# Lithium isotope systematics of forearc mud volcano fluids

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Submarine mud volcanoes (MVs), which are common geological features at plate convergent boundaries, have been recognized as windows onto great depths that are otherwise inaccessible to sampling. Thus, by studying MV fluids, we may be able to infer their origins and sediment–water interactions at considerable depths in forearc region.

Admixture with seawater makes it difficult to draw precise conclusions regarding the origins of MV fluids. Lithium (Li), however, is relatively unaffected by seawater contamination because the Li contents of fluids from MVs in sedimenrary basin are much greater than the seawater content.

It was reported that the low $^{7}Li/^{6}Li$ ratios were observed in the Kumano MV fluids in the Nankai forearc basin [1]. Based on the Li isotopic geothermometer results, Nishio *et al*. [1] argued the Li reservoir temperatures (310 °C at maximum) were significantly higher than the smectite-to-illite conversion temperature (60–150 °C). Nishio *et al*. [1] further inferred that the discontinuous mud diapirism in the Kumano forearc basin results from the periodic injection of deep-seated fluid accumulated in the corner of the serpentinized forearc mantle wedge that travels upward via a thrust fault.

It is expected that the serpentinite MV samples in non-accretionary forearcs provide us information about the serpentinized forearc mantle. Thus, to identify the Li isotpic signatures of mantle wedge, we analyzed chemical compositions (including Li isotpe ratios) of fluids from the South Chamoro Seamount, the Mariana forearc serpentite MV. The results show that the $^{7}Li/^{6}Li$ ratios of the Mariana forearc serpentinite MV was extremely higher than those of the Nankai forearc MVs. It can be explained that the high $^{7}Li/^{6}Li$ ratios were increased by the progressive removal of Li from the upwelling fluids into serpentine near the surface [2]. Accordingly, the $\delta^{7}Li$ value of the hydrated mantle wedge can be approximated as +5‰ to +6‰, which is significantly higher than the upper mantle value +3‰ [1].

[1] Nishio et al. (2015) *EPSL* **414**, 144-155. [2] Benton et al. (2001) *EPSL* **187**, 273-283.