Evolution of the porosity structure of the Shimanto accretionary prism, southwest Japan

Shinichiro Nishino[1], # Akito Tsutsumi[2]

[1] Geology and Mineralogy,Sci,Kyoto Univ., [2] Kyoto Univ.

Although fluid flow caused by dewatering of accreted sediments is important for various phenomena in subduction zones (Shimamoto, 1985), fluid flow mechanisms have not been quantitatively understood. The purpose of this study is to quantitatively determine porosity and permeability structure of the Shimanto accretionary prism, one of the most extensively studied accretionary complex in the world (e.g. Taira et al., 1988).

In order to explore the whole variation of the porosity and the permeability structures across the Shimanto accretionary complex, we measured porosity of rocks of early Cretaceous to Miocene Shimanto belt in Kochi prefecture, SW Japan, and then we compared the porosity data with the results reported in the ODP-reports (e.g. Taylor and Fischer, 1993). In addition to these experimental studies, distribution and structure of veins were observed in the field, as they are traces of past fluid flow in the fractures (Fischer and Byrne, 1990; Fischer, 1996).

The porosity of the Shimanto rocks is mostly under 5% and no change can be seen related with the thrusts or sedimentary age of the Shimanto belt. On the other hand, samples with Miocene age of the ODP (Ocean Drilling Program) Leg 131 site 808 showed much higher porosity of about 30% than the same age sample of the Shimanto belt. This remarkable difference can be explained with porosity-depth relationship (Bray and Karig, 1985) as a result of compaction due to burial to the depth of approximately more than 5km. This estimated depth is consistent with the depth estimated in the studies of thermal histories of the Shimanto belt (e.g. Hasebe et al., 1993).