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Recent and subrecent climate-controlled sedimentation in Potter Cove and Maxwell Bay, King George Island, Antarctica

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Potter Cove is a tributary fjord to Maxwell Bay, south of King George Island at the northern tip of the Antarctic Peninsula. A tidewater glacier used to be at the fjord head. However, during the past 50 years of exceptional warming in the area this glacier retreated dramatically, thereby exposing a new small island and more and more bedrock underneath the ice. At least a large part of the glacier has meanwhile retreated back onto dry land.
In this study we investigate warm and cold periods of the past two millennia to compare these to the recent conditions. The investigations are based on sediment cores from Maxwell Bay and Potter Cove, respectively. Sediments at the core sites originate basically from tributary fjords that discharge sediment-laden meltwater into Maxwell Bay. The results show two clear-cut granulometric classes of sediments: Class 1 is finer with the principal mode at 16 μm; this class dominates the Medieval Warm Period. Class 2 is coarser with the principal mode at 36 μm; it dominates the Little Ice Age (LIA). Class-1 sediments are likely a composite of Class-2 type sediments plus a possibly unimodal sediment with the principal mode around 16 μm (hence Class 1). This sediment has likely been transported in suspension as a result of increased meltwater production. Apparently, colder climate phases were less affected by melting processes than the warmer ones. However, after the LIA sediments become finer but largely lack the meltwater signal. Until AD 2000 no shift from Class 2 to Class 1 sediments is visible which indicates that at least in terms of the associated sedimentary processes the present warming trend is different to those of the recent past. A possible explanation is that after the LIA and during the recent warming trend the glaciers shrank and retreated more rapidly than during earlier warm phases. As a result, less sediment laden meltwater affected the core locations in Maxwell Bay and might thus be responsible for the lack of sedimentary change between the LIA and the Recent.