A numerical study of a vortex ring impacting a permeable wall
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National University of Singapore — We numerically simulate a vortex ring impact-
ing a permeable wall by using a lattice Boltzmann method. The study is on vortex
ring/permeable wall interaction and to address some of the unanswered questions,
including core vorticity, kinetic energy and enstrophy of the flow field. The simula-
tion was conducted for a range of parameters such as wall open-area ratios, structure
dimensions, wall-thicknesses (and Reynolds numbers. Results show that with in-
creasing ϕ or Re_Γ enhances vorticity transport across the permeable wall, leading
to the formation of a regenerated vortex ring, whilst increasing H impedes vorticity
transportation and the formation of regenerated vortex ring. Moreover, higher A
promotes vortex shedding from the wire grids and generates fine-scale structures in
the wake.

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