Origin of chemical fluxes carried by boreal rivers : Evidence from major, and trace element, U and Sr isotope data in two Siberian rivers

M.L. BAGARD[1], F. CHABAUX[1], O.S. POKROVSKY[2], A.S. PROKUSHKIN[3], J. VIERS[2], S. DERENNE[4], J. TEMPLIER[4] AND B. DUPRE[2]

[1]CGS, CNRS, UMR 7517, EOST, 1 rue Blessig, F-67084 Strasbourg Cedex, France
[2]LMTG, CNRS, UMR 5563, Observatoire Midi-Pyrenées, 14 Avenue Edouard Belin
[3]Institute of Forest Research, Russian Academy of Science, Krasnoyarsk, Russia
[4]Laboratoire de chimie bioorganique et organique physique, Université Pierre et Marie Curie et CNRS, Paris, France

High latitude regions are characterized by very contrasted hydrological periods, marked by (a) a very low water flow during cold period (October-May), (b) an intense spring flood in May/June and (c) an intermediate to high water flow in summer (June– September). We propose here to quantify the intensity of geochemical fluxes associated to each of these hydrological periods and to constrain their origin. For this purpose, we analysed the temporal variations of the geochemical composition of water samples (filtered at 0.22µm) collected at the outlet of the Kochechumo and the Nizhnaya Tunguska rivers in Central Siberia (Russia). These analyses, performed over two hydrological cycles (2006-2008), were completed by a study of a smaller experimental watershed within the Kochechumo watershed.

Our results combining major and trace element data together with Sr and U isotope ratios show that the melting flood in May results in the input of specific insoluble and soluble element fluxes in river waters. The mobilization of organic and inorganic colloids (from surface soil horizons) accounts for the insoluble element input during the flood period. The source of the dissolved element flux is clearly distinct from the source of winter waters and also originates from the uppermost horizons of the soil-permafrost system, with slight modification during the melting flood. Indeed, melting snow and leached litter appear to be the main chemical source at the beginning of the flood event whereas the suprapermafrost flow, more affected by water-rock interactions, dominates afterwards. This latter flux also dominates the chemical composition of summer river waters. During the winter, we observe in rivers the predominance of deep underground waters possibly affected by mineral precipitation or dissolution processes.

Use of bioassay in the assessment of soil contamination in the mining area of Rodalquilar (Almería, SE Spain)

M.G. BAGUR-GONZÁLEZ[1]*, C. ESTEPA-MOLINA[2], F. MARTIN-PEINADO[3] AND S. MORALES-RUANO[4]

[1]Anal. Chem. Dep. Univ. Granada. Spain (*correspondence: mgbagur@ugr.es)
[2]Min. & Pet. Dep. Univ. Granada. Spain (carmenem@ugr.es)
[3]Soil Science Dep. Univ. Granada. Spain (fjmartin@ugr.es)
[4]Min. & Pet. Dep/ IACT. Univ. Granada/ CSIC. Spain (smorales@ugr.es)

This work uses two types of bioassays to study the toxicity in soils from a mining area contaminated with heavy metals and arsenic. Total and soluble concentrations were analyzed by XRF and ICP-MS, respectively. Anomalous values for As, Pb, Zn and Cu were obtained in all cases, and in the case of As most samples had values above the intervention levels found in the literature. The *Lactuca sativa L.* bioassay measured the following variables: Seed Germination (SG), Root Elongation (RE), and Root Necrosis (RN). The *Vibrio fischeri* bioassay measured the decrease in luminescence at 5 and 15 minutes in relation to the control.

The results obtained with *Vibrio fischeri* indicated that there was low or negligible toxicity degree in the soil samples using this test, while *Lactuca sativa L.* showed a higher degree of sensitivity. RN was not observed in any of the samples. SG obtained a toxic response in only 20% of the samples (with germination values reduced by 35% in relation to the control). RE was the most discriminate, differentiating three toxicity levels according to the level of reduction compared to the control: high (> 70%), moderate (50-30%), and low (< 30%). 50% of the samples had low or negligible toxicity, 30% showed moderate toxicity and 20% had a high toxicity level. In the soil samples analysed, there was a low correlation between the intervention level in the literature and the data obtained in the bioassays. Regulatory levels must therefore be revised to avoid the use of single values for large regions or countries, and progress must be made towards a proposal for regulatory levels according to specific test and soil type.