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Reconstructing the climate of the southern high latitudes during the early Holocene using data assimilation.

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In this study, we analyze simulations covering the early Holocene period performed with the climate model of intermediate complexity LOVECLIM. The model is constrained to follow the signal recorded in proxy records using a data assimilation method based on a particle filtering. The proxy records selected represent oceanic and atmospheric surface temperature in the Southern Hemisphere derived from various types of archives and proxies (marine cores, ice cores and pollen). The main goal of our analysis is to understand the causes of the temperature minimum recorded in several ice cores in Antarctic around 8ky BP.
Two hypothesis that could potentially explain the observed changes at southern high latitudes during the early Holocene period are discussed. The first one is an increase of the West Antarctic Ice Sheet melting rate. Simulations show that the best fresh water flux evolution is an increase of 0,1 Sv between 10ky BP and 8ky BP. The release of fresh water leads to a large surface ocean cooling in southern hemisphere and a strengthening of westerlies. The second hypothesis attributes the change to a modification in the atmospheric circulation. The more suitable atmospheric circulation, selected by the particle filter, leads to weaker westerlies and colder air temperature over the Antarctic continent at 8 kBP than at 10 kBP.