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A simple and rapid estimation of the seismic moment from tsunami amplitudes: the inverse TS formula.

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We recall the "TS" methodology of Okal et al. (2013), who proposed an efficient algorithm for the fast computation of tsunami amplitudes in the far field as a function of seismic moment, distance and azimuth between the source strike and a given receiver, the latter being to necessary account for directivity effects. The method is based on least-square regressions over a large data set of numerical simulations (4650), using 10 sources regions located in the main subduction zones in the Pacific Basin, and range of four orders of magnitudes of seismic moment.

Here, we apply the inverse of the TS formula to recover the seismic moment from a set of measurements of tsunami amplitudes in deep ocean, provided by the DART buoy network (see http://www.ndbc.noaa.gov/dart.shtml).

The inverse TS formula that has been tested on more than 250 measurements from 20 sources, yields an estimate of the seismic moment with a precision of 0.22 logarithmic units; furthermore the estimation of the seismic moment from the tsunami amplitudes, which is a method independent of the seismic measurements, provides the possibility to highlight non regular events like 'snappy' or 'slow' ones, and large unusual 'COMPACT' sources like Tohoku 2011.

Finally, in addition to the amplitudes recorded in the deep seas by the DART buoy network, we utilize the tsunami amplitudes recorded by the coastal sealevel stations (tide gauges); for this purpose, following a method developed by Reymond et al. (2011) and Jamelot & Reymond (2015), we use a modified Green's law function that is able to take into account the amplification corrections at the different sites. In case of absence of DART buoys near the epicenter, the main interest of the measurements provided by the tide gauges is evident.