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Changes in deep water circulation in the Southern Ocean over the last climatic cycle

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The contribution of NADW during glacial periods to the Southern Ocean is discussed controversially in the light of numerical modelling and palaeoceanographic proxy evidence. We use fine-scale benthic isotope and sortable silt records from core MD02-2589 from the southern flank of the Agulhas Plateau (41^{O}19.90'S, 25^{O} 15.30'E, 2660 m water depth) to assess the variability of NADW and CDW during the last 140 kyrs. The age model for core MD02-2589 is based on 9 AMS radiocarbon dates and additional graphic correlation of the foraminiferal benthic oxygen (*Fontbotia wuellerstorfi*) isotope record to the benthic oxygen of core MD97-2120 from the Chatham Rise (1210m water depth – Pahnke et al 2003).

The variability of NADW advection plausibly exerts dominant control on the carbon isotope signal of CDW. The benthic (*Fontbotia wuellerstorfii*)carbon isotope record of MD02-2589 displays high amplitude changes (up to $\sim$0.8 per mil) on orbital and sub-orbital timescales suggesting interplay between waters of both southern and northern origin. We investigate the possibility that these interactions are controlled not by NADW fluctuations but by Antarctic climate variability and its influence on Southern Ocean deep water circulation. This suggestion is further explored using the mean sortable silt record for MD02-2589, which shows higher flow speeds during glacial periods, in antiphase with the results at ODP Site 1089 (4624m water depth) in the southern Cape Basin.

The benthic oxygen record matches well with the record from core MD95-2042 from the Iberian margin (3146m water depth – Shackleton et al 2000). The similarity of the

records promotes interhemispheric correlation of our time series with similar palaeorecords from the North Atlantic and Greenland. Over termination II flow speed decreases rapidly as ice volume starts to diminish with an increase in chemical ventilation, indicative of an expansion of NADW over the site, lagging behind by $\sim$ 3 kyrs. This suggests a Southern source control over changes in deep ocean circulation in the Southern Ocean. Similarly both the benthic oxygen and carbon records display a very sharp transition from MIS5 into MIS4, a pattern recorded in core MD97-2120 but absent from core MD95-2042 from the Iberian margin.