



## **Sand intrusions and mudstone-clast breccia related to an early Pliocene mega-tsunami (Ranquil Formation, southern Chile)**

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An exceptionally large tsunami affected the shoreline north of Lebu, southern Chile, during the early Pliocene. Its backflow eroded coarse coastal sediments and redistributed them over the continental shelf and slope. Sandstone dykes and sills injected from the base of the resulting hyperconcentrated flow into underlying, partially consolidated muds, assisted in plucking up large blocks of the latter and incorporating them into the flow. Locally, the ripup intraclasts were fragmented further by smaller-scale injections to form a distinct breccia of angular to rounded mudstone clasts within a medium to coarse sandstone matrix. This indicates that high fluid pressures were maintained over relatively large distances within the backflow debris. Calculation of possible dynamic pressures within the flow indicates that these would have been sufficient to cause downward injection to depths of about 70 m. Sandstone sills in places mimic normal sedimentary beds, complete with structures resembling inverse gradation, planar laminae, as well as ripple and trough cross-lamination. These were probably formed by internal sediment flow and shear stress as the semiliquified sand was forcefully injected into cracks. In borehole cores, such sills can easily be misinterpreted as normal sedimentary beds, which can have important implications for hydrocarbon exploration.