

# Violent flows: physical modelling of tsunami



Tsunami waves travel across oceans with quite small vertical displacements (0.5 – 2 m) and long wavelengths (5 – 20 Km). When they reach the shallow depths of coastal and nearshore waters, they shoal up dramatically. Physical modelling of correct tsunami processes is important in predicting the impact of flows and forces on the resilience of coastal zone structures and on the risk to local population. However, the movement of tsunami waves in nearshore waters is difficult to re-create in physical models because the very long wavelengths are beyond the capacity of conventional wave paddles.

**H**R Wallingford, working with Dr Tiziana Rossetto at University College London (UCL), has developed a ‘Tsunami Generator’ that can simulate multiple tsunami waves, and can ensure realistic representation of wavelength and initial drawdown. The Tsunami Generator wave flume (see schematic illustration), recreates the arrival of tsunami waves over coastal sea-bed, shore-line and inland inundation.

Several stages of modelling have been carried out by HRW and UCL researchers to validate the facility’s design and its control system. Recent tests by the UCL team then measured wave loadings on representative (model) buildings.

Tsunami wave impacts on structures are being assessed in the physical experiments.



*Schematic of the Tsunami Generator flume*

Loads from these measurements will be used in the structural analysis of newly designed ‘tsunami-proof’ buildings and reinforced concrete moment-resisting frames, with and

without infill walls, are being used quantify tsunami wave effects on structures. They may also, potentially, be used to assess the validity of existing design guidance.

The Violent Flows project is being undertaken by HR Wallingford, Arup and UCL under Dr Tiziana Rossetto’s Earthquake and People Interaction Centre (EPICENTRE) – see <http://www.epicentreonline.com>. The work is funded by EPSRC via its ‘Challenging Engineering’ scheme.

*For further information on the Tsunami Generator please contact Professor William Allsop, Technical Director, Engineering Hydraulics and Structures Group, HR Wallingford (01491 822230; E-mail [nwha@hrwallingford.co.uk](mailto:nwha@hrwallingford.co.uk)).*