Crustal evolution and backarc opening of the Izu-Ogasawara-Mariana arc-backarc system derived from seismic velocity structures

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The Izu-Ogasawara-Mariana arc backarc system has grown since Eocene through arc evolution and backarc opening. The arc evolution has been processed by accretion of the basaltic magmas and crustal differentiation (e.g., Tatsumi, 2000), it is known that the growth process is accompanied with transformation/delamination of the mafic and dense crustal materials (e.g., Takahashi et al., 2007). This process is recorded as P-wave velocity variation in the lower crust and lower velocity of mantle velocities than 8.0 km/s (e.g., Kodaira et al., accepted). Current volcanic arc is composed of a middle crust with P-wave velocity of 6 km/s and heterogeneous lower crust with P-wave velocity of 6.7-7.3 km/s, however, the Ogasawara ridge, which is inactive Eocene arc, is composed of a crust with higher velocity than the current active arc. This suggests that the Eocene arc with less-differentiated materials has another process of the crustal evolution comparing with that in the active arc. The crustal structure is similar to that of the Aleutian arc, which has no middle crust with P-wave velocity of 6 km/s (e.g., Sillington et al., 2004). The Izu-Ogasawara arc has different stage of the crustal evolution in the north and the south (e.g., Yuasa, 1985), however ratios of each layer in the crust are almost constant between the north and the south although it is large difference in the crustal thickness (Kodaira et al., 2005). This suggests that the current crustal evolution has a process to make a middle crust with the P-wave velocity of 6 km/s. On the other hand, it is known that a backarc opening is accompanied with melting of mantle materials due to the decompression (e.g., Buck et al., 1988). According to our seismic experiments, arc-backarc transition zones of the Izu-Ogasawara-Mariana arc have broadly high velocity lower crusts with P-wave velocity of 7.3-7.5 km/s. Such lower crusts distribute within thin crusts in the eastern margins of the Shikoku basin, Parece Vela basin and the Mariana trough and beneath the Nishinoshima trough. And it is also important characteristics that almost high velocity lower crusts have high reflectivity. Possible causes of the high velocity lower crust could be considered to be mafic crustal materials produced by mantle melting and serpentinization at the crustal breakup, both causes could be according to the crustal structures and a distribution of the reflectors. Japan Agency for Marine-Earth Science and Technology has been investigated the seismic structures in the Izu-Ogasawara-Mariana arc since 2003. In this presentation, we summarize these results and discuss crustal change by the crustal evolution and the backarc opening.