

4.0.P04**Nd and Sr isotopes, Trace and Major elements geochemistry of Neogene sediments of Western Amazonia**

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The Miocene depositional environment of Western Amazonia (Pebas formation) is still a matter of debate. It is unclear either a marine megalake [1] or tidally influenced sea [2] occupied the Western Amazonia. However, it is now accepted that Western Amazonia has experienced marine incursions during the Miocene. The transition from this lake/sea to the modern transcontinental fluvial drainage is poorly documented. In particular, the influence of the Andean tectonics on the establishment of the fluvial Amazonian network has been misestimated. However, recent studies have pointed out the control of the Andean foreland basin dynamics on the Miocene to Pliocene evolution of the Western Amazonian paleoenvironment (Hermsza et al., in press; Roddaz et al., in press; Roddaz et al., submitted).

120 samples of Miocene marine/lacustrine to Pliocene fluvial Amazonian formations have been collected during five field trips in Bolivia, Peru and Ecuador from July 1999 to September 2003 along two transects across the Western Amazonian basin. Trace and Major elements were analyzed in these 120 samples. 28 samples were selected and analyzed for Nd and Sr isotopic compositions. In the southern transect (southern Peru-northern Bolivia), Miocene sediments are characterized by more negative ϵNd values than those of Pliocene reflecting more cratonic input or erosion of Silurian formations of the Subandean zone or both. Pliocene sediments are interpreted as a result of a mixing between cratonic granite and subandean sediments. In the northern transect (Northern Peru-Southern Ecuador), the Miocene sediments are characterized by ϵNd values ranging from -8.5 to -10 closed to those of the Amazon fan [3]. Pliocene sediments recorded three distinct fluvial networks: one with average ϵNd values of -11, another with more negative ϵNd values (-15) and the last one average ϵNd of -5. These distinct paleo-rivers were probably controlled by successive uplifts of the forebulge of the northwestern Amazonian foreland basin.

References

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- [2] Räsänen, M.E., Linna, A.M., Santos, J.C.R. and Negri, F.R., (1995) *Science*, **269**, 386-390.
- [3] McDaniel, D.K., McLennan, S.M., and Hanson, G.N., 1997. *Proc. ODP, Sci. Results*, **155**, College Station, TX (Ocean Drilling Program), 169-176.

4.0.P05 **^{57}Fe Mossbauer spectroscopy of fulgurites: Implications for chemical reduction**

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The superliquidus processing of silicates often results in very reduced products, such as Si-bearing Fe metal in type-I chondrules and in lunar regolith agglutinates. Previous work on fulgurites (the glassy products of lightning strike fusion of sand, soil, or rock) found silicon metal and iron-silicon alloys inside the silicate glass. The mechanism for this extreme reduction is not yet understood. In this work, we begin a ^{57}Fe Mössbauer spectroscopy study as well as continuing a microprobe study of several fulgurites to better constrain the extent and process of Fe reduction.

Preliminary work has begun on three fulgurites and Trinitite – a sand fulgurite from Texas; a basalt talus rock fulgurite from Oregon; and a sand and basalt gravel fulgurite from Connecticut; as well as Trinitite glass from the Trinity bomb test site. Microprobe analyses of the samples show a range of Fe contents – 0.04 wt % Fe in the Texas fulgurite to 3.61 wt % Fe in the Oregon fulgurite. The Texas fulgurite is predictably low given its origins as a sand fulgurite. The other three samples contain higher Fe contents, reflecting the basaltic contributions from their country rocks. Other major elements are highly variable, suggesting that if there are any bulk chemistry controls on redox effects, then the samples may differ in the amount of Fe reduction.

Each Mössbauer spectrum was fitted with three independent components representing distributions of Fe atoms in non-homogenous environments, as is appropriate for glasses. The largest component in all spectra is unequivocally that of Fe^{2+} . However, some spectra show smaller contributions from a combination of Fe^{3+} and Fe^{2+} that cannot be resolved. The Fe^{3+} content is probably lowest in the Connecticut sample, increasing in the Trinitite, Texas, and Oregon (highest Fe^{3+}) samples.

Further investigations of the country rock from the localities are underway, because we expect that the porosity and mineralogy of the starting material will have an effect on the post-melting result. Continuing work includes analyses of several more fulgurites, as well as reduced Fe-Si metal blebs from the Connecticut fulgurite. Compositions and oxidation states of the before and after materials will allow thermodynamic modeling of the reduction mechanism that can then be applied to the formation of other reduced natural glasses.