Geophysical Research Abstracts
Vol. 12, EGU2010-4852, 2010
EGU General Assembly 2010

Detrital fingerprints of fossil continental-subduction zones (Axial Belt Provenance, European Alps)

Alberto Resentini, Eduardo Garzanti, Giovanni Vezzoli, Sergio Andò, Marco G. Malusà, Marta Padoan, and Paolo Paparella

Università di Milano-Bicocca, Italy (a.resentini@campus.unimib.it)

Alpine-type collision orogens are generated by attempted subduction of thinned continental margins. Because of complex tectonic structure, orogenic detritus is characterized by a range of detrital signatures, making its recognition an arduous task (Dickinson and Suczek, 1979). Among the various orogenic sub-provenances, Axial Belt Provenance, derived from the erosion of the neometamorphic axial pile, can be regarded as the most typifying signature of collision orogens (Garzanti et al., 2007).

In the Austroalpine Cretaceous and Penninic Eocene axial belts of the Alps, we ideally distinguish three structural levels, each characterized by diagnostic detrital fingerprints. The shallow level chiefly consists of offscraped remnant-ocean turbidites and unmetamorphosed continental-margin sediments, and mostly produces lithic to lithoquartzose sedimentaclastic sands yielding very-poor heavy-mineral suites including ultrastable minerals. The intermediate level includes low-grade metasediments and polymetamorphic basements, and sheds lithoquartzose to quartzolithofeldspathic metamorphiclastic sands yielding moderately-rich epidote- amphibole suites with chloritoid or garnet. The deep level contains eclogitic remnants of continent- ocean transitions, and supplies quartzofeldspathic to quartzolithic high-rank metamorphiclastic to lithic ultramaficlastic sands yielding rich to extremely-rich suites dominated by garnet, hornblende, or epidote depending on protoliths (continental vs. oceanic) and pressure/temperature paths followed during exhumation. Although widely overprinted under greenschist-facies or amphibolite-facies conditions, occurrence of ultradense eclogite in source areas is readily revealed by the Heavy Mineral Concentration (HMC) index, which mirrors the average density of source rocks in the absence of hydraulic-sorting effects (Garzanti and Andò 2007). The Metamorphic Index (MI, Garzanti and Vezzoli, 2003) and Hornblende Colour Index (HCI) reflect peak temperatures reached at later stages, when subduction is throttled by arrival of thicker continental crust and geothermal gradients increase. Experience gained from modern sediments provides fundamental help to decrypt the innumerable pieces of information stored in the sedimentary record, and thus to identify and reconstruct subduction events of the past.

Dickinson, W., R., Suczek, C.A., 1979.Plate tectonics and sandstone compositions. AAPG Bull. 63, 2164-2182.

Garzanti, E. and Andò, S. 2007. Heavy-mineral concentration in modern sands: implications for provenance interpretation. In Mange, M., and Wright, D., eds. Heavy Minerals in Use. Developments in Sedimentology Series 58. Amsterdam, Elsevier, p. 517-545.

Garzanti, E., and Vezzoli, G. 2003. A classification of metamorphic grains in sands based on their composition and grade. J. Sediment. Res. 73:830-837.

Garzanti, E., Doglioni, C., Vezzoli, G., Andò, S., 2007. Orogenic belts and orogenic sediment provenante. J. Geology, 115:315-334.