Indian Ocean Dipole Index for the Last 115 Years Recorded in Kenyan Coral Annual Bands

Hajime Kayanne[1]; # Nobuko Nakamura[1]; Hiroko Iijima[2]; Timothy R. McClanahan[3]; Swadhin Behera[4]; Toshio Yamagata[1]

[1] Earth & Planetary Sci., Univ. Tokyo; [2] Earth & Planetary Sci.,Univ. Tokyo; [3] WCS,USA.; [4] JAMSTEC

Variability in the tropical and subtropical climate in the Indian Ocean has often been explained in relation to ENSO. However, correlation between ENSO and climate variability is not always strong. Recently, the Indian Ocean Dipole (IOD) was discovered [Saji et al., 1999], which has similar east-west SST and precipitation anomalies and periodicities that are similar to those of ENSO in the Pacific Ocean. IOD is a seasonally phase-locked interannual phenomenon, and produces precipitation anomalies in the East African short rains from October to November. The heavy rains in 1961, 1997 and 2006 were associated with positive IODs in these years [Yamagata et al., 2004].

A signal of the IOD in precipitation was detected in the coral core from Malindi, Kenya (3.2 south latitude and 40.1 east longitude). Luminescence intensity under UV light and oxygen isotope values dated at January, a few months after the short rain period, correlated well with anomalies in precipitation, and we assigned the oxygen value at January of the following year to coral IOD index [Kayanne et al., 2006]. To reconstruct IOD events before the instrumental observations, we extended the coral IOD index record back to 1886 A.D. The coral IOD index marked light oxygen isotope peaks (corresponding to high short rain precipitation) in 1902, 1905, 1912, 1935, 1952, 1961, 1972, 1994 and 1997, and heavy peaks (corresponding to low short rain precipitation) in 1889, 1895, 1931, 1941, 1953, 1971, 1985, 1991 and 1996. The coral index shows general lightening trend probably derived from warming, with decadal changes from relatively low amplitude of oscillation in the 1940s and 1980s to large amplitude in the 1930s, 1950s, 1970s and 1990s. Those seem to be consistent with characteristics of the instrumental IOD index in recent decades. On the other hand, the correlation between the coral index and the ENSO index is weak.