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Temporal variability of CO_2 and CH4 fluxes of a rewetted fen in NE Germany

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During the last 20 years, restoring degraded peatlands became common practice in the context of climate protection, as it is expected to reduce their greenhouse gas (GHG) contribution to the atmosphere in the long term. However, suboptimal management decisions can even impair the GHG budget beyond the "restoration effect" during the first years of the rewetting. To improve future restoration management, the GHG dynamics following rewetting have to be quantified and understood. Apart from this, knowledge on the variability of the gas exchange and the respective drivers over different time scales is still lacking, though especially important for process understanding and advancement of estimations.

Using the eddy covariance (EC) technique we investigate CH4 and CO_2 flux dynamics between the atmosphere and a highly degraded minerotrophic fen grassland flooded in 2004/2005. The study site is located in the Peene River valley (53°52′N, 12°52′E), NE Germany. It is part of the Terrestrial Environmental Observatories Network (TERENO) spanning across Germany. In the course of flooding, a shallow lake (30-80 cm depth) developed in the centre of the rewetted area and persisted until now. The footprint of the EC measurements covers both the shallow lake and non-permanently inundated parts surrounding the lake.

We will present CO_2 and CH4 flux data covering one year since the system was newly established. We applied wavelet analysis and wavelet coherence to detect the multi-scale temporal variability of ecosystem gas exchange and the respective drivers by splitting time series into spectral and temporal components. Thus, transitions of ecosystem processes during the observation period are considered. Both methods are performed on continuous EC data over one year in case of CO_2 and shorter measurement periods in the course of the growing season for CH4, due to data gaps. The addressed scales of temporal variation range from hour to week and season for CH4 and CO_2, respectively.