Impact melt sheet zircons and their implications for the Hadean crust

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Impacts may have been important mechanisms of crustal redistribution and differentiation, particularly during intense post accretionary bombardment between 4.5Ga and 3.9Ga [1]. Our understanding of crustal processes during this period comes predominantly from detrital zircons from the Yilgarn craton. A titanium thermometry peak at 680°C [2], together with granitic inclusion assemblages and rare earth element characteristics have been taken as evidence for a granitic source for the majority of analysed grains (e.g. [3]).

There is, however, currently a lack of understanding of zircons known to crystallise from impact melt sheets, a potential source for the ancient Yilgarn grains. Accordingly, we have characterised zircons from throughout the differentiated 1.85Ga [4] Sudbury impact melt sheet. LA-ICPMS analysis reveals systematic Ti-thermometry crystallisation temperature variations throughout the stratigraphy, which are linked to magmatic differentiation. Sample means range from 860-750°C in norites, to 780-720°C in granophyres and ~780°C in an offset dyke quartz diorite. These results suggest that differentiated impact melt sheets are not the source of the low temperature Hadean zircons, although may be represented in the c.43% of >3.9Ga zircons that fall in the range of 700-900°C.

Analysis of the inclusion populations of Sudbury zircons reveals that all samples are dominated by quartz, plagioclase, alkali-feldspar, biotite and hornblende, with apatite a major constituent of norite inclusion assemblages. The results of our study indicate that late residual melts in relatively mafic magmas can crystallise remarkably similar zircon inclusion populations to those reported for the >3.9Ga Yilgarn zircons.

[1] Grieve *et al.* (2006) *GSA sp. pap.* **405**, 23–31. [2] Watson & Harrison (2005) *Science* **308**, 841-844. [3] Wilde *et al.* (2001) *Nature* **409**, 175-178. [4] Krough *et al.* (1992) *Can J. Earth Science* **19**, 732-738.

The incorporation of Gd in human bone from medical contrast imaging

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Gadolinium (Gd) chelates are the most commonly used contrast agent because of the paramagnetic properties of Gd. Free gadolinium (Gd(III)) is extremely toxic by disrupting cellular processes, and as a known calcium antagonist. Gd is therefore chelated to protect patients from toxic Gd(III) exposure. The literature suggests that Gd clears the body within 60 minutes of exposure. We measured the rare earth element chemistry of 59 femoral head fragments from patients undergoing hip replacement surgery (ICP-MS). 13 patients had documented histories of Gd-based contrast exposure. 15 had no history of exposure and 31 had incomplete medical histories. Significant concentrations of Gd were found in bone from patients with documented exposures as many as 7 years post-exposure (Fig. 1). A complete discussion of results will explore the relation between bone pathology, accumulation of Gd and the distribution of REE in human bone.

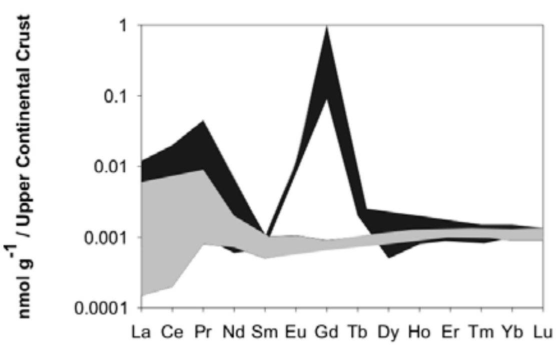

Figure 1: REE bone normalized to upper continental crust.