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Deep circulation changes during the last glacial inception: Rapid Southern Ocean response to insolation, preceding North Atlantic deep water changes.

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Deep water circulation changes during the initiation of the last glacial period, and its role in the global cooling are still poorly known. We compare high-resolution oxygen and carbon isotope composition records of planktic and benthic foraminifera from Southern Ocean and North Atlantic cores for the 130-100 ka period in order to establish the deep circulation changes in both area, in relationship to surface hydrology and global climatology.
A common chronostratigraphic framework has been defined between marine cores from the northern and southern latitudes over that period, assuming that temperature changes occurred simultaneaously in the surface ocean and over the nearby ice cap. Thus North Atlantic and Southern Ocean sea surface temperature records have been correlated to isotopic ice core records of NGRIP and EPICA Dome C respectively.
Sea surface temperatures decrease at about the same time (122ka) in both the northern Atlantic and the Southern Ocean. About 3ka after, an expansion of a poorly ventilated Antarctic Bottom water is observed in the Southern Ocean while no change occurs in the North Atlantic deep circulation. Height thousand years more are needed to observed a shoaling of the North Atlantic deep waters (NADW).
We propose that the Southern Ocean respond rapidly to orbital variations: a spatial and/or temporal increase in sea-ice extent might follow the decrease in obliquity. This positive retroaction through albedo drive a decrease in sea surface temperature and a northward movement of the water fronts. A greater seasonal extent of sea-ice will lead to a less ventilated Antarctic Bottom Water (AABW).
On the opposite a decrease of sea surface temperatures in the North Atlantic is not enough to produce a change in the North Atlantic deep water formation. Only when Ice sheet have build up sufficiently, can they induce a shoaling of NADW through a change in atmospheric circulation pattern and a decrease in sea surface salinity. The influence of AABW reach the North Atlantic simultaneously to the shoaling of NADW.