The weakening of the Indian Monsoon-ENSO relationship and the Tropical Atlantic

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The Indian Monsoon-El Nino Southern Oscillation (ENSO) relationship, according to which a drier than normal monsoon season precedes peak
El Nino conditions, weakened significantly during the last two decades
of the 20th century. In this work an ensemble of integrations of an
Atmospherical General Circulation Model (AGCM) coupled to an ocean model
in the Indian basin and forced with observed sea surface temperatures (SSTs)
elsewhere is used to investigate the causes of such a weakening.
The observed interdecadal variability of the ENSO-Monsoon relationship
during the period 1950-1999 is realistically simulated by the model and a
dominant portion of the variability is associated to changes in the tropical
Atlantic SSTs in boreal summer.
In correspondence to ENSO, the tropical Atlantic SSTs display negative
anomalies south of the Equator in the last quarter of the 20th century
and weakly positive anomalies in the previous period. Those anomalies
in turn produce heating anomalies which excite a Rossby wave response
in the Indian Ocean in both the model and in reanalysis data, impacting
the time-mean monsoon circulation. The proposed mechanism of remote response
of the Indian rainfall to tropical Atlantic sea surface temperatures
is further tested forcing the AGCM coupled to the ocean model in the
Indian basin with climatological SSTs in the Atlantic Ocean and observed
anomalies elsewhere. In this second ensemble the ENSO-Monsoon relation is
characterized by a stable and strong anticorrelation through the whole second
half of the XX century.