Geophysical Research Abstracts
Vol. 18, EGU2016-1333, 2016
EGU General Assembly 2016
© Author(s) 2015. CC Attribution 3.0 License.

Sediment composition of big Chinese and Indochinese rivers reflects geology of their source, not tectonic setting of their sink.

Eduardo Garzanti (1), Sergio Andò (1), Mara Limonta (1), Junsheng Nie (2), Alberto Resentini (1), Giovanni Vezzoli (1), Jiangang Wang (3), and Shouye Yang (4)

(1) Università di Milano-Bicocca, Earth and Environmental Sciences, Milano, Italy (eduardo.garzanti@unimib.it), (2) Lanzhou University, College of Earth and Environmental Sciences, Lanzhou, China, (3) Chinese Academy of Sciences, Institute of Geology and Geophysics, Beijing, China, (4) Tongji University, Laboratory of Marine Geology, Shanghai, China

There are several reasons why the tectonic setting of a sedimentary basin cannot be inferred from the composition of its sedimentary fill. One is that sediments can, and quite often are transported for thousands of kilometers from sources uplifted by certain tectonic processes to subsident basins created by totally different tectonic processes. A classical case is the Amazon River, carrying detritus from the Andean Cordillera to the Atlantic passive margin on the opposite side of South America (Franzinelli and Potter, 1983; Dickinson, 1988). Similar is the case of major rivers in China and Indochina, sourced in Tibetan orogenic highlands and reaching the Chinese passive margin or the back-arc/pull-apart Andaman Sea. The Huang He (Yellow River), the most sediment-laden river in the world, delivers annually to the Bohai Sea 1 billion tons of litho-feldspatho-quartzose sedimentaclastic/metamorphiclastic sediments with moderately rich, amphibole-epidote-garnet suites including apatite and zircon (Nie et al., 2015). The Changjiang (Yangtze) River, the fourth longest on Earth and the largest in Eurasia, carries to the East China Sea litho-feldspatho-quartzose sedimentaclastic/metamorphiclastic sand with moderately poor, amphibole-epidote suites including clinopyroxene and garnet (Vezzoli et al., 2016). The Ayeyarwadi (Irrawaddy) River, ranking among the five major rivers in the world for its annual load of 0.4 billion tons, carries to the Andaman Sea litho-feldspatho-quartzose metamorphiclastic/sedimentaclastic sand with moderately rich, amphibole-epidote suites including garnet and clinopyroxene (Garzanti et al., 2013). Detrital modes in these three very big river basins are thus similar, and would plot in the “Recycled Orogen” field of Dickinson (1985) rather than in the “Continental Block” or “Magmatic Arc” fields. The orogenic signature acquired in mountainous headwaters is carried all the way to the mouth, and even after long-distance transport across wide continental areas sediment composition reveals the geological character of the orogenic source, rather than the passive-margin or back-arc-basin setting of the sink. The accurate reconstruction of such long and complex sediment-routing systems is thus required for a correct provenance analysis of many large ancient clastic wedges (e.g., Wang et al., 2016).

CITED REFERENCES

Dickinson W.R. 1985. Interpreting provenance relations from detrital modes of sandstones. In: Zuffa, G.G. (Ed.), Provenance of arenites. Reidel, Dordrecht, NATO ASI Series 148:333-361.
Dickinson W.R. 1988. Provenance and sediment dispersal in relation to paleotectonics and paleogeography of sedimentary basins. In: Kleinspehn, K.L., Paola, C. (Eds.), New perspectives in basin analysis. Springer, 3-25.
Franzinelli E., Potter P.E. 1983. Petrology, chemistry, and texture of modern river sands, Amazon River system. The Journal of Geology 91:23-39.
Garzanti E., Limonta M., Resentini A., Bandopadhyay P. C., Najman Y., Andò S., Vezzoli G. 2013. Sediment recycling at convergent plate margins (Indo-Burman Ranges and Andaman–Nicobar Ridge). Earth-Science Reviews 123:113-132.
Nie J., Stevens T., Rittner M., Stockli D., Garzanti E., Limonta M., Bird A., Andò S., Vermeesch P., Saylor J., Lu H., Breecker D., Hu X., Liu S., Resentini A., Vezzoli G., Peng W., Carter A., Ji S., Pan B. 2015. Loess Plateau storage of Northeastern Tibetan Plateau-derived Yellow River sediment. Nature Communications 6:10.1038/ncomms9511.
Vezzoli G., Garzanti E., Limonta M., Andò S., Yang S. 2016. Erosion patterns in the Changjiang (Yangtze River) catchment revealed by bulk-sample versus single-mineral provenance budgets. Geomorphology, in review.
Wang J.G., Wu F.Y., Garzanti E., Hu X.M., Ji, W.Q., Liu, Z.C., Liu X.C. 2016. Upper Triassic turbidites of the northern Tethyan Himalaya (Langjiexue Group): the terminal of a sediment-routing system sourced in the Gondwanide Orogen. Gondwana Research, in review.