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GeoDay Abstract

Ten million years of magmatism at the Aucanquilcha Volcanic Cluster, northern Chile: Investigating system evolution using the crystal cargo of lavas.

Views concerning the generation and modification of intermediate arc magma have been the object of debate in recent years, specifically the question of whether new crust is being generated or whether the existing crust is being magmatically reworked. Critical to this issue is understanding (#1) the relative contributions of the crust and mantle during arc magmatism, and (#2) how mass is redistributed through the crustal column with protracted magmatism. To address these issues, I am investigating the magmatic evolution at the Aucanquilcha Volcanic Cluster (AVC)—a long-lived (11 Ma – present) volcanic system built on thick continental crust (>60 km) in the Central Andes. Chemical evolution and spatial distribution of lavas through time suggest the AVC sits atop a batholith.

A cumulative erupted volume plot through time of the AVC shows a fairly typical pattern of early, low eruption output (from 11 to ~6 Ma) followed by a "flare-up" in eruption (from ~5 to ~3 Ma), and ending with low eruption rates (from ~2.5 Ma to present). The beginning, peak, and waning stages of the system are interpreted to represent the degree to which the system was thermally mature and able to process and erupt magma. Importantly, the erupted lavas became more chemically homogeneous and also spatially concentrated through time. The underlying magmatic plumbing system for a long-lived volcanic system such as the AVC is envisioned to be a sizeable zone of interconnected magma mush (crystals and liquid)—a batholith. Critical to issue (#2) above is understanding the time-transgressive evolution and self organization of the batholith beneath the AVC.