



Daily Variations of Methane Flux from Submarine Mud Volcanoes in Southwest Taiwan

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Submarine mud volcanoes are features that episodically emit gases, fluids, and mud onto the seafloor. Methane is the representative gas transport by mud volcanoes efficiently from deep buried sediment to the water column, and potentially to the atmosphere as a greenhouse gas. An active mud volcano, site-G96, located at the upper slope of southwest Taiwan, has plume from the top of mud volcano (360 m) direct to the sea surface. We can observe the bubbles at the sea surface.

This study was conducted during cruise OR3-1693 in June 2013. To understand the activity of gas emissions of mud volcano, we utilized the 38kHz echo sounder to scan back and forth over the site-G96 and obtained 53 acoustic images of plumes. Five water column samples were collected above the venting of G96 at the tidal maximum and minimum. Three gravity cores were taken at the mudflow site of G96.

The results show high concentration of methane (38,522 $\mu\text{l/l}$) and shallow depth of sulfate methane transition zone ($\sim 70\text{cm}$) in the cored sediment profiles. The $\text{C}_1/(\text{C}_2+\text{C}_3)$ ratios from cored sediments are in the range of 29-392, indicating that the methane gas is mostly thermogenic in origin. Calculated areas of the plumes from echo sounder images show good correlation with the tide variations during the survey on 1st -2nd June 2013. Flux of methane from the water column to atmosphere can be estimated by diffusive exchange equation, showing that gas emission from an active mud volcano could be largely various (0.065, 3.426, 3.414, 0, 41.739 $\mu\text{mol m}^{-2} \text{d}^{-1}$) from time to time, at least, in this study.