Mid-Cretaceous Tectonics of the Ryukyu arc reconstructed by geology of Kerama Islands, Okinawa

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The basement rocks of the Japanese islands are characterized by an along-arc distribution of accretionary complexes and metamorphic belts with oceanward-younging polarity. An intermittent formation of metamorphic belts is interpreted to have been related with subduction of mid-oceanic ridge. The ages of such tectonic events have been estimated by U-Pb age analysis of detrital zircon after 2000s (Isozaki *et al.*, 2010), and the timing of Kula-Pacific ridge subduction was estimated to be 60-70 Ma. However, a numerical model by Seton *et al.* (2015) simulated that the age of Izanagi-Pacific ridge subduction was 50-60 Ma, which is inconsistent with geological evidence (Isozaki *et al.* 2010). Using a different geophysical model, Wu *et al.* (2016) suggested that there has been East Asian Sea plate, relatively stationary to Eurasian plate, covering large area of western paleo-Pacific Ocean at 52 Ma. They also insisted that the Ryukyu arc was passive continental margin at 52 Ma. Taking these recent discussions into considerations, the purpose of this study is to constrain plate tectonic setting of NW Pacific by reexamining Cretaceous geological records of the Ryukyu arc. In this study we focus on Kerama Islands, located at the southwestern edge of the distribution of the Shimanto accretionary complex.

The bedrock of Kerama Islands is made up of a pile of three lithological units, greenstone, metasandstone, and pelitic schist in ascending order. Metamorphosed pelagic sediment is not observed. Greenstone generally contains epidote, actinolite, chlorite, and, hornblende as metamorphic minerals. Previous study shows the greenstone in Kerama Islands has geochemical features of N-MORB (Chinen *et al.*, 2004). Our detailed observation of the contact between the top of greenstone unit and the bottom of sedimentary rock layer shows that the boundary records intrusion of basaltic lava, the protolith of the greenstone.

U-Pb ages of detrital zircon grains obtained from massive metasandstone and psammitic schist in Kerama Islands were analyzed. The measurement was carried out using LA-ICP-MS installed at the National Museum of Nature and Science. The concordant ages calculated from the result is ranging from 104 to 2565 Ma. The youngest age of zircon ranges 104-110 Ma (early Cretaceous) and no zircon grains with late Cretaceous age is obtained. The depositional age of original rocks of metasandstone in Kerama Islands is considered to be ~100 Ma.

We examined peak metamorphic temperature of pelitic schist in Kerama Islands. Raman spectra of carbonaceous materials in thin section of the samples are obtained using a Raman spectrometer with a 532 nm Nd-YAG laser installed at Nagoya University. Peak decomposition of Raman spectra was performed and peak metamorphic temperature was estimated following the method of Beyssac *et al.* (2002). The result shows that the bedrock of Kerama Islands suffered 470-525˚C, which correspond to the temperature range of proposed metamorphic facies of greenstone characterized by the combination of epidote and actinolite (Maruyama *et al.*, 1996; Hacker *et al.*, 2003). This peak metamorphic temperature of Kerama Islands is higher than any reported temperatures in the Shimanto belt.

According to numerical model of Iwamori (2000), metamorphic *P-T* condition of rocks of Kerama Islands achieved by subduction of mid-oceanic ridge for several millions of years. Ridge subduction is also

supported by the existence of N-MORB intruded into trench-filled terrigenious sediment. Ridge subduction beneath paleo-Ryukyu trench at ~100 Ma, proposed by this research, would be a strong constrain for plate tectonic reconstruction of Cretaceous NW pacific.

