



Supplement of

**The Ross Sea and Amundsen Sea Ice–Sea Model (RAISE v1.0):
a high-resolution ocean–sea ice–ice shelf coupling model for
simulating the Dense Shelf Water and Antarctic Bottom Water
in the Ross Sea, Antarctica**

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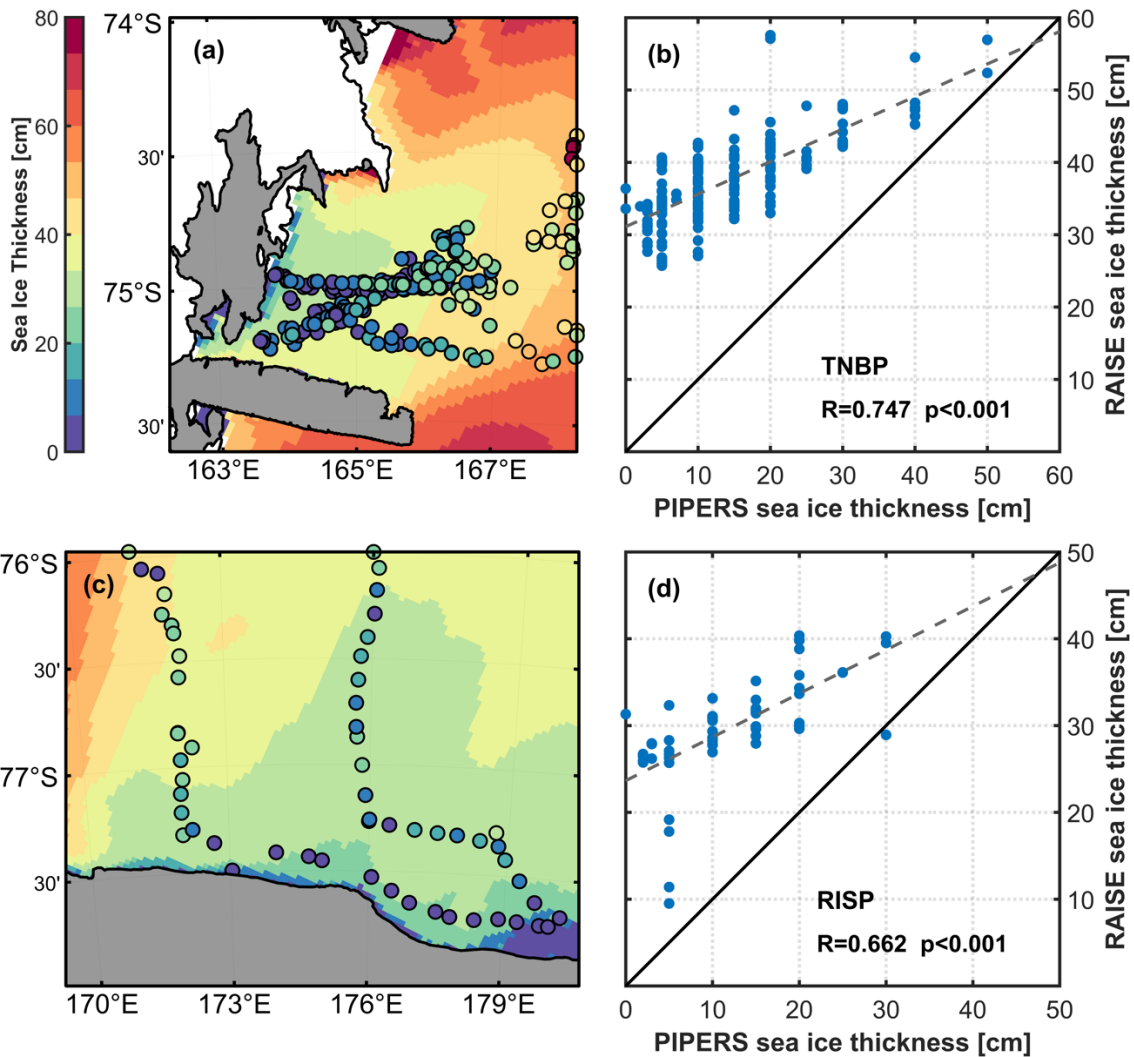


Fig. S1. (a and c) Sea ice thicknesses from the RAISE model (color shading) and from observations (colored dots) during the cruise observations of the U.S. PIPERS project conducted in April–June of 2017 (<https://www.usap-dc.org/view/dataset/601183>) in the **(a)** Terra Nova Bay and **(c)** Ross Ice Shelf polynya areas. **(b and d)** The scatter plots of modelled ice thickness versus observed ice thickness in the cruise in the **(b)** Terra Nova Bay and **(d)** Ross Ice Shelf polynya areas. The black solid line indicates the 1:1 ratio line, and the grey dashed line indicates the linear regression fit. The correlation coefficients (R) and p -values are provided for **(b)** and **(d)**.

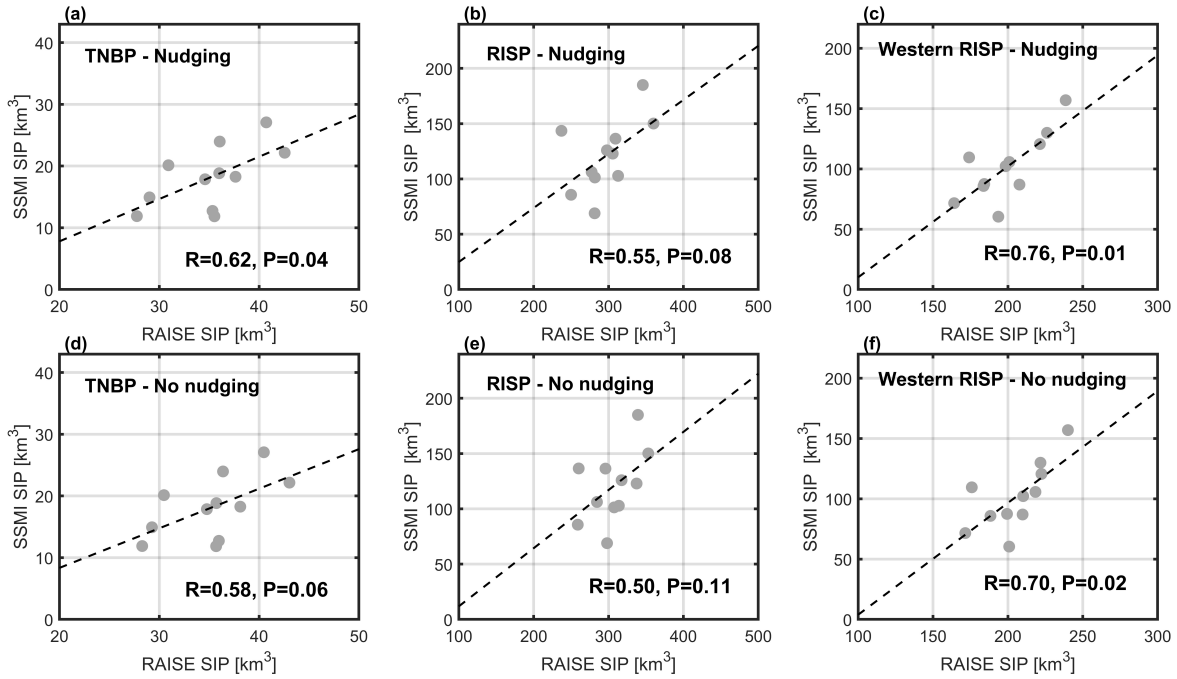


Fig. S2. Scatter plots of modelled winter sea ice production versus satellite-estimated winter sea ice production from simulations (a–c) with nudging and (d–f) without nudging for (a and d) the Terra Nova Bay polynya (TNBP), (b and e) the Ross Ice Shelf polynya (RISP), and (c and f) the western RISP. The grey dashed line indicates the linear regression fit. The correlation coefficient (R) and p-value (P) are provided for each panel.

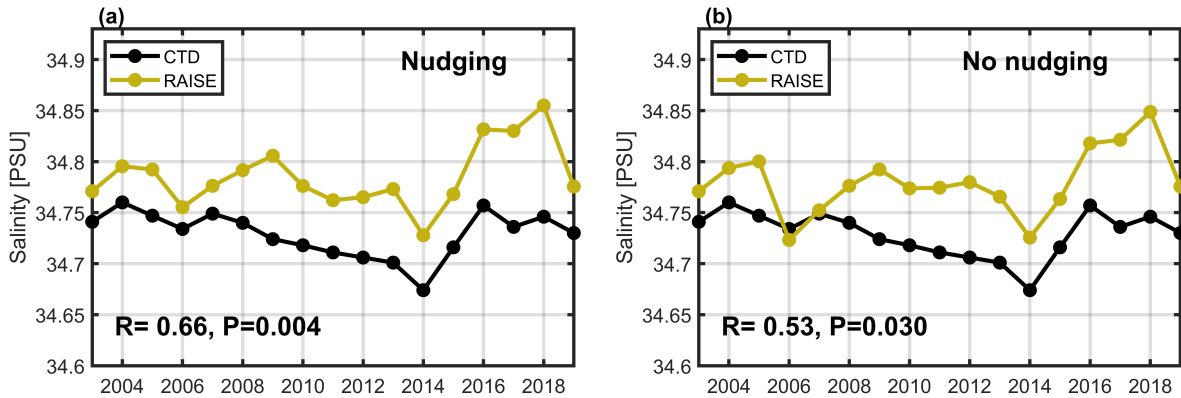


Fig. S3. (a) Time series of summer bottom water salinity near the Ross Island from the RAISE model simulation with nudging (i.e. the model version used in this study) and CTD observations (from Jacobs et al. (2022)) during 2003–2019. (b) Time series of summer bottom water salinity near the Ross Island from the RAISE model simulation without nudging (the model version used in Xie et al. (2024)) and CTD observations.