



[Start](#) | [Grid View](#) | [Author Index](#) | [Meeting Information](#)

## GSA Annual Meeting in Phoenix, Arizona, USA - 2019

Paper No. 131-4

Presentation Time: 9:00 AM-6:30 PM

FATE OF THE LOWER LITHOSPHERE DURING SHALLOW-ANGLE SUBDUCTION: THE LARAMIDE EXAMPLE

**CHAPMAN, Alan D.**<sup>1</sup>, RAUTELA, Ojashvi<sup>1</sup>, SHIELDS, Jessie E.<sup>2</sup>, DUCEA, Mihai N.<sup>3</sup> and SALEEBY, Jason B.<sup>4</sup>, (1)Geology Department, Macalester College, 1600 Grand Ave., St. Paul, MN 55105, (2)Department of Earth and Environmental Sciences, California State University, Fresno, CA 93740, (3)Faculty of Geology and Geophysics, University of Bucharest, Bucharest, 011004, Romania; Department of Geosciences, University of Arizona, Tucson, 85721, (4)Division of Geological and Planetary Sciences, California Institute Technology, Pasadena, CA 91125-0001

Continental arc lower crust and underlying mantle wedge assemblages native to the Mojave Desert (i.e., the southern California batholith; SCB) were displaced eastward during Laramide shallow-angle subduction and reattached to the base of the Colorado Plateau transition zone (central Arizona) and further inboard. We identify here two xenolith localities from the transition zone (Camp Creek and Chino Valley) that likely contain remnants of the missing Mojave lithosphere. Nodules of garnet clinopyroxenite, the dominant xenolith type at both studied localities, yield low jadeite components in clinopyroxene, chemically homogeneous "type-B" garnet, and peak conditions of equilibration from 600-900 °C and 12-28 kbar. These relations strongly suggest a continental arc residue ("arclogite"), rather than a lower plate subduction ("eclogite"), origin. Zircon grains extracted from these nodules yield a bimodal age distribution with peaks at ca. 75 and 150 Ma, overlapping SCB pluton ages and suggesting a consanguineous relationship. In contrast, Mesozoic and early Cenozoic igneous rocks native to SW Arizona, with age peaks at ca. 60 and 170 Ma, do not provide as close a match. In light of these results, we suggest that transition zone xenoliths: 1) began forming in Late Jurassic time as a mafic keel to continental arc magmas emplaced into the Mojave Desert and associated with eastward subduction of the Farallon plate; 2) experienced a second ca. 80-70 Ma pulse of growth associated with increased magmatism in the SCB; 3) were transported km eastward along the leading edge of the shallowly subducting Farallon plate; and 4) were reattached to the base of the crust at the new location, in south central Arizona. Cenozoic U-Pb zircon and Sm-Nd garnet ages suggest that displaced arclogite remained at elevated temperature (>700 °C) for 10s of Myr following its dispersal and until late Oligocene entrainment in host latite. The lack of arclogite and abundance of spinel peridotite xenoliths in Miocene and younger volcanic host rocks, and the presence of seismically fast and vertically dipping features beneath the western Colorado Plateau, suggest that arclogite has been foundering into the mantle and being replaced by upwelling asthenosphere since at least 12 Ma and perhaps as early as 25 Ma.

Session No. 131--Booth# 364

T58. Late Cretaceous to Early Paleogene Tectonic Development of the North American Cordillera (Posters)

Monday, 23 September 2019: 9:00 AM-6:30 PM

Hall AB, North Building (Phoenix Convention Center)

Geological Society of America *Abstracts with Programs*. Vol. 51, No. 5

doi: 10.1130/abs/2019AM-337465

© Copyright 2019 The Geological Society of America (GSA), all rights reserved. Permission is hereby granted to the author(s) of this abstract to reproduce and distribute it freely, for noncommercial purposes. Permission is hereby granted to any individual scientist to download a single copy of this electronic file and reproduce up to 20 paper copies for noncommercial purposes advancing science and education, including classroom use, provided all reproductions include the complete content shown here, including the author information. All other forms of reproduction and/or transmittal are prohibited without written permission from GSA Copyright Permissions.

[Back to: T58. Late Cretaceous to Early Paleogene Tectonic Development of the North American Cordillera \(Posters\)](#)

[<< Previous Abstract](#) | [Next Abstract >>](#)