Net ecosystem exchange related to different rewetting intensities of a drained coastal fen

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Peatlands are important carbon (C) reservoirs. Although they account for only 3% of total global area they store 550 Gt C. This corresponds to 75% of atmospheric C.

Drainage and agricultural use of peatlands cause considerable release of climate relevant carbon dioxide (CO_2). Thus, rewetting measures attempt to re-activate C storage potentials of peatlands. Yet, further research is needed about the biogeochemical processes related to rewetting.

We present results of net ecosystem exchange (NEE) measurements of a rewetted coastal fen from two vegetation periods with different rewetting intensities. In 2009 mean water level was short below ground surface whilst 2010 implicated a year-round flooding. Measurements were conducted with the Eddy-Covariance method which provides quasi-continuous flux measurements on ecosystem scale.

Vegetation period 2009 exhibited a high negative NEE indicating considerable CO_2 storage of the coastal fen. Flooding decreased the amount of stored CO_2 for approximately 50% during the vegetation period 2010. Since a significant part of local vegetation (above all Carex acutiformis stands) was killed by the increased water level, we assume NEE to be dampened by a lower gross primary production. Additionally, the plant residuals may provide a labile C source for microbial respiration.

Flooding affects the element budget of peatlands dramatically and causes a considerable element outflow, detectable e. g. as CO_2 emission. Our results display only the initial phase of flooding. Long time studies are necessary to investigate whether CO_2 will be stored after a certain period of time. Nevertheless, the climate effects of flooding should be considered when rewetting measures are assessed