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# Investigating the link between Antarctic Circumpolar Current inception and events at the Oligocene-Miocene transition

**H.A. Pfuhl** (1) and I.N. McCave (2)

(1) Dept. of Earth and Environmental Sciences, Ludwig Maximilians University Munich, Theresienstr. 41, Munich, 80333 Germany, (Pfuhl@geophysik.uni-muenchen.de), (2) Godwin Lab., Dept. of Earth Sciences, University of Cambridge, Downing Street, Cambridge, CB2 3EQ United Kingdom

As the debate about Earth's climatic transition from Cretaceous "greenhouse" to modern-day "icehouse", i.e. with bipolar ice-coverage, progresses on the basis of recent observations, one crucial factor remains uncertain – the onset of Antarctic Circumpolar Circulation. The Antarctic Circumpolar Current (ACC) is a strong, wind-driven current, which in parts reaches the ocean-floor and significantly limits meridional heat-exchange in the Southern Hemisphere. ACC inception depended on changes in atmospheric circulation patterns largely influenced by progressive isolation of the Antarctic continent due to tectonic opening of Tasman Gateway (TG) south of Australia and Drake Passage (DP) south of America to deep throughflow.

Timing of TG deepening from around 35.5 to 30.2 Ma is well constrained and the widespread Marshall Paraconformity of the Australasian region from $\sim$ 33-30 Ma relates to this event. Timing of a deep opening of DP, however, remains contentious. Several recent publications argue that deep throughflow was established near the Eocene-Oligocene transition and that subsequent initiation of the ACC drove abrupt climatic cooling at the Eocene/Oligocene-boundary. We present data from Leg 189 to the Tasman Gateway, which suggest that a homogenous Southern Ocean water mass did not exist prior to the mid-Oligocene interval. This is consistent with reconstructions of current-speed (sortable silt), which reveal a single, marked increase over the investigated period from 28-21 Ma. This abrupt increase precedes the Mi-1 glaciation event in the earliest Miocene by $\sim$ 60 ky. We believe that this increase relates to the onset

of ACC-type circulation and is the driving force behind early Miocene cooling. These data contradict some of the evidence cited in support of an earlier deep throughflow.