Distribution and chemical composition of gas seepage on the Boso Peninsula, Chiba

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The Boso Peninsula, south to east Chiba, is the largest field of natural gas dissolved in formation water in Japan with methane concentration of >99%. The gas seepage related to the subsurface gas accumulation have often been observed on land of the central part of Kujukuri plain to Otaki area and have been used as fuel by local residents, methane has been continuously released from the underground to atmosphere in this area. However, the detailed distribution, seep rate/volume etc. are not well known, in addition, the potential effect on the global warming or carbon cycle model has not been discussed. In this research, we mapped the seep location together with geological setting and collected gas samples to reveal the source, migration, and seep process of these gas by analyzing chemical and isotope composition. The gas seepage is usually located near the boundary between low permeable alluvial mudstone and sandy formations of the Kazusa Group, and is likely constricted by the change of permeability. The seep gas is composed of >75% methane and trace amounts of carbon dioxide, ethane, nitrogen derived from the atmosphere, methane is microbially produced in anaerobic environment. The $\delta^{13}C$ value of methane is stable at around -70‰, indicating methane is generated mainly by carbon dioxide reduction and by acetate fermentation with some contribution of methane oxidation near the surface. These gases are mainly derived from deep gas dissolved in formation water and delivered through the permeable layers near the formation boundary to the surface.

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