



*Supplement of*

**Methane oxidation in the waters of a humic-rich boreal lake stimulated by photosynthesis, nitrite, Fe(III) and humics**

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2 **Table S1. Specifics of the CARD-FISH probes applied.**

Probe	Specificity	% Formamide in hybridization buffer	Probe sequence (5'-3')	Publication
ANME-1-350	ANME-1	40%	AGT TTT CGC GCC TGATGC	(Boetius et al., 2000)
ANME-2-538	ANME-2	40%	GGC TAC CAC TCG GGC CGC	(Treude et al., 2005)
EUB338 I-III	Most bacteria	35%	GCT GCC TCC CGT AGG AGT GCA GCC ACC CGT AGG TGT GCT GCC ACC CGT AGG TGT	(Daims et al., 1999)
Ma450	Alpha-MOB	20%	ATC CAG GTA CCG TCA TTA TC	(Eller and Frenzel, 2001)
Mgamma84	Gamma-MOB	20%	CCA CTC GTC AGC GCC CGA	(Eller and Frenzel, 2001)
Mgamma705			CTG GTG TTC CTT CAG ATC	
NON338	Negative control	35%	ACT CCT ACG GGA GGC AGC	(Wallner et al., 1993)

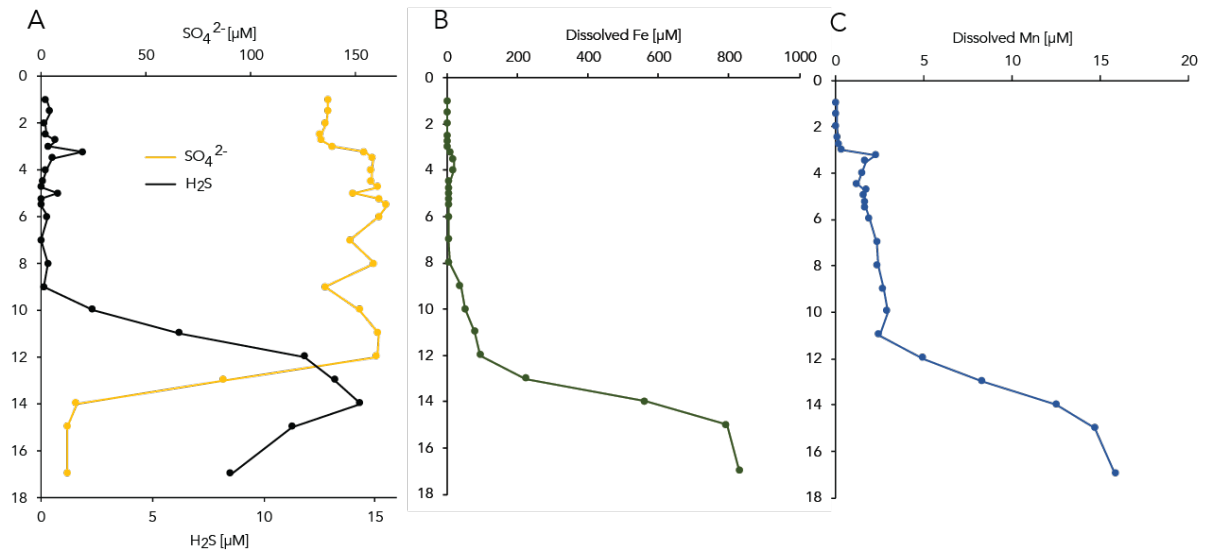
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4 **Table S2. Experimental setups to quantify methane oxidation potential and the influence of**  
5 **different electron acceptors on methane oxidation.**

Setup	Stock solution	Treatment	Conditions	Depths
dark	--	--	dark	3, 4, 5, 7 & 9 m
nitrate	5 mM 100 at.% $^{15}\text{NO}_3^-$	40 $\mu\text{M}$	dark	
nitrite	5 mM 100 at.% $^{15}\text{NO}_2^-$	20 $\mu\text{M}$	dark	
AQDS <sup>1</sup>	10 g l <sup>-1</sup> AQDS	44 mg l <sup>-1</sup>	dark	
light	--	--	light	3, 4 & 5 m
oxygen	saturated O <sub>2</sub> solution	15 $\mu\text{M}$	dark	
Humics <sup>2</sup>	2 g l <sup>-1</sup> LHA	125 mg l <sup>-1</sup>	dark	5, 7 & 9 m
Fe(III)	100 mM ferrihydrite suspension <sup>3</sup>	100 $\mu\text{M}$	dark	
Mn(IV)	100 mM birnessite suspension <sup>4</sup>	100 $\mu\text{M}$	dark	

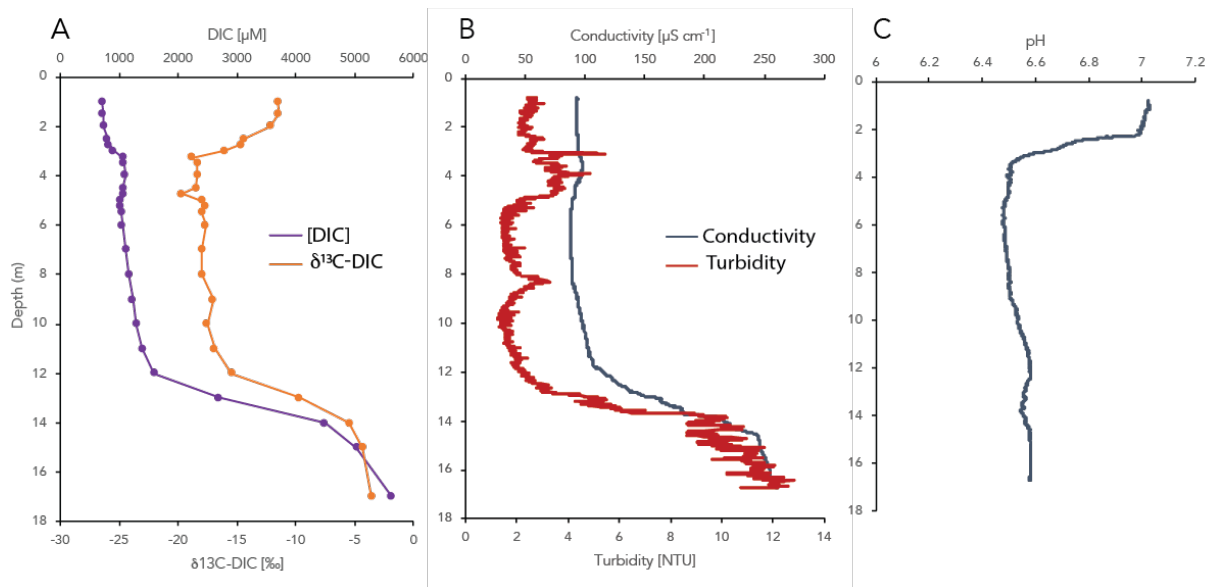
6 <sup>1</sup>AQDS: anthraquinone-2,6-disulfonate (J&K Scientific)7 <sup>2</sup>Leonardite Humic Acid Standard (purchased from the International Humic Substances Society)8 <sup>3</sup>ferrihydrite was synthesized according to Cornell and Schwertmann (Cornell and Schwertmann, 2003)9 <sup>4</sup>birnessite was synthesized according to Golden et al. (Golden et al., 1987)

10 **Fig. S1.** Profiles of sulfate, sulfide (A), dissolved iron (B) and manganese (C) in the Lake Lovojärvi  
11 water column.



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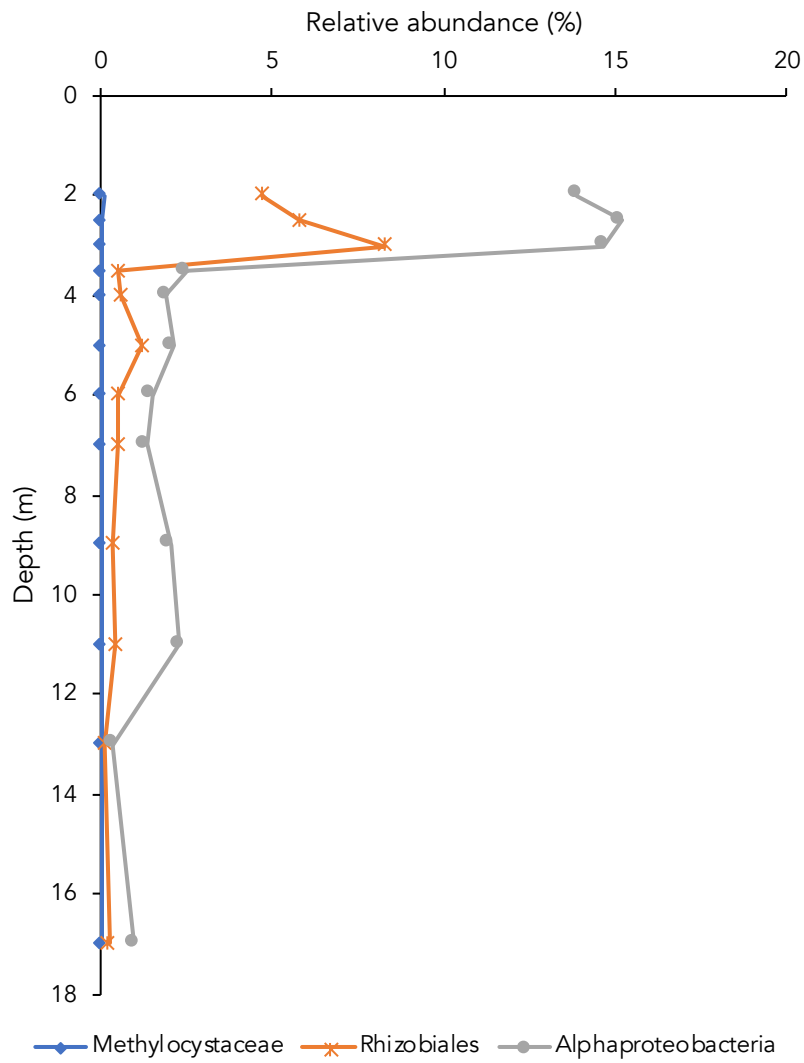
13 **Fig. S2.** Depth profiles of (A) DIC and  $\delta^{13}\text{C}$ -DIC, (B) conductivity and turbidity and (C) pH. DIC –  
14 Dissolved inorganic carbon.



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17 **Fig. S3.** Relative abundance of Alphaproteobacteria, Rhizobiales and *Methylocystaceae* reads  
18 according to 16S rRNA sequencing.



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