

MODEST EMISSION OF THE CH₄ FROM THE WESTERN ARCTIC OCEAN

Tae Siek Rhee

Tae Siek Rhee^{1}, Young Shin Kwon^{1,2}, Mi-Seon Kim^{1,3}, Scott R. Dallimore⁴,
Charles K. Paul⁵, and Young Keun Jin¹*

¹*Korea Polar Research Institute, Incheon, Korea*

²*Department of Polar Sciences, University of Science and Technology, Daejeon, Korea*

³*Department of Ocean Environmental Sciences, Chungnam National University,
Daejeon, Korea*

⁴*Geological Survey of Canada, Sidney, Canada*

⁵*Monterey Bay Aquarium Research Institute, Moss Landing, California, U.S.A.*

**rhee@kopri.re.kr*

ABSTRACT

Korea Polar Research Institute (KOPRI) is interested to study environmental conditions in the Arctic and, in particular, to understand the potential release of the key greenhouse gas, methane (CH₄), from the sea bed, to the water column and potentially to the atmosphere. We have measured CH₄ concentrations in the surface ocean and its overlying air to estimate the emissions from the western arctic seas including the Chukchi Sea, the Beaufort Sea, and the East Siberian Sea. A series of campaigns have been conducted on the KOPRI icebreaker R/V Araon in the summer season during 2013 – 2018. We divided the Arctic Ocean into the outer continental shelf of the East Siberian Sea, the Chukchi Sea, and the Beaufort Sea and the deep basin of the Arctic Ocean. The surface ocean was found to be supersaturated nearly everywhere with respect to the CH₄ in the overlying air. Nonetheless, we have insufficient regional coverage to assess the trend of saturation anomaly in each sea. Of interest, however, the values in 2016 were found to be larger in every sea. Flux densities of outgassing CH₄ were 0.1 mg m² d⁻¹ in the East Siberian Sea, 0.04 mg m² d⁻¹ for the Chukchi Sea, 0.02 mg m² d⁻¹ for the Beaufort Sea, and 0.04 mg m² d⁻¹ for the deep basin of the Arctic Ocean. These values are modestly larger than the global mean value of the continental shelf except for the Beaufort Sea where the CH₄ emission is significantly lower. Our estimate of CH₄ emission in the East Siberian Sea abides by the previous observations, but its magnitude is far lower due likely to the distance from the hot spot area. Our intent in the future is to extend our studies to consider methane flux in the shallow nearshore environments where permafrost is possibly rapidly degrading in response to ongoing marine transgression.