MERIDIONAL GRADIENT OF SEA SURFACE TEMPERATURE OVER THE BAY OF BENGAL AND ITS ASSOCIATION WITH SUMMER MONSOON RAINFALL IN THE INDIAN SUBCONTINENT

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Introduction

The Indian summer monsoon (ISM) is predominantly driven by the 30-60 day mode of Intra-seasonal oscillation (ISO) via active break cycles(Goswami & Mohan,2001). Indian Ocean plays a key role in the genesis and propagation of ISO, as the manifestation of active and break cycles(Waliser,2006). The inception of the ISO originates in the equatorial Indian Ocean and migrates these convective cloud bands northward over the Bay of Bengal (BoB)(Joseph & Sabin,2008).

Objectives

- Understand the relation between newly developed BMSI index and rainfall over Central India
- Analyze the potential of BMSI index to identify active and break period of Indian summer monsoon over Central India

Data & Methodology

Datasets

- IMD gridded rainfall data (0.25°x0.25°)
- NOAA's Optimum Interpolation Sea Surface temperature (OISST, 0.25° x 0.25°)
- ECMWF Reanalysis v5 (ERA5) u wind and v wind datasets(0.25° x 0.25°)

Methodology

- We developed an index named 'BoB Meridional SST Index (BMSI)' which is based on the meridional sea surface temperature gradient between the east equatorial Indian Ocean (EEIO) and the northern BoB (NBB).
- Study period 1982 to 2019
- The High Gradient Days (HGD) days: days having SST gradient > +1 standard deviation of BMSI at least for three consecutive days.
- The Low Gradient Days (HGD) days: days having SST gradient < -1 standard deviation of BMSI at least for three consecutive days

Results & Discussion

- There is significant correlation between BMSI and rainfall over central India (r >.7)(Fig. 1)

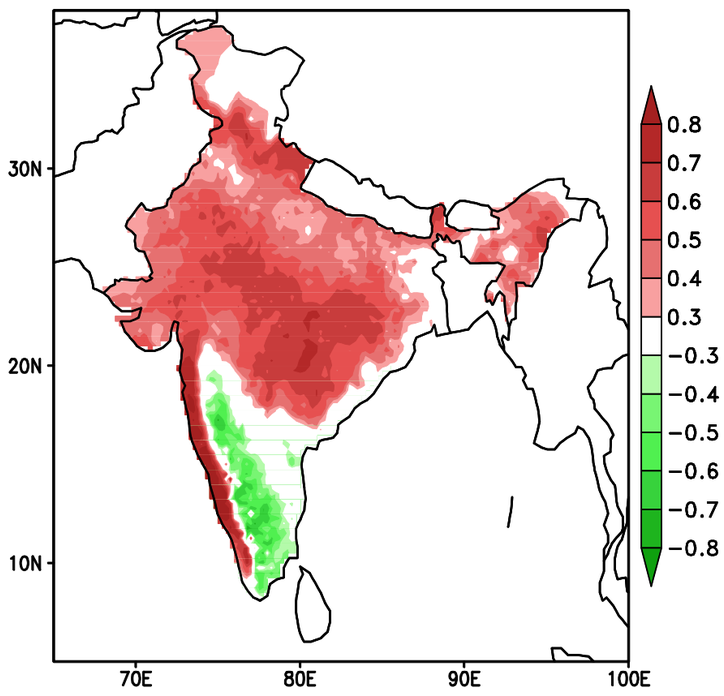

Fig.1: spatial correlation between BMSI and ISMR over India

- The correlation analysis of BMSI and ISMR over the central Indian region manifests a proceeding and receding phase with a correlation coefficient of 0.85 and 0.92 (Fig.2)

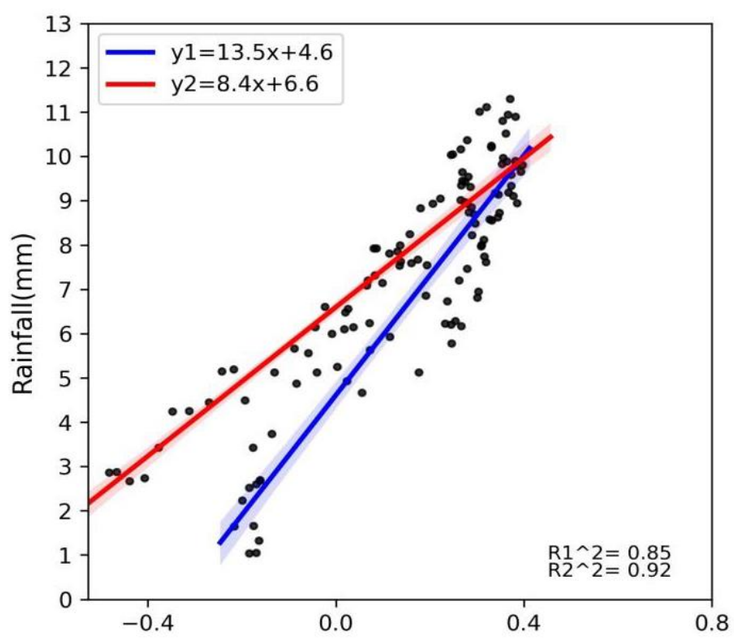

Fig. 2: correlation between BSMI and rainfall during ISMR. Blue line indicates the proceeding phase and red line indicates the receding phase

- The rainfall composite developed based on BSMI clearly manifesting a positive anomaly over the central India and west coast during HGD period and negative anomaly during LGD peiod just like the rainfall anomaly during active and break period in ISMR (Fig. 3)

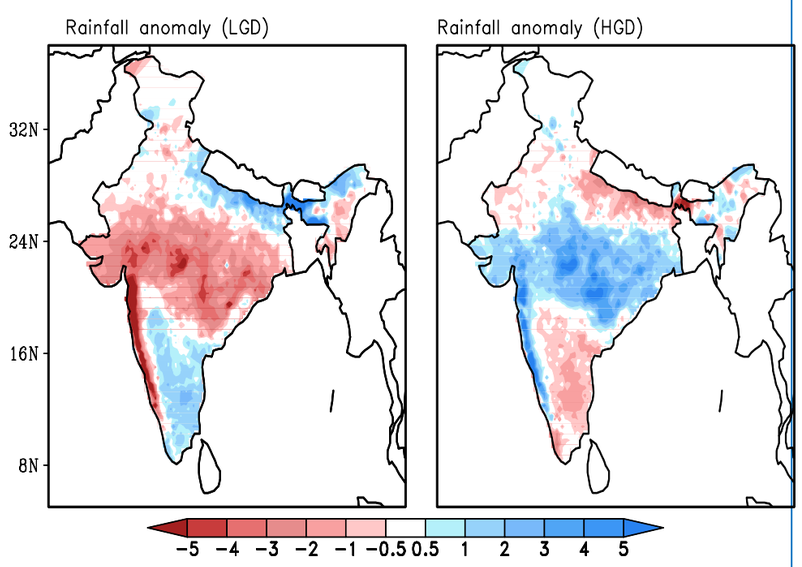

Fig. 3:Rainfall anomaly during LGD(left) and HGD(right) period.

- The acceleration of low level westerlies is clearly evident during the HGD days whereas significant weakening is evident in LGD.

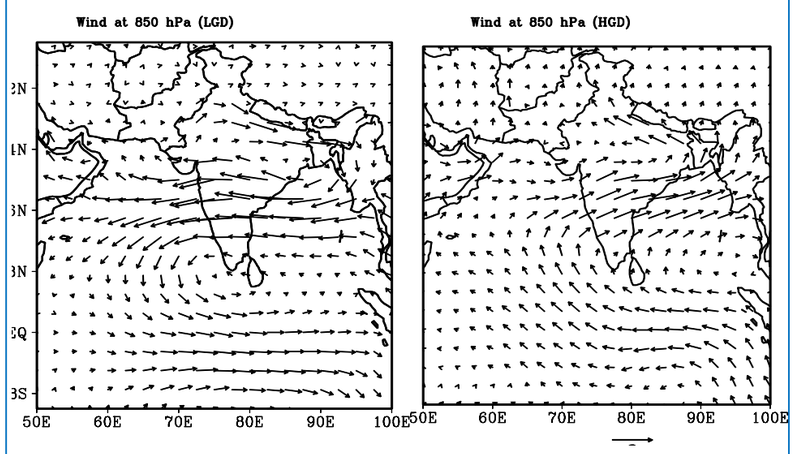

Fig. 3: wind anomaly at 850 hpa during LGD(left) and HGD(right) period.

Summary/Conclusion

- The HGD and LGD are explicitly mimicking the active and break phases of ISMR.
- This indicates the dominating influence of SST gradient between equatorial Indian Ocean and North Bay of Bengal on IISMR over Central India.
- Thus it can be summarize that the 30-60 day mode of Intra-seasonal oscillation (ISO) is driven by the BSMI .
- A detailed further study in the BMSI and ISO is warranted under the scenario of decreasing variability of low frequency ISO.

Acknowledgements & References

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