INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE

THE BEST STUDENT PAPER AWARD FOR THE YEAR 2013

To encourage and inspire student scientists, IITM has instituted since 2007, an Annual Best Student Paper Award for the best research contribution in the form of published paper in standard research journal by the Ph.D. Students of this Institute. The award presently carries a cash reward of Rs. 10,000/- and a citation.

The 'Best Student Paper Award goes to the paper entitled

"Spring Asymmetric Mode in the Tropical Indian Ocean: Role of El Niño and IOD"

Published in the Journal Climate Dynamics, 40, March 2013,
DOI:10.1007/s00382-012-1340-1,1467-1481

by

Soumi Chakravorty, J.S. Chowdary and C. Gnanaseelan

which has been adjudged to be the best research contribution of the year 2013.

The spring asymmetric mode over the Tropical Indian Ocean (TIO) is characterized by contrasting patterns of rainfall and surface wind anomalies north and south of Equator. The asymmetric pattern in rainfall has evolved as a leading mode of variability in the TIO and is strongly correlated with El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD). The evolution of the asymmetric pattern in rainfall and surface wind are examined in the twentieth century reanalysis and/or atmospheric general circulation model (AGCM) simulations for the period of 1871–2008. The study revealed that spring asymmetric mode is well developed when El Niño co-occurred with IOD and is driven by the associated meridional gradients in sea surface temperature (SST) and sea level pressure (SLP). The pure El Niño composites are characterized by spatially homogeneous positive SST anomalies, weaker SLP gradients and convection, leading to weak asymmetric mode. The asymmetric mode is absent in the pure IOD composites due to the persistence of east west SST gradient for a longer duration than the co-occurrence years. The meridional gradient in SST anomalies over the TIO associated with the ENSO-IOD forcing is therefore crucial in developing/strengthening the spring asymmetric mode. The northwest Pacific anti-cyclonic circulation further strengthens the asymmetric mode in surface winds by inducing north-easterlies in the north Indian Ocean during pure El Niño and co-occurrence years. The simulations based on AGCM, forced by observed SSTs during the period of 1871–2000 supported the findings. The analysis of available long term ship track and station data further strengthens the hypothesis. The spring asymmetric mode is significant after the 1976's climate shift mainly due to frequent co-occurrence of El Niño and IOD events. The coupled ocean-atmosphere model sensitivity experiments revealed that air-sea coupled processes in the tropical Indian and Pacific Oceans are responsible for the asymmetric mode formation and its maintenance.

This citation is presented to

Soumi Chakravorty

in recognition of her contribution to the above research paper.

IITM, Pune
November 17, 2014

Dr. R. Krishnan
Director

INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE

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The 'Best Student Paper Award goes to the paper entitled

"Role of ocean-atmosphere interaction on northward propagation of Indian summer monsoon intra-seasonal oscillations (MISO)"

Published in the Journal Climate Dynamics (Special issue: CSFv2), 41, September 2013, DOI 10.1007/s00382-013-1854-1, 1651–1669

by

S. Sharmila, P.A. Pillai, S. Joseph, M. Roxy, R.P.M. Krishna, R. Chattopadhyay, S. Abhilash, A.K. Sahai and B.N. Goswami

which has been adjudged to be the best research contribution of the year 2013.

This study investigates the relative role of atmospheric dynamics and ocean-atmosphere coupling in the initiation, maintenance, and northward propagation of Indian summer monsoon intraseasonal oscillations (MISO) using the recent version of state-of-the-art coupled NCEP-Climate Forecast System (CFSv2) model and its atmospheric component, the Global Forecast System (GFS). Three numerical simulations are performed; (1) CFSv2 with high frequency air-sea interaction (at every half an hour), (2) GFS forced with observed monthly sea surface temperature (SST) (interpolated to daily) and (3) GFS forced with daily SST obtained from the CFSv2 simulations. Results show that the MISO simulated by CFSv2 has realistic northward propagation of convection from the equator, while both GFS experiments show only standing mode of MISO over the Indian subcontinent. The analyses further indicate that even with the conducive vertical wind shear, the absence of meridional humidity gradient and moistening of the atmosphere column north of convection hinders the northward movement of convection in GFS. This moistening mechanism works only in the presence of an 'active' ocean. In CFSv2, the lead-lag relationship between the atmospheric fluxes, SST and convection are maintained, while such lead-lag is unrealistic in the uncoupled simulations. These results lead to the conclusion that high frequency air-sea coupling is a necessary and crucial condition for reproducing the realistic northward propagation of MISO in the model. This study demonstrates the seminal role of air-sea coupling in simulating realistic MISO using CFSv2-GFS dynamical modeling framework for the first time.

This citation is presented to

Sharmila Sur

in recognition of her contribution to the above research paper.

IITM, Pune
November 17, 2014

Dr. R. Krishnan
Director