Gaschnig, R.M., Lewis, R.S., and Vervoort, J.D., 2023, Age and origin of Early Cretaceous magmatism in the southernmost Omineca Belt, northern U.S. Cordillera: GSA Bulletin, https://doi.org/10.1130/B36845.1.

Supplemental Material

Supplemental Text S1. Kaniksu batholith geochronology results—sample-by-sample descriptions.

Figure S1. Tera-Wasserburg diagrams (left panels) and associated weighted mean plots (right panels) showing U-Pb zircon results for the Kaniksu peraluminous suite. Error ellipses and bars represent internal two standard errors.

Figure S2. Tera-Wasserburg diagrams (left panels) and associated weighted mean plots (right panels) showing U-Pb zircon results for the Kaniksu metaluminous suite.

Figure S3. Tera Wasserburg diagrams (left panels) and associated weighted mean plots (right panels) showing U-Pb zircon results for the Kaniksu alkalic suite.

Table S1. Zircon U-Pb data.

Table S2. Zircon Hf isotope data.

Kaniksu batholith geochronology results – sample by sample descriptions

Peraluminous suite

Sample 08RL670 is an biotite tonalite containing epidote of apparently magmatic origin from the eastern slope of the Selkirk Mountains. Zircon from this sample contain Mesoproterozoic and Paleoproterozoic inherited cores. Most of the magmatic rims form a coherent cluster yielding a weighted mean $^{206}Pb/^{238}U$ age of 116.3 ± 2.3 Ma. Two younger outliers and one older outlier are interpreted to reflect Pb loss and minor inheritance, respectively.

Sample 10RMG052 is a biotite-muscovite granodiorite collected from the Roman Nose area along the crest of the Selkirk Mountains. Zircons show complex zoning, commonly consisting of distinct cores, many of which are Paleoproterozoic, dark mantles, and brighter rims. Rim dates form a continuum from 98 to 115 Ma, making it impossible to calculate a precise weighted mean age. However, the Th/U ratios of the rims positively correlate with age, with the oldest ages having higher Th/U ratios (>0.1) that are most typical of magmatic zircon (e.g., Rubatto, 2002). This suggests that the magma may have been initially emplaced around 115 Ma but later experienced a combination of metamorphic growth and Pb loss due to protracted high temperatures as other magmas were emplaced nearby.

Sample 08RL668 is a muscovite-biotite granodiorite from the western Cabinet Mountains. This sampled unit forms the core of a round zoned pluton, which contains a rim of megacrystic hornblende-biotite granodiorite from which sample 08RL666 (see below) was collected. Like 10RMG052, zircon from 08RL668 contain Paleoproterozoic inheritance and rim dates plot along a continuum, in this case from 113 to 126 Ma. It is not possible to calculate a weighted mean for this sample, due to the combined effects of earlier Cretaceous inheritance and Pb loss.

Sample 07RMG17 is a fine-grained biotite granodiorite from along the Pack River in the Selkirk Mountains. A few zircons have Paleoproterozoic cores, and one xenocryst was analyzed with an 1865 Ma core surrounded by 1259 Ma rim. However, most zircon (both cores and rims) yield a weighted mean age of 73.3 ± 2.2 Ma.

Sample 07RMG21 is a biotite granodiorite from the western foothills of the Cabinet Mountains. Zircon commonly contain Mesoproterozoic and Paleoproterozoic cores. A cluster of three ~112 Ma ages was observed, but the majority of magmatic zones yield a weighed mean of 107.1 ± 2.4.

Sample 07RMG16 is a garnet-bearing biotite granodiorite from Schweitzer Basin in the southern Selkirk Mountains. Many zircons contain inherited cores ranging in age from Mesoproterozoic to Neoarchean. Magmatic rims yield a weighted mean age of 107.5 ± 3.1 Ma.

Metaluminous suite

Sample 07RMG055 is a foliated megacrystic biotite granodiorite from the eastern Selkirk Mountains just south of the Canadian border. Zircon show simple oscillatory zoning, and no inherited cores were observed. The majority of analyses yield a weighted mean age of 97.7 ± 3.0.

Sample 09RL759 is a porphyritic hornblende-biotite granodiorite from the western Cabinet Mountains. Several zircons contain inherited cores ranging in ages from Mesoproterozoic to Neoarchean. Magmatic rims yield a weighted mean age of 109.9 ± 3.0 Ma.

Sample 08RL666 is a megacrystic hornblende-biotite granodiorite from the western Cabinet Mountains. This body forms a shell around the unit from which sample 08RL668 (see above) was collected. No inherited cores were observed, and the majority of analyses yield a weighted mean of 116.0 ± 1.6 Ma.

Sample 07RMG19 is a hornblende-biotite granodiorite from the east shore of Lake Pend Oreille near Echo Point. Zircons show oscillatory zoning, and no inherited cores were observed. The majority of analyses yield a weighted mean of 88.6 ± 2.3 Ma.

Sample 07RMG18 is a biotite granite porphyry from the east shore of Lake Pend Oreille near Whiskey Rock. One Paleoproterozoic inherited core was observed. The other analyses yield a weighted mean of 99.6 ± 3.7 Ma after the exclusion of one strongly discordant analysis.

Alkalic suite

Sample 10RMG054 is a lineated syenite from the eastern Selkirk Mountains, near the Canadian border. Zircon show sector zoning, and no inherited Precambrian cores were observed. The majority of analyses yield a weighted mean age of 88.8 ± 3.9 Ma.

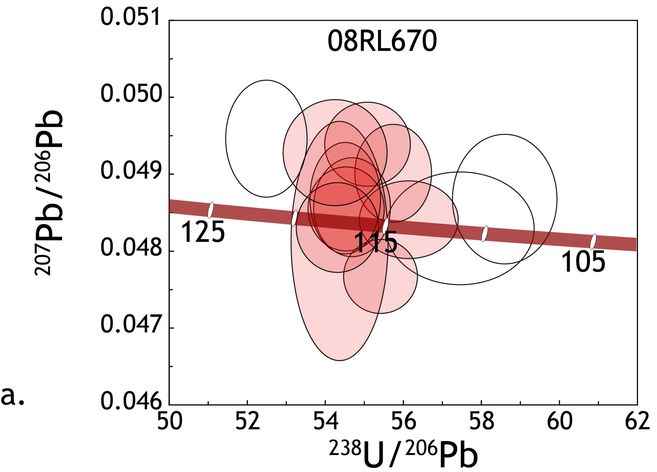
Sample 09RL757 is a pyroxene-hornblende monzonite from the western Cabinet Mountains. The sample contains zircon with both oscillatory and sector zoning, and several Mesoproterozoic to Paleoproterozoic inherited cores were found. Magmatic zones yield a weighted mean age of 113.6 ± 3.0 Ma.

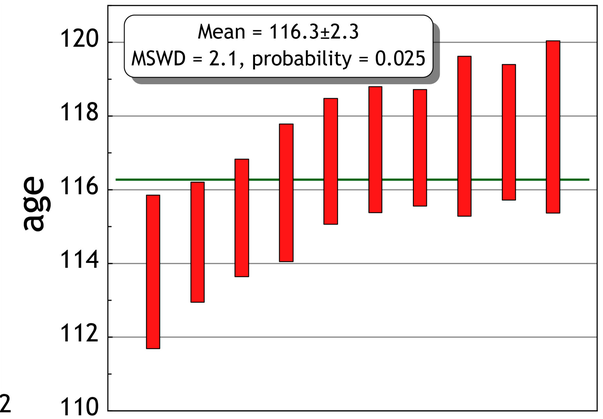
Sample 05RL533 is a biotite-hornblende quartz monzonite from the southern Cabinet Mountains. Inherited cores with Mesoproterozoic, Paleoproterozoic, and Mesoarchean ages were observed. The majority of magmatic zones yield a weighted mean age of 110.4 ± 2.9 Ma.

Sample 08RMG01 is a hornblende syenite from Gold Hill near the town of Potlatch, some 110 km south of the main Kaniksu batholith. Like several of the other alkalic samples, zircon show sector zoning. No Precambrian components were observed. Analyses yield a weighted mean of 111.5 ± 1.9 Ma.

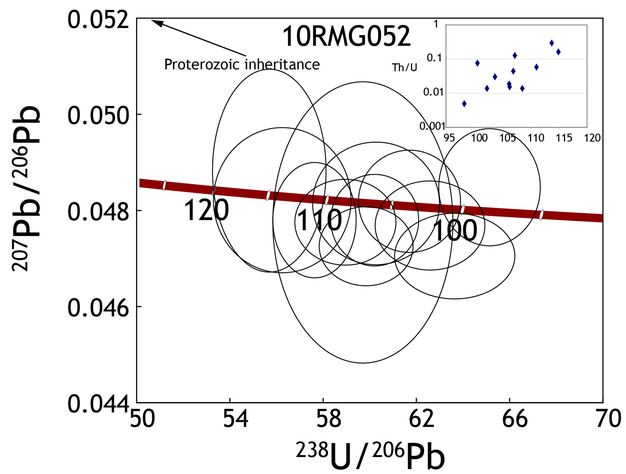
Reference cited

Rubatto, D., 2002, Zircon trace element geochemistry: partitioning with garnet and the link between U-Pb ages and metamorphism: Chemical Geology, v. 184, no. 1-2, p. 123-138.

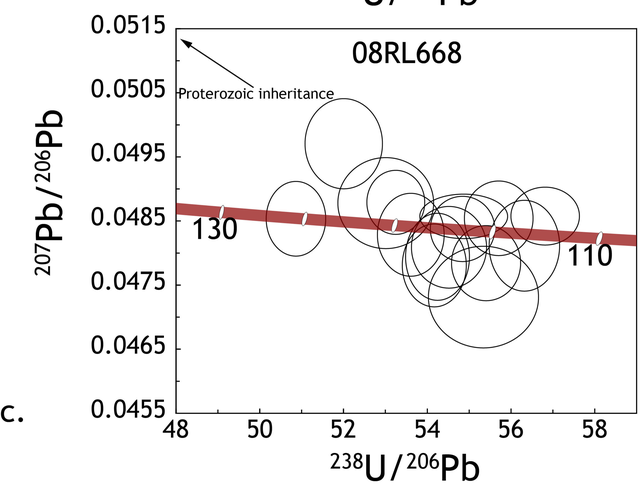

08RL670
125
115
105
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$


Mean = 116.3±2.3
MSWD = 2.1, probability = 0.025
age

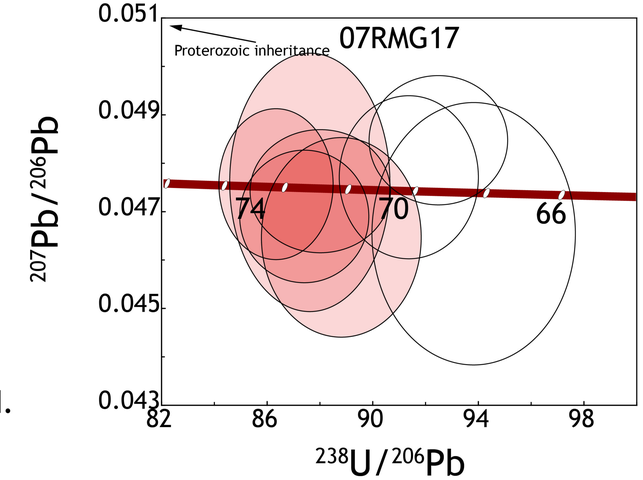
a.


10RMG052
Proterozoic inheritance
Th/U
120
110
100
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$

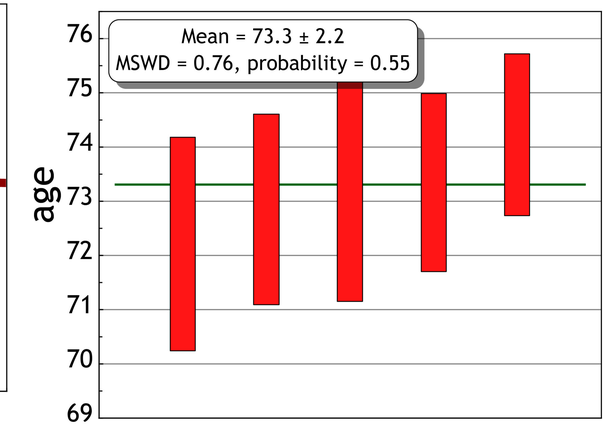
b.

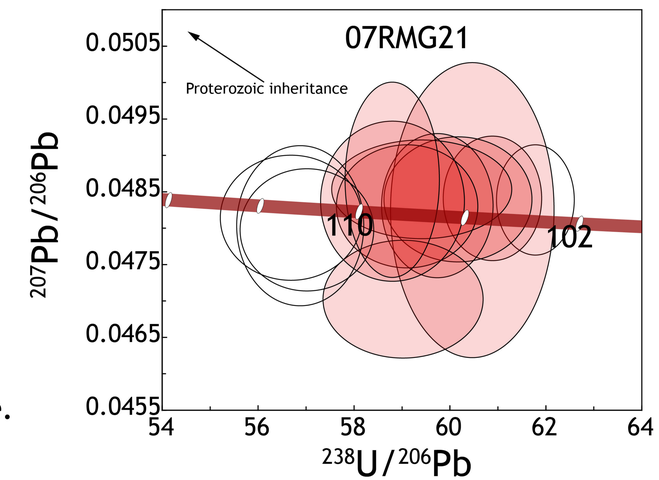

08RL668
Proterozoic inheritance
130
110
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$

c.

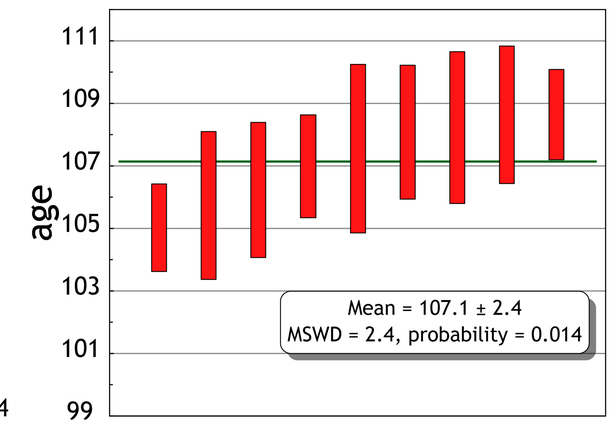

07RMG17
Proterozoic inheritance
74
70
66
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$

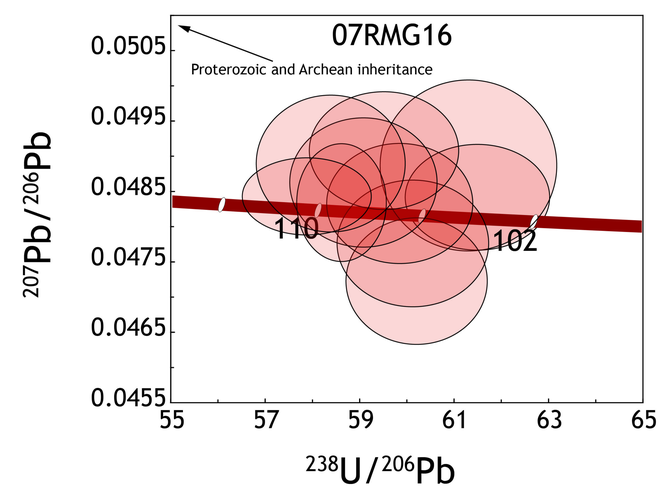
d.


Mean = 73.3 ± 2.2
MSWD = 0.76, probability = 0.55
age

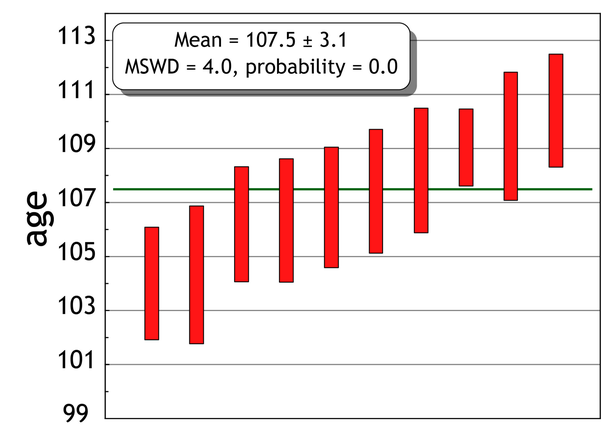

07RMG21
Proterozoic inheritance
110
102
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$

e.

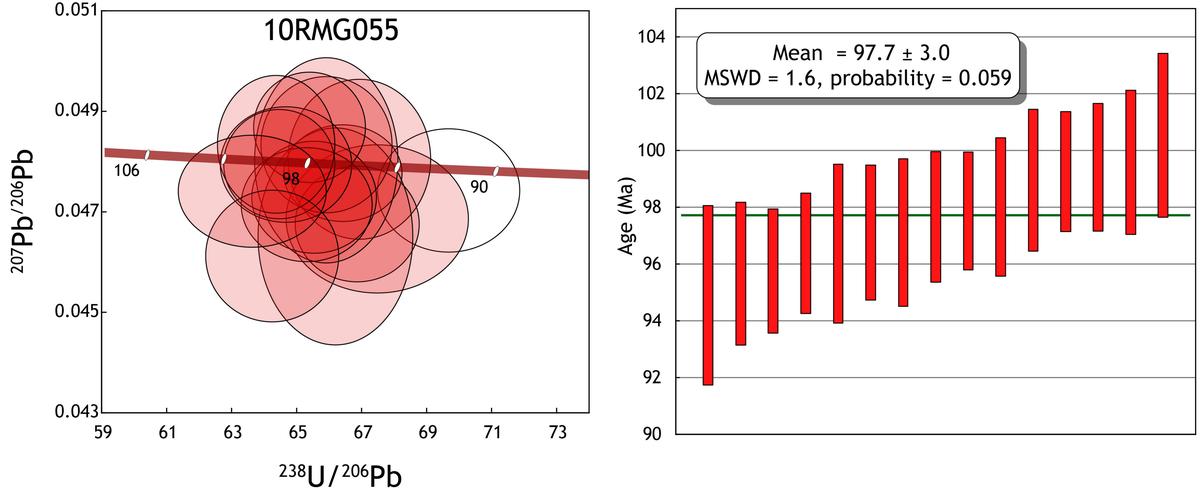

Mean = 107.1 ± 2.4
MSWD = 2.4, probability = 0.014
age


07RMG16
Proterozoic and Archean inheritance
110
102
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$

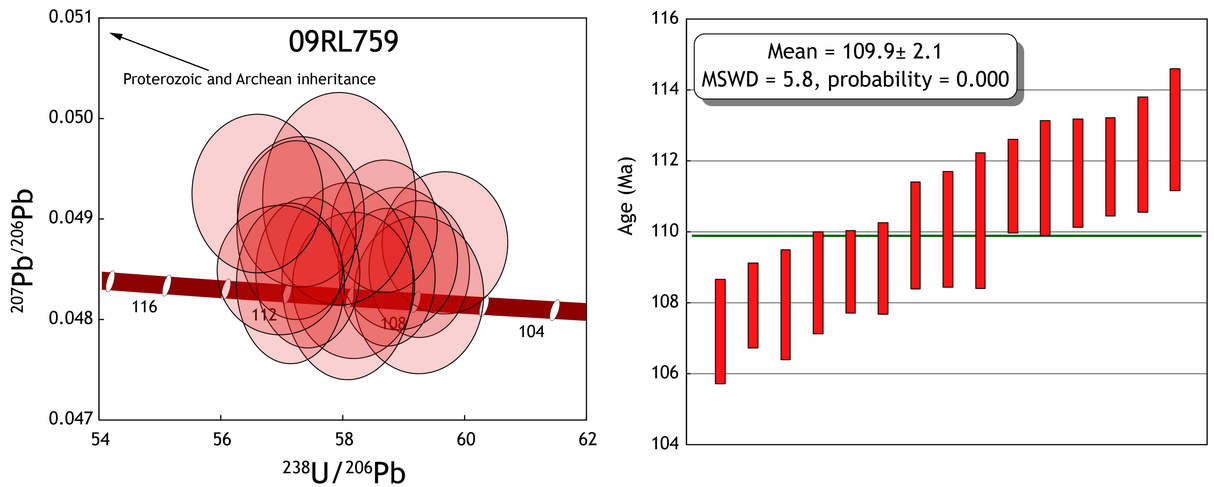
f.


Mean = 107.5 ± 3.1
MSWD = 4.0, probability = 0.0
age

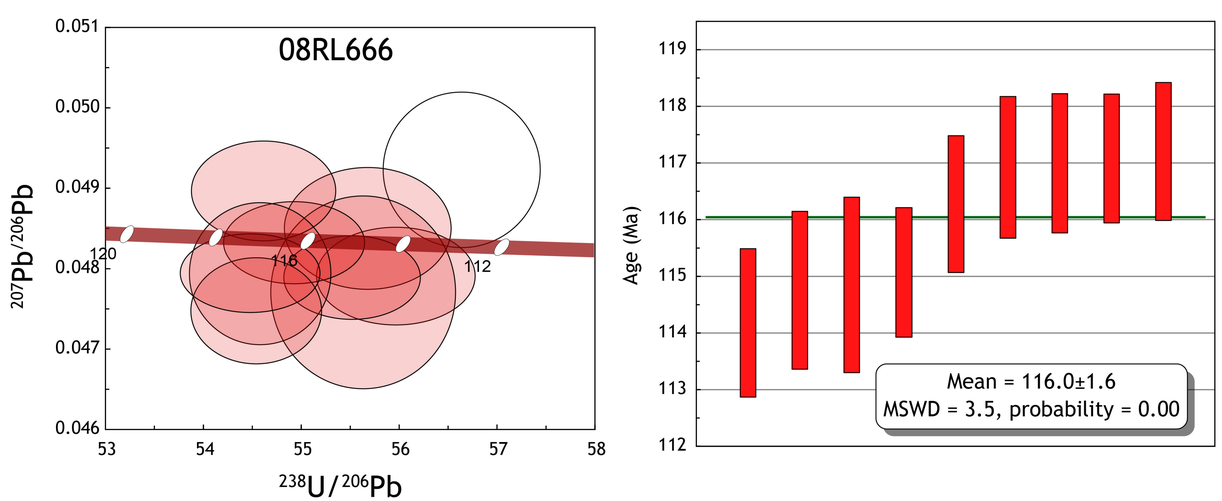
a.


10RMG055
Mean = 97.7 ± 3.0
MSWD = 1.6, probability = 0.059
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
Age (Ma)

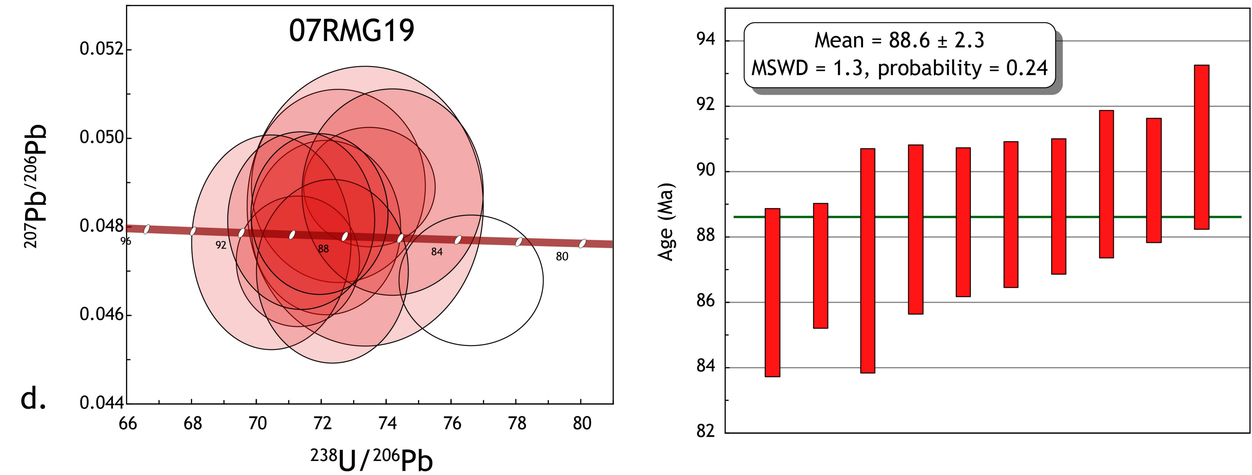
b.


09RL759
Proterozoic and Archean inheritance
Mean = 109.9± 2.1
MSWD = 5.8, probability = 0.000
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
Age (Ma)

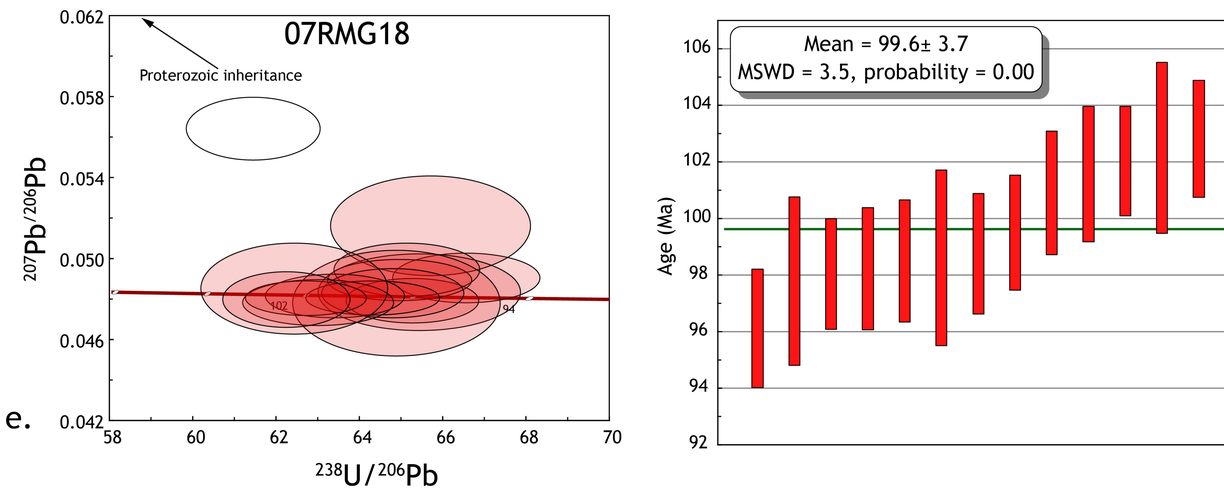
c.

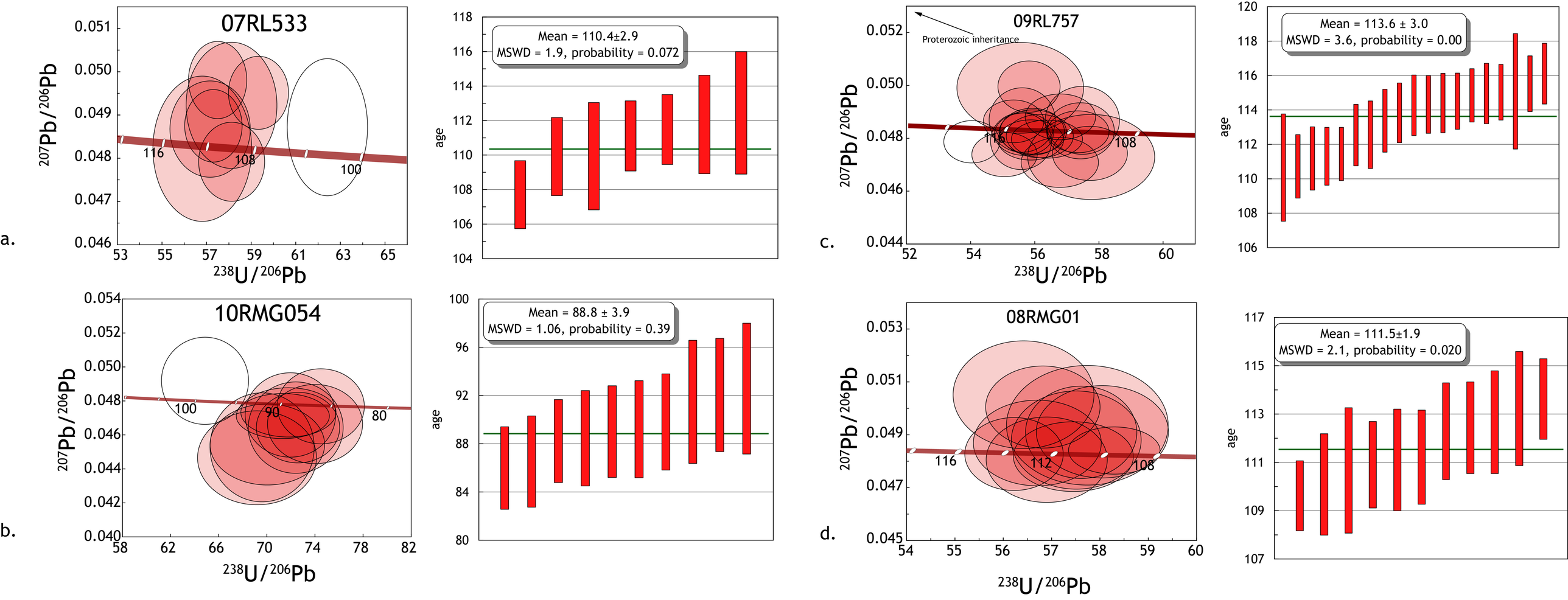

08RL666
Mean = 116.0±1.6
MSWD = 3.5, probability = 0.00
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
Age (Ma)

d.


07RMG19
Mean = 88.6 ± 2.3
MSWD = 1.3, probability = 0.24
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
Age (Ma)

e.


07RMG18
Proterozoic inheritance
Mean = 99.6± 3.7
MSWD = 3.5, probability = 0.00
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
Age (Ma)


a.
07RL533
$^{207}Pb/^{206}Pb$
$^{238}U/^{206}Pb$
116
108
100
Mean = 110.4±2.9
MSWD = 1.9, probability = 0.072
age
b.
10RMG054
100
90
80
Mean = 88.8 ± 3.9
MSWD = 1.06, probability = 0.39
c.
09RL757
Proterozoic inheritance
Mean = 113.6 ± 3.0
MSWD = 3.6, probability = 0.00
d.
08RMG01
112
Mean = 111.5±1.9
MSWD = 2.1, probability = 0.020