIONAL HYBRID VORTEX-PENALIZATION METHOD WITH APPLICATION TO PASSIVE FLOW CONTROL

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**ABSTRACT.** In this work, a hybrid particle-penalization technique is proposed to achieve accurate and efficient computations of 3D incompressible flows past bluff bodies. This immersed boundary approach indeed maintains the efficiency and the robustness of vortex methods and allows to easily model complex media, like solid-fluid-porous ones, without prescribing any boundary condition [1]. The method is applied to implement porous coatings ([2]) on a hemisphere in order to passively control the flow dynamics.

**Keywords:** Vortex methods, Brinkman penalization method, remeshing, passive flow control, porous media.

**Mathematics Subject Classifications (2010):** 76D55, 65N85, 65N75.

## REFERENCES

- [1] C. Mimeau, F. Gallizio, G.-H. Cottet, I. Mortazavi. Vortex penalization method for bluff body flows. *SIAM International Journal for Numerical Methods in Fluids*, 79: 55-83, 2015.
- [2] C. Mimeau, I. Mortazavi, G.-H. Cottet. Passive flow control around a semi-circular cylinder using porous coatings. *International Journal of Flow Control*, 6: 43-60, 2014.

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