

## P-T-D path of the Sambagawa metamorphism

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The P-T paths derived from precise inversion method of garnet in pelitic schists and amphiboles in basic schists are composed of two segments: the one is the segment in the lower pressure and temperature conditions and another one is in the higher pressure and temperature regime both in the prograde and retrograde metamorphism. The segment of the lower temperature regime shows low  $dp/dT$  but that of higher temperature regime does small  $dp/dT$ . The boundary between two regimes is about 400C.

Metamorphism in the prograde metamorphism is divided into two types: the early stage is the small  $dp/dT$  and the later stage is the high  $dp/dT$  in terms of the p-T path. The early stage is then characterized by the enough heating or thermal equilibration during sediment subduction, but the later stage is by the near adiabatic compression due to rapid sediment subduction. Therefore, we can propose such physical model that the boundary between slab and the metamorphic rocks is weakly coupled and sediment subduction is slow, and in the later stage it becomes strongly coupled state, leading to the high speed sediment subduction. On the other hand, the retrograde metamorphism, corresponding to the exhumation stage is characterized by the early rapid exhumation and the later slow exhumation. Thus, it is possibly inferred that the early process of exhumation is derived from weak coupling between slab and metamorphic rocks and the slow exhumation due to small buoyant force or the relatively strong coupling between slab and metamorphic rocks.

The proposed model is investigated by the deformation path linked with p-T path of the metamorphic rocks. The mechanical coupling is mainly due to the viscous drag force within the metamorphic rocks derived from plate subduction. Therefore, the situation of the coupling is different in the prograde and retrograde stages because of forward and inverse motion between slab and metamorphic rocks, respectively. Namely, the near adiabatic path in the prograde stage means strong coupling and that in the retrograde stage does weak coupling. The strong coupling, therefore, suggests the small strain rate but the weak one does large strain rate in the metamorphic rocks. Thus, it is of great importance that the strain rate path together with p-T path is possible to determine using the garnet microstructure.