Sea level feedback for 2004 Sumatra and 2010 Maule earthquakes.

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The co-seismic gravitational perturbations of large earthquakes can be studied on a global scale with the aid of Gravity Recovery and Climate Experiment (GRACE) Level 2 data time series. For submarine earthquakes as that of 2004 Sumatran, the gravitational effect of the ocean water, displaced away from the uplifted crust, is quite important as pointed out by previous studies by including in the modelling a global ocean layer. When a realistic ocean is instead considered, taking into account the shape of continents, new problems arise. Indeed, the realistic ocean mixes different wavelength perturbations and the solution of the sea level equation converges if short wavelength perturbations are also included. In order to investigate this issue and quantify the minimum threshold at which the convergence is obtained, we calculate the sea level feedback of the realistic ocean involving shorter and shorter wavelength perturbations until its contribution to long wavelength perturbations remains stable. If the convergence is not achieved, the error in the modelled co-seismic gravity anomalies for the 2004 Sumatran earthquake can be as large as the uncertainty in the GRACE data analysis, making meaningless the comparison between models and data. Having clarified this issue we point out the differences between the sea level feedback due to global and relistic oceans. We present also results for the 2010 Maule (Chile) earthquake.