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Multi-disciplinary research on an old oceanic plate and petit-spot

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Petit-spot is a crap of young (< 10 Ma) small volcanoes recently discovered in the northwestern Pacific Plate with Early Cretaceous age (~130) [e.g., Hirano et al., 2006].
According to Hirano et al. (2006), they erupted strong to moderate alkaline basalt. The rock samples commonly show high vesicularity in spite of the deep-water eruptions (~6000m). They generally include some deep-seated xenoliths or xenocrysts [Hirano et al., 2004; Abe et al., 2006]. Noble gas isotopic data suggest the source mantle of alkali basalts is similar to that of MORB rather than that of OIB. These rocks origin is inferred to the boundary area of the lithosphere/ asthenosphere about 90 km below the seafloor [Hirano et al., 2006]. This particular volcanism classified as a kind of intra-oceanic plate eruptions, however, there are neither hotspots nor large igneous provinces. Therefore, the volcanic activity is not adequate for any existence volcanic models on the earth.
In order to investigate this peculiar phenomenon, we are conducting a multidisciplinary research on a lot of different area of expertise. We have taken place 6 main researches cruises (YK05-06, KR05-10, KR07-06, KR07-07, YK07-15, YK08-09) and several related cruises (KR06-03, MR06-05, MR08-06) for the field survey. In addition to the surveys, we are conducting shore-based researches, such as petrology and geochemistry. There are two main purposes on the research for the first-stage; 1) to understand mechanism of the petit-spot volcanism, 2) to clarify the source of petit-spot magma (Baba et al., 2007; KR07-06 cruise report). Now, we expanded the research target to the investigation of the oceanic plate itself. We also try to estimate the influences of the petit-spot volcanism on the oceanic plate and the earth evolutions.
The size of the volcanoes is too small to discover without swath bathymetric survey using research vessels. Multi-narrow beam bathymetric survey with surface ship gravity meter and magnetometer observations has been always taken place in order to find other petit-spot knolls during the cruises. Hirano et al. [2008] pointed out such petit-spot like intra-plate volcanism may be ubiquitous in the areas of front sides of trench outer-rises, thus widely spread throughout old-age oceanic plates. Heat flow measurement and sediment sampling by piston corer was already taking placed during KR04-08.

Keywords: petit-spot, oceanic plate, ocean bottom science, alkaline basalt, heat flow, upper mantle structure