

P-T pseudosection tutorial 2

Richard White.

This tutorial is a more advanced level instruction (no lengthy explanations) for constructing a P-T pseudosection from equilibria that have been identified from a T-x diagram. The rock composition is that of X=1. The diagram will be calculated from 750-950°C and 4 to 11 kbar. In this tute I will go through calculating only part of the diagram, the rest you can finish on your own. To keep things simple I have not bothered with the sill=ky transition

In your thermocalc folder you will need the following files

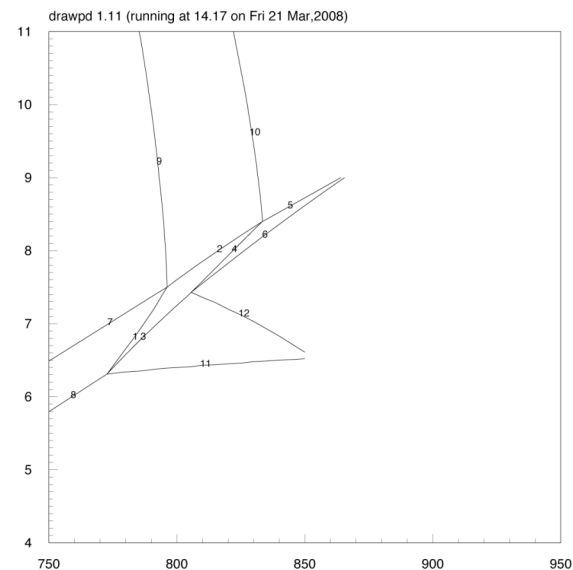
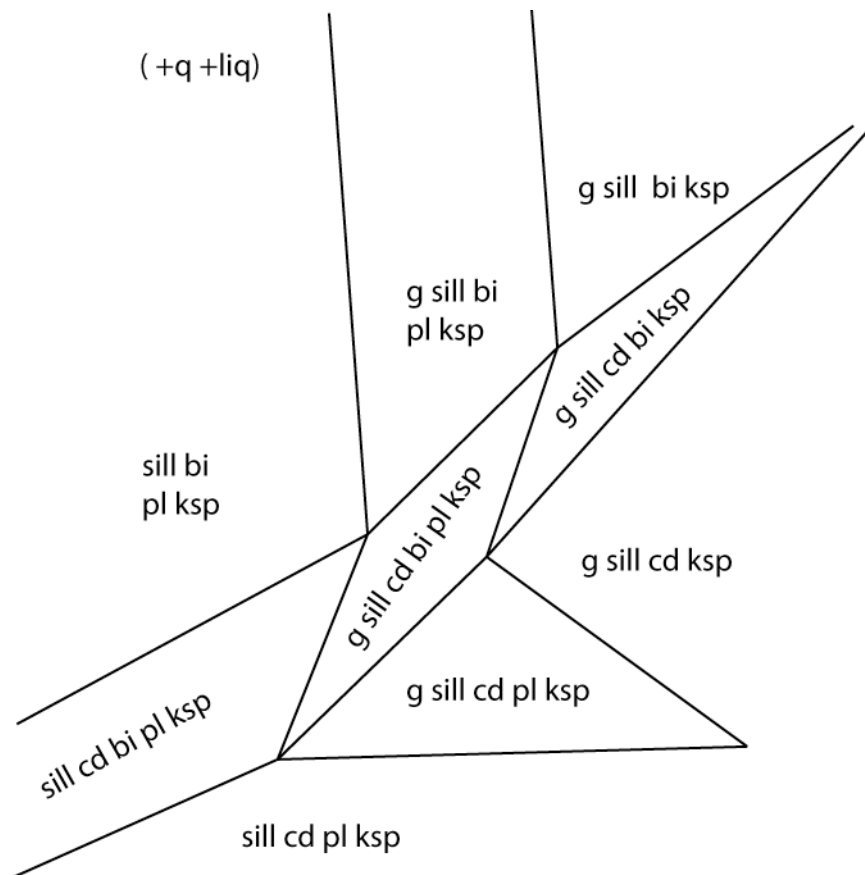
```
tc-ptpstute2  
tc-NCKFMASHp  
dr dtpstute2 (mac)  
drdpt2 (PC)
```

In your tc-prefs file use the scripts

```
calcmode 1  
scriptfile ptpstute2
```

so thermocalc automatically uses this script file and knows you are doing phase diagram calculations.

From the T-x diagram at 6.4 kbar we have the equilibria bi-cd-g-liq-ksp-pl-sill-q and the (g) and (bi) lines that bound that field. By calculating these lines you will see that there are also (cd) and (pl) lines with the points (g bi) (g cd) (cd pl) & (bi pl). then calculate the boundaries to the trivariant fields that occur around the divariant field.



The (cd) and (bi) lines that bound the g-sill-cd-bi-ksp-q-liq field appear to connect at a (cd bi) point at just over 9 kbar. However, P-T grids in KFMASH show that the reaction $g + cd = opx + sill$ occurs at conditions close to this. As this composition is a high XMg pelite, there is a reasonable chance that a multi variant version of this reaction may be seen. From the g-sill-cd-bi-ksp-q-liq assemblage it is worthwhile to check if opx becomes stable making the divariant g-opx-sill-cd-bi-ksp-q-liq assemblage. The easiest way to do this is to look for the (opx cd) and (opx bi) points, which calculate at

```
% -----
i5  bi g liq ksp sill q - cd opx
```

```
8.77 852.5 % cd = 0opx = 0
```

```
% -----
i6  cd g liq ksp sill q - bi opx
```

8.80 857.4 % bi = 0opx = 0

now we need to work out the boundaries to this field. It may at this stage be worthwhile to use the compositions from one of these points as starting guesses.

Even with the new starting guesses I had trouble calculating the (bi) and (cd) lines from this field. I would recommend looking at the modes of other minerals at the (opx cd) and (opx bi) points and trying to calculate points rather than lines.

P(kbar)	T(?C)	x(bi)	y(bi)	Q(bi)	x(cd)	h(cd)	x(g)	z(g)	x(opx)	y(opx)	Q(opx)	q(L)	fsp(L)	na(L)	an(L)	ol(L)
8.77	852.5	0.1635	0.3850	0.09470	0.1115	0.6732	0.3735	0.01181	0.2312	0.1510	0.2220	0.1686	0.3346	0.3677	0.01697	0.004079
mode	bi	cd	g	opx	liq	ksp	sill	q								
	0.09728	0	0.1592	0	0.2078	0.09362	0.1511	0.2910								

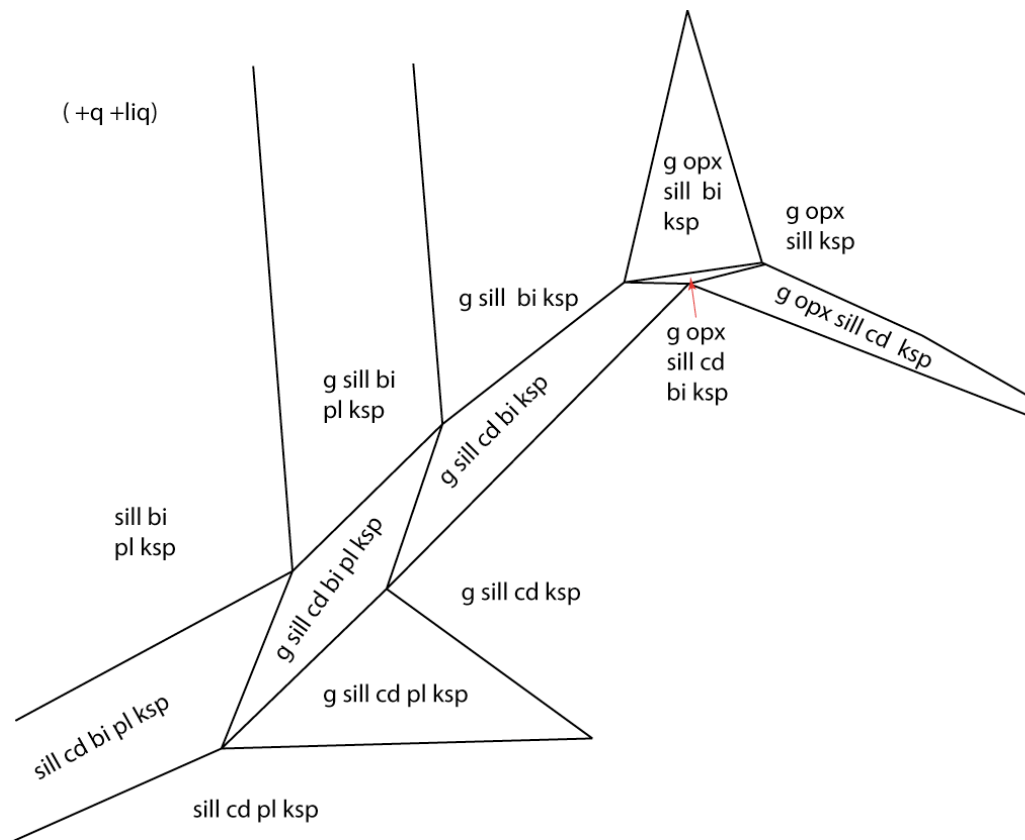
P(kbar)	T(?C)	x(bi)	y(bi)	Q(bi)	x(cd)	h(cd)	x(g)	z(g)	x(opx)	y(opx)	Q(opx)	q(L)	fsp(L)	na(L)	an(L)	ol(L)
8.80	857.4	0.1648	0.3868	0.09454	0.1127	0.6723	0.3731	0.01013	0.2324	0.1531	0.2218	0.1754	0.3343	0.3067	0.01558	0.004196
mode	bi	cd	g	opx	liq	ksp	sill	q								
	0	0.1301	0.1738	0	0.2339	0.1324	0.1021	0.2278								

from this information likely points to calculate are (cd bi) (bi ksp) (cd ksp). Of these, (cd bi) exists meaning the field only has 3 edges

% -----
i<k> g liq ksp sill q - bi cd

9.17 872.5 % bi = 0cd = 0

It is probably easier to define this field using the 'connect' code in drawpd . When you do this you will notice that this field is so narrow as to be effectively univariant. Again, calculate the boundaries to the surrounding trivariant fields, noting that the (opx) & (cd) boundaries to the g-opx-cd-sill-ksp-q-liq field will be sub-isobaric as the univariant KFMASH equivalent reaction is sub-isobaric. In addition there will be a (cd ksp) point at about 930°C I had to change starting guesses at this point. the pseudosection should look like



The rest of the diagram should be pretty straight forward, starting With the lines that emanate from the remaining points. You may have to change starting guesses at some stage especially to calculate the lower-P equilibria.

