

Holocene activity of the Liquiñe-Ofqui Fault Zone near Aysén Fjord (Chilean Patagonia)

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In the first months of 2007, the Aysén region in southern Chile was affected by a seismic swarm with more than 7,200 recorded earthquakes. Its largest earthquake (M 6.2) occurred in April, and had its epicenter in Aysén fjord. Ground shaking intensities became so high (up to MMI IX) that hundreds of onshore mass movements were triggered, several of which entered into the fjord, resulting in mass-transport deposits (MTDs) preserved at the fjord bottom. Here we present a Holocene record of past earthquakes in the, up to now, unstudied Patagonian fjordland based on MTD stratigraphy. High-resolution seismic data retrieved using two different seismic sources (sparker and TOPAS) revealed multiple older MTDs on different stratigraphic levels. Correlation of the seismic stratigraphy with sedimentological data obtained from a long Calypso core (MD07-3117) provided conclusive identification of these deposits as to whether or not they were seismically triggered. Additionally, radiocarbon dating allowed to reconstruct an age model, which was validated by tephrochronology, providing an age for the different MTD levels. Moreover, the distribution of the MTDs in the fjord, combined with ground-motion modelling, allowed estimating potential source faults and rupture areas for each of the prehistorical events. We thus present a highly detailed paleoseismological history of the Aysén region, including at least six major Holocene earthquakes with possibly also different source mechanisms and areas. Even though earthquakes do not seem to have occurred at regular time intervals, an average recurrence time of 2,000 years can be inferred for earthquakes with a minimum shaking intensity of MMI VI.