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Hot Spots and Hot Water in the Miocene: Geology and Geochronology of the DeLamar Mine, Lindgren's Epithermal District, Southwest Idaho

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With support from Integra Resources, the Idaho Geological Survey completed geologic mapping of two 1:24,000 quadrangles surrounding the Miocene DeLamar and Florida Mountain mines in the Silver City district in southwestern Idaho. Production from 1863 – 1998 is estimated minimally at 1.3 M ounces of Au and 70 M ounces of silver from underground and open pit mining. Permitting for a new mine is in progress.

In 1900, Waldemar Lindgren noted the association of rhyolite-hosted, Ag-rich bonanza veins and nearby apparent “hot spring” deposits at DeLamar and later named them “epithermal” veins. The quartz veins contain pyrite, silver sulfides and selenides, and gold. Adularia has been previously dated by $^{40}\text{Ar}/^{39}\text{Ar}$ on Florida Mountain at ca. 15.8 to 15.5 Ma.

Rhyolitic volcanism and mineralization followed eruption of local basalt flows that correlate regionally to early phases of the Columbia River Basalt Group (CRBG). Our mapping delineated textures and phenocrysts characteristic of the rhyolites. Zircons from pre, syn, and post-mineralization flows and domes were dated with tandem in situ LA-ICP-MS and chemical abrasion ID-TIMS U-Pb methods with ≤ 0.01 Ma resolution. In the mine area, the Porphyritic Rhyolite unit is oldest at 16.39 Ma, with the Banded Rhyolite resolvably younger at 16.33 Ma. Both are mineralized. A tuff interbedded with basalt and two sparsely altered rhyolites near sinter are dated at 16.26 to 16.18 Ma. Post-mineralization Millsite Rhyolite and Swisher Mountain Rhyolite are 15.71 Ma and 14.75 Ma, respectively. We interpret the most intense hydrothermal activity at DeLamar as bracketed to 16.3 to 16.1 Ma. This hydrothermal activity correlates to both the most intense period of CRBG volcanism (Wapshilla Ridge Member/Grande Ronde Basalt) and the wetter mid-Miocene Climate Optimum. We hypothesize that this combination of enhanced regional mantle heat flux and greater meteoric water availability promoted hot springs and mineralization.