Evolution of the Salmon River suture and continental delamination in the Syringa embayment

K.I. LUND[1], J.N. ALEINIKOFF[1], D.M. UNRUH[1], E.Y. YACOB[1] AND C.M. FANNING[2]

[1]US Geological Survey, MS 973 Denver, CO 80225, USA (klund@usgs.gov)
[2]Research School of Earth Sciences, ANU, Canberra, ACT 0200, Australia

The geology of west-central Idaho is dominated by the Salmon River suture that formed during dextral-oblique plate motion in the Cretaceous (~130-85 Ma). It is an unusual suture because it (1) juxtaposes Mesozoic island-arc rocks directly against Proterozoic continental rocks; (2) is defined by abrupt changes in $^{87}Sr/^{86}Sr$ intial ratios, ages, and origins in nearby and stitching plutons; and (3) has an ~90-degree change in trend from NNE in Idaho to W into Washington (Syringa embayment). NE of the embayment, SHRIMP U-Pb dates on detrital zircon show that Cretaceous island arc rocks are intercalated with Proterozoic continental rocks; U-Pb dates on inherited zircon and Sr and Nd isotopic analyses indicate diverse plutonic sources; U-Pb intrusive ages limit events.

Sample	Age (Inheritance)	$^{87}Sr/^{86}Sr_i$	εNd_i
Paragneiss of Dutch Oven Cr	Y (~1350-2500 Ma)		
Quartzite of Wild Goose Camp	Z (~900-1450 Ma; few X, W)		
Orthogneiss of Apgar Cr	94 ± 1 Ma (X)	0.7083	-5.22
Orthogneiss of Andys Hump	73 ± 3 Ma (X, Y, J, K)	0.7102	-7.62
Paragneiss of Swiftwater Cr	110-91 Ma (100-300 Ma; few Z, Y)		
Coolwater orthogneiss	91 ± 2 Ma (93-230 Ma)	0.7066	-2.91

Cretaceous island arc-derived Coolwater orthogneiss and paragneiss of Swiftwater are exposed in a window through the crustal-scale top-to-the-west Lowell thrust. The arc rocks were inserted as a wedge into the continent, delaminating Meso- and Neoproterozoic rocks (paragneiss of Dutch Oven Creek and quartzite of Wild Goose Camp) and continent-derived orthogneiss of Apgar Creek from underlying basement. Orthogneiss of Andys Hump intruded the top of the wedge. The entire package was folded into an antiformal culmination and exposed by normal faults. Detrital zircon data delimit Neoproterozoic rift margin deposits, suggesting that the Syringa embayment is an inherited segment that underwent local Cretaceous orthogonal contraction within overall dextral transpressive accretion.

The western Idaho Suture Zone: Mesozoic crustal boundary

ROBERT J. FLECK[1] AND JOSEPH L. WOODEN[2]

[1]U.S. Geological Survey MS937, 345 Middlefield Road, Menlo Park, CA 94025. (fleck@usgs.gov)
[2]U.S. Geological Survey, Stanford—USGS Micro-Analytical Center, Stanford University, Green Earth Sciences Building, Stanford, CA 94305

A zone of highly strained and metamorphosed rocks, called the western Idaho suture zone (WISZ), represents the boundary between Proterozoic North American lithosphere and accreted Late Paleozoic and Mesozoic intraoceanic terranes. Cretaceous plutons intruded the WISZ and subsequently were deformed within the zone. Pronounced variations in Sr, Nd, and O isotope ratios and in major- and trace-element compositions occur in these plutons from west to east across the suture zone, reflecting an increased mixing of Proterozoic sialic components in the marginal arc magmas. The zone of most highly deformed rocks coincides with an abrupt west to east increase in initial $^{87}Sr/^{86}Sr$ ratios and whole-rock $\delta^{18}O$ and a decrease in ε_{Nd}. The WISZ and coincident isotopic variations are traceable for more than 300 km from eastern Washington to near Ola in southwestern Idaho, where Columbia River basalts conceal its extension to the south.

Differences between SHRIMP U-Pb zircon ages and K-Ar, $^{40}Ar/^{39}Ar$, and Rb-Sr mineral ages in Early Cretaceous plutons in the WISZ document patterns of thermal disturbance caused by deformation, subsequent batholith intrusion, and uplift of the continental margin. Inherited Proterozoic zircons occur in 111-Ma plutons with initial $^{87}Sr/^{86}Sr$ ratios of 0.7048 to 0.7057 within the WISZ, but none are observed in similar-aged intrusions 7 km west of the zone that have initial $^{87}Sr/^{86}Sr$ ratios of 0.7037. The occurrence of Proterozoic zircons in plutons of the WISZ confirms that suturing was complete by 111 Ma and that mixing of components from both cratonal and accreted arc terranes was occurring within these magmas. Major crustal movements within the WISZ commenced after about 135 Ma, but much of the displacement may have been largely vertical, during and following emplacement of batholith-scale silicic magmas. Deformation continued until at least 85 Ma and probably until 74 Ma, but may not have been synchronous throughout the length of the suture zone.