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# Turbulent dynamics and ice-shelf basal melt rates from large-eddy simulations

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Large-eddy simulations are used to investigate boundary layer turbulence and its control on ice-shelf basal melt rates in Antarctic settings. We present simulations at relatively low thermal driving and low ice-shelf basal slopes, resulting in simulated melt rates from 10s cm/yr to several m/yr. Our results are broadly consistent with the linear relationships between far-field thermal driving and melt rate and between ice-shelf slope and melt rate reported by previous studies. The simulated thermal exchange coefficient is lower than recommended values; thermal exchange becomes less efficient as stratification increases. In our simulations, shear production of turbulent kinetic energy outweighs buoyant production, as found below Larsen C Ice Shelf through recent microstructure measurements. We also find that turbulent intensity and melt rate vary significantly with the orientation between the ice-shelf slope and the far-field flow, even at low ice-shelf slopes. Our results suggest that numerical ocean models employing the standard ice-shelf melt parameterization will underestimate slope effects on ice-shelf melt rates even if they capture the mean buoyancy effects on boundary layer flow. The proposed slope effects would modify feedbacks between ocean circulation and ice-shelf geometry and tidal variability in ice-shelf melt rates.