$\delta^{18}O$ and Cl/Nb evidence for fractional crystallization origin of silicic island arc magmas

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Subduction-related silicic magmas may form either by extreme crystal fractionation or by partial melting of crustal rocks. Both mechanisms can be distinguished by their characteristic $\delta^{18}O$ and Cl signatures.

Laser-fluorination analysis of andesitic to rhyolitic volcanic glasses from the Kermadec island volcanoes and of basaltic to dacitic glasses from the Lau and Havre backarc rifts yielded very uniform $\delta^{18}O$ values of 5.4 to 6.5‰. This range is characteristic for mantle-derived magmas. The Cl concentrations show a positive correlation with the SiO_2 content while Cl/Nb ratios remain almost constant for the samples.

Magma generation by partial melting of sediments and/or low temperature hydrothermally altered oceanic crust, both typically having high $\delta^{18}O$, can be ruled out as these processes would cause much heavier isotopic values. A strong positive correlation between $\delta^{18}O$ and SiO_2 content would be expected but is not seen in our data.

Hydrothermal alteration of the oceanic crust leads to amphibolite with low $\delta^{18}O$, and melting of such rocks would lead to values much lower than observed. Assimilation of such materials also causes high and variable Cl concentrations and variable Cl/Nb ratios unlike the observed systematic trend.

The small variation of the $\delta^{18}O$ data as well as the very slight increase with SiO_2 content is best explained by fractional crystallization that modifies $\delta^{18}O$ values of the precursor mantle magma by 0.3 to 0.8‰ towards heavier values [1]. This is also consistent with a positive correlation between the incompatible Cl and SiO_2 content and with the constant Cl/Nb ratios in these samples. Both parameters prove monotonous enrichment of the magmas in Cl with increasing differentiation and indicate that degassing was insignificant at least for the submarine glasses.

[1] Bindeman *et al*. (2004) *GCA* **68**, 841–865.

Destruction of Paleoproterozoic crust: Deciphered from detrital zircon populations and geochemistry of quartzites (NE Poland)

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Among the many crystalline rocks sampled from the Precambrian basement of NE Poland, which is accessible only by drilling, there are local occurrences of quartzites and quartzitic schists. The quartzites were previously interpreted as Neoproterozoic quasi-platform cover which was formed during post-Gothian peneplanation after emplacement of Mezoproterozoic AMCG intrusions [1]. Correlation with Jotnian sediments exposed in Central Fennoscandia (Baltic Shield) was presumed. Here we present the first results of detrital zircon U-Pb and geochemical investigations of the provenance of quartzitic samples from two isolated drill holes (Mońki and Zabiele). Quartz meta-arenites and subarkoses in terms of Herron's chemical classification record a transition from an active continental margin towards a passive continental margin setting (Th–Sc–Zr/10, Th–La–Sc and Ti/Zr–La/Sc plots). A total of 70 detrital zircon grains from two drill core samples were analyzed by SHRIMP II. The U-Pb data demonstrate that the detritus was derived mainly from Paleoproterozoic crust (2.1–1.8 Ga). Archean grains are rare. No Mezoproterozoic component was detected. Three Paleoproterozic age populations were identified with a major peak at 1.95 Ga. The youngest concordant grains were dated at 1757 ± 24 Ma (Mońki depth 740 m) and 1745 ± 24 Ma (Zabiele depth 690 m) age. These data, however, do not support a Jotnian signature as deposition of Jotnian sediments in central Fennoscandia continued long after the 1.55 Ga anorogenic rapakivi magmatism up to 1.26 Ga A significant revision of the formerly assumed stratigraphic position of quartzitic rocks and correlation with uppermost mature Paleoproterozoic Västervik quartzites [2], S Sweden from the Fennoscandian continental margin, is proposed.

[1] Ryka W. (1998) *Prace Państ. Inst. Geol.* **161**, 19–26.
[2] Claesson S. & Sultan L. (2008) *33rd International Geological Congress, Oslo 6–14/8* ***2008***, session GDP-02