Huge underestimation for the implication of hydrothermal gas species on ocean and atmosphere

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Abstract

As important chemical compositions of hydrothermal fluids, hydrothermal gas species, such as CO_2, CH_4, H_2S and H_2, provide critical carbon and energy sources for the hydrothermal ecosystem. Meanwhile, a large amount of gas species derived from hydrothermal activities is released to the ocean every year, which not only strongly affects the chemical parameters of ambient seawater, but enhances the greenhouse effect and global climate change.

Directly and accurately measurement the gaseous concentrations of high-temperature hydrothermal vents was not previously possible. *In situ* Raman detection technology has overcome this challenge efficiently. Since 2015, *in situ* Raman detection to high temperature hydrothermal fluids has been carried out by Raman insertion probe (RiP) system during the Kexue cruise[1]. Lots of *in situ* Raman spectra of CO_2, CH_4, H_2 and H_2S were acquired at Okinawa Trough and Manus basin hydrothermal fields.

Compared with those derived from previous studies, concentrations of CO_2, CH_4, H_2S and H_2 measured by *in situ* Raman detection are about three to five times higher than those based on traditional sampling analyses methods. Therefore, based on the obvious differences of concentration, the contributions of hydrothermal gaseous species to the hydrothermal ecosystem, ocean and atmosphere have likely been dramatically undervalued.

[1] X. Zhang, et al.(2017). , Deep Sea Res., Part I **123**, 1-12.