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A numerical approach for simulating flow through thin porous media

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A numerical approach for simulating flow through thin porous media

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I. Significance and novelty of this paper

The paper provides a numerical model for fluid interaction with the thin porous barriers, which is implemented in the frame work of the smoothed particle hydrodynamics (SPH) method for the first time. This latter one is the major novelty of our work. The model we develop and present in this manuscript is different from previous models of wave interactions with thin porous media. It is not limited to potential flows, and therefore has no problem with easily handling complex plate geometry and can be used for any type of waves including regular, irregular and even breaking waves. Here we model the perforated plate as a thin continuous media which interacts with the fluid. As a result, we present a new formulation of SPH method which is computationally efficient and accurate for a wide range of fluid dynamic problems. In particular we use our underlying model for fluid interaction with porous structures that can be used as permeable breakwaters to damp the wave energy and permit the water exchange for environmental purposes. Moreover, the developed model is proposing a new form of permeable boundaries for SPH method, which to the best of our knowledge has not previously appeared.