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Eddy-Covariance methane flux studies in the Russian Arctic Seas

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The East Siberian Arctic Shelf (ESAS) is a unique area of the World Ocean. First, being the largest and shallowest shelf area of the World Ocean with a mean depth of 48 m (Laptev), 58 m (East-Siberian), and 80 m (Chukchi) and corresponding areas of 498×10^3 km^2, 987×10^3 km^2, and 620×10^3 km^2, respectively, the ESAS represents about 47% of the whole area of the Arctic shelves which is about 50% of the total area of the Arctic Ocean. Second, it is shallow, representing a *short conduit* for seabed CH_4 to the atmosphere. Data from more than 5000 water samples collected between 2003-2009 showed the ESAS as a strong CH_4 source into the atmosphere (Shakhova et al 2009, 2007). It is also proved by the helicopter survey (Salyuk et al., 2009). Here we present some results of eddy-covariance (EC) CH_4 flux study performed in 2007 and 2008. The measurements were done using a flux package that consists of: high-resolution fast methane analyzer (DLT-100; response time: $<$0.05 seconds; accuracy: better than 1% of reading; concentration range: 10 ppb – 25 ppmv; www.lgrinc.com) at 20 Hz and two sonic anemometers: Y81000 (Young Inc.) and WindMasterPro (Gill Inc.) measuring the 3D wind vector and sonic temperature; Li-Cor 1400 meteorological station measuring the wind speed and direction, moisture and temperature; Li-Cor 7500 open path infrared gas analyzer, measuring H_2O and CO_2; motion package (NAV440 Crossbow), measuring all 6-components of ship motion, 3-components of acceleration, magnetic field, and position. All the data were resampled to 10 Hz and synchronized for ship motion correction and EC flux calculations. The capability of the flux package to quantify main air-sea greenhouse gas fluxes CO_2 and H_2O in the Arctic Ocean has been demonstrated (Pipko et al., 2008; Semiletov et al., 2007). The EC data show that a major ESAS area roughly limited by 100-200 m isobaths is the methane source to the atmosphere. Typically, the EC flux averaged over 30 min intervals was ranged from 50 to 250 ng /(m^2 sec). Higher flux values are associated with the hot spots. Peculiarities and limitations of the EC flux estimations from moving vessel are discussed. This study is supported by the Russian Foundation for Basic Research, NOAA, and FEBRAS.

References.

Pipko, I.I., I.A. Repina, A.N. Salyuk, I.P. Semiletov, and S.P. Pugach (2008), Comparison of Calculated and Measured CO2 Fluxes between the Ocean and Atmosphere in the Southwestern Part of the East Siberia Sea, *Transactions (Doklady) Earth Sciences*, 422, N7, 1105–1109 (translated in English by Springer).

Salyuk A., Semiletov I., Nesterov V., and N. Shakhova. (2009) Helicopter survey of methane and carbon dioxide sources on the Laptev Sea shelf near the Lena River Delta. Geophysical Research Abstracts, Vol. 11, EGU2009-8184, 2009, EGU General Assembly 2009.

Semiletov, I., I.I. Pipko, I.A. Repina, and N. Shakhova, 2007, Carbonate dynamics and carbon dioxide fluxes across the atmosphere-ice-water interfaces in the Arctic Ocean Pacific sector of the Arctic, *Journal of Marine Systems*, 66 (1-4), 204-226.

Shakhova, N., I. Semiletov, A. Salyuk, N. Belcheva, and D. Kosmach (2007). Anomalies of methane in air above the sea surface in the East-Siberian Arctic shelf, *Transactions of Russian Academy of Sciences*, 414 (6), pp.1344-1351(translated in English by Springer).

Shakhova, N**.,** Semiletov I., Leifer I., Salyuk A., Rekant, and Kosmach D. (2009) Geochemical and Geophysical Evidence of Methane Release over the East Siberian Arctic Shelf, J. Geophys. Res., submitted.