Gas geochemistry of hydrothermal fluid from SEPR7-32 degree S

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Because Southern East Pacific Rise (SEPR) is known as the superfast spreading ridge, geochemical flux of volatile species to the ocean through the hydrothermal systems in this region should have great impact. To provide key information to discuss this influence, we studied chemical and isotopic compositions of CO_2, CH_4, H_2 and He dissolved in the hydrothermal fluids collected from 7.4S, 11.3S, 13.6S, 14.0S, 17.4S, 18.4S, 21.6S, 31.2S and 31.8S along the SEPR, during AT3-30 cruise conducted in 1998-1999.

Along the SEPR from 7.4S to 31.8S, we found two significant anomalies in $CO_2/^4He$ ratio of the hydrothermal fluids. One is detected around 31.2S and 31.8S, which would be related with influence by Juan Fernandez hot spot activity, as discussed in Resing et al. (2004). The other anomaly in $CO_2/^4He$ ratio was not so much drastic but was found in rather in awide region from 17.4 to 21.6S. As Kurt et al. (2005) demonstrated based on noble gas isotope sytematics, mantle heterogeneity caused by contribution from the lower mantle in this region well explain the observed anomalies, because the lower mantle is enriched in CO_2 compared with the upper mantle. Since this heterogeneity is considered as related with superfast spreading activity of SEPR, our data indicates that enrichment in CO_2 in the hydrothermal fluids is a typical characteristics of hydrothermal systems in such a tectonic setting, which in turn implies that CO_2 flux from the earth interior to the ocean could be proportional to the spreading activity.

On the other hand, $CH_4/^4He$ and $H_2/^4He$ ratios are likely to be related with the venting temperature. As these species are minor species and sensitive for geochemical environment. As Seewald et al. (2003) discussed, concentration of these species would be controlled by hydrothermal water-rock interaction, or by geochemical conditions just beneath the seafloor.