High precision LA-SF-ICP-MS U-Pb zircon dating of Archaean gneisses, southern West Greenland

J.A. HOLLIS[1], D. FREI[1], A. GERDES[2], A. A. GARDE[1], AND J.A.M. VAN GOOL[1]

[1] Geological Survey of Denmark & Greenland, Øster Voldgade 10, 1350 Copenhagen-K, DENMARK; jho@geus.dk

[2] Institute of Geosciences, J.W. Goethe University, Senckenberganlage 28, 60054 Frankfurt, GERMANY

High-precision LA-SF-ICP-MS U-Pb zircon dating

High precision U-Pb zircon dating is achieved using a New Wave UP 213 laser coupled to a ThermoFinnigan Element2 magnetic sector field - inductively coupled plasma - mass spectrometer (SF-ICP-MS). A low-volume sample chamber allows a fast washout time (≥ 15 s). Helium is used to flush the sample chamber. This yields smooth, spike-free signals and allows detection of minute inclusions. The automated system and fast analysis time (< 2 min) gives a sample throughput at least three- to four-fold higher than SIMS techniques.

Analyses of widely used zircon standards (i.e. 91500, Mud Tank, Plesovice) gives precision and accuracy comparable to SIMS. Long-term precision (2σ) based on 109 analyses of 338 ± 1 Ma Plesovice zircon [1] by 2 operators was 1.8 % , 2.3 %, and 1.1 % for $^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$ and $^{207}Pb/^{206}Pb$ ratios respectively.

Detrital zircon studies in southern West Greenland

The short analytical time allows analysis of large numbers of grains, making the technique well suited to regional studies. In southern West Greenland this has been used to assess the age and sources for the main supracrustal belts from Archaean detrital zircon populations. Average precisions of 4.2 % , 4.8 %, and 1.5 % for $^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$ and $^{207}Pb/^{206}Pb$ ratios respectively were obtained for over 1,000 analysed grains.

Data collected for metavolcanic and metasedimentary rocks shows distinct and regionally significant episodes of volcanism and sedimentation at 3.07 and 2.83 Ga. These correlate with major episodes of TTG magmatism, consistent with a common link between Archaean crustal growth via subduction-related magmatism and formation of supracrustal rocks. These causal links on a regional scale are difficult to establish without the benefit of large data sets. Meanwhile the quality of data allows confidence in the significance of individual analyses.

[1] Aftalion M., Bowes D,R., and Vrana S. (1989) Neues Jahr. Min. Monat **4**, 145-152.