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Diversity in Tsunami Forecasts in the Indian Ocean

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The development of the Indian Ocean Tsunami Warning and mitigation System (IOTWS) has occurred rapidly over the past few years and there are now a number of centres that perform tsunami modelling, both for risk assessment and for the provision of forecasts and warnings. The aim of this work is to determine to what extent event-specific tsunami forecasts from different numerical forecast systems differ. This will have implications for the inter-operability of the IOTWS.

Forecasts from eight separate tsunami forecast systems are considered. Eight hypothetical earthquake scenarios within the Indian Ocean and ten output points at a range of depths were defined. Each forecast centre provided, where possible, time series of sea-level elevation for each of the scenarios at each location.

Comparison of the resulting time series shows that the main details of the tsunami forecast, such as arrival times and characteristics of the leading waves are similar. However, there is considerable variability in the value of the maximum amplitude (hmax) for each event and, on average the standard deviation of hmax is approximately 70% of the mean. This variability is likely due to differences in the choice of numerical model and bathymetry datasets, specification of earthquake rupture mechanism, etc. This represents the range of uncertainty that exists in the real-time situation. The results suggest that it is possible that tsunami forecasts and advisories from different centres for a particular event may conflict with each other.