Is the Kyushu Island (the Kurosegawa - paleo Ryoke zone) a fragment of the Qinling - Dabie -Sulu collision zone?

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The Higo metamorphic rocks has been interpreted as low to medium pressure type metamorphic rocks (Yamamoto, 1962; Karakida and Yamamoto, 1982; Obata et al.,1994). Recently Osanai et al.(1998) suggested a decompressional P-T path from a high pressure ~1.2 GPa based on the study of a sapphirine - bearing granulite. Miyazaki (2004) and Maki et al.(2004) have discussed again the nature of the metamorphism as the low to medium pressure type based on pelitic mineral assembalges.

We newly found a garnet amphibolite containing a ilmenite (Ilm) + clinopyroxene (Cpx) symplectite from Tomochi, Kumamoto Prefecture. The garnet amphibolite occurs as a thin layer (~5 cm thick) within pelitic gneiss. The mineral assemblage is garnet (Prp10Alm61Sps8Grs12And9) - ferrohornblende - plagioclase (An90) - quartz. The Ilm+Cpx symplectite occurs either as an inclusion in garnet or as a breakdown product after garnet. It is always surrounded by an aggregate of Cpx + Ms (muscovite) in either case. Cpx has a composition of Di40Hd60 with small amounts of Na2O (0.3 ~ 0.5 wt %) and Al2O3 (0.5 ~ 1.3 wt%). Garnet in contact with Cpx gives 730 ~ 780 oC based on Cpx - Grt geothermometer. The estimated bulk composition of the symplectite plus Cpx + Ms aggregate gives the following formula recasted to O=12 neglecting H2O: K0.319Ca1.030Mg0.412Fe1.388Ti0.777Al0.958Si3.018O12. The total of cations is 7.90, which is close to the garnet formula. The obtained formula suggests majoritic garnet as the precursor mineral from which the symplectite and Cpx + Ms were formed by breakdown reactions. The majoritic garnet can contain significant amounts of K2O and TiO2 as suggested by natural samples from Ontong Java Plateau (Collerson et al., 2000) and by high pressure experiments (Ringwood and Lovering, 1970), respectively.

Recently Zhang and Liou (2003) reported the assemblage of Grt + Cpx + Ilm in the garnet clinopyroxenite from the Sulu UHP region. They discussed ultra-deep condition up to 15 GPa (~ 450 km depth) as the stability condition for the possible precursor majoritic garnet. The Ilm + Cpx symplectite from the Higo possibly shows 6 GPa based on Collerson et al. (2000)'s majorite geobarometer applied to the estimated precursor composition. Thus our sample possibly shows a remnant of the UHP metamorphism.

The tectonic situation of the Higo metamorphic rocks has been under debate mostly based on geochronological studies. There are two age groups in relation to the metamorphism: the older age group (214~ 282 Ma) possibly corresponding to the high to ultrahigh P metamorphism and the younger age one (~ 120 Ma) representing the low to medium P metamorphism. The older age is close to that of the QDS collision zone (230 Ma).

Above considerations lead to an idea that the Higo metamorphic terrane will be a fragment of the QDS collision zone and has been emplaced to the present position after the UHP metamorphism (~230 Ma) and has undergone the low to medium P metamorphism in Cretaceous. Hara et al. (1992) considered the Higo and the Kurosegawa terranes as a fragment of continent (K-continent) and named them the Kurosegawa - paleo-Ryoke zone. We support this idea and present an assumption that the K-continent is the QDS collision zone.