OBJECTIVE
ESTIMATE NET ECOSYSTEM CARBON BALANCE OF THE POLYGONAL TUNDRA USING LATERAL CARBON EXPORT AND VERTICAL CARBON FLUX MEASUREMENTS OVER ONE GROWING SEASON

RESULTS

Here, the cumulative fluxes of all net ecosystem carbon balance (NECB) components between June 8th and September 8th are summarized. During these three months, the NECB accumulated -17.5 ± 1.2 g C m⁻². The vertical fluxes of FDOC and FCO₂ and the lateral fluxes of FDOC and FCO₂ contributed with -19.0 ± 1.2, 11 ± 0.2, 0.1 ± 0.01 and 0.4 ± 0.02 g C m⁻², respectively, to the NECB.

DISCUSSION
Our results show up to 11 times higher DIC concentration compared to DOC concentration in the polygonal tundra discharge water. This is in contrast to other studies reporting a CDOC/CDIC ratio of smaller than 1 from an Alaskan permafrost-affected watershed (Kling et al. 2000) and a ratio of 0.24 - 1.30 in Canadian boreal biomes (Hutchins et al. 2019). However, at the northern outlet of Samoylov Island, CDOC of 40.3 - 43.2 mg L⁻¹ and CDIC of 2.6 - 6.5 mg L⁻¹ were observed in September 2008, leading to a CDOC/CDIC ratio of close to 10 (Abnizova et al. 2012). Therefore, we are confident that our results of CDOC and CDIC are reliable.

The results of the NECB indicate that the vertical CO₂ uptake dominates the carbon balance during the growing season, even after the inclusion of lateral C export rate. However, the inclusion of this lateral carbon export leads to a decrease of 3% in the seasonal ecosystem carbon balance.

VERTICAL CO₂ FLUX DOMINATES THE NECB

However, lateral C flux decreases C uptake by 3% during growing season.

Please note: a comparison of DOC export rates from catchment A and B will be provided in the upcoming paper.

STUDY SITE
The study site lays within the Lena River Delta, northern Russia, and is characterized by polygonal tundra. Water runoff and carbon (C) content measurements were conducted at three weirs, and the vertical C flux was observed at an eddy covariance tower.

METHODS
LATERAL CARBON EXPORT

We observed the continuous water runoff rate at three weirs during the growing season of 2014. From frequent measurements of the concentration of dissolved organic carbon (COD) and dissolved inorganic carbon (CDOC), calculated from dissolved CO₂ (DIC), we could estimate the lateral C export rate.

VERTICAL CARBON FLUX

Vertical C fluxes of CO₂ and CH₄ were observed at the eddy covariance tower located within the catchment A.

BIBLIOGRAPHY


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