Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09211, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09211
EGU General Assembly 2008

Tracking the provenance – Assessing sedimentary pathways and upper plate dynamics at the South Central Chile margin

B. Heberer (1,2), J. H. Behrmann (3), M. Rahn (4)

(1) University of Freiburg, Geological Institute, Germany, (2) University of Salzburg, Department of Geography and Geology, Austria, (3) IFM-GEOMAR Kiel, Germany, (4) HSK, Villigen-HSK, Switzerland (bianca.heberer@sbg.ac.at / Phone: +43-662-8044-5461)

A combination of apatite fission track (FT) dating and sediment analysis was carried out on modern to subrecent trench sands from gravity cores and estuarine sands of South Central Chile between 46˚ and 30˚S to (a) obtain information on sediment provenance, present-day erosion patterns, tectonic processes in the source area and (b) to test the generally made assumption of a negligible transport time within the lag time concept.

Bulk samples were collected from major rivers with drainage systems encompassing the three main Chilean morphological units, i.e. the Main Andean Range, the Longitudinal Valley, and the Coastal Cordillera. Between 36˚ and 42˚S the fluvial load of rivers such as e.g. the Biobío is transported via submarine canyons to large deep sea trench fans. These sites were preferentially targeted for gravity coring as they are not or only subordinately subject to the northward directed material transport within the trench, and thus are supposed to reflect the source area.

Apatite FT age distributions from the trench fans and the estuaries were tentatively referred to their sources by comparing their single grain age distribution to the cooling age pattern of the bedrocks of the feeder area. Drainage systems were derived from digital elevation models, and areal extents of units carrying a specific age signature were quantified. Thus we could denominate those units contributing to the flux of sediment to the basin, which seem to be over- or underrepresented in the river-mouth

resp. trench fan sediment.

Sedimentological and mineralogical investigations suggest an overwhelming volcanic contribution from the Main Cordillera. Indeed, a pronounced signal of Late Miocene ages, most likely of volcanic origin, occurs within most FT grain age distributions. However, an older, Cretaceous, population significantly contributes to the detrital grain age distributions. Within the Biobío drainage, e.g., Cretaceous age groups, consistent with ages from the Coastal Cordillera, account for most ($>$80%) of the total population of dated grains. This implies that a large portion of the apatites was shed off this trench-parallel range despite a low relative fraction of less than 20% within the total drainage area. In contrast, young apatites from the easily erodible volcanic edifices in the Main Range only subordinately provide apatite to the trench. Although first-order controlling parameters such as apatite content and erosion rates play a major role, the repeated dominance of the Cretaceous signal is thought to be triggered by a very recent uplift event of this coastal segment. The adjacent trench section is filled with sediments leading to tectonic accretion and, therefore, uplift. The uplift event is not yet reflected in the FT age itself, because erosion has not yet reached the depth of the apatite FT partial annealing zone in the Coastal range. Changes of accretion and erosion are expected to occur episodically along this margin segment.

The assumption of a zero transport time from the hinterland to the trench is confirmed for the large drainage systems discharging into submarine canyons and thus bypassing the continental slope.