Run-up Simulation Enables Tsunami Research

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Topic on run-up is often found in hydrodynamics or coastal engineering literature. Related to tsunami, this phenomenon is difficult to model especially if interacting with the variables it passes through such as coast profile and mitigation system.

Doctoral student Benazir has developed a simulation method of tsunami run-up and applications in several tsunami cases in Indonesia which he presented during his doctoral promotion at Faculty of Engineering UGM on Monday (30/7).

His research is classified in three schemes. First scheme: process of wave evolution from source of generation, propagation in constant depth and transaction, and run-up in coast with uniform slopes. Second scheme is study of tsunami run-up interaction to model of hypothetical vegetation as mitigation system. Third scheme is development and implementation of nested grid for tsunami case study in Pacitan Bay, East Java.

He concluded that tsunami generation with Dam Break method would produce surge wave that is breaking in shallow waters and lands so it resembles the physical form of tsunami when reaching and arriving on the coast.

Tsunami run-up comparison based on numerical model results to the physical model result, he said, does not accurately correspond with deviations reaching 9,64-20,61% for all data with bigger numerical model results than physical model.

“This is affected by numerical model computation that is constructed based on the theory that shallow waters waves have inabilities in adjusting to the vertical convection problems, breaking waves, and aspects related to turbulence,” he added.

Even so, important characteristics of tsunami simulation such as propagation, run-off, and inundation can be resolved well with additional aid of equations. He said development and implementation of Nested Grip did support tsunami modelling with grid measure variations or various data resolution in one computation. Run-up processes become more detailed, so mapping of inundation areas is more detailed, too, in the case study of Pacitan tsunami.

He added that modelling result showed that tsunami arrives in coastlines after 24 minutes with wave reaching 6.9 m high. Run-up and length of inundation in study location are not affected only by tsunami scale in the scenario and morphology and condition of topography but also by presence and condition of coastal vegetation in the bay,

“The level of success of coastal forest in reducing the tsunami ranges between 12.98-51.85% and very dependable on the growth condition of each vegetation sector,” he said.

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