# Mixed basalt-rhyolite complexes north of the Yellowstone Caldera, WY, USA

PETER B. LARSON[1]* AND CHAD J. PRITCHARD[2]

[1]SoE, Washington State University, Pullman WA 99164-2812 USA *correspondence: plarson@wsu.edu

[2]Department of Geology, Eastern Washington University, Cheney WA 99004-2439 USA

The Quaternary Yellowstone rhyolites, Wyoming, USA, are well known and voluminous, and erupted from complex calderas on the northeastern end of the Snake River Plain-Yellowstone time progressive track of high silica rhyolite volcanic centers. Coeval basalts at Yellowstone are found only outside the margins of the calderas. Four extracaldera basalt-rhyolite mixed flows occur in a linear array that extends from Norris Geyser Basin north towards Mammoth Hot Springs (the Norris-Mammoth Corridor): these include the Grizzly Lake, Gardner River, Crystal Spring, and Appolinaris Spring mixed magma complexes. Though mixing and commingling of magmas is widespread, mixing between rhyolite and basalt magmas in volcanic rocks is not common. Our model combines previous work on the mixed magma complexes with results from new analyses, recent mixing experiments, and regional tectonics. Extensional tectonism as seen in the East Gallatin-Washburn fault zone is coeval with eruption of the mixed magmas, and this feature is also present in other areas of basalt and rhyolite mixing/mingling in erupted rocks (*e.g.*, Iceland). The central portions, or core, of the Yellowstone complexes contain increased concentrations of emulsion rock, basaltic pillows in a rhyolite matrix, net veining/filaments, mixed magma with highly variable geochemistry ($SiO_2$ ranges from 50 to 78 wt %). Phenocrysts have been transferred between mafic and felsic portions of the complexes. Whole-rock major element analyses generally show linear mixing trends that span the range between typical Yellowstone extra-caldera rhyolites and basalts. Matrix analyses show more complex mixing behavior. These analyses at the micron-scale suggest that zones of chaotic mixing between basalt and high-silica rhyolites may be more complete than previously thought. Radiogenic isotope models suggest that other extra-caldera rhyolites have undergone cryptic mixing or comingling.