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Spatio-temporal change of methane emission from reservoir

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Authors present their investigation of spatial and temporal changes of methane emission from the surface of the Mozhaisk reservoir, situated 120 km to the west from Moscow, Russia. Seasonal changes in the content and specific flow of methane were revealed for different morphological areas of the reservoir based on the data of field observations in 2015-2018. In the low-flow Mozhaisk reservoir, the methane content in the surface and bottom layers of the deep-water areas at the end of the summer stratification period may differ by three orders of magnitude. According to the results of flux measuring by «floating chambers» in the entral area of the reservoir from the beginning of June to the end of the period of direct stratification (August-September) methane flux increased from less than 1 to 16 mg 4-C/(m**2 hour). The simultaneous measurements with “floating chambers” of 2 types (simple – for taking samples of the integral flux, and with a shield, rejecting bubbles – for samples of diffusion flux) revealed typical values of these flux components and their change during the sampling period. In the beginning of stratification diffusive flux predominates with mean values 0,2 mg4-/(m2 hour) and forms 100% of the total flux while methane concentration near bottom is low. The increase of the total methane flux is associated with an increase of the bubble component: its ratio grows from 75% to 98.7%. Integral methane flux rapid increase is observed when the upper edge of bottom anoxic zone reaches the lower edge of epilimnion. The diffusion flux of methane according to the calculation data reaches the highest values at the end of summer in the shallow riverhead of the reservoir. According to estimation of total methane emission from the surface of water it is 0.26-0.46 10**3 g 4-C in years with different weather and stratification conditions. Comparison of field measurements with literature data showed that the scale of emission from reservoirs with slow water exchange in the temperate zone can be underestimated in the evaluation of global methane emission. Supported by RGS 17-05-41095.