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Investigating the deep part of the TALDICE ice core

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The bottom part of polar ice cores contains important information, which can improve our knowledge of the past climate further back in time.
The 1620 m deep ice core retrieved at Talos Dome in the framework of the TALDICE project, provided high-resolution climate reconstructions in the Ross Sea sector of Antarctica (Stenni et al., 2011) covering the last climatic cycle. A common age scale, called Antarctic Ice Core Chronology (AICC2012) was built for EPICA Dome C, EPICA Dronning Maud Land, Vostok, and TALDICE ice cores (Bazin et al., 2013). However, for the latter, this chronology was defined only until the depth of ∼1438 m, coinciding with an age of about 154,000 years BP (hereafter ky). The bottom part of the core, down to 1620 m depth, still lacks an official dating. Our aim is to propose a new dating for the uninvestigated deep part of the TALDICE ice core and to reconstruct the climate variability for this Antarctic sector further back in time.
Here, we present new high-resolution stable isotope (18O/16O and D/H ratios) data obtained on 5 cm samples covering the depth below 1547 m. Moreover, the 81Kr radiometric dating technique was adopted to determine the age of the ice at the depth of 1574-1578 m. Additional high-resolution d18O atmospheric oxygen (d18O atm) and 40Ar measurements in the air bubbles of the bottom part of the core are planned, allowing to increase the dating precision.
Krypton was extracted from the air bubbles, using 5.4 kg of ice, and measured with the Atom Trap Trace Analysis (ATTA) technique. The obtained radiometric age is 459±50 ky and suggests that the TALDICE deep portion is probably older than previously inferred. The thinning function profile obtained plotting ice age versus depth data, and including the new 81Kr dating, shows the expected exponential shape, which is an indicator of regular ice thinning under conditions of vertical shear. The comparison between the EPICA Dome C isotopic profile and the new TALDICE high-resolution record suggests that up to a depth of 1557 m, probably corresponding to an age of 360 ky BP, the climatic signal is preserved, further lengthening the paleoclimate reconstruction obtained from this core. However, the lack of similarities with the EDC record below 1557 m, and the contextual presence of unexpected large ice crystals suggests that other processes, that will be investigated in the future, played a role in erasing the climatic signal in the deeper part of the core.