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Science of Tsunami Forecasting: 2010 Chilean Tsunami Challenge

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Tsunami forecasting with real-time models and real-time data has always been one of the main goals of tsunami research. The February 27th, 2010 Chile tsunami provided the challenge and the opportunity to test the modern state of the science in tsunami forecasting. By contrast with the previous basin-wide tsunami generated by the third largest 2004 Sumatra earthquake, the fifth largest Chilean earthquake occurred at the time and in the area where a variety of real-time measurements and model forecast models have been available to assess the generated tsunami in real-time.

The Chile tsunami was generated by a Mw 8.8 earthquake (35.846S, 72.719W), at 06:34 UTC, 115 km (60 miles) NNE of Concepcion, Chile (according to the USGS). It has been recorded at coastal sea level gages around the Pacific Ocean, staring from the near-field record that caught the wave half an hour after generation at Valparaiso, to the coastal recordings of the wave arrived at Japan and Russian Far East almost a day later. In approximately 3 hours after the earthquake, the tsunami was first recorded at DART buoy 32412, providing real-time deep ocean signature of the propagating tsunami. All that measurements provided ample data for the real-time forecast analysis and for the model performance and forecast skills assessment throughout the Pacific basin.

We present results of the performance of the NOAA forecast. The forecast method uses MOST model with the data assimilated from the earthquake and deep-ocean tsunami DART measurement. The comparison with tide gages and coastal impacts provide opportunity to assess the accuracy and efficiency of the forecast. The successes, lessons learned and future challengers for the tsunami forecast science are discussed.