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Continuous high-resolution measurements of dissolved CH_4, CO_2 and δ^{13}C-CO_2 in surface water during the SWERUS-C3 expedition in the East Siberian Arctic Ocean

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The carbon budget in the Arctic is still unknown. Especially the fate of CH_4 from subsea permafrost on the East Siberian Arctic Shelf (ESAS) is unclear. In July-September 2014 the joined SWERUS-C3 expedition on board the Swedish icebreaker ODEN was undertaken. Among its goals was to get a better insight into the fate of carbon in the Arctic, to document possible CH_4 release from subsea permafrost and deep sea and to understand mechanisms and magnitudes of CH_4 release to the atmosphere.

During the first leg of the expedition the in situ concentration of dissolved CH_4, CO_2 as well as the δ^{13}C signature of CO_2 were determined. Measurements were made continuously with a Water Equilibration Gas Analyzer System (WEGAS) that was specifically developed at Stockholm University for the determination of gases dissolved in water. The aim of this study was to quantify the concentration of dissolved CO_2 and CH_4 in the surface water of the East Siberian Arctic Ocean (ESAO) as well as the contribution of terrestrial organic matter respiration to the dissolved inorganic carbon (DIC).

Combined with continuous high-precision atmospheric measurements that were performed during the SWERUS-C3 expedition, the WEGAS dataset will allow to calculate accurate high-resolution CH_4 fluxes and thus give a better insight into the current outgassing of CH_4 to the atmosphere.

Together with measurements of δ^{13}C of inorganic carbon that was sampled during the expedition, the isotopic composition of the dissolved organic carbon pool will allow to quantify the of terrestrial carbon contribution to total respiration in the ESAO.