Unusual U-REE deposits at Mt Isa, Australia and potential links to mid-crustal anorogenic granites

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The unusual Uranium-Rare Earth Element (U-REE) deposits of Mount Isa, Queensland, associated with immobile element enrichment (Y, Zr, Nb, LREE, locally Ti) show a significant spatial relationship to radiometrically anomalous intrusive phases of the mid-crustal Sybella Granite Batholith. The high K and U radiometric anomalies in recent phases of the Sybella Batholith suggest a possible link with the U-REE deposits. Geochemical results for the most anomalous Sybella microgranite phase, indicates enrichment in several incompatible and high field strength elements, including elevated mean LREE content (189ppm Zr, 26ppm Y, 44ppm La and 90ppm Ce).

In the largest U-REE deposit, Valhalla, LREE enrichment (≥500ppm) is well correlated with the highest U (≥3.2wt% U_3O_8), associated with brannerite and uraniferous zircon [1]. The textural association of fluoroapatite surrounding brannerite [2, 1] suggests involvement of F in controlling U, REE and Zr mobility. The Sybella microgranite phase has geochemical characteristics typical of anorogenic granites [3], which are associated with U-REE mineralisation at other localities worldwide. Previous geochronological work on the Sybella microgranite gives ambiguous emplacement age constraints, allowing the possibility of a syn-Isan intrusion significantly later than the main intrusive Sybella phase (ca. 1670Ma [4]), possibly around 1555-1510Ma [1].

Our geochemical results, combined with a younger microgranite age, would support a genetic association with the ~1530Ma U-REE deposits, and more geochronological work is in progress to further test this possibility. Given that magmatic fractionation promotes enrichment of the incompatible elements seen at Valhalla, and that these elements are generally immobile in typical metamorphic fluids, we suggest that this unusual style of mineralisation most likely has a magmatic-hydrothermal origin.

[1] Polito *et al*. (2009) *Min Dep* **44**, 11–40. [2] Gregory *et al*. (2005) *Econ Geol* **100**, 537–546. [3] Eby (1990) *Lithos* **26**, 115–134. [4] Page & Bell (1986) *Journal Geol* **94**, 365–379.

Impact of biotic and abiotic factors on the mobilization of heavy metals in Al-Ghadir river sediments (Lebanon)

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Although there is no doubt about the importance of bacterial activity on solubilisation and distribution of metal in aquatic sediments, hydromorphic soils and ground waters very little is known about the involvement of bacterial dissolution in periodically anaerobic environments like that found in dredged sediments and little is known about the processes and environmental factor controlling this process.

Our study aims at underlining the role of autochthonous bacteria in the biodegradation of organic matters and the mobilization of metals (Zn, Pb, Co, Cr, Cd, Al, Mn and Fe) contained in sediments in Al-Ghadir river. In order to do so, we have follow over time the evolution of carbon metabolism (Organic matter evolved, carbon consumption, organic acids production) and metals release in batch reactor where the sediments were mixed with a culture medium. The experiments were monitored under standard anaerobic conditions.

Under the adopted conditions, the incubated sediments showed a significant release of organic carbon corresponding to bacterial development.

Mineral analysis showed an important solubilisation of iron and manganese (in reduced form) indicating the presence of Fe and Mn-reducing bacteria in sediments. Co and Cr solubilisation were also observed and appeared concomitant to Fe and Mn indicating that Co and Cr are associated to Fe and Mn in sediment. Al and Zn were associated to organic matter while Cd and Cu were associated to organic matter and to Fe and Mn oxides.

At the end of the incubation, the molecular techniques showed (i) the disappearance of some bacterial strains due to the toxicity of the released heavy metals and (ii) the growth of new population of microorganisms tolerant to the same heavy metals.