Simultaneous *in situ* laser ablation analysis of Pb-U and Lu-Hf isotope ratios in zircons using MC-ICPMS

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Laser Ablation ICPMS is a powerful technique for producing high quality zircon age data from U-Th-Pb isotopic studies. The results may, however, not correctly indicate the number of zircon forming events, especially those arising from multiple growth and alteration processes. This limitation can be overcome by combining Pb-U and Lu-Hf analyses made on small, well defined zircon areas, ideally from the same spot.

At last years Goldschmidt conference we presented U-Pb and Lu-Hf data measured simultaneously from the same spot using laser ablation ([1]). The flow of the ablation cell was split by a Y-shaped connector and introduced simultaneously into the Thermo Scientific ELEMENT 2 for U-Th-Pb analysis and into the Thermo Scientific NEPTUNE for high precision Lu-Hf analysis. Often, Pb and U concentrations in zircons are much lower compared to Hf concentrations. This requires different detection systems for the analysis of Pb-U and Lu-Hf. The amount of Lu-Hf in zircons is sufficient for producing ion beam intensities to be measured in Faraday Cup detectors, whereas Pb and U isotopes require ion counting detectors.

In this study we present U-Th-Pb and Lu-Hf isotope ratios obtained using the NEPTUNE MC-ICPMS where the mass spectrometer was ran in a combined mode of static Faraday cup measurements and rapid dynamic peak jumping: For high precision Lu-Hf measurements we used static Faraday cup measurements alternating with rapid peak jumping of the U-Th-Pb isotopes on the axial ion counter. The NEPTUNE was coupled to a UP213 Laser from New Wave and it is equipped with 9 Faraday Cups enabling the analysis of all Hf isotopes, including the Yb, Lu and W interferences. During the analysis, all Pb isotopes, as well as Hg, Th and U isotopes are measured in fast peakjumping mode in the secondary electron multiplier. This enables the analysis of the Pb-U and the Lu-Hf isotopes systesms within one Laser Ablation event (e.g. within the same spot).

[1] Schwieters, J.B. *et al*. (2008) *Geochim. Cosmochim. Acta* **72**-12S A843.

Nd isotopes in the Norwegian Sea: Glacial-interglacial ISOW variability?

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Paired neodymium isotope (ε_{Nd}) records measured on benthic foraminifers and acid-reductive sediment leaches from marine sediment core KN177-2 GGC17 (62° 49.25N 1° 18.1645E, 968m) in the Norwegian Sea reveal a complex history of compositional variability. Despite both techniques having been used to reconstruct records of past bottom water ε_{Nd} composition [1,2], at this locality the two records significantly differ and do not co-vary through time. The benthic foraminifer ε_{Nd} data fall entirely within the range of observed Norwegian Sea water ε_{Nd} compositions [3], while the sediment leach ε_{Nd} data are often more radiogenic than any contemporary Norwegian Sea water ε_{Nd}. The sediment leach data are likely recording detrital ε_{Nd} rather than bottom water.

Owing to the proximity of the core site to the Iceland-Scotland ridge, one possible interpretation of the benthic foraminifer ε_{Nd} data is as a record of past Iceland-Scotland Overflow Water (ISOW) composition. As a contributor to North Atlantic Deep Water (NADW), ISOW ε_{Nd} changes on glacial-interglacial timescales may be reflected in NADW composition; no such NADW ε_{Nd} variability has thus far been detected [4,5], but this may be a function either of data resolution in these studies or the absence of a glacial ISOW contribution. Simple modelling shows that, if the glacial ISOW contribution to NADW was the same as at present, then the observed change in NADW ε_{Nd} composition could be ~-0.4 ε units.

[1] Klevenz *et al.* (2008) *EPSL* **265,** 571-587. [2] Rutberg *et al.* (2000) *Nature* **405,** 935-938. [3] Lacan and Jeandel (2004b) *G*^{3} **5** Q11006. [4] Foster and Vance (2006) *Nature* **444,** 918-921. [5] van de Flierdt *et al.* (2006) *Paleoceanography* **21,** PA4102.