

# Using oceanographic data to calculate the melt rate at an ice shelf's base

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To predict the response of ice shelves to climate variability we need to be able to calculate basal melt rates as a function of the oceanographic forcing on the sub-ice shelf cavity. Key processes are the transfer of heat and salt to the ice shelf base. From the limited available evidence, this appears to have been successfully parameterized for the low melt rate regime, such as beneath large areas of Ronne Ice Shelf, but a dearth of data from the rapidly melting counterpart has hindered the development and testing of such parameterizations for use on warm-sector ice shelves.

In the late 1980s several hot-water drilled access holes were made through George VI Ice Shelf, which lies between the west coast of the Antarctic Peninsula and Alexander Island. The oceanographic regime beneath the ice shelf is similar to that in the Amundsen Sea Embayment. Thermistor cables were deployed at each drill site to measure the temperature through the ice column and in the upper part of the water column; oceanographic profiles (CTD) were obtained from two of the sites at the southern end of the ice shelf. At some sites the thermistor cables were logged every hour or so for a year or more, giving an indication of variability.

We present some of these unpublished data, highlighting differences between the ice-ocean boundary layers beneath this high melt rate environment and the low melt rate environment exemplified by Ronne Ice Shelf. The results suggest that the parameterization used successfully to calculate melt rates beneath the lower melt rate areas of Ronne Ice Shelf cannot be applied in a straight-forward manner to George VI Ice Shelf. We discuss the implications for the calculation of melt rates beneath extreme melt environments such as Amundsen Sea embayment ice shelves.