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A terrestrial record from Iles Kerguelen: Reconstructing climate history in the sub-Antarctic Indian Ocean during the last glacial-interglacial transition

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The Southern Ocean is characterised by (i) the Antarctic Circumpolar Current (ACC), flowing from west to east around the Antarctic continent and connecting the Atlantic, Indian and Pacific Ocean basins and (ii) several oceanic fronts such as the Polar Front (PF). Storm tracks, often with high wind speeds, prevail at these latitudes as they are strongly influenced by the Southern Hemisphere Westerlies (SHW). Information on past climate change at the mid- and high southern latitudes (40°-70°S), especially from a terrestrial point of view, is still sparse in comparison with the same latitudes in the Northern Hemisphere. Fortunately, dispersed and remote islands and island groups occur in the Southern Ocean. Changes in zonal circulation – i.e. the strength and position of the SHW – result in significant imprints in this region and it is therefore imperative to map, in time and space, the strength and latitudinal shifts of this zonal circulation. Latitudinal shifts of the ACC and PF during periods of climate change must have influenced climate conditions on, at least, some of these islands, offering the possibility to reconstruct changes of the oceanic frontal systems in the Southern Ocean.

Here we present preliminary results from a chronologically well constrained terrestrial record sampled on Iles Kerguelen (49°S – 69°E, South Indian Ocean), situated in the core of the SHW and at the PF. We focus on the last glacial-interglacial transition, a period characterised by a return to cold conditions, after an initial post-LGM warming.

The Estacade sequence presented here is analysed with multi-proxy approach (peat stratigraphy, pollen, plant macrofossils, magnetic susceptibility, biogenic silica and Rock Eval). The onset of peat growth at the Estacade site c. 16.3 kyr BP coincides with the post-LGM warming in Antarctica, which already started 18 kyr BP (EPICA Dome C ice core). At c. 14 kyr BP, so c.500 years later as the onset of the ACR, a sudden change to more humid and windy conditions on the Kerguelen archipelago can be observed in our proxy-data, implying a latitudinal shift and/or strengthening of the SHW. The end of the period with strong westerly influence on Iles Kerguelen at c. 11.7 kyr BP coincides with the onset of the Holocene and is characterised by the expansion of thermophilous species such as Acaena magellanica and Uninia compacta in our pollen record.