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A 300 000 year isotopic record from the TALDICE ice core (East Antarctica)

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The TALos Dome Ice CorE (TALDICE) project retrieved an ice core from a peripheral dome of East Antarctica. This international project aimed at drilling an ice core reaching back in time the past two climatic cycles (about 250,000 years). Talos Dome (72° 49' S, 159° 11' E; 2315 m; 80 kg m^{-2} yr^{-1}; -41°C) is located at about 290 km from the Southern Ocean, 250 km from the Ross Sea, 275 km from the Zucchelli Station (Terra Nova Bay). Backtrajectory analyses suggest that Talos Dome is mainly influenced by air masses arriving both from the Pacific (Ross Sea) and Indian Ocean sectors. In December 2007 the drilling team reached the depth of 1619.2 m. A preliminary dating based on an ice flow model and an inverse method suggests for the upper 1560 m an age of about 300 000 years BP. This near coastal site allows a higher climate resolution study for the Holocene compared to the ones obtained from the more inland drilling sites.

The paleotemperature reconstructions from Antarctic ice cores relies mainly on δD and δ^{18}O records. The main factors controlling the observed distribution of their surface values in Antarctic snow are mainly related to the condensation temperature and the origin of moisture. Measuring both isotopes in the ice allow the determination of the deuterium excess (d=δD-8*δ^{18}O) which is mainly controlled by the climatic conditions in the moisture source regions. The ice cores have been cut in the cold laboratory of the Alfred Wegener Institut at Bremerhaven. δ^{18}O and δD measurements have been performed on a continuous basis of 100 cm ("bag samples") and 10 cm (detailed samples) in Italy and France.

The full δ^{18}O record obtained from the bag samples is presented here along with a preliminary deuterium excess data set. The long term climate variability is in good agreement with the EPICA Dome C ice core with the exception of trends during interglacial periods (present and past interglacial). While most of the Holocene record shows a good agreement with EPICA EDML and EDC ice cores, the lack of early Holocene optimum at Talos Dome may be linked with changes in local ice sheet elevation. This new isotopic record shows similar millennial scale climate variability (AIM events) during the last glacial period and the deglaciation.