**TOP 233845: THE ORIGIN OF HIGHLY EVOLVED, VOLUMINOUS RHYOLITES BY PROGRESSIVE, MULTIPLE EPISODES OF PARTIAL MELTING: THE RESOLUTION OF SOME PARADOXES**

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The tectonic setting of voluminous (≥ 100's of $km^3$) highly differentiated (high-$SiO_2$, low-Sr) rhyolite is often continental lithospheric extension, where bimodal eruption with basalt is common. The origin of these rhyolites is paradoxical because their presumed immediate parental source (dacite/rhyodacite) is required to be even more voluminous, and yet is generally sparse as an erupted magma type in these tectonic settings. Instead, voluminous dacite most commonly erupts at continental arcs with thick crust, a tectonic setting notable for the scarcity of rhyolite (e.g., central Andes and eastern Sierra Nevada batholith). In this study, Ar geochronology, geochemistry, and the phenocryst assemblage of rhyolites erupted episodically over a 40 Myr interval from western Mexico are used to propose a model in which progressive episodes of partial melting lead to the formation of voluminous highly differentiated rhyolite. A key component to the model is lithospheric extension, which permits the invasion of significant volumes of basaltic magma into the upper (≤ 20 km) crust. Initial basaltic injections freeze into the granitoid upper crust as a complex of sills and dikes. Over time, subsequent injections of basalt drive partial melting of this mixed lithology. At temperatures of ~850 ± 50°C, in the presence of an $H_2O$-rich fluid, partial melts of a 50:50 source lithology will be rhyolitic, of which ~70-80% may be from the pre-existing granitoid and ~20-30% from the new basalt intrusions. However, the Sr in the rhyolitic partial melt may be preferentially derived from the mafic sills, owing to a lower bulk partition coefficient for Sr (and possibly higher Sr contents) in the gabbro vs. granitoid. Thus, these initial rhyolitic melts may have a Sr isotopic signature that is largely derived from the gabbroic intrusions, whereas other major and trace elements may be largely derived from the granitoid source. Over time, numerous batches of these rhyolitic melts will collectively form large volumes of "true" granite in the upper crust. It is proposed that extensive partial melting of these young minimum-melt granitic bodies, driven by another influx of basaltic magma into the upper crust, allows significant volumes of highly differentiated rhyolites to be erupted, often coevally with basalt.

**Rhyolite, Lithosphere extension, Sr partitioning, Partial melting**

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