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Coastal ice core evidence for a circum-Antarctic bipolar seesaw during the last deglaciation

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The transition from the last glacial period into the Holocene has a different shape in Antarctica, and the surrounding Southern Ocean, than in Greenland, and more generally in the Northern Hemisphere. Typically, the warming associated with the last deglaciation is relatively steady in Antarctica although interrupted by a return to cold conditions, the Antarctic Cold Reversal before the onset of the Holocene. Instead, it is, in Greenland, characterized by two rapid warmings respectively at the onset of the Bölling-Alleröd and of the Holocene with in-between the Younger-Dryas, a well-marked cold event, which follows the Bölling-Alleröd. Recent studies attempted at explaining the different sequence of events in the two hemispheres through the ocean bi-polar see-saw that explains the competition between deep waters formed in the North Atlantic and in the Southern Ocean. Critical to document the causes and mechanisms involved in this different Greenland / Antarctic behaviour (more generally between North and South) is our ability to define the timing of events between Greenland and Antarctica, which indeed has long been a matter of intense debate.
Here we investigate a new 1620 m long ice core drilled at Talos Dome (TD) a peripheral dome of East Antarctica in the framework of the TALDICE (TAlos Dome Ice CorE) project, involving five European nations and led by Italy. TD is located in the Ross Sea sector, about 550 km north of Taylor Dome and 1100 km East from the EPICA Dome C drilling site. The TALDICE coring site (159°11'E 72°49'S; 2315 m; T -41°C; www.taldice.org) is located near the dome summit and is characterised by an annual snow accumulation rate of 80 mm water equivalent. In this study, we present the new oxygen isotope record from the TALDICE ice core with a focus on the time window between 8 and 25 ky. In this work, methane measurements have been used to synchronise TALDICE to NGRIP and EPICA (EDC and EDML) ice cores on GICC05 age scale.
The TALDICE and EPICA ice cores, synchronised to GICC05, allows us to confirm the bipolar see-saw between Greenland and Antarctica also from the most distant ice core from the North Atlantic "centre of action" in the Ross Sea sector. This interhemispheric signature is coherent between plateau and coastal sites from the South Atlantic to the Southwest Pacific, providing support that this is a "uniform" feature of millennial-scale climate change in Antarctica. The data presented here reveal synchronous albeit distinct fingerprints of Antarctic Isotopic Maximum in the Indo-Pacific versus Atlantic sectors. This breaks down the hypothesis proposed for Taylor Dome ice core of a synchronous climate change between the two hemispheres during deglaciation in the Ross Sea area. The new ice core chronologies presented here support the hypothesis that the ACR could be a response of MWP1a partially originating from Antarctica.