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Clouds influence melting on Antarctic Peninsula ice shelves

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Rapid environmental change is being observed on the Antarctic Peninsula, with consequences for the ice shelves surrounding it. The region's largest remaining ice shelf, Larsen C, is beginning to exhibit signs displayed by its neighbours, Larsen A and B, prior to their collapse. Quantifying the amount of energy received at the surface of Larsen C - its surface energy balance, or SEB - is critical if we are to constrain melt rates and understand how these may change in future. The challenge of collecting measurements and consequent lack of observational data in Antarctica means that models are an invaluable tool for this undertaking. However, most models struggle to represent cloud microphysics, which strongly influences the amount of radiation received at the surface. We use the UK Met Office Unified Model (MetUM) to examine the influence of cloud properties on the SEB of Larsen C, and to explore which microphysical quantities are most important for accurately representing it. The amount of ice and liquid in clouds strongly influences surface radiative fluxes, and consequently melt rates. An optimal configuration of the MetUM is therefore chosen that most closely reproduces observed cloud phase and produces a realistic approximation of the SEB. The understanding gained from this study underpins future work to develop a recent climatology of surface fluxes and melt rates, and project into the future, with implications for estimates of global sea level rise, and applicability to other ice shelves around Antarctica.