Impact of Oceans around south Asia on Monsoon

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12th Session of
South Asian Climate Outlook Forum (SASCOF-12)
Pune, India 19-20 April 2018
The South Asian Monsoon System

June-September mean rainfall (mm/day)

Latitude-Time section of Outgoing Longwave Radiation

Tracks of monsoon depressions
(from Prajesh et al 2015)
Indian summer Monsoon: Teleconnections

Map of correlation coefficient between ISMR (IITM) and OLR

Well known ENSO-Monsoon link: ISMR-Nino3.4 index correlation is about 0.54 (1958-2016)

Nino3.4 index alone explains about 34% of variance of ISMR in the interannual time-scale
Interannual variation of All India summer monsoon rainfall

Not all excess/droughts are linked to ENSO
Indian summer Monsoon: Teleconnections

**EQUINOO-Monsoon link: ISMR-EQWIN correlation is about 0.4 (1958-2016)**

**EQWIN explains about 19% of variance of ISMR in the interannual time-scale**
Equatorial Indian Ocean Oscillation (EQUINOO)

- EQUINOO: Oscillation in convection over the Equatorial Indian Ocean
- Positive EQUINOO has excess (suppressed) convection over the Western (Eastern) Equatorial Indian Ocean
- Zonal wind in the central equatorial Indian Ocean is considered as an index of EQUINOO

Gadgil et al (2004), GRL
The extremes of ISMR are well separated in the phase plane of EQWIN and ENSO index averaged for June-September.

This indicates that all the extremes of ISMR (1958-present) can be explained considering only two modes, viz. ENSO and EQUINOOC.

A composite index defined with a linear combination of EQWIN and ENSO index is highly correlated to ISMR and it can explain about 53% of the total variance of ISMR (interannual).

The variance of ISMR explained by both the modes add up since the cross-correlation between the two indices are almost zero during the summer monsoon season.

Gadgil et al (2004), GRL

Surendran et al (2015), ERL
Possible Predictions of Large Excess/Deficit Rain within the Season

- With the help of composite index for the month of June, we can predict the possibility of large excess/deficit in the months of July-September.

Surendran et al (2015), ERL

- With the help of composite index for the month of July, we can predict the possibility of extremes in the months of August and September.

Surendran et al (2015), ERL
Indian Monsoon and Indian Ocean Dipole

Correlation between DMI and rainfall


- While the DMI is correlated with rain over the equatorial Indian Ocean, it does not have similar relation with rain over the Indian region during the summer monsoon season.
Relationship between EQUINOO and IOD is not very strong as indicated by a relatively low correlation coefficient between EQWIN and DMI.
Outlook for EQUINOX in 2018

ECMWF

Courtesy:
Prof. Sulochana Gadgil & Dr. DS Pai
Outlook for EQUINOO in 2018

EUROSIP

Courtesy:
Prof. Sulochana Gadgil & Dr. DS Pai
Outlook for EQUINOX in 2018

North American MME (NMME, IRI)

Courtesy:

Prof. Sulochana Gadgil & Dr. Antony Barnston, IRI
The link between EQUINOO and the monsoon is opposite to the observed in almost all the models (Nanjundiah et al. 2013).
Thank You

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