Large weakening in monsoonal rainfalls over western India during the Younger Dryas

ANTOINE COGEZ[1]*, LAURE MEYNADIER[1], CLAUDE ALLÈGRE[1] AND FRANCK BASSINOT[2]

[1]Equipe de Géochimie et Cosmochimie, Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, UMR 7154 CNRS, F-75005 Paris, France (*correspondence: cogez@ipgp.fr)

[2]Laboratoire des Sciences du Climat et de l'Environnement, CEA, CNRS, Gif sur Yvette, France

We studied the monsoonal rainfalls evolution since 30 kyrs over western India, using neodymium isotopes (εNd) in sediment cores. Since neodymium isotopes are not fractionated by physico-chemical processes, they are an excellent tracer of mixing in seawater between different continental sources weathered by rainfalls. Using this technique Gourlan *et al*. (2010) already found that Ganges and Brahmaputra discharge was 3 times stronger during interglacial than during glacial times. To test such a result for the Western Gaths in India where the precipitations are among the strongest in this area, we measured εNd since 30 kyrs in 5 oceanic cores, one in the middle of the Arabian Sea, two along the Western Indian Coast and two south of India, on the Maldives Plateau. The carbonate phase and Mn coatings around foraminiferae were leached using acetic acid; we also measured εNd in the detrital fraction of the sediment because it carries the signature of the sources. Dating was performed using $\delta^{18}O$ in planktonic foraminiferae from the same cores and three or four radiocarbon dates per cores.

Both signals from the cores located along the Western Gaths display a large positive peak synchronous with the Younger Dryas (YD) event, 12 kyrs ago. Using a first order mixing model we estimate that local precipitations could have been up to 5 times weaker during this period. Moreover the recovery to Holocene rain level could have been much more longer than the onset. To our knowledge this is the first time that εNd records display a dependency of monsoon rain on YD event. This clearly show that monsoon regime was controlled by Northern Hemisphere climate regime. Large amplitude differences are seen when comparing εNd to $\delta^{18}O$ in planktonic foraminiferae.

The three other cores display a pattern characteristic of the deglaciation (decreasing εNd since the Last Glacial Maximum) without the trace of YD and rather correlated with the $\delta^{18}O$ records. We surmise that those patterns are imprinted by Himalaya where ice covering has a large influence on the precipitations and sediments discharge.

Early Ordovician volcanism in Eucísia and Mateus areas, Central Iberian Zone, northern Portugal

C.J.M. COKE[1], R.J.S. TEIXEIRA[1], M.E.P. GOMES[1], F. CORFU[2] AND A. RUBIO ORDÓÑEZ[3]

[1]Department of Geology, UTAD, Apartado 1013, 5001-801 Vila Real, Portugal (ccoke@utad.pt, rteixeir@utad.pt, mgomes@utad.pt)

[2]Dep. of Geosciences, Univ. of Oslo, PO Box 1047 Blindern, N-0316 Oslo, Norway (fernando.corfu@geo.uio.no)

[3]Dep. of Geology, Univ. of Oviedo, C/ Jesús Arias de Velasco, 33005 Oviedo, Spain (arubio@geol.uniovi.es)

The Eucísia (Alfândega da Fé) and Mateus (Vila Real) areas are located in the Central Iberian Zone, a segment of the northern Gondwana margin which underwent a long Variscan geodynamic evolution. Lithostratigraphically both areas are characterized by a predominance of Precambrian to Cambrian metasedimentary rocks and by the transgressive nature of the Ordovician formations. Continental rifting on the platform of northern Gondwana began around the Middle Cambrian, and opening of the Rheic ocean took place near the Ordovician-Cambrian boundary. In the Eucísia and Mateus areas there is evidence of extensional volcanism related to these events, contemporaneous with a transient inversion, known as the Sardic phase. At Eucísia the Ordovician Armorican Quartzite Formation hosts a < 40 cm thick ash-fall tuff bed, which is mainly composed by muscovite and small amounts of quartz. At Mateus, a subvolcanic porphyritic rock occurs in a 3 m thick vein cutting Precambrian-Cambrian schists. The phenocrysts consist of euhedral/ovoidal plagioclase and microcline and rounded bluish quartz. The groundmass is dark, fine grained and contains quartz, feldspars, muscovite, rare biotite and graphite (identified by XRD). The mineralogical and textural features of this vein resemble those of the augen gneisses from the Ollo de Sapo Formation in Sanabria (Spain), except for a lower degree of deformation/recrystallization. The tuff and the porphyry are both alkali-calcic, peraluminous (ASI ≈ 1.75 – 2.91) and classified as rhyolites in the R_1-R_2 diagram. They show moderate REE contents ($\Sigma \approx 78.3 – 182.6$), $(La/Lu)_N$ values between 11.78 and 12.06, weak negative Eu anomalies ($Eu/Eu^* \approx 0.45 – 0.52$) and REE patterns typical of peraluminous granites. Both rocks have a high content of zircon xenocrysts, but also some magmatic zircon prisms which were dated by U-Pb (ID-TIMS) yielding concordia ages that indicate crystallization in the Early Ordovician: the ash-fall tuff from Eucísia at 482.1 ± 1.5 Ma and the rhyolite porphyry from Mateus at 478.0 ± 1.7 Ma.