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Oceanic circulation changes over the last glacial inception: timing and links between polar latitudes of both hemispheres

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The changes in thermohaline circulation at the initiation of the last glacial period, and its role in the chain of events linking the decrease of Northern summer insolation with the establishment of continental ice-sheets and global cooling are still poorly known. We present here new constraints on deep-water circulation changes in the North Atlantic and the Southern Ocean during the last glacial inception (130 – 60 ka), in relationship to surface hydrology and global climatology.

We compare the high resolution oxygen and carbon isotope composition (δ^{18}O, δ^{13}C) records of planktic and benthic foraminifera from the Southern Ocean core MD02-2488 (46˚28'8S, 88˚01'3E, 3420 m water depth), with available records from both the Southern Ocean (core MD97-2120, *Pahnke et al. 2003; Pahnke and Zahn 2005*; and ODP site 1089, *Gersonde et al 1999; Hodell et al 2003*) and the North Atlantic (cores SU90-08, *Grousset et al., 1993*; CH69-K09, *Labeyrie et al. AGU mon. 1999*; and NEAP18K, *Chapman and Shackleton 1999*). Our strategy is to correlate in details high latitude sea surface records from both hemispheres with the corresponding ice isotopic records (NorthGRIP in Greenland and EPICA Dome C in Antarctica), using the atmospheric methane and oxygen isotopic records for the interhemispheric correlation (e.g. *Blunier et al 1998; Landais et al 2003; Landais et al 2005*).

Benthic (*Cibicides*) δ^{13}C data show decoupled intermediate- and deep-water changes in the Southern Ocean over the last glacial inception: a two-steps δ^{13}C decrease is observed in deep waters during periods of large sea surface cooling (MIS 5.5-5.4 and MIS 5.1-4 transitions), whereas a single rapid δ^{13}C decrease is recorded at intermediate depths at the MIS 5.1-4 transition only. We show that the early deep-water δ^{13}C decrease is not associated with a reduction in NADW ventilation, but with the northward expansion of a poorly ventilated AABW water-mass in the deep Southern Ocean. Such deep-water changes in the Southern Ocean seem to be induced by ocean-atmosphere interactions in reaction to an early cooling in the high southern latitudes, whereas deep-water changes in the North Atlantic are closely related to sea surface conditions and 65°N insolation variations. Links between surface and deep-water changes of polar latitudes of both hemispheres will be detailed, in relationship with insolation variations and ice-sheets growth.