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Three-dimensional simulation of tsunami run-up around conical island

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At the circular Babi Island in the Flores tsunami (1992) and pear shaped island in the Okushiri event (1993), unexpectedly large tsunami runup heights in the lee of conic islands were observed. The flume and basin physical model studies were conducted in the Coastal Hydraulic Laboratory, Engineering Research and Development Center, U.S. Army Corps of Engineers to provide a better understanding of the physical phenomena and verify numerical models used in predicting tsunami wave runup on beaches, islands, and vertical walls. Reasonably accurate comparison of run-up height of solitary eaves on a circular island has been obtained between laboratory experimental results and two-dimensional computation model results. In this study we apply three-dimensional RANS model to simulate wave run-up on conical island. In the runup computation we obtain that 3D calculations are in very good comparison with laboratory and 2D numerical results. A close examination of the three-dimensional velocity distribution around conical island to compare with depth-integrated model is performed. It is shown that the velocity distribution along the vertical coordinate is not uniform: and velocity field is weaker in bottom layer and higher - on sea surface. The maximum difference (about 40%) appears at the time when solitary wave reached the circular island.