

Laramide Subduction and Metamorphism of the Orocochia Schist, northern Plomosa Mountains, west-central Arizona: Insights from Zircon U-Pb Geochronology by N. M. Seymour, E. D. Strickland, J. S. Singleton, D. F. Stockli, and M. S. Wong

Items include in Data Repository:

1. Description of Analytical Methods and supplementary figures (this file)
2. Excel file with Sample locations & descriptions, Orocochia Schist U-Pb data (w/ CL images, Concordia), and NPIC zircon data (w/ CL images)
3. Excel file with 0316-P145 REE data

FULL METHODOLOGICAL DETAILS

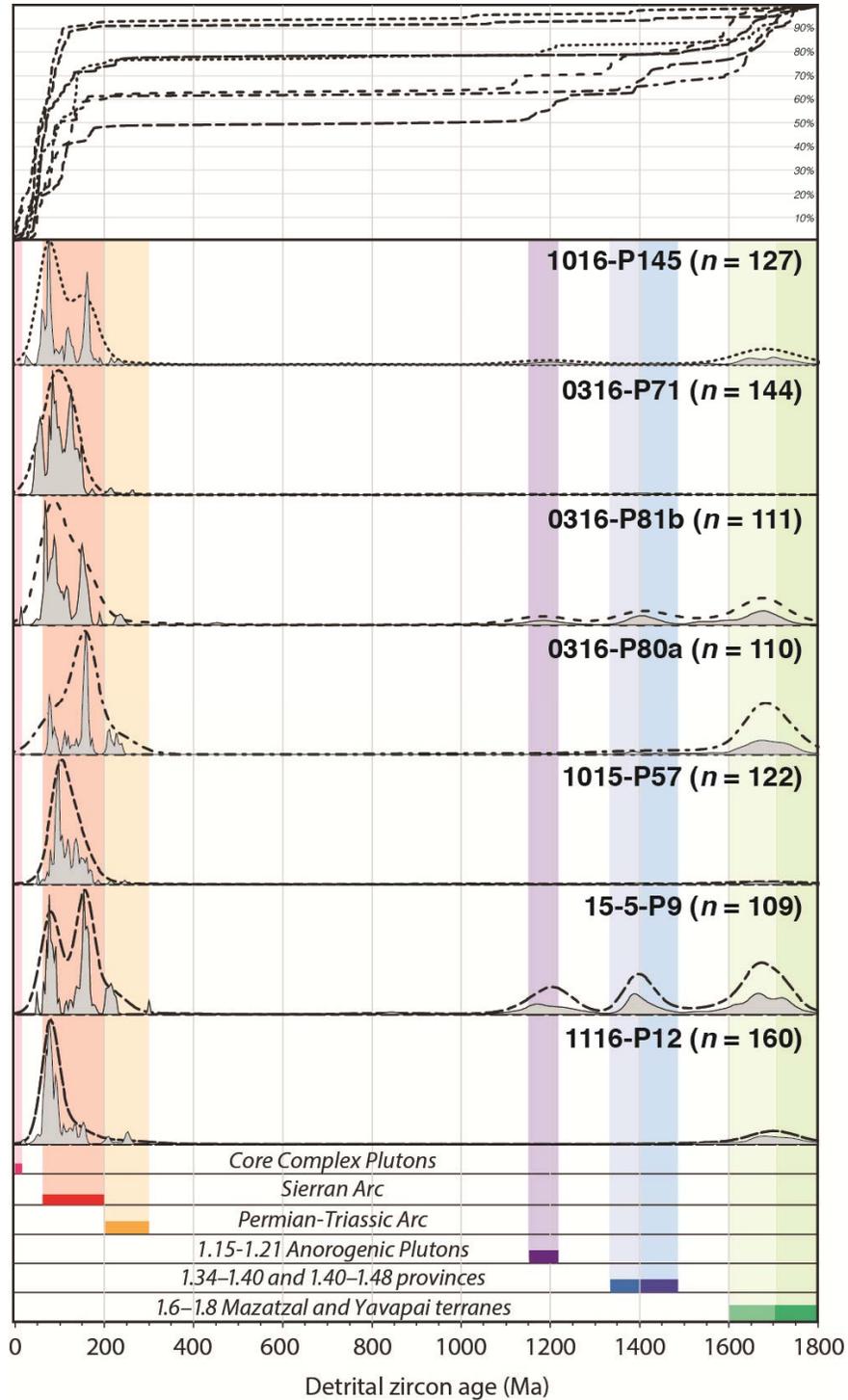
Zircon grains were extracted using standard crushing, density, and magnetic separation techniques. Grains from three Orocochia Schist (P9, P57, and P80a) and two NPIC samples (P43 and P47) were mounted in epoxy and polished. Orocochia Schist samples were imaged using cathodoluminescence (CL) on a JEOL JSM636OLV scanning electron microscope at Colgate University and NPIC samples were imaged on a JEOL 5800LV scanning electron microscope at the USGS-Denver. Mosaic images are provided in the zircon U-Pb data file for each sample. Whole, unpolished grains from an additional 4 OS samples (P12, P71, P81b, and P145) were handpicked under an optical microscope at 100X magnification and mounted parallel to the c-axis on double-sided tape in order to resolve thin, bright rims imaged in CL by drilling perpendicular to growth zones (referred to as depth profiling).

Both polished epoxy mount and unpolished tape mount preparations were analyzed using a Photon Machines Analyte G.2 Excimer laser paired with two ThermoScientific Element II high-resolution magnetic sector inductively coupled plasma mass spectrometers (ICP-MS) at the University of Texas at Austin. A large-volume Helix cell produces for very rapid washout times and allows for 0.5- μm steps in vertical resolution, critical for high-fidelity depth profiles (Seymour et al., 2016 and references therein). Samples P9, P12, P57, P71, P80a, P81b, P43, and P47 were analyzed via standard single-stream LA-ICP-MS for U-Pb. OS sample 0316-P145 was analyzed via LA-ICP-MS split-stream depth profiling, where the aerosol volume was divided and simultaneously analyzed for U-Pb on one ICP and trace elements on a second ICP.

Zircon grains were analyzed using a 30 μm diameter spot using a repetition rate of 10 Hz for 30 seconds, creating a ~ 17 μm deep ablation pit. Drill rate calibration of depth profiles by laser interferometric microscopy quantified Paleocene overgrowths as <10 μm thick, consistent with CL images. Sample analyses were interspersed (5:1) with primary standard GJ1 (Elhlou et al., 2006) to correct for isotopic and downhole fractionation. Secondary standards Pak1 ($^{206}\text{Pb}/^{238}\text{U}$ age 43.03 ± 0.01 Ma, in-house unpublished TIMS data), Plesovice ($^{206}\text{Pb}/^{238}\text{U}$ TIMS age 337.37 ± 0.37 Ma, Slama et al., 2008), and 91500 ($^{206}\text{Pb}/^{207}\text{Pb}$ age TIMS 1065.4 ± 0.3 Ma, Wiedenbeck et al., 1995) were analyzed to monitor age accuracy. Weighted $^{206}\text{Pb}/^{238}\text{U}$ means of concordant data are reported for both core and overgrowth age populations. Uncorrected values are provided in addition to reduced data. Raw $^{206}\text{Pb}/^{238}\text{U}$ and trace element data were reduced in Iolite using VizualAgeDRS and TraceElementIS, respectively (Ludwig, 2003; Paton et al., 2011; Petrus and Kamber, 2012). The U decay constant of Jaffey et al. (1971) was used for all age calculations. Weighted $^{206}\text{Pb}/^{238}\text{U}$ means of concordant zircon data are reported for both core and overgrowth age populations. All errors are reported at 2σ . Ablation rates and pit depths used to compare rims

resolved via depth profiling to CL imaging were calibrated based on standard data provided by the UT-Austin facilities.

SUPPLEMENTARY FIGURE



Supplementary Figure DR1. Kernel density estimate (gray shaded curve), probability density plot (dashed line), and cumulative density function (top) for each Orocopia Schist sample. Dashed line patterns are unique to each sample. Colored bars are keyed to the source area map found in Jacobson et al. (2011).

REFERENCES

- Elhlou, S., Belousova, E., Griffin, W.L., Pearson, N.J., and S. Y. O'Reilly, 2006, Trace element and isotopic composition of GJ-red zircon standard by laser ablation: *Geochimica et Cosmochimica Acta*, v. 70, no. 18, doi: 10.1016/j.gca.2006.06.1383.
- Jacobson, C.E., Grove, M., Pedrick, J.N., Barth, A.P., Marsaglia, K. M., Gehrels, G.E., and Nourse, J.A., 2011, Late Cretaceous early Cenozoic tectonic evolution of the southern California margin inferred from provenance of trench and forearc sediments: *Geological Society of America Bulletin*, v. 123, no. 3–4, p. 485–506, doi: 10.1130/B30238.1.
- Jaffey, A.H., Flynn, K.F., Glendenin, L.E., Bentley, W.C., and Essling, A.M., 1971, Precision measurements of half-lives and specific activities of ²³⁵U and ²³⁸U: *Physical Review C*, v. 4, p. 1889–1906, doi: 10.1103/PhysRevC.4.1889.
- Ludwig, K., 2003, ISOPLOT 3.00: A Geochronology Toolkit for Microsoft Excel: Berkeley Geochronological Center Special Publication, Berkeley, California.
- Paton, C., Hellstrom, J., Paul, B., Woodhead, J., and Hergt, J., 2011, Iolite: Freeware for the visualisation and processing of mass spectrometric data: *Journal of Analytical Atomic Spectrometry*, v. 26, p. 2508–2518, doi: 10.1039/C1JA10172B.
- Petrus, J.A., and Kamber, B.S., 2012, VizualAge: A Novel Approach to Laser Ablation ICP-MS U-Pb Geochronology Data Reduction: *Geostandards and Geoanalytical Research*, v. 36, p. 247–270, doi: 10.1111/j.1751-908X.2012.00158.x.
- Seymour, N.M., Stockli, D.F., Beltrando, M., and Smye, A.J., 2016, Tracing the thermal evolution of the Corsican lower crust during Tethyan rifting: *Tectonics*, v. 35, p.2439–2466, doi: 10.1002/2016TC004178.
- Slama, J., Kosler, J., Condon, D.J., Crowley, J.L., Gerdes, A., Hanchar, J.M., Horstwood, M.S., Morris, G.A., Nasdala, L., Norberg, N. and Schaltegger, U., 2008, Plesovice zircon—a new natural reference material for U–Pb and Hf isotopic microanalysis: *Chemical Geology*, v. 249, p.1–35, doi: 10.1016/j.chemgeo.2007.11.005.
- Wiedenbeck, M., Alle, P., Corfu, F., Griffin, W.L., Meier, M., Oberli, F., Von Quadt, A., Roddick, J.C., and Spiegel, W., 1995, Three natural zircon standards for U–Th–Pb, Lu–Hf, trace element and REE analyses: *Geostandards and Geoanalytical Research*, v. 19, p. 1 – 23, doi: 10.1111/j.1751-908X.1995.tb00147.x.