Palaeoclimate reconstruction in the southern Great Hungarian Plain based on noble gases

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The solubility dependency of noble gases enables the determination of the recharge temperature, the so-called noble gas temperature (NGT), which being complemented with groundwater dating is a very powerful tool for palaeoclimate reconstruction. Around the world, numerous studies on palaeoclimate reconstruction using NGT's have found 4−6°C temperature rising between the Last Glacial Maxiumum (LGM) and the Holocene. Only two study areas are known so far where larger temperature differences between late Pleistocene and early Holocene have been obtained based on noble gas concentrations in groundwater [1-2]. One of the aims of our investigation was to confirm this unusual temperature shift after the LGM. Palaeobotanical and quartermalacological studies have shown that the southern part of the Great Hungarian Plain was never continuously frozen, not even during the LGM [3].

31 groundwater samples have been analysed for radiocarbon and noble gases as well as water chemistry and stable isotopes. Inverse calculations were performed to find input parameters, namely temperature, excess air amount, and fractionation of the excess air for the closed-system model [3], which most accurately reproduced the measured values. We obtained NGT's with low temperature inaccuracy, that were plotted against ^{14}C values. Two data groups can be distinguished: the first one contains NGT's from 10 to 13°C with a mean of 12.39±0.81°C. These samples might represent the Holocene. The other group with an average 3.26±0.38°C involves the cold NGT's that seems to derive from the late Pleistocene, namely the LGM. As a result, we obtained a difference of 9.13±0.89°C between the Holocene and late Pleistocene. Our study has confirmed that the temperature increase was much higher in the Carpathian Basin than in most of the other parts of the world at that time.

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[1] Aeschbach-Hertig *et al.*, *Geo. Cosm. Act.* **66**. 797-817. [2] Stute and Deák, *Radiocarbon*, **31**. 902-918. [3] Sümegi and Krolopp, *Quatern. Int.* **91**. 53-63

Fractionated highly siderophile elements in fertile mantle xenoliths

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In our attempt to understand the chemical and isotopic composition of the upper mantle we focussed on fertile mantle xenoliths with (a) more than 10% cpx and with (b) rocks with little or no indication of metasomatism [1]. Six of these samples have lower $^{87}Sr/^{86}Sr$ ratios in cpx than the most depleted MORB-samples. HSE and Os-isotopes of nine samples were determined by isotope dilution and mass spectrometry using the same equipment as, and following procedures by Becker at al [2].

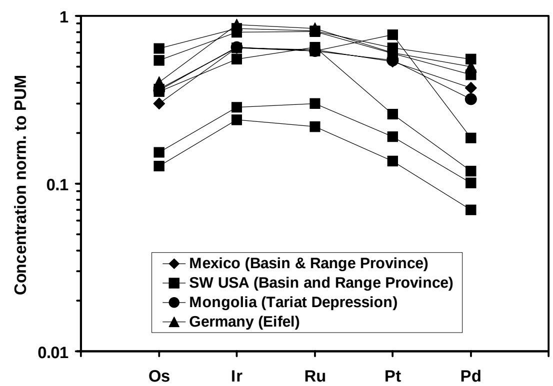

Figure 1: HSE patterns of fertile mantle xenoliths normalised to PUM [2].

All samples analysed (Figure 1) have (a) high Ir/Os, often observed in peridotites with melt/rock interaction, are (b) depleted in Pt and Pd relative to Ir, normally found in peridotites that have experienced partial melting, have (c) lower absolute HSE abundances than PUM, and show (d) a good correlation of Ir and Os with Al, contrary to a larger data set of mantle HSE [2]. Some of these characterisitics suggest complex processes that have affected the HSE, yet major and trace element composition and mineralogy indicate the primitive nature of these rocks apparently unaffected by igneous processes and metasomatism.

[1] Witt-Eickschen *et al*. (2009) *GCA* **73**, 1755-1778. [2] Becker *et al.* (2006) *GCA* **70**, 4528-4550.