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Large silicic volcanic fields as the surface manifestation of thermal maturation and weakening of the crust

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Large Silicic Volcanic Fields (LSVF) are considered the surface manifestations of batholith formation at depth and they are commonly associated with "ignimbrite flare-ups". The Late Miocene to Recent Altiplano-Puna Volcanic Complex (APVC) is one of the largest and best preserved LSVF in the world. Here, available age and volume data on major ignimbrite eruptions in the APVC shows that ignimbrite volcanism in the region initiated at ~10Ma and appears to have "pulsed" with major episodes of activity at ~8, 6, and 4 Ma. Four key observations fall out of the available age and volume data.

1) Pulsing of the ignimbrite eruptions with an approximate two million year period.
2) Trend to larger volume eruptions climaxing at about 4 Ma.
3) Migration and focusing of activity toward the central part of the APVC with time.
4) Markedly diminished activity since 4 Ma.

These data combined with knowledge of the petrogenesis and evolution of the magmas, allow intrusion rates and magma production rates to be calculated and peak production rates of ~4000 km3/Ma are suggested. Interestingly the pattern of sudden onset, spatially diffuse, volumetrically minor eruptions leading to a focused catastrophic episode that is followed by quiescence seems to be a feature of most large silicic magmatic fields. This suggests a consistency of process during ignimbrite flare-ups in space and time.

The timing, pattern, and volumes of ignimbrite volcanism will be coupled with new geophysical data (gravity, seismic, geodetic) and geochemical data to present an integrated model for the anatomy and development of ignimbrite flare-ups. This model confirms the APVC (and other LSVF's) are the surface manifestation of intrusion and batholith formation, and that the ignimbrite flare-up is the result of progressive thermal (and mechanical) maturation of the crustal column due to advection of heat by magmatism and its effects on lithosphere strength.

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