Geophysical Research Abstracts, Vol. 9, 08095, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08095

Forearc deformation and erosion on different timescales – Chile, 37˚ - 38˚S

K. Rehak (1), M.R. Strecker (1), H.P. Echtler (2), S. Binnie (3), M. Summerfield (3), T. Dunai (3), S. Freeman (4)

(1) Institut für Geowissenschaften, Universität Potsdam, Germany, (2) GeoForschungsZentrum Potsdam, Germany, (3) Institute of Geography, University of Edinburgh, Scotland, (4) AMS, SUERC, Glasgow, Scotland

rehak@geo.uni-potsdam.de

The Nahuelbuta segment of the active forearc of south-central Chile is characterized by ongoing uplift, recorded by elevated marine terraces, emerged strandlines, and pronounced drainage-system pertubations. A comparison between ^{14}C- and OSL-ages of Quaternary marine terraces and emerged strandlines, and exhumation data based on apatite fission track ages from the basement of the Coastal Cordillera reveals a dramatic difference between short-term uplift rates of about 2 to 5 m/kyr (Kaizuka et al., 1973; Nelson and Manley, 1992, Melnick et al. 2006) and long-term exhumation rates of about 0.04 to 0.07 m/kyr (Glodny et al., subm.). The reason for this discrepancy is not known. It may be driven by processes at the plate interface associated with a Plio-Quaternary acceleration of uplift, which may have caused a change in erosion rates.

Here, we test this hypothesis of accelerated uplift by dating erosion surfaces and fluvial terraces of the paleo-drainage system in the Coastal Cordillera of south-central Chile with cosmogenic radionuclides (^{10}Be, ^{26}Al). Our preliminary results provide data for an integrative reconstruction of Quaternary uplift evolution on time scales of 10^6 to 10^3 years. We show that the Coastal Cordillera has been subjected to progressive acceleration of uplift, at least since approximately 1 Myr. Probably coupled with a more pronounced uplift is the distinct increase in Holocene erosion rates. Based on regional stratigraphic relationships, and historical and climatological data we infer that this change in erosion rates is not related to anthropogenic or climatic forcing.

Instead, we suggest that either changes in coupling of the plate interface, perhaps associated with the subduction of bathymetric anomalies or variations in basal accretion of sediment, or an increase in earthquake-related forearc uplift control the Holocene increase of erosion.

Glodny, J., Gräfe, K. and Echtler, H.P. (submitted): The continental margin dynamics in South Central Chile (36˚-42˚S) from the apatite and zircon fission track perspective. International Journal of Earth Sciences.

Kaizuka, S. Matsuda, T., Nogami, M. and Yonekura, N. (1973): Quaternary Tectonic and Recent Seismic Crustal Movements in the Arauco Peninsula and its Environs. Central Chile, Tokyo Metropolitan University.

Melnick, D., Bookhagen, B, Echtler, H.P. and Strecker, M.R. (2006): Coastal deformation and great subduction earthquakes, Isla Santa María, Chile (37˚S). Geological Society of America Bulletin, 118(11/12). 1463-1480.

Nelson, A.R. and Manley, W.F. (1992): Holocene coseismic and aseismic uplift of Isla Mocha, south-central Chile. Impacts of tectonics on Quaternary coastal evolution. Quaternary International, 15-16. 61-76.