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Svalbard ice cores studies threatened by rapid climate warming

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The rapid warming are affecting the paleoclimate archives in Svalbard glaciers and therefore it is urgent to recover ice from these ice caps for future studies. Over the last two decades, ice cores have been retrieved from three major glacier-ice caps in Svalbard; Lomonosovfonna, Austfonna and Holtedahlfonna. The longest of these cores covers the past 1200 years. We have used the δ^{18}O records to reconstruct the winter surface air temperatures utilizing techniques used in dendrochronology called 'scaling'. During the 1800s, which according to our results was the coldest century in Svalbard, the Little Ice Age winter cooling was of the order of 4˚C, compared to the 1900s. One of the most striking features of the reconstruction is a lasting pre-1300 period of warm winters, where DJF temperatures were comparable to those that were observed in Svalbard in the 1930s and in the most recent decade. From the Svalbard ice cores we have learned that despite the fact that atmospheric records in these ice cores have been to some degree altered by melt it is still possible to gain information about major trends of both climate parameters and pollution history. The different geographical positions and characteristic of the coring locations also provide information on both the spatial variability component, in addition to the temporal record, of both climate and pollution. Some major ions, black carbon and various other ice chemistry data show a clear east-west zonal gradient across the archipelago suggesting a different origin for air masses arriving in different sectors of Svalbard. The results show that with careful site selection, high-resolution sampling and multiple isotopic and chemical analyses ice cores from small Arctic ice caps are extremely useful for a wide range of environmental studies.