

Unusually large earthquakes along Chile Trench occurring at 300 year interval

Masanobu Shishikura[1]; Takanobu Kamataki[2]; Yuki Sawai[1]; Marco Cisternas[3]; Brian Atwater[4]

[1] Active Fault Research Center, AIST, GSJ; [2] AFRC, GSJ/AIST; [3] Univ. Valparaiso; [4] USGS

It is commonly thought that the longer the time since last earthquake, the larger the next earthquakes slip will be. But this logical predictor of earthquake size, unsuccessful for large earthquakes on a strike-slip fault, fails also with the giant 1960 Chile earthquake of magnitude 9.5. Although the time since the preceding earthquake spanned 123 years, the estimated slip in 1960, which occurred on a fault between the Nazca and South American tectonic plates, equaled 250-350 years a worth of the plate motion. Thus the average interval between such giant earthquakes on this fault should span several centuries. Here we present evidence that such long intervals were indeed typical of the last two millennia. We use buried soils and sand layers as records of tectonic subsidence and tsunami inundation at an estuary midway along the 1960 rupture. In these records, the 1960 earthquake ended a recurrence interval that had begun almost four centuries before, with an earthquake documented by Spanish conquistadors in 1575. Two later earthquakes, in 1737 and 1837, produced little if any subsidence or tsunami at the estuary and they therefore probably left the fault partly loaded with accumulated plate motion that the 1960 earthquake then expended.