

Assessing the Petrogenesis and Magmatic Sulfide Prospectivity of the Southwestern Laurentia Large Igneous Province (SWLLIP)

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The ~1.1 Ga magmatism of the Southwestern Laurentia Large Igneous Province (SWLLIP) generated a series of mafic-ultramafic dikes and sills emplaced within Mesoproterozoic sedimentary units and older crystalline basement rock throughout the southwest United States and northern Mexico. This LIP event remains enigmatic in terms of identifying the processes that generated this magmatism and any potential links to the contemporaneous magmatism of North America's mineralized Mid-Continent Rift LIP to the northwest of the SWLLIP. The contemporaneous 1.1 Ga Mid-Continent Rift LIP event hosts economically viable magmatic sulfide deposits in the Duluth Complex in Minnesota and elsewhere. This study aims to further our knowledge of the petrogenesis of the SWLLIP and the magmatic sulfide potential of this magmatic event.

Whole-rock lithogeochemical and Pt, Pd, and Au data have been obtained for 52 SWLLIP samples from California, Arizona, and New Mexico, allowing an initial assessment of the petrogenesis, magmatic sulfide fertility, sulfide saturation status, and crustal contamination of magmas of the SWLLIP. All these factors are critical aspects of assessing the potential for this LIP to host magmatic Ni-Cu-platinum group element (PGE) sulfide mineralization. Two suites have been identified within the SWLLIP, a potentially prospective mainly tholeiitic suite, and a seemingly unprospective alkaline suite, with the petrogenesis and magmatic sulfide potential currently being assessed in more detail.

The ongoing interpretation of these data will not only enable the determination of the petrogenesis and magmatic sulfide potential of this event but will place this LIP into the tectonic and global LIP record, potentially aiding in paleocontinental reconstruction. These data will also allow the further testing of the hypothesis that magmatism may be derived from a mantle plume that formed the magmatism of the Mid-Continent Rift of North America, as mentioned above.