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Late Holocene coastal stratigraphy, coastal changes and potential palaeoseismological implications inferred from geo-archives in Central Chile (29–32°S)

Simon Matthias May (1), Anna Pint (1), Gilles Rixhon (1), Dieter Kelletat (1), Volker Wennrich (2), and Helmut Brückner (1)

(1) University of Cologne, Institute of Geography, Cologne, Germany (mays@uni-koeln.de), (2) Institute for Geology and Mineralogy, University of Cologne, Zülpicher Str. 49a, 50674 Cologne, Germany

Coastal geomorphology and the stratigraphy of coastal geoarchives record past changes and fluctuations of coastal environments. In addition, these archives potentially store traces of past extreme events such as earthquakes and tsunamis, severe storms, and major floodings of the coastal hinterland, e.g. due to El Niño conditions. Studying their characteristics may thus improve the knowledge of past frequency and magnitude patterns of such extreme events. For instance, large scaled spatial information about past earthquakes is needed for the understanding and estimation of seismo-tectonic processes. Misinterpretations in the size of preceding earthquakes may lead to incorrect strain balance estimations along megathrusts. Thus, fundamental research on the occurrence of past earthquakes is needed, which can be reflected in sudden or long-term coastal, geomorphodynamic and back-barrier environmental changes.

Using sedimentological, geomorphological and microfaunal evidence, coeval geomorphodynamic and palaeoenvironmental changes at four different locations between 29°50’ and 32°20’S in Central Chile were identified in estuary systems, coastal swamps and coastal plains. The results may represent possible indirect evidence for palaeoseismicity, affecting the coastal system by vertical tectonic movements. Changes of coastline elevation, morphodynamic activity and/or coastal environments, as well as the formation of a liquefaction layer took place during the last c. 400 years. Moreover, major flooding events related to strong El Niño conditions are assumed to have influenced the coastal stratigraphy by depositing high energy fluvial deposits. Our results suggest that the coastal environment, geomorphology and stratigraphy are considerably influenced by tectonic processes in the study area; a relation of the presented findings to the 1730 Great Valparaíso Earthquake is assumed. In general, the findings may encourage the implementation of comparable detailed studies, which may ultimately contribute to a better understanding of the Holocene coastal evolution and its relation to palaeoseismicity in Central Chile.