Supplementary information for The effect of partial dissolution on sea-ice chemical transport: a combined model–observational study using poly- and perfluoroalkylated substances (PFAS)

Max Thomas[1], Briana Cate[1], Jack Garnett[2], Inga J. Smith[1], Martin Vancoppenolle[3], and Crispin Halsall[2]

[1]University of Otago, Department of Physics
[2]Lancaster Environment Centre, Lancaster University
[3]Sorbonne Université, Laboratoire d'Océanographie et du Climat (LOCEAN), Institut Pierre-Simon-Laplace (IPSL), CNRS/IRD/MNHN

Correspondence: max.thomas@otago.ac.nz

1 Introduction

Here, we present two figures to support the main analysis. The main results of the paper are replicated with the critical Rayleigh number, Ra_{c}, and desalination strength, ϵ, as $Ra_{\mathrm{c}} = 4.89$ and $\epsilon = 5.84 \times 10^{-4}$ kg(m^{3}s)$^{-1}$, following Griewank and Notz (2015).

2 Results

Figure 1 shows the derived tuning parameters for each chemical of interest for Methods B, C, and D when the model was run with tuning parameters from Griewank and Notz (2015). Figure 2 shows the model performance for Methods A through D.

These figures are discussed in the main text, in Section 4.

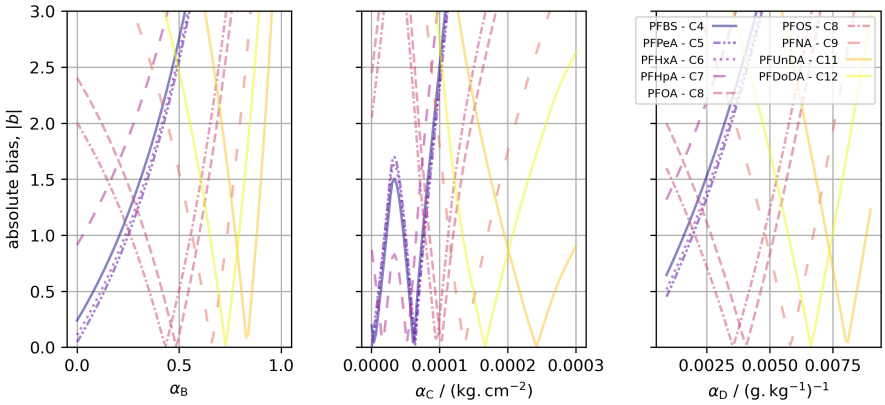

Figure 1. Absolute bias, $|b|$, between measurements and model with a range of tuning parameters, α, for Methods B, C, and D. Tuning parameters for desalination were taken from Griewank and Notz (2015).

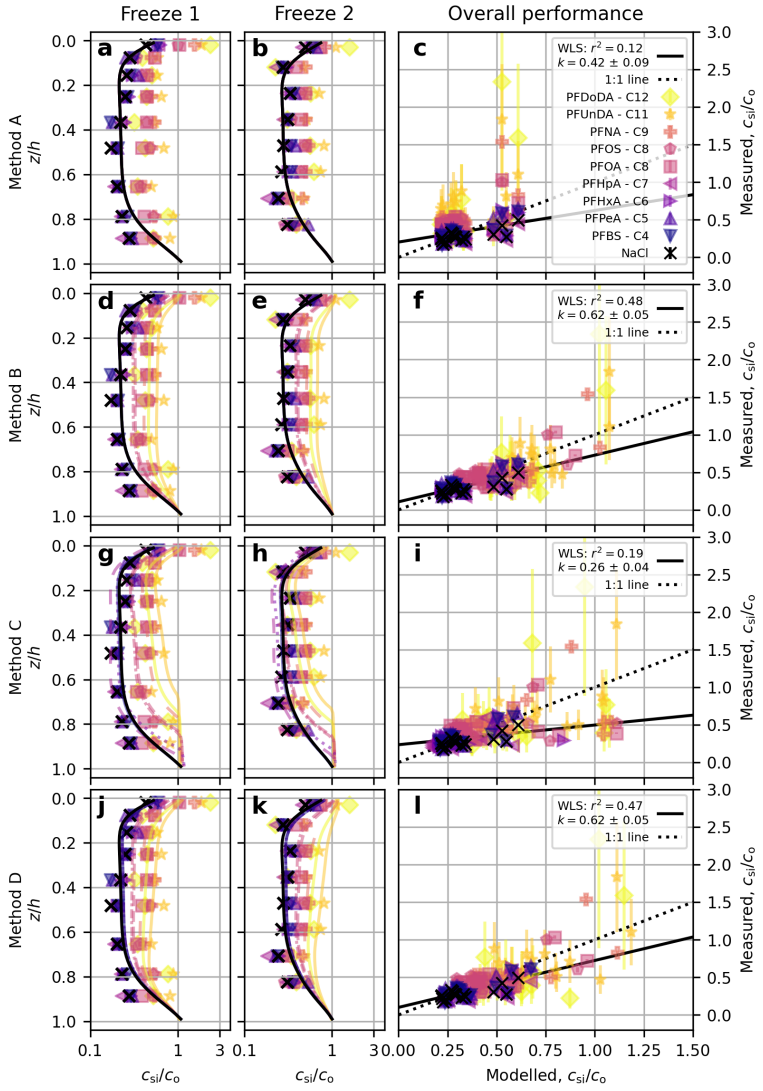

Figure 2. Comparison of modelled and measured concentration for: Method A, perfectly dissolved chemicals (a, b, c); Method B, simple partitioning (d, e, f); Method C, surface area adsorption (g, h, i); and Method D, salting out (j, k, l). Depth profiles are shown for freeze 1 (a, d, g, j) and freeze 2 (b, e, h, k). Modelled against measured concentrations are shown in panels c, f, i, and l, alongside the best fit weighted least squares regression (black line, gradient k with one standard error and coefficient of determination r^2 shown in legend) and the theoretical 1 to 1 line for perfect model behavior (dotted black). Concentration for the profiles is given on a log scale to highlight separation between the profiles. Tuning parameters for desalination were taken from Griewank and Notz (2015).

References

Griewank, P. J. and Notz, D.: A 1-D modelling study of Arctic sea-ice salinity, The Cryosphere, 9, 305–329, https://doi.org/10.5194/tc-9-305-2015, 2015.