

Organic-poor Neoproterozoic Banded Iron Formations from the Slave and North China Cratons

BREANA HASHMAN¹, DOMINIC PAPINEAU^{2,3}, WOUTER BLEEKER⁴, AND YUSHENG WAN⁵

¹ Department of Earth Sciences, Dickinson College, United States, hashmanb@dickinson.edu

² Department of Earth and Environmental Sciences, Boston College, United States.

³ Geophysical Laboratory, Carnegie Institution of Washington, United States.

⁴ Geological Survey of Canada, Ottawa, Canada.

⁵ Beijing SHRIMP Center, China.

Geochemical data suggest that Banded Iron Formations (BIFs) preserve a record of both abiological and biological processes. Rare earth elements, compositional, and mineralogical data of BIFs over the last thirty years have led Klein (2005) to suggest that BIFs are hydrothermally-influenced chemical precipitates. This view complements that of Li et al. (2011) who used the presence of Fe (III) acetate salt, and apatite+magnetite associations to suggest that bacteria played a role in the formation of Paleoproterozoic BIFs from Western Australia. Ferruginous metasedimentary rocks from the Eoarchean Akilia Association in Greenland have apatite+graphite mineral-pairs that might represent biosignatures (Papineau et al., 2010; Mojzsis et al., 1996), but recent work has shown that these mineral associations can also be fluid-deposited later in the history of BIFs (Papineau et al., 2011). In order to further understand the genesis of these rocks, a study was performed on ca. 2.85 Ga BIFs from the Slave Craton in Canada and on ca. 2.53 Ga BIFs from the Anshan province of the North China Craton.

Mineral occurrences of possible biological relevance like apatite, sulfides, and carbonates were mapped in petrographic thin sections from both localities and found to typically occur in bands parallel to bedding. This is consistent with an authigenic origin from the sedimentary or diagenetic environment. No apatite-graphite associations were found in BIFs from either location, although these mineral-pairs were found in Neoproterozoic turbidites from the Slave Craton. Only BIFs from Anshan province contained minor amounts of carbonates, typically occurring in bands, with isotopically light $\delta^{13}\text{C}_{\text{carb}}$ values ranging from -9‰ to -27‰. Diagenetic oxidation of organic matter likely accounts for this carbonate as well as for the low amount of organic carbon in the samples. Only one BIF sample from the Slave had detectable levels of organic carbon with only about 0.02wt% TOC and $\delta^{13}\text{C}_{\text{org}}$ value of -25.7‰. Current work is focused on major and minor element compositions to establish detailed comparisons with other Archean BIFs.

Mid-Miocene volcanism in the Owyhee Mountains (ID) and implications for coeval epithermal precious metal mineralization

ZACHARY HASTEN^{1*}, MATTHEW BRUESEKE¹, JAMES SAUNDERS² AND WILLIS HAMES²

¹Kansas State University, Department of Geology, Manhattan, Kansas, USA, zhasten@k-state.edu (* presenting author) and brueseke@k-state.edu

²Auburn University, Department of Geology and Geography, Auburn, Alabama, USA, saundja@auburn.edu and hameswe@auburn.edu

The inception of the Yellowstone hotspot is associated with a period of extensive mid-Miocene volcanism in and adjacent to the northern Great Basin (NGB) and the Oregon Plateau (OP). This volcanism is also associated with spatially and temporally contemporaneous precious metal mineralization throughout the region. This relationship between mid-Miocene volcanism and gold/silver mineralization is present in the Silver City district, Owyhee Mountains ID (OM), USA. This study focuses on the mid-Miocene magmatism in OM and its relationship to coeval volcanism in the region as well as the relationship and controls on the accompanying gold and silver mineralization. The mid-Miocene magmatic suite in OM is compositionally diverse and ranges from locally erupted Steens Basalt through high-Si rhyolite. Field relationships and geochemistry of the silicic units indicates that there were at least two chemically and spatially distinct magmatic reservoirs underlying the OM. The distinct reservoirs produced at least three physically and chemically identifiable effusive silicic units: the previously identified Silver City rhyolite [1], a quartz latite unit [2], and a transitional (between the two) silicic unit. While some major and trace element concentrations overlap between these units, other trace element data, including Zr, Nb, Ba, and Nd, show well defined separations. The OM silicic volcanic suite also chemically physically resembles lava flows found in other coeval, regional eruptive systems. Sr-Nd-Pb isotope data currently being obtained will provide additional constraints that will help constrain the petrogenesis of the silicic units, including whether they were sourced from Cretaceous granitoid upper crust and how the intermediate magmas formed. Previous work in OM has yielded K-Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ ages of ~16.6 to 14 Ma [3], while recent $^{40}\text{Ar}/^{39}\text{Ar}$ dating of adularia from epithermal veins has provided mineralization ages ranging from 16.1 to 15.5 Ma, with the majority of mineralization occurring around 15.7 Ma [4]. Already obtained Pb isotope data from OM gold and gangue samples will be compared to Pb isotope compositions of OM volcanic units and local crust to better understand the role that mid-Miocene volcanism plays in the mineralization process and the fundamental relationship between the source of the ores (e.g. mantle or crust) and the source of the magmas.

[1] Lindgren (1900) *USGS Annual Report* **20**, pt 3 65-256. [2] Pansze (1975) *Idaho BMG* **P-161**. [3] Bonnicksen and Godchaux (2006) *Idaho BMG* **DWM-80**. [4] Aseto (2011) *GSA Abstracts with Programs* **43**, 28.