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Deep-sea sedimentary records of diatom stable isotopes in the Atlantic Sector of the Southern Ocean

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We present high-resolution carbon and nitrogen isotope records of diatom-bound organic matter from ODP Sites 1094 and 1093 in the Atlantic sector of the Southern Ocean. These records are combined with reconstructions of summer sea surface temperature and winter sea ice extent. Site 1093 is located near the modern day Polar Front and site 1094 is located close to the winter sea ice boundary. Both cores exhibit seven glacial-interglacial cycles (MIS 1-16). The carbon and nitrogen isotopes of site 1093 show good correlation, in contrast to the anti-correlation that was measured in ODP 1094 records. This difference implies that the productivity in site 1093 is influenced mainly by changes of nutrient availability where in site 1094 the productivity is closely linked to global temperature change, sea ice coverage and dissolved levels of carbon dioxide.

The Terminations periods were studied in detail in both sites 1093 and 1094, showing large variability in pattern and in magnitude, among the proxies and between the sites. The sequence of events in sites 1094 and 1093 show that SSST and WSI lead carbon and nitrogen isotopic records in three out of six Terminations (I-II &IV). While the other three Terminations, III, V& VII show different order, carbon and nitrogen isotopes lead SSST and WSI. Such detailed observations increase our understanding of the climate processes that occurred in the transition between glacial to interglacial cycles.