Chemical composition of Kamchatka rivers, Russia

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In the general attempt to link chemical weathering and climate, the study of riverine erosion in Kamchatka Peninsula provides important informations. As it was shown by several authors (Louvat and Allègre, 1997; Dessert et al., 2002), chemical weathering of silicate rocks, and in particular basalts, is acting as a major atmospheric CO_2 sink. But except previous works on chemical weathering in Iceland (e.g. Gislason et al., 1996), none study have focused on basalt weathering in cold climate. Furthermore, because of almost absence of pollution, this volcanic province is an ideal experimental field for investigating pristine water-basalt interactions.

The Kamchatka Peninsula is a unique region, located in the Far East of Russia, where active volcanism and hydrothermal activity are observed. River samples were collected in April and August 2000. We principally sampled the major rivers of the peninsula (Kamchatka, Avacha and Paratunka) in order to study their erosion fluxes to the ocean. Temperature, pH and alkalinity were measured in the field during sampling. Anions and cations were measured by ion chromatography and trace elements by ICP-MS. $^{87}Sr/^{86}Sr$ isotopic ratios were determined using mass spectrometry. We use also annual data of surface water from the Russian Hydrological Survey.

The dissolved load of the rivers represent a mixture of the atmospheric, weathering and hydrothermal/volcanic sources. To characterise the riverine erosion rates and associated atmospheric CO_2 consumption, it is important to decipher the part of the signal which concerns just the weathering of volcanic rocks. The chemical composition of atmospheric and hydrothermal end-members can be identified by using elements such as Cl and B. After corrections, element concentrations due to basalt weathering are relatively low (e.g. HCO_3 < 400 µmol/l) and inferior to those of Icelandic rivers. These low concentrations are in agreement with the global observations of Dessert et al. (2002) and confirm the good correlation between concentrations and surface temperature. Finally, in spite of low HCO_3 concentrations, the runoff is sufficiently important to produce an atmospheric CO_2 consumption rate around 0.3 10^6 mol/km^2/yr.

References

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Has iodide a conservative behaviour towards claystones ? The Tournemire argillite case

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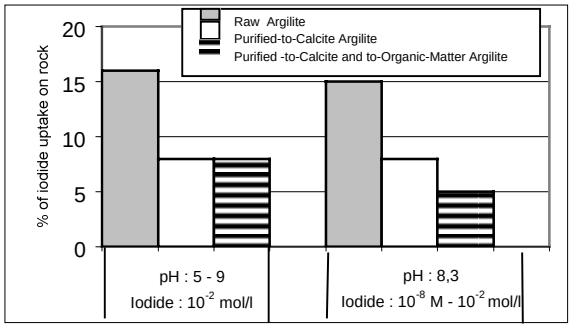
Introduction

Hydraulically active fractures have been discovered in indurated claystones of the Tournemire site (Aveyron, France). An artificial tracer experiment with iodide is thus planned to estimate the extent of circulation in such networks (Savoye *et al.*, 2001). Before carrying out the *in situ* experiments, the sorption properties of iodide were evaluated in the laboratory with batch method in order to verify the conservative behaviour of this tracer.

Materials and methods

Our purpose is to estimate the extent of iodide uptake on three important phases for the argillite of Tournemire: the clayey fraction, the calcite and the organic matter. A study of the influence of both pH and iodide initial concentration was carried out on three solids, obtained by a method based on aqueous extractions (Devol-Brown *et al.*, 1998). The solids are respectively a raw argillite, a calcite-free argillite and a purified-to-calcite and to-organic-matter argillite. The experiments were performed in a controlled atmosphere.



Results and discussion

A summary of the results is reported in the Figure 1.

Figure 1: Iodide sorption on the argillite of Tournemire

The results suggest that, whatever the considered solid-solution system, iodide sorption is weak, and even almost null which means that iodide has no significant affinity for the clayey fraction, the organic matter or the calcite. So, iodide seems to have a conservative behaviour towards the argillite of Tournemire.

References

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