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Pumice clast analysis: Unveiling conduit dynamics in Utah's Quaternary rhyolite volcanos.

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Abstract: Textural studies of pumice clasts have been used for decades to estimate eruption styles, particularly through bubble size distribution (BSD) analysis along with quantification of vesicle sizes, numbers, connectivity, and crystallization textures. In more recent years, studies have evolved to include finer-scale analysis by scanning electron microscopy (SEM) and large-scale digital elevation models (DEM). By integrating textural, geochemical, and SEM analysis of the vesicularity of pumice clasts, a comprehensive conduit model can be constructed, which can be further used to estimate volatile content and explosivity. In this contribution, we investigate pumice from two Quaternary deposits from the Black Rock Desert and Mineral Mountains located in west central Utah, a first-of-its-kind study for these units. In hand sample, the 2.4 Ma crystal-poor Cudahy Mine pumice ($\text{SiO}_2 = 76.1 \text{ wt.}\%$) appears characterized by small, uniform bubbles, whereas the $<1 \text{ Ma}$ Ranch Canyon pumice ($\text{SiO}_2 = 77.5\%$) contains ample K-feldspar phenocrysts and elongated fibrous vesicles. We employ X-ray tomographic and scanning electron microscopies to determine bubble sphericity and interconnectivity, crystal volumes, and density and vesicularity estimates. Our resulting data are used to establish a model for intra-conduit processes and eruption intensity of these two anorogenic, monogenetic rhyolite volcanoes. These imaging techniques provide a unique way to understand eruption dynamics for ancient volcanoes.