Geochemical characteristics of major ions and trace metals in the porewater and marine sediment and its potential effect on the marine environment: First series oil seep survives in the Brazilian margin by the human-occupied vehicle Shinkai 6500

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Cold seep, since it was first discovered in the Gulf of Mexico by Dr.Charles Paull 1983, has been widely recognized that its importance on the marine environment, which can support deep-sea chemosynthetic communities (Gage and Tyler, 1992; Van Dover, 2000), play role of source or sink of chemical matters to the ocean (G. Bayon, 2011; Nolwenn Lemaitre, 2014), and is often associated with the presence of oil and gas in sub-surface reservoirs (Levin, 2005). However, the research on the existence of cold seeps in the Brazilian margin is still uncompleted, where it has large proven oil and gas reserves. And this situation was unchanged until the May of 2013. An investigation named *Iatá-piúna* cruise, which was belong to one part of project of QUELLE2013 (an around-the-world voyage by the SHINKAI 6500), was conducted on the Brazilian margin. It was the world's first manned research submersible to enter these waters, aiming to detect the cold seeps and understand the seep ecosystems. And it led to the world's third discovery of natural oil seep on the seafloor of North Sao Paulo Plateau.

This research is trying to describe the geochemical characteristics of cold seep by multiple chemical tracers in porewater and marine sediments, and evaluate the potential effect on the marine environment.

Sediment samples were collected by human-occupied vehicle *Shinkai 6500*. And porewater was squeezed from sediments. The major chemical components and nutrients in pore water were measured. And traditional Tessier method was used to extract rare earth elements and trace metals from sediments. Samples were analyzed by ICP-MS (HP 4500, RSD<3%).

The results showed that among the three sampling sites(*1343, 1345H1, 1346H2*), the concentration of major chemical components have little changes with depth, no evidence shows the existence of methane and active oil seeps, except for the site *1345H1, where* silicate in the porewater obviously increases with the depth. There is possibility that it is influenced by geothermal gradient since the solubility of silicate can be controlled by temperature (Fournier and Potter,

1982). The distribution of silicate and ammonium in porewater suggests it may diffuse to bottom water. However, phosphate has opposite distribution type with silicate and ammonium. Manganese, Fe and REEs in the exchangeable and carbonate fraction of sediment shows the relative high concentration in the surface sediments, and increase with depth, indicating it may play the role of sources to the water column. Future research should also focus on the major ions and trace metals in the water column, finding the relationship between the marine sediment and bottom seawater.