

48-4 - Booth No. 235: CRUSTAL THICKENING DURING THE END-CRETACEOUS MAGMATIC FLARE-UP IN THE NORTH CASCADES



Sunday, September 22, 2024



8:00 AM - 5:30 PM



Hall D (Anaheim Convention Center)

Booth No. 235

Abstract

Continental arcs are marked by periods of low and high magmatic flux. High flux events are known as 'flare-ups' and may be related to thrusting rocks with high melt fertility under the arc or changes in the rate of melt production in the underlying mantle wedge. These two hypotheses predict different temporal records for crustal thickness over the course of a flare-up. Flare-ups driven by fertile crustal or lithospheric material should start with overthickened crust, whereas mantle driven flare-ups should start with a thin crust to accommodate a thicker, more productive, mantle wedge. To test these relationships, we have integrated geochronologic and geochemical analyses of the plutonic rocks that comprise the latest Cretaceous magmatic flare-up in the North Cascades, WA.

All geochronologic data was produced using high precision U-Pb zircon geochronology via CA-ID-TIMS (chemical abrasion-isotope dilution-thermal ionization mass spectrometry). This approach provides sub-million-year resolution and enables us to identify changes in magma emplacement rates over the course of a single flare-up event. Specifically, our findings highlight three prominent periods of high magma emplacement rates at ~76 Ma, ~68 Ma, and ~64 Ma. Each dated sample is paired with whole rock geochemical measurements. Recent research has suggested an association between the thickness of the Earth's crust in arcs and the $(La/Yb)_N$ ratio, which is sensitive to the presence of garnet as a residual phase in the melt source region or as an igneous phase during fractional crystallization. Our data suggests that each period of high magma emplacement (~76, ~68, and ~64 Ma) is characterized by a sudden and pronounced increase in $(La/Yb)_N$ at their termination. This geochemical relationship suggests that increasing crustal thickness is associated with temporary, and localized, termination of magmatism. We discuss whether this crustal thickening is related to the addition of magmatic material or through structural thickening related to regional transpression.

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