Exhumation tectonics of eclogite facies rocks in the Omachi Seamount, Izu-Bonin Arc.

Hayato Ueda[1]; Tadashi Usuki[2]; Yoshiyuki Kuramoto[3]

[1] Dep. Earth Sci., Niigata Univ.; [2] NIPR; [3] Earth and Planetatary Sci,Hokkaido Univ

Amphibolites containing micro-inclusions formed in the eclogite facies were sampled by the submersible Shinkai 6500 from the Omachi Seamount (Ueda et al., 2003). They are regarded as exhumed fragments originated from ocean crust subducted down to 60-70 km beneath the Izu-Bonin Arc. Although we have not got their radiometric ages yet, the occurrence overlain by Late Eocene to Early Oligocene suggests that they were exhumed in an early stage of the Izu-Bonin Arc. Here we discuss on their exhumation process.

The amphibolites were floats within the area of serpentinite exposure. The serpentinites are antigorite schist, characterized by evident foliation and stretched spinel pseudomorphs. Stretched lineations determined by video record trend north-south with nearly horizontal plunges. Three to four metamorphic and deformation stages can be recognized in a garnet-zoisite amphibolite: stage I (paragonite-eclogite facies), IIa (kyanite-eclogite facies), IIb (paragonite-eclogite facies), and III (amphibolite facies). The stage I minerals are observable in zoisite porphyroclasts, presumably remnants of primary gabbroic texture. The stages IIa and IIb are characterized by formation of pronounced mineral foliation and lineation. The stage III minerals are seen along matrix rims and pseudomorphs after garnet. Transition from stages I to IIa represents increasing temperature and pressure, probably owing to subduction. Transition from IIa to III reflects decompression, hence, the foliation and lineation were formed during this exhuming period. These structures suggest that both amphibolites and serpentinite were unroofed together.

The Philippine Sea Plate were extended over 1000 km in north-south direction since the initiation of the Izu-Bonin Arc, as recorded in its magnetic lineations (Hilde and Lee, 1984). Since the rift axes were crosscut by the trench, their eastern end were probably cooled by the subducted slab. It is known that the upper mantle materials are occasionally pulled up to the surface at the spreading axes if they are not sufficiently hot enough to produce basaltic magma (e.g. Ohara et al., 2001). Fragments of eclogitized ocean crust are possibly unroofed if the subducted slab exists beneath such cool rift. A similar (but with a differing trench-rift relation) unroofing process of eclogites along with back-arc spreading is known to be proceeding at D'Entrecasteaux Islands off Papua New Guinea (Hill et al., 1992). The north-south trending stretching lineations can be attributed to the back-arc spreading in the West Philippine Basin or Daito Ridge Group.