Cordilleran Section - 115th Annual Meeting - 2019

Paper No. 7-9
Presentation Time: 9:00 AM-6:00 PM

A TWO-PULSE COOLING HISTORY OF LATE EOCENE TO MIOCENE EXTENSIONAL EXHUMATION FROM THE SOUTHERN EAST HUMBOLDT RANGE METAMORPHIC CORE COMPLEX, NEVADA

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The East Humboldt Range metamorphic core complex in northeastern Nevada exposes an exceptional crustal cross-section in the northeastern Basin and Range province. Despite extensive previous investigation, the timing and progression of major crustal extension in this terrain remains subject to controversy. Two WNW-trending, thermobarometric transects span 20 km and incorporate new $^{40}Ar/^{39}Ar$ K-feldspar Multi-Diffusion Domain (MDD) models that address this controversy. A recently discovered kyanite schist locality in the southern East Humboldt Range constrains inferred Late Cretaceous pre-extensional peak pressure-temperature conditions in excess of 6 kb and 625°C. Eight new $^{40}Ar/^{39}Ar$ potassium feldspar age spectra modeled using Arvert 6.1.1 (Zeitler, 2017) yield MDD models agreeing with previously reported $^{40}Ar/^{39}Ar$ mica and U-Th/He zircon and apatite results, recording two distinct pulses of Late Eocene to mid-Miocene cooling, with a previously undocumented heating event in between. Although the beginning of the initial phase of cooling is poorly constrained, MDD modelling indicates that cooling had ceased by approximately 35 Ma. The structural position of these samples <500 m beneath the detachment fault strongly implies that the Late Eocene cooling in the southeastern East Humboldt Range was associated with extensional exhumation. Following this initial phase of extension, MDD modeling indicates a Late Oligocene reheating event beginning at 29 Ma. With increasing structural depth in the transport direction, the length and intensity of this heating event becomes progressively greater. The inflection from heating to cooling initiates as early as 26 Ma at the southeastern end of the transect, but not until after 20 Ma at the northwestern end. The structurally deepest and farthest west sample, and therefore the entire East Humboldt Range, had cooled through 150°C by 12 Ma, in excellent agreement with the fault gouge dating results of Haines and van der Pluijm (2010). The WNW-propagating wave of rapid cooling is consistent with rolling-hinge style exhumation of the lower plate from ESE to WNW at a rate of 1.7 - 2.8 km/m.y.

Session No. 7--Booth# 25

T1. Cordilleran Tectonics from the Basin and Range to Alaska and the Arctic: A Celebration of Elizabeth Miller's Career (2018 GSA Structure and Tectonics Division Career Contribution Award) (Posters)
Wednesday, 15 May 2019: 9:00 AM-6:00 PM
Exhibit Hall B (Oregon Convention Center)
Geological Society of America *Abstracts with Programs.* Vol. 51, No. 4
doi: 10.1130/abs/2019CD-329766