Multi-stage gold mineralization at the Hollinger-McIntyre deposit: A LA-ICPMS mapping study

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The Hollinger-McIntyre gold deposit, Timmins, Ontario, is the second largest Archean quartz-carbonate vein system in the world, with a total gold production of ~1000 tonnes Au[1]. The deposit consists of two mineralization types: an early-stage intrusion-related Cu-Mo-Au-Ag mineralization telescoped by a syn-deformation Au-pyrite-quartz-carbonate vein system that constitutes the bulk of the ore[2].

We used a new LA-ICP-MS elemental imaging technique to map pyrite grains from the Au-pyrite-quartz-carbonate vein system. The elemental maps have revealed at least three paragenic stages (Figure 1): (1) early stage, where invisible Au was enriched in As-rich pyrite; (2) lowering As associated with increasing Ni; Au, Cu and Zn were depleted in this stage; (3) native Au filling fractures in early pyrite grains or discrete grains associated with sphalerite and chalcopyrite in quartz veins; Ni and As were depleted in this stage. The early-stage pyrite at Hollinger-McIntyre is enriched in As and Au different from those of pyrite from Carlin-style deposits[3], but similar to those from porphyry Au-Cu deposits (unpublished data). The latter would be compatible with the early intrusion-related Cu-Mo-Au-Ag stage.

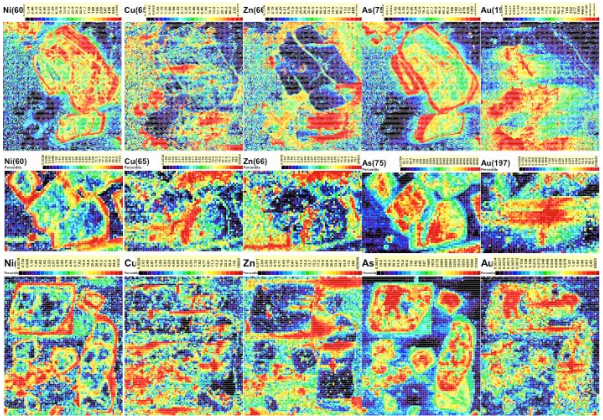

Figure 1. Mapping of selective elements for gold ore from the Hollinger-McIntyre Au deposit (Scales are in ppm).

[1] Wood *et al* (1986) Proc. Gold'86 Symposium, 56-80. [2] Burrows and Spooner (1986) Proc. Gold'86 Symposium, 23-39. [3] Large *et al*, 2009. *Econ. Geol.* **104**, 635-668.

Modeling of modern δ^{30}Si distributions in the oceans and in marine sediments

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δ^{30}Si is used as a proxy for reconstruction of marine silicic acid utilization and Si cycling in the geological past. A better understanding of modern δ^{30}Si distribution and its control mechanism is imperative for applying this proxy with confidence.

It has been a decade since the first modeling effort on global marine δ^{30}Si distribution was accomplished [1]. There are much more field studies that have been conducted since then, which facilitates model validation and model-data comparison. In this study, we present a more sophisticated model setup compared to previous modeling studies [1, 2], aiming at representing a realistic global pattern of oceanic and sedimentary δ^{30}Si distributions and revealing possible controlling mechanisms.

Our model results suggested that surface δ^{30}Si in the North Atlantic and in the Southern Ocean (Figure 1) are largely controlled by seasonal variations of mixed layer depth and diatom primary production. The difference is up to 0.3‰ between summer and winter months, which should be considered when measuring oceanic δ^{30}Si.

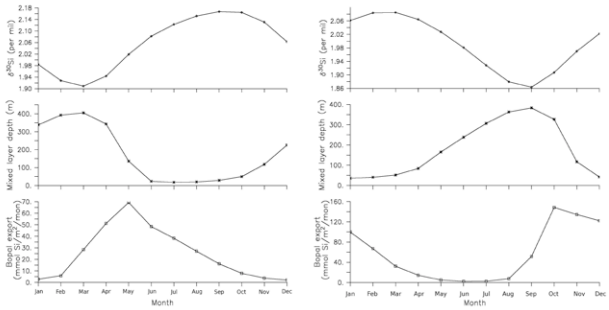

Figure 1: The seasonal variations of surface δ^{30}Si (upper 100 m), mixed layer depth and biogenic opal export in the North Atlantic (left) and in the Southern Ocean (right).

[1] Wischmeyer, De La Rocha, Maier-Reimer & Wolf-Gladrow (2003), Global Biogeochemical Cycles 17(3), 1083. [2] Reynolds (2009), Global Biogeochemical Cycles 23.

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