

The influence of subglacial processes on ice-sheet dynamics in the vicinity of the South Pole: A modeling study

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Subglacial conditions of large polar ice sheets remain poorly understood, despite recent advances in satellite observation. Major uncertainties related to basal conditions, such as the temperature field, are due to an insufficient knowledge of geothermal heat flow. We use a hybrid method that combines numerical modeling of the ice sheet thermodynamics with a priori information, using a simple assimilation technique. Additional data are essentially vertical temperature profiles measured in the ice sheet at selected spots, as well as the distribution of subglacial lakes. In this way, geothermal heat-flow datasets are improved to yield calculated temperatures in accord with observations in areas where information is available. Although the whole Antarctic ice sheet is modeled, the analysis essentially focuses on the area around the South Pole, where IceCube is installed. A nearby subglacial lake may influence the dynamics of the ice sheet on longer time scales. We evaluate the effect of subglacial discharge on the behavior of the ice sheet in the vicinity of the South Pole.

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