

The potential of automated transparent-chambers to detect 'cold spots' and 'hot moments' of carbon fluxes in wet and rewetted peatlands

C. Fritz^{1,5}, J. van Huissteden², R. Nouta^{1,3}, R. Aben¹, B. Kruijt⁴, M. van den Berg^{1,2}, Y. van der Velden¹, J. Boonman¹, B. van den Riet⁶, T. Pelsma⁷, N. Bosma³, G. Erkens⁸, W. Liu⁹, G. van Dijk⁶, AJP Smolders¹, M. Velthuis¹, LPM Lamers¹, & S. Weideveld¹

¹Radboud University, ²Vrije University, ³Wetterskip Fryslân, ⁴Wageningen University, ⁵Rhein-Waal University, ⁶B-Ware Research, ⁷Waternet, ⁸Deltares, ⁹University of Groningen
Contact: c.fritz@science.ru.nl



Figure 1: Chambers on wet grassland and Paludiculture site

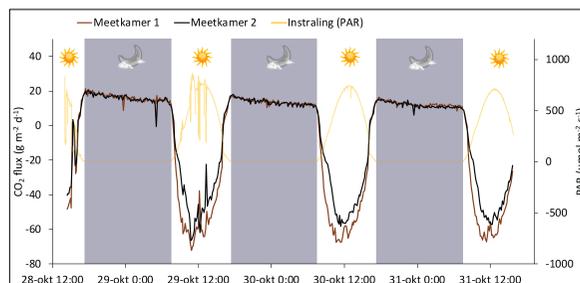


Figure 2: Diurnal variation of CO₂ fluxes (NEE)

Flux data and gap-filling and sites

Raw data is filtered based on quality parameters (low r^2 , wind and frost compromising closure of the lid). Per site soil/air temperature, soil moisture, water table & PAR are continuously logged also outside campaigns. Gap-filling (flux extrapolation) uses standard approaches (e.g. T₅ Lloyd-Taylor) or the VU-model where less than 8 campaigns per year were performed. Data analysis is ongoing.

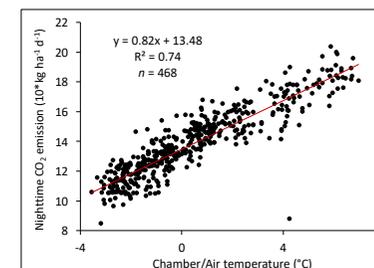


Figure 3: Correlation between fluxes and environmental factors

Automated chamber background information

Chambers' diameter and height range usually between 35 and 50 cm. The entire equipment is portable, runs on 12V/24V battery packs and is installed for 3-7 days. For Paludiculture plants it can be stacked up to capture emission of the entire canopy (think of *Typha* and *Phragmites*). Monthly campaigns have been successfully completed on various locations (e.g. Ankeveen, Aldeboarn, Ijlperveld, Gersloot, Haskerdijken). Being light-weighted and battery-run the system can be deployed on walking distance (2-5 km from the road).

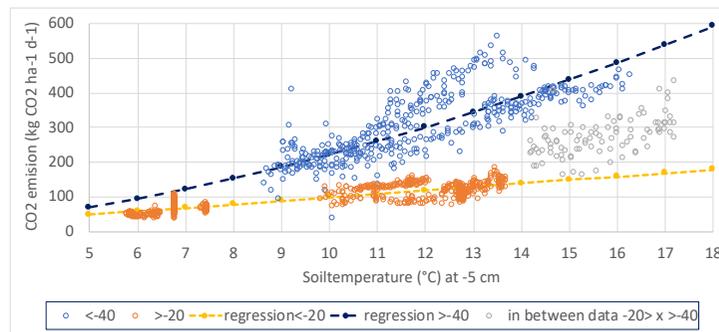


Figure 4: Night time fluxes in relationship to water table (~cold spots)

Research outcomes

Portable automatic chambers record reliable carbon fluxes day and night. A large variation of sites and vegetation can be investigated by 1-2 persons with a limited time investment. In-situ water tables 0-20 cm below surface lead to substantial reduction in night-time R_{eco} . Factor 2-3 higher CO₂ emission were found within drainage treatments. Continuous data of automatic chambers allow for the detection of episodic high emission events for both carbon dioxide and methane. Methane emissions found in *Typha* were usually below 220 mg CH₄ m⁻² d⁻¹. At the *Sphagnum* site methane emission were close to zero.

Take home: Automated chambers close the gap between manual chambers and eddy co-variance by detecting both *cold spots* (high spatial resolution) and *hot moments* (continuous data). Raising water tables to the peat surface effectively reduces carbon emission that are further modulated by vegetation.