

THERMOCALC Short Course (São Paulo): 2006

Practical: Mineral recalculation answers

1. Partial THERMOCALC output for analysis 1 is

- 1) $\text{gr} + \text{py} + 2\text{coe} = 3\text{di} + 2\text{ky}$
- 2) $\text{gr} + \text{alm} + 2\text{coe} = 3\text{hed} + 2\text{ky}$
- 3) $\text{py} + 3\text{hed} = \text{alm} + 3\text{di}$

TC	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	sdT	sdP
1	1266	1174	1090	1013	943	878	817	761	709	660	614	31	1.0
2	708	800	892	982	1072	1162	1251	1341	1430	1520	1610	73	1.6
3	954	968	982	997	1011	1025	1039	1053	1067	1082	1096	38	5.3

giving $T_{30 \text{ kbar}} = 1025^\circ\text{C}$, with $\sigma_T = 38$. (Using a more appropriate T for $a-x$ gives a temperature some 50°C lower, with $T_{30\text{kbar}} = 968^\circ\text{C}$, using $T = 1000^\circ\text{C}$ for $a-x$ and the corresponding Q value).

2. In the charge balance calculation for analysis 2, both charge sums give 0.52473, so the analysis is charge balanced.
3. Partial THERMOCALC output for analysis 3, using $x(\text{cpx}) = 0.159$, is

TC	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	sdT	sdP
1	1163	1082	1008	940	877	818	763	712	663	618	575	29	1.0
2	471	546	621	695	770	844	918	992	1067	1141	1215	66	1.8
3	772	784	796	808	820	832	844	856	867	879	891	32	5.4

giving $T_{30 \text{ kbar}} = 832^\circ\text{C}$, with $\sigma_T = 32$, a fairly dramatic decrease in T from 1. above.

4. Partial THERMOCALC output for analysis 4, using $x(\text{cpx}) = 0.112$, is

TC	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	sdT	sdP
1	1095	1021	953	890	831	776	725	677	631	588	548	27	1.0
2	295	354	414	473	533	592	652	712	772	833	893	57	1.9
3	624	634	645	655	665	675	685	696	706	716	726	28	5.5

giving $T_{30 \text{ kbar}} = 675^\circ\text{C}$, with $\sigma_T = 28$, with a further drop in T from 3. above. So the dataset-derived uncertainty is $\sigma_T^{\text{ds}} \approx 30^\circ\text{C}$

5. There is a very small difference in the resulting temperature on inclusion of a little eskolaite end-member into the analysis.
6. $T_{30 \text{ kbar}} = 712^\circ\text{C}$, saying that $\sigma_T^{\text{mo}} \approx 40^\circ\text{C}$.
7. $\sigma_T^{\text{ds+w}} \approx 50^\circ\text{C}$, so $\sigma_T^{\text{w}} \approx 40^\circ\text{C}$
8. Minima: comparison $\pm_T \approx 40^\circ\text{C}$; absolute $\pm_T \approx 130^\circ\text{C}$.

If this looks bad, try the same sort of analysis with garnet-biotite thermometry!