Effects of peatland drainage and warming on dissolved organic carbon quality and quantity

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Dissolved Export in Wetlands and Streams:

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I Change in porewater DOC with warming:

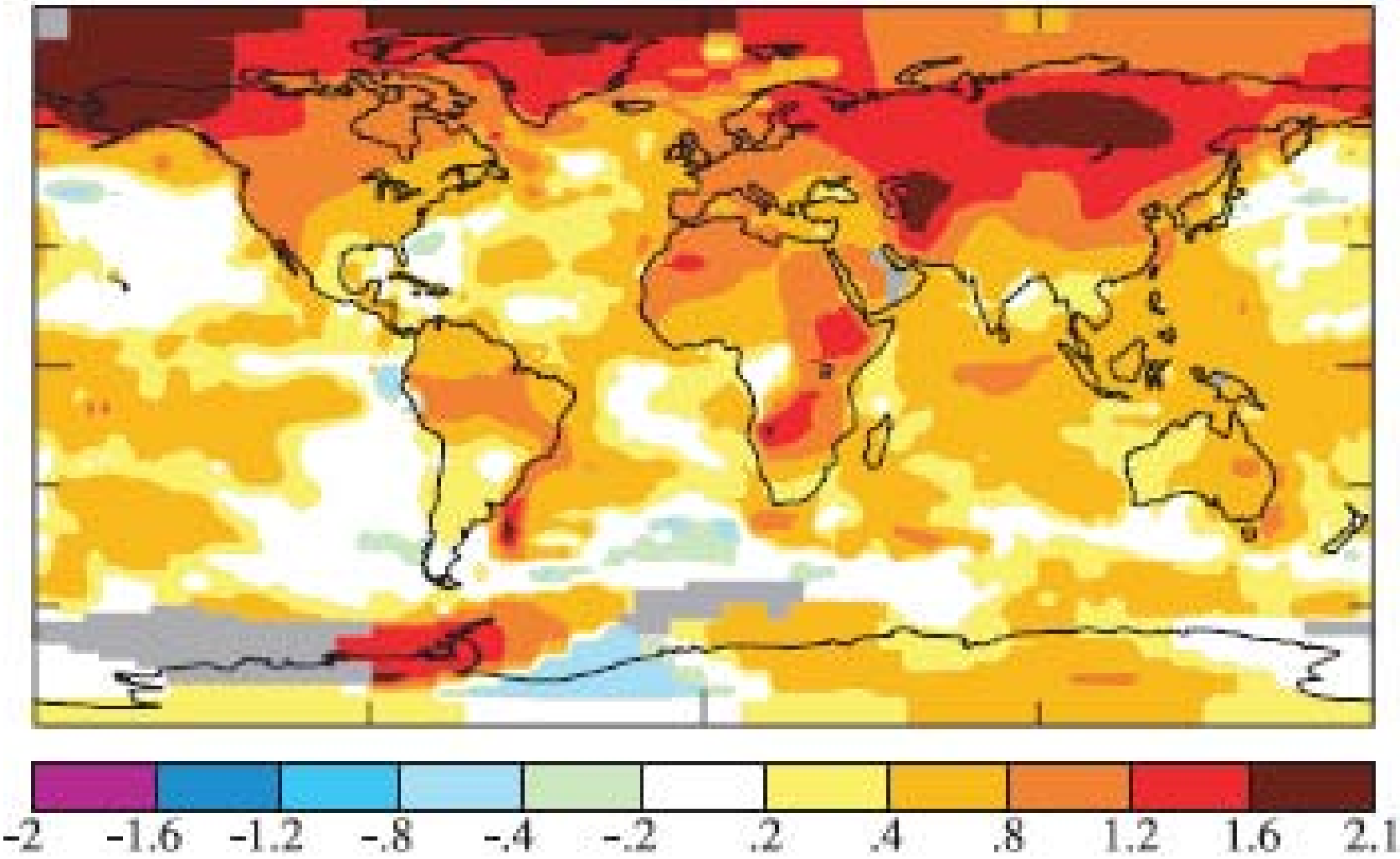
Warming experiment in a poor fen (MI)

II Change in porewater DOC with drainage:

Long-term drainage in a poor fen complex (MI)

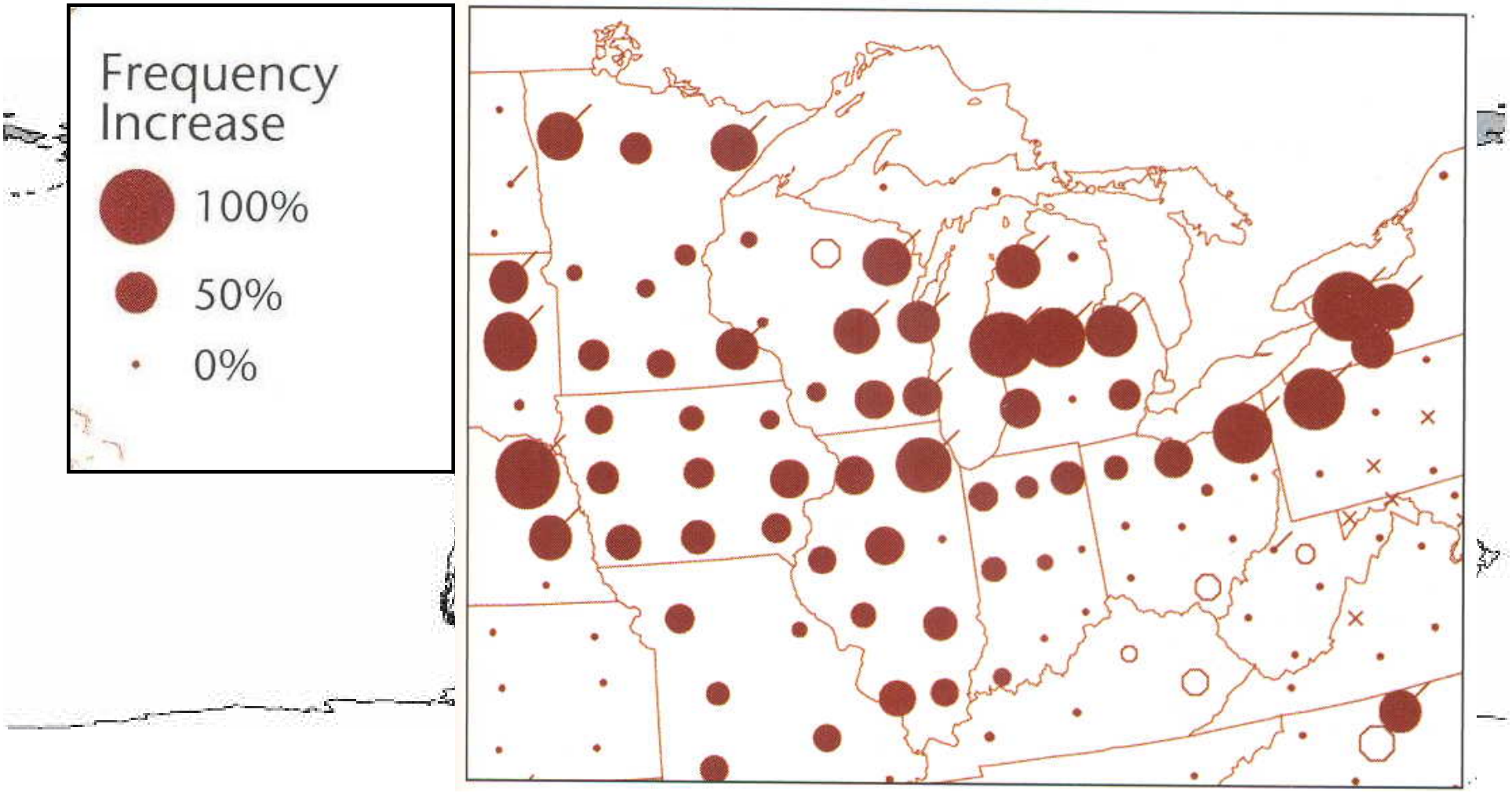
Experimental drainage in a rich fen (AK)

Mean Surface Temperature Anomaly (1951-1980)

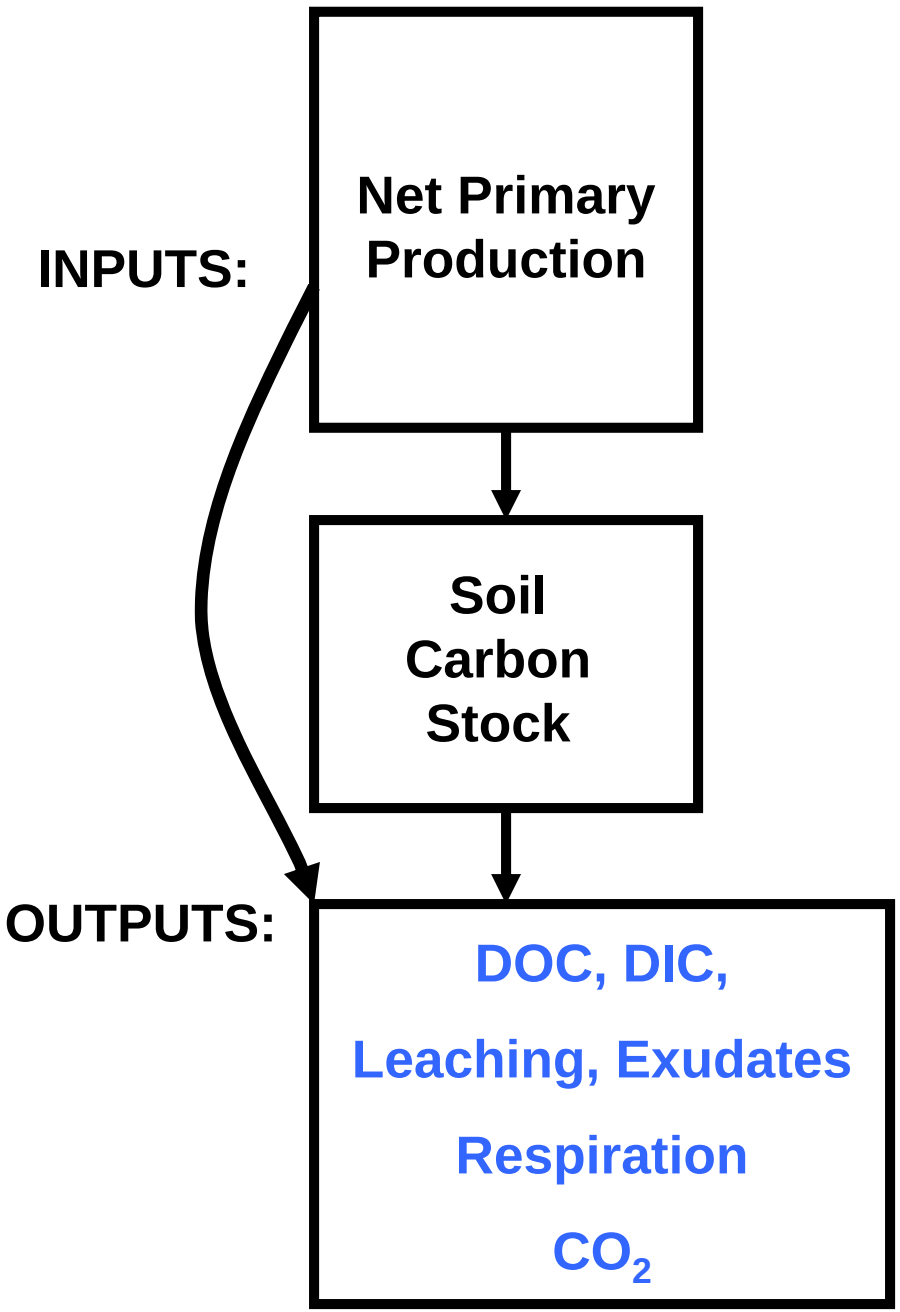


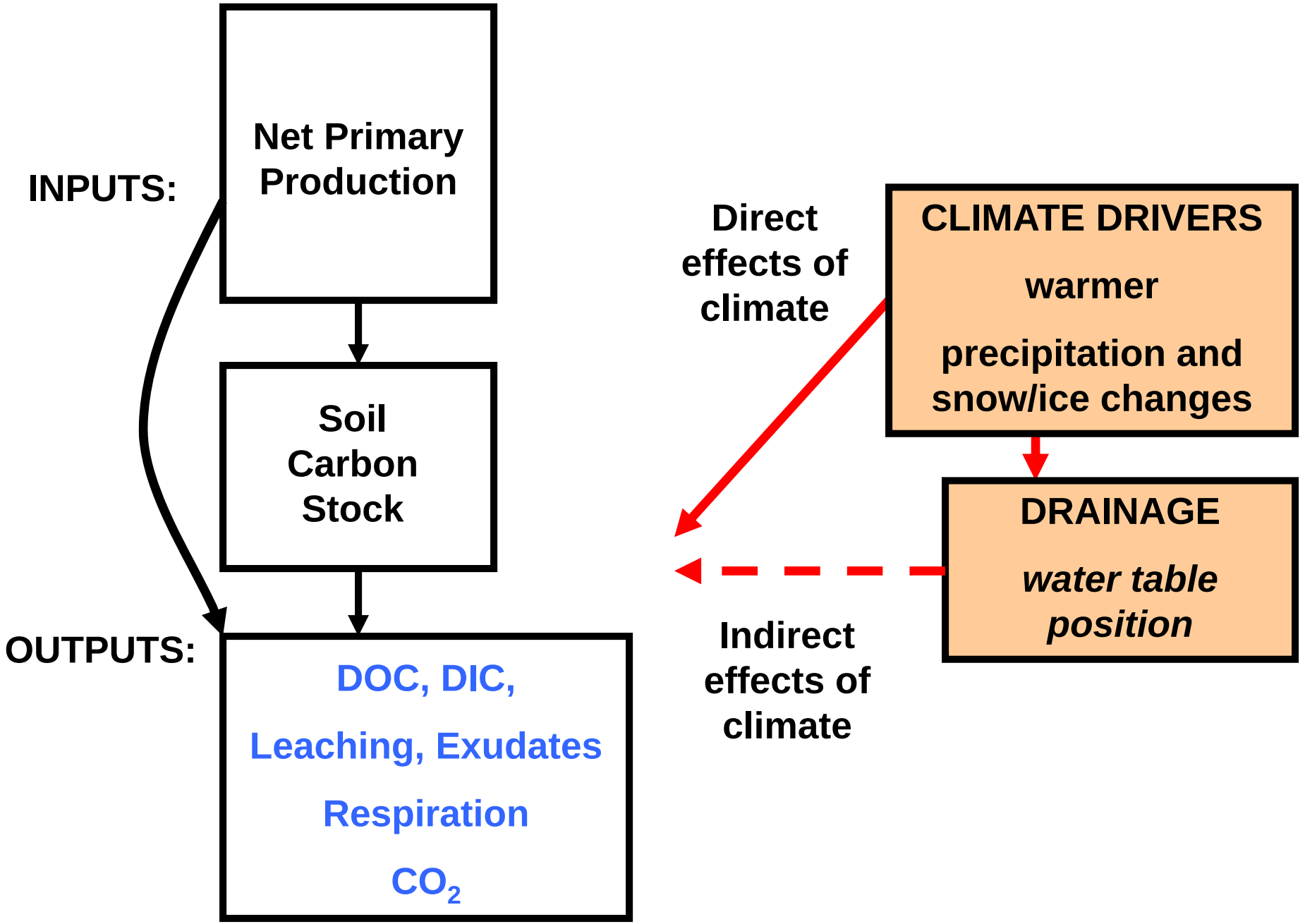
Hansen et al., 2006*. PNAS*

Changes in extreme precipitation over the last 30 years

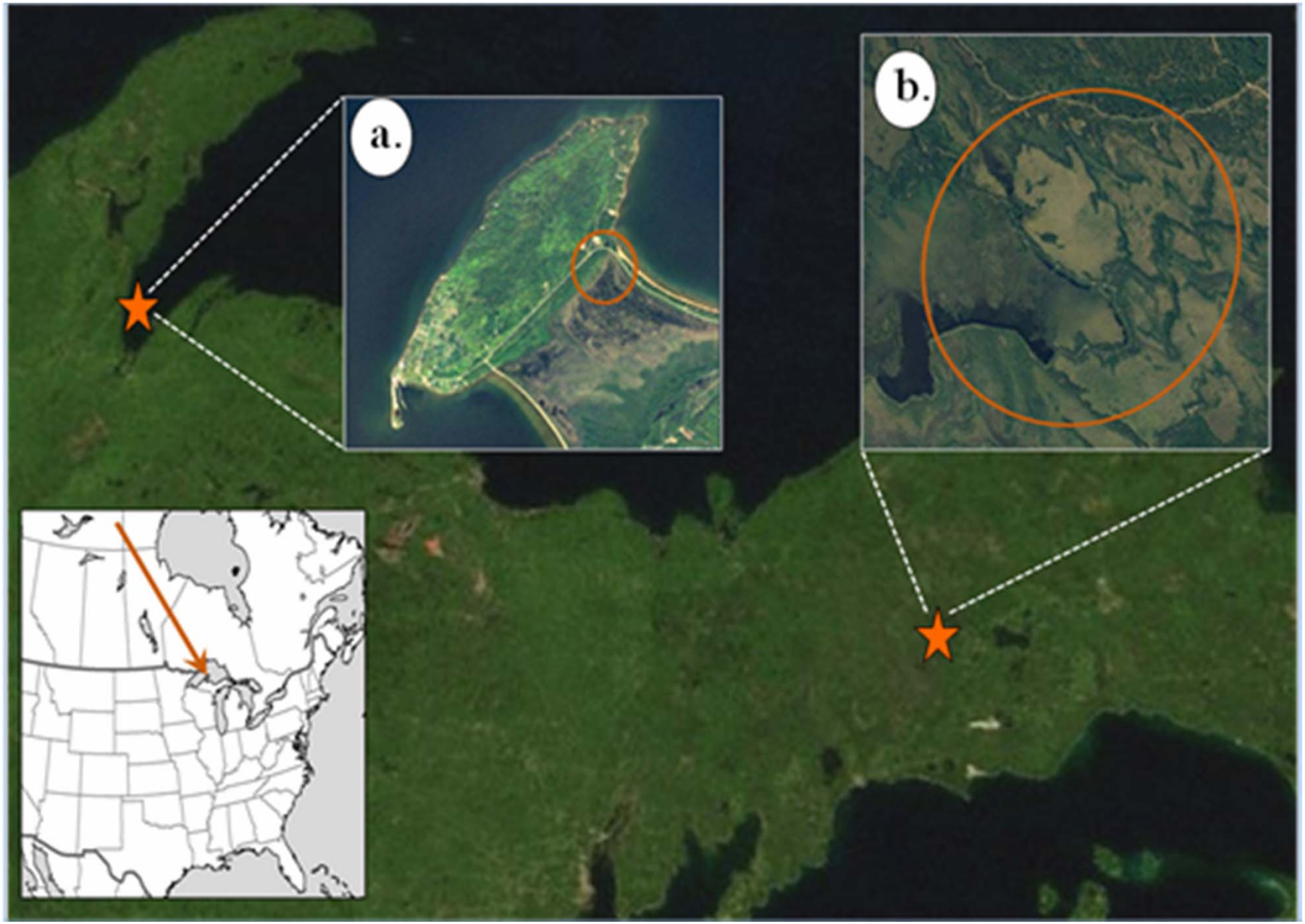


Kunkel et al. 1999, and Groisman et al., 2005*. Journal of Climate*

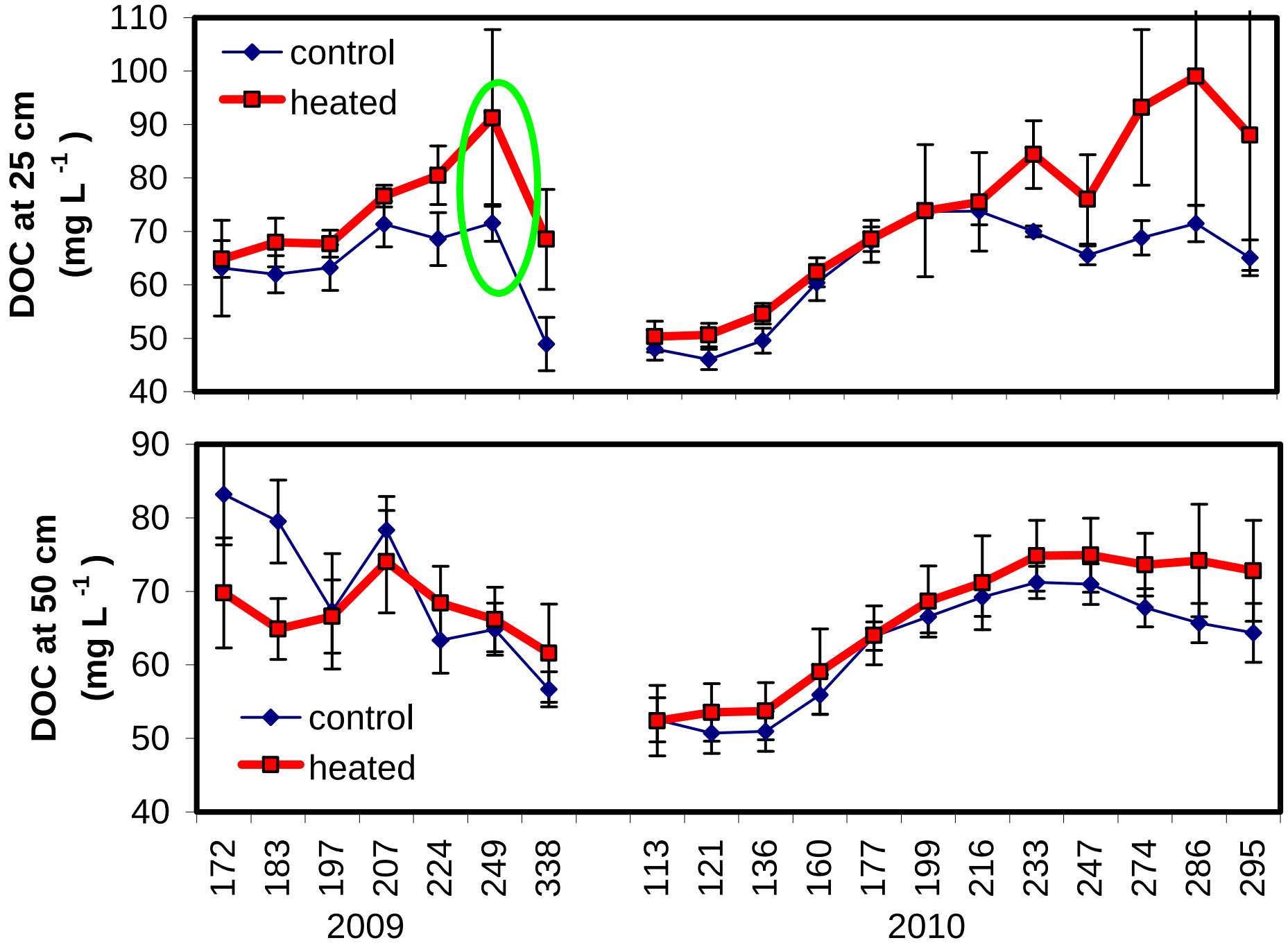

INPUTS:
Net Primary Production
Soil Carbon Stock
OUTPUTS:
DOC, DIC,
Leaching, Exudates
Respiration
CO_2

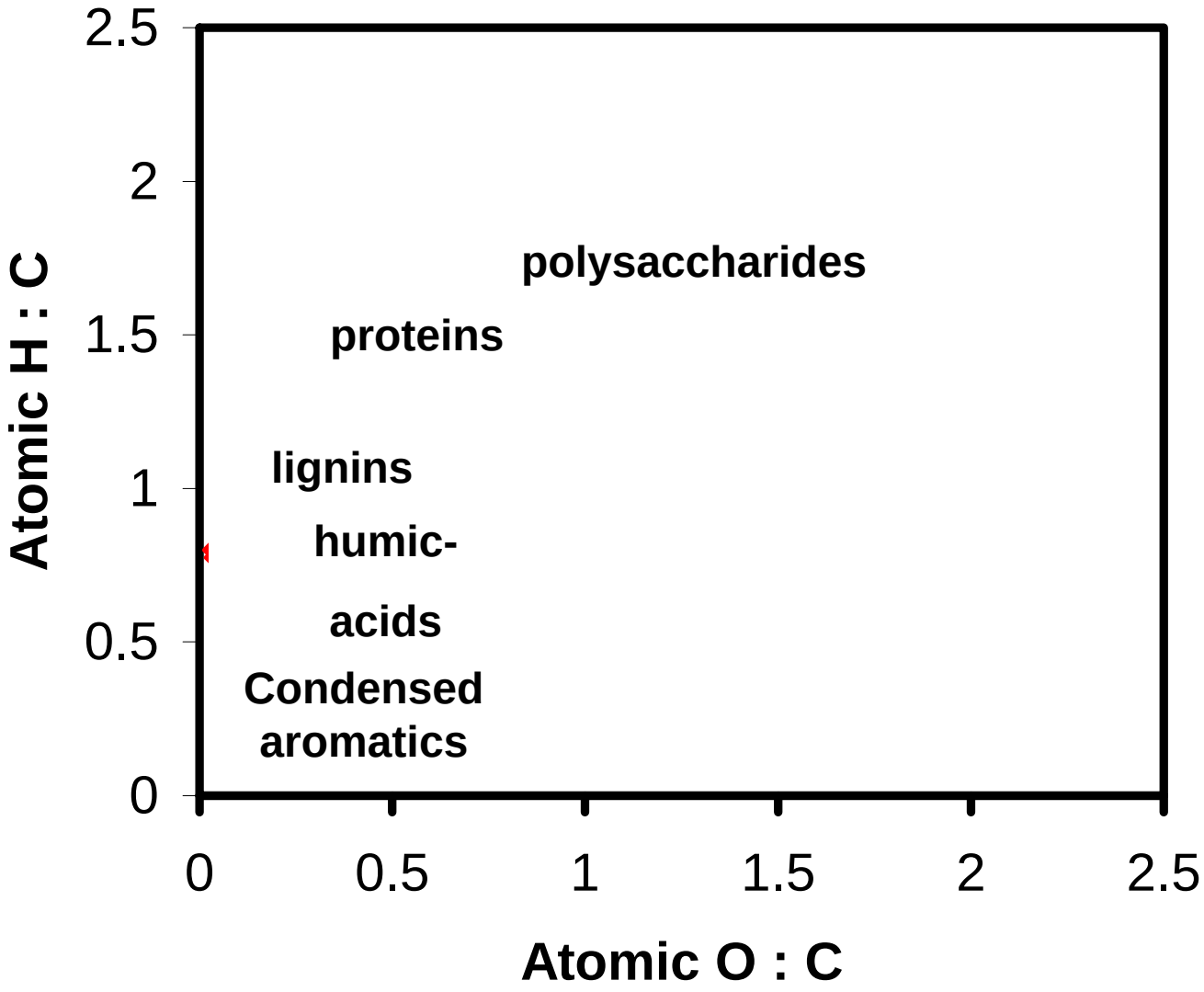

INPUTS:
Net Primary Production
Soil Carbon Stock
OUTPUTS:
DOC, DIC,
Leaching, Exudates
Respiration
CO_2
Direct effects of climate
CLIMATE DRIVERS
warmer
precipitation and snow/ice changes
DRAINAGE
water table position
Indirect effects of climate

Change in dissolved organic carbon with warming and drainage

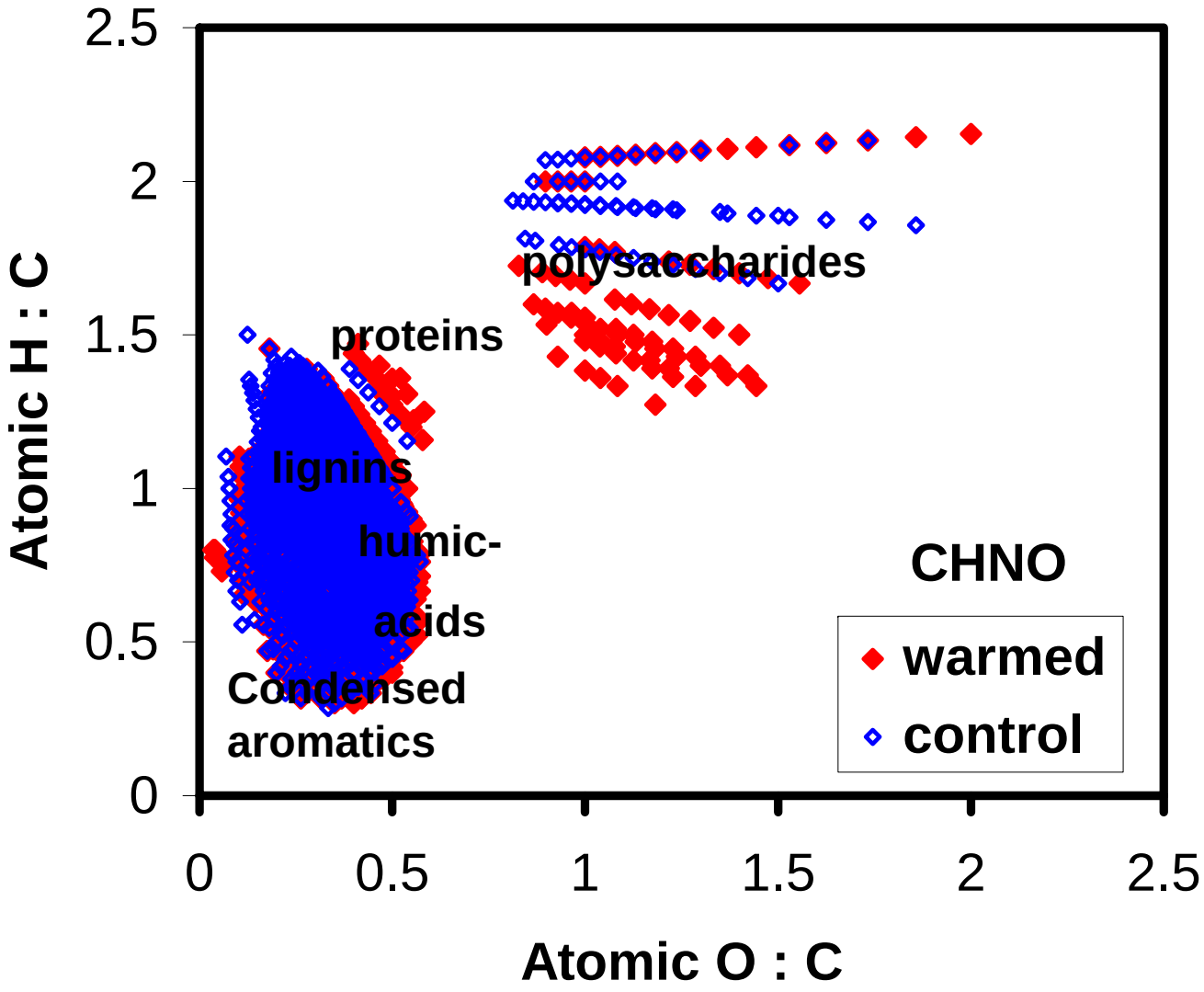


Change in dissolved organic carbon with warming

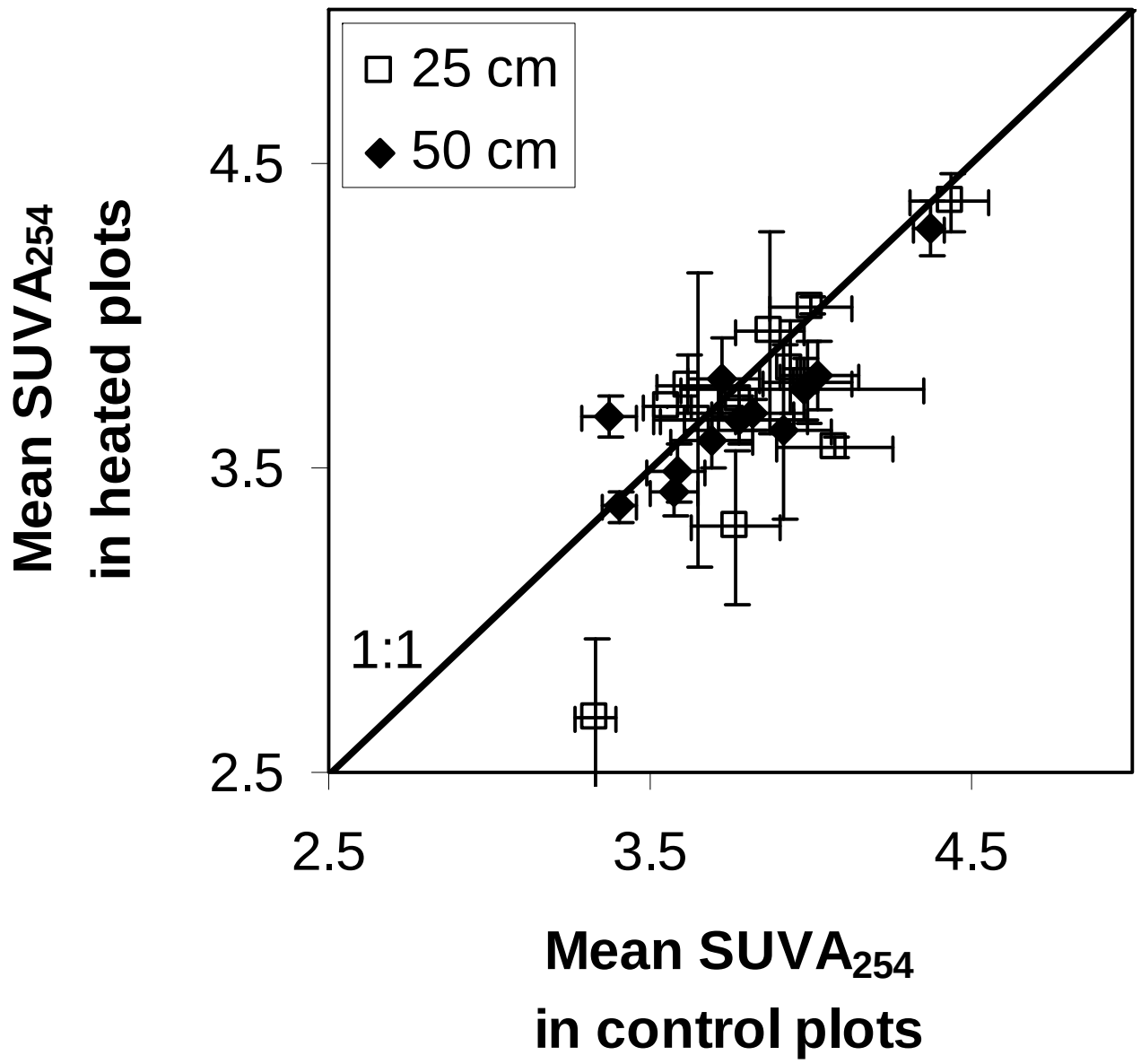

DOC at 25 cm (mg L-1)
110
100
90
80
70
60
50
40
control
heated
DOC at 50 cm (mg L-1)
90
80
70
60
50
40
control
heated
172
183
197
207
224
249
338
113
121
136
160
177
199
216
233
247
274
286
295
2009
2010



Kane, Mazzoleni, Kratz, Hribljan, Johnson, Pypker, and Chimner. *In prep.*

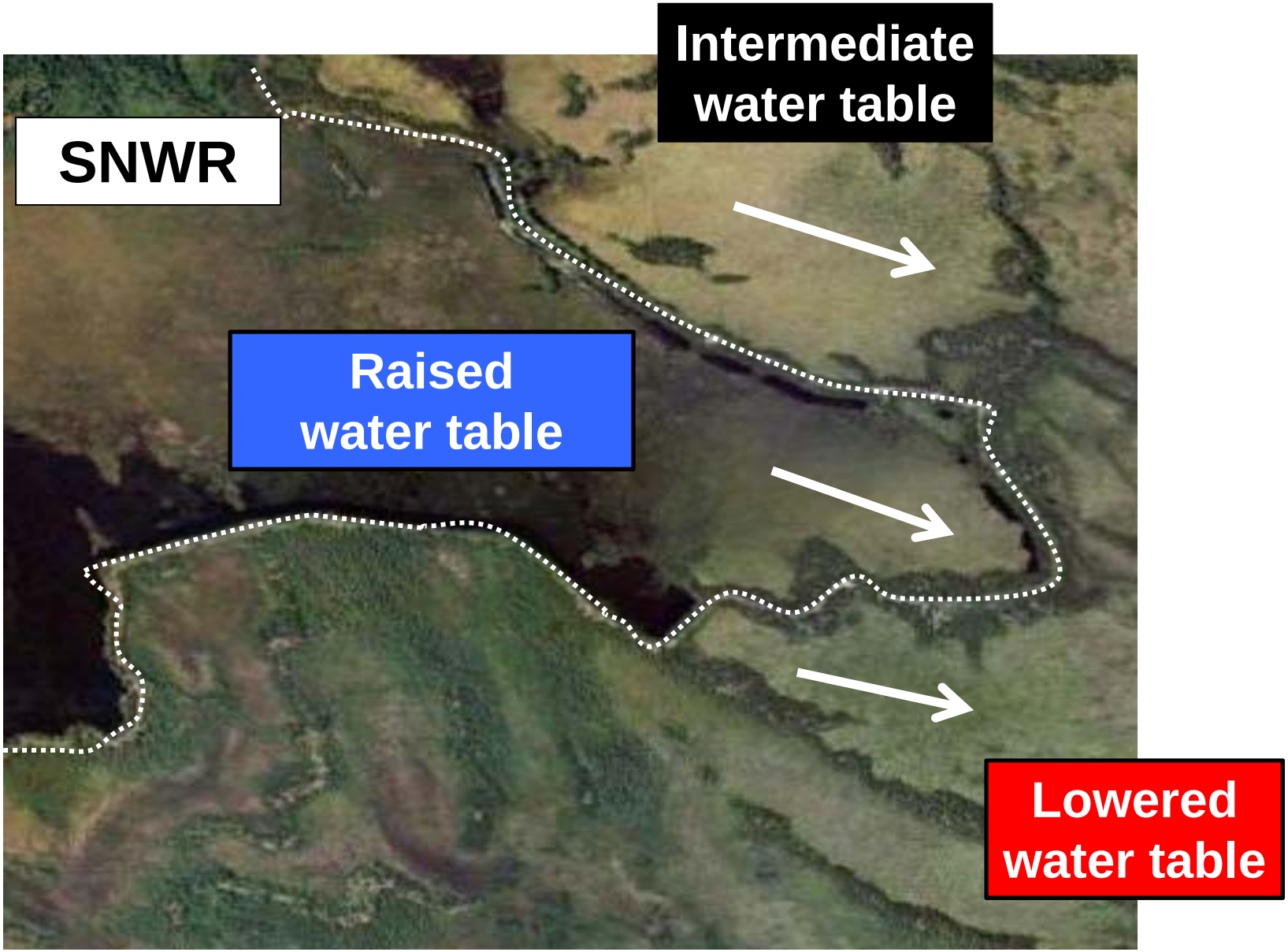


Kane, Mazzoleni, Kratz, Hribljan, Johnson, Pypker, and Chimner. *In prep.*



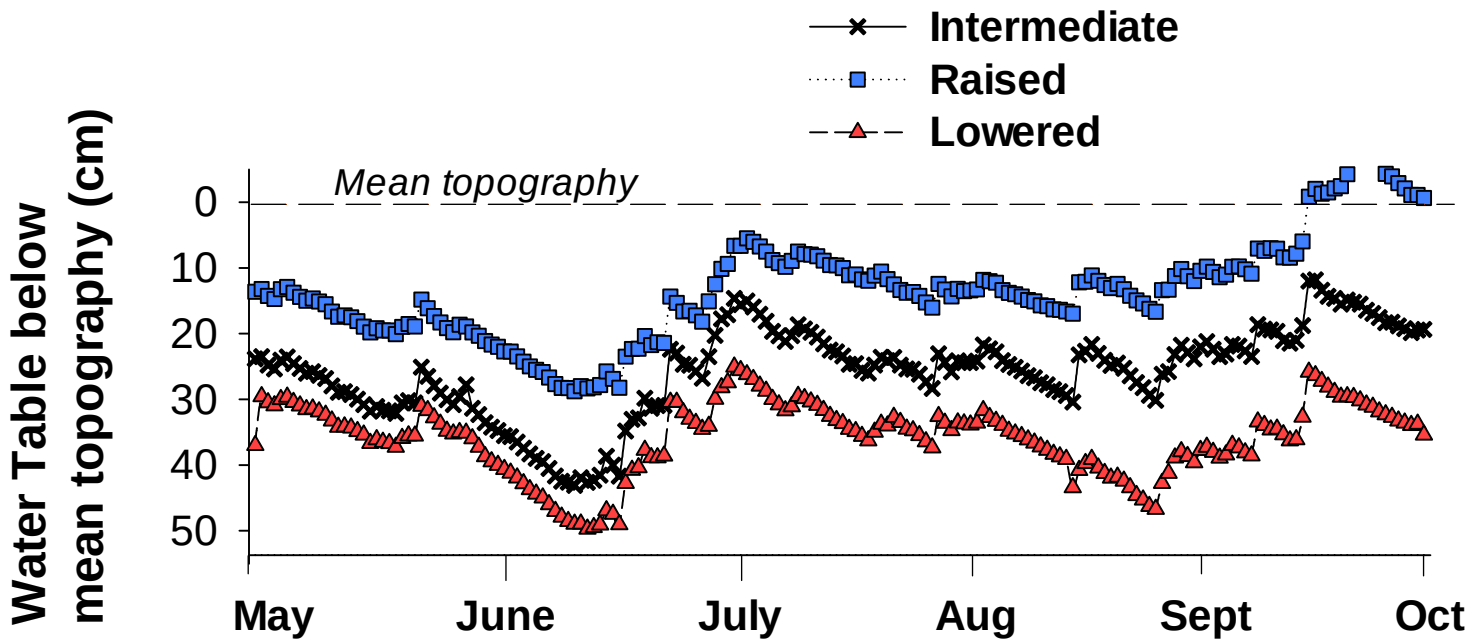
Kane, Mazzoleni, Kratz, Hribljan, Johnson, Pypker, and Chimner. *In prep.*

Change in DOC with altered hydrology



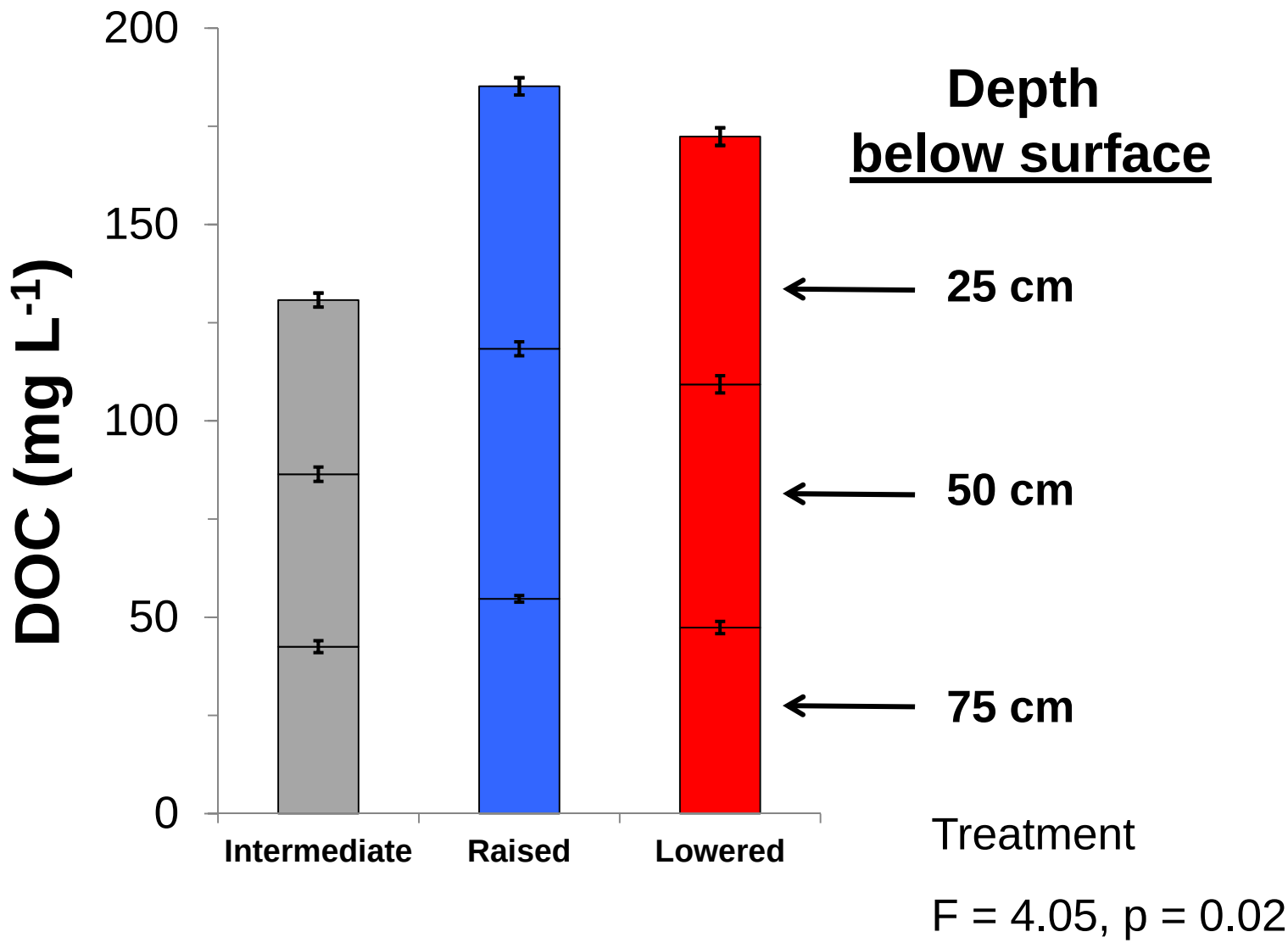
Hribljan, Kane, Turetsky, and Chimner. *In prep.*

Change in DOC with altered hydrology



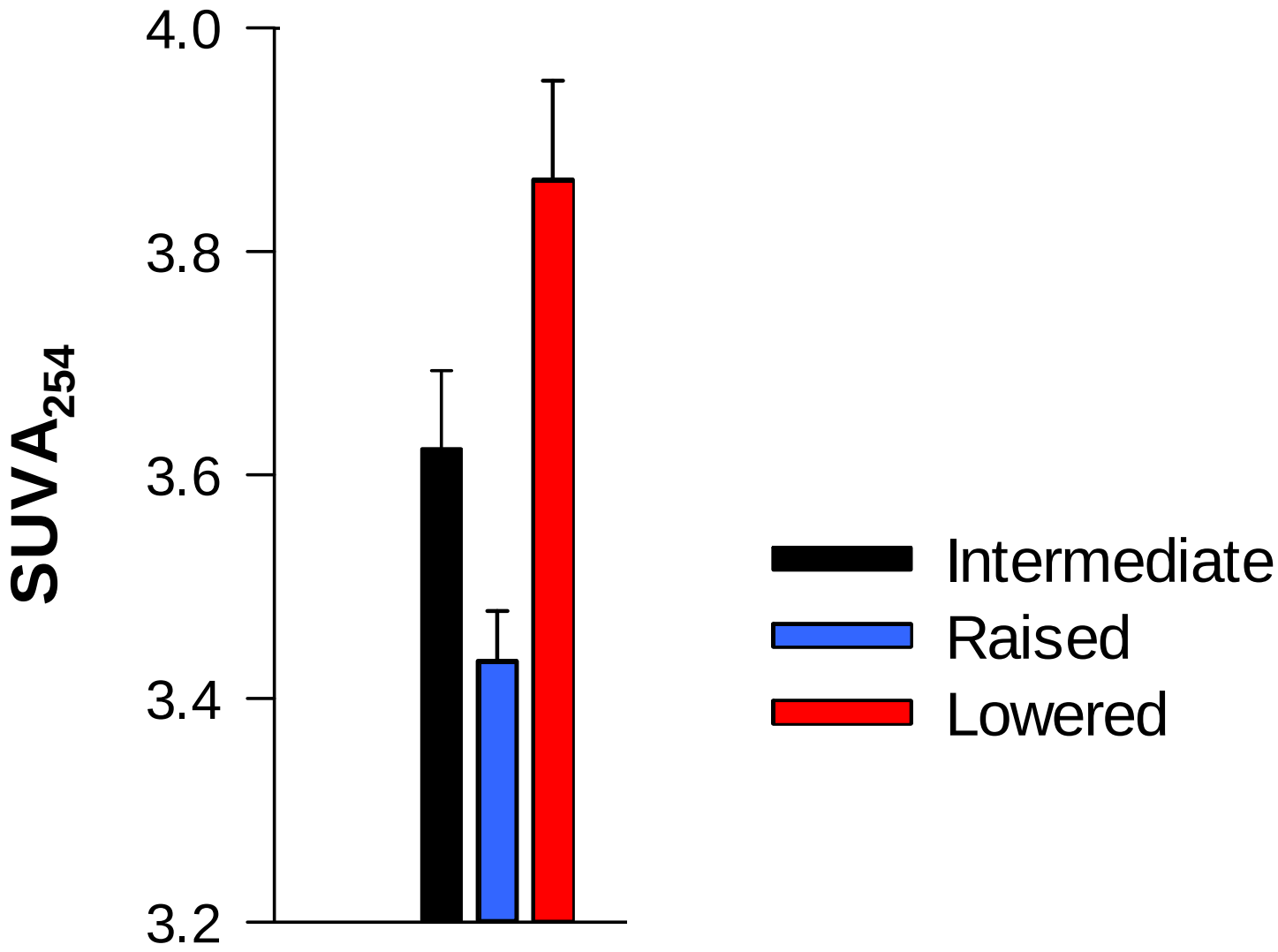
Hribljan, Kane, Turetsky, and Chimner. *In prep.*

Change in DOC with altered hydrology



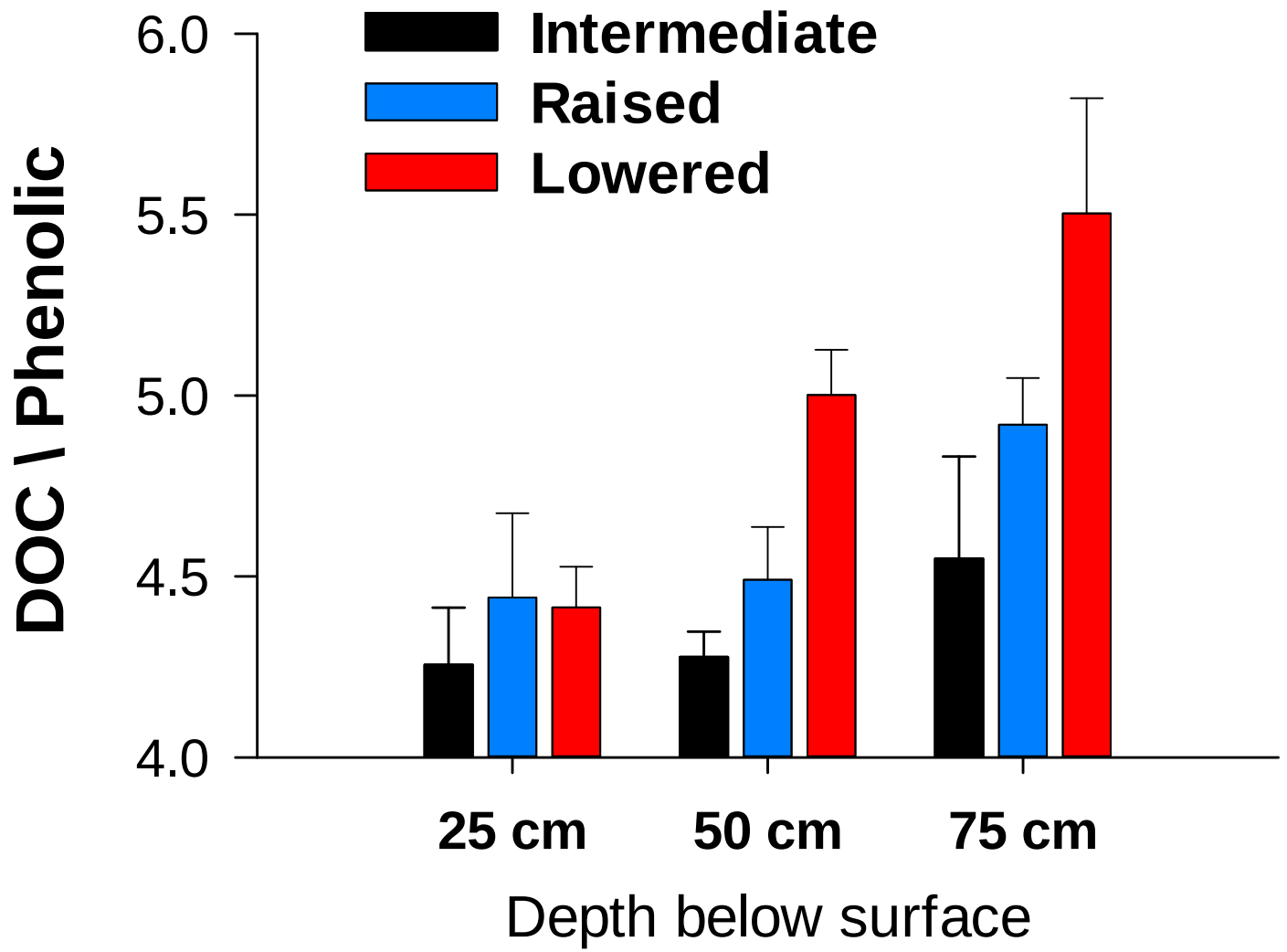
Hribljan, Kane, Turetsky, and Chimner. *In prep.*

Change in DOC with altered hydrology



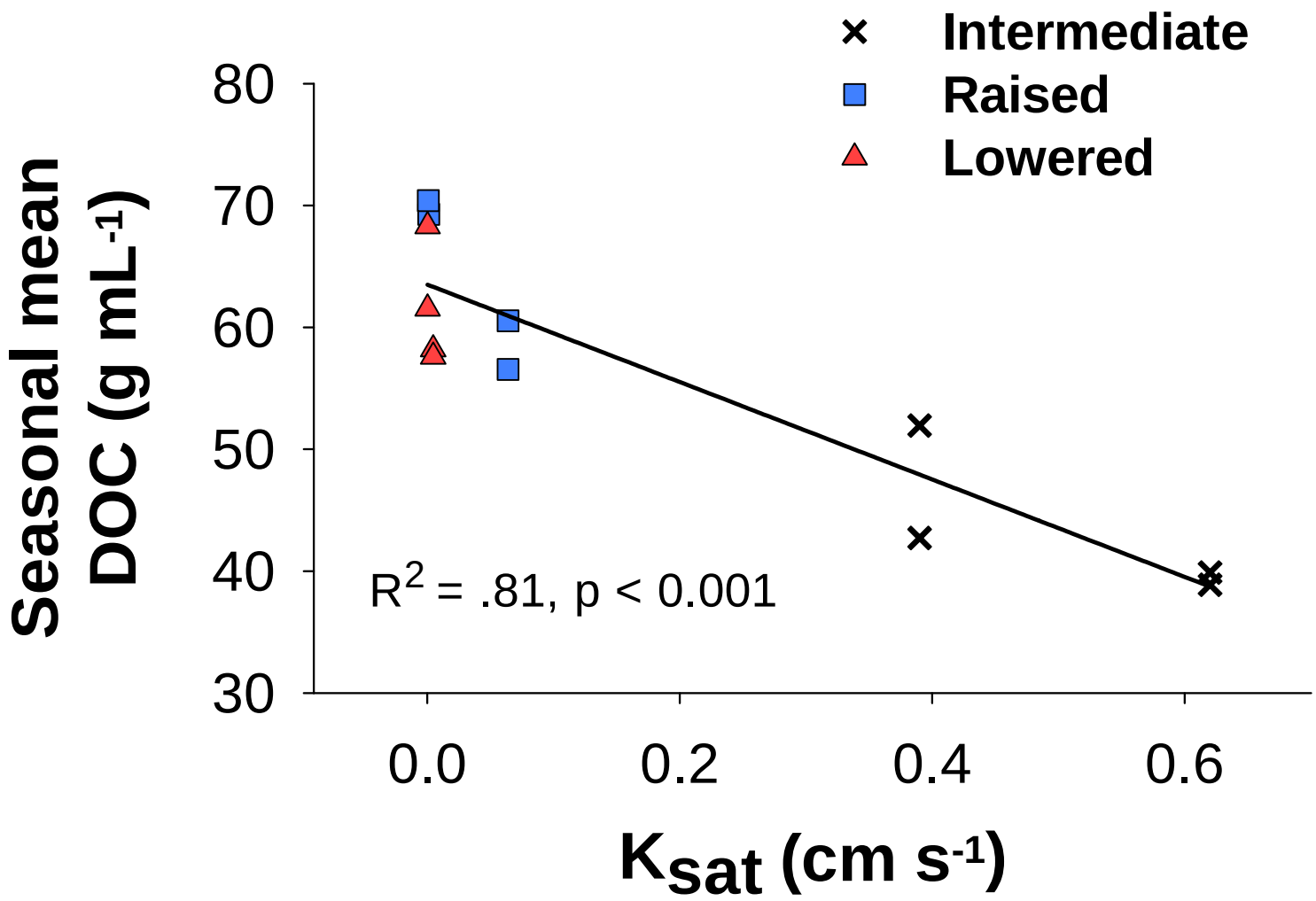
Hribljan, Kane, Turetsky, and Chimner. *In prep.*

Change in DOC with altered hydrology



Hribljan, Kane, Turetsky, and Chimner. *In prep.*

Change in DOC with altered hydrology



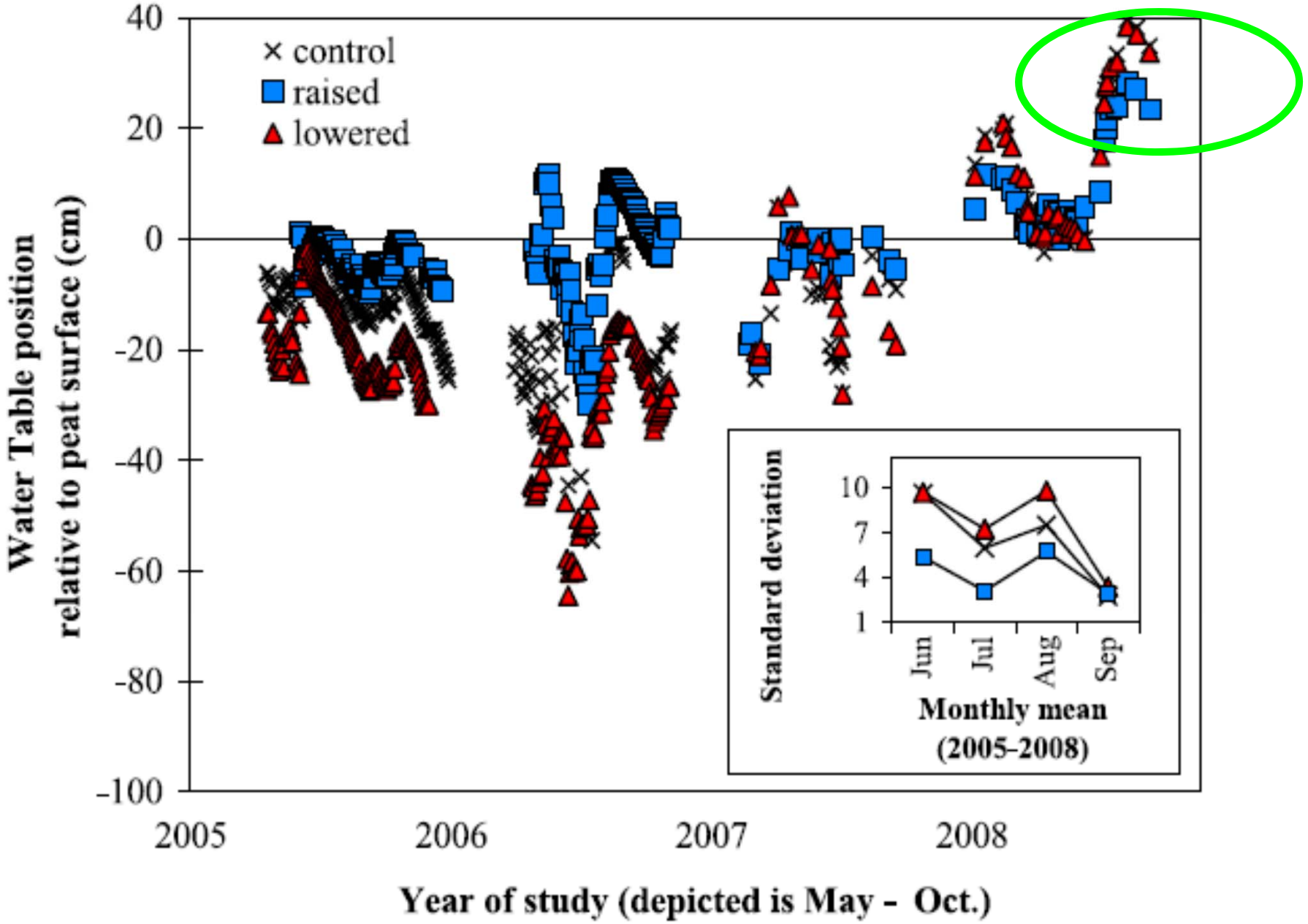
Hribljan, Kane, Turetsky, and Chimner. *In prep.*

The Alaska Peatland Experiment (APEX)

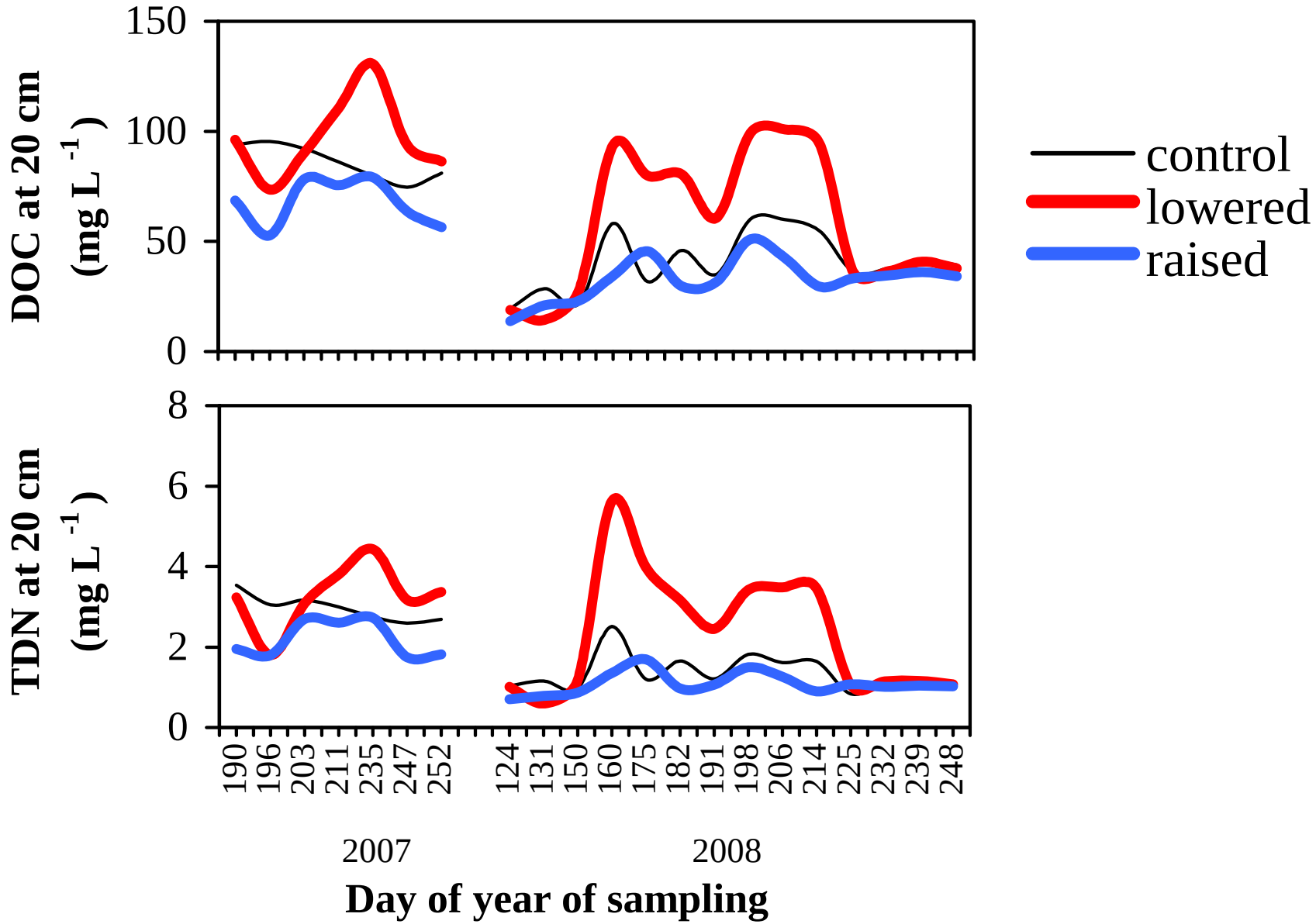
Raised

Drained

Control



Kane et al., 2010. *Journal of Geophysical Research-Biogeoscience*



Kane et al., 2010. *Journal of Geophysical Research-Biogeoscience*

Changes in algal production-

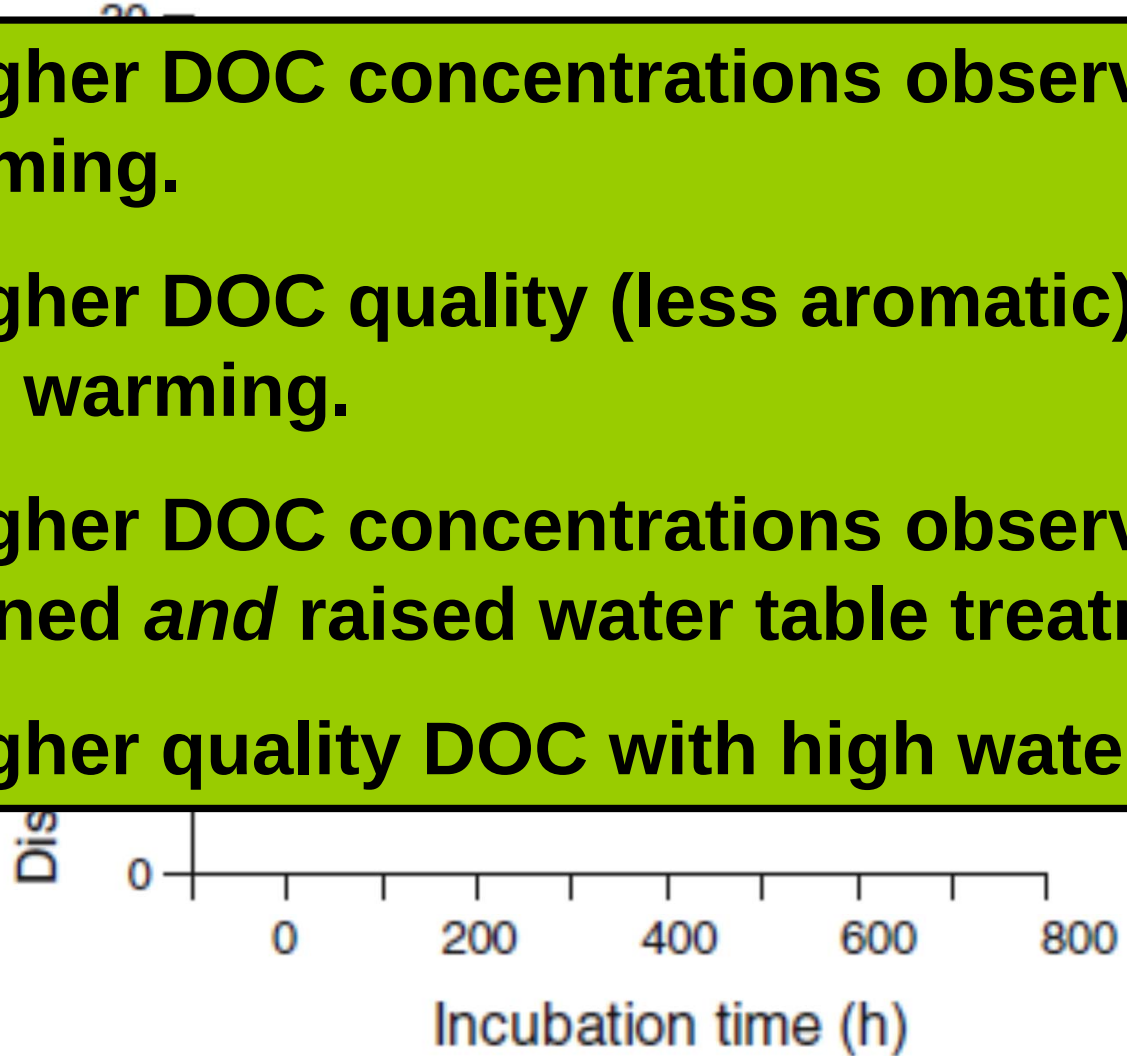
Consequences for anaerobic metabolism?

*** Higher DOC concentrations observed with warming.**

*** Higher DOC quality (less aromatic) observed with warming.**

*** Higher DOC concentrations observed in both drained *and* raised water table treatments-**

*** Higher quality DOC with high water table.**



Wyatt, Turetsky, Rober, Giroldo, Kane, and Stevenson. 2011. *Oecologia*


Tanana Flats, AK

Thanks!

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