Supplement of

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

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Supplementary material S1

Estimate of bias on O\textsubscript{2} concentrations due to diel O\textsubscript{2} production/respiration

Since the ice cores were not always sampled at the same time of the day, but between 11AM and 3PM, we estimated the potential bias on the measured O\textsubscript{2} concentrations as following: According to the incubation experiments of Mar Fernández Méndez (https://www.mpi-bremen.de/Binaries/Binary16430/M.Sc._Thesis_Mar_Fern%C3%A1ndez.pdf, p.27), the net primary production (NPP) of F. cylindrus (a typical cold-water species that can be found in Arctic and Antarctic seawater and sea ice) was 1.73 µmol O\textsubscript{2} L\textsuperscript{-1} incubation water\textsuperscript{-1} h\textsuperscript{-1}. Assuming a 12 hours of daylight, we may expect a NPP of 20.76 µmol O\textsubscript{2} L\textsubscript{brine}\textsuperscript{-1} d\textsuperscript{-1} in the field. Because brine volume fraction approach 20 % in the bottom of the ice where the highest chlorophyll-a concentrations was observed (Figure 3), we may expect a NPP of 20.76 * 20 % µmol O\textsubscript{2} L\textsubscript{ice}\textsuperscript{-1} d\textsuperscript{-1}, hence 4.15 µmol O\textsubscript{2} L\textsuperscript{-1} d\textsuperscript{-1}. This accounts for 3 to 6 % of the mean O\textsubscript{2} concentrations in bulk ice (ranging from 67.4 to 122.4 µmol O\textsubscript{2} L\textsuperscript{-1}).
Gas concentrations in bulk ice (black dots) compared to their solubility in ice (white dots). From left to right, O$_2$, Ar and N$_2$ concentrations. The dashed areas refer to ice layers with brine volume fraction above 5%.