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Near Field data analysis of the Maule event by c omparison between tide gauges, long base tiltmeters and broad band seismometers.

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The 27 February 2010 tsunami was generated by the Mw 8.8 earthquake of the Maule region in Central Chile. The Maule event generated the strongest tsunami in the Southern Pacific Ocean since 1960, when a Mw 9.5 broke the segment of the Chilean subduction immediately to the South of the Maule event. The 1960 earthquake triggered a transoceanic tsunami which caused casualties as far as in Japan. The 2010 earthquake and tsunami is one of the most extensively recorded events of the Pacific Ocean, on various sensors. In a first step, we made an analysis of the time series recorded by various sensors in the region of Iquique where we collected data of a tide gauge, two long base tiltmeters of 38 m and 51 m long with a high resolution of 1 nrad, and broad-band seismometers (STS2) of the IPOC array, installed at short distances from the coast (0 to 25 km). We focus our study on the first arrival of tsunami wave, the ability of long base tiltmeters and seismometers to record tsunami waves, the ability to quantify the weight of the moving water of the mass and the ability to give an early warning. The tide gauge is located on the coast, and subject to the possible destruction of the tsunami. It is not the case for the long base tiltmeters located at several km inside of the coast. The observation of the tiltmeters is not only an isolated measurement sensitive to the local effects, it is sensitive to the weight of the tsunami wave and thus continuously provide an integrated measurement of the wave in displacement. The tiltmeter can give more informations on the near-real time interpretation of first arrivals on shore for tsunami hazard assessment, and on dispersion along the coast. The comparison with the tide gauge data shows the local resonances in the harbour. In a second step, we use all the tide gauges data available along the South American coast, to identify long period free oscillations due to the tsunami excitation. In a last step, we used numeric al simulation to compute the tsunami waves solving the hydrodynamic equation under the non linear shallow water theory. This calculation shows more precisely the resonant oscillation of the tsunami wave along the coast to compare with the free earth oscillation. This calculation is too the input of a Boussinesq model with gravity model to simulate the crustal loading and the gravity effect due to the fluctuation in sea level. Our study shows the ability of weak tsunami recordings to constrain seismic sources, and the ability of tiltmeters and very broad-band seismometers to act like remote, on-land tidal gauges.