GHG MITIGATION POTENTIAL OF PALUDICULTURE FOR FIVE DIFFERENT DANISH PEATLAND SITES – A MESOCOSM STUDY

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INTRO

Country	Total Area (ha)	Peatland Area (ha)	% of total Area	SOC 6 – 12 % (ha)	SOC > 12 % (ha)
Denmark	4 309 400	171 000	3.95	98 080	73 523

> 25 % of agricultural GHG emissions

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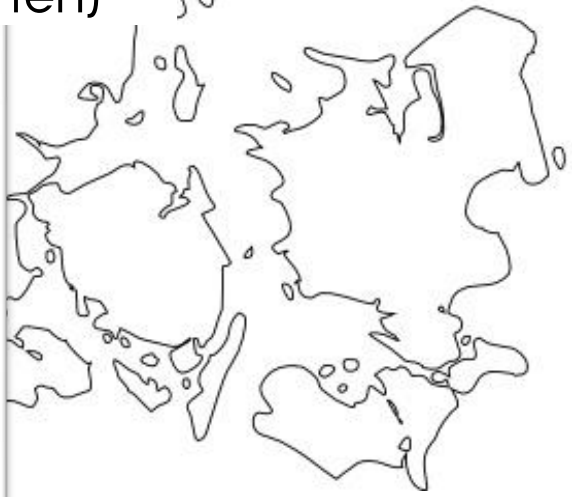
INTRO


Store Vildmose (bog)
Lille Vildmose (bog)
Selkær enge (fen)
Vejrumbro + Øby
(riparian fen)



DESIGN

AIMS

Danish peatlands have different soil properties → There must be differences in GHG emissions → But can we reduce these on all sites with paludiculture?

#1: Determine magnitudes of emissions from soil respiration for different drained agricultural peatlands in Denmark

#2: Assess the greenhouse gas mitigation potential for these sites by rewetting and paludiculture

#3: Determine soil-, and site-specific drivers for emissions and the mitigation potential by paludiculture

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METHODS

#1: Opaque chamber measurements

- CO_2, CH_4 and N_2O, biweekly from 07/19 to 07/ 20
  - Extrapolation to cumulative annual values
  - GWP's for CH_4 = 34, and N_2O = 298

2: Soil

- Analysed in segments for TN and TC; BD and pH; Fe, K, P, S (on ICP); von Post

3: Primary productivity

- Mesocosm biomass cut twice annually, biweekly determination of plant development

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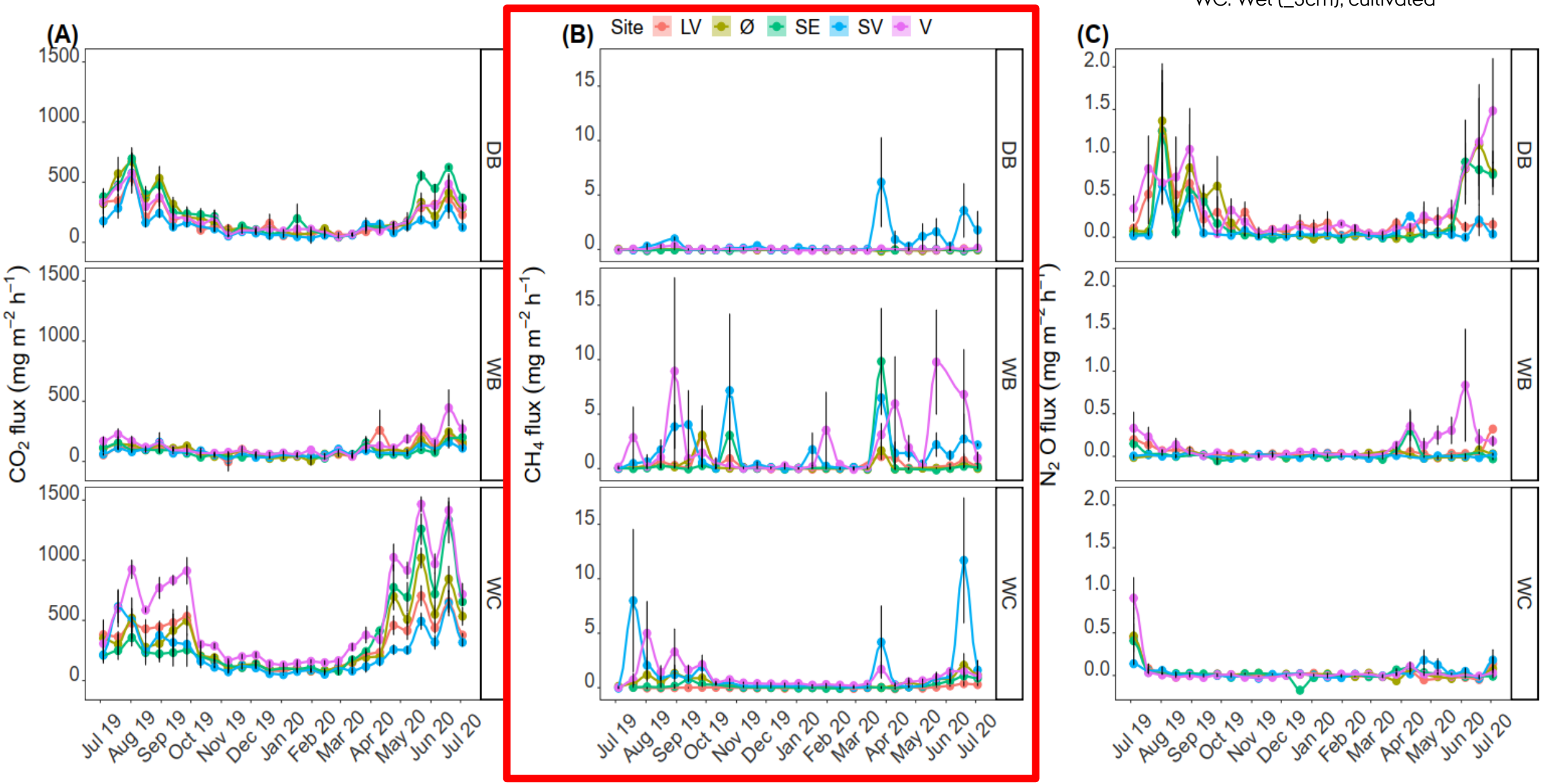
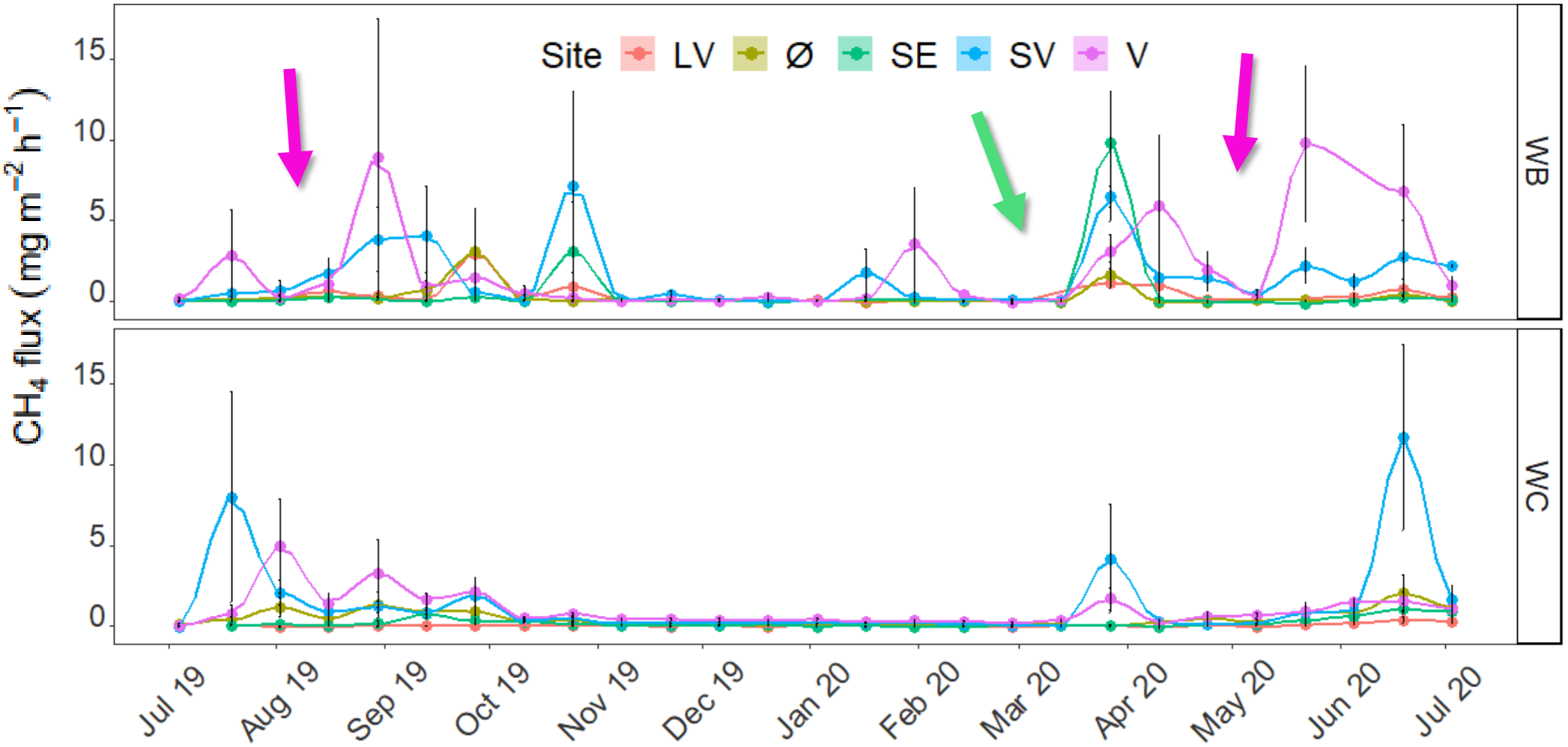
GHG FLUXES

DB: Drained (-40cm), bare
WB: Wet (-5cm), bare
WC: Wet (_5cm), cultivated

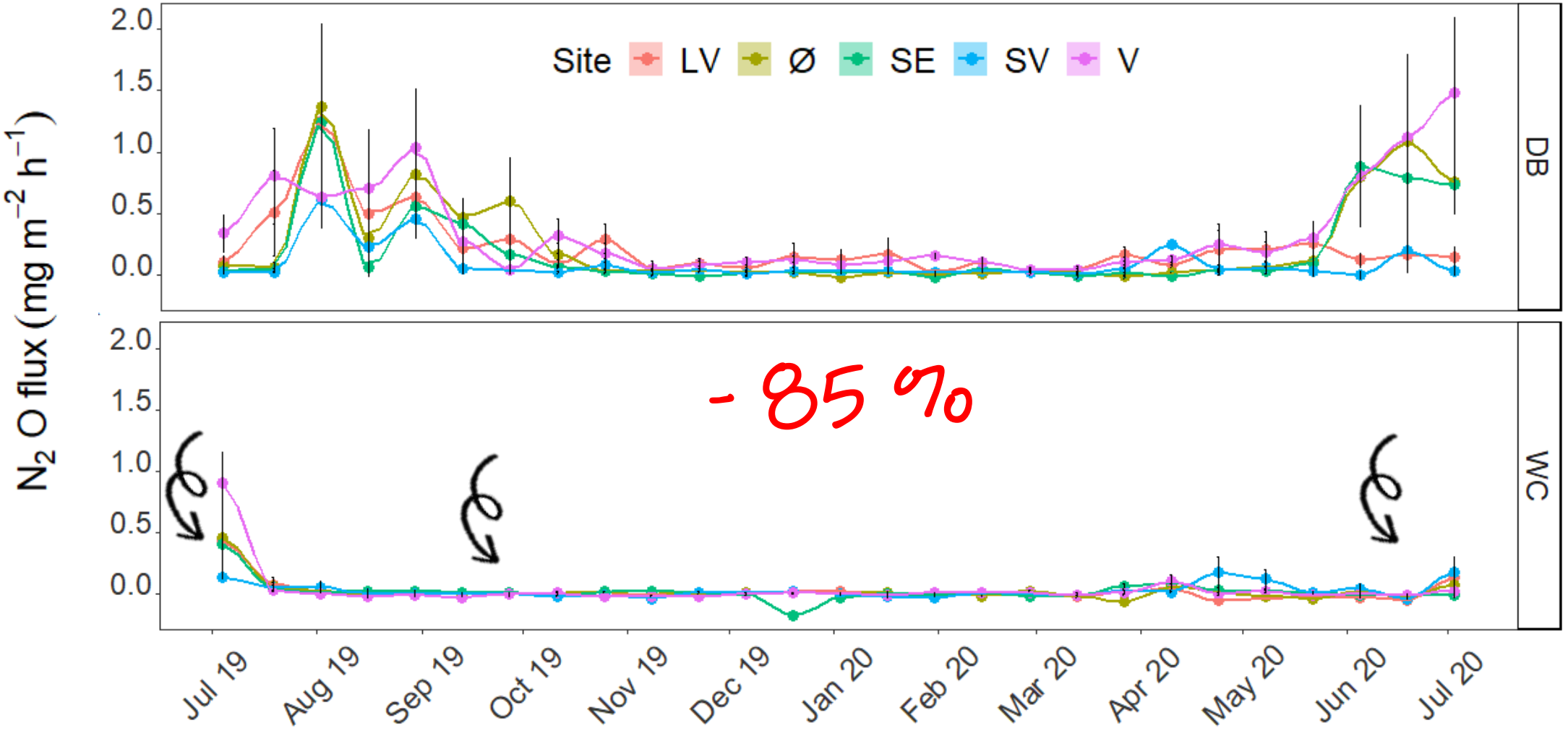


METHANE FLUXES

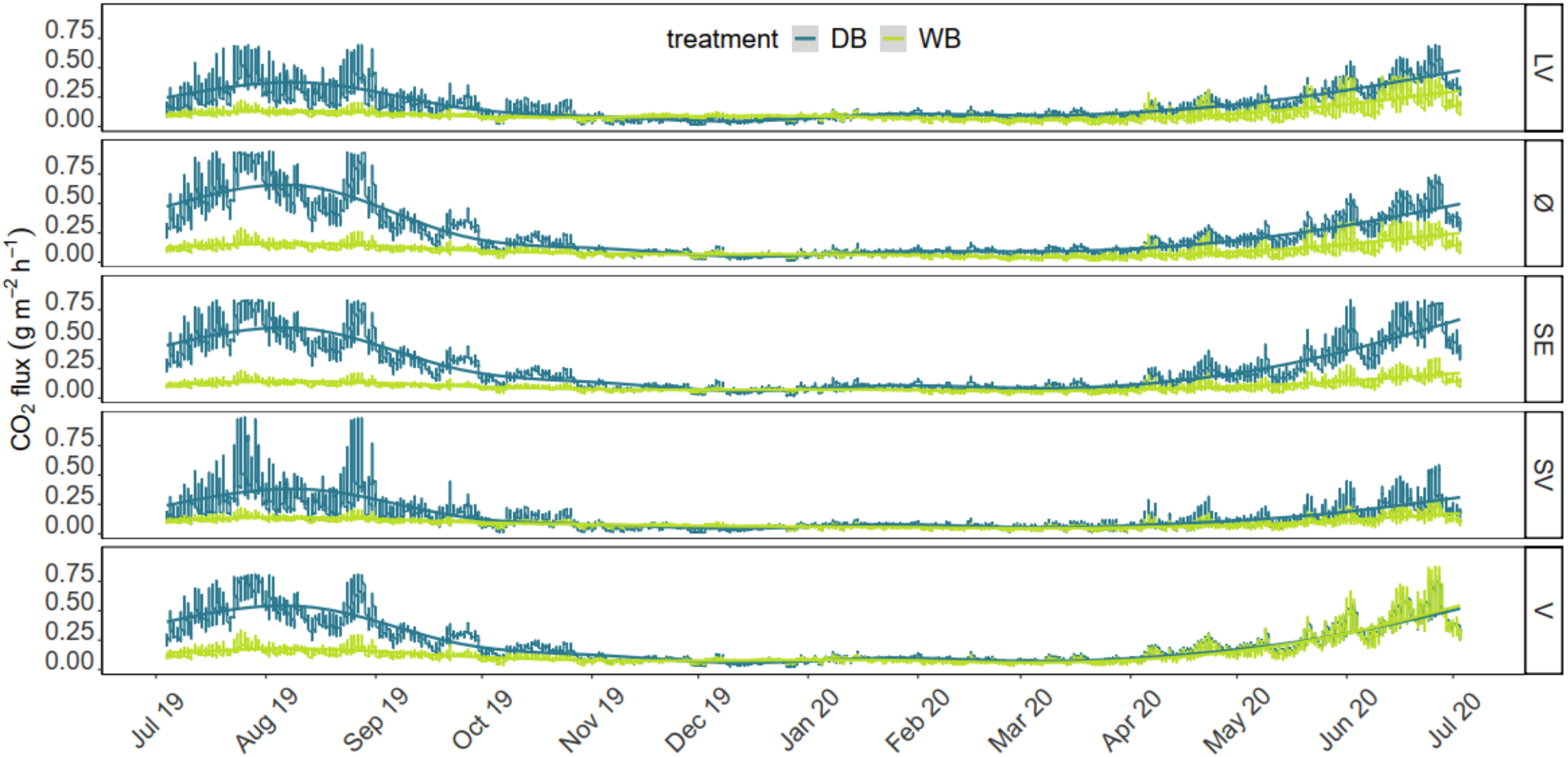


- 33 %

N_2O FLUXES


Site LV Ø SE SV V
DB
WC
- 85 %
N_2O flux (mg m^{-2} h^{-1})
2.0
1.5
1.0
0.5
0.0
Jul 19
Aug 19
Sep 19
Oct 19
Nov 19
Dec 19
Jan 20
Feb 20
Mar 20
Apr 20
May 20
Jun 20
Jul 20

CO_2 DYNAMICS



-49 %

-57 %

-67 %

-44 %

-37 %

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PEATWISE
Wise use of drained peatlands in a bio-based economy

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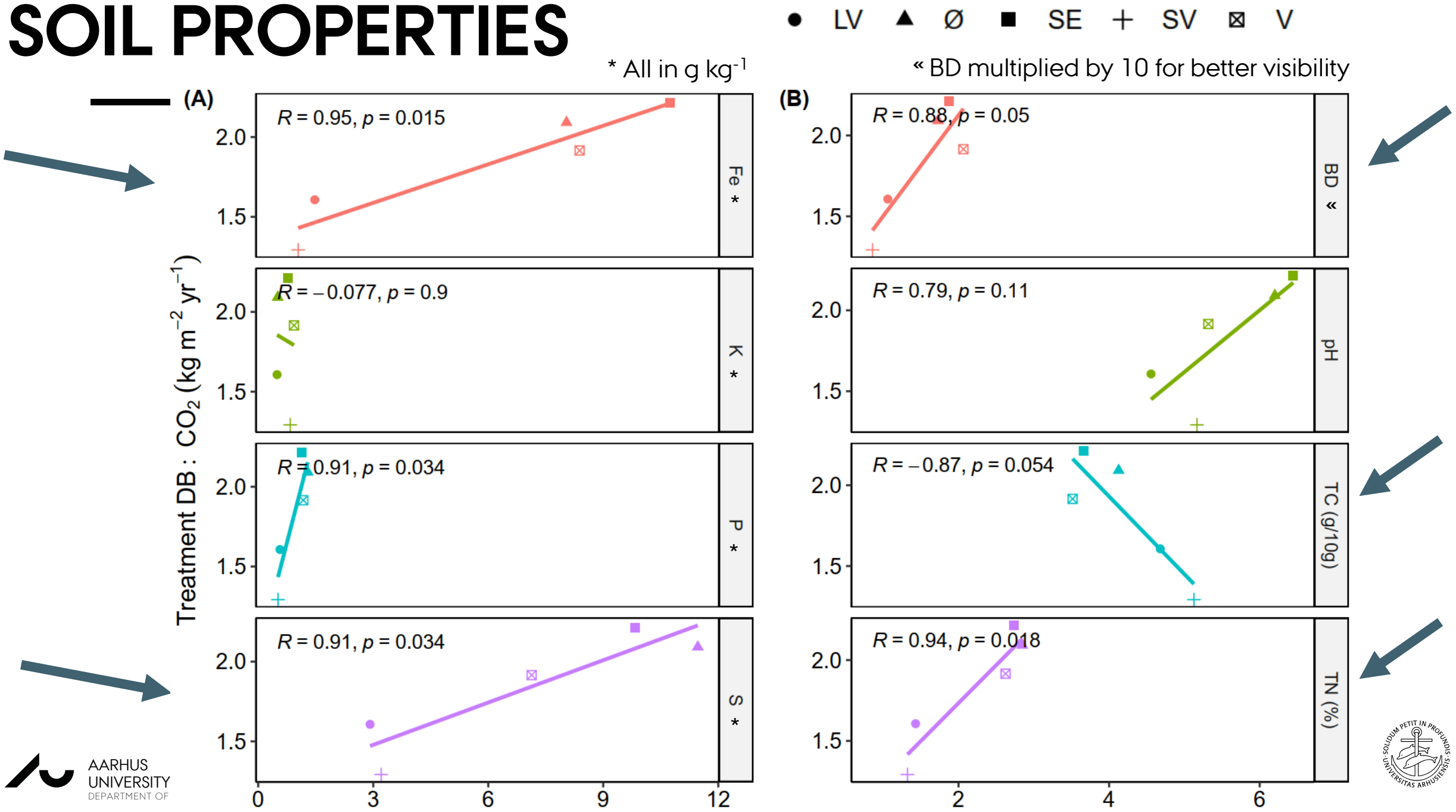
SOIL PROPERTIES



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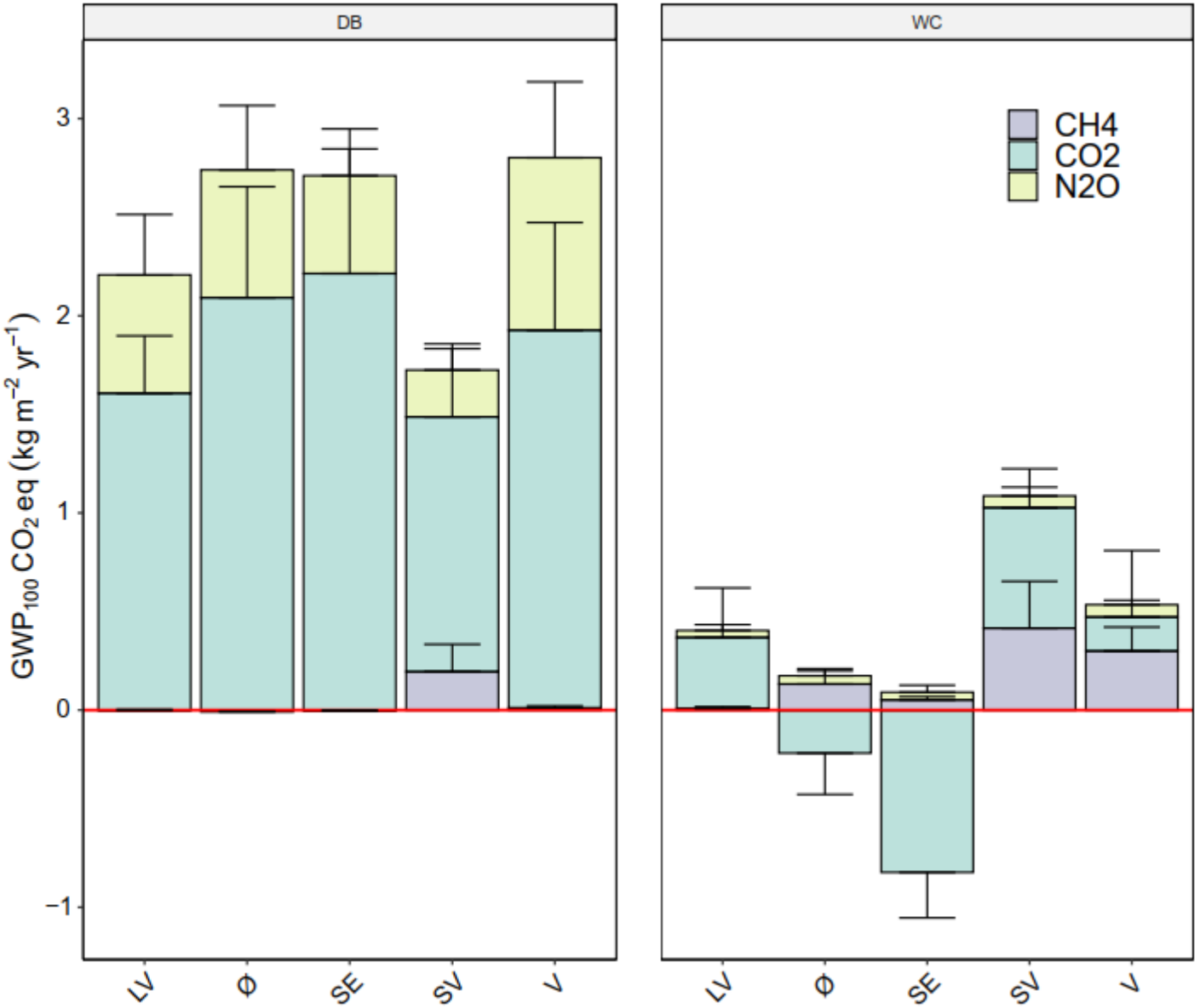
GWP

- Carbon Dioxide:
  - Reduction between 37 % (SV) - 127 % (SE)

- Two C-sinks:
  - Ø
  - Selkær Enge

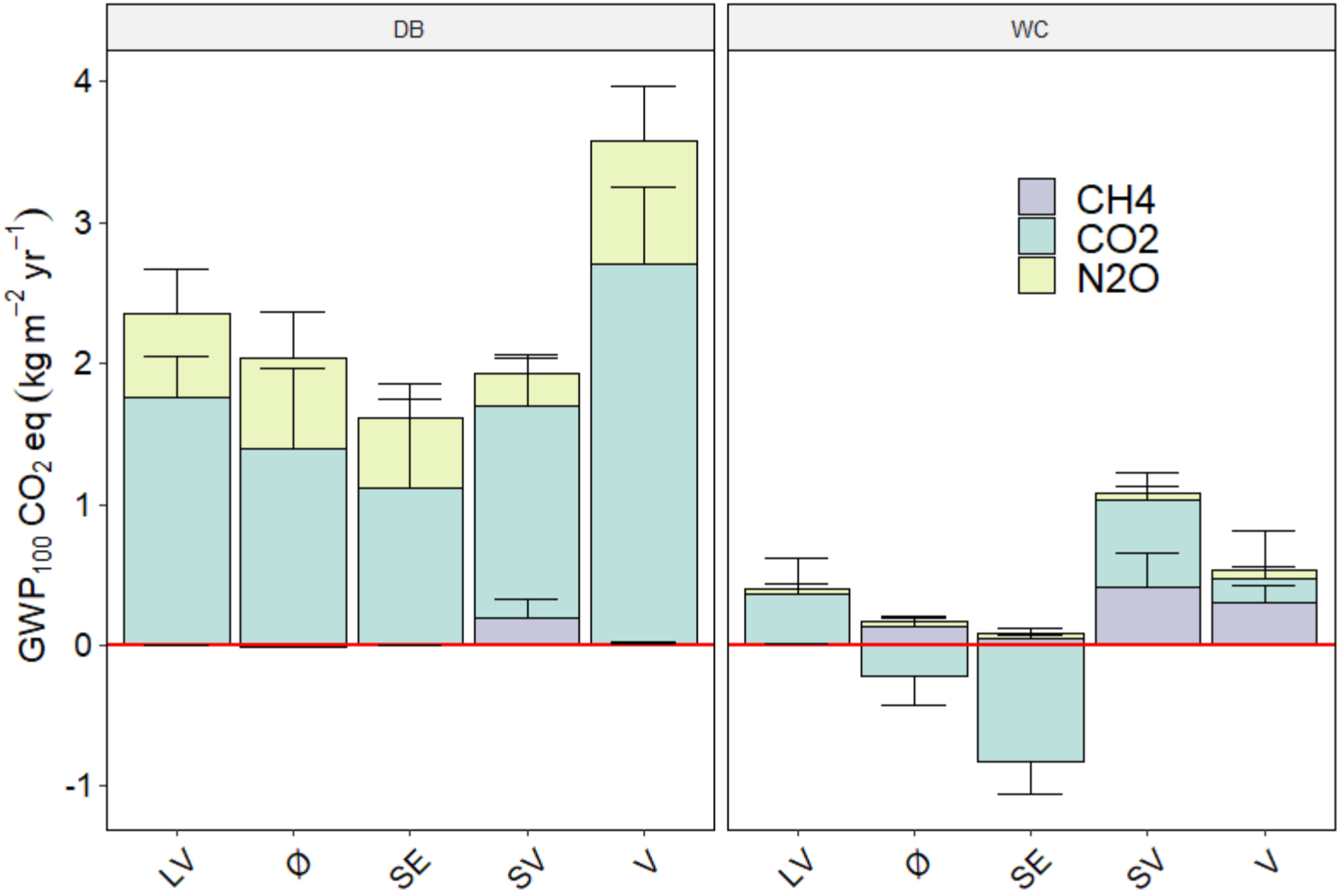
- Methane:
  - Overall increase (55 – 120%)

- Nitrous Oxide:
  - Negligible



GWP

- Reduction of GHG
  - 44 % (SV)
  - 83 % (LV)
  - 85 % (V)
  - 102 % (Ø)
  - 145 % (SE)



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KEY MESSAGES

#1: Rewetting alone (WB) reduced total CO_2eq ha^{-1} yr^{-1} from DB by 24 % - 64 %

#2: RCG cultivation reduced CO_2eq ha^{-1} yr^{-1} by 37 % - 127 % (44 % - 145%) compared to DB (and estimated: dry, cultivated)

#3: RCG paludiculture reduced CH_4 by on avg. 33 % as compared to WB

#4: Soils with low TC % and high Fe and S content (fens) emit more than bogs when drained, but can be C sinks with paludiculture

Site-specific differences in GHG dynamics for Danish peatlands:

Paludiculture promising to mitigate by min. 44% as compared to BAU

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