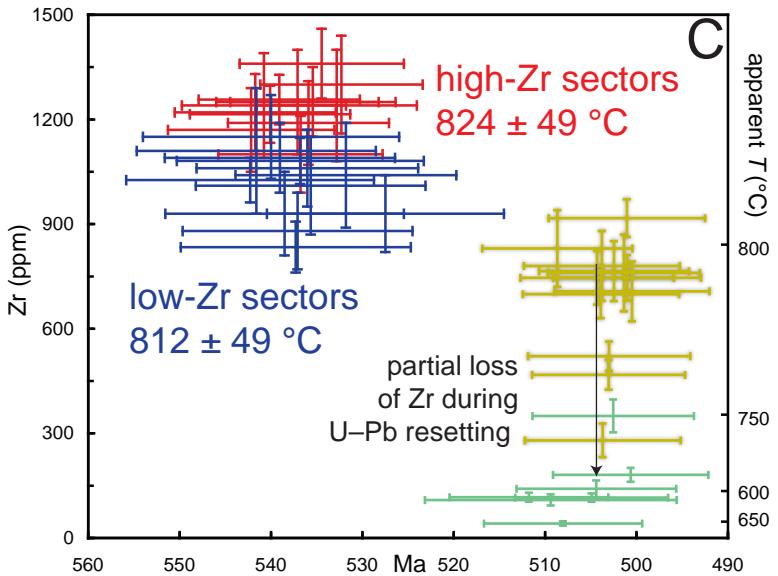
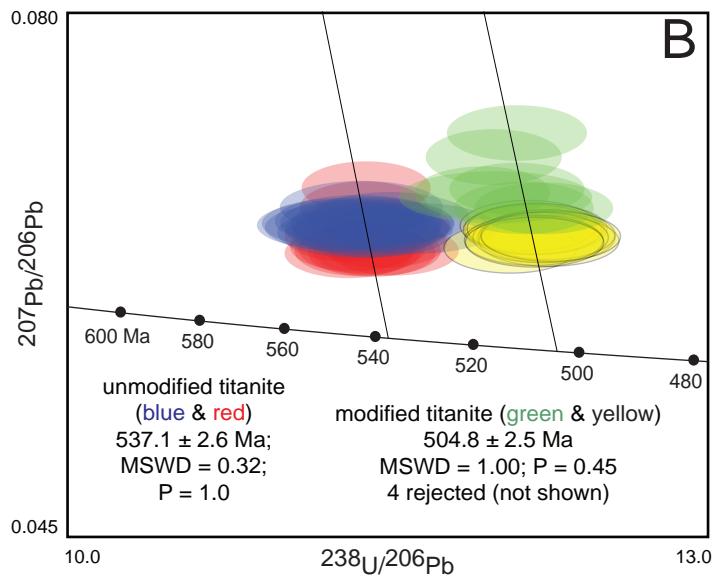
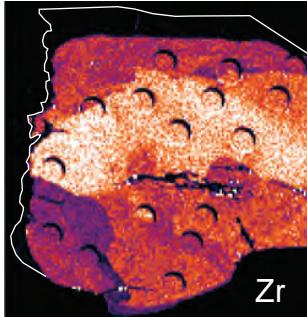


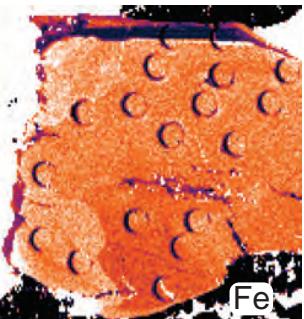
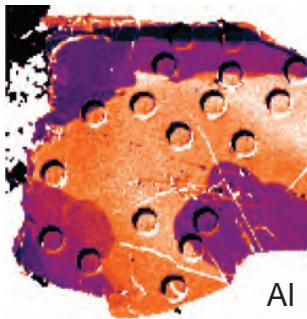
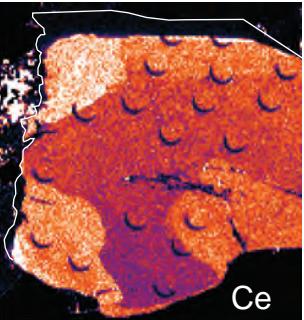
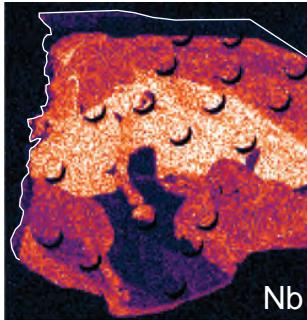
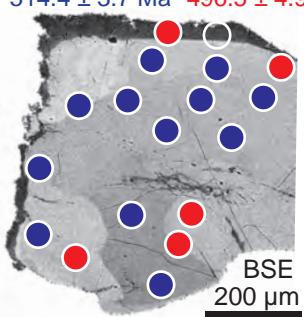
spots: locations of LA-ICP-MS analyses; colors correspond to colors in B and C



sample 21B2 titanite grain 1



blue spots: red spots:
 $514.4 \pm 3.7 \text{ Ma}$ $496.5 \pm 4.9 \text{ Ma}$



high



low

0.10

B

$^{207}\text{Pb}/^{206}\text{Pb}$

0.05

sample 21B
grain 1

oldest dates
 $514.4 \pm 3.7 \text{ Ma}$
 $\text{MSWD} = 1.04$
 $P = 0.41$

youngest dates
 $496.5 \pm 4.9 \text{ Ma}$
 $\text{MSWD} = 1.02$
 $P = 0.40$

550 Ma 540 530 520 510 500 490 480

$^{238}\text{U}/^{206}\text{Pb}$

11.0

13.0

9000

7000

5000

3000

1000

$^{238}\text{U}/^{206}\text{Pb}$

Ma

C

950

950

900

850

800

750

700

650

600

550

500

450

400

350

300

250

200

150

100

50

0

apparent T ($^{\circ}\text{C}$)

progressive loss of Zr in multiple alteration events

C

Ma

490

500

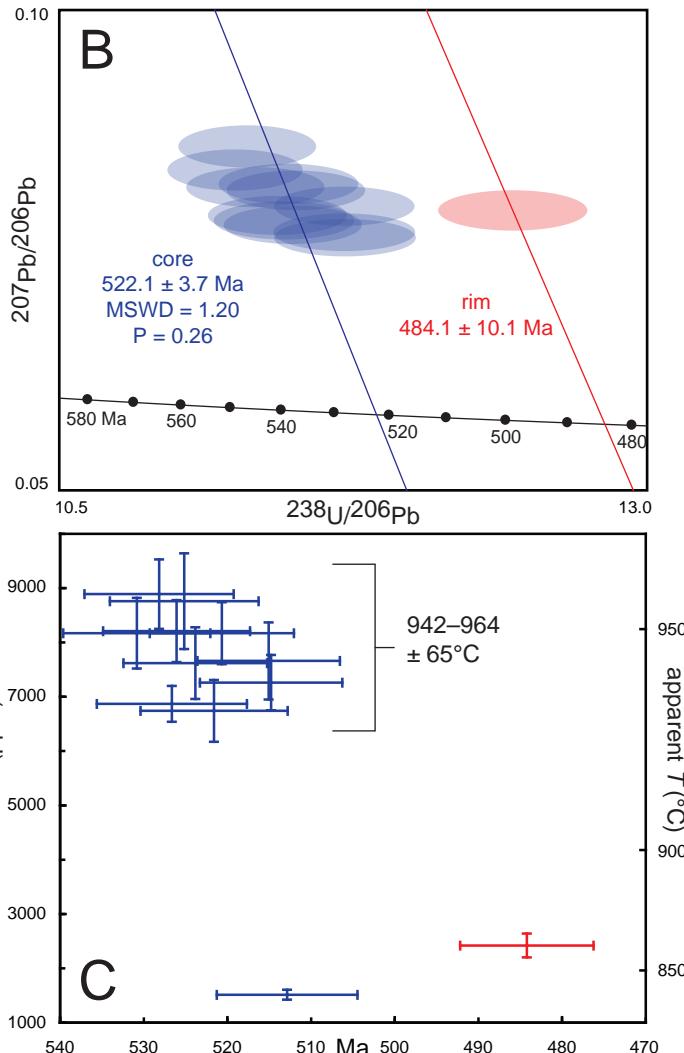
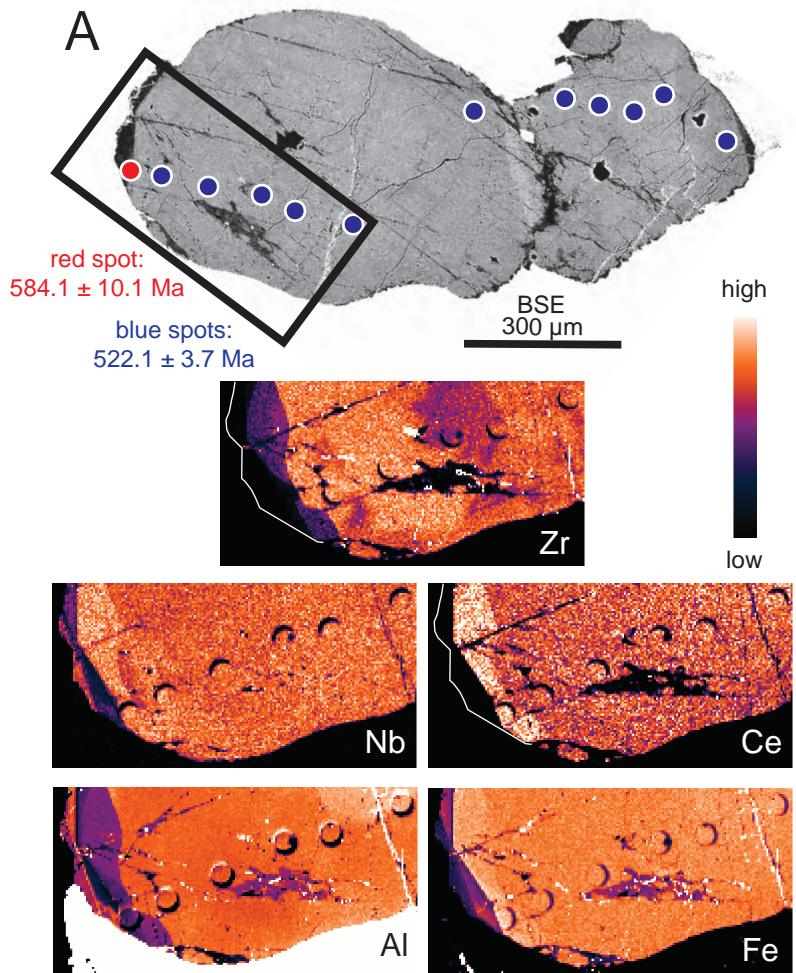
510

520

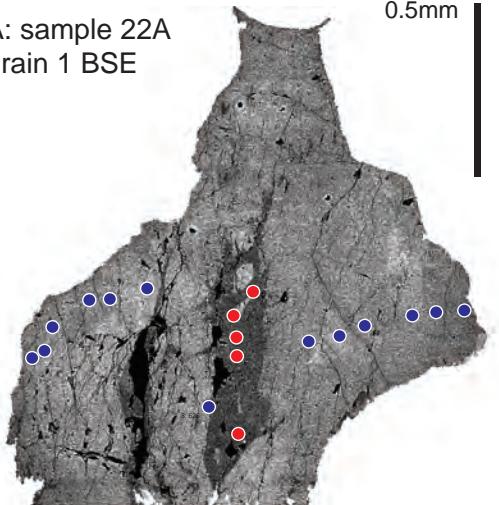
530

540

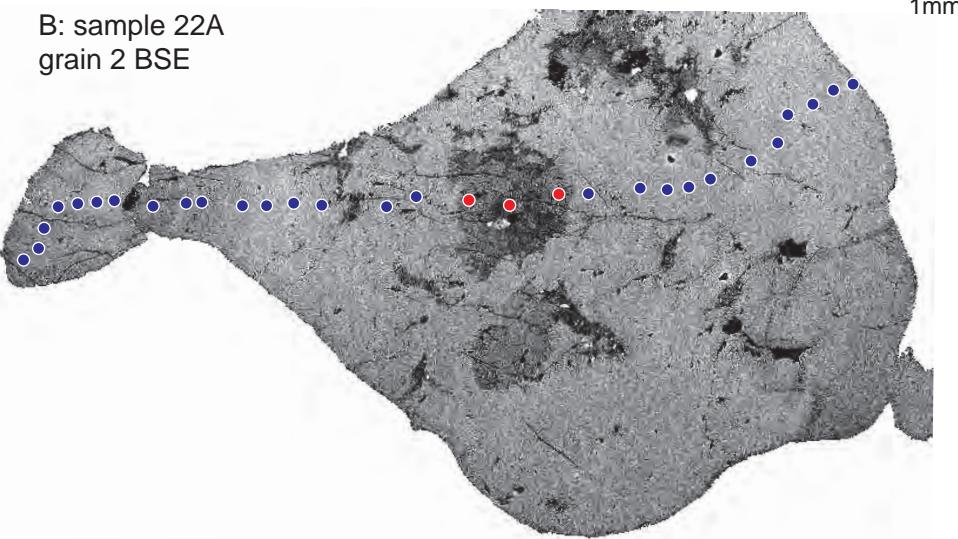
sample 21B2 titanite grain 2



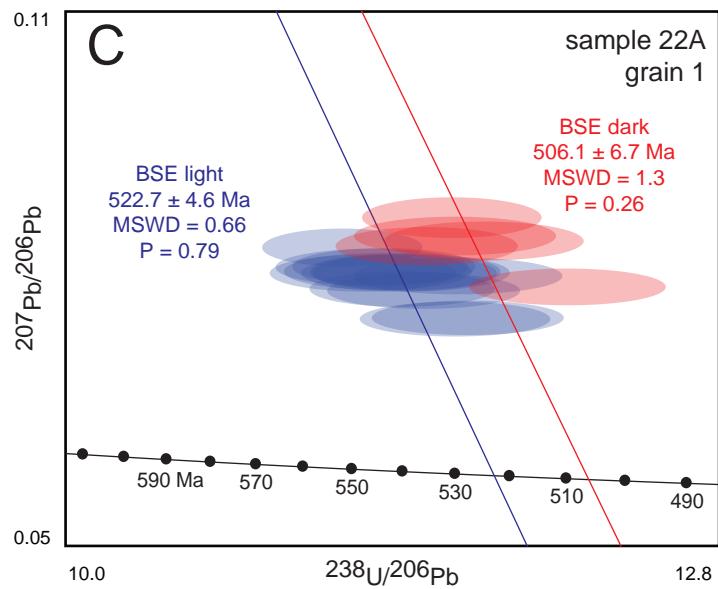
A: sample 22A
grain 1 BSE



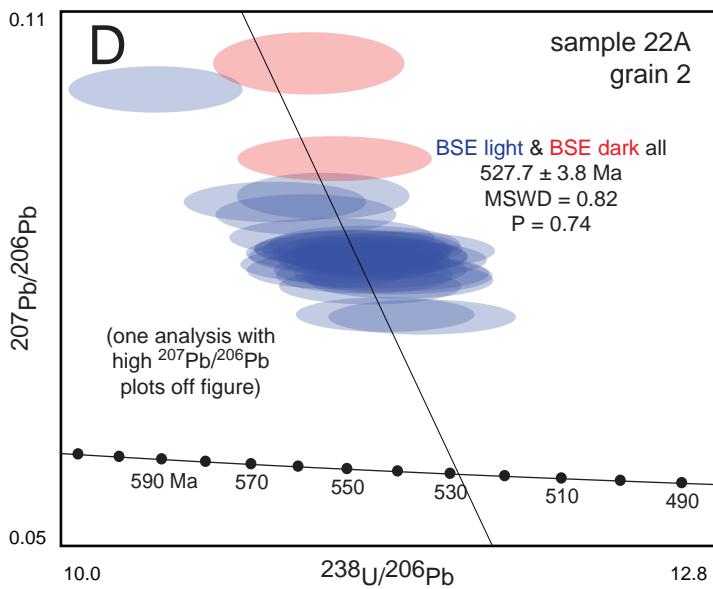
B: sample 22A
grain 2 BSE



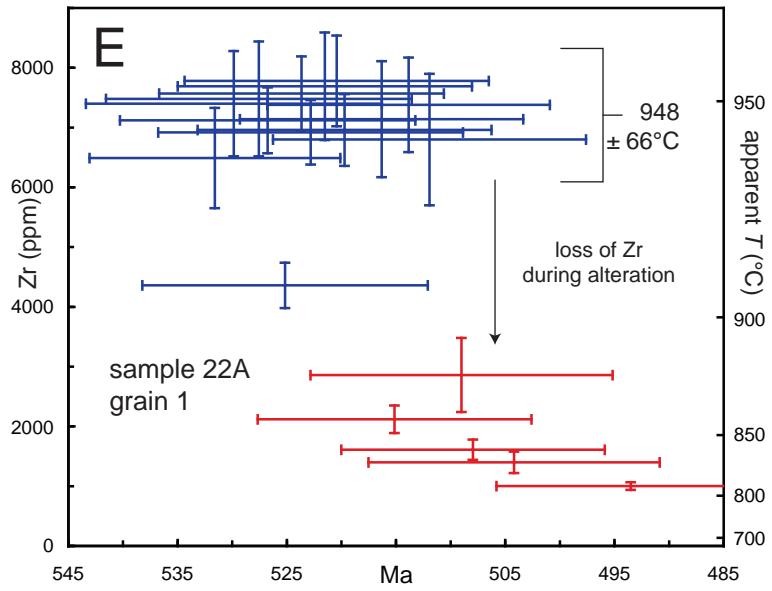
C



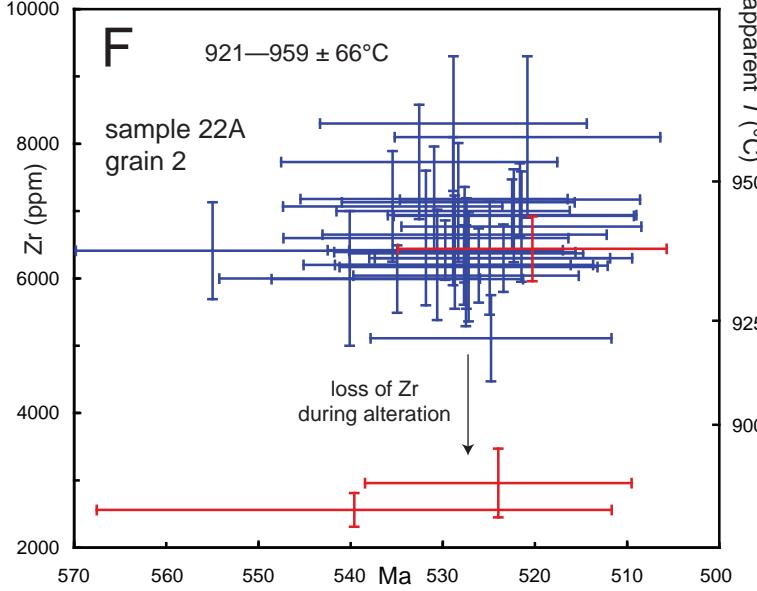
D

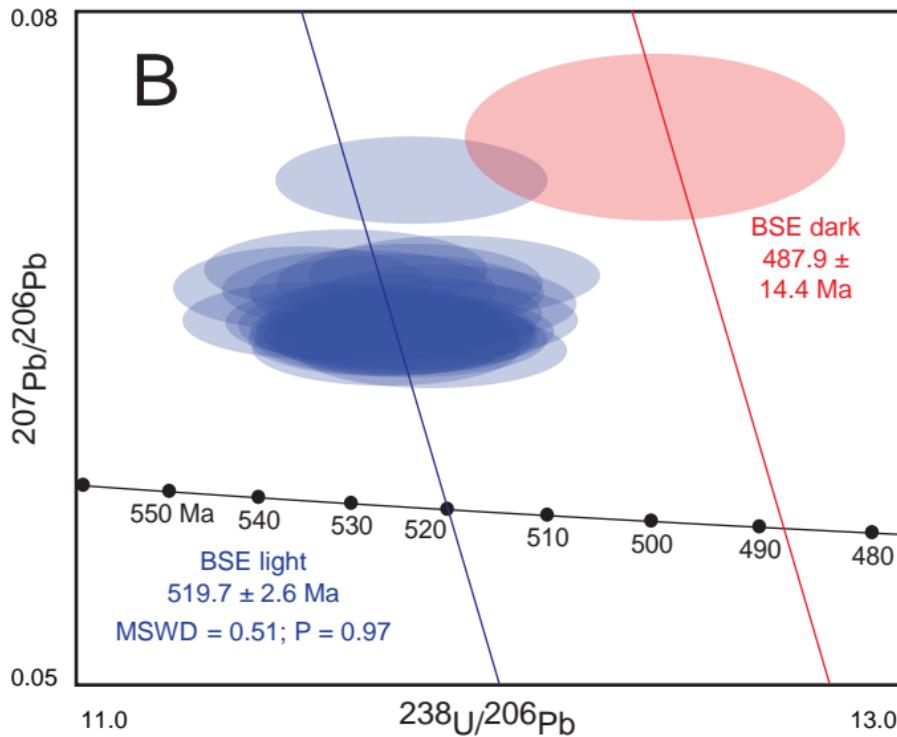
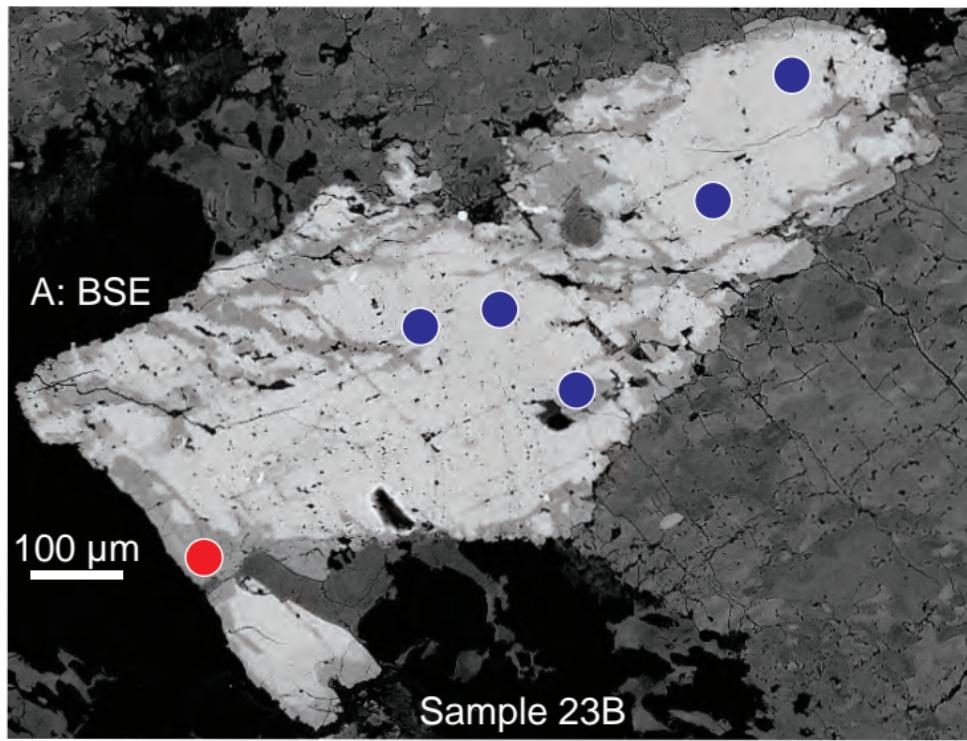


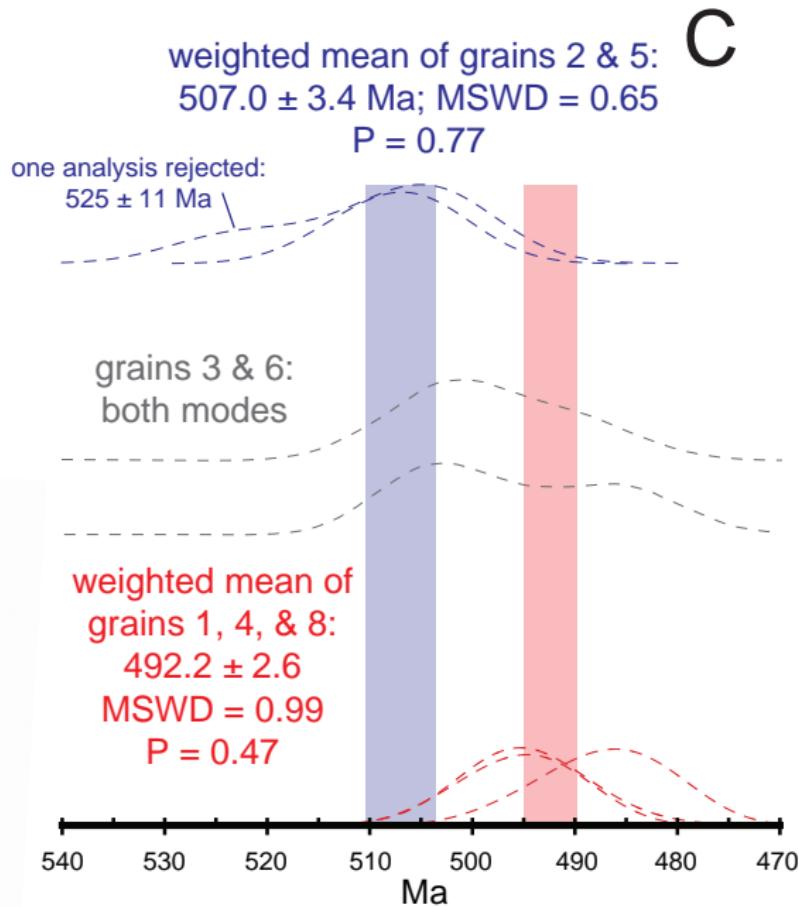
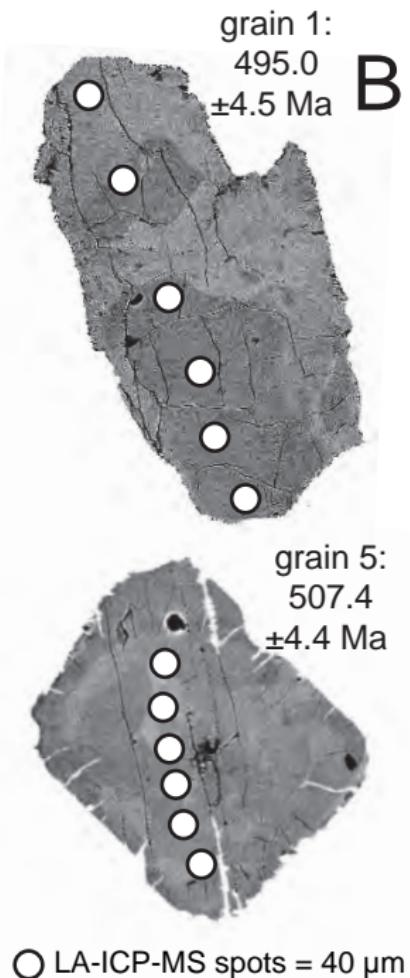
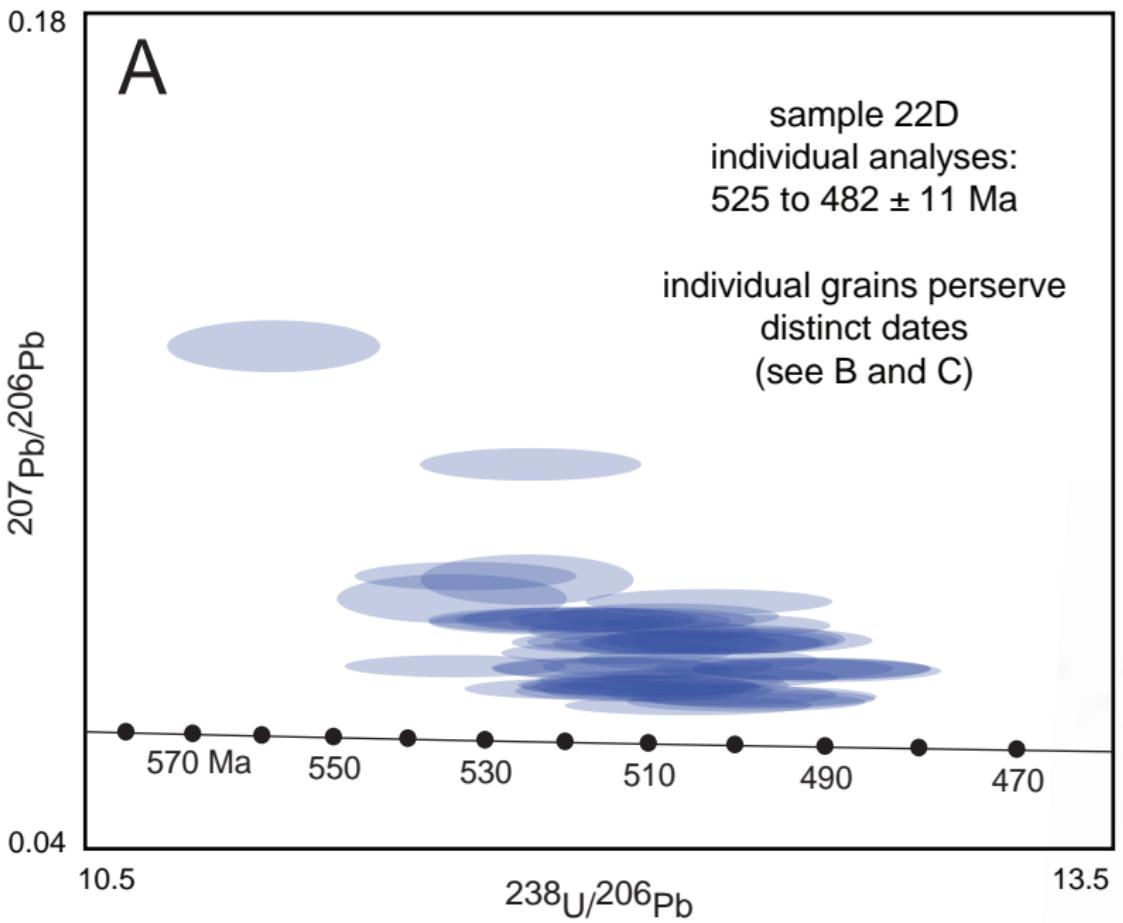
E



F







0.13

 $^{207}\text{Pb}/^{206}\text{Pb}$

0.05

 $^{238}\text{U}/^{206}\text{Pb}$

sample 22G
individual analyses:
one spot, 535 ± 17 Ma;
all other analyses, 519 to 495 ± 10 Ma

10.2

13.0

590 Ma

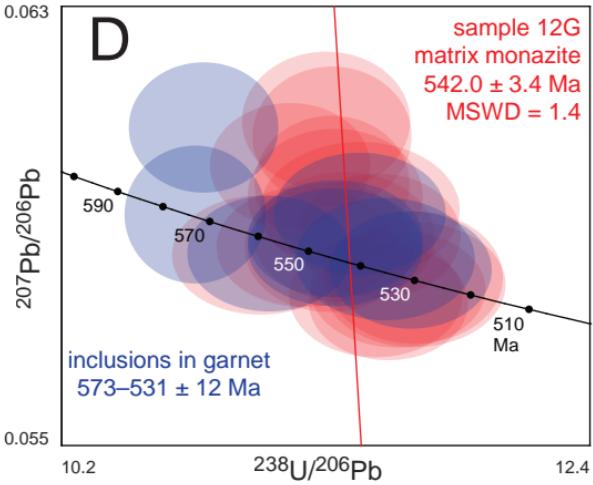
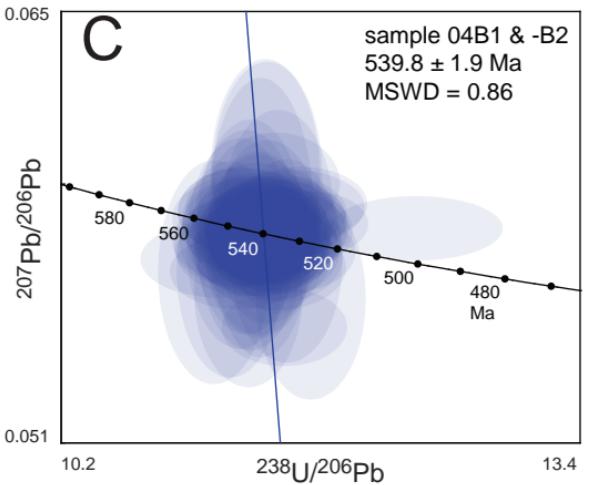
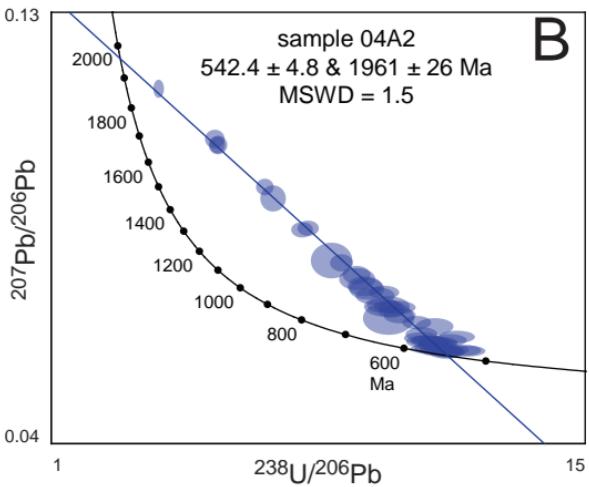
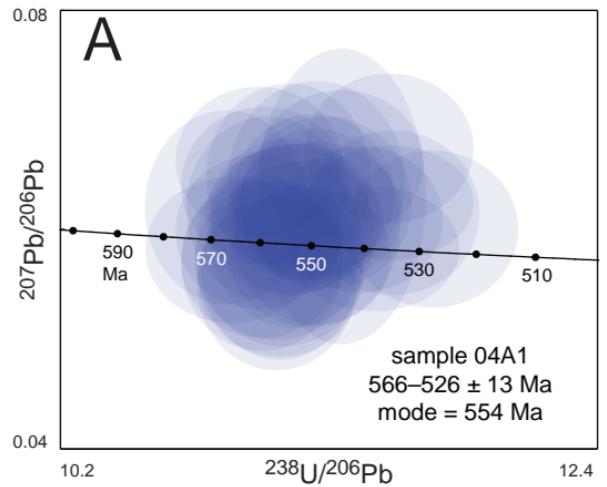
570

550

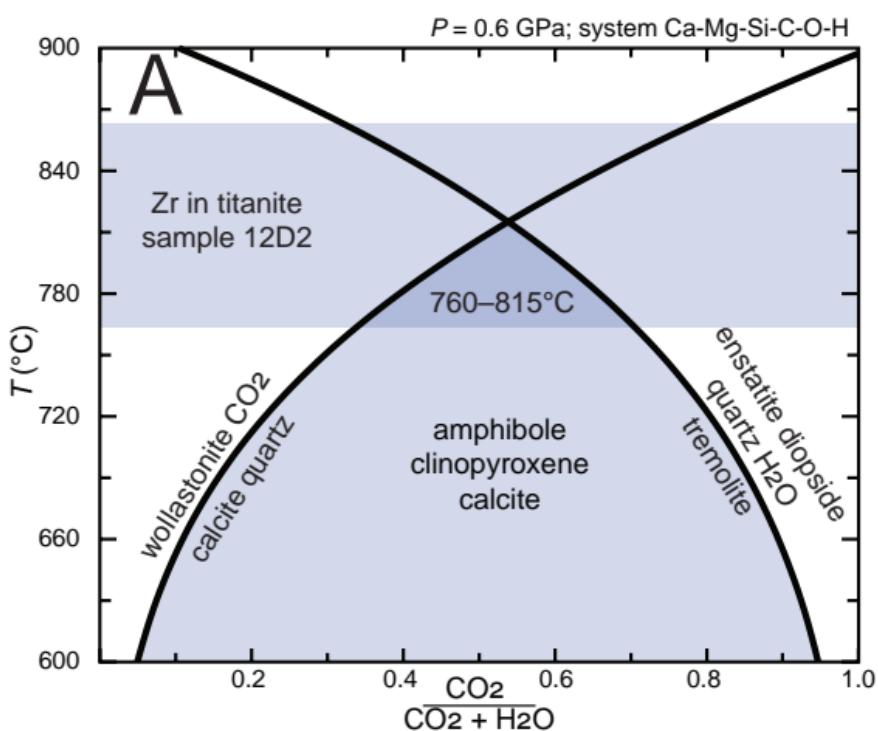
530

510

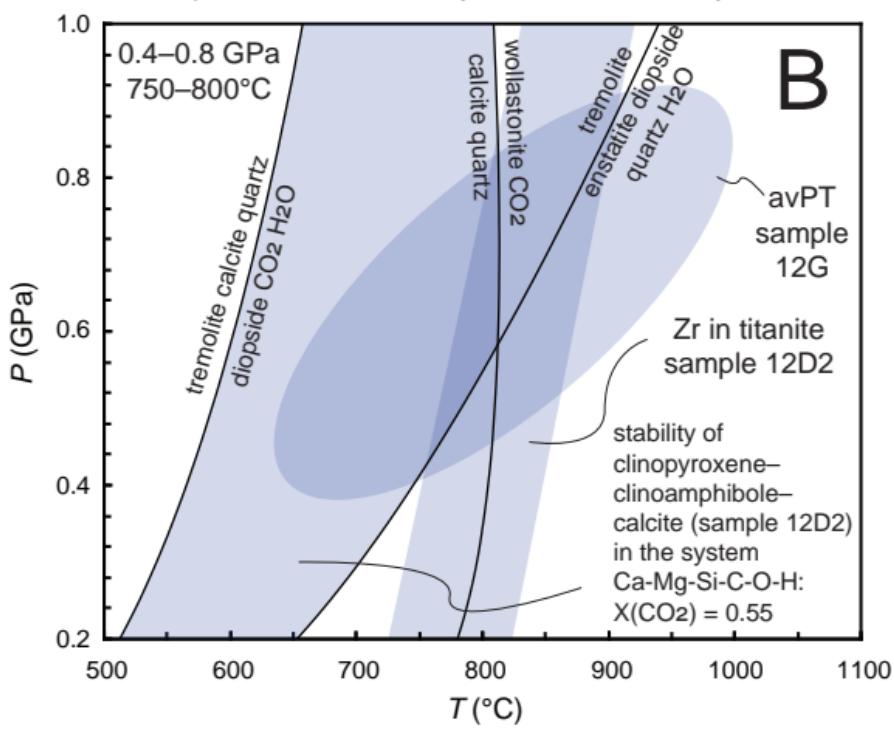
490



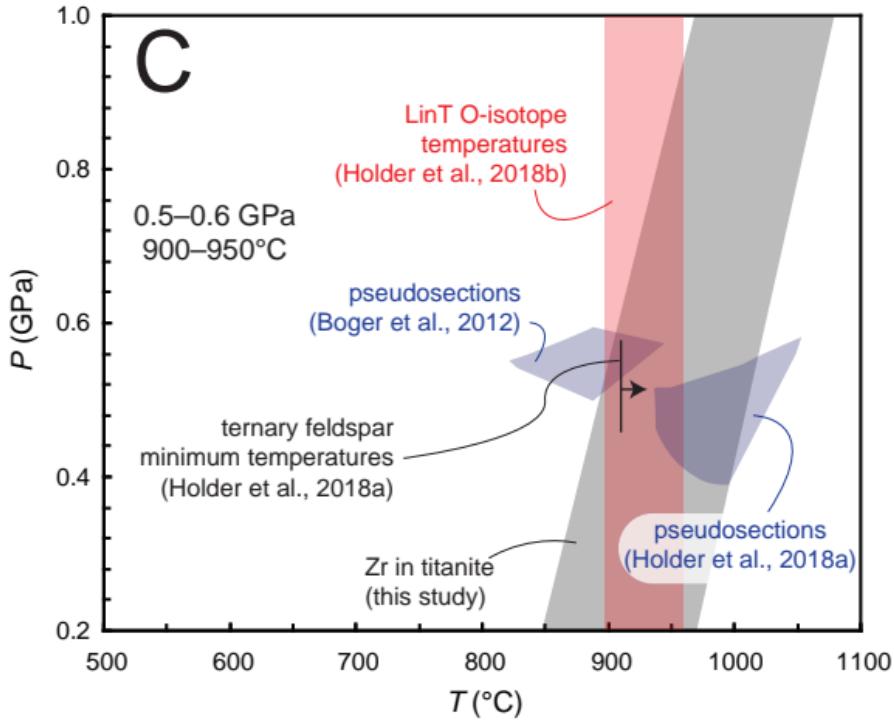
T of metamorphism in the Ikalamavony domain between Ihosy and Ankaramena



P-T of metamorphism in the Ikalamavony domain between Ihosy and Ankaramena



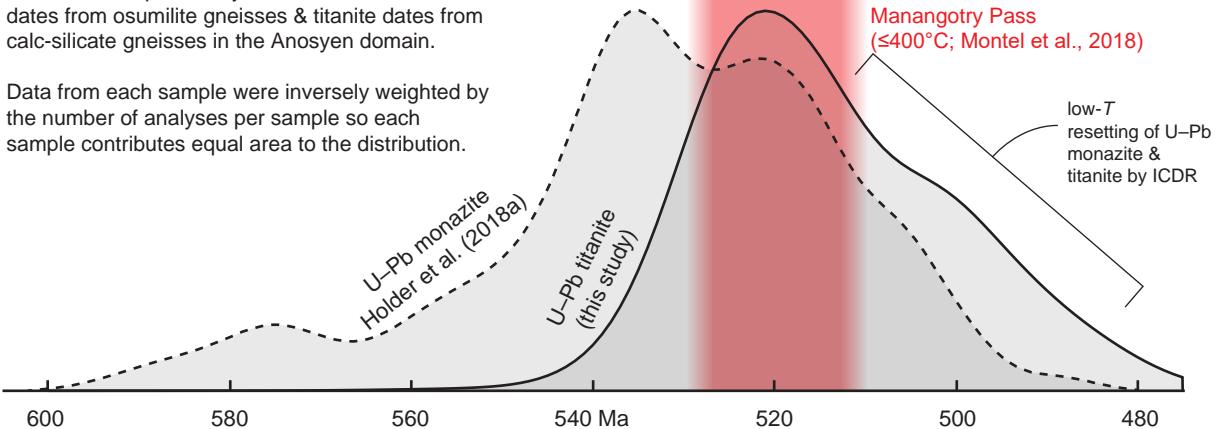
P-T conditions of metamorphism in the Anosy domain near Tranomaro



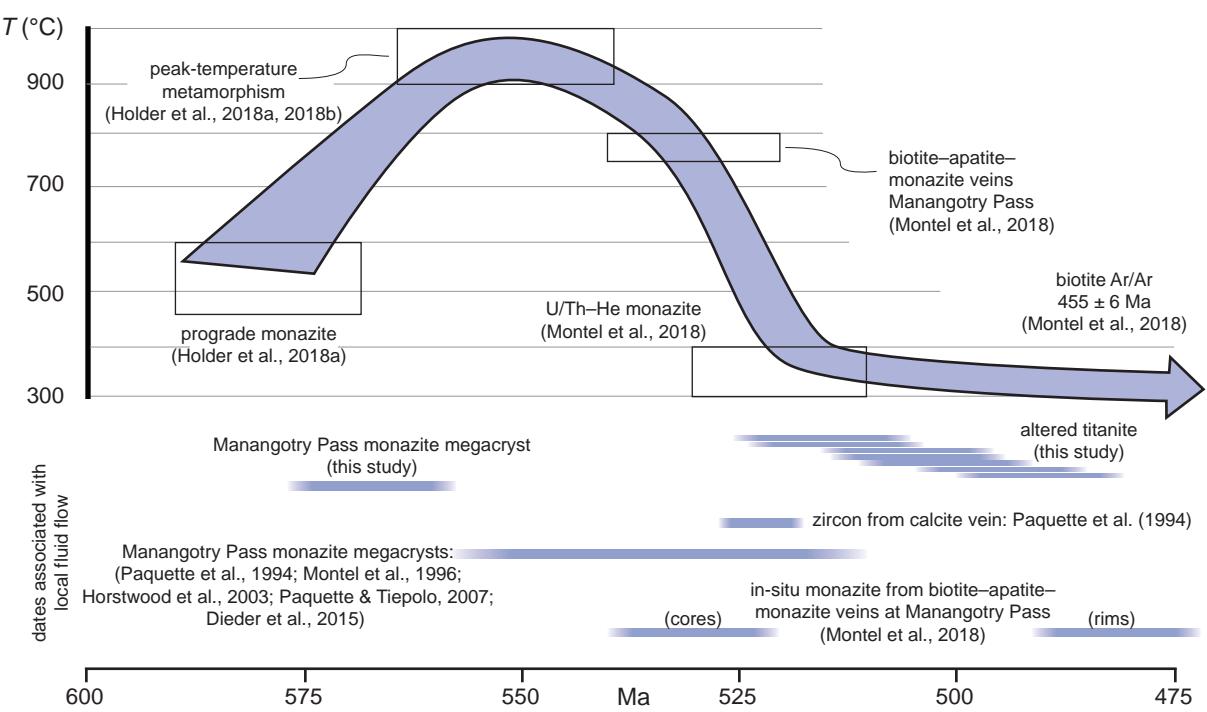
A: Cumulative probability distributions of monazite dates from osumilite gneisses & titanite dates from calc-silicate gneisses in the Anosy domain.

U/Th–He monazite dates at Manangotry Pass ($\leq 400^\circ\text{C}$; Montel et al., 2018)

Data from each sample were inversely weighted by the number of analyses per sample so each sample contributes equal area to the distribution.



B: Temperature–time path for the Anosy domain near Tranomaro



C: Temperature–time path for the Ikalamavony and southern Antananarivo domains near Ankaramena

