ES3/P14/ID89 - EXTENSIVE DATASET OF COASTAL UPLIFT AND TSUNAMI TRACE HEIGHT ASSOCIATED WITH THE MW8.8 EARTHQUAKE IN CENTRAL CHILE (33.2 °-39.8°S)

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In the dawn of February 27, 2010, a subduction earthquake of magnitude Mw8,8 occurred off the coast of Cobquecura (73,24°W; 36,29°S). It affected the central zone of Chile and induced surface displacements in the coastal area. Later, a tsunami strongly flooded the coasts of the Regions O'Higgins, Maule and Araucanía. We here present a large set of data (vertical displacement and tsunami trace height) that have been collected in the few weeks after the event.

The coseismic coastal uplift was estimated from observations of the algal band of the group Lithothamnium (following the Ortlieb et al. (1998) methodology), together with other algae and typical mollusks from the subtidal to intertidal zone. These were vertically displaced in response to coseismic displacements. Evidences of vertical deformation were observed between 34.13°S and 38.34°S. The minimal observed uplift was of 15 +/-10 cm. The highest uplift values were measured in the closest sites relatively to the trough, mainly on the western coast of Arauco peninsula (between 133 +/-20 cm and 240 +/-20 cm). A maximum value of 310 +/-30 cm was observed in the Island Santa Maria. Uplift values decreases to the East with increasing distance to the trough. In some estuaries or coastal lakes, subsidence of up to 0,5-1 m was estimated. In regional terms, the data show that the change from uplift to subsidence happened at a distance of 110-120 km with respect to the trough.

The higher "trace heights" of the tsunami that affected the coasts after the earthquake, were observed immediately to the north of the epicentre. There, trace height reached even ca. 14 m, then diminishing progressively towards the north, up to values of the order of 2,5 m (south of Valparaiso). On the coast close to Cobquecura, trace height diminished up to 2-4 m, increasing locally up to 6-8 m in Dichato-Talcahuano's zones and Tirúa. The testimonies compiled (N = 10) coincide with that the times of flood arrival changed between 15-25 minutes in the epicenter zone, and 30-60 minutes in the most distant areas. Both the distribution of the maximum trace heights and the testimony information near the epicentre zone suggest that the tsunami could have had a complexity associated with the seismic event.

ES3/P15/ID90 - SOURCE RUPTURE PROCESS, DIRECTIVITY AND COULOMB STRESS CHANGE OF THE 12 JANUARY 2010 (PORT-AU-PRINCE HAITI, MW7.0) EARTHQUAKE

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The Haiti earthquake occurred on Tuesday, January 12, 2010 at 21:53:10 UTC. Its epicenter was at 18.46 degrees North, 72.53 degrees West, about 25 km WSW of Haiti's capital, Port-au-Prince, along the tectonic boundary between Caribbean and North America plate dominated by left-lateral strike slip motion and compression with 2 cm/yr of slip velocity eastward with respect to the North America plate. The earthquake was relatively shallow (about 13 km depth) with Mw 7.0 and CMT mechanism solution indicating left-lateral strike slip movement with a fault plane oriented toward the WNW-ESE. More than 10 aftershocks ranging from 5.0 to 5.9 in magnitude struck the area in hours following the main shock. Most of these aftershocks have occurred to the west of the mainshock in the Mirogoane Lakes region and its distribution suggests that the length of the rupture was around 70 km. Rupture velocity and direction was constrained by using the directivity effect determined from broad-band waveforms recorded at regional and teleseismic distances using DIRDOP computational code (DIRectivity DOPpler effect) [1]. The Results show that the rupture spread mainly from WNW to ESE with a velocity of 2.5 km/s. In order to obtain the spatiotemporal slip distribution of a finite rupture model we have used teleseismic body wave and the Kikuchi and Kanamori's method [2]. The inversion show complex source time function with a total scalar seismic moment of 2.2 x 10^{19}Nm (Mw=6.9) a source duration of about 18 sec with a main energy relesea in the first 13 sec. Finally, we compared a map of aftershocks with the Coulomb stress changes caused by the main shock in the region [3]. [1] Kikuchi, M., and Kanamori, H., 1982, Inversion of complex body waves: Bull. Seismol. Soc. Am., v. 72, p. 491-506. [2] Caldeira B., Bezzeghoud M, Borges JF, 2009; DIRDOP: a directivity approach to determining the seismic rupture velocity vector. J Seismology, DOI 10.1007/s10950-009-9183-x [3] King, G. C. P., Stein, R. S. y Lin, J, 1994, Static stress changes and the triggering of earthquakes. Bull. Seismol. Soc. Am. 84,935-953.

ES3/P16/ID91 - DESTRUCTIVE EARTHQUAKE AT COAST OF CENTRAL CHILE ON FEBRUARY, 27TH, 2010. SEISMIC HISTORY AND THE PRELIMINARY ANALYSIS OF AFTERSHOCK PROCESS INITIAL STAGE

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The seismic history of region on a course of the cumulative scalar seismic moment release has been tracked from 1570 up to 1960 (time of the Big Chilean earthquake of 22.05.1960); and from 1960 up to 2010. Cumulative scalar seismic moment (M_{0cum}) release analysis from 1570 up to 1960 has shown that time of earthquake 22.05.1960 preparation is approximately 180 years. Time course ofM_{0cum} during 1960 up to 2010 has revealed the expressed phase of seismic quiescence was observed from 1986 up to the beginning of 2010. An opportunity of occurrence of new strong earthquake in this area is specified too by abnormal low value of the ordering index, observed on the end of 2001 with its subsequent almost monotonous growth down to 27.02.2010 earthquake. However, the period of approximately 50 years between earthquakes of 22.05.1960 and 27.02.2010 has appeared insufficient for occurrence of earthquake withM_W = 8.8. Actual deficiency in M_{0cum} release on the beginning of 2010 was 3.73·10^{21} N·m, that approximately in 5 times less the M_0 of the earthquake 27.02.2010.Aftershock process of 27.02.2010 earthquake in its initial stage develops enough slowly for seismic event of such force. For the first 3 months nearby 440 aftershocks with magnitudes 4.5 ≤ M_W ≤ 6.9 has occurred. The value of the total scalar seismic moment released in aftershocks for this time was about 1.62·10^{20} N·m or only 0.88% from the M_0 of the main event. The analysis of M_{0cum} release time course in the first day after 27.02.2010 earthquake has allowed to make a conclusion on an opportunity of new strong repeated pushes occurrence with moment magnitude up to 7.0 - 7.5. Thus, a series of three enough strong aftershocks on March 11 - 16, 2010 with M_W 6.9, 6.8 and 6.6 has been predicted in a mode of real time. Since March, 17th, 2010 the new phase of seismic quiescence in aftershock process was started. Predicted average speed of M_{0cum} release in the assumption of its linear release at least in the first weeks after earthquake of 27.02.2010 is estimated as 6.16·10^{18} N·m/day. Presence of more or less long linear phase of liberationM_{0cum} releasein aftershock process (its duration depends both from earthquake magnitude and from the place of its occurrence) before by virtue of Omori law enters, proves to be true results of a number strong earthquakes aftershock process analysis.

ES3/P17/ID92 - THE AFTERSHOCK ACTIVITY OF THE 8/6/2008 (MW=6.4) EARTHQUAKE OF NW PELOPONNESE, GREECE: STUDY ON FAULT GEOMETRY, SOURCE PARAMETERS AND STRONG MOTION OF THE MAINSHOCK

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After the recent strong earthquake (Mw=6.4) of Achaia-Elia (NW Peloponnese, Greece) on June 8, 2008, a temporary network of 13 velocimeters and 5 accelerometers were deployed by ITSAK (Institute of Engineering Seismology and Earthquake Engineering) in the vicinity of the seismic fault. This temporary network has operated for almost 3 months and recorded an important amount of aftershocks ($0.8 \le M \le 4.3$). A very good azimuthal coverage of this network around the causative fault and its composition of high technology instruments (sensors' response from 30sec to 0.01sec and 24-bit digitizers) allowed us to obtain a very well defined and accurate aftershock space distribution as well as high quality seismic recordings.

The distribution of this aftershock activity helped us to define the geometry of the active fault which in combination with the properties of the seismic source, contributed to the simulation of the mainshock's strong motion in the near and intermediary field (R<50km) using the Empirical Green's