Prolonged vs. Failed Subduction Zone

S. UMINO[1], K. KITAMURA[1], K. KANAYAMA[1], Y. KUSANO[1], K. NAGAISHI[2], T. ISHIKAWA[3] AND O. ISHIZUKA[4]

[1]Kanazawa University, Kanazawa , Ishikawa 920-1192, Japan (*Umino: sesumin@staff.kanazawa-u.ac.jp)
[2]Marine Works Japan, Nangoku, Kochi 783-8502, Japan
[3]JAMSTEC, Nangoku, Kochi 783-8502, Japan
[4]Geological Survey of Japan, Tsukuba, Ibaraki 305-8567, Japan

Both the Izu-Ogasawara (Bonin)-Mariana (IBM) Arc and the Oman Ophiolite preserve the entire geological records of intra-oceanic subduction initiation and arc evolution. Specifically primitive boninite sequences provide the evolutionary history of thermochemical structure of the wedge mantle. We present the characteristics and genetic conditions of primary boninitic magmas determined by melt inclusions in Cr spinel, based on which we will discuss the divergent fate of the long-standing IBM Arc and the failed subduction zone in the Oman Ophiolite.

Melt inclusions comprise homogeneous glass with boninitic compositions with high SiO_2 of 53-63 wt% and higher MgO of 16-23 wt% than the bulk composition of boninite. Combination of olivine-liquid and olivine-orthopyroxene-liquid geothermo-barometers [1] has demonstrated that most primitive magmas for high-Si boninite with 3 wt% H_2O from IBM were generated at a much higher temperature and pressure of 0.8-0.9 GPa and 1480°C than the primary low-Si boninite magma with 2 wt% H2O from Oman formed at 0.4-0.6 GPa and 1350°C.

In the proto IBM arc, descent of the old and dense Pacific Plate caused intense upwelling of hot, depleted asthenosphere from deep mantle, which was melted to produce high-Si boninite magma with introduction of fluid and partial melt of the subducted slab [2]. In Oman, shallow subduction of young and buoyant lithosphere into the hot subaxial asthenosphere caused flux melting of the slightly depleted residue after MORB extraction to produce arc tholeiitic and low-Si boninitic magmas with addition of fluids liberated from the subducted slab now preserved as the high-grade metamorphic soles beneath the ophiolite sheets.

[1] Putirka (2008) *Reviews in Mineralogy*, **69** [2] Kanayama, K. *et al* (2012) *Island Arc*, **21**, 288 – 316 [3] Kusano, Y. *et al* (2014) Special Publication, *Geological Society of London*, **392**, 177-193 [4] Ishikawa *et al* (2002) *EPSL*, doi: 10.1016/j.epsl.2005.09.049