North-Central Section - 54th Annual Meeting - 2020

Paper No. 29-15
Presentation Time: 8:30 AM-5:30 PM

MICROLITE ORIENTATIONS AND STRAIN LOCALIZATION WITHIN THE BASAL SHEAR ZONE OF A LARGE RHYOLITE LAVA DOME, MINYON FALLS, AUSTRALIA

DYKSTRA, Brooke A., Department of Geology, University of Illinois at Urbana-Champaign, Urbana, IL 61801, SEITZINGER, Zenja, Department of Geological Sciences Integrated Science Center, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454 and KNESEL, Kurt, Department of Geosciences, Trinity University, One Trinity Place, San Antonio, TX 78212

The Minyon Falls Rhyolite is a large lava dome in the southern part of the Nimbin Rhyolite dome complex of the Tweed shield volcano, in eastern Australia. In excess of 100 m thick and 4 km in diameter, the lava dome is comprised of a flow-banded obsidian overlain by banded crystalline rhyolite. Folds in the main mass of crystalline rhyolite indicate strains of up to 1 associated with gravity spreading during emplacement. In contrast, structures and textures of the basal obsidian indicate accommodation of large shear strains. To better constrain the localization of strain within the basal shear zone, we measured the 3-D orientations of microlites in obsidian from flow-front and near-vent localities. Microlite and flow-band orientations around rotated phenocrysts indicate that strain in the basal obsidian was dominated by simple shear. During simple shear, rod-like microlites rotate and tend to align subparallel to the flow, with the degree of alignment increasing with the magnitude of local strain.

Thin-sections of oriented samples were cut perpendicular to layering defined by flow bands. The size and orientation of acicular microlites were measured by serially imaging down into thin-section slides at high magnification. Orientation distributions were then characterized by the standard deviation of microlite trend and plunge, with uncertainties of about 1° and 5° respectively. Due to the inherent better resolution, we focus our attention here on measured trend distributions. Preliminary analysis reveals no systematic variation for the standard deviation of microlite trend with stratigraphic or lateral position within the basal shear zone. Samples with the greatest and least degree of alignment are within 0.5 m of each other, with standard deviations of 5 and 40, respectively. Within a single thin-section, trend standard deviations may vary by a factor of 4 among individual flow bands. The measured distributions are indicative of strains ranging from 2 to greater than 10 in both near-vent and flow-front positions. Our results therefore indicate that the most of the strain associated with emplacement of viscous rhyolite lava is heterogeneously partitioned within a basal zone of shear, while the main mass of lava is rafted above.

Session No. 29--Booth# 19

T4. Petrology, Mineralogy, and High-Temperature Geochemistry (Posters)
Tuesday, 19 May 2020: 8:30 AM-5:30 PM

Lake Superior Ballroom KJ (Duluth Entertainment Convention Center)

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