Dueling Transects show enhanced $\delta^{13}C$ and $\delta^{18}O$ differences between the South Atlantic and South Pacific during the last glaciation: The deep gateway hypothesis

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Deep ocean circulation during the Last Glacial Maximum (LGM) was characterized by shoaling of northern sourced waters that is considered a primary cause of enhanced vertical gradients in $\delta^{13}C$ and $\delta^{18}O$ in the deep ocean. High-resolution depth transects of $\delta^{13}C$ and $\delta^{18}O$ in *Cibicidoides spp.* from the Southwest Pacific and Southwest Atlantic basins record northern and southern sourced deep waters changes during the LGM and deglaciation.. The Atlantic between ~1.0 and 2.5 km was more than 1 ‰ enriched in $\delta^{13}C$ than the Pacific and remained thus through the deglaciation. During the LGM, Atlantic $\delta^{18}O$ was ~ 0.5 ‰ more enriched than the Pacific below 2.5 km and this implies independent deep water sources. We attribute this to a 'deep gateway' effect whereby northern sourced waters shallower than the Drake Passage sill were unable to flow south into the Southern Ocean; a net meridional geostrophic transport cannot be supported in the absence of a net east-west circumpolar pressure gradient above the sill depth. We surmise that from the LGM through the early deglaciation, shoaled northern-sourced waters were unable to escape the Atlantic and contribute to deep water in the Southern Ocean.