Large impact of the Agulhas Return Current on SW Indian sector of the Southern Ocean during late glacial

*Minoru Ikehara[1], Xavier Crosta[2], Sunil Shukla[3,2], Katsunori Kimoto[4], Takuya Itaki[5], Hiroki Matsui[1], M.C. Manoj[3]

1. Center for Advanced Marine Core Research, Kochi University, 2. Université Bordeaux 1, 3. Birbal Sahni Institute of Palaeosciences, 4. JAMSTEC, 5. AIST

The Agulhas Current is a major actor of the Atlantic Meridional Overturning Circulation (AMOC) and thereof of global climate. Models and paleoceanographic data suggest that the volume of warm and saline Agulhas water leaking into the South Atlantic stimulates regional buoyancy anomalies that ultimately impact convective activity in the northern North Atlantic. Spillage of Agulhas Current into the South Atlantic was shown to strongly vary on glacial-interglacial timescales, possibly in relation to meridional shifts of the mobile Subtropical and Subantarctic fronts and the monsoon system. Conversely, the impact of the Agulhas Current on the Southern Ocean (SO), via its return branch, is much less documented.

Through the analysis of ice-rafted debris, census counts of microfossils (diatom, radiolaria and planktic foraminifera) and $d^{18}O$ and Mg/Ca of planktic foraminifera, we here reconstruct cool and icy conditions during the early Marine Isotope Stage 2 (MIS2, 30–23 ka) but warm, ice-free conditions during the full glacial late MIS2 (23–15 ka) in core DCR-1PC from Del Caño Rise (46˚S, 44˚E, 2632m), Indian sector of the SO. We propose that these unexpected warm conditions result from increased transport of warm waters from low latitudes to the SO via the Agulhas Return Current in time of reduced Agulhas Current leakage due to a northward shift of the Westerlies and SO hydrographic fronts. As such, a general cooling in the SO may conduct, via negative feedbacks, to warm surface conditions in regions of strong western boundary current.

Keywords: Southern Ocean, Agulhas Return Current, Atlantic Meridional Overturning Circulation, Agulhas leakage, last glacial maximum

