

The southern region of Peru earthquake of June 23rd, 2001

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The western border of South America is one of the most important seismogenic regions in the world. In this region the most damaging earthquake ever recorded occurred. In June 23rd, 2001, another very strong earthquake ($M_w=8.1-8.2$) occurred and produced death and damages in the whole southern region of Peru. This earthquake was originated by a friction process between Nazca and South American plates and affected an area of about 300km x 120km defined by the distribution of more than 220 aftershocks recorded by a local seismic network that operated 20 days. The epicenter of the main shock was localized in the northwestern extremity of the aftershock area, which suggests that the rupture propagated towards the SE direction. The modeling of P-wave for teleseismic distances permitted to define a focal mechanism of reverse type with NW-SE oriented nodal planes and a possible fault plane moving beneath almost horizontally in NE direction. The source time function (STF) suggests a complex process of rupture during 85 sec with 2 successive sources. The second one of greater size, and located approximately 100-120 km toward the SE direction was estimated to have a rupture velocity of about 2 km/sec on a 28°-dipping plane to the SE (N135°). A second event happened 45 sec after the first one with an epicenter 130km farther to the SE and a complex STF. This event and the second source of the main shock caused a tsunami with waves from 7 to 8 meters that propagated almost orthogonally to the coast line, by affecting mainly the Camaná area.

Three of all the aftershocks presented magnitudes greater or equal to $M_w=6.6$, two of them occurred in front of the cities of Ilo and Mollendo (June 26th and July 7th) with focal mechanisms similar to the main seismic event. The aftershock of July 5th shows a normal mechanism at a depth of 75 km, and is therefore most likely located within the subducting Nazca plate and not in the coupling. The aftershocks of June 26th ($M_w=6.6$) and July 5th ($M_w=6.6$) show simple short duration STF. The aftershock of July 7th ($M_w=7.5$) with 27-second duration suggests a complex process of energy release with the possible occurrence of a secondary shock with lower focal depth and focal mechanism of inverse type with a great lateral component. Simple and composed focal mechanisms were elaborated for the aftershocks and all have similar characteristics to the main earthquake. The earthquake of June 23rd caused major damages in the

whole southern Peru. The damage in towns of Arequipa, Moquegua allow to consider maximum intensities from 6 to 7 (MSK-79). In Alto de la Alianza and Ciudad Nueva zones from Tacna, the maximum intensity was of 7- (MSK-79).