Geophysical Research Abstracts
Vol. 15, EGU2013-1834-1, 2013
EGU General Assembly 2013

Determining the palaeodrainage of the Nile river from a provenance study of the Nile delta cone sediments: an on-going geochemical study

Laura Fielding (1), Yani Najman (1), Ian Millar (2), Peter Butterworth (3), Ben Kneller (4), and Eduardo Garzanti (5)

(1) Lancaster University, Lancsater, United Kingdom (l.edwards4@lancaster.ac.uk), (2) NERC Isotope Geosciences Laboratory, British Geological Survey, Nottingham, United Kingdom (ilm@bgs.ac.uk), (3) BP Egypt, Maadi, Cairo, Egypt (peter.butterworth@se1.bp.com), (4) The University of Aberdeen, Aberdeen, United Kingdom (b.kneller@abdn.ac.uk), (5) The University of Milano-Bicocca, Milan, Italy (eduardo.garzanti@unimib.it)

This study documents the palaeodrainage history of the Nile River, in particular the time of transition from a small locally sourced drainage network to the initiation of an extensive Nile catchment, by conducting a provenance study of the well-dated Nile cone sediments. The identification of specific source inputs into the Nile cone has important implications for the prediction of reservoir quality and connectivity in hydrocarbon reservoirs.

Presently, the Nile river drains as far south as south of Lake Victoria, with the White Nile draining largely Cratonic basement rocks of Archean to Proterozoic ages and the Blue Nile draining Cenozoic continental flood basalts and Neoproterozoic basement in Ethiopia. However, the timing of catchment expansion to its current extent is highly debated. There are a number of proposed palaeodrainage reconstructions, two of which are:

A) The Blue Nile did not connect with the main (lower) Nile until the Late Messinian, and the White Nile did not connect with the lower Nile until at 0.5 Ma (e.g. Issawi and McCauley, 1992). In this model, the pre-Messinian Nile cone sediments are derived exclusively from the northern part of the present drainage basin, from the Red Sea Hills.

B) The Blue Nile and Atbara Rivers have been connected to the main (lower) Nile since the Oligocene, simultaneous with large scale regional uplift and volcanism in the Ethiopian Highlands; with the river following a similar course to present day (Burke and Wells 1989).
The palaeo-Nile cone sediments have the capacity to provide a unique archive of the river's highly debated palaeodrainage history. Our first objective was to characterise petrographically, geochemically and isotopically each possible source area (Ethiopian Flood Basalts, African Craton and Red Sea Hills) using a multidisciplinary approach in order to identify the presence (if any) of sediment from these sources in the delta core samples.

Heavy mineral, petrographic, U-Pb zircon and rutile analyses so far support the hypothesis of the Blue Nile and/or the Red Sea Hills contributing detritus to the Nile delta since the Oligocene with very little input from the White Nile throughout the core. XRF, Sm-Nd and Rb-Sr analyses also point to a significant mafic (Blue Nile or Red Sea Hills) source since the Oligocene.

More recent analytical work has involved studying the Lu/Hf of zircon. This is being carried out to assess the occurrence of the 30Ma zircons identified in the core, the Ethiopian Highlands and at Faiyum in the Western Desert. These results are preliminary, and the Red Sea Hills region in particular is subject to on-going work to more completely characterise its geochemical and isotopic signature.