

Cenozoic slab-rollback magmatism in western North America: Similarities and differences in space-time-composition

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Magmatism migrated progressively westward across western North America in the early-late Cenozoic in response to Farallon slab rollback. Best known for the ignimbrite flareup, rollback magmatism (RM) generated voluminous, mostly felsic to intermediate rocks from the Great Basin, through the Southern Rocky Mountains, Mogollon-Datil, and Trans-Pecos Texas volcanic fields, to the southern Sierra Madre Occidental, Mexico. Despite relatively regular westward progression, RM had major similarities and distinct differences in composition and eruptive style. RM began with intermediate or effusive activity by ~47 Ma (GB, TPT, SMO), ≥40 Ma (MD), and 38 Ma (SRM). Proportionally minor caldera-forming, felsic ignimbrites erupted as early as 46 Ma (GB, SMO). The ignimbrite flareup (~500-600 calderas, mostly in the SMO; ~600,000 km³ total erupted volume of silicic magma) began ~37 Ma, migrated southwestward in all fields, but ended or transitioned to variably different magmatism at different times. Most ignimbrites and all intermediate rocks are calc-alkaline with an arc geochemical signature; peralkaline ignimbrites erupted in SRM (25 Ma), TPT (37-32 Ma), and the northern SMO (30 Ma). Major ignimbrite episodes correlate across SRM, MD, and TPT, but gaps in caldera magmatism in those fields (31.4-29.3; 26.8-25.1) were times of major activity in the GB. Distinctive HFSE-enriched ignimbrites erupted in the GB at ~25 Ma. Intermediate magmatism accompanied the ignimbrite flareup but in different proportions in different fields. The ignimbrite flareup ended early in the east (28 Ma, TPT; 25 Ma, MD; 23 Ma, SRM) but transitioned to additional peralkaline rhyolites (southern GB ~16-7 Ma; northern SMO ~12 Ma) related to development of a slab window or major extension. In the GB, caldera-forming eruptions ended at the northeast edge of the Walker Lane at 19 Ma, but intermediate volcanism continued westward into the ancestral Cascades arc. Petrogenetic interpretations of RM magmatism should consider its considerable variability in space and time.