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# Three-dimensional simulation of extreme runup heights during the 2004 Indonesian and 2011 Japanese tsunamis

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A post-tsunami runup survey for the 2004 Sumatra–Andaman earthquake showed that the highest runup which was recorded at Lhok Nga (West Banda Aceh, Sumatra). A reported maximum tsunami height of 35 m and maximum runup height of up to 51 m occurred near the Lhok Nga Twin Peaks (Labuhan and Ritieng). The 2011 earthquake triggered extremely destructive tsunami waves up to 37.9 m in height at the tiny fishery port Koborinai located north of Miyako City in the Iwate Prefecture. The extremely high runups of tsunami waves in both cases were successfully reproduced by numerical simulation through stepwise refinement of the spatial scale using multi-nesting and consideration of the vertical acceleration of flow along steep slopes using a CFD model (FLOW3D) to solve the Reynolds-averaged Navier–Stokes (RANS) equations. The velocity field was also computed, and the simulation results show that the water flow that climbed the coast possessed a strong vertical velocity component. This approach made it possible to reproduce also observed overflow through a saddleback between the twin peaks during the 2004 Indonesian tsunami.