Tonalite generation in arc regimes: results from metadiorite partial melting experiments

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Piston-cylinder experiments have been conducted to determine the melt composition, volume change of the melting reactions and the aH_2O of melt produced during partial melting of a metadiorite. An unmelted sample of metadiorite (plag + qtz + hbl + bt + czo) was collected from the Pembroke Valley, Fiordland, New Zealand. The metadiorite experienced partial melting simultaneously with fracturing at granulite facies conditions T>750°C and P˜1.4 GPa during the Early Cretaceous (Clark et al., 2000).

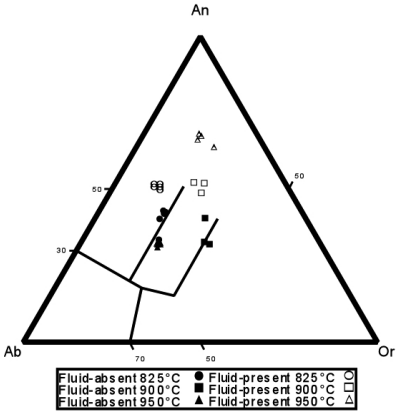
Fluid-absent Results

The fluid–absent solidus occurs between 800-825°C. Experimental melt compositions are presented in Figure 1. Low *T* melts suggest the initial reaction of bt followed the partial melting of hbl +/- czo. Cpx, grt and melt are the primary reaction products. Melt compositions are initially tonalitic but become granodioritic with *T*, as grt becomes stable and the dominant reaction shifts to hbl +/- czo. Compositions later become more tonalitic as more czo is incorporated into the melting reaction. The hbl + czo reaction has a positive ΔV, producing melt filled cracks and suggests a high dilatational strain is associated with melting. LA-ICPMS data show that 950°C melts are adakitic.

Fluid-present (2wt% H_2O added) Results

The solidus under these conditions occurs between 750-800°C. The melt compositions reflect a similar evolution as in the fluid-absent experiments. Increased Ca concentrations as a function of *T* are attributed to the early involvement of czo in the melting reaction, the absence of product grt, and hbl remaining stable in excess of 950°C.

Figure 1: 1.4 GPa experimental melt compositions.



References

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Interannual variability of the POC export flux estimated from Th-234 in the equatorial Pacific during the period 1999 to 2001

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Introduction

The boundary of the warm pool and the upwelling area is dependent on the east-west advection of the western Pacific warm pool in the equatorial Pacific. The change of boundary also affects the carbon productivity by biomass and the transport process of carbon in this area. It is important to clarify the carbon export flux in order to understand the carbon cycling mechanism in the upper ocean. Th-234 ($t_{1/2}$= 24.1 day) was used as a tracer to investigate the scavenging and export fluxes of particle transport processes. The export fluxes of POC were estimated from Th-234 in the western and central equatorial Pacific during 1999 to 2001. Seawater and settling particle samples were taken from the surface to the depth of 200m during MR98-K02, MR99-K07 and MR00-K08 cruises, aboard the R. V. Mirai of JAMSTEC.

Results and Discussion

The surface water temperature tended to lower from the west to the east in the equatorial Pacific. The boundary in the warm pool in the western Pacific and the upwelling area in the equatorial Pacific was recognized near 155-160E. In the upwelling area, there was no correlation to the Chl. a and POC concentrations in seawater. It has been clarified to be a result by the difference between the species of plankton (Matsumoto et al., 2001).

The ratios of POC in the settling particles could not recognize the large difference in this area. The POC/ Th-234 ratios in the suspended particles showed the value in which 2 times were higher than those in the settling particles. The export fluxes of POC were calculated as the product of the calculated flux of Th-234 in seawater times the POC/Th-234 ratio in the settling particles. Measured POC export fluxes in the depth of 200 m were from 1.1 to 10.0 mmolC/m2/day and estimated export fluxes of POC ranged from 1.0 to 8.2 mmolC/m2/day. The e ratios (the ratio of POC export flux in primary production) were from 0.03 to 0.27. These ratios showed that the values in the warm pool were higher than those in the upwelling area. It is considered that the different of the POC export flux and the e ratio in these areas are attributed to cause by the compositions of particle matter and the plankton species.

References

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