Access to the largest geosphere laboratory in the world – the Äspö Hard Rock Laboratory

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Nova FoU (Nova R&D) www.novaoskarshamn.se is a joint research and development platform at Nova Centre for University Studies Research and Development in Oskarshamn, Sweden. The platform is a cooperation between the Swedish Nuclear Fuel and Waste Management Co (SKB) and the municipality of Oskarshamn. SKB has a general policy to broaden the use within society concerning research results, knowledge and data gathered within the SKB research program. Nova FoU is the organisation which implements this policy by facilitating access for external research and development projects to SKB's facilities in Oskarshamn, Sweden (Fig. 1 and 2). The facilities are: Äspö Hard Rock Laboratory Äspö HRL) (located 450 meters underground), the Bentonite Laboratory, the Canister Laboratory and Site Investigations Oskarshamn.

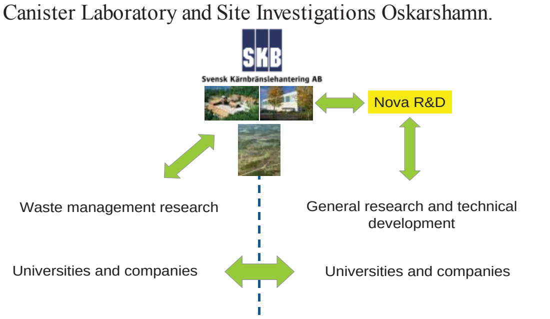

Figure 1: Nova FoU gives free access to the SKB facilities in Oskarshamn for general resarch and technical development within various geospehere projects and for technical development.

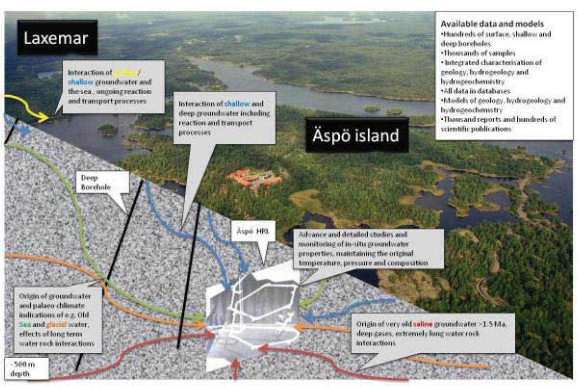

Figure 2: Research possibilities at Äspö HRL through Nova FoU

The unique Äspö Hard Tock laboratory is now open for new research outside the field of spent nuclear fuel. The present Nova status is that more than 20 projects are ongoing and engage 80 researchers. The total project value is 5 million USD. Major domestic universities and international universities are involved.

A new way to look at mantle heterogeneities : Multiple sulfur-isotope on Pacific Antarctic ridge

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On- and off-axis basalts have been collected along the Pacific-Antarctic Ridge (PAR) during the PACANTARCTIC cruises, between 65 and 40°S. The distance between this area and any of the numerous pacific hotspots (d>1000 km) allows determination of the average local upper mantle composition, undisturbed by any mantle plume [1]. Previous study [2] has revealed a subtle but significant Sr-Nd-Hf-Pb-He isotope variability for on-axis samples, mostly seen as the consequence of a large-scale melting process of a marble-cake assemblage. The off-axis samples, collected between 50 and 40°S, show more radiogenic $^{87}Sr/^{86}Sr$, $^{206}Pb/^{204}Pb$, and $^{4}He/^{3}He$ ratios, varying between the local mean MORB value and 0.703065, 20.2 and 180 000 respectively. Such values reflect an increased contribution of the marble-cake enriched component.

In order to better assess the nature of the local components and their distribution in the Pacific Antarctic mantle, we conducted a Sulfur multi-isotopes study on 29 on-axis and 8 off-axis samples from the PAR. Using an improved method allowing quantitative recovery of sulfur from basaltic glasses, we report data with external precision to be ± 0.005‰, 0.10‰ and 0.10‰ in 1σ for $\Delta^{33}S$, $\delta^{34}S$, and $\Delta^{36}S$ respectively.

All our samples are homogeneously ^{33}S and ^{36}S slightly depleted compared to the theoretical mass-dependent prediction, with a mean $\Delta^{33}S$ of -0.015 ± 0.004 (1σ) and a mean $\Delta^{36}S$ of -0.186 ± 0.046 (1σ). Besides, almost all the basalts are ^{34}S depleted when compared to the Canyon Diablo Troilite (CDT) standard. Their mean $\delta^{34}S$ is -0.68 ± 0.42 ‰ (1σ), varying between -1.2 and +0.6‰. $\delta^{34}S$ of our samples appears constant over lengthscales of several hundred kilometers with localized spikes of ^{34}S-enriched values, recorded mainly in on-axis samples. The $\delta^{34}S$ background of on-axis samples is constant at -0.8‰ from 65 to 46°S and reaches -1.2 ‰ northward. The off-axis basalts are equally ^{34}S depleted and also record the $\delta^{34}S$ background transition at 46°S.

We interpret the spike-like ^{34}S enrichments as the result of oceanic crust assimilation, in agreement with their high Cl/K ratios (>0.2) typical of fast-spreading ridge context. Taken together, the negative $\delta^{34}S$ recorded in the on- and off-axis basalts show that the local depleted mantle is statistically distinct of the chondrite reservoir ($\delta^{34}S$ = 0.0 ± 0.4 ‰), from the sulfur isotopes point of view. Finally, along ridge variation in the $\delta^{34}S$ background at the northern end of the area is concomitant with a Pb isotopic evolution toward less radiogenic values. This illustrates the isotope variability of the local enriched component, revealing that the marble-cake assemblage may contain more than one recycled constituent.

[1] Moreira et al. (2008) G.*R.L.* **35**, 49-54. [2] Hamelin et al. (2011) *Earth Planet. Sci. Lett.* **302**, 154-162.