



First geological evidence of a prehistorical tsunami in the Southern edge of the Atacama Desert (Chile)

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Northern Chile coast is considered one of the highest tsunamigenic hazard areas as proved by at least 14 events described in the historical chronicles of the last 500 years. Surprisingly, the study of the tsunami geological record in this sector of the Pacific coast, specifically in the Atacama region, has not been carried out. This work describes a large boulder field at topographic heights +10 - +18.5 m a.s.l. with some debris heavier than 44 t. The minimum tsunami inland penetration has been estimated in the field in 284 m. These debris mostly come from the erosion of the Quaternary marine terraces that crop out in the present interglacial coastal cliff above which the tsunami developed an important erosive scarp. The use of different equations has allowed estimating wave heights higher than 20 m and a minimum $M_s < 8.8$ for the triggering earthquake. As these features do not agree with any of the historical events that have affected the Atacama coasts in recent times we proposed that the Cisne Bay boulder field is the first record of a prehistorical tsunami in Northern Chile.

This event probably corresponds to a 300 years return period supercycle that potentially affected Central and North of Chile and would be linked with an extremely highly destructive tsunamigenic event near the epicenter. These supercycles involve large rupture areas able to generate destructive seismic and tsunamigenic events for Central-North Chile, very similar to the 1730 Valparaiso earthquake ($M_w \sim 9$) that generated tsunami height waves of 12 m near the epicenter. We propose the immediately previous event within this supercycle as the earthquake that triggered the tsunami generating Cisne Bay boulder field. In this sense, Tsujj (2013) describe a distance tsunami that caused serious damages in fishing villages in the central sector of the Japanese Pacific Coast in 1420 without an associated earthquake. This tsunamigenic event is so far unknown in the Southamerican Pacific coast and it is the most probable candidate to explain the significant morphosedimentary evidence described in the Atacama coast.