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Insights into Southern Ocean dynamics during the mid-Pleistocene climate transition from benthic foraminiferal stable carbon isotopes

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The mid-Pleistocene transition (MPT) is arguably the most enigmatic long-term climate shift of the Quaternary, and is characterized by increasingly severe glacial conditions about 1.2 to 0.6 million years ago. Although these processes were presumably linked by a continuous lowering of glacial atmospheric CO_2 levels, the underlying processes are incompletely understood. Here, we investigate high-resolution epibenthic foraminiferal stable carbon isotope records from the Southern Ocean to assess the contribution of circulation and carbon cycle changes to climate dynamics of the MPT. Specifically, we compare two new benthic foraminiferal (*Cibicidoides/Cibicides* sp.) $d^{13}C$ records from central South Pacific IODP Site U1541 (54.2°S, 125.4°W, 3,606 m water depth) and Southeast Atlantic ODP Site 1094 (53.2°S, 05.1°E, 2,807 m water depth) with existing data from the global ocean to assess South Pacific Ocean ventilation changes and Pacific-Atlantic Ocean deep-water exchange over the past 1.7 Ma. The data show a good agreement between lower Circumpolar Deep Water (CDW) $d^{13}C$ signatures in the central South Pacific (U1541) and in the Southeast Atlantic (ODP Sites 1089, 1090 and 1094), suggesting a continuous homogenization of CDW between the Atlantic and Pacific sectors of the Southern Ocean over the past 1.7 Ma. Although we observe a continuous decline in CDW $d^{13}C$ signatures during the MPT in both the South Pacific and South Atlantic, vertical $d^{13}C$ gradients with underlying and overlying southern- and northern-sourced water masses, respectively, were much larger in the South Pacific than in the South Atlantic during the MPT. Our data provide on the one hand evidence for distinct Antarctic bottom water dynamics in different sectors of the Southern Ocean during the MPT and on the other signifies a contribution of reduced glacial CDW ventilation and increased glacial respired carbon storage in the Southern Ocean to the MPT.