

## 「みらい」MR12-E03航海における大気中CH<sub>4</sub>、CO<sub>2</sub>、CO濃度の船上観測 Shipboard measurements of atmospheric CH<sub>4</sub>, CO<sub>2</sub> and CO mixing ratios during the MR12-E03 cruise of the R/V Mirai

遠嶋 康徳<sup>1\*</sup>, 笹野大輔<sup>2</sup>, 石戸谷重之<sup>3</sup>, 勝又啓一<sup>1</sup>, 松下隼士<sup>1</sup>, 石島 健太郎<sup>4</sup>, Patra Prabir<sup>4</sup>

Yasunori Tohjima<sup>1\*</sup>, SASANO, Daisuke<sup>2</sup>, ISHIDOYA, Shigeyuki<sup>3</sup>, KATSUMATA, Keiichi<sup>1</sup>, MATSUSHITA, Junji<sup>1</sup>, Kentaro Ishijima<sup>4</sup>, Prabir Patra<sup>4</sup>

<sup>1</sup> 国立環境研究所, <sup>2</sup> 気象研究所, <sup>3</sup> 産業技術総合研究所, <sup>4</sup> 海洋研究開発機構

<sup>1</sup>National Institute for Environmental Studies, <sup>2</sup>Meteorological Research Institute, <sup>3</sup>National Institute of Advanced Industrial Science and Technology, <sup>4</sup>Japan Agency for Marine-Earth Science and Technology

In order to investigate the potential sources of methane (CH<sub>4</sub>) in the Arctic region, continuous measurements of the atmospheric CH<sub>4</sub> were carried out during a R/V Mirai Arctic Ocean cruise from September 3 to October 17, 2012. A cavity ring-down spectroscopy (CRDS) analyzer was used for the shipboard measurements of the atmospheric CH<sub>4</sub>, carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO). The analytical precisions evaluated from the measurements of the standard gases at a 24-hour interval during the cruise were 0.02 ppm, 0.3 ppb, and 0.9 ppb for the 5-min averages of CO<sub>2</sub>, CH<sub>4</sub>, and CO mixing ratios, respectively. When the wind blew from the relative direction of 200 +/- 20 degrees (rear left of the vessel), the contamination caused by its own exhaust fumes affected the CO<sub>2</sub> and CO mixing ratios with a tight correlation ( $\Delta_{CO}/\Delta_{CO_2}=3.8$  ppb/ppm), while there was no significant influence from the exhaust fumes on the CH<sub>4</sub> mixing ratio. Such pollution events are easily distinguishable by the characteristics of the relative wind direction, the tight correlation of CO vs. CO<sub>2</sub>, and large short-term (~a few second) variability. The observed CH<sub>4</sub> mixing ratios showed larger variations with elevated peaks of several tens ppb in the Bering Strait, Chukchi Sea, and Arctic Ocean (65-75°N, 155-175°W) in comparison with in the western North Pacific. The largest CH<sub>4</sub> peaks of about 50 ppb were observed off the northern Alaskan coast. Since these CH<sub>4</sub> peaks were associated with similar CO<sub>2</sub> peaks but not with CO peaks, it is unlikely that the combustion processes or ocean were the sources of the elevated CH<sub>4</sub>. The backward trajectory analysis suggests that the North Slope of Alaska is the most probable CH<sub>4</sub> source region. The simulated CH<sub>4</sub> variations based on an atmospheric transport model and given flux maps well capture the observed CH<sub>4</sub> variations, also suggesting that the most of elevated CH<sub>4</sub> were derived from the land sources.

キーワード: 大気メタン, 北極海, キャビティーリングダウン分光計, 船上観測

Keywords: atmospheric CH<sub>4</sub>, the Arctic Ocean, cavity ring down spectroscopy analyzer (CRDS), shipboard measurements