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*Supplement of*

## **Seasonal methane accumulation and release from a gas emission site in the central North Sea**

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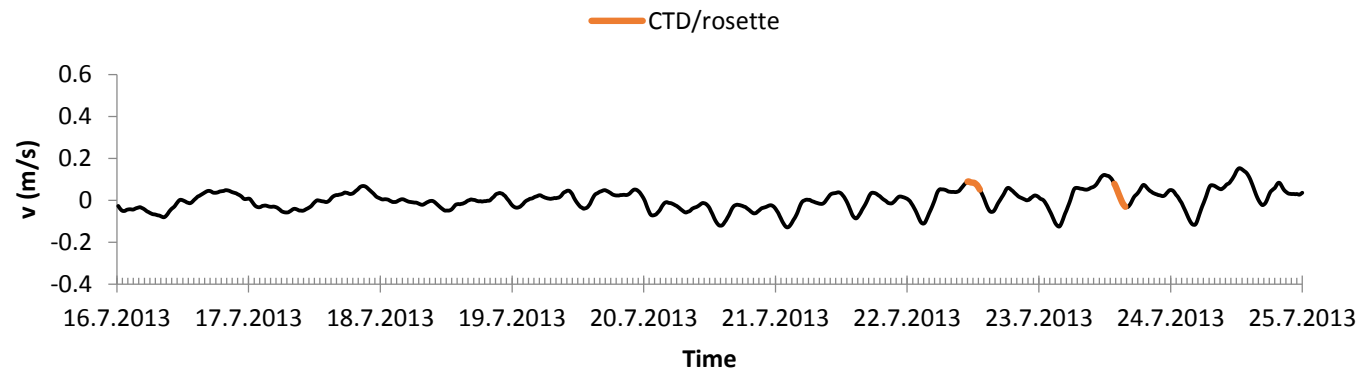
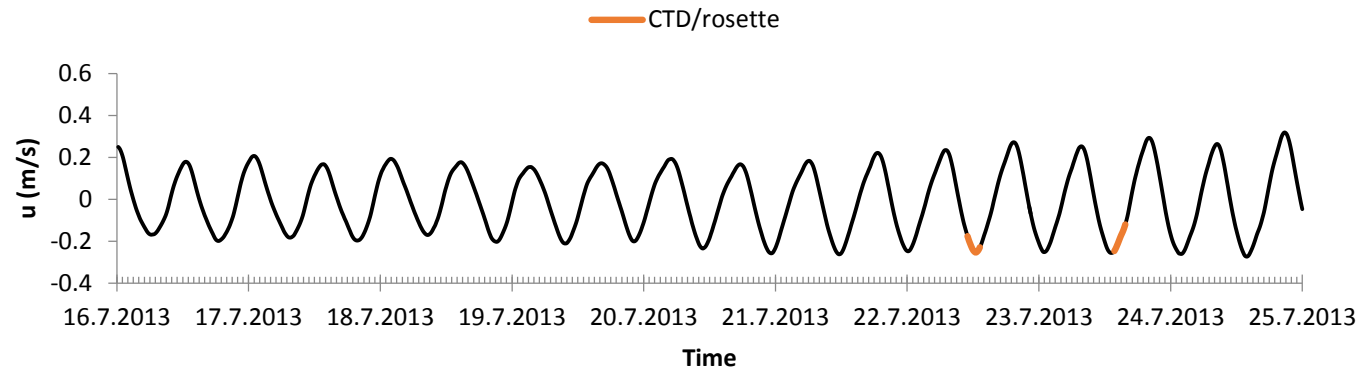
## Supplement Fig. S1

The MOx values were corrected for differences between in situ and incubation temperatures using a temperature coefficient  $Q_{10}$  of 1.6 (unpublished data of a North Sea sample) and Eq. 1:

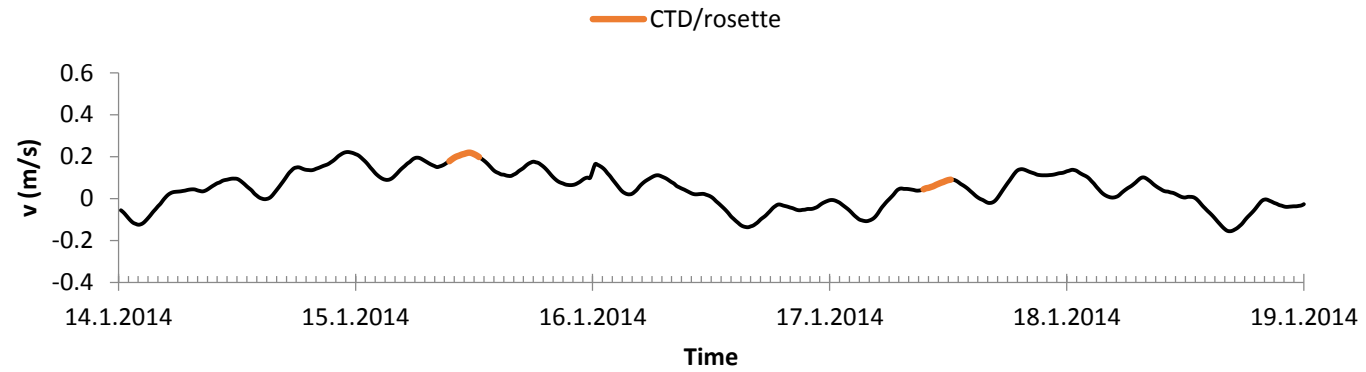
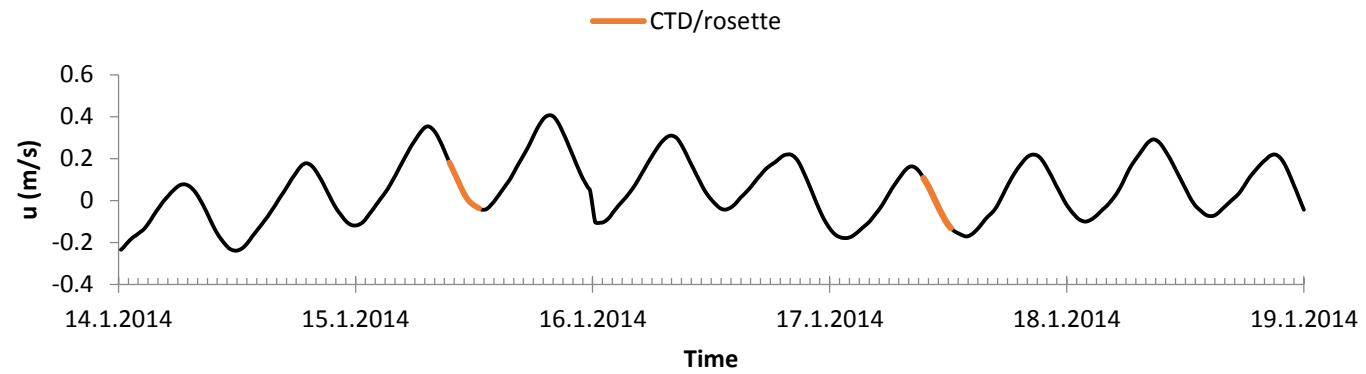
$$Q_{10} = \left( \frac{R_2}{R_1} \right)^{\left( \frac{10}{T_2 - T_1} \right)}$$

(1)

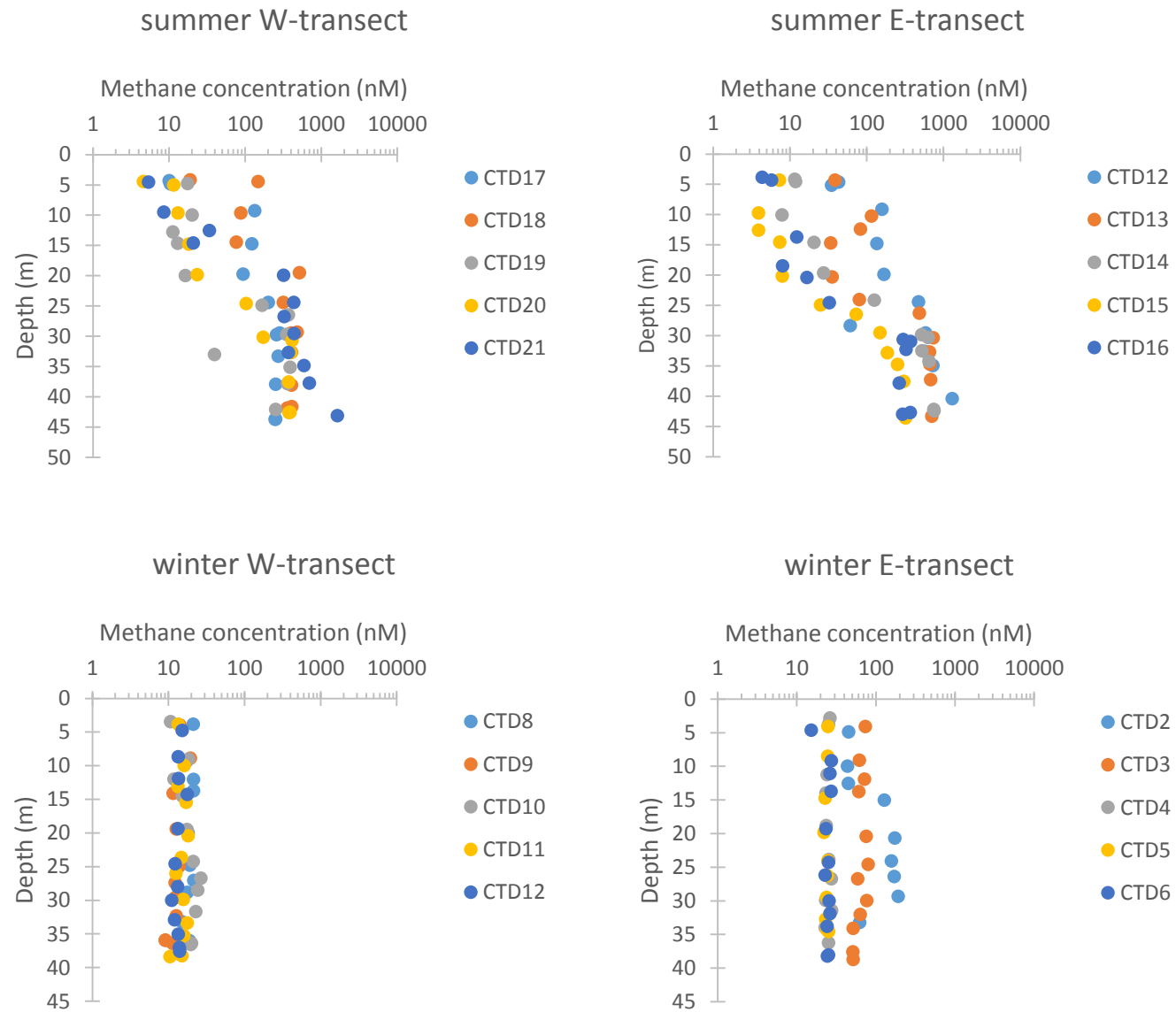
where  $R_1$  is the reaction rate measured at temperature  $T_1$  and  $R_2$  the rate measured at temperature  $T_2$  ( $T_1 < T_2$ ). Due to the temperature differences the measured rates are 11-16% higher or lower than in situ rates depending if the incubation temperature was higher or lower than the in situ temperature.



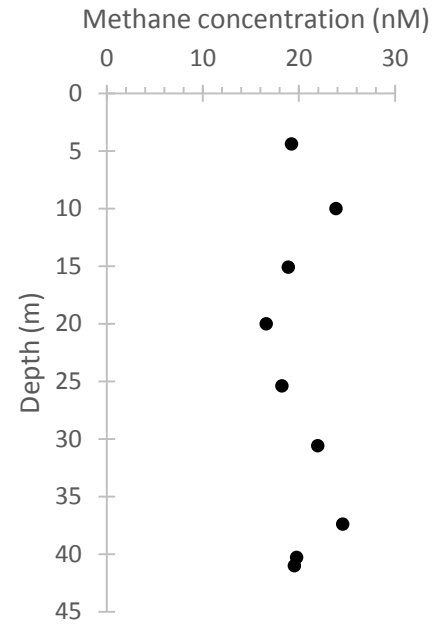
Supplement Fig. S2: Modelled east-west ( $u$ ) and north-south ( $v$ ) component of current vector during deployment of CTD/rosette in summer.



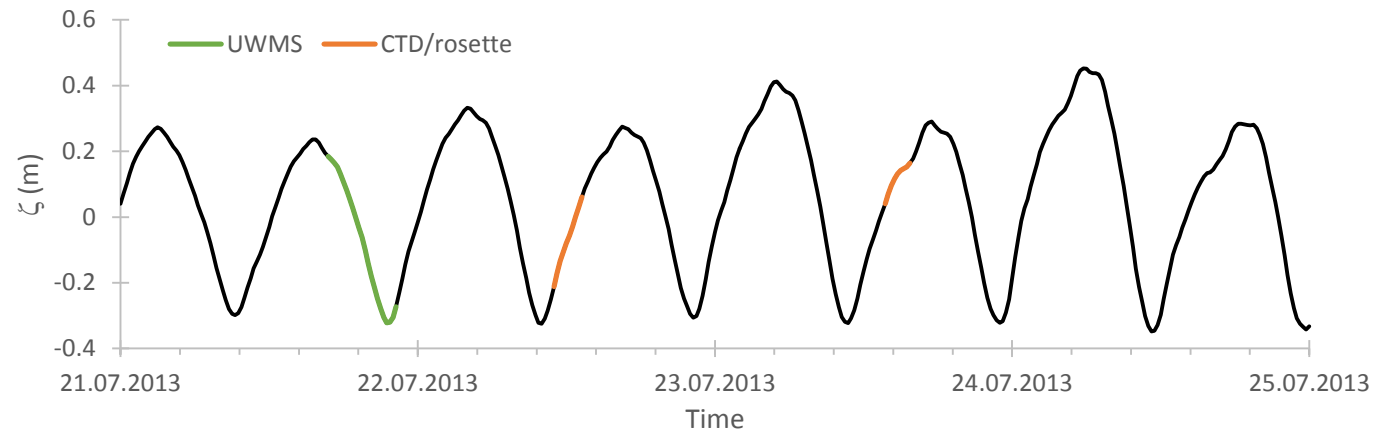
Supplement Fig. S3: Modelled east-west (u) and north-south (v) component of current vector during deployment of CTD/rosette in winter.



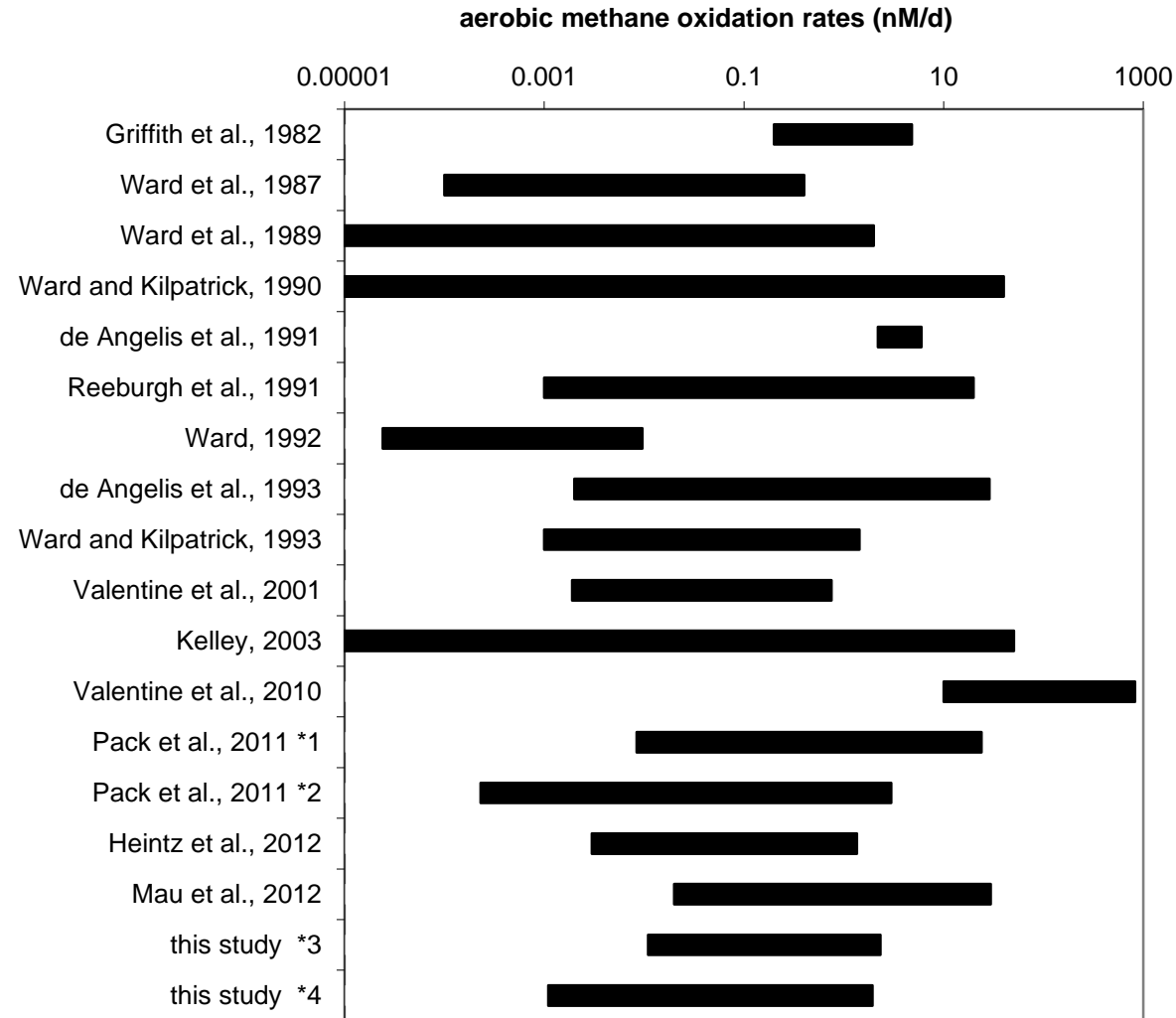
Supplement Fig. S4: Depth profiles of methane concentrations on a log-scale. Methane concentrations were measured on discrete water samples.



Supplement Fig. S5: Methane concentrations measured at reference station located 55°18.35' N and 4°05.44' E.

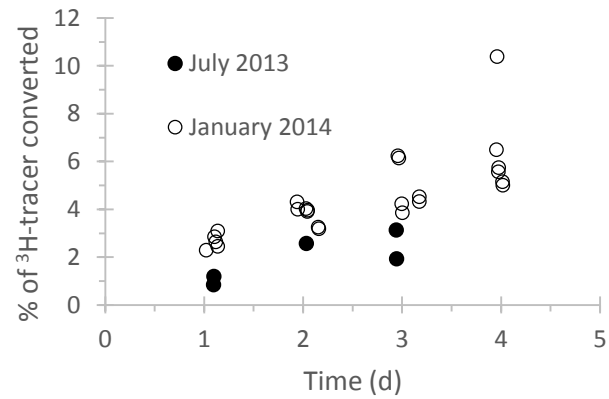


Supplement Fig. S6: Sea level height ( $\zeta$ ) during deployment of UWMS and CTD/rosette.



Supplement Fig. S7: **Fig. 1 by Mau et al. 2013**: Range of methane oxidation rates measured at different locations in the ocean water column derived from tracer incubations using  $^3\text{H-CH}_4$  (Reeburgh et al., 1991; Valentine et al., 2001, 2010; Heintz et al., 2012, Mau et al., 2012) or  $^{14}\text{C-CH}_4$  (all others). Pack et al. (2011) compared incubations with  $^3\text{H-CH}_4$  (\*1) and incubations with low-level  $^{14}\text{C-CH}_4$  (\*2) that were measured with accelerator mass spectrometry. In this study we compared incubations with  $^3\text{H-CH}_4$  (\*3) and incubations with  $^{14}\text{C-CH}_4$  (\*4).





Supplement Fig. S8: Time series of water samples collected during both field programs and incubated with  $^3\text{H}$ -methane.