Abstract ID: 243

Title: CENOZOIC SLAB WINDOWS BENEATH WESTERN U.S.
Student: No
Topic: Tectonics
Medium: Invited Oral Presentation
Author 1 (CONTACT AUTHOR)
Name: Eugene Humphreys
Org: University of Oregon
Country: USA

Keywords: subduction, slab window, tectonics, magmatism

Abstract: A fragment of ocean lithosphere, the Siletzia terrain, filled the Columbia Embayment and accreted to North America at ~48 Ma. Subduction jumped west of the accreted lithosphere, and rapidly the Challis arc ceased volcanic activity and the Cascade arc started across Oregon and Washington. Subducting Farallon plate must have torn at the southern margin of the accreted lithosphere (in central Oregon), separating the steeply dipping Cascadia slab from the Laramide-related flat slab to the south. This opened a northern "window" in the slab; the southern edge propagated north to south across the Great Basin, exposing the hydrated lithosphere to asthenosphere and causing the ignimbrite flareup there. This flat slab removal ended the Laramide orogeny. Great Basin lithosphere, thermally weakened and rising (because of slab removal and heating) extended, rotating the Siletzia terrain clockwise in the process. Subduction slab south of the Selitzia terrain steepened in dip, extending the Cascade arc as far south as Lake Tahoe. North America encountered the Pacific plate before the ignimbrite flareup ended, initiating the transform margin and a second (the famous) slab window. The transform margin and window grew in width as the transform-bounding triple junctions diverged, eventually entraining the Sierra Nevada-Great Valley block to move parallel to the Pacific plate. This block motion developed an interior shear zone, the eastern California-Walker Lane shear zone, which has accommodated ~1 cm/yr of right-lateral shear strain during the last ~7 m.y. The oceanic Siletzia terrain remained too strong to deform significantly, and accommodated right-lateral shear through continued clockwise block rotation. This results in the interior shear zone broadening across NW Nevada and SE Oregon, where it becomes integrated with Basin and Range extension, and north-south contraction along the northern margin of the Siletzia terrain.

Following slab removal, several systems of small-scale convection occurred, including delamination of the southern Sierra Nevada lithosphere (ongoing), Penninsular Ranges lithosphere (several m.y. ago) and Wallowa pluton lithosphere (16 m.y. ago, associated with the Columbia River flood basalt eruptions). The Transverse Ranges downwelling, occurring beneath Pelona-type schist (and therefore beneath continental lithosphere), probably is a foundering fragment of abandoned Farallon slab. Subducting Juan de Fuca plate retains a gap at the location of the inherited tear in central Oregon. The north-propagating southern edge of the Gorda-Juan de Fuca slab is imaged where predicted by plate reconstruction models extending from the Mendocino ripple junction to central

Nevada. This sinking slab excites a toroidal flow from beneath the slab around its southern edge to above the slab, which applies tractions on the base of the Great Basin region that may be important to ongoing tectonism, uplift and magmatism.