MODELLING THE INTERACTIONS BETWEEN WATER AND CARBON DYNAMICS IN WETLANDS

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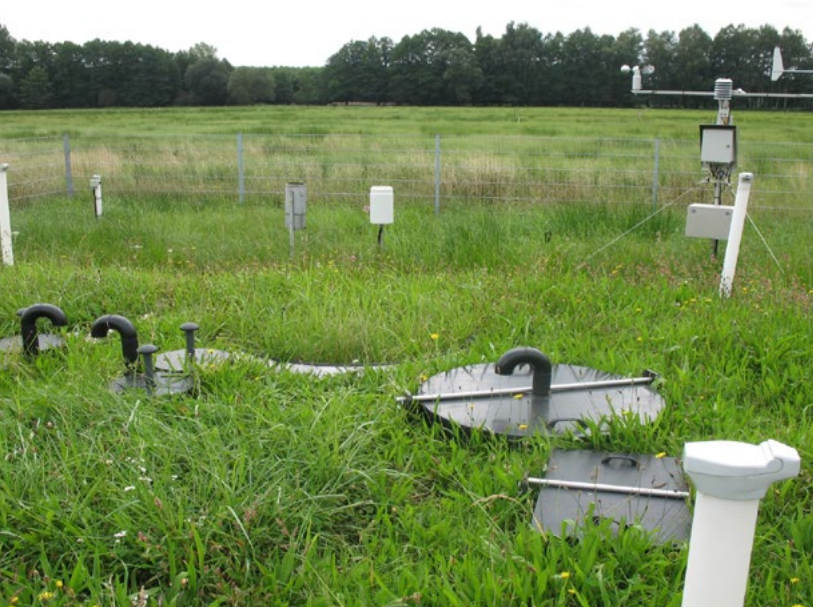

Groundwater lysimeter station in Spreewald wetland,
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Wetlands cover large parts of the North German Lowlands. The water and carbon cycles of agricultural used areas with shallow groundwater tables are highly complex and interconnected processes. These processes determine the role of these sites in the water and nutrient balance of our landscapes with regard to their source and sink functions. Agricultural and water management as well as climate change affect these processes and can increase or decrease the water retention, the emissions of greenhouse gases or the leaching of nutrients into the rivers. Therefore the development of robust and sustainable land use and management systems is necessary for overcoming future challenges.

Nearly all wetlands in Northeast Germany were drained for an agricultural land use during the last hundred years. Due to their sensitive role in the water and substance cycle of landscapes, wetlands and peatlands play an important role both in the German climate protection plans (BMUB, 2016) and in the European Water Framework Directive (EG-WRRL, 2000). The climate action plan 2050 of the German government aims to rewet the drained peatlands by 2050 and the European Water Framework Directive aims at improving the water balance in wetlands and their better integration into water management of the catchment areas.

But all these plans have to consider the actual site conditions as well as possible changes in climate and water availability. The low precipitation in these parts of Germany are not sufficient to fulfill the high water demand necessary to save high water levels during the whole year. In consequence the water levels can drop deeper than at extensive used grassland sites and the green house gas (GHS) and nutrient emissions are increasing instead decreasing. The conclusion must be the development of site-adapted strategies for wetlands/peatlands to reduce emissions including land use and water management.

The precondition for an improved management is an understanding of the relevant hydrological and biogeochemical processes and their complex interactions. This starts with an integrated and coordinated measuring of the water and matter fluxes, including the hydrological, geochemical and biological site conditions above and below the surface. The data obtained serve as a basis for the application and improvement of models for water and matter fluxes, including biomass development.

The ZALF working groups involved in the project ICAW$_2$ have extensive experience, methods and models in the relevant problem area. Through the interdisciplinary cooperation, the existing methods and models are to be brought together and will be further developed. The planned experimental approach is based on a modern technical advanced weighable groundwater lysimeter station located in the Spreewald wetland region and proven chamber systems for the measurement of gas fluxes. The knowledge gained from the measurements is the basis for detailed hydraulic and geochemical process modelling and enhanced understanding of the dynamic processes as a basis for the improvement of models. These can then be used for the development of improved management systems. All together they serve the further development of the agro-ecosystem model MONICA, which was designed for the development of robust agricultural and water management systems.

Project: An approach to better understand and model the interactions between water and carbon dynamics in agricultural wetlands (ICAW$_2$) **Term:** 2020 - 2023 **Sponsor:** ZALF Integrated Priority Project (IPP) **Lead at ZALF:** C. Merz (cmerz@zalf.de)