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Astronomical forcing and climate : insights from ice core records

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Ice cores provide a wealth of insights into past changes in climate and atmospheric composition.

Obtaining information on past polar temperature changes is important to document climate variations beyond instrumental records, and to test our understanding of past climate variations, including the Earth system response to astronomical forcing.

Since the 1960s, major breakthrough in ice core science have delivered a matrix of quantitative Greenland and Antarctic ice core records.

Temperature reconstructions from polar ice cores document past polar amplification, and provide quantitative constraints to test climate models.

Climate information from the air and ice preserved in deep ice cores has been crucial to unveil the tight coupling between the carbon cycle and climate and the role of past changes in atmospheric greenhouse gas composition in the Earth system response to astronomical forcing.

Ice core constraints on past changes in ice sheet topography are also key to characterize the contribution of the Greenland and Antarctic ice sheets to past sea level changes.

The construction of a common chronological framework for Greenland and Antarctic ice core records has unveiled the bipolar sequence of events during the glacial-interglacial cycle, and the interplay between abrupt change and the response of the climate system to astronomical forcing.

International efforts have started to obtain the oldest ice cores (hopefully back to 1,5 million years) from Antarctica, in order to understand the reasons for the major shifts in the response of the climate system to astronomical forcing at that time, leading to more intense and longer glacial periods.