

## Emission of Greenhouse Gases (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) from Coastal Lakes of the Polish Baltic Coast

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**H**ypertrophic conditions in coastal lakes (CL) of southern Baltic result in intense productivity of phytoplankton and lead to enhanced sedimentation of labile organic matter (LOM). Microbial degradation of the LOM releases greenhouse gases which are transferred to the atmosphere via molecular diffusion and ebullition. Between 2014 and 2015 seven CLs along the Polish Baltic coast were subject to complex biogeochemical monitoring aiming at estimating annual emission of CH<sub>4</sub>, CO<sub>2</sub> and N<sub>2</sub>O.

It has been established that:

CL acts as net sources of CH<sub>4</sub> and N<sub>2</sub>O. The estimated CH<sub>4</sub> flux is  $16.27 \pm 26.56 \text{ mgC} \cdot \text{m}^{-2} \cdot \text{d}^{-1}$  and N<sub>2</sub>O flux is  $0.76 \pm 0.54 \text{ mgN}_2\text{O} \cdot \text{m}^{-2} \cdot \text{d}^{-1}$ . During summer CL are autotrophic i.e. absorb CO<sub>2</sub> from the ambient air and the CO<sub>2</sub> flux is  $-640.4 \pm 222.2 \text{ mgC} \cdot \text{m}^{-2} \cdot \text{d}^{-1}$ . In winter CL change to heterotrophic and CO<sub>2</sub> flux is  $14078.4 \pm 7626.7 \text{ mgC} \cdot \text{m}^{-2} \cdot \text{d}^{-1}$ .

In CL methane is predominantly formed via acetate fermentation.

Biogeochemical processes in CL are to a large degree controlled by wind-induced sediment mixing and the depth of methanogenic zone (MZ) is dependent on hydrodynamic conditions. In non-disturbed sediments MZ occurs c.a. 10 cm below the bottom and diffusion of CH<sub>4</sub> to the water column occurs throughout the whole year. In deeply mixed sediments the depth of MZ is higher and diffusion of CH<sub>4</sub> to lake water is reduced.

Microbial gases are transported from the sediment to the atmosphere via ebullition; however, enhanced turbulence and oxygenation lead to dissolution of gas bubbles in lake water column.

Gas exchange in CL is affected by macrophytes via bioventilation.

### Biography:

Dr. Michał Woszczyk holds a PhD in geology (earned in 2005) and habilitation in geography (earned in 2016) and currently works as associate professor at the Faculty of Geographical and Geological Sciences, Adam Mickiewicz University, Poznań, Poland. His research is aimed at understanding the functioning and long-term evolution of estuaries with the main focus put on sedimentary and biogeochemical processes. In addition, he is involved in paleolimnological studies of inland lakes. He authored and co-author of over 30 publications.