Low Cu/Ag in continental crust and slab melts

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The continental crust (CC) has distinctively low Cu/Ag (~500) compared to primitive mantle and mantle derived magmas with Cu/Ag ~ 3000-4000 [1,2]. Low Cu/Ag < 1000 is however typical for evolved arc melts formed by low-temperature crystal fractionation in presence of crystalline Cu-rich sulfide [2,3]. Thus, the low Cu/Ag in bulk CC has been porposed to reflect an enlarged fraction of evolved arc magmas and delamination of their complimentary mafic sulfide-bearing cumulates back in the mantle [3].

We studied the systematics of chalcophile elements in a suite of high-Mg# rocks from the Western Aleutian Arc and Komandorsky Basin - a region, where modern crust has a composition and geophysical properties similar to Archaean CC [4]. The samples were analysed by LA-ICP-MS in-situ (glass) or in pressed pellets (whole rocks).

MORB-type basalts from the Komandorsky Basin are relatively enriched in Cu (62-75 ppm), depleted in Ag (0.022-0.028 ppm) and have high mantle-like Cu/Ag (~2700). At the opposite extreme, SiO_2- and Sr-rich high-Mg# andesites and dacites - possible slab melts - are depleted in Cu (10-30 ppm), enriched in Ag (0.04-0.10 ppm) and have very low Cu/Ag (200-460). Piip Volcano high-Mg# basaltic andesites - the products of advanced interaction of slab melts with mantle peridotite - have intermediate compositions. Low-temperature hydrous slab melting in the presence of crystalline sulfide can explain the ~10x lower Cu/Ag in the Aleutian adakites compared to their MORB/OIB-like source in the subducted slab.

The results suggest that low Cu/Ag in CC may reflect a large contribution from melts derived from subducted sulfide-bearing eclogite. Delamination of sulfide-rich arc cumulates is not required to explain dissimilar Cu/Ag in the CC and Earth's mantle.

[1] Rudnick & Gao (2003) *Treatise on Geochemistry*, 1-64. [2] Jenner et al. (2010) *J. Petrol.* **51**, 2445-2464. [3] Jenner (2017) *Nature Geosci* **10**, 524. [4] Gazel et al. (2015) *Nature Geosci* **8**, 321-327.