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*Supplement of*

## **Methane and nitrous oxide sources and emissions in a subtropical freshwater reservoir, South East Queensland, Australia**

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17 **Supplement Material**

18 Storage Capacity Curve

19 Bathymetric surveys of the reservoir used a single beam echo sounder (ATU200S, CruzPro  
20 Ltd., Henderson, New Zealand) and a differential global positioning system (Etrex, Garmin  
21 Inc., Olathe, KS, USA with MobileMapper DGPS beacon, Thales Inc., Saint-Laurent,  
22 Quebec, Canada) to obtain measurements with depth resolutions of 0.01 m and within 0.5 m  
23 lateral resolutions. A grid survey track was chosen to optimise subsequent data interpolation  
24 and boat draft limited the surveys to a water depth greater than 0.4 m. Water depths were  
25 referenced to the Australian Height Datum (AHD) at full supply (92.75 m AHD) and data  
26 interpolated using inverse distance weighting with Esri's ArcMAP 10.1 software (Esri,  
27 Redlands, CA, USA). The reservoir had a maximum water depth of approximately 11.75 m  
28 and this finding was used to generate the deepest depth contour (81 m AHD). Depth contours  
29 of 1 m resolution were generated from 81 m AHD to the lake full supply level of 92.75 m and  
30 the surface area of each depth contour was calculated. These depth specific surface areas  
31 were then used to generate a storage capacity curve (Duggal and Soni, 1996) using the Cone  
32 Formula outlined below:

33 
$$\Delta V_{12} = \frac{h}{3} \times (A_1 + A_2 + \sqrt{A_1 \times A_2}), \quad (S1)$$

34 where  $\Delta V_{12}$  is the volume between areas  $A_1$  and  $A_2$ ,  $A_i$  is the surface area  $i$  and  $h$  is the vertical  
35 distance between surface areas  $A_1$  and  $A_2$ .

36 Table S1: Gold Creek Reservoir storage capacity curve showing surface area, cumulative volume and storage  
 37 capacity at 1 m resolution from stream bed to full supply level.

<b>Water depth (m)</b>	<b>Depth contour (m AHD)</b>	<b>Surface area (ha)</b>	<b>Cumulative Volume (ML)</b>	<b>Storage capacity (%)</b>
11.75	81	0.06	0	0
10.75	82	0.31	1.69	0.2
9.75	83	1.04	8.08	1.0
8.75	84	2.35	24.59	3.0
7.75	85	3.55	53.89	6.6
6.75	86	4.94	96.15	11.7
5.75	87	6.37	152.54	18.6
4.75	88	7.82	223.37	27.2
3.75	89	9.32	308.96	37.7
2.75	90	11.07	410.79	50.1
1.75	91	13.33	532.61	65.0
0.75	92	16.34	680.71	83.0
0	92.75	19.35	819.73	100

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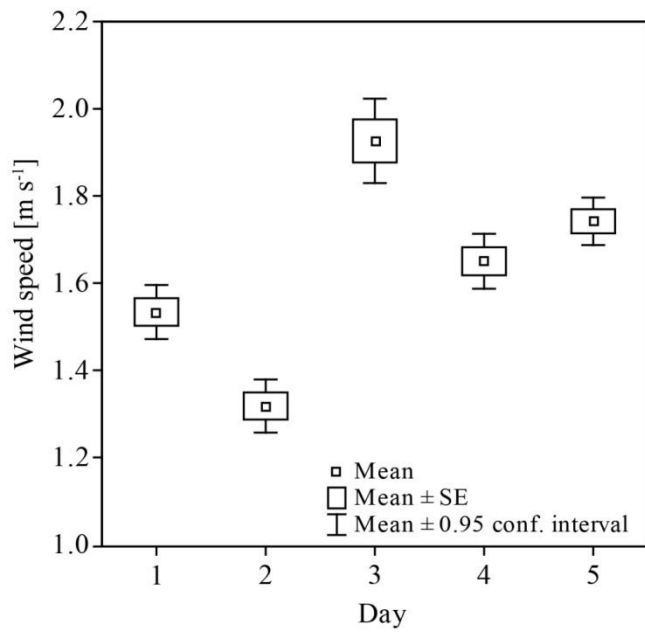
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40 Table S2: Descriptions of all study measurement types with information about the location and time when the  
 41 studies were conducted. Water depths were for the sites s1: 1.1 m, s2: 1.7 m, s3: 1.9 m, s4: 2.1 m, d5: 4.4 m, d6:  
 42 7.5 m, d7: 9.7 m, d8: 10.2 m during the spatial emission study. The detailed study was undertaken at sites s4 and  
 43 d7.

<b>Measurement type</b>	<b>Location</b>	<b>Time</b>
Water-air flux measurements (CH <sub>4</sub> , N <sub>2</sub> O) with surface floating chambers	Sites s4, d7	March 2012
	Sites s1-s4, d5-d8	February 2014
Water column sampling (CH <sub>4</sub> , N <sub>2</sub> O, nutrients) with Niskin water sampler	Sites s4, d7	March 2012
Pore water sampling (CH <sub>4</sub> , N <sub>2</sub> O, nutrients) by centrifugation	Site s4	March 2012
Laboratory sediment incubations (CH <sub>4</sub> , N <sub>2</sub> O, nutrients)	Site s4	March 2012
Wind speed measurements with weather transmitter	Site d7	March 2012, February 2014

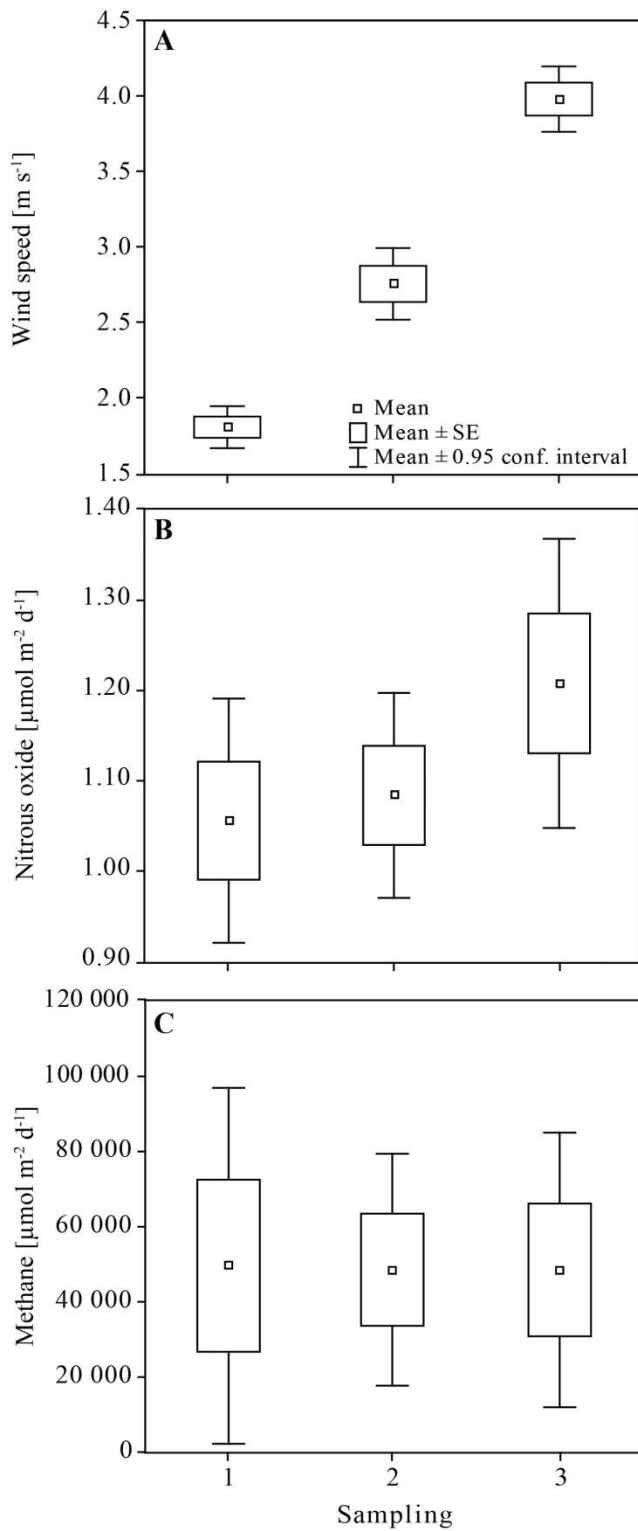
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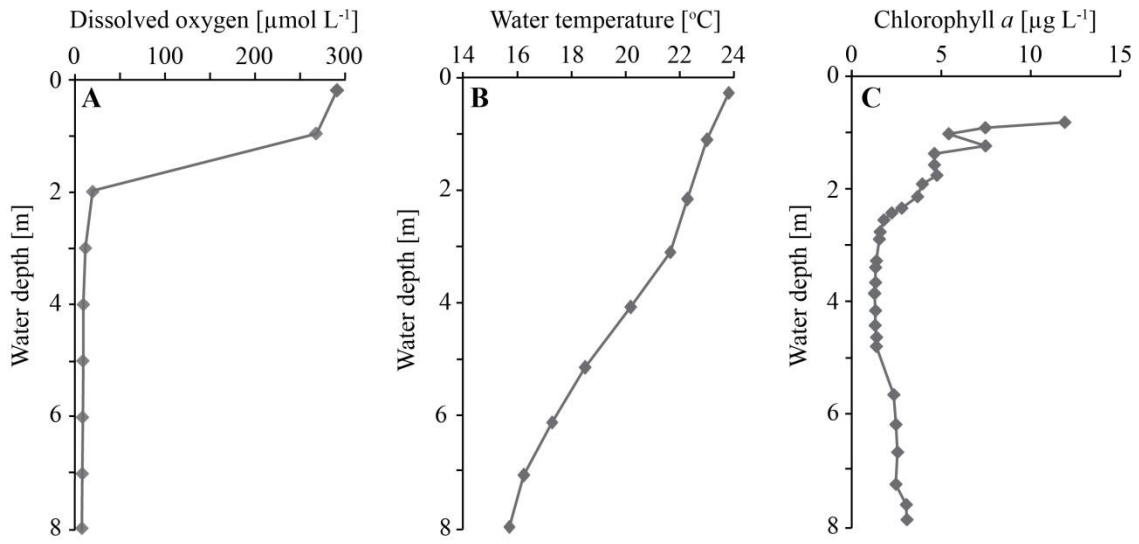
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47 Figure S1: Wind speed from sampling over five consecutive days. Box plots represent mean ± SE and mean ±  
48 0.95 confidence interval, n = 1,440.



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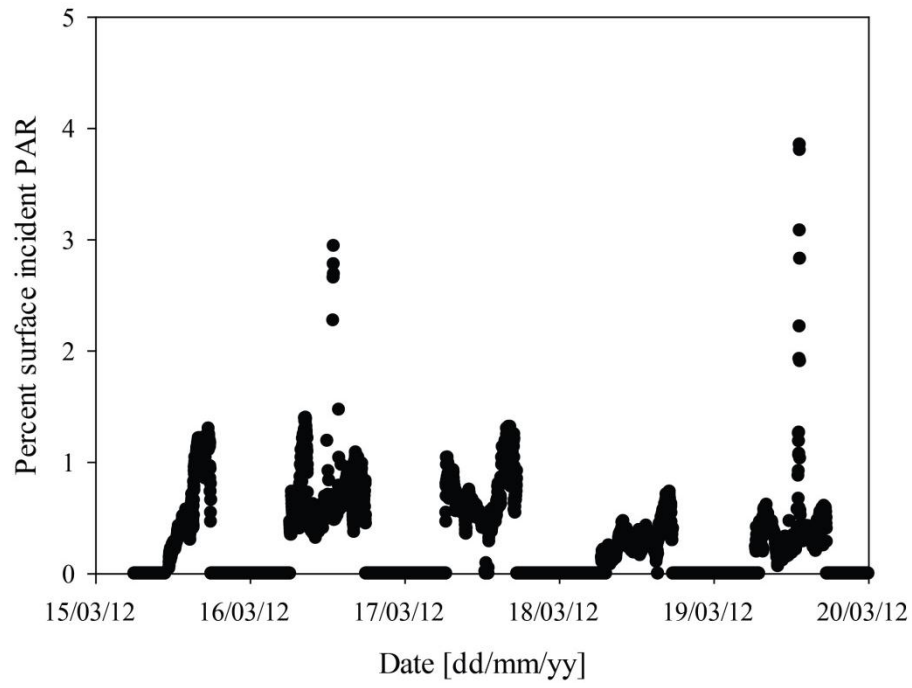
50 Figure S2: Wind speed (A) and nitrous oxide (B) and methane (C) fluxes from the spatial emission study over  
 51 three surface floating chamber deployments. Nitrous oxide and methane fluxes are averaged over sampling sites  
 52 s1-s4 and d5-d8. Box plots represent mean  $\pm$  SE and mean  $\pm$  0.95 confidence interval; with the number of  
 53 replicates being  $n = 120$  for wind speed and  $n = 24$  for nitrous oxide, methane.



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55 Figure S3: Water depth profiles of dissolved oxygen (A), water temperature (B) and chlorophyll *a* (C) from  
 56 deep sampling site d7.

57



58

59 Figure S4: Long term underwater light logger measurements from shallow sampling site s4 at 1.25 m depth.



60 **References**

61 Duggal, K. N., and Soni, J. P.: Elements of Water Resources Engineering, New Age  
62 International (P) Limited, 1996.

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