



Geological records of recent and historical ruptures of the Chilean subduction zone: a latitudinal transect of earthquake deformation and tsunami inundation

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Historical and instrumental records provide evidence for multiple great earthquakes and tsunami along the Chilean megathrust. However, as the written history of Chile only commenced with Spanish colonisation in the mid-16th century, these records are too short to adequately assess the recurrence of the greatest magnitude seismic hazards, and instead we must rely on geological investigations of sediments to obtain long-term patterns.

Here we present the results from recent palaeoseismic investigations in south-central Chile, assessing vertical deformation associated with two of the most recent ruptures of the Valdivia seismic segment and the lateral extent of the associated tsunami deposits. We present data from tidal marshes in a north-south transect between Concepción and Isla de Chiloé, including Chaihuin, Pucatrihue, Llico and Chucalén, where sediments record evidence of the 1960 and up to three earlier events. We quantify vertical deformation using a diatom transfer function based on an expanded modern training set, and show variability in the magnitude of deformation both between events at the same site, and between sites for the same event. The deformation episodes are accompanied by the occurrence of coarse sand layers with thicknesses between 0.5 and 30 cm. We use sedimentological characteristics and diatom compositions to infer a tsunamigenic origin for these sand layers.