The mobility of U in groundwater: A study done in a semi-arid region of South Africa

M. TREDOUX[1]*, A. LITTHAUER[1] AND P.D. VERMEULEN[2]

[1]Dept of Geology, Univ. of the Free State, PO Box 339, Bloemfontein, 9300 South Africa (*correspondence: mtredoux.sci@ufs.ac.za)

[2]Inst. for Groundwater Studies, Univ. of the Free State, PO Box 339, Bloemfontein, 9300 South Africa (vermeulend.sci@ufs.ac.za)

The current trend to limit fossil fuel burning will inevitably lead to an increase in the use of nuclear power. Understanding of the geochemical behaviour of U thus becomes of renewed importance in order to estimate the impact of more intense activity at all levels of the U fuel cycle. This study investigated the area around an abandoned U exploration target , so as to establish the extent to which U from a disturbed ore body would be taken up by water, especially the groundwater, in contact with it. This information is of cardinal importance to inhabitants of the region, as boreholes are the major source of potable water [1].

The ore body consists of coffinite and secondary uraninite disseminated in C-rich sandstone [2] (Cole and Wipplinger, 2001). Seventeen boreholes were sampled, most of them in the immediate vicinity of the zone with elevated U concentrations. Five surface samples were taken, four from a semi-permanent stream which crosses the ore zone and one from a small pond in an exploration pit. The samples were analysed for major ions by ICP-OES and for U, Pb, Mo, W and As by ICP-MS.

Chemical contour maps will be presented, from which it is clear that (a) all the samples had very low ($<1\mu g.L^{-1}$) trace element concentrations, and (b) slightly elevated U values in the water occur only within the ore zone. The observed immobility of U in this study is in concert with the findings of research done at the Oklo Natural reactor (e.g. [3]) and in the marine environment (e.g. [4]), and indicate that U mining, if responsibly done, may be environmentally less invasive than coal mining.

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Hypersaline metalliferous fluids associated with orogenic gold deposits in the Loulo mining district, West Mali: Significance to ore genetic models

PETER J. TRELOAR[1], DAVID LAWRENCE[1], ANDREW H. RANKIN[2] AND PAUL HARBIDGE[2]

[1]CEESR, Kingston University, KT1 2EE, UK (*correspondence: P.Treloar@kingston.ac.uk) (D.lawrence@kingston.ac.uk, A.Rankin@kingston.ac.uk)

[2]Randgold Resources, St Helier, Jersey, JE1 1BJ (PHarbidge@randgoldresources.com)

The current paradigm for orogenic gold deposits is that they are derived from metamorphic fluids. However, the recognition of hypersaline $H_2O \pm CO_2$ fluid inclusions, with up to ~60 wt. % TDS in orogenic gold deposits of the Loulo mining district in West Mali, enables us to question this model. Two, distinctly different, fluid inclusion populations have been recognised in the Loulo deposits. The dominant population are low salinity (<10 wt. %), CO_2-rich and mixed CO_2-H_2O inclusions of low salinity both with variable amounts of N_2 and CH_4. These inclusions are similar to those reported throughout the Birimian of West Africa where they are generally interpreted as being derived from fluids of metamorphic origin. Hypersaline inclusions form a volumetrically smaller, but important, set. We have cracked open hypersaline inclusions hosted in quartz veins and identified an array of associated daughter minerals that include Na, Fe, K and Ca chlorides, Fe oxides and carbonates. Other metals detected in the daughter minerals include Cu, Pb, Zn, Sr and Ba at > 1000ppm. These fluid chemistries and those of their daughter minerals are characteristic of magmatically derived fluids. Au mineralisation is associated with a pervasive B flux marked by extensive syngenetic tourmaline growth, and substitution of Ni and Co into sulphide phases. These factors, together with the lack of evaporites in the region, all suggest a significant magmatic fluid influence on the origin of these 'typical' orogenic gold deposits. However, two features suggest a potential link into a deeper seated IOCG system. One is the widespread albite alteration that accompanies mineralisation. The other is the presence of spatially associated Fe-skarn deposits. We stress the recognition of a potential important linkage between a hitherto unrecognised but important magmatic contribution to orogenic gold deposits and IOCG systems.