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Past and future changes in tropical climate amplified by the Indian Ocean

Pedro DiNezio

Institute for Geophysics, University of Texas at Austin, Austin, United States of America (pdn@ig.utexas.edu)

Presently, the Indian Ocean exhibits a unique climate state with subtle east-west contrasts and weak year-to-year variability. Whether these features could change in response to external forcings remains highly debated, an issue that is critical to predict future climate changes in highly populated neighboring countries. We explored this question combining climate reconstructions and numerical simulations and of the Last Glacial Maximum – the interval ca. 21,000 years ago when the Earth experienced the largest, most recent climate change. We found that the Indian Ocean exhibited radically altered rainfall patterns and oceanographic conditions across the basin, changes that according to our simulations, can only be explained by the amplifying effect of coupled ocean-atmosphere feedbacks. We also find that these changes favored the emergence of an El Niño mode driving significantly stronger climate variability. Despite different triggers in the past and the future, our results show that Indian Ocean climate could also be highly sensitive to future greenhouse forcing.