Highly siderophile element mobility during oceanic LIP emplacements: implications from subaerial and submarine basalts on Shatsky Rise

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Causal mechanisms and ultimate trigger for the global environmental catastrophes are long-standing matter of debates. Since the discovery of global Ir anomaly in Cretaceous-Tertiary boundary layer, highly siderophile elements (HSEs) in sedimentary sequences have been recongnized as useful tracers for identifying extraterrestrial impacts. However, a question remains as to whether enormaous supply of HSEs is also caused by massive volcanism leading to the formation of large igneous provinces (LIPs). This idea has been revived by the studies of Cenozoic-Mesozoic marine Os isotope record that exhibits frequent negative excurions over the time intervals of LIP eruptions. It seems likely that continental flood basalt eruptions exert a significant influence on the continental flux of the Os to the ocean, due to the combined effects of coverage of the continents and weathering of basaltic lavas [1]. By contrast, decline in seawater $^{187}Os/^{188}Os$ accompanying oceanic plateau formations imply direct release of HSEs from erupted lavas to the ocean [2, 3].

In this contribution, we have determined the HSE concentrations and $^{187}Os/^{188}Os$ ratios of oceanic LIP basalts recovered from Hole U1349A on summit site of Ori massif of the Shatsky Rise, northwest Pacific Ocean. The drillcore provides an ideal opportunity to evaluate the HSE mobility due to volcanic degassing and/or contrasting alteration styles because the 85-m-thick basement section at this site is separated into subaerial and submarine portions comprised of a single magma type (high-MgO tholeiite) with narrow compositional range [4]. The results demonstrate that Os-Ir-Ru-Pt concentrations and initial $^{187}Os/^{188}Os$ ratios are relatively uniform thoroughout the section, whereas measured Pd and Re contents from subaerial portion are substantially lower than those in less altered basalts from deeper submarine portion. Such systematic variations suggest that Pd and Re can be lost during magmatic degassing and/or post-magmatic alteration, but other HSEs such as Os-Ir-Ru-Pt appear to behave as immobile elements. Present study may therefore lend no support for the significant release of Os during oceanic LIP emplacements. Thus, degassing/alteration in more extreme conditions or different processes need to be sought to explain the marine Os isotope record.

[1] Ravizza & Peucker-Ehrenbrink (2003) *Science* **13,** 1392-1395 [2] Turgeon & Creaser (2008) *Nature* **454,** 323-U329 [3] Tejada *et al* (2009) *Geology* **37**, 855-858 [4] Sano *et al* (2012) *G3* **13**, Q08010