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Numerical simulation of Shallow water wave propagation around arrays of emerged bodies AMIR ZAINALI, ROBERT WEISS, Virginia Tech — Flow around the fixed groups of localized bodies are often encountered in the context of environmental fluid mechanics. Common examples include surface wave propagation through vegetation and flow around the offshore and onshore structures. In the literature, shallow water equations (SWE) are frequently used to model environmental flows. Due to conservative and shock-capturing properties they provide us with good approximations of the wave breaking and runup. In addition, various studies have shown that the inclusion of dispersive effects before the wave breakup can be of a crucial importance. To model the interaction of the wave with the emerged bodies, the exact geometry of the emerged bodies can be considered in the model. However, this approach can be computationally very expensive, particularly if we want to model the interaction of arrays of bodies with complicated geometries. Alternatively, an immersed boundary method can be used. This approach provides us with a significant improvement in numerical efficiency with a negligible numerical accuracy loss. In this study, we use the fully nonlinear and weakly dispersive GreenNaghdi model, coupled with Brinkman penalization technique to simulate the interaction between fluid flow and emerged bodies.

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