

The role of the Béni floodplain on the chemical weathering fluxes in the upper Madeira basin, Bolivia

J. GAILLARDET¹, L. MAURICE-BOURGOIN²,
J.L. GUYOT³, A. DOSSETO⁴

¹Laboratoire de Géochimie et Cosmochimie, IPGP-CNRS UMR 7579, 4 Place Jussieu, 75252 Paris cedex 05, France

²Observatoire Midi Pyrénées, LMTG, UMR 5563 IRD/CNRS/UPS, 14 Avenue Edouard Belin, 31400 Toulouse, France

³Institut de Recherche pour le Développement, Casilla 18 1209, Lima 18, Peru

⁴Institute GEMOC Key Centre, Department of Earth and Planetary Sciences, Macquarie University, Sydney, NSW 2109, Australia

On a global scale, several authors have reported good correlations between physical erosion fluxes and chemical weathering fluxes (Gaillardet et al., 1999). This linkage have several origins, one being that the active floodplains can act as a biogeochemical reactor in which the sediments produced in mountainous zones and transported by the rivers, once deposited in foreland basins, are deeply weathered.

We have tested this idea in the floodplain of the Rio Beni, in the upper Madeira Basin, in Bolivia.

Extreme physical denudation rates are found in the Bolivian Andes, in particular due to the abundance of poorly lithified shales and of extensive outcrops of fluviolacustrine deposits in the Upper Andes. These river sediments are exported and 40% is deposited in the foreland basin of the Beni R. where extensive floodplains are submitted to wet tropical conditions.

We compare here monthly collected river samples upstream (Rurrenabaque) and downstream (Riberalta) the Rio Beni floodplain and averaged dissolved fluxes (over one year). Concentrations of major elements are corrected from atmospheric inputs.

The main result is that the floodplain has almost no effect on the chemical denudation rates of the Rio Beni, except lowering them because of an increase in the drainage surface area. Although long-term weathering in the floodplain is more intense than in the Andes, the flux of dissolved material released does not impact the Rio Beni chemical denudation rates. The different elements show particular behavior that we will discuss in detail.

We conclude that the foreland basin of the Rio Beni acts above all as a deposition area and does not contribute to the actual chemical weathering rates. This conclusion supports the idea that chemical erosion is essentially active in mountainous areas and that the high temperatures of the plain do not increase the chemical denudation rates. In the Beni river basin, tectonic characteristics (uplift and subsidence zone) appear as the first-order factors controlling chemical weathering fluxes.

Reference

Gaillardet, J. et al., 1999. *Chem. Geol.* **159**, 3–30.

doi:10.1016/j.gca.2006.06.381

Carbon isotope and biogeochemical studies of the Kara Sea—Yenisei and Ob river systems

E.M. GALIMOV, L.A. KODINA, G.S. KOROBENIK,
V.S. SEVASTIANOV, O.V. STEPANETS

V.I. Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS, Moscow, Russia (galimov@geokhi.ru)

The Kara Sea is distinguished by the strong influence of continental river discharge. The studied samples were collected during expeditions to Kara Sea on board of R/V “Academik Boris Petrov” in 1995–2003. Hydrochemical parameters, content and isotopic composition of organic and carbonate carbon, and hydrocarbons (HC), phytoplankton and particulate (suspended) organic matter (POM) in waters were studied at the more than 200 stations throughout the Sea. The $\delta^{13}\text{C}_{\text{org}}$ in sediments varied from -23‰ to -28‰ , and the phytoplankton was $1\text{--}4\text{‰}$ isotopically lighter. Relative enrichment of plankton in Kara Sea in the light carbon isotope is due to the low temperature and deep invasion of the river CO_2 into the sea. Isotope composition of the dissolved CO_2 in the surface seawater was studied and the $\delta^{13}\text{C}_{\text{CO}_2}$ map was plotted. By study of the river-estuary-sea water profiles we deduced from the $\delta^{13}\text{C}$ of plankton and POM that the river water bears $\sim 70\%$ of detritic-humic material and $\sim 30\%$ of plankton-tongeneous, while the coastal marine water— $\sim 20\%$ and 80% , respectively.

Gas hydrocarbons (HC) were extracted from water and sediments. The peculiarity of the geochemistry of the HC-gases in the surface conditions is a comparable content of methane ($0.3\text{--}5\ \mu\text{L/L}$) and the $\text{C}_2\text{--C}_5$ HC ($0.1\text{--}0.5\ \mu\text{L/L}$), including unsaturated HC. Microbial methane with $\delta^{13}\text{C} -105\text{‰}$ to -90‰ appears at the sediment depths between 40 and 200 cm. Frequently the evidences are observed of the methane oxidation, detected by its depletion in the light carbon isotope, and appearance of the isotopically light autigenic carbonates, including ikaite. Ikaite with $\delta^{13}\text{C} -25\text{‰}$ to -60‰ were found out in many localities of the Kara Sea.

The sediments are highly oxygenated along the Novaya Zemlya trough, and biochemical activity is significantly suppressed in those sediments.

The obtained data are important for gas-oil exploration in the Kara Sea and provide a background for ecological control.

doi:10.1016/j.gca.2006.06.382