

Atmospheric gas concentration anomalies in the ocean: A preliminary report from a shallow gas hydrate exploration project

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We could often notice the gas plumes rising from a seafloor water column at gas hydrate fields. Active gas vents at the seafloor have previously been reported by some researchers. Methane (CH₄) is a major constituent of seep gases. Methane is an important short-lived climate pollutant. It is reported that oil spill at sea bottom and offshore oil/gas platforms affect atmospheric CH₄ concentration. Likewise gas seeps may contribute to atmospheric gas concentration above the sea surface. Our objectives were to investigate the distribution of atmospheric CH₄ distribution over the sea surface of gas hydrate areas by continuous measurement on a research vessel.

We took advantage of topographical survey (7K14, 7K15) for grasping the resources of shallow gas hydrate and for continuously measuring CH₄ concentration. We used the R/V Kaiyo-Maru No.7 (Kaiyo Engineering Co., Ltd., Japan) from April to June 2014 and from May to July 2015. Continuous measurement of atmospheric CH₄ was performed on the ship using a wave-length-scanned cavity ring-down spectrometer (WS-CRDS) (model G2201-i, Picarro Inc., USA). Air sample was collected from an air inlet installed at the compass deck (approximately 8 m above the sea level) of the ship using an air pump placed in an observation room. The ship sailed at approximately 6 knot during the survey periods. Ship's location data were obtained with a nautical GPS.

There were 2 types of sea areas: (1) areas with gas plumes observed, and (2) areas with no gas plumes observed. Additionally, gas plumes were unevenly distributed in the gas plume area. In some of gas plume areas, the anomalies of CH₄ concentration were coincidentally observed around above gas plumes. Atmospheric gas concentration affected by sea water temperature, water depth, and scale of gas plume varied every different sea areas.

This study was conducted as a part of the shallow methane hydrate exploration project of METI.

Keywords: gas hydrate, Methane gas, gas plume