Reconstructing Antarctic Holocene climate/environmental changes from ice and marine cores

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Paleotemperature reconstructions from Antarctic ice cores rely mainly on δD and $\delta^{18}O$ records, with the main key factors controlling their observed distribution in Antarctic surface snow being related to the condensation temperature of the precipitation and the origin of the moisture. Reconstructions of past sea-surface temperatures (SST) and sea ice cover (SIC) from marine cores at high southern latitudes mainly rely on diatom-based transfer functions. However, quantitative records of SST and SIC are concentrated in the mid-latitudes of the Southern Ocean and only few records exist in the Antarctic coastal areas.

Here we present an overview of the Holocene climate records that have been compiled in the framework of the ESF-HOLOCLIP project, as well as a new isotopic record from the TALDICE ice core, recently drilled in a peripheral dome facing the Ross Sea. One of the main goals of HOLOCLIP is to reconstruct Holocene climate/environmental changes from ice and marine cores and integrate these data in model simulations.

The main common features recognized in Holocene climate records obtained from ice cores are a warm early Holocene (from about 10 to 11.5 ka BP), a cool period centred at ~8 ka BP and a secondary optimum peaking at ~4 ka BP. The Holocene climate reconstructions obtained from sediment cores demonstrate a warmer early-mid Holocene hypsithermal followed by a cooler neoglacial with an amplitude and timing of the transitions variable regionally around Antarctica.

Though there exist some problems in both ice and marine core records (chronologies, temporal resolution, global vs. regional, annual vs. seasonal), such approach is unique to fuel paleoclimate models and to better understand the ocean-ice-atmosphere interactions at high southern latitudes beyond the instrumental period.