Paludicultuur en natte teelten (Nassanbau) in NL - AgroInno

Christian Fritz, & G.ert-Jan van Duinen in Samenwerking met

RJE Vroom, RJM Temmink, G. van Dijk, R. Aben, J. Geurts, S. Harpenslager, S. Kosten, J. Couwenberg, W. Lui, E. van den Elzen, M. van der Berg, J. Land, F. Wichern, S. Weideveld, T. Gremmen, B. van den Riet, E. de Hullu, T. Heuts, A. Grootjans, LPM Lamers & AJP Smolders

Stichting Bargerveen
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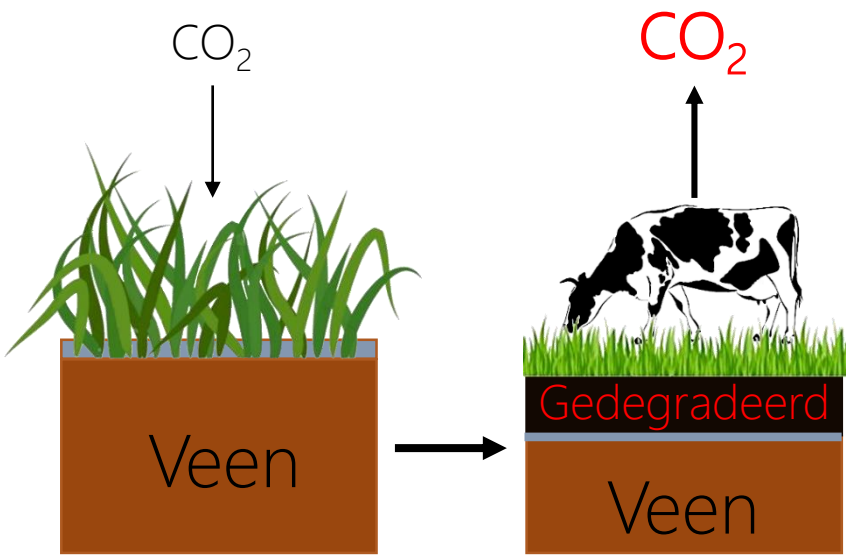
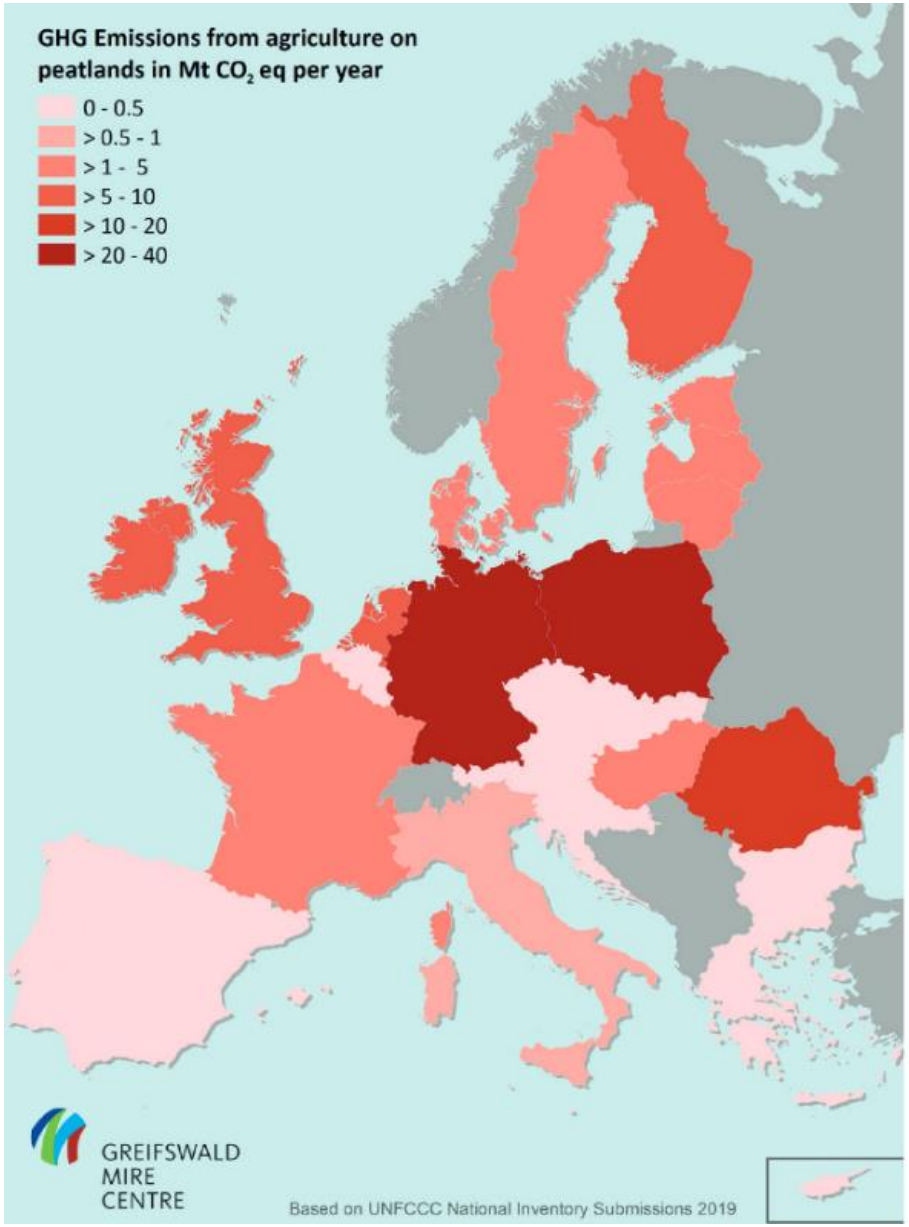
Hoge emissies uit VEEN





* 2019 figures include UK

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Oplossingen ..., voor welke toekomst?

Paludicultuur: **Biomass oogst** op **nat veen** én behoud van ecosysteem diensten

Management opties

10.000 Jahre Forschung nachholen

Techniek is er

Veel ervaring met biomassa

Konkurrenz belebt das Geschäft: 3-4 grote jongens (zie RRR21)

Veel projecten in Nederland

Interreg North-West Europe CCONNECTS

Veen Voer en Verder

Wellink EQ

Provincie Utrecht

VIPNL

Veel projecten – arbeidsintensief en oplossingen voor m^2 scala

Grotere percelen van 10-100 ha ontberen middelen en aanloopsteun

Voorbeelden: Lingezegen/Waterrijk; Marickenland & Burkmeer

Lisdodde/Typha: focus op kleinschalige proeven

Waterstanden niet op oorde en ganzen vraat

Leren van commerciële rietteelt

>7000 ha rietteelt

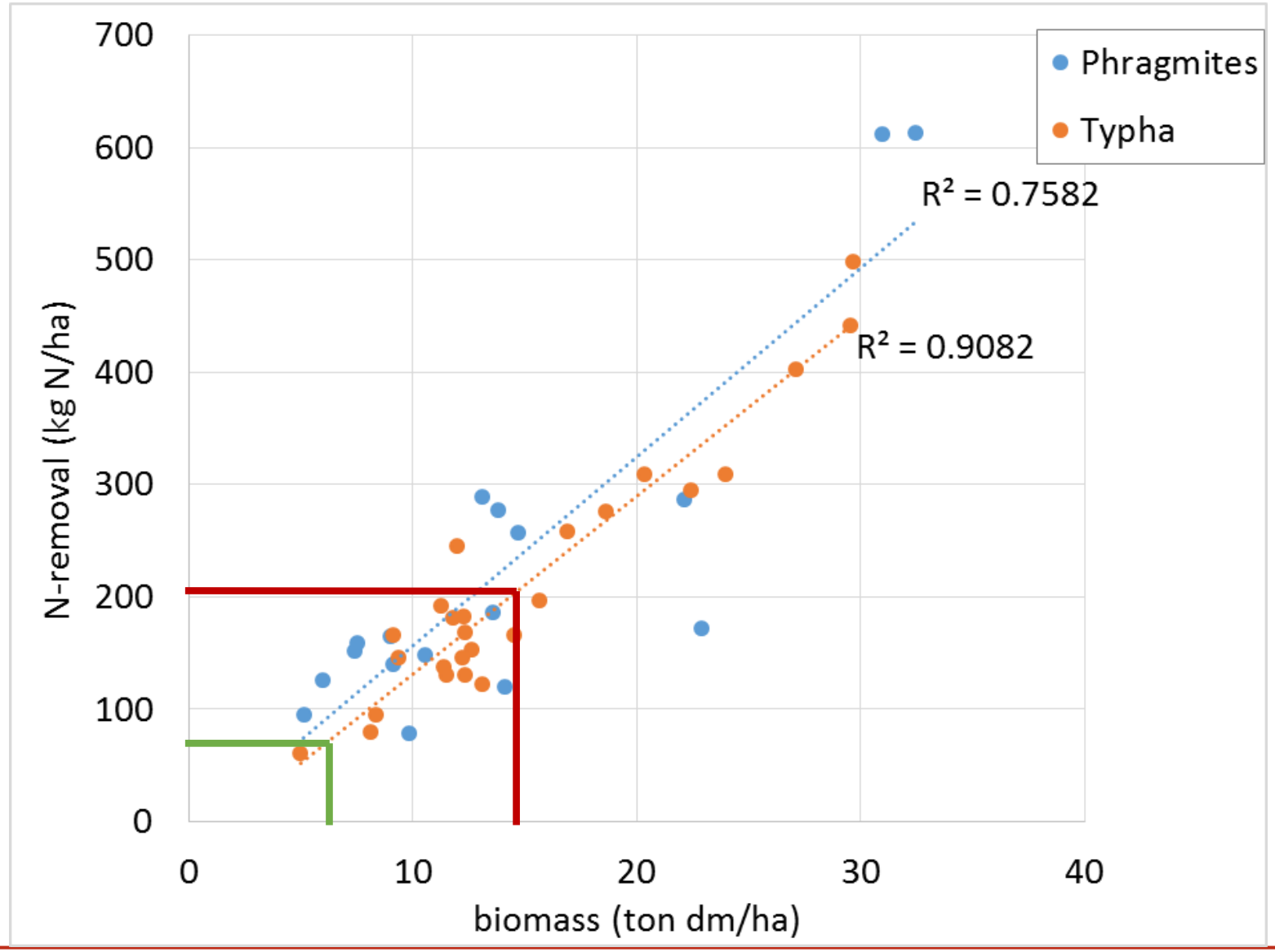
traditie en biobased-bouwmaterialen

oogst bovengronds én veenvorming ondergronds

Philipp Schröder, lensescape.org

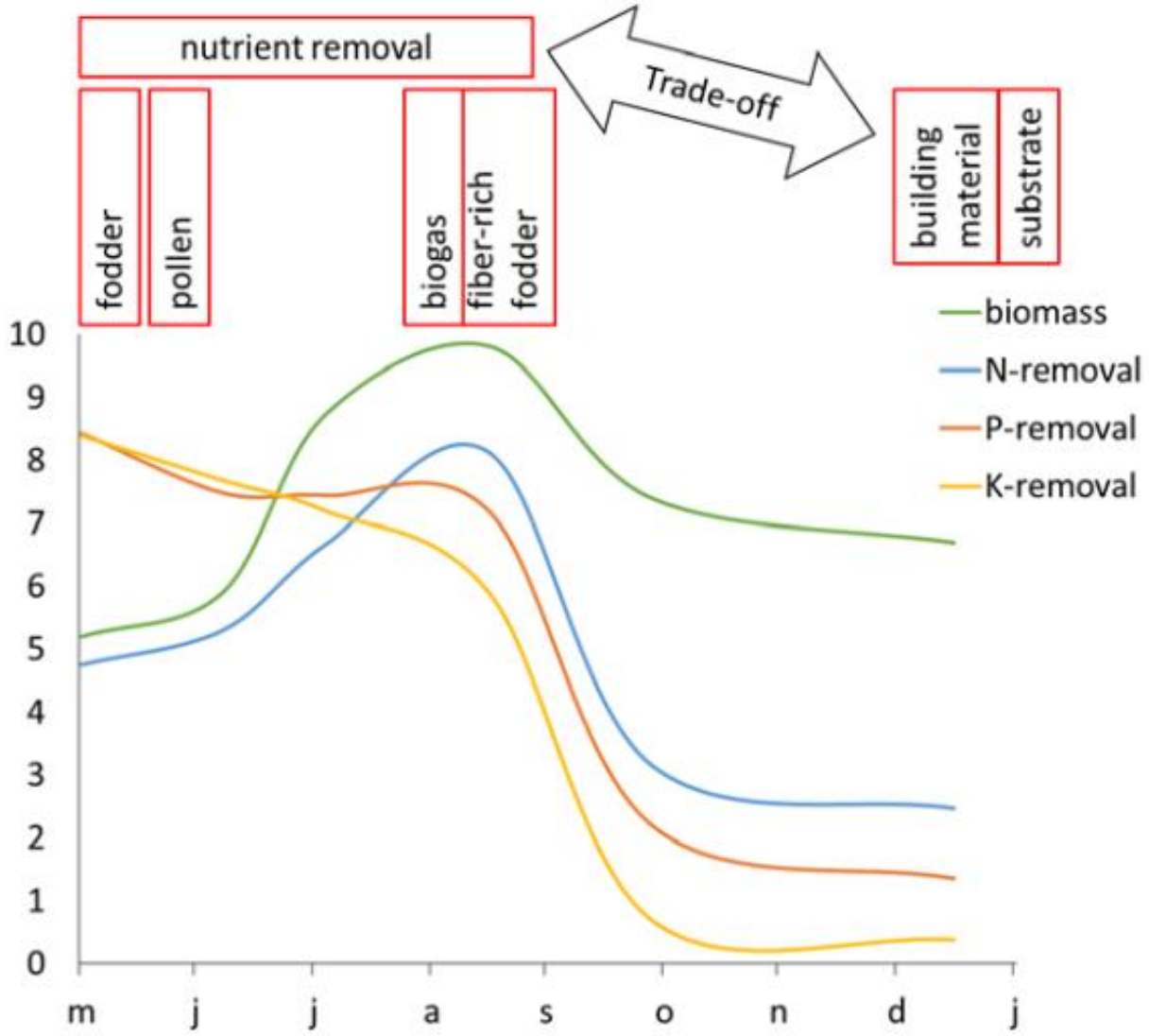
functionerend infrastructuur en veenvorming

Lisdodde/Typha heeft veel stikstof nodig



Geurts et al. 2020, Vroom et al. 2020 STOTEN; Vroom et al. 2022 PLSO

Winter oogst effectief



Geurts & Fritz eds. 2018; Geurts et al. 2020; Vroom et al. 2022

Veenmos en riet redden het klimaat

Gaudig et al. 2018; Günther et al. 2020; Vroom et al. 2020

Veenmos en riet redden het klimaat – tot 30 t CO_2e besparing

van den Elzen et al. 2020; Tiemeyer et al. 2020; Günther et al. 2020; Bianchi et al. 2021

Lisdodde/Typha meestal ongunstige waterstanden - te nat of droog

Koebsch et al. (2020) Philosophical Transactions , DOI: (10.1098/rstb.2019.0685)

Efficiënter telen op natte grond → water

Kosten

Efficiënter telen op natte grond → zaaien

Graszoden verwijderen en sponge functie herstellen

Producte en ketens

Het maaien van het veld met lisdodde, belangrijk onderdeel van de proef om vernatting rendabel te maken. Rechts Wilko Kemp.

FOTO'S MARGOT BRAKEL FOTOGRAFIE

Uitleg langs de Herenweg bij Ankeveen: 'Proef met natte landbouw tegen bodemdaling'

De uitstoot van methaan en kooldioxide wordt voortdurend gemeten.

Voorbeeld Pilotproject: Waternet

Voorbeeld Pilotproject: Waternet

Producten

RIET GOED
textiel gemaakt van rietsigaren

Interreg North-West Europe
CCONNECTS
European Regional Development Fund

Landschap Noord-Holland

BETTER WETTER

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EDR INTERREG Deutschland Nederland

Samen aan de slag

Veel projecten met biomassa op nat veel in NL

Paludicultuur: meerwaarde voor klimaat en diensten
Natte teelten: focus op opbrengst en natte bodem

Veel ketens kunnen gesloten worden

Subsidies voor drainage en intensivering → market failure

Projecten op schaal (10-1000 ha)

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Thank you for your attention and funding

- Carbon Connects team
- Gert-Jan van Duinen
- GMC
- Paludi-Prima Team
- Optimoos Team
- Stefan Weideveld
- Mandy Velthuis
- RU TeCe (Floris, Arjan, Gerben)

- Tom Heuts
- Judith van der Knaap
- Gijs van Dijk
- Renske Vroom
- Ralph Temmink
- Sarian Kosten
- Ralf Aben
- Leon Lamers
- Annelies Veraart
- Bjorn Robroek
- Fons Smolders
- Peter Cruijsen
- Roy Peters

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VU

WAGENINGEN UR

NWO
Netherlands Organisation for Scientific Research

Deltares

university of groningen

Interreg
North-West Europe
Carbon Connects

WETTERSKIP FRYSLÂN

van hall larenstein
university of applied sciences

ONDERZOEKCENTRUM B ware

HOCHSCHULE RHEIN-WAAL
Rhine-Waal University of Applied Sciences

Utrecht University

Samenvatting

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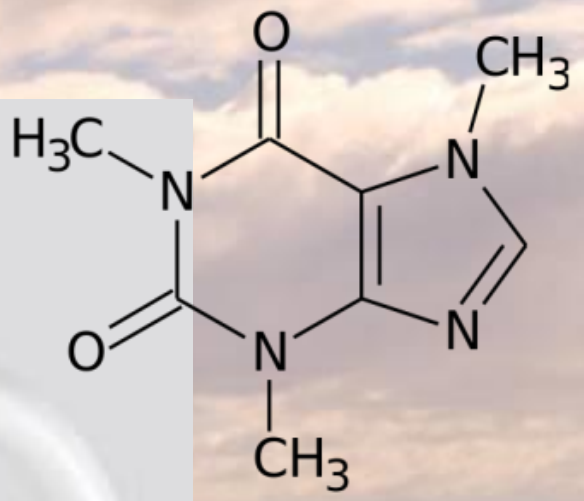
Everyone geared up?



Search “MV & methane” renders…

Plenty of carbon and little methane

Research

New Phytologist

Zero methane emission bogs: extreme rhizosphere oxygenation by cushion plants in Patagonia

Christian Fritz[1,2], Veronica A. Pancotto[3], Josephus T. M. Elzenga[2], Eric J. W. Visser[4], Ab P. Grootjans[2,5], Arjan Pol[6], Rodolfo Iturraspe[7], Jan G. M. Roelofs[1] and Alfons J. P. Smolders[1]

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Received: *20 August 2010*
Accepted: *23 November 2010*

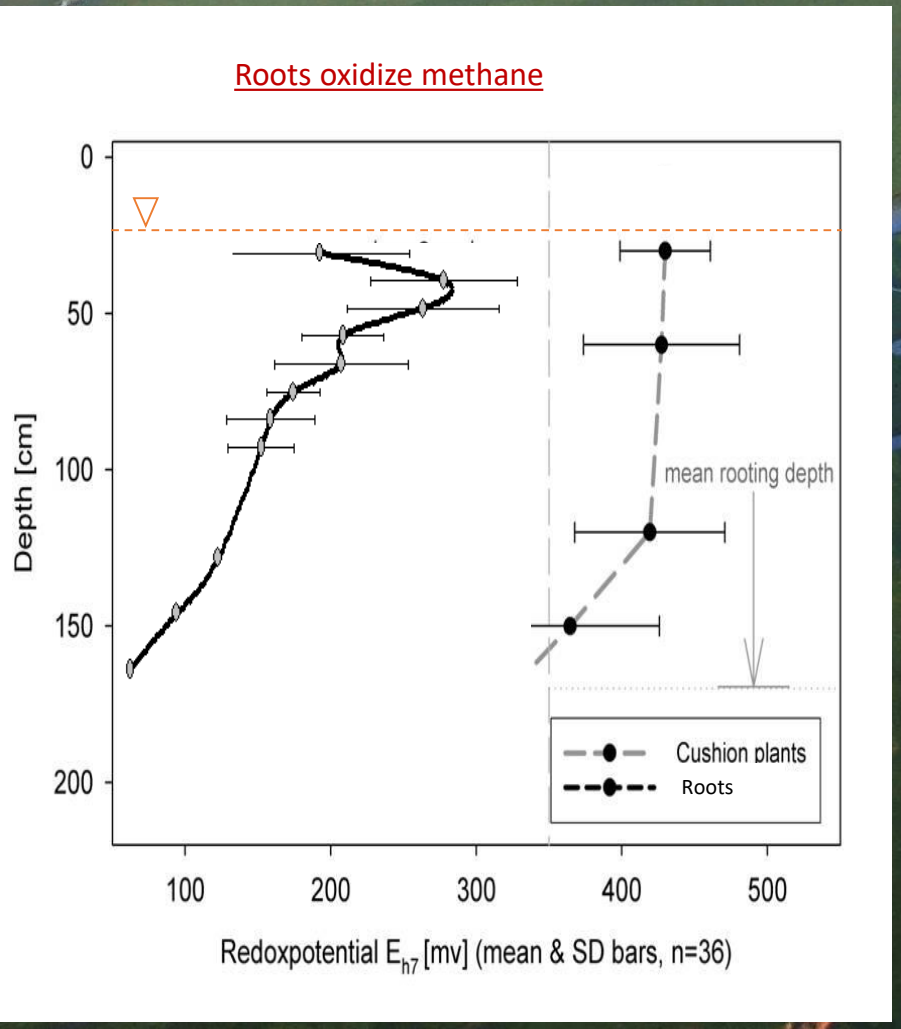
New Phytologist (2011) **190**: 398–408
doi: 10.1111/j.1469-8137.2010.03604.x

Key words: cushion plant, methane, nutrient, Patagonia, rhizosphere oxygenation, root, *Sphagnum*, wetland.

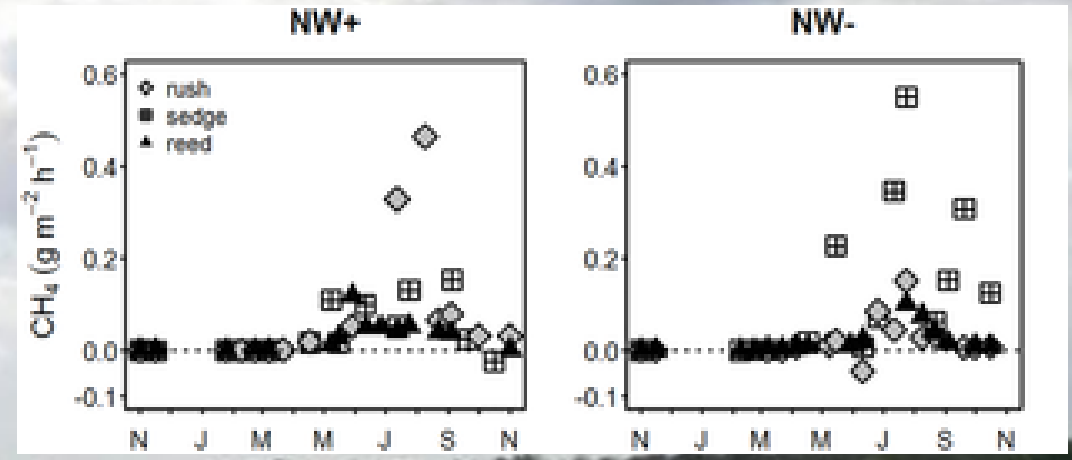
Summary

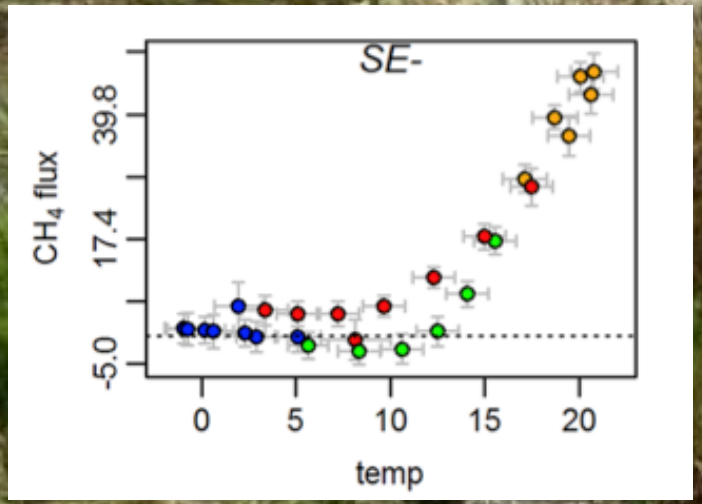
- Vascular wetland plants may substantially increase methane emissions by producing root exudates and easily degradable litter, and by providing a low-resistance diffusion pathway via their aerenchyma. However, model studies have indicated that vascular plants can reduce methane emission when soil oxygen demand is exceeded by oxygen released from roots. Here, we tested whether these conditions occur in bogs dominated by cushion plants.
- Root–methane interactions were studied by comparing methane emissions, stock and oxygen availability in depth profiles below lawns of either cushion plants or *Sphagnum* mosses in Patagonia.
- Cushion plants, *Astelia pumila* and *Donatia fascicularis*, formed extensive root systems up to 120 cm in depth. The cold soil (< 10°C) and highly decomposed peat resulted in low microbial activity and oxygen consumption. In cushion plant lawns, high soil oxygen coincided with high root densities, but methane emissions were absent. In *Sphagnum* lawns, methane emissions were substantial. High

Roots oxidize methane



Methane peaks first year after flooding following vegetation die-back



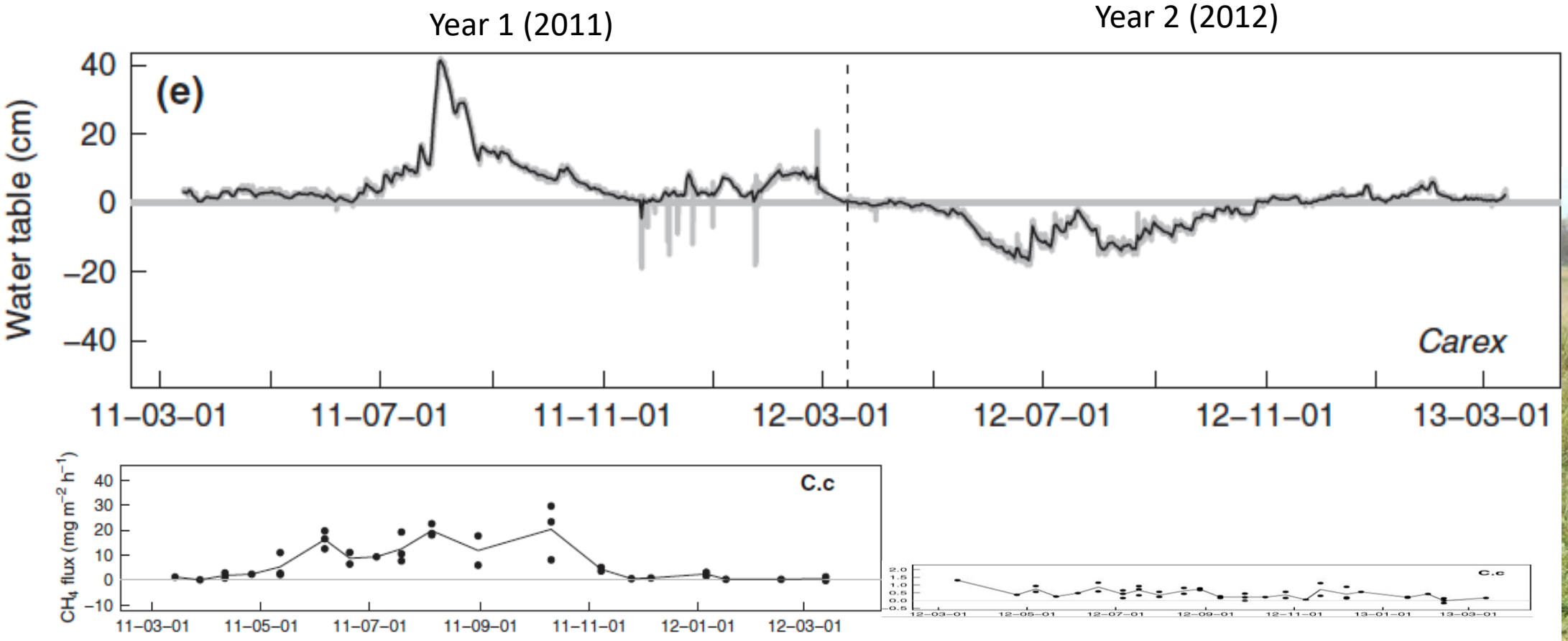


Hahn et al. 2015 PLoS ONE 10(10): e0140657. doi:10.1371/journal. pone.0140657

Aben et al. 2017 Nat. Com.

Get crops and other reactive carbon out

Also seasonal damage after short-lived flooding events



Günther et al. 2014 GCB Bioenergy (2014), doi: 10.1111/gcbb.12214 Similar results in Vanselow-Algan et al. (2015)

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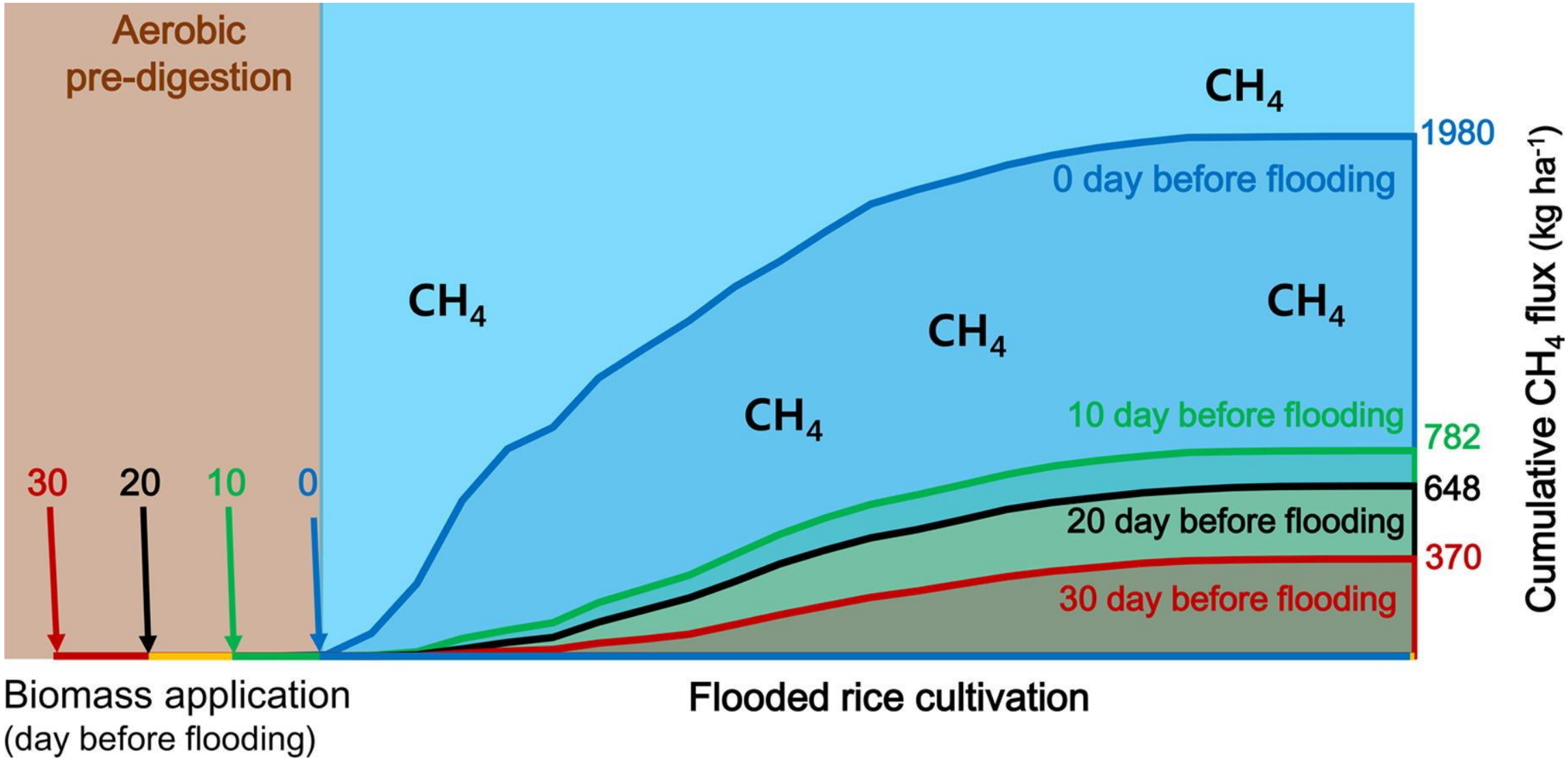
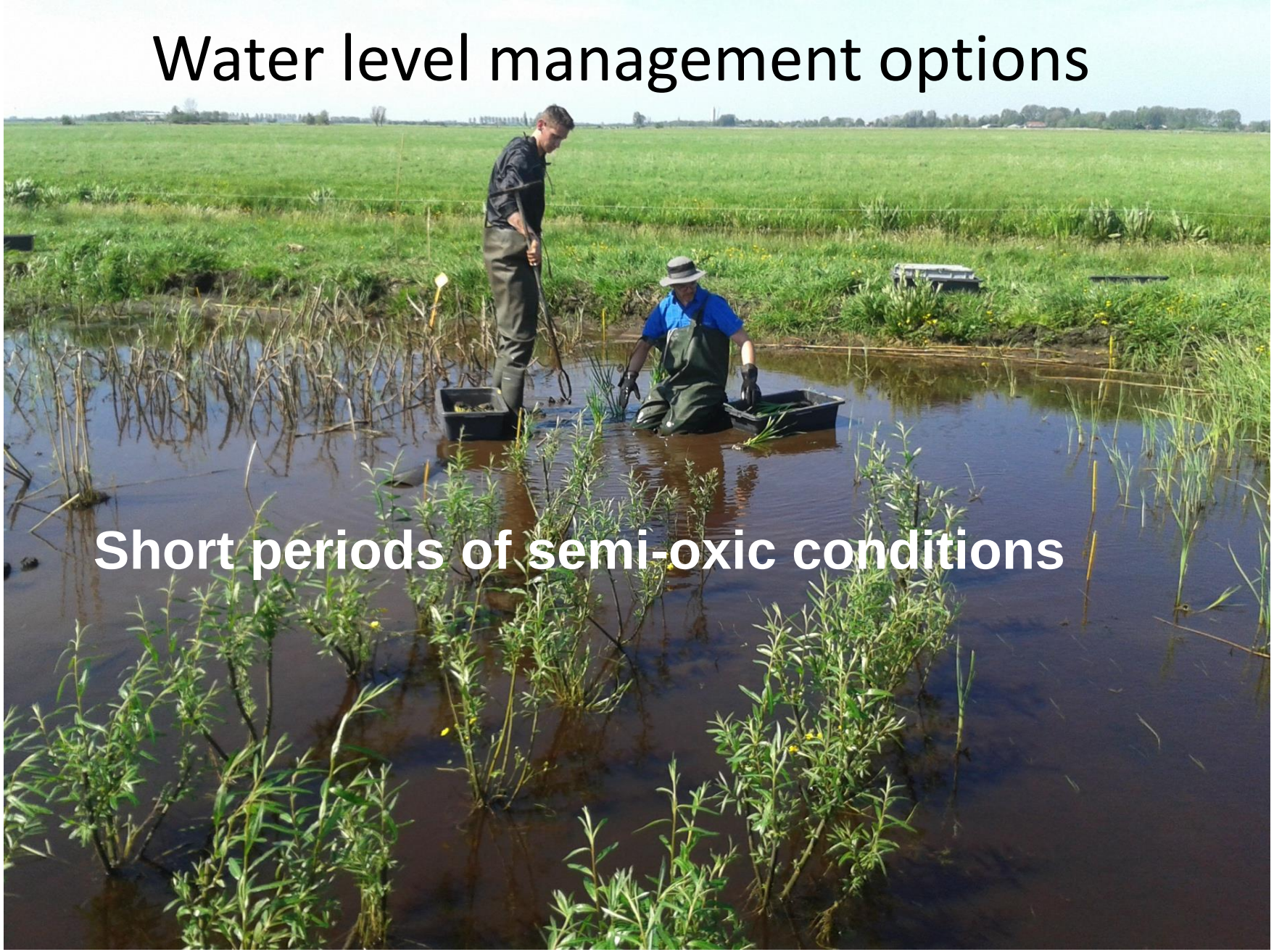
Magnitude of biomass related methane is up to 2000 kg ha^{-1}

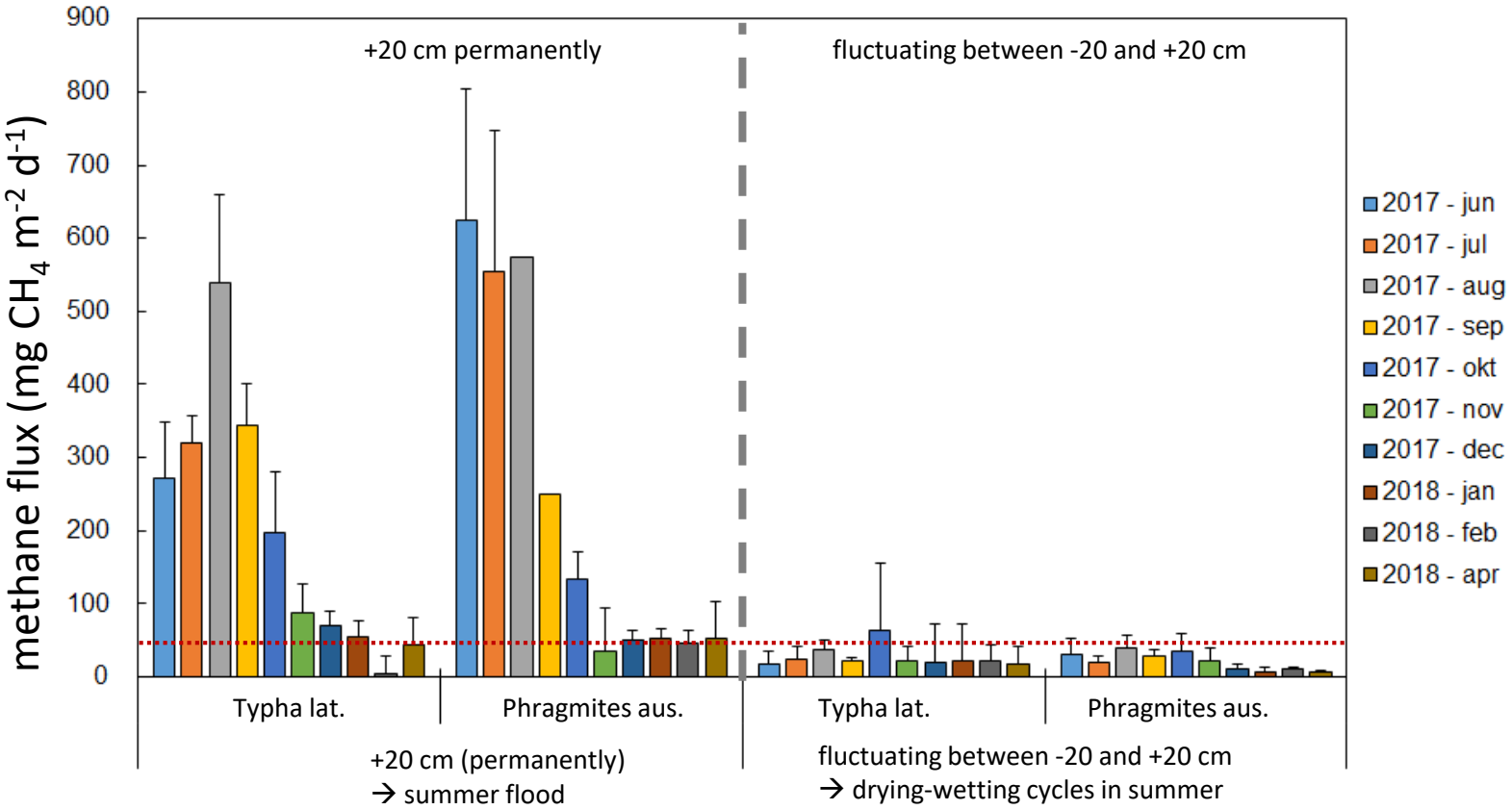


Lee et al. 2020 Science of the Total Environment 711 (2020) 134641

Water level management options



Fluctuating water levels during summer prevent methane



Vroom et al. 2018; Vroom in prep.; Aarhus University

Sphagnum farming harnesses methane emissions

Gaudig et al. 2018

Close to zero methane emissions

		CO_2	CH_4 g m^{-2} a^{-1}	N_2O	Sum GHGs (CO_2eq)
Year 1	*S. palustre*	-629 ± 188	1.4 ± 0.5	0.0 ±0.3	-578 ±209
	S. papillosum	-898 ± 196	2.7 ± 0.7	0.1 ± 0.2	-790 ± 221
	Ditches	608 ± 393	14.4 ± 6.2	0.3 ± 0.4	1101 ± 577
Year 2	*S. palustre*	-547 ± 92	1.0 ± 0.4	0.0 ± 0.1	-506 ± 98
	S. papillosum	-875 ± 100	1.2 ± 0.5	-0.1 ± 0.1	-857 ± 108
	Ditches	910 ± 604	4.8 ± 4.9	0.6 ± 0.4	1135 ± 631

Günther et al. 2017
MaP

How to deal with wet feed?

Time to regenerate

Functioning peatlands

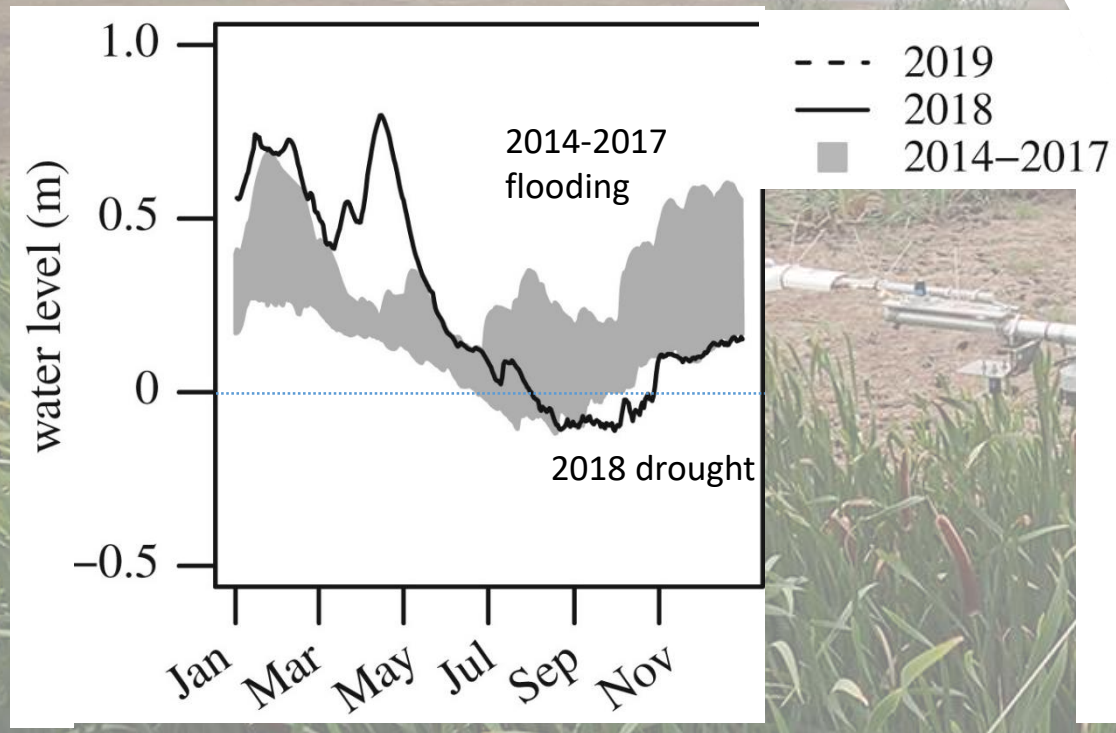
Polder Zarnekow – 2018 drought kick-started vegetation

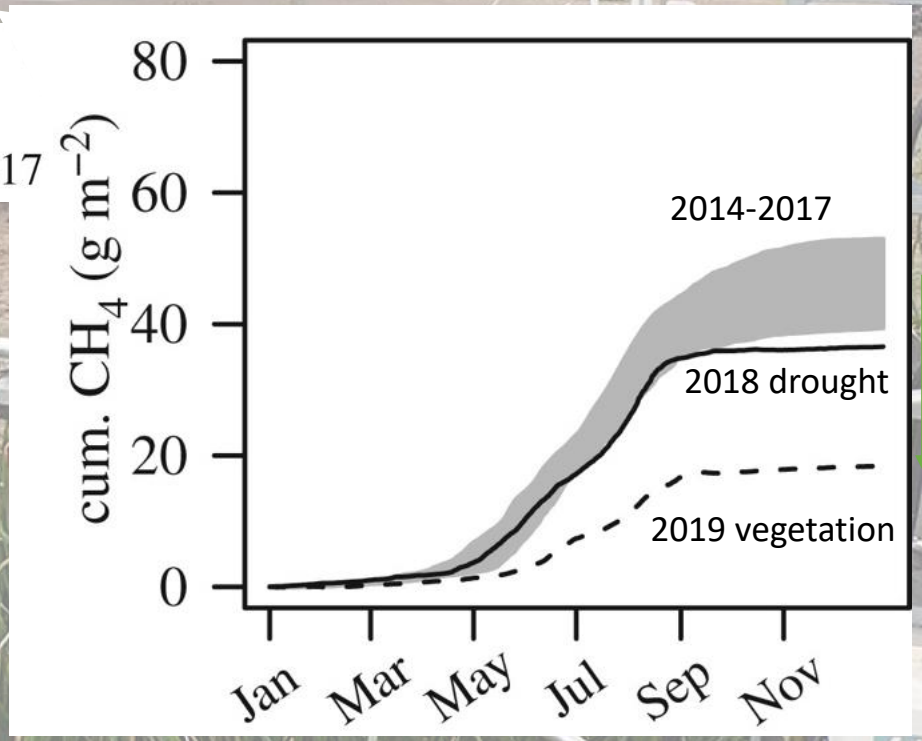
GFZ Helmholtz Centre Potsdam

Universität Rostock

Koebsch et al. (2020) Philosophical Transactions of the Royal Society B Volume: 375, Issue: 1810, DOI: (10.1098/rstb.2019.0685)

Multi-year drop in methane production and emission





Koebsch et al. (2020) Philosophical Transactions of the Royal Society B Volume: 375, Issue: 1810, DOI: (10.1098/rstb.2019.0685)

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Vegetation development by episodic events and/or Paludiculture

Fritz (2016)

Top-soil recycling offers a quick-fix for methane but…

Harpenslager et al. 2015; Zak et al. 2018;
Smolders et al. 2018; Huth et al. 2020;

Carbon fractions in top-soil and pumping in reactive carbon

Harpenslager et al. 2015; van den Elzen 2020

Increased chloride concentration reduces methane but…

van Dijk et al. 2015/2019; Wetscapes publications

https://www.123rf.com/photo_29796685_nacl-written-on-a-heap-of-salt-sodium-chloride.html

Promising pathways

- Remove biomass and reactive root/humus layer prior to rewetting
- Avoid prolonged summer flooding
- Reduce grass cover & prevent die-back of grass-like vegetation
- Short-lived drawdown is effective (when short lived)
- Allow for episodic droughts kick-starting peat-form vegetation

→ Join us for the 100kg CH_4ALLENGE

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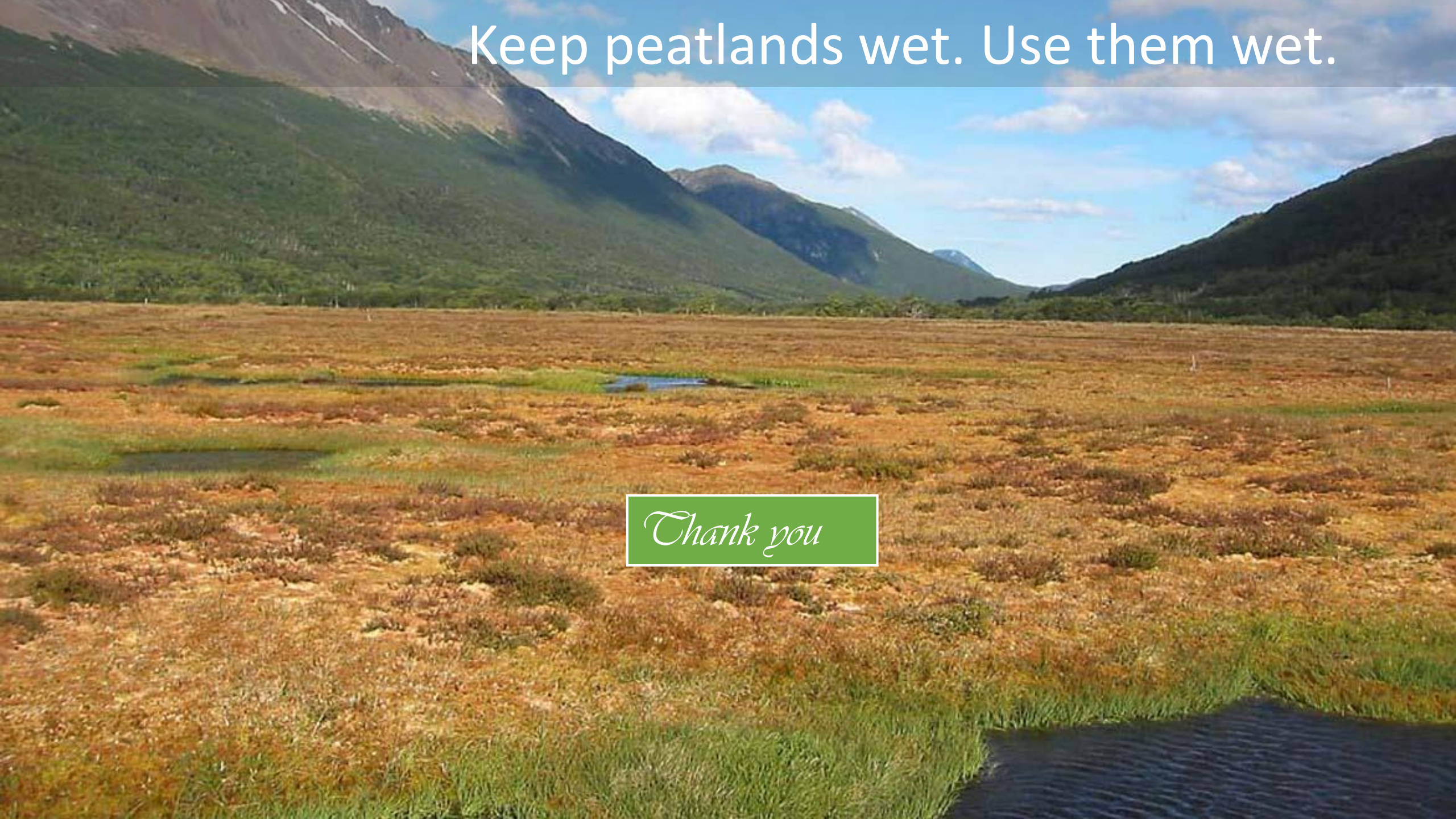
Pathways

KEEP
CALM
AND
ACT
ON CO2

Günther et al. 2020 Nat. Com.


Keep peatlands wet. Use them wet.
Thank you

Engage in the discussion following talks by

- Renske Vroom
- Adam Koks
- Bas van den Riet
- Cheng Chen
- Ralph Temmink

Time for extra coffee?

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SAY
NO
TO
METHANE
KEEP
CALM
AND
ACT
ON CO2

Logo's

Keep peatlands wet

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https://static01.nyt.com/images/2018/09/19/climate/19CLI-METHANE/19CLI-METHANE-superJumbo.jpg?quality=90&auto=webp