790,000 years of millennial-scale Cape Horn Current variability and interhemispheric linkages

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I. State-of-the-art

Millennial-scale variations in the strength and position of the ***Antarctic Circumpolar Current*** exert considerable influence on the ***global meridional overturning circulation*** and the ***ocean carbon cycle***[1]. The mechanistic understanding of these variations is still incomplete, due to the scarcity of sediment records covering ***multiple glacial-interglacial cycles*** with ***millennial-scale resolution.***

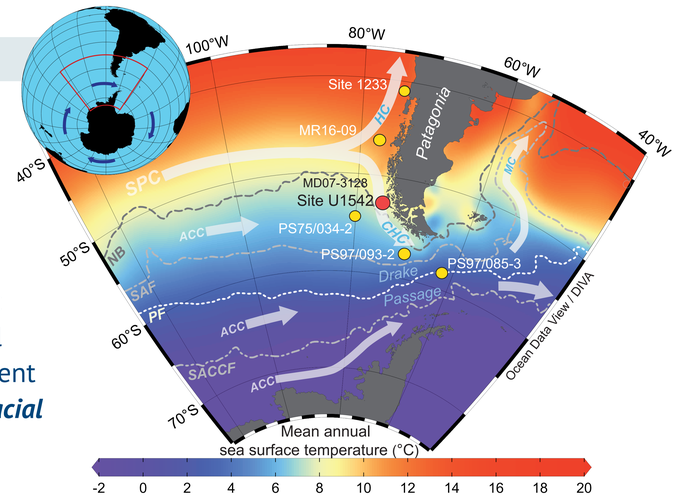


Fig. 1 Map of the Drake Passage region with mean annual sea surface temperature. White transparent arrows are schematic representations of major surface currents; the Antarctic Circumpolar Current (ACC), the South Pacific Current (SPC), the Cape Horn Current (CHC), the Humboldt Current (HC), and the Malvinas Current (MC). Altimetry-derived ACC fronts[30]; Northern Boundary (NB), Subantarctic Front (SAF), Polar Front (PF), and Southern ACC front (SACCF).

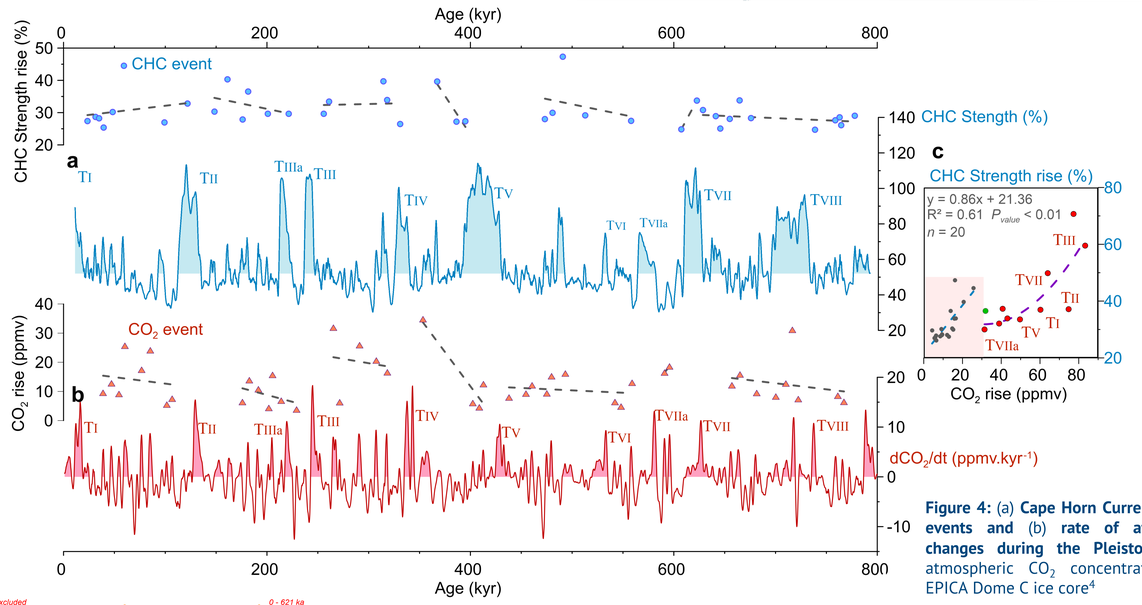
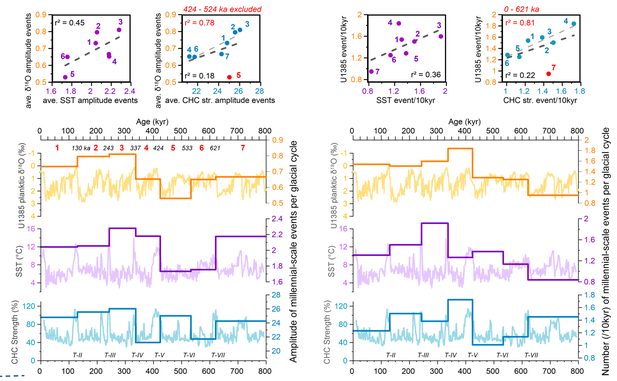


Figure 4: (a) **Cape Horn Current strengthening events and** (b) **rate of atmospheric CO_2 changes during the Pleistocene** based on atmospheric CO_2 concentrations from the EPICA Dome C ice core[4]

II. Interhemispheric comparison

By comparing millennial-scale ***Cape Horn Current strengthening events*** and ***sea surface warming events*** to ***cooling events*** from a millennial-scale record located on the ***Iberian margin***, we found;

1. The ***recurrence*** of event within a glacial cycle is similar in ***both hemisphere***
2. The ***amplitude*** of event within a glacial cycle is similar in ***both hemisphere***



III. Current strength & CO_2

The variations in the Cape Horn Current are associated with ***atmospheric CO_2 changes***, suggesting a mechanistic link through the Southern Ocean carbon cycle. This underline the role of the Antarctic Circumpolar Current system in ***enhancing the exchange*** between ***surface*** and ***deeper water*** in the Southern Ocean and the corresponding ***release of CO_2***

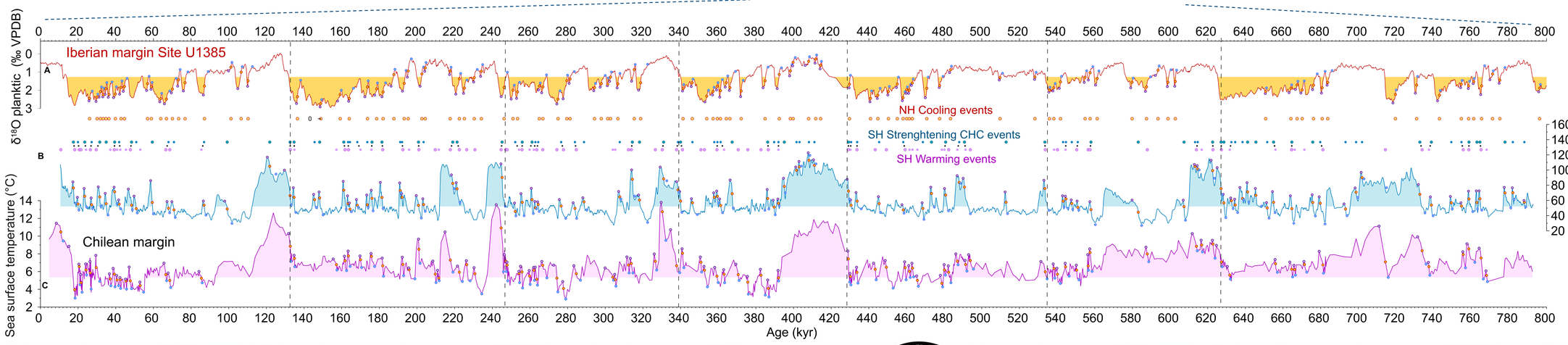


Figure 2 (top) and 3 (bottom). The amplitude and number of millennial-scale events for each glacial cycle. Average amplitude (left) and number (right) of stadial events at Site U1385 (orange), sea surface temperature (SST) warming events (purple), and Cape Horn Current (CHC) strengthening events (blue) at Site U1542 for each glacial cycle, highlighting a correlation between the amplitude and number in one hemisphere and in the other.

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