## Mode Shift in the Indian Ocean Climate under Global Warming Stress

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The Indian Ocean Dipole (IOD) has become a major influence on the climate variation not only in the Indian Ocean but also globally. IOD produces precipitation anomalies in the East African short rain, which was recorded in annual coral bands obtained from Kenya as oxygen isotope anomalies providing coral IOD index [1]. The coral IOD index reconstructed from a 115-year coral record show a mode shift

of IOD variability through the twentieth century, IOD has been occurring more frequently in recent decades [2]. A dominantly decadal periodicity before 1924 shifted to mostly quasi-biennial ranging from 18 months to 3 years events since 1960. The mode shift has also coincided with an intensified coupling with Indian summer monsoon rainfall. We suggest that global warming effects on the western Indian Ocean have driven the observed shift in IOD variability. The IOD has replaced the El Nino/Southern Oscillation as the major driver of climate patterns over the Indian Ocean region.

Keywords: Indian Ocean Dipole; monsoon; ENSO; coral annual band.

## References

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- [2] N. Nakamura et al., *Goephys, Res. Lett.* **36**, L23708 (2009).



Figure 1. (a) Coral oxygen isotope record for 1887-2002. (b) The coral IOD index derived from (a). (c) The mode shift of coral IOD periodicity. (d) Correlation coefficients between coral IOD index – Indian summer monsoon rainfall (ISMR) (blue) and NINO3 SST – ISMR (red). ISMR was mainly controlled by ENSO during the former half of the twentieth century, but has been controlled by IOD since 1980s. [2]