

Sm-Nd and Rb-Sr isotopic systematics of suspended sediments transported by the Solimoes and Madeira Rio: New insights about erosion and sediment provenance in the Amazon basin

J. VIERS¹, M. RODDAZ¹, N. FILIZOLA², F. GUYOT,
F³. SONDAG¹ AND G. BOAVENTURA⁴

¹LMTG, Université de Toulouse, CNRS, IRD, Toulouse, France (viers@lmtg.obs-mip.fr)

²CEMETHI, Universidade do estado do Amazonas, Brazil

³LMTG, Université de Toulouse, CNRS, IRD, Casilla 18 1209 Lima 18, Peru (Jean-Loup.Guyot@ird.fr)

⁴Universidade do Brasilia, Brasilia, Brazil

The Amazon basin is the world's largest Cenozoic fluvial basin with an actual drainage area of $5.8 \cdot 10^6 \text{ km}^2$ and a depositional area of approximately $2.5\text{-}3 \cdot 10^6 \text{ km}^2$. It supplies about 7% of the suspended load (Filizola and Guyot, 2004) to the world's oceans. Filizola and Guyot (2004) give a mean annual suspended sediment flux close to $600 \cdot 10^6 \text{ t.yr}^{-1}$ at Obidos (Para state, Brazil). Ninety seven percent of this amount is contributed by Andean tributaries (62% from the Solimões River and 35% from the Madeira River).

This study reports the Sm-Nd and Rb-Sr isotopic systematics of materials being transported today by the Solimoes Rio and Madeira Rio during the year 2004. Within the ORE (Environmental Research Observatory) HyBam (Hydrology of the Amazon Basin) (<http://www.ore-hybam.org>) monthly samples are collected from the Solimoes River at Manacapuru station (Amazonas state, Brazil) and from the Madeira River at Porto Velho station (Rondonia state, Brazil) (see Hybam website for more details).

The Nd isotopic composition ranges from -8.9‰ to 9.9‰ and from -10.8‰ to -12.1‰ for the Solimoes and Madeira suspended sediments, respectively. The $^{87}\text{Sr}/^{86}\text{Sr}$ ranges from 0.713 to 0.717 and from 0.728 to 0.740 for the Solimoes and Madeira, respectively.

The purposes of this work are 1/ to assess possible systematic temporal variation in the Sm-Nd and Rb-Sr isotopic characteristics of the sediments, 2/ to use these potential differences of isotopic composition to constrain the geographic provenance of these sediments and the importance of bank erosion, and 3/ to estimate a global isotopic signature for sediments transported today by the Amazon River to the Atlantic ocean that can have important implications for the marine geochemistry of Nd.

Reference

Filizola N. and Guyot J-L. (2004) *Hydrological Sciences Journal*, **49**, 143-153.

Carbon and hydrogen isotopic compositions of petroleum hydrocarbons to trace alteration processes in reservoirs

A. VIETH, R. ELIAS AND H. WILKES

GeoForschungsZentrum Potsdam, Telegrafenberg, D-14473 Potsdam, Germany (vieth@gfz-potsdam.de, elias@gfz-potsdam.de, wilkes@gfz-potsdam.de)

Hydrocarbons in petroleum reservoirs are subjected to viable abiotic and biotic alteration processes, such as evaporative fractionation, water washing and biodegradation. These processes cause significant changes in the molecular composition of the crude oil and therefore lead to a decrease in petroleum quality (e.g. lower API gravity, higher viscosity, higher TAN). Hence, the producibility of the respective fluids is negatively affected and the total volume of petroleum in place is reduced. Among the different alteration processes, biodegradation is responsible for the quantitative most important compositional changes in a petroleum reservoir, and therefore the ability to assess the extent of biodegradation is of particular interest for the petroleum industry.

Microbial processes favour the conversion of molecules containing lighter isotopes and therefore biodegradation leads to an enrichment of compounds with heavier isotopes (^{13}C , D) in the residual fraction. In general, hydrogen isotope fractionation tends to be at least one order of magnitude higher than carbon isotope fractionation, indicating higher sensitivity in the assessment of microbial degradation processes.

Recently it was shown that carbon isotope ratios of light hydrocarbons can be used to evaluate biodegradation processes in the Gullfaks reservoir, offshore Norway (Vieth and Wilkes 2006). However, it became clear that both source and also maturity effects have to be well constrained when using carbon isotope ratios for the assessment of biodegradation. In contrast to laboratory experiments, the hydrogen isotope ratios of light hydrocarbons in these crude oils from the Gullfaks field do not show a clear dependence on biodegradation processes. It is suggested that in petroleum reservoirs, besides differences in maturity and source, also the effects of hydrogen exchange between oil and formation water over geologic times have to be considered.

This study investigates the effects of biodegradation on carbon and hydrogen isotopes in crude oils. Here, we will present results of compound-specific isotope analysis on oil samples from different petroleum systems and demonstrate how carbon and hydrogen isotope ratios of petroleum hydrocarbons can be used to evaluate biotic as well as abiotic alteration processes in reservoirs.

References

Vieth, A. and Wilkes, H. (2006), *Geochim. Cosmochim. Acta.* **70** 651-665.