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Direct numerical simulation of convection and dissolution at a vertical ice-seawater interface BISHAKHDATTA GAYEN, ROSS W. GRIFFITHS, ROSS C. KERR, The Australian National University — Direct numerical simulations are performed to investigate the convection generated when a wall of ice dissolves into seawater under Antarctic ocean conditions. The ambient water temperatures are kept between $-1\,^{\circ}\mathrm{C}$ and $6\,^{\circ}\mathrm{C}$ and salinities around 35 ppm, where diffusion of salt to the ice-water interface depresses the freezing point and further enhances heat diffusion to the ice. We use three coupled interface equations, along with the Boussinesq approximation and the equation of state for seawater, to solve for interface temperature, salinity and melt rate. Fluxes of both heat and salt to the interface play a significant role in governing the rate of dissolution of ice. At the presently achievable Grashof numbers turbulence is equally produced from both buoyancy and velocity shear, which indicates the importance of shear production at geophysical scales.

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