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# Mathematical Modelling of Melt Lake Formation On An Ice Shelf

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The accumulation of surface meltwater on ice shelves can lead to the formation of melt lakes. These structures have been implicated in crevasse propagation and ice-shelf collapse; the Larsen B ice shelf was observed to have a large amount of melt lakes present on its surface just before its collapse in 2002. Through modelling the transport of heat through the surface of the Larsen C ice shelf, where melt lakes have also been observed, this work aims to provide new insights into the ways in which melt lakes are forming and the effect that meltwater filling crevasses on the ice shelf will have. This will enable an assessment of the role of meltwater in triggering ice-shelf collapse. The Antarctic Peninsula, where Larsen C is situated, has warmed several times the global average over the last century and this ice shelf has been suggested as a candidate for becoming fully saturated with meltwater by the end of the current century. Here we present results of a 1-D mathematical model of heat transfer through an idealized ice shelf. When forced with automatic weather station data from Larsen C, surface melting and the subsequent meltwater accumulation, melt lake development and refreezing are demonstrated through the modelled results. Furthermore, the effect of lateral meltwater transport upon melt lakes and the effect of the lakes upon the surface energy balance are examined. Investigating the role of meltwater in ice-shelf stability is key as collapse can affect ocean circulation and temperature, and cause a loss of habitat. Additionally, it can cause a loss of the buttressing effect that ice shelves can have on their tributary glaciers, thus allowing the glaciers to accelerate, contributing to sea-level rise.