Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05609, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05609
EGU General Assembly 2008

A probabilistic tsunami hazard assessment for Australia, the Indian Ocean and Southwest Pacific

D. Burbidge (1), C. Thomas (1), H. K. Thio (2), R. Mleczko (1)

(1) Geoscience Australia, Canberra, Australia, (2) URS Corp, California, USA (David.Burbidge@ga.gov.au / Phone +61-02-62499761).

The major tsunami disaster in the Indian Ocean in 2004, and the subsequent large events off the south coast of Indonesia and in the Solomon Islands, have raised awareness of the possibility of potentially damaging tsunami in the Australian region. Here we present a probabilistic hazard assessment for countries throughout the region for tsunami generated by subduction zone earthquakes.

To conduct a probabilistic tsunami hazard assessment, one first needs to estimate the likelihood of the tsunami occurring. Here we present new estimates of the likelihood of a major megathrust earthquake on each of the subduction zones in the region. Our method is based on the global rate of occurrence of such events and the rate of convergence and geometry of each particular subduction zone. This allows us to create a synthetic catalogue of possible megathrust earthquakes in the region with associated probabilities for each event.

To calculate the resulting tsunami for each event we create a library of “unit source” tsunami for a set of 100km x 50km unit sources along each subduction zone. For each unit source, we calculate the sea floor deformation by modelling the slip along the unit source as a dislocation in a stratified, linear elastic half-space. This sea floor deformation is then fed into a tsunami propagation model to calculate the wave height off the coast for each unit source. Our propagation model uses a staggered grid, finite different scheme to solve the linear, shallow water wave equations for tsunami propagation. The tsunami from any earthquake in the synthetic catalogue can then be quickly calculated by summing the unit source tsunami from all the unit sources that

fall within the rupture zone of the earthquake. The results of these calculations can then be combined with our estimate of the probability of the earthquake to produce hazard maps showing (for example) the probability of a tsunami exceeding a given height offshore from a given stretch of coastline.

While the method here is only applied to countries around the Indian and SW Pacific Oceans, the technique is general and can be applied to other regions, such as the Mediterranean. To gauge our level of confidence in the hazard assessment, we also conduct tsunami hindcasts of several of the recent events in the region and do tests to look at the sensitivity of the results to uncertainties in the input data and the accuracy of the numerical models.