Magma Storage and Eruption Dynamics of an Individual Eruptive Unit at Mt Jefferson, Oregon

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Mt. Jefferson is a large composite volcano in the central Oregon Cascades. It is characterized by more diverse lavas than found at Mt. Hood and slightly less diverse compositions than the Three Sisters centers to the south (Conrey *et al.*, 2004). In an attempt to understand the relative roles of the magma mixing, decompression, crystallization and degassing responsible for what we see in the eruptive products, we conducted a detailed analysis of a single eruptive unit. This approach was designed to simulate the methodology applied to eruptive units in currently active centers.

The specific unit we studied was the Whitewater Glacier andesite. This unit was erupted ~10kbp, during the end of the Wisconsin glaciation. The margins of the unit have joint patterns characteristic of being quenched against ice. Our results document that the early erupted components of the unit had undergone extensive degassing at pressures of <2.5 kb. Components erupted later contain amphiboles that yield pressure estimates of ~3.5-3.7 kb. Based on major and trace element mineral compositions, this unit is composed of a mixture of four components 1)dacitic/rhyolitic melt 2) hydrous amphibole gabbro 3) olivine phyric basalt and 4)two pyroxene basalt. The petrogenesis of each of these components is the subject of ongoing study–however essentially all the mineral components observed in the flow are the disaggregated materials from those four mixing components - heavily modified by subsequent post mixing re-equilibration. In effect, none of the components in this andesite crystallized from an andesitic magma.

Taken together, the field and mineral chemistry evidence implies that this unit represents the inverted stratigraphy of a magma chamber at a depth of ~ 7-11 km. Mixing of mafic components preceded eruption, and continued throughout. This conclusion is supported by the fact that the range of plagioclase, pyroxene and groundmass compositions is the same across the enture unit. The presence of amphibole in only the final portions of the eruption suggests that the top of the chamber was at least partially degassed, and was below the pressure and H_2O content required for amphibole stability. However, the progressive changes in mineralogy reflected in the presence or amphibole as a function of stratigraphy indicate that there was no turbullent overturn of the chamber at the time of eruption.