199-14 - CHLORINE CONCENTRATIONS IN METAMORPHIC WALLROCKS IN THE SIERRA NEVADA: IMPLICATIONS FOR ARC HALOGEN BUDGETS

Tuesday, September 24, 2024

8:00 AM - 5:30 PM

Hall D (Anaheim Convention Center)

Booth No. 195

Abstract

Ongoing investigations of halogen element (F, Cl, Br, I) concentrations in rocks and minerals in the Cretaceous Sierra Nevada Batholith, CA, aim to elucidate the spatio-temporal distribution and budget of these important elements in a “typical” continental convergent margin arc. Using a 3.0 kW Axios (Panalytical) wavelength-dispersive X-ray fluorescence spectrometer (XRF) equipped with a Ge 111 crystal to eliminate second order interferences on Cl-Kα lines, the Pomona College XRF lab has undertaken a campaign-style study of Cl in pressed powder samples of metamorphic and metavolcanic rocks in the Sierra. This work complements pyrohydrolysis + ion chromatography (IC) and ICP-MS analyses the research team is undertaking at the University of Texas – Austin. Both labs quadruply wash powders to eliminate Cl contributions from decrepitated fluid inclusions or grain boundary deposits. Intercomparison between the two labs show correlation (r^2 = 0.98) between analyses of the same unknown samples, but decreased accuracy of XRF (>30% relative) below 30 μg/g. Despite lower precision, XRF characterization is a relatively rapid and less labor intensive means to identify key Cl variations among rock types and to select samples for full analysis of all four halogen elements by pyrohydrolysis + IC (Cl,F) and ICP-MS (Br,I). Results thus far indicate that Mg- to Al-rich pelites ranging in metamorphic grade from phyllite to migmatite vary widely in Cl: 50–500 μg/g; cordierite-biotite hornfels are typically elevated in Cl (200–400 μg/g) and other lithologies such as skarns and amphibolite are highly varied (50–600 μg/g Cl); a localized study of a high temperature (650–750°C) migmatites surrounding a gabbro-diorite complex shows low and relatively uniform Cl (100 ± 50 μg/g) in the migmatites. This fundings suggests that Cl may have been mobilized into melts during biotite dehydration melting in the migmatites. Metavolcanic rocks vary from 20 to over 2000 μg/g Cl, suggesting post-eruptive exchange with exogenous fluids during hydrothermal alteration and metamorphism. Metavolcanic packages in different pendants, screens and septa show some localized patterns in Cl concentration that are being explored further.

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