Kurz, G.A., Schmitz, M.D., Northrup, C.J., and Vallier, T.L., 2016, Isotopic compositions of intrusive rocks from the Wallowa and Olds Ferry arc terranes of northeastern Oregon and western Idaho: Implications for Cordilleran evolution, lithospheric structure, and Miocene magmatism: Lithosphere, doi:10.1130/L550.1.
GSA Data Repository Item 2016220

Supplementary Material

Kurz, G.A., Schmitz, M.D., Northrup, C.J., and Vallier, T.L. (2016) "Isotopic compositions of intrusive rocks from the Wallowa-Seven Devils and Olds Ferry arc terranes of northeastern Oregon and western Idaho: Implications for Cordilleran evolution, lithospheric structure, and Miocene magmatism"

Table S1. U-Th-Pb Isotopic Data for Magmatic Zircon from Intrusive Rocks of the Salmon River Canyon and Oxbow Complex
Table S2. U-Th-Pb Isotopic Data for Magmatic Zircon and Titanite from Intrusive Rocks of the Olds Ferry Arc Terrane
Table S3. Whole Rock Trace Element Data for Intrusive Rocks of the Salmon River Canyon, Oxbow Complex, and Olds Ferry Arc Terrane
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Table S5. Geochemical and Isotopic Parameters for Mantle and Binary Mixing Components

Sample Preparation and Analytical Methods
NavDat References
References for Data Compiled Separate from the NAVDAT Database

Kurz, G.A., Schmitz, M.D., Northrup, C.J., and Vallier, T.L., 2016, Isotopic compositions of intrusive rocks from the Wallowa and Olds Ferry arc terranes of northeastern Oregon and western Idaho: Implications for Cordilleran evolution, lithospheric structure, and Miocene magmatism: Lithosphere, doi:10.1130/L550.1.
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Table S1. U-Th-Pb Isotopic Data for Magmatic Zircon from Intrusive Rocks of the Oxbow Complex and Salmon River Canyon.

	Compositional Parameters					Radiogenic Isotope Ratios								Isotopic Ages					
ID (a)	^{206}Pb* x10^{-13} mol (b)	mol % ^{206}Pb* (b)	Pb*/Pb$_c$ (b)	Pbc (pg) (b)	^{206}Pb/^{204}Pb (c)	^{208}Pb/^{206}Pb (d)	^{207}Pb/^{206}Pb (d)	% err (e)	^{207}Pb/^{235}U (d)	% err (e)	^{206}Pb/^{238}U (d)	% err (e)	corr. coef.	^{207}Pb/^{206}Pb (f)	± (e)	^{207}Pb/^{235}U (f)	± (e)	^{206}Pb/^{238}U (f)	± (e)
OX08-02																			
z2	**0.345**	**98.48%**	**20**	**0.44**	**1225**	**0.182**	**0.051300**	**0.640**	**0.290317**	**0.692**	**0.041045**	**0.098**	**0.586**	**254.31**	**14.71**	**258.81**	**1.58**	**259.31**	**0.25**
z3	0.277	98.03%	15	0.46	944	0.172	0.051274	0.662	0.292034	0.719	0.041308	0.098	0.623	253.18	15.23	260.16	1.65	260.93	0.25
z4	**0.206**	**98.30%**	**17**	**0.29**	**1094**	**0.130**	**0.051538**	**0.515**	**0.291756**	**0.567**	**0.041057**	**0.093**	**0.620**	**264.98**	**11.81**	**259.94**	**1.30**	**259.38**	**0.24**
z5	0.181	92.24%	4	1.25	239	0.143	0.051162	1.947	0.291816	2.081	0.041368	0.196	0.712	248.14	44.81	259.99	4.77	261.30	0.50
z6	**0.116**	**97.59%**	**12**	**0.23**	**771**	**0.144**	**0.051408**	**0.799**	**0.291011**	**0.870**	**0.041056**	**0.136**	**0.575**	**259.16**	**18.36**	**259.36**	**1.99**	**259.38**	**0.35**
z7	0.219	98.25%	17	0.32	1065	0.127	0.051433	0.532	0.292257	0.584	0.041212	0.100	0.583	260.30	12.22	260.33	1.34	260.34	0.25
z8	**0.595**	**99.35%**	**46**	**0.32**	**2877**	**0.154**	**0.051541**	**0.322**	**0.291544**	**0.342**	**0.041025**	**0.081**	**0.358**	**265.12**	**7.40**	**259.77**	**0.78**	**259.18**	**0.21**
z9	**0.800**	**99.53%**	**65**	**0.31**	**3959**	**0.180**	**0.051557**	**0.151**	**0.291402**	**0.187**	**0.040992**	**0.066**	**0.674**	**265.83**	**3.46**	**259.66**	**0.43**	**258.98**	**0.17**
z10	**0.383**	**99.20%**	**37**	**0.25**	**2328**	**0.133**	**0.051491**	**0.275**	**0.291068**	**0.310**	**0.040998**	**0.067**	**0.603**	**262.86**	**6.30**	**259.40**	**0.71**	**259.02**	**0.17**
OX08-08																			
z1	**1.705**	**98.28%**	**17**	**2.47**	**1068**	**0.132**	**0.051219**	**0.393**	**0.289**	**0.416**	**0.040934**	**0.098**	**0.340**	**250.70**	**9.05**	**257.84**	**0.95**	**258.62**	**0.25**
z2	**1.026**	**98.48%**	**20**	**1.31**	**1216**	**0.159**	**0.051407**	**0.356**	**0.290**	**0.393**	**0.040961**	**0.074**	**0.577**	**259.10**	**8.18**	**258.82**	**0.90**	**258.78**	**0.19**
z3	**0.908**	**97.53%**	**12**	**1.90**	**745**	**0.133**	**0.051320**	**0.370**	**0.290**	**0.408**	**0.040948**	**0.068**	**0.611**	**255.25**	**8.50**	**258.36**	**0.93**	**258.71**	**0.17**
z4	**1.082**	**99.11%**	**33**	**0.80**	**2084**	**0.131**	**0.051365**	**0.242**	**0.290**	**0.278**	**0.040955**	**0.062**	**0.653**	**257.25**	**5.57**	**258.60**	**0.63**	**258.75**	**0.16**
z5	1.977	97.21%	10	4.69	657	0.124	0.050850	0.253	0.286	0.291	0.040786	0.091	0.553	234.03	5.83	255.37	0.66	257.70	0.23
z6	**0.820**	**99.45%**	**53**	**0.37**	**3367**	**0.130**	**0.051610**	**0.225**	**0.292**	**0.267**	**0.040969**	**0.100**	**0.570**	**268.17**	**5.17**	**259.76**	**0.61**	**258.83**	**0.25**
z7	**0.865**	**99.37%**	**47**	**0.45**	**2952**	**0.129**	**0.051298**	**0.214**	**0.290**	**0.250**	**0.040955**	**0.064**	**0.645**	**254.25**	**4.92**	**258.30**	**0.57**	**258.75**	**0.16**
z8	**1.038**	**99.60%**	**74**	**0.34**	**4664**	**0.127**	**0.051394**	**0.127**	**0.290**	**0.161**	**0.040952**	**0.055**	**0.726**	**258.55**	**2.92**	**258.71**	**0.37**	**258.73**	**0.14**
z9	**0.862**	**99.44%**	**52**	**0.40**	**3323**	**0.125**	**0.051420**	**0.165**	**0.290**	**0.198**	**0.040948**	**0.062**	**0.656**	**259.71**	**3.78**	**258.81**	**0.45**	**258.71**	**0.16**
SAL09-01																			
z1	**0.360**	**99.20%**	**36**	**0.24**	**2335**	**0.112**	**0.051657**	**0.264**	**0.302931**	**0.298**	**0.042532**	**0.069**	**0.584**	**270.25**	**6.05**	**268.69**	**0.70**	**268.51**	**0.18**
z2	**0.742**	**99.49%**	**57**	**0.31**	**3660**	**0.118**	**0.051625**	**0.116**	**0.302920**	**0.159**	**0.042557**	**0.052**	**0.874**	**268.83**	**2.67**	**268.68**	**0.38**	**268.66**	**0.14**
z3	**0.660**	**99.49%**	**59**	**0.28**	**3672**	**0.139**	**0.051675**	**0.243**	**0.303014**	**0.280**	**0.042529**	**0.061**	**0.666**	**271.05**	**5.58**	**268.75**	**0.66**	**268.49**	**0.16**
z4	0.945	99.27%	40	0.57	2557	0.114	0.051596	0.216	0.303242	0.248	0.042626	0.061	0.614	267.53	4.95	268.93	0.59	269.09	0.16
z5	**0.240**	**98.29%**	**17**	**0.34**	**1088**	**0.100**	**0.051261**	**0.579**	**0.300529**	**0.631**	**0.042520**	**0.088**	**0.632**	**252.60**	**13.32**	**266.81**	**1.48**	**268.44**	**0.23**
z6	**0.358**	**98.14%**	**16**	**0.56**	**1001**	**0.124**	**0.051404**	**0.528**	**0.301357**	**0.576**	**0.042519**	**0.081**	**0.629**	**258.98**	**12.14**	**267.46**	**1.35**	**268.43**	**0.21**
z7	**0.244**	**98.28%**	**17**	**0.35**	**1084**	**0.112**	**0.051605**	**0.529**	**0.302869**	**0.579**	**0.042566**	**0.084**	**0.637**	**267.96**	**12.14**	**268.64**	**1.37**	**268.72**	**0.22**
z8	**0.417**	**98.61%**	**21**	**0.49**	**1334**	**0.108**	**0.051576**	**0.418**	**0.302652**	**0.460**	**0.042559**	**0.078**	**0.595**	**266.65**	**9.59**	**268.47**	**1.08**	**268.68**	**0.21**

(a) z1, z2, etc., are labels for single zircon grains or fragments; all zircon fractions were annealed and chemically abraded after Mattinson (2005); bold indicates analyses used in weighted mean calculations.

(b) Pb* and Pbc represent radiogenic and common Pb, respectively; mol % ^{206}Pb* with respect to radiogenic, blank and initial common Pb.

(c) Measured ratio corrected for spike and fractionation only. Mass fractionation correction of 0.22 ± 0.02 (1-sigma) %/amu (atomic mass unit) was applied to all single-collector Daly analyses, based on analysis of NBS-981 and NBS-982.

(d) Corrected for fractionation, spike, and common Pb; up to 1 pg of common Pb was assumed to be procedural blank: ^{206}Pb/^{204}Pb = 18.60 ± 0.80%; ^{207}Pb/^{204}Pb = 15.69 ± 0.32%; ^{208}Pb/^{204}Pb = 38.51 ± 0.74% (all uncertainties 1-sigma). Residual common Pb was allocated an isotopic composition estimated from the Stacey and Kramers (1975) Earth reference model at the nominal sample age.

(e) Errors are 2-sigma, propagated using the algorithms of Schmitz and Schoene (2007).

(f) Calculations are based on the decay constants of Jaffey et al. (1971). ^{206}Pb/^{238}U and ^{207}Pb/^{206}Pb ages corrected for initial disequilibrium in ^{230}Th/^{238}U using Th/U [magma] = 4.

Table S2. U-Th-Pb Isotopic Data for Magmatic Zircon and Titanite from Intrusive Rocks of the Olds Ferry Arc Terrane.

	Compositional Parameters					Radiogenic Isotope Ratios								Isotopic Ages					
ID (a)	^{206}Pb* x10^{-13} mol (b)	mol % ^{206}Pb* (b)	Pb*/Pb$_c$ (b)	Pbc (pg) (b)	^{206}Pb/^{204}Pb (c)	^{208}Pb/^{206}Pb (d)	^{207}Pb/^{206}Pb (d)	% err (e)	^{207}Pb/^{235}U (d)	% err (e)	^{206}Pb/^{238}U (d)	% err (e)	corr. coef.	^{207}Pb/^{206}Pb (f)	± (e)	^{207}Pb/^{235}U (f)	± (e)	^{206}Pb/^{238}U (f)	± (e)
HT04-04																			
z1	**2.633**	**99.00%**	**28**	**2.19**	**1854**	**0.080**	**0.050946**	**0.322**	**0.263883**	**0.486**	**0.037567**	**0.333**	**0.751**	**238.37**	**7.43**	**237.79**	**1.03**	**237.73**	**0.78**
z2	**2.360**	**99.17%**	**34**	**1.63**	**2238**	**0.073**	**0.050837**	**0.227**	**0.263457**	**0.266**	**0.037586**	**0.069**	**0.643**	**233.45**	**5.24**	**237.45**	**0.56**	**237.85**	**0.16**
z3	**4.575**	**98.98%**	**27**	**3.86**	**1830**	**0.065**	**0.050930**	**0.270**	**0.263858**	**0.313**	**0.037575**	**0.081**	**0.622**	**237.66**	**6.24**	**237.77**	**0.66**	**237.78**	**0.19**
z4	**1.752**	**99.43%**	**49**	**0.82**	**3272**	**0.069**	**0.050949**	**0.164**	**0.263726**	**0.203**	**0.037542**	**0.071**	**0.674**	**238.51**	**3.77**	**237.66**	**0.43**	**237.58**	**0.17**
z5	**2.119**	**99.29%**	**40**	**1.25**	**2614**	**0.079**	**0.051016**	**0.219**	**0.264245**	**0.297**	**0.037566**	**0.166**	**0.689**	**241.57**	**5.05**	**238.08**	**0.63**	**237.73**	**0.39**
z6	**2.188**	**99.57%**	**67**	**0.77**	**4363**	**0.087**	**0.050897**	**0.140**	**0.263415**	**0.175**	**0.037536**	**0.060**	**0.698**	**236.15**	**3.23**	**237.42**	**0.37**	**237.54**	**0.14**
z7	**3.129**	**99.68%**	**88**	**0.82**	**5820**	**0.074**	**0.050913**	**0.155**	**0.263662**	**0.181**	**0.037559**	**0.063**	**0.549**	**236.89**	**3.58**	**237.61**	**0.38**	**237.69**	**0.15**
HT07-02																			
z1	**1.644**	**99.64%**	**84**	**0.49**	**5132**	**0.172**	**0.050925**	**0.113**	**0.263510**	**0.148**	**0.037529**	**0.056**	**0.741**	**237.42**	**2.60**	**237.49**	**0.31**	**237.50**	**0.13**
z2	**1.911**	**99.72%**	**109**	**0.44**	**6640**	**0.164**	**0.050877**	**0.095**	**0.263425**	**0.132**	**0.037552**	**0.057**	**0.777**	**235.27**	**2.18**	**237.42**	**0.28**	**237.64**	**0.13**
z3	**3.917**	**99.88%**	**259**	**0.39**	**15373**	**0.199**	**0.050957**	**0.056**	**0.263842**	**0.099**	**0.037552**	**0.053**	**0.901**	**238.90**	**1.30**	**237.76**	**0.21**	**237.64**	**0.12**
z4	0.522	99.03%	30	0.42	1920	0.103	0.050729	0.325	0.243076	0.364	0.034753	0.069	0.623	228.51	7.52	220.94	0.72	220.23	0.15
z5	**1.751**	**99.71%**	**106**	**0.41**	**6523**	**0.156**	**0.050838**	**0.116**	**0.263309**	**0.150**	**0.037564**	**0.055**	**0.727**	**233.51**	**2.68**	**237.33**	**0.32**	**237.72**	**0.13**
z7	**0.545**	**98.95%**	**29**	**0.48**	**1768**	**0.174**	**0.050802**	**0.336**	**0.262973**	**0.374**	**0.037543**	**0.066**	**0.633**	**231.85**	**7.75**	**237.06**	**0.79**	**237.59**	**0.15**
z8	**2.017**	**99.45%**	**56**	**0.91**	**3413**	**0.165**	**0.050806**	**0.174**	**0.262831**	**0.206**	**0.037520**	**0.063**	**0.620**	**232.05**	**4.03**	**236.95**	**0.44**	**237.44**	**0.15**
z9	**0.716**	**98.75%**	**23**	**0.74**	**1489**	**0.126**	**0.050923**	**0.358**	**0.263625**	**0.395**	**0.037546**	**0.070**	**0.592**	**237.36**	**8.26**	**237.58**	**0.84**	**237.61**	**0.16**
z10	0.664	98.90%	27	0.61	1684	0.135	0.050930	0.340	0.262161	0.376	0.037333	0.063	0.628	237.65	7.83	236.41	0.79	236.28	0.15
DC08-07																			
z1	1.299	99.44%	51	0.61	3300	0.109	0.050804	0.161	0.252937	0.193	0.036109	0.055	0.674	231.95	3.73	228.96	0.40	228.67	0.12
z2	0.999	99.55%	63	0.37	4131	0.092	0.050768	0.141	0.249796	0.174	0.035686	0.054	0.699	230.32	3.26	226.41	0.35	226.03	0.12
z3	**0.857**	**99.14%**	**33**	**0.61**	**2169**	**0.084**	**0.050729**	**0.244**	**0.247591**	**0.277**	**0.035398**	**0.059**	**0.630**	**228.53**	**5.64**	**224.62**	**0.56**	**224.24**	**0.13**
z4	0.509	98.89%	26	0.47	1677	0.103	0.050785	0.321	0.252725	0.356	0.036092	0.066	0.595	231.07	7.42	228.79	0.73	228.56	0.15
z5	0.409	98.18%	16	0.62	1023	0.104	0.050795	0.512	0.252767	0.556	0.036091	0.073	0.648	231.52	11.83	228.82	1.14	228.56	0.16
z6	0.446	98.65%	21	0.50	1378	0.105	0.050696	0.449	0.251616	0.491	0.035997	0.074	0.616	227.02	10.37	227.89	1.00	227.97	0.17
z7	0.232	97.32%	10	0.52	695	0.088	0.050705	0.772	0.250315	0.834	0.035805	0.097	0.670	227.42	17.83	226.83	1.69	226.77	0.22
z8	0.185	96.43%	8	0.56	522	0.101	0.050775	1.049	0.250214	1.129	0.035740	0.112	0.739	230.63	24.22	226.75	2.29	226.38	0.25

(a) z1, z2, etc., are labels for single zircon or sphene grains or fragments; all zircon fractions were annealed and chemically abraded after Mattinson (2005); bold indicates analyses used in weighted mean calculations.

(b) Pb* and Pbc represent radiogenic and common Pb, respectively; mol % ^{206}Pb* with respect to radiogenic, blank and initial common Pb.

(c) Measured ratio corrected for spike and fractionation only. Mass fractionation correction of 0.22 ± 0.02 (1-sigma) %/amu (atomic mass unit) was applied to all single-collector Daly analyses, based on analysis of NBS-981 and NBS-982.

(d) Corrected for fractionation, spike, and common Pb; up to 1 pg of common Pb was assumed to be procedural blank: ^{206}Pb/204Pb = 18.60 ± 0.80%; ^{207}Pb/^{204}Pb = 15.69 ± 0.32%; ^{208}Pb/^{204}Pb = 38.51 ± 0.74% (all uncertainties 1-sigma). Residual common Pb was allocated an isotopic composition estimated from the Stacey and Kramers (1975) Earth reference model at the nominal sample age.

(e) Errors are 2-sigma, propagated using the algorithms of Schmitz and Schoene (2007).

(f) Calculations are based on the decay constants of Jaffey et al. (1971). ^{206}Pb/^{238}U and ^{207}Pb/^{206}Pb ages corrected for initial disequilibrium in ^{230}Th/^{238}U using Th/U [magma] = 4.

(g) Corrected for fractionation, spike, and blank Pb only.

Table S2. Continued.

	Compositional Parameters					Radiogenic Isotope Ratios								Isotopic Ages					
ID (a)	^{206}Pb* x10^{-13} mol (b)	mol % ^{206}Pb* (b)	Pb*/Pb$_c$ (b)	Pbc (pg) (b)	^{206}Pb/^{204}Pb (c)	^{208}Pb/^{206}Pb (d)	^{207}Pb/^{206}Pb (d)	% err (e)	^{207}Pb/^{235}U (d)	% err (e)	^{206}Pb/^{238}U (d)	% err (e)	corr. coef.	^{207}Pb/^{206}Pb (f)	± (e)	^{207}Pb/^{235}U (f)	± (e)	^{206}Pb/^{238}U (f)	± (e)
RC07-06																			
z1	**7.763**	**99.85%**	**191**	**0.96**	**12447**	**0.090**	**0.050599**	**0.061**	**0.243124**	**0.104**	**0.034848**	**0.058**	**0.872**	**222.62**	**1.40**	**220.98**	**0.21**	**220.82**	**0.13**
z2	**4.707**	**99.82%**	**162**	**0.70**	**10296**	**0.115**	**0.050611**	**0.070**	**0.243189**	**0.110**	**0.034850**	**0.054**	**0.853**	**223.14**	**1.61**	**221.03**	**0.22**	**220.83**	**0.12**
z3	**2.973**	**99.70%**	**96**	**0.73**	**6215**	**0.095**	**0.050578**	**0.093**	**0.243133**	**0.130**	**0.034864**	**0.056**	**0.783**	**221.64**	**2.15**	**220.98**	**0.26**	**220.92**	**0.12**
z4	**5.225**	**99.85%**	**193**	**0.65**	**12217**	**0.121**	**0.050581**	**0.061**	**0.243006**	**0.107**	**0.034844**	**0.061**	**0.872**	**221.76**	**1.41**	**220.88**	**0.21**	**220.80**	**0.13**
z5	**3.694**	**99.37%**	**44**	**1.93**	**2940**	**0.074**	**0.050546**	**0.177**	**0.243003**	**0.214**	**0.034867**	**0.065**	**0.669**	**220.20**	**4.10**	**220.88**	**0.42**	**220.94**	**0.14**
z6	1.139	99.66%	84	0.32	5441	0.098	0.050488	0.114	0.242934	0.151	0.034898	0.059	0.745	217.53	2.65	220.82	0.30	221.13	0.13
z7	**1.608**	**99.61%**	**74**	**0.51**	**4815**	**0.095**	**0.050542**	**0.116**	**0.243001**	**0.152**	**0.034870**	**0.057**	**0.743**	**220.01**	**2.68**	**220.87**	**0.30**	**220.96**	**0.12**
z8	1.766	99.73%	105	0.40	6855	0.089	0.050519	0.094	0.243268	0.131	0.034924	0.055	0.785	218.97	2.19	221.09	0.26	221.29	0.12
RC07-03																			
z1	1.861	99.79%	143	0.32	8886	0.142	0.050512	0.078	0.242657	0.120	0.034842	0.060	0.823	218.61	1.81	220.59	0.24	220.78	0.13
z2	1.108	99.62%	78	0.35	4840	0.153	0.050545	0.135	0.242820	0.169	0.034842	0.059	0.689	220.12	3.13	220.73	0.34	220.78	0.13
z3	2.268	99.81%	154	0.36	9549	0.145	0.050527	0.088	0.242734	0.131	0.034842	0.070	0.779	219.32	2.03	220.66	0.26	220.78	0.15
z4	**2.867**	**99.83%**	**171**	**0.41**	**10647**	**0.143**	**0.050504**	**0.069**	**0.241987**	**0.111**	**0.034751**	**0.057**	**0.851**	**218.23**	**1.61**	**220.05**	**0.22**	**220.22**	**0.12**
z5	2.733	99.67%	93	0.74	5694	0.162	0.050535	0.099	0.243241	0.138	0.034910	0.061	0.765	219.66	2.30	221.07	0.27	221.20	0.13
z6	**1.190**	**99.66%**	**87**	**0.34**	**5419**	**0.147**	**0.050496**	**0.117**	**0.241970**	**0.155**	**0.034754**	**0.064**	**0.723**	**217.87**	**2.71**	**220.03**	**0.31**	**220.23**	**0.14**
z7	0.373	98.70%	24	0.40	1435	0.187	0.050523	0.363	0.243122	0.413	0.034900	0.089	0.636	219.15	8.40	220.97	0.82	221.15	0.19
z8	**3.288**	**99.70%**	**99**	**0.82**	**6150**	**0.148**	**0.050526**	**0.097**	**0.242237**	**0.134**	**0.034772**	**0.056**	**0.777**	**219.26**	**2.24**	**220.25**	**0.26**	**220.34**	**0.12**
z9	**2.685**	**99.66%**	**87**	**0.76**	**5395**	**0.143**	**0.050514**	**0.105**	**0.242195**	**0.141**	**0.034773**	**0.056**	**0.757**	**218.74**	**2.43**	**220.22**	**0.28**	**220.35**	**0.12**
RC07-04																			
z1	**1.979**	**99.24%**	**38**	**1.24**	**2450**	**0.101**	**0.050583**	**0.220**	**0.241228**	**0.253**	**0.034588**	**0.070**	**0.583**	**221.87**	**5.08**	**219.43**	**0.50**	**219.20**	**0.15**
z2	2.786	99.86%	205	0.32	13150	0.105	0.050524	0.064	0.241435	0.106	0.034658	0.054	0.879	219.19	1.48	219.59	0.21	219.63	0.12
z3	**2.217**	**99.04%**	**30**	**1.76**	**1941**	**0.102**	**0.050537**	**0.266**	**0.240820**	**0.297**	**0.034560**	**0.061**	**0.595**	**219.79**	**6.15**	**219.09**	**0.59**	**219.03**	**0.13**
z4	2.167	99.60%	72	0.72	4612	0.106	0.050520	0.196	0.241377	0.232	0.034652	0.078	0.586	218.99	4.55	219.55	0.46	219.60	0.17
z5	1.377	98.64%	21	1.57	1364	0.108	0.050495	0.447	0.241400	0.484	0.034673	0.105	0.447	217.83	10.35	219.57	0.96	219.73	0.23

(a) z1, t2, etc., are labels for single zircon or titanite grains or fragments; all zircon fractions were annealed and chemically abraded after Mattinson (2005); bold indicates analyses used in weighted mean calculations.

(b) Pb* and Pbc represent radiogenic and common Pb, respectively; mol % ^{206}Pb* with respect to radiogenic, blank and initial common Pb.

(c) Measured ratio corrected for spike and fractionation only. Mass fractionation correction of 0.22 ± 0.02 (1-sigma) %/amu (atomic mass unit) was applied to all single-collector Daly analyses, based on analysis of NBS-981 and NBS-982.

(d) Corrected for fractionation, spike, and common Pb; up to 1 pg of common Pb was assumed to be procedural blank: ^{206}Pb/^{204}Pb = 18.60 ± 0.80%; ^{207}Pb/^{204}Pb = 15.69 ± 0.32%; ^{208}Pb/^{204}Pb = 38.51 ± 0.74% (all uncertainties 1-sigma). Residual common Pb was allocated an isotopic composition estimated from the Stacey and Kramers (1975) Earth reference model at the nominal sample age.

(e) Errors are 2-sigma, propagated using the algorithms of Schmitz and Schoene (2007).

(f) Calculations are based on the decay constants of Jaffey et al. (1971). ^{206}Pb/^{238}U and ^{207}Pb/^{206}Pb ages corrected for initial disequilibrium in ^{230}Th/^{238}U using Th/U [magma] = 4.

(g) Corrected for fractionation, spike, and blank Pb only.

Table S2. Continued.

Compositional Parameters						Radiogenic Isotope Ratios								Isotopic Ages					
ID (a)	$^{206}Pb^*$ x10^{-13} mol (b)	mol % $^{206}Pb^*$ (b)	Pb^*/Pb_c (b)	Pbc (pg) (b)	$^{206}Pb/^{204}Pb$ (c)	$^{208}Pb/^{206}Pb$ (d)	$^{207}Pb/^{206}Pb$ (d)	% err (e)	$^{207}Pb/^{235}U$ (d)	% err (e)	$^{206}Pb/^{238}U$ (d)	% err (e)	corr. coef.	$^{207}Pb/^{206}Pb$ (f)	± (e)	$^{207}Pb/^{235}U$ (f)	± (e)	$^{206}Pb/^{238}U$ (f)	± (e)
RC07-05																			
z1	1.329	99.54%	61	0.50	4043	0.070	0.050495	0.145	0.238242	0.186	0.034219	0.079	0.677	217.84	3.35	216.98	0.36	216.90	0.17
z2	1.402	99.59%	70	0.47	4534	0.101	0.050471	0.153	0.239906	0.183	0.034475	0.063	0.612	216.73	3.54	218.34	0.36	218.49	0.13
z3	**3.304**	**99.69%**	**91**	**0.84**	**6007**	**0.073**	**0.050441**	**0.097**	**0.237543**	**0.135**	**0.034155**	**0.058**	**0.770**	**215.37**	**2.25**	**216.41**	**0.26**	**216.50**	**0.12**
z4	4.002	99.78%	128	0.72	8470	0.074	0.050459	0.073	0.238871	0.115	0.034334	0.058	0.846	216.21	1.68	217.50	0.22	217.61	0.12
z5	2.746	99.73%	104	0.61	6862	0.075	0.050490	0.115	0.239813	0.150	0.034448	0.058	0.721	217.62	2.67	218.27	0.29	218.33	0.12
z6	3.814	99.85%	186	0.48	12262	0.074	0.050483	0.066	0.238521	0.109	0.034268	0.059	0.864	217.27	1.52	217.21	0.21	217.20	0.13
z7	1.351	99.70%	94	0.33	6220	0.077	0.050468	0.101	0.239495	0.141	0.034417	0.059	0.785	216.62	2.34	218.01	0.28	218.14	0.13
z8	0.970	99.50%	56	0.40	3689	0.085	0.050476	0.164	0.240161	0.200	0.034508	0.062	0.691	216.98	3.79	218.55	0.39	218.70	0.13
z9	1.796	99.67%	86	0.49	5572	0.093	0.050438	0.109	0.240505	0.146	0.034583	0.057	0.768	215.22	2.52	218.83	0.29	219.17	0.12
CUD09-01																			
z1	**1.713**	**99.08%**	**32**	**1.31**	**2016**	**0.136**	**0.050486**	**0.221**	**0.237721**	**0.253**	**0.034150**	**0.061**	**0.615**	**217.45**	**5.10**	**216.55**	**0.49**	**216.47**	**0.13**
z2	**5.554**	**99.92%**	**441**	**0.36**	**23479**	**0.342**	**0.050465**	**0.078**	**0.237641**	**0.113**	**0.034153**	**0.059**	**0.762**	**216.49**	**1.81**	**216.49**	**0.22**	**216.49**	**0.13**
z3	**0.833**	**99.16%**	**35**	**0.58**	**2220**	**0.136**	**0.050481**	**0.260**	**0.237786**	**0.290**	**0.034163**	**0.060**	**0.580**	**217.22**	**6.01**	**216.61**	**0.57**	**216.55**	**0.13**
z4	**2.889**	**99.71%**	**112**	**0.69**	**6462**	**0.232**	**0.050593**	**0.113**	**0.238255**	**0.150**	**0.034155**	**0.062**	**0.721**	**222.33**	**2.62**	**216.99**	**0.29**	**216.50**	**0.13**
z5	1.611	99.56%	78	0.58	4250	0.321	0.050533	0.151	0.237661	0.178	0.034110	0.056	0.601	219.58	3.50	216.50	0.35	216.22	0.12
z6	**0.594**	**99.41%**	**55**	**0.29**	**3178**	**0.249**	**0.050533**	**0.175**	**0.237905**	**0.210**	**0.034145**	**0.064**	**0.655**	**219.60**	**4.05**	**216.70**	**0.41**	**216.44**	**0.14**
z7	**0.451**	**99.30%**	**47**	**0.26**	**2655**	**0.270**	**0.050542**	**0.255**	**0.237853**	**0.290**	**0.034131**	**0.076**	**0.562**	**220.00**	**5.90**	**216.66**	**0.57**	**216.35**	**0.16**
DC07-06																			
z1	**2.144**	**99.65%**	**84**	**0.62**	**5308**	**0.128**	**0.050354**	**0.116**	**0.229817**	**0.151**	**0.033101**	**0.056**	**0.746**	**211.37**	**2.69**	**210.05**	**0.29**	**209.93**	**0.12**
z2	**2.534**	**99.69%**	**93**	**0.65**	**5958**	**0.115**	**0.050297**	**0.106**	**0.229699**	**0.144**	**0.033122**	**0.059**	**0.757**	**208.76**	**2.46**	**209.95**	**0.27**	**210.06**	**0.12**
z3	**2.802**	**99.48%**	**56**	**1.21**	**3563**	**0.129**	**0.050313**	**0.140**	**0.229928**	**0.179**	**0.033144**	**0.057**	**0.777**	**209.48**	**3.24**	**210.14**	**0.34**	**210.20**	**0.12**
z4	**3.221**	**99.70%**	**97**	**0.81**	**6120**	**0.131**	**0.050312**	**0.100**	**0.229731**	**0.137**	**0.033117**	**0.057**	**0.775**	**209.42**	**2.31**	**209.98**	**0.26**	**210.03**	**0.12**
z5	**2.720**	**99.66%**	**86**	**0.77**	**5415**	**0.134**	**0.050350**	**0.119**	**0.229879**	**0.154**	**0.033113**	**0.057**	**0.728**	**211.20**	**2.76**	**210.10**	**0.29**	**210.00**	**0.12**

(a) z1, t2, etc., are labels for single zircon or titanite grains or fragments; all zircon fractions were annealed and chemically abraded after Mattinson (2005); bold indicates analyses used in weighted mean calculations.
(b) Pb* and Pbc represent radiogenic and common Pb, respectively; mol % $^{206}Pb^*$ with respect to radiogenic, blank and initial common Pb.
(c) Measured ratio corrected for spike and fractionation only. Mass fractionation correction of 0.22 ± 0.02 (1-sigma) %/amu (atomic mass unit) was applied to all single-collector Daly analyses, based on analysis of NBS-981 and NBS-982.
(d) Corrected for fractionation, spike, and common Pb; up to 1 pg of common Pb was assumed to be procedural blank: $^{206}Pb/^{204}Pb$ = 18.60 ± 0.80%; $^{207}Pb/^{204}Pb$ = 15.69 ± 0.32%; $^{208}Pb/^{204}Pb$ = 38.51 ± 0.74% (all uncertainties 1-sigma). Residual common Pb was allocated an isotopic composition estimated from the Stacey and Kramers (1975) Earth reference model at the nominal sample age.
(e) Errors are 2-sigma, propagated using the algorithms of Schmitz and Schoene (2007).
(f) Calculations are based on the decay constants of Jaffey et al. (1971). $^{206}Pb/^{238}U$ and $^{207}Pb/^{206}Pb$ ages corrected for initial disequilibrium in $^{230}Th/^{238}U$ using Th/U [magma] = 4.
(g) Corrected for fractionation, spike, and blank Pb only.

Table S2. Continued.

	Sample (Radiogenic + Initial Pb) Isotope Ratios									
(a)	$^{238}U/^{204}Pb$ (g)	% err (e)	$^{206}Pb/^{204}Pb$ (g)	% err (e)	corr. coef. 8/4-6/4	$^{235}U/^{204}Pb$ (g)	% err (e)	$^{207}Pb/^{204}Pb$ (g)	% err (e)	corr. coef. 5/4-7/4
DC08-01										
t1	108.126	5.465	19.846	0.392	0.560	0.784	5.465	15.741	0.314	0.082
t2	12.241	0.775	19.153	0.094	0.191	0.089	0.775	15.679	0.130	0.067
t3	4102.266	18.680	49.591	11.687	1.000	29.752	18.680	17.028	1.635	0.913
t4	776.915	19.770	24.693	4.922	0.994	5.635	19.770	16.050	0.831	0.561
t5	184.224	4.540	20.403	0.449	0.902	1.336	4.540	15.717	0.232	0.071
DC08-14										
t1	111.241	3.938	19.749	0.297	0.789	0.807	3.938	15.625	0.222	-0.034
t2	162.379	2.058	20.264	0.208	0.833	1.178	2.058	15.716	0.156	0.062
t3	22.631	2.337	19.065	0.140	0.363	0.164	2.337	15.663	0.162	0.020
t4	1398.827	21.432	29.070	7.755	0.998	10.145	21.432	16.006	0.928	0.487
t5	171.847	40.635	19.952	3.070	0.908	1.246	40.635	15.624	1.406	-0.089

(a) z1, t2, etc., are labels for single zircon or titanite grains or fragments; all zircon fractions were annealed and chemically abraded after Mattinson (2005); bold indicates analyses used in weighted mean calculations.

(b) Pb* and Pbc represent radiogenic and common Pb, respectively; mol % $^{206}Pb^*$ with respect to radiogenic, blank and initial common Pb.

(c) Measured ratio corrected for spike and fractionation only. Mass fractionation correction of 0.22 ± 0.02 (1-sigma) %/amu (atomic mass unit) was applied to all single-collector Daly analyses, based on analysis of NBS-981 and NBS-982.

(d) Corrected for fractionation, spike, and common Pb; up to 1 pg of common Pb was assumed to be procedural blank: $^{206}Pb/^{204}Pb$ = 18.60 ± 0.80%; $^{207}Pb/^{204}Pb$ = 15.69 ± 0.32%; $^{208}Pb/^{204}Pb$ = 38.51 ± 0.74% (all uncertainties 1-sigma).

(e) Errors are 2-sigma, propagated using the algorithms of Schmitz and Schoene (2007).

(f) Calculations are based on the decay constants of Jaffey et al. (1971). $^{206}Pb/^{238}U$ and $^{207}Pb/^{206}Pb$ ages corrected for initial disequilibrium in $^{230}Th/^{238}U$ using Th/U [magma] = 4.

(g) Corrected for fractionation, spike, and blank Pb only.

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GSA Data Repository Item 2016220

Table S3. Trace Element Data for Intrusive Rocks from the Olds Ferry Arc Terrane, Oxbow Complex, and Salmon River Canyon.

	Olds Ferry Arc Terrane							
	Huntington Area							
	HT04-04	HT07-01	HT07-02	HT07-03	HT07-04	HT07-06	WB07-01	WB07-02
Ni	2.54	1.801	15.74	91.79	26.45	1.355	34.16	1.712
Cr	6.27	3.829	34.57	204.7	24.21	2.127	60.82	2.148
Cs	0.65	0.10	0.50	0.97	4.90	0.29	15.04	1.75
Rb	18.88	0.84	32.73	16.01	50.15	3.74	17.14	60.74
Ba	370	59	247	498	1208	68	329	639
Th	1.07	0.41	0.77	1.84	0.02	0.56	2.26	1.43
K	14190	1050	15900	10710	29130	2760	8450	20810
U	0.81	0.34	0.65	0.76	0.01	0.48	0.74	0.74
Ta	0.11	0.06	0.07	0.29	0.00	0.07	0.63	0.18
Nb	1.67	0.94	1.14	5.53	0.03	1.08	12.07	3.11
La	4.46	3.85	4.93	12.18	0.18	3.70	15.83	8.18
Ce	12.15	10.28	13.86	26.83	0.55	11.33	35.51	18.77
Pb	4.79	1.78	5.05	4.52	3.11	1.29	3.73	24.54
Pr	2.28	1.71	2.31	3.58	0.12	1.77	4.97	2.79
Sr	140	149	303	378	184	115	348	125
P	570	860	820	1530	270	460	1630	680
Nd	11.89	9.01	11.87	15.32	0.74	8.81	22.09	12.78
Sm	4.24	3.13	4.25	3.82	0.37	2.81	6.14	3.67
Zr	116.5	55.2	105.1	108.4	2.6	113.7	183.2	115.2
Hf	3.65	1.65	3.24	2.23	0.11	3.32	4.29	2.93
Eu	0.94	1.05	1.16	1.26	0.31	0.65	1.85	1.16
Ti	3830	4030	5890	7370	5530	1900	13230	3640
Gd	5.24	3.72	5.40	4.00	0.60	3.36	6.67	4.18
Tb	0.98	0.67	1.01	0.61	0.10	0.64	1.10	0.74
Dy	6.83	4.57	7.04	3.83	0.71	4.46	6.96	4.87
Y	45.49	29.35	47.74	23.56	3.97	30.24	40.81	32.61
Ho	1.56	1.02	1.61	0.82	0.15	1.02	1.47	1.09
Er	4.51	2.89	4.66	2.27	0.43	3.01	3.95	3.16
Tm	0.71	0.45	0.73	0.34	0.06	0.48	0.58	0.49
Yb	4.78	3.00	4.97	2.23	0.39	3.30	3.79	3.38
Lu	0.66	0.42	0.69	0.31	0.07	0.48	0.50	0.46
(a) Values in parts per million (ppm)								
UTM Zone 11								
Easting	481388	481141	481383	481383	480242	480242	471579	471470
Northing	4916429	4915702	4914163	4914163	4911636	4911636	4907739	4907392

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Table S3. Continued.

	Olds Ferry Arc Terrane									
	Mineral-Iron Mountain District				Rush Creek Canyon					
	DC07-06	DC08-01	DC08-07	DC08-14	RC07-02	RC07-03	RC07-04	RC07-05	RC07-06	CUD09-01
Ni	6.475	11.02	1.557	10.14	4.335	1.929	2.612	1.34	18.75	4.404
Cr	10.98	51.29	2.379	51.09	5.693	3.394	3.076	2.845	35.71	9.035
Cs	4.01	1.97	2.68	2.06	0.13	0.38	0.35	0.64	0.51	8.55
Rb	54.03	34.31	15.82	30.55	2.99	3.33	4.02	8.90	11.94	98.08
Ba	983	796	493	764	208	382	680	668	255	2407
Th	7.61	3.14	2.71	2.79	0.96	0.42	1.03	2.64	0.43	4.15
K	18330	---	---	---	2180	6150	7980	10330	4980	---
U	2.59	1.93	1.01	1.86	0.42	0.12	0.28	0.46	0.24	1.49
Ta	0.30	0.23	0.11	0.22	0.12	0.10	0.11	0.15	0.04	0.23
Nb	3.26	4.84	1.61	4.70	2.23	1.96	1.60	1.90	0.61	3.25
La	13.54	11.58	8.13	9.89	7.03	6.74	6.46	6.87	2.81	13.16
Ce	27.28	23.97	16.00	20.32	14.75	10.26	9.11	10.92	6.66	27.01
Pb	5.29	16.77	3.03	17.22	1.24	1.23	2.20	2.28	2.08	3.06
Pr	3.59	2.79	1.85	2.42	2.38	2.17	1.93	2.29	1.03	3.33
Sr	233	941	152	906	321	255	242	111	224	992
P	660	---	---	---	810	1110	600	470	480	---
Nd	13.83	10.79	7.24	9.56	11.42	9.97	8.72	9.92	5.10	13.49
Sm	3.27	2.14	1.60	1.90	3.59	2.77	2.50	2.92	1.69	3.02
Zr	94.9	91.2	87.8	86.5	89.4	66.9	107.1	145.3	27.6	106.8
Hf	2.63	2.49	2.56	2.33	2.13	1.62	2.86	3.93	0.87	3.09
Eu	0.90	0.63	0.50	0.60	1.22	0.91	0.96	0.72	0.67	0.93
Ti	3340	2274	1650	2141	6010	4160	3560	2040	5340	2971
Gd	3.39	2.03	1.76	1.86	4.20	3.11	2.93	3.30	2.11	3.32
Tb	0.53	0.31	0.31	0.29	0.73	0.53	0.52	0.58	0.38	0.55
Dy	3.39	1.87	2.05	1.77	4.87	3.47	3.56	3.98	2.61	3.41
Y	22.88	11.97	14.07	11.64	31.04	22.22	23.72	27.66	16.91	22.11
Ho	0.74	0.41	0.47	0.39	1.09	0.77	0.80	0.90	0.59	0.74
Er	2.14	1.23	1.49	1.20	3.06	2.24	2.34	2.66	1.68	2.24
Tm	0.34	0.21	0.26	0.20	0.46	0.34	0.38	0.43	0.26	0.37
Yb	2.32	1.35	1.80	1.31	3.01	2.24	2.59	3.01	1.77	2.48
Lu	0.34	0.21	0.30	0.21	0.41	0.32	0.38	0.43	0.25	0.39
(a) Values in parts per million (ppm)										
UTM Zone 11										
Easting	496274	493444	498298	493493	524364	524344	524489	524044	524089	510294
Northing	4933762	4933920	4931232	4934591	4949956	4949793	4949590	4948775	4948626	4954192

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Table S3. Continued.

	Oxbow Complex									
	OX08-01	OX08-02	OX08-03	OX08-04	OX08-06	OX08-08	OX08-09	OX08-10	OX08-11	OX08-14
Ni	---	2.282	30.4	104.4	22.29	1.037	9.832	1.634	7.402	30.51
Cr	---	4.215	28.99	237	64.18	1.557	12.97	0.924	2.478	141.5
Cs	0.02	0.08	0.06	0.07	0.34	0.04	0.23	0.03	0.17	0.20
Rb	1.02	6.21	16.40	6.20	38.70	11.34	8.17	1.35	7.22	32.07
Ba	28	246	253	132	151	278	156	94	120	315
Th	1.68	1.93	1.36	0.32	0.19	2.45	0.48	0.46	0.42	0.59
K	700	---	---	---	---	---	---	---	---	---
U	0.64	0.84	0.84	0.13	0.18	1.09	0.26	0.25	0.37	0.30
Ta	0.51	0.33	0.23	0.14	0.07	0.47	0.12	0.13	0.12	0.09
Nb	7.22	5.23	3.61	2.32	1.32	5.19	2.15	2.17	2.15	1.62
La	9.73	8.46	9.70	4.06	3.08	10.96	5.40	2.32	5.67	3.55
Ce	17.88	22.58	25.57	10.85	8.74	23.87	14.86	8.42	15.50	8.80
Pb	0.68	0.94	1.42	2.00	2.92	0.90	0.39	0.31	0.25	0.53
Pr	3.23	3.14	3.93	1.73	1.50	3.12	2.40	1.27	2.48	1.33
Sr	29	110	144	127	280	93	248	196	242	141
P	210	---	---	---	---	---	---	---	---	---
Nd	13.50	14.41	19.69	8.82	8.34	12.09	12.74	7.75	13.24	6.60
Sm	3.24	3.89	5.89	2.71	3.07	2.61	3.99	2.98	4.15	2.08
Zr	207.5	230.0	161.2	58.5	56.4	132.3	72.3	100.7	78.2	48.8
Hf	5.22	5.93	4.42	1.52	1.71	3.68	2.17	3.10	2.40	1.43
Eu	0.81	0.96	1.70	0.92	1.08	0.63	1.33	1.14	1.42	0.68
Ti	1360	2679	12590	7224	6878	1534	8813	3988	7589	5105
Gd	3.32	4.40	7.09	3.19	3.96	2.68	4.68	3.80	5.02	2.62
Tb	0.59	0.81	1.27	0.56	0.74	0.47	0.85	0.71	0.91	0.49
Dy	4.00	5.28	8.20	3.52	4.84	3.00	5.37	4.65	5.80	3.17
Y	26.08	34.70	49.64	20.49	28.52	21.07	31.67	29.55	34.58	19.53
Ho	0.91	1.16	1.74	0.73	1.03	0.67	1.13	1.03	1.22	0.70
Er	2.73	3.58	5.06	2.11	2.98	2.13	3.26	3.10	3.56	2.07
Tm	0.43	0.58	0.78	0.32	0.45	0.37	0.50	0.48	0.55	0.32
Yb	3.12	3.85	5.04	1.95	2.91	2.57	3.19	3.20	3.52	2.06
Lu	0.41	0.59	0.76	0.29	0.44	0.42	0.48	0.51	0.54	0.33

(a) Values in parts per million (ppm)

UTM Zone 11										
Easting	513509	513542	513552	513508	513829	510899	512453	512438	512426	514290
Northing	4981170	4981335	4981205	4981061	4980897	4969339	4977396	4977359	4977283	4982077

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Table S3. Continued.

	Salmon River Canyon		
	SAL09-01	SAL09-02	SAL09-03
Ni	0.946	58.45	0.365
Cr	1.509	85.79	-0.067
Cs	0.11	0.14	0.45
Rb	6.19	10.88	28.65
Ba	233	137	386
Th	1.66	0.34	2.09
K	---	---	---
U	0.86	0.18	0.81
Ta	0.29	0.07	0.52
Nb	3.93	1.10	6.83
La	11.01	3.82	11.90
Ce	22.87	10.21	30.22
Pb	0.60	0.72	0.97
Pr	3.31	1.60	4.17
Sr	111	356	118
P	---	---	---
Nd	13.67	8.09	18.44
Sm	3.00	2.27	4.54
Zr	135.2	43.0	148.8
Hf	3.47	1.23	3.88
Eu	0.85	0.83	1.33
Ti	1579	4882	5629
Gd	3.13	2.54	4.72
Tb	0.53	0.44	0.80
Dy	3.36	2.73	4.97
Y	22.91	15.63	29.70
Ho	0.75	0.57	1.04
Er	2.35	1.62	3.12
Tm	0.39	0.24	0.50
Yb	2.70	1.57	3.33
Lu	0.44	0.23	0.51

(a) Values in parts per million (ppm)

UTM Zone 11			
Easting	556291	556291	555871
Northing	5051106	5051106	5051435

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Table S4. Sr, Nd, and Pb Isotopic Data for Intrusive Rocks from the Wallowa Arc Terrane, Olds Ferry Arc Terrane, Oxbow Complex, and Salmon River Canyon.

Sample	Rb (ppm)	Sr (ppm)	Rb/Sr	$^{87}Rb/^{86}Sr$	± ± 2s [abs]	$^{87}Sr/^{86}Sr$ (Measured)	± ± 2s [abs]	$^{87}Sr/^{86}Sr$ (Initial)
Wallowa Arc Terrane, Cougar Creek Complex								
CC631	5.90	262.76	0.0225	0.0650	0.0001	0.703137	0.000009	0.702919
CC641	21.71	479.79	0.0452	0.1309	0.0001	0.703289	0.000015	0.702851
CC682	2.46	375.99	0.0066	0.0190	0.0000	0.703056	0.000012	0.702993
CC7171	1.98	351.40	0.0056	0.0163	0.0000	0.703124	0.000012	0.703070
CC831	27.89	395.72	0.0705	0.2040	0.0002	0.703316	0.000013	0.702634
CC632	1.70	207.63	0.0082	0.0236	0.0000	0.702910	0.000011	0.702831
CC6161	1.32	524.74	0.0025	0.0193	0.0000	0.703200	0.000010	0.703135
CC6161 (b)	0.24	568.72	0.0004	0.0012	0.0000	0.703225	0.000009	0.703221
CC7112	4.57	215.99	0.0211	0.0612	0.0001	0.703081	0.000010	0.702876
CC0702	3.34	378.46	0.0088	0.0255	0.0000	0.703118	0.000018	0.703033
CC0704	6.23	282.24	0.0221	0.0639	0.0001	0.703379	0.000025	0.703165
CC08-01	44.86	180.47	0.2486	0.7191	0.0007	0.705337	0.000014	0.702933
CC08-03	5.80	248.34	0.0233	0.0675	0.0001	0.703414	0.000013	0.703188
CC08-04	4.67	373.52	0.0125	0.0362	0.0000	0.703243	0.000018	0.703123
CC08-05	3.30	421.52	0.0078	0.0226	0.0000	0.703121	0.000013	0.703046
CC08-06	19.73	229.13	0.0861	0.2491	0.0002	0.703910	0.000013	0.703077
Salmon River Canyon								
SAL09-01	13.71	149.26	0.0919	0.2658	0.0003	0.704192	0.000007	0.703303
SAL09-02	11.20	365.05	0.0307	0.0888	0.0001	0.703282	0.000008	0.702985
SAL09-03	37.67	140.08	0.2689	0.7781	0.0008	0.705579	0.000007	0.702978
Oxbow Complex								
OX08-01	2.22	38.75	0.0572	0.1652	0.0002	0.704559	0.000012	0.704006
OX08-02	13.79	155.75	0.0885	0.2560	0.0003	0.704196	0.000024	0.703340
OX08-03	16.72	182.90	0.0914	0.2644	0.0003	0.704026	0.000012	0.703142
OX08-04	6.40	128.03	0.0500	0.1447	0.0001	0.703905	0.000007	0.703421
OX08-06	39.42	279.25	0.1412	0.4084	0.0004	0.705030	0.000012	0.703666
OX08-08	18.17	120.30	0.1510	0.4367	0.0004	0.704917	0.000013	0.703457
OX08-09	9.11	226.50	0.0402	0.1164	0.0001	0.703456	0.000010	0.703067
OX08-10	1.38	201.96	0.0068	0.0198	0.0000	0.703326	0.000011	0.703259
OX08-11	7.26	238.79	0.0304	0.0879	0.0001	0.703642	0.000013	0.703348
OX08-14	32.57	138.75	0.2347	0.6791	0.0007	0.704955	0.000008	0.702685
Olds Ferry Arc Terrane								
HT04-04	15.57	92.20	0.1689	0.4888	0.0005	0.705338	0.000022	0.703704
DC07-06	53.87	204.84	0.2630	0.7609	0.0008	0.706354	0.000014	0.703810
HT07-01	0.77	132.05	0.0058	0.0168	0.0000	0.704022	0.000013	0.703966
HT07-02	18.96	172.66	0.1098	0.3177	0.0003	0.705065	0.000017	0.704003
HT07-03	11.84	280.87	0.0421	0.1220	0.0001	0.703936	0.000014	0.703529
RC07-02	2.38	294.27	0.0081	0.0234	0.0000	0.703392	0.000013	0.703313
RC07-03	21.86	317.40	0.0689	0.1992	0.0002	0.704166	0.000014	0.703500
RC07-04	15.99	213.16	0.0750	0.2170	0.0002	0.704225	0.000016	0.703500
RC07-05	30.21	156.39	0.1932	0.5587	0.0006	0.705214	0.000016	0.703346
RC07-06	10.92	214.37	0.0509	0.1474	0.0001	0.704019	0.000015	0.703526
HT07-04	32.00	100.89	0.3172	0.9172	0.0009	0.706572	0.000011	0.703506
HT07-06	2.76	91.84	0.0301	0.0869	0.0001	0.705339	0.000028	0.705049
WB07-01	14.87	316.55	0.0470	0.1359	0.0001	0.704282	0.000036	0.703828
WB07-02	61.64	129.58	0.4757	1.3756	0.0014	0.707715	0.000016	0.703117
DC08-07	24.67	182.77	0.1350	0.3905	0.0004	0.705441	0.000007	0.704136
CUD09-01	91.13	1047.01	0.0870	0.2519	0.0003	0.705382	0.000007	0.704541
Olds Ferry Arc Terrane (Eocene)								
DC08-01	44.61	1025.39	0.0435	0.1259	0.0001	0.704688	0.000007	0.704606
DC08-14	45.52	1032.72	0.0441	0.1275	0.0001	0.704672	0.000011	0.704588

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Table S4. Continued.

Sample	Sm (ppm)	Nd (ppm)	$^{147}Sm/^{144}Nd$	± ± 2s [abs]	$^{143}Nd/^{144}Nd$ (Measured)	± ± 2s [abs]	$^{143}Nd/^{144}Nd$ (Initial)	εNd (Initial)
Wallowa Arc Terrane, Cougar Creek Complex								
CC631	2.83	10.12	0.1688	0.0003	0.512992	0.000006	0.512733	7.75
CC641	1.50	9.47	0.0959	0.0002	0.512857	0.000004	0.512709	7.30
CC682	2.40	7.75	0.1869	0.0004	0.513009	0.000005	0.512722	7.54
CC7171	2.20	6.70	0.1986	0.0004	0.513033	0.000008	0.512728	7.66
CC831	4.19	21.19	0.1196	0.0002	0.512937	0.000003	0.512753	8.15
CC632	2.58	11.46	0.1361	0.0003	0.513033	0.000003	0.512824	9.53
CC6161	3.39	15.62	0.1310	0.0003	0.512882	0.000004	0.512681	6.74
CC6161 (b)	3.42	15.69	0.1317	0.0003	0.512884	0.000003	0.512682	6.76
CC7112	2.94	10.52	0.1691	0.0003	0.512982	0.000003	0.512722	7.54
CC0702	1.84	5.80	0.1917	0.0004	0.513017	0.000003	0.512722	7.55
CC0704	2.87	11.26	0.1542	0.0003	0.512947	0.000006	0.512710	7.31
CC08-01	4.27	22.93	0.1125	0.0002	0.512897	0.000003	0.512724	7.58
CC08-03	1.43	10.32	0.0837	0.0002	0.512843	0.000003	0.512715	7.40
CC08-04	2.77	8.14	0.2058	0.0004	0.513045	0.000003	0.512728	7.67
CC08-05	3.57	11.90	0.1815	0.0004	0.513009	0.000003	0.512730	7.69
CC08-06	2.42	13.54	0.1082	0.0002	0.512877	0.000003	0.512710	7.31
Salmon River Canyon								
SAL09-01	4.03	19.15	0.1273	0.0003	0.512909	0.000004	0.512714	7.38
SAL09-02	2.18	7.08	0.1858	0.0004	0.513025	0.000004	0.512740	7.89
SAL09-03	5.14	21.14	0.1470	0.0003	0.512937	0.000004	0.512711	7.33
Oxbow Complex								
OX08-01	4.90	20.41	0.1452	0.0003	0.512926	0.000004	0.512703	7.17
OX08-02	5.38	20.28	0.1605	0.0003	0.512942	0.000003	0.512695	7.01
OX08-03	54.96	181.74	0.1828	0.0004	0.513043	0.000006	0.512762	8.32
OX08-04	2.77	9.13	0.1835	0.0004	0.512974	0.000004	0.512691	6.95
OX08-06	28.12	75.59	0.2249	0.0004	0.513089	0.000003	0.512743	7.95
OX08-08	28.48	130.99	0.1314	0.0003	0.512896	0.000003	0.512694	6.99
OX08-09	38.70	125.20	0.1868	0.0004	0.513010	0.000005	0.512723	7.57
OX08-10	28.35	83.57	0.2051	0.0004	0.513067	0.000013	0.512752	8.12
OX08-11	33.61	117.37	0.1731	0.0003	0.513040	0.000003	0.512774	8.55
OX08-14	2.11	6.53	0.1956	0.0004	0.513003	0.000005	0.512702	7.16
Olds Ferry Arc Terrane								
HT04-04	3.71	10.82	0.2073	0.0004	0.513021	0.000004	0.512702	7.15
DC07-06	2.91	12.74	0.1380	0.0003	0.512652	0.000004	0.512440	2.04
HT07-01	2.97	8.91	0.2014	0.0004	0.512996	0.000003	0.512687	6.86
HT07-02	2.66	7.70	0.2086	0.0004	0.513016	0.000008	0.512695	7.01
HT07-03	3.17	13.14	0.1458	0.0003	0.512880	0.000003	0.512656	6.25
RC07-02	3.32	11.15	0.1802	0.0004	0.513005	0.000003	0.512727	7.65
RC07-03	3.01	11.56	0.1574	0.0003	0.512963	0.000004	0.512721	7.53
RC07-04	1.99	7.29	0.1653	0.0003	0.512969	0.000008	0.512715	7.41
RC07-05	3.07	11.23	0.1654	0.0003	0.512975	0.000004	0.512720	7.51
RC07-06	1.65	5.09	0.1955	0.0004	0.513025	0.000010	0.512724	7.59
HT07-04	0.27	0.57	0.2889	0.0006	0.513116	0.000009	0.512671	6.56
HT07-06	2.37	7.76	0.1846	0.0004	0.513001	0.000005	0.512717	7.44
WB07-01	5.66	21.20	0.1613	0.0003	0.512862	0.000005	0.512614	5.43
WB07-02	3.81	13.39	0.1718	0.0003	0.512951	0.000004	0.512687	6.86
DC08-07	1.84	8.69	0.1277	0.0003	0.512882	0.000005	0.512685	6.83
CUD09-01	3.21	14.13	0.1371	0.0003	0.512738	0.000003	0.512527	3.74
Olds Ferry Arc Terrane (Eocene)								
DC08-01	2.19	11.52	0.1147	0.0002	0.512772	0.000004	0.512596	5.08
DC08-14	2.13	11.04	0.1167	0.0002	0.512779	0.000003	0.512599	5.15

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Table S4. Continued.

Sample	$^{208}Pb/^{204}Pb$	± ± 2s [abs]	$^{207}Pb/^{204}Pb$	± ± 2s [abs]	$^{206}Pb/^{204}Pb$	± ± 2s [abs]	$^{208}Pb/^{206}Pb$	± ± 2s [abs]	$^{207}Pb/^{206}Pb$	± ± 2s [abs]
Wallowa Arc Terrane, Cougar Creek Complex										
CC7171	37.9172	0.0047	15.5400	0.0019	18.4442	0.0023	2.0558	0.0000	0.8426	0.0000
CC831	37.6325	0.0024	15.5128	0.0010	18.3399	0.0012	2.0519	0.0000	0.8458	0.0000
CC0702	37.8152	0.0050	15.5339	0.0019	18.4742	0.0022	2.0469	0.0001	0.8409	0.0000
CC0704	37.9063	0.0029	15.5396	0.0011	18.4308	0.0014	2.0567	0.0000	0.8431	0.0000
CC08-01	37.6659	0.0041	15.5378	0.0013	18.7284	0.0011	2.0111	0.0001	0.8296	0.0000
CC08-05	37.6465	0.0021	15.5113	0.0007	18.2217	0.0006	2.0661	0.0001	0.8513	0.0000
CC08-06	37.6263	0.0011	15.5065	0.0004	18.2126	0.0005	2.0660	0.0000	0.8514	0.0000
CC7272	38.0594	0.0097	15.5670	0.0038	18.6458	0.0046	2.0411	0.0001	0.8349	0.0000
CC7112	37.7516	0.0039	15.5222	0.0015	18.3230	0.0015	2.0604	0.0001	0.8472	0.0000
Salmon River canyon										
SAL09-01	38.1876	0.0031	15.5921	0.0011	19.8368	0.0013	1.9251	0.0001	0.7860	0.0000
SAL09-03	38.2049	0.0206	15.5533	0.0083	19.1773	0.0103	1.9922	0.0001	0.8110	0.0000
Oxbow Complex										
OX08-02	38.1682	0.0092	15.5799	0.0036	18.8231	0.0041	2.0276	0.0002	0.8277	0.0001
OX08-08	38.0409	0.0057	15.5380	0.0023	18.7249	0.0027	2.0316	0.0001	0.8298	0.0000
OX08-11	38.2926	0.0072	15.5922	0.0029	19.3242	0.0035	1.9815	0.0001	0.8069	0.0001
OX08-15	37.9116	0.0229	15.5495	0.0082	18.4699	0.0094	2.0528	0.0005	0.8419	0.0002
Olds Ferry arc terrane										
HT04-04	38.2825	0.0011	15.5875	0.0004	18.7092	0.0005	2.0462	0.0000	0.8332	0.0000
DC07-06	38.5220	0.0057	15.6261	0.0023	18.6448	0.0019	2.0662	0.0001	0.8381	0.0000
HT07-02	38.3210	0.0076	15.5827	0.0031	18.7053	0.0037	2.0488	0.0001	0.8331	0.0000
RC07-03	38.2385	0.0014	15.5744	0.0005	18.5459	0.0005	2.0619	0.0000	0.8398	0.0000
RC07-04	38.4272	0.0216	15.5952	0.0067	18.5116	0.0079	2.0759	0.0007	0.8426	0.0001
RC07-05	38.2329	0.0021	15.5790	0.0007	18.5556	0.0007	2.0604	0.0000	0.8396	0.0000
RC07-06	38.2309	0.0037	15.5793	0.0014	18.5401	0.0016	2.0621	0.0001	0.8403	0.0000
WB07-02	38.4024	0.0015	15.5975	0.0005	18.7858	0.0006	2.0442	0.0000	0.8303	0.0000
DC08-07	38.3985	0.0057	15.6156	0.0023	18.6921	0.0027	2.0542	0.0000	0.8354	0.0000
CUD09-01	38.4714	0.0093	15.6227	0.0036	18.8047	0.0040	2.0459	0.0002	0.8308	0.0000
Olds Ferry arc terrane (Eocene)										
DC08-01	38.7669	0.0019	15.6433	0.0007	19.0404	0.0008	2.0360	0.00002	0.8216	0.00001
DC08-14	38.7386	0.0017	15.6354	0.0006	19.0354	0.0006	2.0351	0.00004	0.8214	0.00001

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Table S5. Geochemical and Isotopic Parameters for Mantle and Binary Mixing Compoments.

Component	Parent Trace Element (ppm)	Daughter Trace Element (ppm)	Isotopic P/D Ratio	Isotopic Ratio (Measured)		Isotopic Ratio (Initial)	Mean Value (Initial)
			$^{147}Sm/^{144}Nd$	$^{143}Nd/^{144}Nd$		$^{143}Nd/^{144}Nd$	
Nd	Sm	Nd			εNd (I)		εNd (I)
DMM		0.713	0.2387	0.513110	7.95	0.512743	
EMI (high)			0.1900	0.512360	-5.22	0.512068	-5.09
EMI (low)			0.1810	0.512360	-4.95	0.512082	
EMII	0.347	0.6	0.1920	0.512500	-2.55	0.512205	
HIMU (high)			0.2240	0.512900	4.29	0.512555	4.52
HIMU (low)			0.2090	0.512900	4.74	0.512579	
Triassic Seawater					-2.00		
Permian Seawater					-6.00		
Average Miogeocline		32			-20.98	0.511562	
			$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$		$^{87}Sr/^{86}Sr$	$^{87}Sr/^{86}Sr$
Sr	Rb	Sr					
DMM		9.8	0.0253	0.7026		0.702515	
EMI (high)			0.0852	0.7053		0.705015	0.705050
EMI (low)			0.0646	0.7053		0.705084	
EMII	1.456	20.044	0.2050	0.7090		0.708315	
HIMU (high)			0.0310	0.7030		0.702896	0.702931
HIMU (low)			0.0100	0.7030		0.702967	
Triassic Seawater						0.707800	
Permian Seawater						0.706750	
Average Miogeocline		339				0.730000	
			$^{238}U/^{206}Pb$	$^{206}Pb/^{204}Pb$		$^{206}Pb/^{204}Pb$	$^{206}Pb/^{204}Pb$
^{206}Pb	U	Pb					
DMM		0.0232	4.059	18		17.849302	
EMI (high)			7.340	17.65		17.377488	17.4148
EMI (low)			5.330	17.65		17.452113	
EMII	0.04	1	5.846	19		18.782956	
HIMU (high)			20.000	21		20.257460	20.3596
HIMU (low)			14.500	21		20.461659	
			$^{235}U/^{207}Pb$	$^{207}Pb/^{204}Pb$		$^{207}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$
^{207}Pb	U	Pb					
DMM		0.0232	0.0294	15.430		15.422344	
EMI (high)			0.0532	15.475		15.461138	15.4630
EMI (low)			0.0387	15.475		15.464932	
EMII	0.04	1	0.0424	15.675		15.663961	
HIMU (high)			0.1451	15.850		15.812227	15.8174
HIMU (low)			0.1052	15.850		15.822615	
			$^{232}Th/^{208}Pb$	$^{208}Pb/^{204}Pb$		$^{208}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$
^{208}Pb	Th	Pb					
DMM		0.0232	23.630	37.70		37.423660	
EMI (high)			22.800	38.14		37.873366	37.9617
EMI (low)			7.700	38.14		38.049953	
EMII	0.177	1	50.622	38.86		38.268002	
HIMU (high)			3.600	39.75		39.707900	39.7097
HIMU (low)			3.300	39.75		39.711408	

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Sample Preparation and Analytical Methods

U-Pb ID-TIMS Zircon Geochronology

One to three kilogram bulk rock samples were processed at the Boise State University (BSU) mineral separation facility. All samples were processed using standard crushing, magnetic, and density separation techniques. Separated zircon were subjected to a modified version of the chemical abrasion method of Mattinson (2005), reflecting a preference to prepare and analyze carefully selected single crystals or crystal fragments. Zircon separates were placed in a muffle furnace at 900°C for 60 hours in quartz beakers. Single annealed crystals were then transferred to 3 mL Teflon PFA beakers, rinsed twice with 3.5 M HNO_3, and loaded into 300 μL Teflon PFA microcapsules. Fifteen microcapsules were placed in a large-capacity Parr vessel, and the crystals partially dissolved in 120 μL of 29 M HF with a trace of 3.5 M HNO_3 for 10-12 hours at 180°C. The contents of each microcapsule were returned to 3 mL Teflon PFA beakers, the HF removed, and the residual grains rinsed in ultrapure H_2O, immersed in 3.5 M HNO_3, ultrasonically cleaned for an hour, and fluxed on a hotplate at 80°C for an hour. The HNO_3 was removed and the grains were again rinsed three times in ultrapure H_2O or 3.5 M HNO_3, before being reloaded into the same 300 μL Teflon PFA microcapsules (rinsed and fluxed in 6 M HCl during crystal sonication and washing) and spiked with the BSU mixed ^{233}U-^{235}U-^{205}Pb tracer solution (BSU1B). The chemically abraded grains were dissolved in Parr vessels in 120 μL of 29 M HF with a trace of 3.5 M HNO_3 at 220°C for 48 hours, dried to fluorides, and then re-dissolved in 6 M HCl at 180°C overnight. U and Pb were separated from the zircon matrix using an HCl-based anion-exchange

chromatographic procedure (Krogh, 1973), eluted together and dried with 2 μL of 0.05 N H_3PO_4.

For mass spectrometry, Pb and U were loaded on a single outgassed Re filament in 2 μL of a silica-gel/phosphoric acid mixture (Gerstenberger and Haase, 1997). U and Pb isotopic measurements were made on an IsotopX Isoprobe-T multicollector thermal ionization mass spectrometer equipped with an ion-counting Daly detector. Pb isotopes were measured by peak-jumping all isotopes on the Daly detector for 100 to 150 cycles, and corrected for 0.22 ± 0.04%/a.m.u. mass fractionation. Transitory isobaric interferences due to high-molecular weight organics, particularly on ^{204}Pb and ^{207}Pb, disappeared within approximately 30 cycles, while ionization efficiency averaged 10^4 cps/pg of each Pb isotope. Linearity (to ≥1.4 x 10^6 cps) and the associated deadtime correction of the Daly detector were monitored by repeated analyses of NBS982, and have been constant since installation. Uranium was analyzed as UO_2^+ ions in static Faraday mode on 10^{11} ohm resistors for 150 to 200 cycles, and corrected for isobaric interference of $^{233}U^{18}O^{16}O$ on $^{235}U^{16}O^{16}O$ with an $^{18}O/^{16}O$ of 0.00206. Ionization efficiency averaged 20 mV/ng of each U isotope. U mass fractionation was corrected using the double spike.

U-Pb dates and uncertainties were calculated using the algorithms of Schmitz and Schoene (2007), and the U decay constants of Jaffey et al. (1971). $^{206}Pb/^{238}U$ ratios and dates were corrected for initial ^{230}Th disequilibrium using a Th/U[magma] of 4, resulting in a systematic increase in the $^{206}Pb/^{238}U$ dates of ~90 kyrs. Common Pb in analyses up to 1 pg was attributed to laboratory blank and subtracted based on the measured laboratory Pb isotopic composition and associated uncertainty. This simple correction is typical of

most analyses; occasional analyses with common Pb in excess of 1 pg were assumed to contain initial Pb within mineral inclusions, which was subtracted based on the model two-stage Pb isotope evolution of Stacey and Kramers (1975). U blanks were <0.1 pg. Over the course of the experiment, isotopic analyses of the TEMORA zircon standard yielded a weighted mean $^{206}Pb/^{238}U$ age of 417.43 ± 0.06 (n=11, MSWD = 0.8).

Concordant U-Pb dates (considering decay constant errors) were obtained from 60 individually analyzed zircon grains from the eight dated samples, and are illustrated on concordia diagrams. Each sample yields a majority cluster of equivalent single zircon $^{206}Pb/^{238}U$ dates that we interpret as the igneous crystallization age of the zircons, and which approximates the solidification age of the pluton. We discard from age calculations the minority of grains with dates that are resolvable from the majority cluster at the 95% confidence interval. Relatively more common outliers with older dates are interpreted as antecrysts from an earlier magmatic episode or composite grains with xenocrystic cores, while rarer outliers with younger dates are interpreted to have severe Pb loss not completely mitigated by chemical abrasion. Non-systematic errors on the sample weighted mean ages are reported in the text and Table 1.1 as internal 2σ for those samples with probability of fit of >0.05 on the weighted mean date. For one sample with probability of fit <0.05, errors are at the 95% confidence interval, which is the internal 2s error expanded by the square root of the MSWD and the Student's T multiplier of n-1 degrees of freedom (Ludwig, 2003). These error estimates should be considered when comparing our $^{206}Pb/^{238}U$ dates with those from other laboratories that used the EARTHTIME tracer solution or one that was calibrated using EARTHTIME gravimetric standards. When comparing our dates with those derived from other decay schemes (e.g.,

$^{40}Ar/^{39}Ar$, ^{187}Re-^{187}Os), the systematic uncertainties in tracer calibration (0.03%; Condon et al., 2015; McLean et al., 2003) and the ^{238}U decay constant (0.106%; Jaffey et al., 1971) should be added to the internal error in quadrature.

U-Pb ID-TIMS Titanite Geochronology

Single-grain and/or multi-grain fractions of titanite were selected from mineral separates and transferred to 3 mL Teflon PFA beakers, sonicated and rinsed twice with 3.5 M HNO_3, and loaded into 300 μL Teflon PFA microcapsules with a weighed aliquot of the Boise State University mixed ^{233}U-^{235}U-^{205}Pb tracer solution, and 120 μL of 29 M HF with a trace of 3.5 M HNO_3. Microcapsules were placed in a large-capacity Parr vessel, and the crystals dissolved at 220°C for 48 hours, dried to fluorides, and then re-dissolved in 6 M HCl at 180°C overnight. U and Pb were separated from the dissolved matrix using a two-stage HBr- and HCl-based anion-exchange chromatographic procedure (Krogh, 1973) to purify Pb and U, respectively. Purified Pb and U were collected separately and dried with 2 μL of 0.05 N H_3PO_4.

Pb and U were loaded separately on outgassed zone-refined Re center filaments in 2 μl of a silica-gel/phosphoric acid mixture (Gerstenberger and Haase, 1997), and isotopic measurements made on an IsotopX Isoprobe-T multicollector thermal ionization mass spectrometer equipped with nine Faraday cups and an ion-counting Daly detector. Pb isotopes were measured by peak-jumping all isotopes on the Daly detector for 100 to 150 cycles, and corrected for 0.18 ± 0.04%/a.m.u. mass fractionation. Transitory isobaric interferences due to high-molecular weight organics, particularly on ^{204}Pb and ^{207}Pb, disappeared within approximately 30 cycles, while ionization efficiency averaged $>10^4$ cps/pg of each Pb isotope. Linearity (to $\geq 1.4 \times 10^6$ cps) and the associated deadtime

uncertainties in tracer calibration and ^{238}U decay constant (Jaffey et al., 1971) should be added to the internal error in quadrature. This total systematic error is ± 0.25 Ma for the crystallization ages of the samples reported herein.

Sr, Nd, and Pb Isotopic Analysis

For Sr isotopic analysis, 50 to 100 mg of powder were dissolved with 3 mL 29M HF + 1 mL 15M HNO_3 in Savillex PFA beakers at 150°C for 60 hours, dried and redissolved in 5 mL 6M HCl at 150°C for 16 hours. A 10% aliquot of the solution was spiked with ^{87}Rb and ^{84}Sr tracers, fluxed overnight, dried and redissolved in 5 mL 1M HCl + 0.1M HF at 150°C overnight. Rb and Sr were separated by standard cation exchange chemistry (by elution in 2.5M HCl on 6mm i.d. x 20cm columns of AG-50W-X8 resin, H+ form, 200-400 mesh). The Rb fraction was further purified by either a) ion exchange in 0.6M HCl on 6mm i.d. x 10cm columns of AG-50W-X8 resin (H+ form, 200-400 mesh), or b) treatment with 29M HF to precipitate residual alkaline earths and extraction in ultrapure water for mass spectrometry. Rb and Sr were loaded in 0.1N H_3PO_4 along with a tantalum oxide emitter solution (R. Creaser, pers. comm.) on single degassed Re filaments, and their isotope ratios measured on the IsotopX Isoprobe-T in the Boise State University Isotope Geology Laboratory. The $^{87}Rb/^{85}Rb$ ratio was measured in static Faraday mode; a mass bias correction was estimated by external analysis of natural Rb standards. Sr isotope ratios were analyzed in dynamic mode, fractionation corrected with an exponential law relative to $^{86}Sr/^{88}Sr = 0.1194$, and are reported as spike-stripped and bias corrected relative to the accepted value of the NBS-987 standard (0.710248). The quoted uncertainty for each analysis is the internal standard

error; the external reproducibility of the NBS-987 standard over the course of the study was 0.710251 ± 3 (1σ); uncertainty in [Rb], [Sr], and $^{87}Rb/^{86}Sr$ are estimated at ≤ 0.2% (1σ). Initial $^{87}Sr/^{86}Sr$ is calculated assuming an ^{87}Rb decay constant of 1.42x10-11 y^{-1}.

For Nd isotopic analysis, 50 to 100 mg of sample powder were spiked with a mixed ^{149}Sm-^{150}Nd tracer, dissolved with 5 mL 29M HF + 15M HNO_3 (3:1) in Parr pressure vessels at 200°C for 72 hours, dried and redissolved in 5 mL 6M HCl at 120°C for 24 hours. Total dissolutions were dried and redissolved in 5 mL 1M HCl + 0.1M HF at 120°C overnight. Bulk rare earth elements were separated by standard dilute HCl and HNO_3 based cation exchange chemistry on 6mm i.d. x 20cm columns of AG-50W-X8 resin, H+ form, 200-400 mesh; Sm and Nd were separated by reverse phase HDEHP chromatography on 4mm i.d. x 10cm columns of Eichrom Ln-spec resin, 50-100 mesh. Sm and Nd isotopes were measured on an IsotopX Isoprobe-T in static and dynamic Faraday modes, respectively. Instrumental mass fractionation of Sm and Nd isotopes was corrected with an exponential law relative to $^{146}Nd/^{144}Nd$ = 0.7219 and $^{152}Sm/^{147}Sm$ = 1.783. $^{143}Nd/^{144}Nd$ ratio is reported as spike-stripped and bias-corrected relative to the accepted value of JNdi-1 standard (0.512110). The quoted uncertainty for each analysis is the internal standard error; the external reproducibility of the JNdi-1 standard over the course of the study was 0.512102 ± 3 (2σ); uncertainty in [Sm], [Nd] and $^{147}Sm/^{144}Nd$ are estimated at ≤ 0.2% (2s). Present-day εNd(0) and tCHUR (Ga) calculated with ($^{147}Sm/^{144}Nd$)CHUR = 0.1967 and ($^{143}Nd/^{144}Nd$)CHUR = 0.512638; εNd(2.6) calculated at age of crystallization; tDM (Ga) calculated with ($^{143}Nd/^{144}Nd$)DM = 0.513151, ($^{147}Sm/^{144}Nd$)DM = 0.2137.

For Pb isotopic analysis, ~ 200 mg of separated feldspar were sequentially leached using the method of Housh and Bowring (1991). Feldspar separates were transferred to 15 mL Savillex beaker in ethanol and rinsed three times with 1 ml MQH_2O. Feldspar separates were fluxed in 1 mL 3.5M HNO_3 for 30 minutes on a 120°C hot plate, and then rinsed three times with 0.5 mL MQH_2O. Feldspar separates were then fluxed in 1 mL 6M HCl for 30 minutes on a 120°C hot plate, and then rinsed three times with 0.5 mL MQH_2O. Feldspar separates were then sequentially dissolved in 1 mL 1M HF + 0.1 mL 16M HNO_3 for 15 to 30 minutes on a 120°C hotplate. After each leaching step, acid was pipetted out and transferred to a clean 5 mL Savillex beaker, and rinsed three times with 0.5 mL MQH_2O. Each MQH_2O rinse was combined with the retrieved leachate. This step was repeated up to five or six times depending on the size of the remaining sample after each leaching step. Pb was separated by anion exchange in dilute HBr medium using AG1-X8, 200-400 mesh Eichron resin in 100 μL columns. Pb samples were loaded on outgassed Re center filaments in 2 μl of a silica-gel/phosphoric acid mixture (Gerstenberger and Haase, 1997), and isotopic measurements made on an IsotopX Isoprobe-T multicollector thermal ionization mass spectrometer equipped with nine Faraday cups and an ion-counting Daly detector.

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