P-T history of the Tonaru epidote amphibolite mass in the Sambagawa metamorphic belt, central Shikoku, Southwest Japan

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The Tonaru epidote amphibolite mass occurs as a large tectonic block (ca. 6.5 km x 1 km) in the high-grade schists (albite- and oligoclase-biotite zones) of the Sambagawa metamorphic belt of the Besshi district, central Shikoku, Southwest Japan. The Tonaru mass consists mainly of garnet-epidote amphibolites with small amounts of diopside amphibolites. The protolith of the Tonaru mass is considered as layered gabbro based on the occurrence of remnant layering of melanocrastic and leucocrastic layers derived from original cumulate structure (e.g. Banno et al., 1976).

The constituent minerals of the Tonaru mass commonly show the epidote amphibolite facies, but some eclogitic mineral assemblages occur in the eastern part of the garnet-epidote amphibolite mass. According to the mineral parageneses and chemical compositions of the constituent minerals of the eclogites and the garnet-epidote amphibolites, the Tonaru mass had suffered a prograde metamorphism from the epidote-blueschist facies to the eclogite facies before the emplacement into the Sambagawa schists. The estimated P-T conditions are T = 300-450 C and P = 0.7-1.1 GPa for the epidote-blueschist facies and the peak P-T conditions of the eclogite facies are T = 700-730 C and P higher than 1.5 GPa. After the eclogite facies, the Tonaru mass was retrograded in the epidote amphibolite facies which is equivalent to the albite-biotite zone of the Sambagawa high-grade schists. The Tonaru mass had suffered a prograde metamorphism again up to the conditions of the oligoclase-biotite zone together with the surrounding Sambagawa schists.

The prograde P-T paths up to the peak metamorphic conditions in the eclogite facies among the Tonaru mass and the other tectonic blocks in the Besshi district show a similar high dP/dT geothermal gradient in spite of diverse peak P-T conditions. These prograde eclogites were reached different depths along the same subduction zone and they were ultimately uplifted and emplaced into the hanging wall side of the Sambagawa schists during the Sambagawa prograde metamorphism.