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Tropical and Southern Westerlies Influence on Glacial Interhemispheric Asymmetry over the 35 to 10 ka period. The role of the Indo Pacific Warm Pool

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An oceanic bipolar seesaw linked to a southward shift of the southern westerly wind belt pushed by widespread sea ice formation in the North Atlantic has been invoked to explain the interhemispheric climatic asymmetry recognized in terrestrial and marine records of climate change during the last glacial cycle and deglaciation. Cold phases in one hemisphere coincide with warm ones in the other, and vice versa.

We have reconstructed environmental changes at high resolution [<35 years] backed up by a sound chronology, obtained from a deep-sea core located south of Australia near the modern Subtropical Front. We have used a multi-proxy approach, based on planktonic foraminifer assemblages counts and sea-surface temperature reconstructions obtained from these assemblages, plus the δ18O of 2 species of planktonic foraminifers [G. ruber and G. bulloides], to reconstruct changes in the water column as well as the position of various oceanic fronts above the core site.

We will show that oceanic changes offshore southern Australia shed new light on the functioning of the interhemispheric asymmetry during and after the last glaciation (33 to 10 ka period).

Millennial scale warm phases south of Australia are synchronous with the cold Northern Hemisphere Heinrich Stadials. The warm phases reflect the presence of the Leeuwin Current (LC) that originates from the Indo Pacific Warm Pool (IPWP) as an offshoot from the Indonesian Throughflow that sees water being transferred from the Pacific into the the Indian Ocean.

The glacial on-and-off behaviour of the LC south of Australia is linked to significant latitudinal shifts of the Subtropical Front (STF) off southern Australia and its continuation west to south of Africa, controlling the leakage of warm Agulhas water from the Indian into the Atlantic Ocean. This triggered major changes in the Atlantic Meridional Overturning Circulation, with ensuing implications for changes in the North Atlantic..

We will argue that the behaviour of the IPWP, that was under the influence of maximum austral summer insolation at the Last Glacial Maximum, has played an important role in transferring heat via the Agulhas Current, and therefore contributed to the asymmetry in climatic conditions across the globe.