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Supplement of

Insights into oxygen transport and net community production in sea ice from oxygen, nitrogen and argon concentrations

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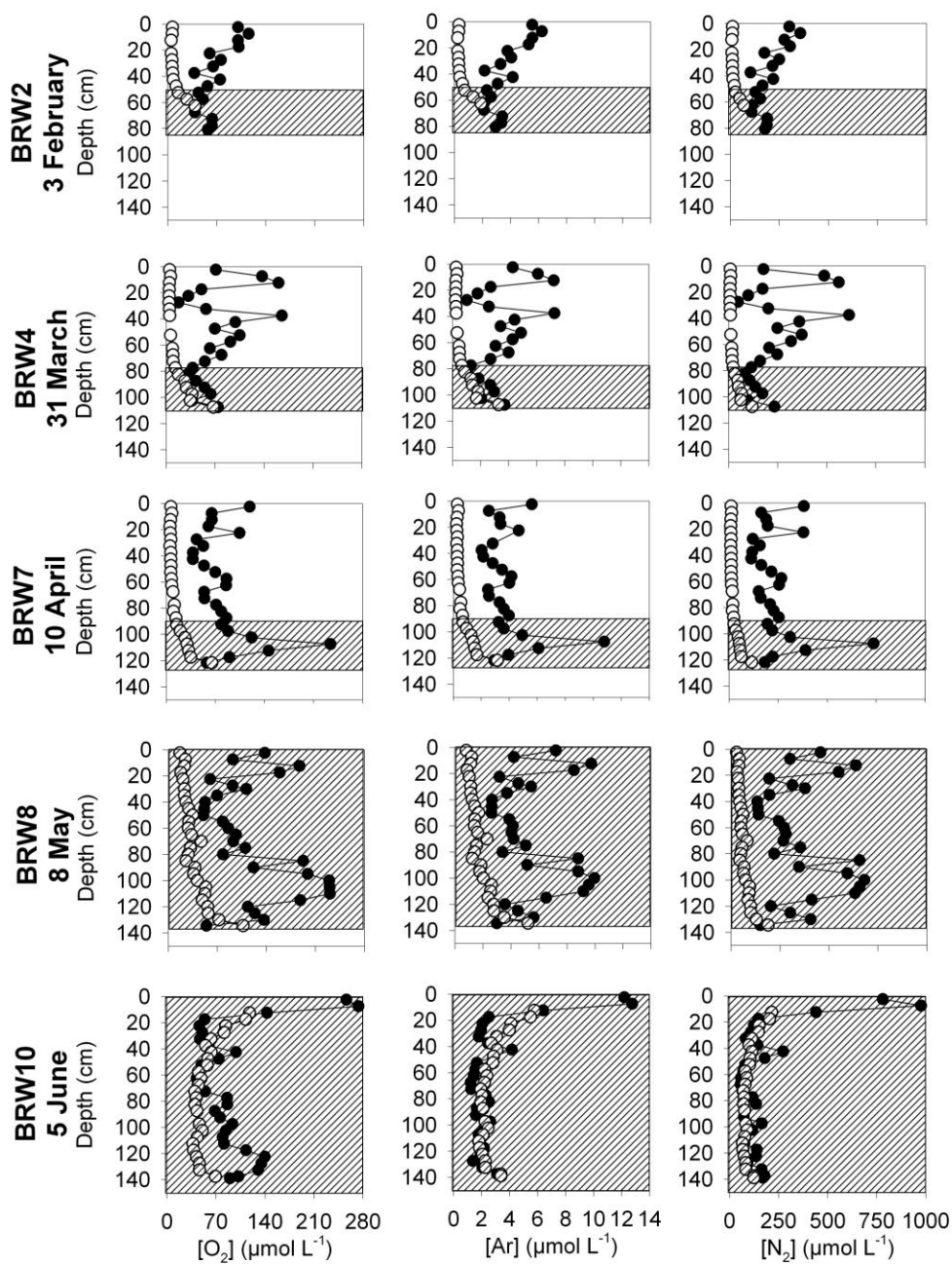
1 **Supplementary material S1**

2 *Estimate of bias on O₂ concentrations due to diel O₂ production/respiration*

3 Since the ice cores were not always sampled at the same time of the day, but between 11AM
4 and 3PM, we estimated the potential bias on the measured O₂ concentrations as following:
5 According to the incubation experiments of Mar Fernández Méndez ([https://www.mpi-
6 bremen.de/Binaries/Binary16430/M.Sc._Thesis_Mar_Fern%C3%A1ndez.pdf](https://www.mpi-bremen.de/Binaries/Binary16430/M.Sc._Thesis_Mar_Fern%C3%A1ndez.pdf), p.27), the net
7 primary production (NPP) of *F. cylindrus* (a typical cold-water species that can be found in
8 Arctic and Antarctic seawater and sea ice) was $1.73 \mu\text{mol O}_2 \text{ L}_{\text{incubation water}}^{-1} \text{ h}^{-1}$. Assuming a
9 12 hours of daylight, we may expect a NPP of $20.76 \mu\text{mol O}_2 \text{ L}_{\text{brine}}^{-1} \text{ d}^{-1}$ in the field. Because
10 brine volume fraction approach 20 % in the bottom of the ice where the highest chlorophyll-a
11 concentrations was observed (Figure 3), we may expect a NPP of $20.76 * 20 \% \mu\text{mol O}_2 \text{ L}_{\text{ice}}^{-1}$
12 d^{-1} , hence $4.15 \mu\text{mol O}_2 \text{ L}_{\text{ice}}^{-1} \text{ d}^{-1}$. This accounts for 3 to 6 % of the mean O₂ concentrations in
13 bulk ice (ranging from 67.4 to 122.4 $\mu\text{mol O}_2 \text{ L}_{\text{ice}}^{-1}$).

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1 Supplementary material S2



● Gas concentration in bulk ice
○ Gas solubility in bulk ice

- 2
- 3 Gas concentrations in bulk ice (black dots) compared to their solubility in ice (white dots).
- 4 From left to right, O₂, Ar and N₂ concentrations. The dashed areas refer to ice layers with
- 5 brine volume fraction above 5 %.