High-resolution U-Pb LA-Q-ICPMS age mapping of zircon

DAVID CHEW[1], JOE PETRUS[2], BALZ KAMBER[1],
TERESA UBIDE[1] AND CORA MCKENNA[1]

[1]Trinity College Dublin, Ireland (chewd@tcd.ie)
[2]Laurentian University, Sudbury, Canada

We present U-Pb LA-Q-ICPMS age maps of leucosome zircon from the Eastern Cordillera of Peru. The zircons have typical grain sizes of c. 200×100 μm^2 and clearly defined cores and rims (c. 1050 Ma cores with low U; c. 470 Ma rims with high U). Images were acquired by rastering a 7 μm spot at 3 $\mu m/s$, with an 8 Hz repetition rate and a 5.4 J/cm^2 fluence. 91500 zircon was analyzed regularly under identical conditions as the primary reference material. The images display excellent correlation between CL intensity and U content (Figs 1, 2). The U-Pb age maps are consistent with independent SIMS ages, while secondary standard age maps are either in agreement (Temora) or consistently too young (Plešovice). The difference in U-Pb fractionation between Plešovice and 91500/Temora is attributed to differences in radiation damage or colour which likely influences laser coupling at small spot sizes (7μm).

Customized mapping routines integrated within Iolite (Imago; [1]) were developed to analyse the data in more detail, including the abilities to: define arbitrarily shaped regions of interest, inspect the data under the cursor on a concordia diagram, and bin all of the map data onto a contoured concordia diagram. Using this last approach, a number of $4 \times 4 \mu m$ "data" blocks were sampled from a U-Pb zircon map. When plotted as a contour on a concordia diagram, the data blocks define discordia mixing lines between the c. 470 and 1050 Ma age components and also Pb loss and common Pb vectors. Potential applications of this new tool include imaging complex polyphase zircons and extracting data from polygons of isochronous areas; correlating zones of Pb loss with high U; and characterising the U-Pb systematics of key samples for U-Pb TIMS dating.
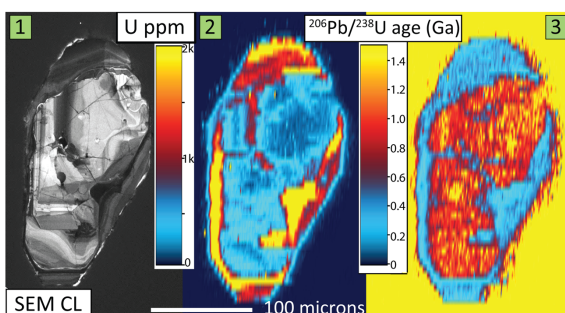
[1] Petrus J & Kamber B (2013) Min. Mag. **77(5)** 1959.