The ANUGA Tsunami Inundation Model

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Abstract

The 26 December 2004 tsunami demonstrated to the world the catastrophic consequences that can result from natural hazards. Part of the Australian Government response to this event was the establishment of the Australian Tsunami Warning System (ATWS), and the increased priority given to federally funded research into hazard and risk modelling of tsunami impact. An important outcome of this research has been the development by Geoscience Australia and the Australian National University of the ANUGA hydrodynamic inundation modelling tool to simulate water flow such as that generated by tsunami.

The core of ANUGA is a Python implementation of a finite-volume method for solving the conservative form of the Shallow Water Wave equation. This method allows the study area to be represented by an unstructured mesh with variable resolution to suit the particular problem. The conserved quantities are water level (stage) and horizontal momentum. An important capability of ANUGA is that it can robustly model the process of wetting and drying as water enters and leaves an area. This means that it is suitable for simulating water flow onto a beach or dry land and around structures such as buildings. ANUGA has been successfully validated against physical data from wave tank experiments.

Using this tool, Geoscience Australia has conducted detailed tsunami impact modelling work in selected regions and is embarking on national studies in collaboration with Emergency Management departments from state and territory governments as well as the reinsurance industry. The objectives are to develop national tsunami hazard and risk maps as well as decision support tools for use with early warning and disaster response. The decision support tools will provide emergency managers with response plans, scenarios for capacity testing, community awareness tools, and in particular:

- an improved picture of national tsunami risk to more clearly identify resourcing issues for particular communities and regions;
- scenarios for a wide range of tsunami events for which casualty and infrastructure consequences are predicted and against which emergency management capability can be assessed; and
- “real time” consequence prediction tools for tactical use by emergency managers to obtain assessments of tsunami impact and expected consequences to guide initial resource deployment.