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Whole-Rock Vs. Micro analysis of $^{87}Sr/^{86}Sr$ Aztec Wash Pluton as a test of mush zone differentiation

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There is growing evidence that suggests that silicic intrusions are incrementally emplaced: geophysical imaging shows no big tanks of magma while geochronology indicates long timescales of pluton formation. But if zoning and differentiation occur in the upper crust, how does this happen given evidence of individual rocks cooling rapidly below 550°C? Could granites form by a reaction process between a low temperature water-rich melt (LTM) and a preexisting gabbro as intruding sills underplate previous ones, providing the heat and fluids for this mush zone reaction process?[1]

The Miocene-aged Aztec Wash pluton (NV) consists of two zones, an overlying homogeneous granite and an underlying heterogeneous zone, made of repeated sequences of monzondiorite evolving up to monzonite. Widespread extension has uplifted and rotated the Aztec Wash pluton, exposing a cross-sectional view. We can test the hypothesis that granites form from a melt rock reaction of a preexisting gabbro through the use of Sr isotopes. Since plagioclase is present in both gabbro and granite, do the granitic plagioclase contain $^{87}Sr/^{86}Sr$ signatures indicating a previous life as a gabbro? To examine this trend, we will be analyzing a 10-meter long sequence of monzondiorite-monzonite near the stratigraphic floor of Aztec Wash.

We measure whole-rock (WR) and LA $^{87}Sr/^{86}Sr$ from a vertical sample transect where monzonite overlies monzondiorite with an abrupt interface between the two. WR monzondiorite varies 0.7089 – 0.7091 while WR monzonite is 0.7099-0.7100, suggesting two distinct “sources”. However, our results show that laser-ablated plagioclase at the contact contains values from 0.7095 to 0.7098 in the monzonite, potentially consistent with a gabbro origin. However, more $^{87}Sr/^{86}Sr$ analyses of plagioclase and k-spar are needed to properly assess this hypothesis. However, if granites do form via a melt-rock reaction between an LTM, this would have further implications for how we view igneous processes and how we view volcanic-plutonic connections.

[1] Lundstrom, IGR 58, 371, 2016.