

Role of the Indian Ocean in the monsoon-ENSO system

P. Terray

Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques
Paris, France

ABSTRACT

In this talk, we use recent observations and IPCC AR4 coupled simulations in order to assess the relationships of the Indian Summer Monsoon (ISM), El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) events with Sea Surface Temperature (SST) anomaly patterns over the Indian and Pacific oceans. The focus is on the predictability of various components of the tropical Indo-Pacific climate and their links to Indian Ocean SST forcing.

It is found that southern Indian Ocean SST acts as a major boundary forcing for the late ISM (LISM), ENSO and IOD events during recent decades (eg, after the 1976/77 climate shift). Weak (strong) LISMs, El Niños (La Niñas) and positive (negative) IOD events are preceded by significant negative (positive) SST anomalies in the southeastern subtropical Indian Ocean, off Australia during boreal winter. These SST anomalies are mainly linked to subtropical Indian Ocean dipole events, recently studied by Behera and Yamagata (2001) and to ENSO. These SST anomalies are highly persistent and may be a trigger for both the wind-thermocline-SST positive feedback off Sumatra and the development of westerly wind anomalies over the western Pacific. Both phenomena are well-known precursors for the evolution of IOD and El Niño events.

Interestingly, such significant relationships also hold for the double and quadruple CO₂ stabilized scenarios available in the IPCC AR4 database, suggesting that these changes may be linked to the Indian Ocean warming trend.

These results shed some light on the possible influence of global warming or decadal fluctuations on El Niño evolution through changes in atmospheric teleconnection patterns between the Indian and Pacific oceans.