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Late Holocene megathrust earthquakes in south central Chile

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A lack of comprehensive understanding of the seismic hazards associated with a subduction zone can lead to inadequate anticipation of earthquake and tsunami magnitudes. Four hundred and fifty years of Chilean historical documents record the effects of numerous great earthquakes; however, with recurrence intervals between the largest megathrust earthquakes approaching 300 years, seismic hazard assessment requires longer chronologies. This research seeks to verify and extend historical records in south central Chile using a relative-sea level approach to palaeoseismology.

Our quantitative, diatom-based approaches to relative sea-level reconstruction are successful in reconstructing the magnitude of coseismic deformation during recent, well documented Chilean earthquakes. The few disparities between my estimates and independent data highlight the possibility of shaking-induced sediment consolidation in tidal marshes. Following this encouraging confirmation of the approach, we quantify land-level changes in longer sedimentary records from the centre of the rupture zone of the 1960 Valdivia earthquake. Here, laterally extensive marsh soils abruptly overlain by low intertidal sediments attest to the occurrence of four megathrust earthquakes. Sites preserve evidence of the 1960 and 1575 earthquakes and we constrain the timing of two predecessors to 1270 to 1410 and 1050 to 1200. The sediments and biostratigraphy lack evidence for the historically documented 1737 and 1837 earthquakes.