A potential IPICS climate record from Derwael Ice Rise, Dronning Maud Land, Antarctica

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Understanding present and future climate change depends on knowledge of natural climate variability. Considerable uncertainties remain in the reconstruction of past climate. Most notably, polar regions and high altitudes remain poorly represented, yet these regions encompass areas where the climate is changing more rapidly than anywhere else on the planet. In East Antarctica, climate records are essentially retrieved through deep ice core drillings in the central portions of the ice sheet. However, in coastal areas - where atmospheric and oceanic influences are more important - records are mostly lacking.

Here we present and overview of geophsyical investigations on an ice rise sitting within the Roi Baudouin Ice Shelf, Dronning Maud Land, Antarctica. Given the local flow pattern, such ice rise is prone to give an undisturbed record of climate changes over the last millennium and beyond. Ice thickness is found to be 500 meters and given a mean accumulation rate of 0.4 to 0.5 m/yr, a high resolution record is to be expected. Preliminarily drilling up to a depth of 120 m reveals very few melt layers, which implies that the record should be undisturbed for isotopic analysis. The record length is determined from ice flow modelling, and may well cover the last 2000 years, due to the Raymond effect. This effect, especially present in local-flow ice masses of small size, results in an upwarping of the internal layers underneath the ice divide due to a higher effective viscosity of the ice characterized by a nonlinear rheology. This leads to older ice forced further upwards in the core compared to flank positions. Furthermore, since the Raymond effect is very strong in this particular ice rise, it is assumed that the local flow has been unaffected for at least several thousands of years.

Given the above considerations, we suspect that Derwael ice rise has the potential for future drilling to the bed. Given the flat bed topography, it is very likely that sediments are found at the bed, which would create a wider interest besides the IPICS signal. We propose an international drilling operation based on logistical support from Princess Elisabeth Station, Antarctica.