Simulation of immersed moving porous bodies using a coupled Immersed Boundary - Lattice Boltzmann method. Application to the control of flow separation around bluff bodies. MARIANNA PEPONA, JULIEN FAVIER, Aix Marseille University, M2P2 UMR7340 — A numerical framework to simulate fluid flows in interaction with moving porous bluff bodies of complex geometry is proposed in this work. It is based on the Generalized Lattice Boltzmann method, which models the flow in the Representative Elementary Volume scale including the porous effects (porosity and the Brinkman-Forchheimer extended Darcy force model), coupled to the Immersed Boundary method to handle complex geometries and moving bodies. The coupling between both methods will be presented and the numerical results will be discussed in both porous and rigid configurations. The effect of the structure permeability on the boundary layer separation around a bluff body will be studied in the case of a static body and an oscillating one in cross-flow. A special focus will be placed on the manipulation of the vortex shedding frequency and lock-in phenomenon by a porous actuator.

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