A contribution from radiogenic isotope study to metal source and timing of gold orogenic deposits: A case of Nezhdaninsky deposit, Yakutia, Russia

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The relation of orogenic gold deposits to a magmatic activity is still yet controversial. The U-Pb and Rb-Sr (rock forming minerals) isotope ratio of the intrusive rocks associated with the Nezhdaninky world class gold deposit (NGD) (Au>470 t) hosted by the Permian carbonaceous-clastic sequence was studied [1]. The lamprophyre dikes has the concordant U-Pb zircon age of 121±1 Ma, (ID-TIMS) and the isochron Rb-Sr age of 121.0±2.8 Ma and are temporaly close to the auriferous veins aged at 119.0±4 and 132±12 Ma. The Kurum granodiorites and the Gel'dy stock quartz diorite aged at 94 ± 1 Ma and 92.6±0.8 Ma, respectively, postdate the NGD and were not parts of this mineral system.

A study of 62 galena samples from NGD and several ore occurrences and K-feldspar from intrusive rocks using high-precision (±0.02%) MC-ICP-MS method with $^{205}Tl/^{203}Tl$ normalization [2] showed that the predominant lead component at the NGD was derived from the Permian sedimentary host rocks. The subordinate lead was derived from Early Cretaceous magmatic rocks.

Thus, the NGD rocks formed within a time span of 25-28 Ma. This timing corresponds to two epochs of magmatic activity at the South Verkhoyansk Fold belt. The age of the NGD gold mineralization is not younger than 120 Ma [3]. The Nd-Sr-Pb isotope data on the igneous rocks and auriferous mineralization of the NGD [1, 2] suggest the Early and Late Cretaceous magma sources were formed in the Precambrian crust dated at ~1.8 Ga.

These data suggest the relation of the NGD to the lamprohyre and Early Cretaceous deep-seated crustal magmas and an ivolvement into the hydrothermal system of metals from underlying Permian clastic host rocks.

[1] Chernyshev *et al*. (2012) *Geology of Ore Deposits* **54**, **N 6**, 411-433. [2] Chernyshev *et al*. (2011) *Geology of Ore Deposits* **53**, **N 5**, 353-373. [3] Chugaev *et al*. (2010) *Doklady Earth Sciences* **434**, 1337-1342.

Surface area characterization of suspended sediment in glacial meltwater using "nano-BET"

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Suspended load is the greatest source of fluvial sediment flux to the ocean, on the order of 15-20 gigatons of material per year [1] and should have significant implications for global element cycling. However, the degree of element flux to the ocean is not solely dependent on the amount of material transported; the reactibility of the sediment grains must also be considered. Reactibility of sediment is primarily determined by two factors: mineralogical composition and grain surface area. Since surface area is directly related to reacitibility (i.e. more surface area means more sites for a reaction to potentially occur), it is a good overall estimate of element availability for a given sample.

Our study attempts to characterize the reactive surface area of suspended sediments in glacial meltwater. The hydrology of subglacial environments, consists of a complex "plumbing" system of channels that governs the flow of water under a glacier and the overall dissolved elemental flux. However, the surface area of the suspended load from glacial meltwater, and the relationship to subglacial geology and regional climate, remains uncharacterized due to the difficulty of measurements. Surface areas calculated by mineral shape and size underestimate reactive surface area by several orders of magnitude and conventional gas adsorption techniques require at least one gram of sample, often unattainable in the field.

Recent developments [2] have made it possible to measure the BET surface areas of miligram size samples with nano-scale precision. Using this new method, suspended sediment samples from two alpine glacier sites in Canada and Alaska were collected and analyzed. Results will demonstrate how the reactive surface area of suspended glacial sediments changes over the melt season and help provide better constraints for element availability in glacial meltwater.

[1] Jones *et al*. (and references therein) (2012) *Geochim. Cosmochim. Acta* **77**, 108-120. [2] Aciego *et al*. (2011) *Quaternary Sci. Rev*. **30**, 2389-2397.

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