This paper describes the implementation of the Boussinesq-type model and extends its application to the tsunami wave runup on the clustered islands (multiple adjacent conical islands), in turn, an extensively validated two-dimensional Boussinesq-type model is employed to examine the interaction between a propagating solitary wave and multiple idealised conical islands, with particular emphasis on a combination effect of two adjustable parameters for spacing interval/diameter ratio between the adjacent conical islands, $S/D$, and the rotating angle of the structural configuration, $\theta$ on maximum soliton runup heights. An extensive parameter study concerning the combination effect of altering $\theta$ and $S/D$ on the maximum soliton runup with the multi-conical islands is subsequently carried out and the distributions of the maximum runup heights on each conical island are obtained and compared for the twin-island cases. The worst case study is performed for each case in respect of the enhancement in the maximum wave runup heights by the multi-conical islands. It is found that the nonlinear wave diffraction, reflection and refraction play a significant role in varying the maximum soliton runup heights on multi-conical islands. The comparatively large maximum soliton runups are generally predicted for the merged and bottom mounted clustered-islands. Furthermore, the joints of the clustered-merged islands are demonstrated to suffer the most of the tsunami wave attack. The conical islands that position in the shadow regions behind the surrounding islands are found to withstand relatively less extreme wave impact.

Although, these numerical investigations are considerable simplifications of the multi conical islands, they give a critical insight into certain important hydrodynamic characteristics of the interaction between an extreme wave event and a group of clustered conical islands, and thus providing a useful engineering guidance for extreme wave mitigation and coastal development.

**KEY WORDS:** Tsunami wave; clustered islands; Boussinesq-type model; runup.