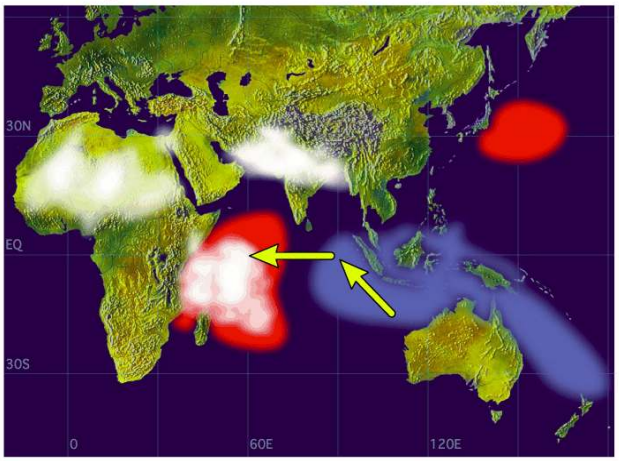
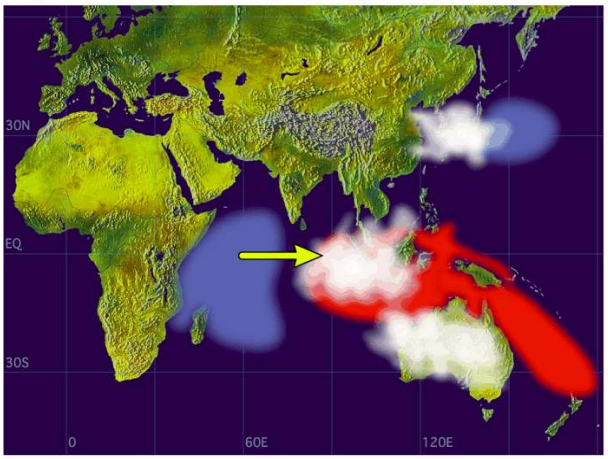
Positive Dipole Mode



Negative Dipole Mode



The Indian Ocean Dipole

The Indian Ocean Dipole (IOD) is a climate change mode that occurs in the tropical parts of the Indian Ocean.

It was not until 1999 that this event was identified by analysis of satellite Sea Surface Temperature (SST) image anomalies over such a large ocean expanse that had not been possible to analyse using previous ship based Conductivity / Temperature / Depth (CTD) observations.

However its occurrence can be traced through coral records to the mid-Holocene period (11,000 years ago to present). Coral records suggest that strong IOD events occur in both El Niño Southern Oscillation (ENSO)years (1877, 1994 and 1997) and in non ENSO (1961) years[1].

The positive phase is normally characterized by anomalous cooling of the SST in the south eastern equatorial Indian Ocean (northern coast of Australia, eastern coast of Japan and throughout Indonesia) and anomalous warming in the western equatorial Indian Ocean (east coast of Africa from the northern half of Madagascar to the northern edge of Somalia). The negative phase is a reversal of the positive phase (see figures above). A positive phase causes the normal convection situated over the eastern Indian Ocean warm pool to shift to the west and brings heavy rainfall over east Africa and severe droughts and forest fires to the Indonesian region.

The dipole mode is normally initiated in summer (June-August) and observing the state of the dipole is useful for weather forecasting. For example when it peaks in the autumn (September-November), and when it is negative, there are more cyclones in the Bay of Bengal[2]. It is observed that significant IOD events evolve in the absence of ENSO events though an apparent correlation between IOD and ENSO, some 30% concurrence, sometimes implicates that IOD events are ENSO dependent[3].

A significant positive phase IOD event occurred in 1997–1998 and another in 2006. The 1997–1998 event contributed towards unusually higher SST that resulted in more than 90% of shallow water coral mortality (coral bleaching) on most Indian Ocean reefs including the Chagos Archipelago[4].

[1] Abram, N.J., Gagan, M.K., Liu, Z., Hantoro, W.S., McCulloch, M.T., and Suwargadi, B.W. 2007. Seasonal characteristics of the Indian Ocean Dipole during the Holocene epoch. Nature 445, 299-302

[2] Kripalani, R.H. and Kumar, P., 2004 *Int. J. Climatol., 24, 1267-1282.*

[3] Behera, S., Luo, J., Sakuma, H. and Yamagata, T. 2007 Geophysical Research Abstracts, 9, 11076,

[4] Sheppard, C.R.C. 2003 Predicted recurrences of mass coral mortality in the Indian Ocean. Nature, 425, 18 September. http://www.nature.com/nature/journal/v425/n6955/full/nature01987.html

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The annual membership subscription costs only £20/$40, or £100/$200 for six years.

If you would like more information on the publications or membership, please contact the Secretary (simonhughes@hughes-mccormack.co.uk) or visit the web site www.chagos-trust.org.

Text contributed by David J Dixon and Simon Hughes. Image source: UN Atlas of the Oceans.