



## **Fluid migration in the Nankai Trough Kumano forearc basin**

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Noble gas abundance and isotope data from drilling mud gas samples obtained during IODP Expedition 338 between October 2012 and January 2013 and Expedition 348 between September 2013 and January 2014 provide new insights on fluid origin and fluid migration in the southern rim of the Kumano forearc basin offshore SE Japan. The samples derive from three adjoining boreholes (C0002F, C0002N and C0002P) and depths between 950 and 3050 meter below sea floor (mbsf) and are composed of air and variable contributions of mantle-derived fluids and crustal fluids.

The air-corrected  $^3\text{He}/^4\text{He}$  ratios of samples from Exp. 338 are highly variable. Samples from 1400 mbsf and 1800 mbsf are strongly dominated by crustal helium, while the air-free helium isotope composition of gas from 950 mbsf is the highest observed in our study and in good agreement with the estimated helium isotope value of the subducting Phillipine Sea Plate (PSP) in southwest Japan (3.4 Ra). In contrast, samples collected during Exp. 348 in the depth interval 1700-3050 mbsf show only binary mixing between air and a mantle-derived component with a  $^3\text{He}/^4\text{He}$  ratio of  $\sim 2.4$  Ra and no significant depth variation.

The data from Exp 338 indicate channelized and active fluid flow through permeable strata from the subducting PSP (950 mbsf), while active fluid flow from another source enriched in crustal helium accounts for the helium isotopic composition in 1400 mbsf and 1800 mbsf. We interpret the results from Exp 338 as a short-term episodic fluid flow event, maybe caused by reactivation of buried trust faults. Elevated  $^{222}\text{Rn}$  activities observed during Exp 338 were not found during drilling one year later (Exp 348), which suggest for Exp 348 pervasive migration of fluids through pore space along mineral grain boundaries with only little input of in-situ produced crustal helium.