SRINIVAS GANGIREDLA, PhD Student
Indian Institute of Tropical Meteorology (IITM)
Pune, India

WCRP-JNU Training School on Monsoon variability in changing climate

Jeju National University (JNU), Jeju 16 – 20 January 2017

Currently working on

- ***Equatorial Indian Ocean subsurface temperature bias in a Climate forecasting system (CFSv2) coupled model***

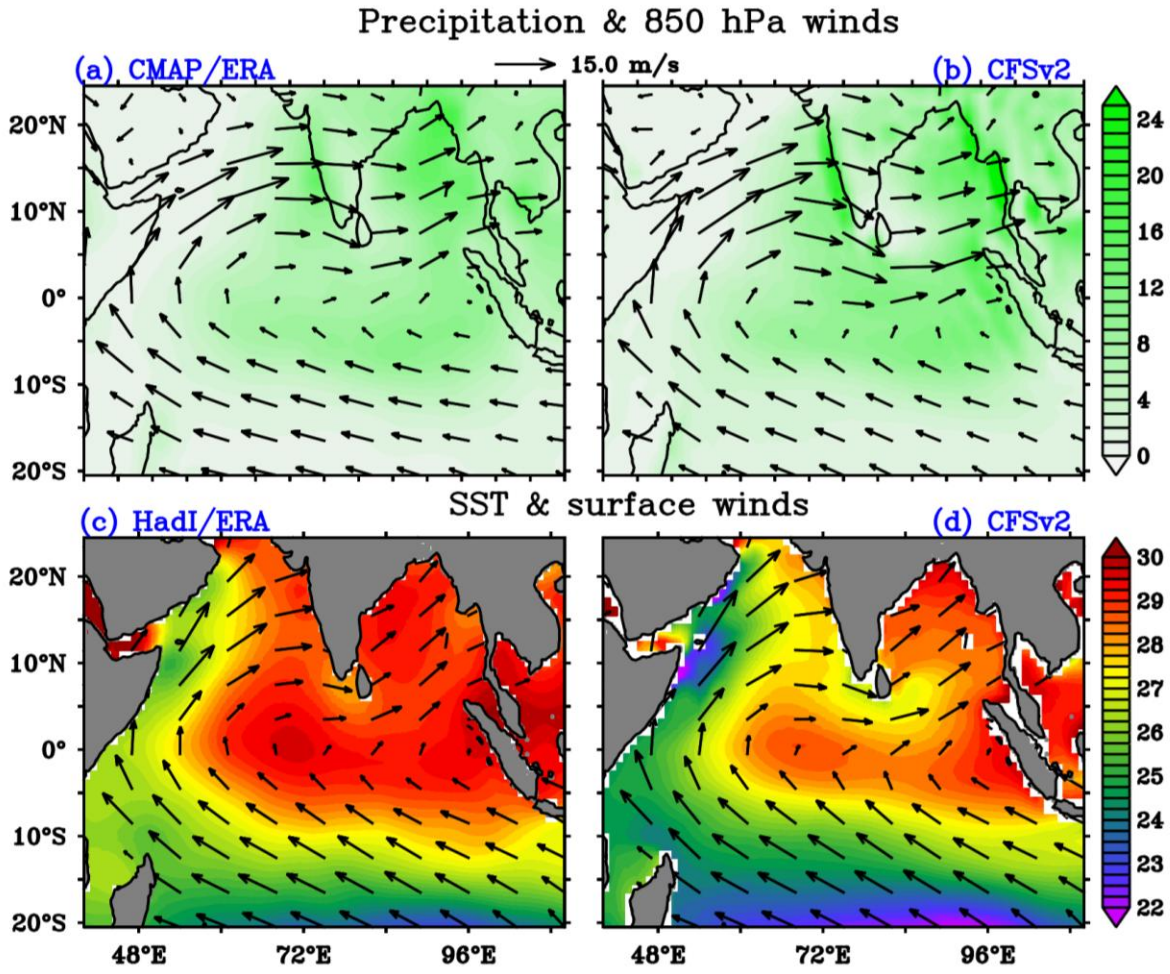
Climate forecasting system (CFSv2) **is a coupled model being used for seasonal forecast in most of the countries including India under the** ***National Monsoon Mission.***

Atmospheric component

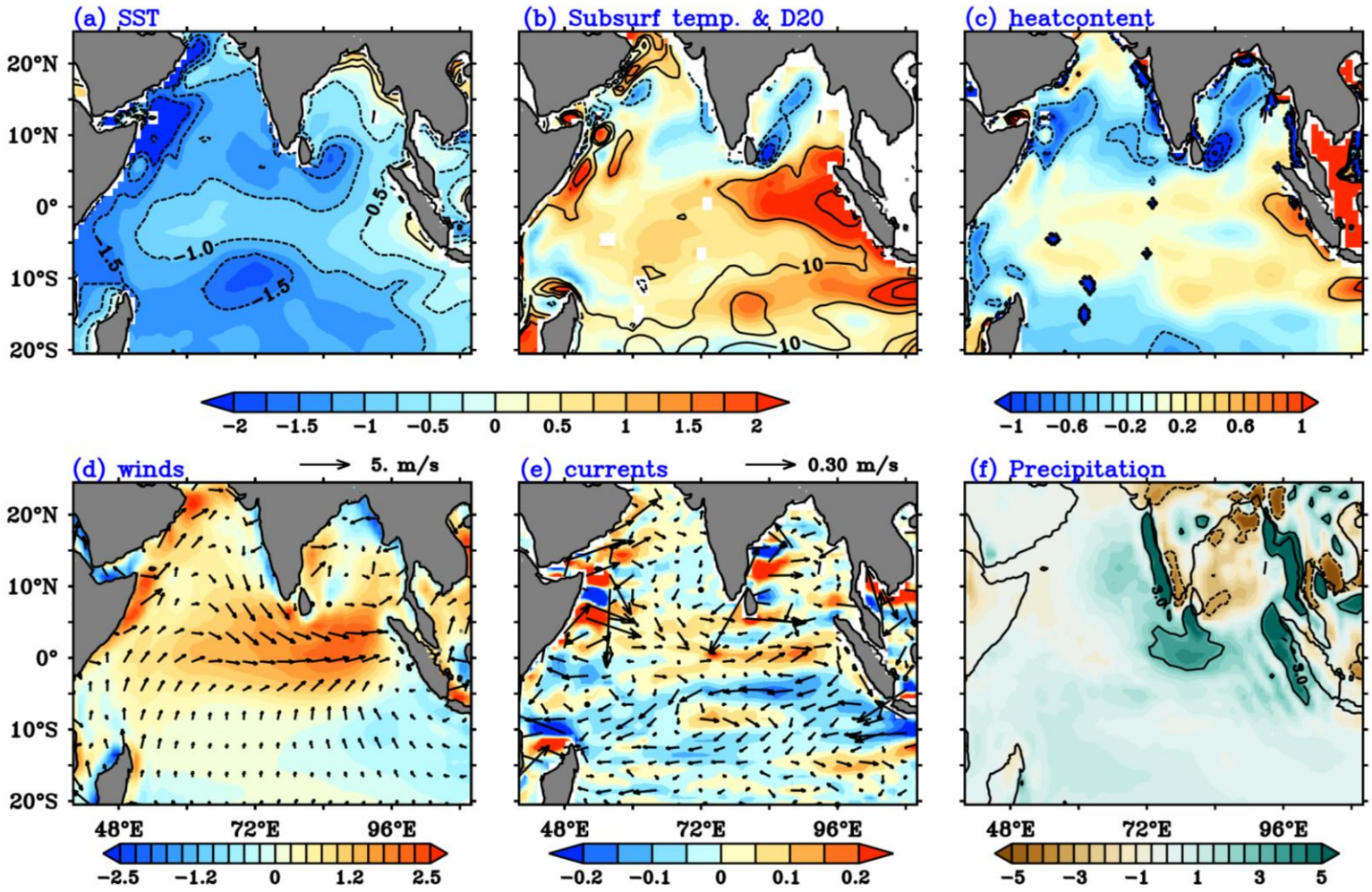
Global Forecasting System (GFS)

Oceanic component

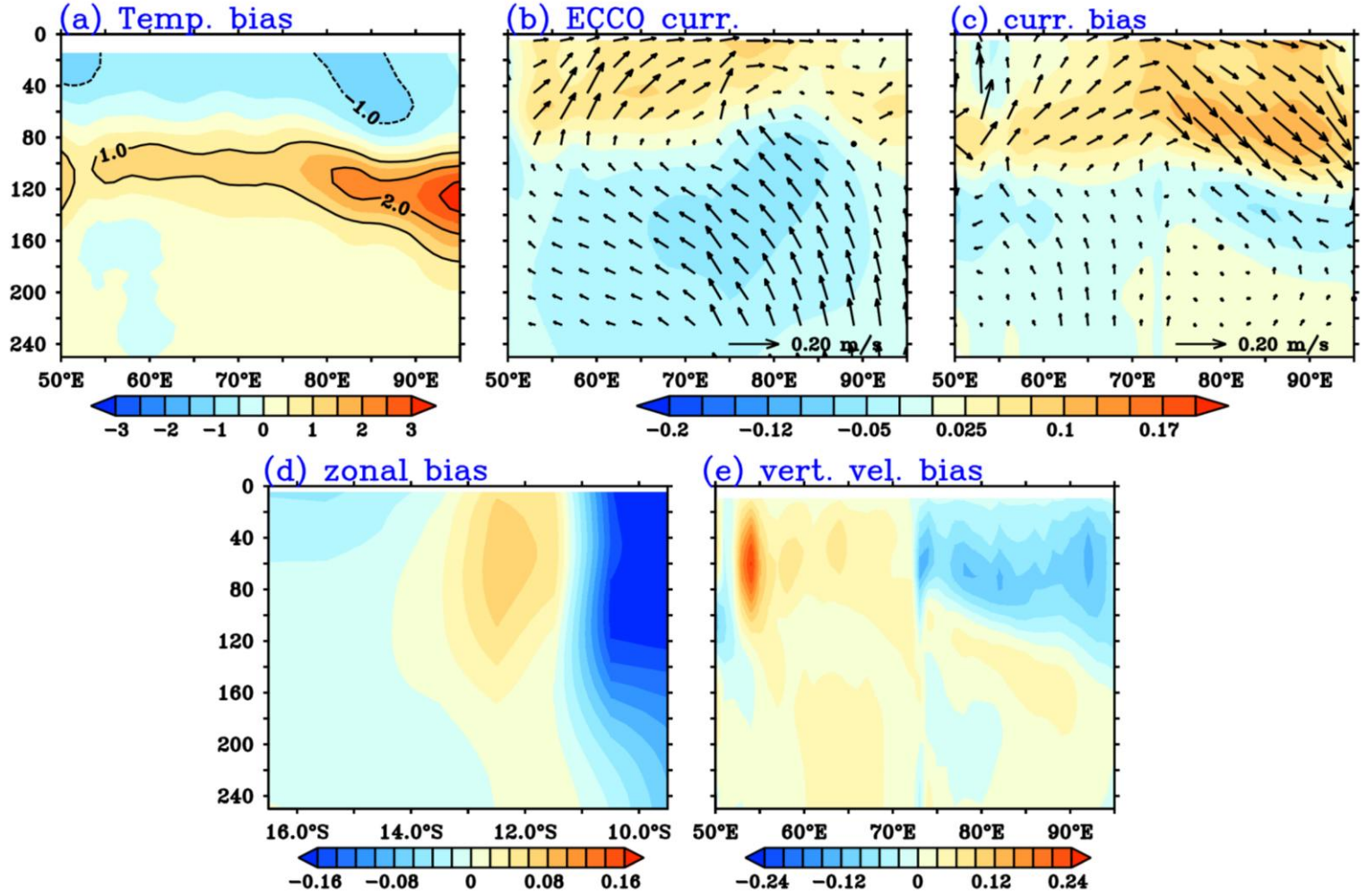
Modular Ocean Model (MOM4p1)



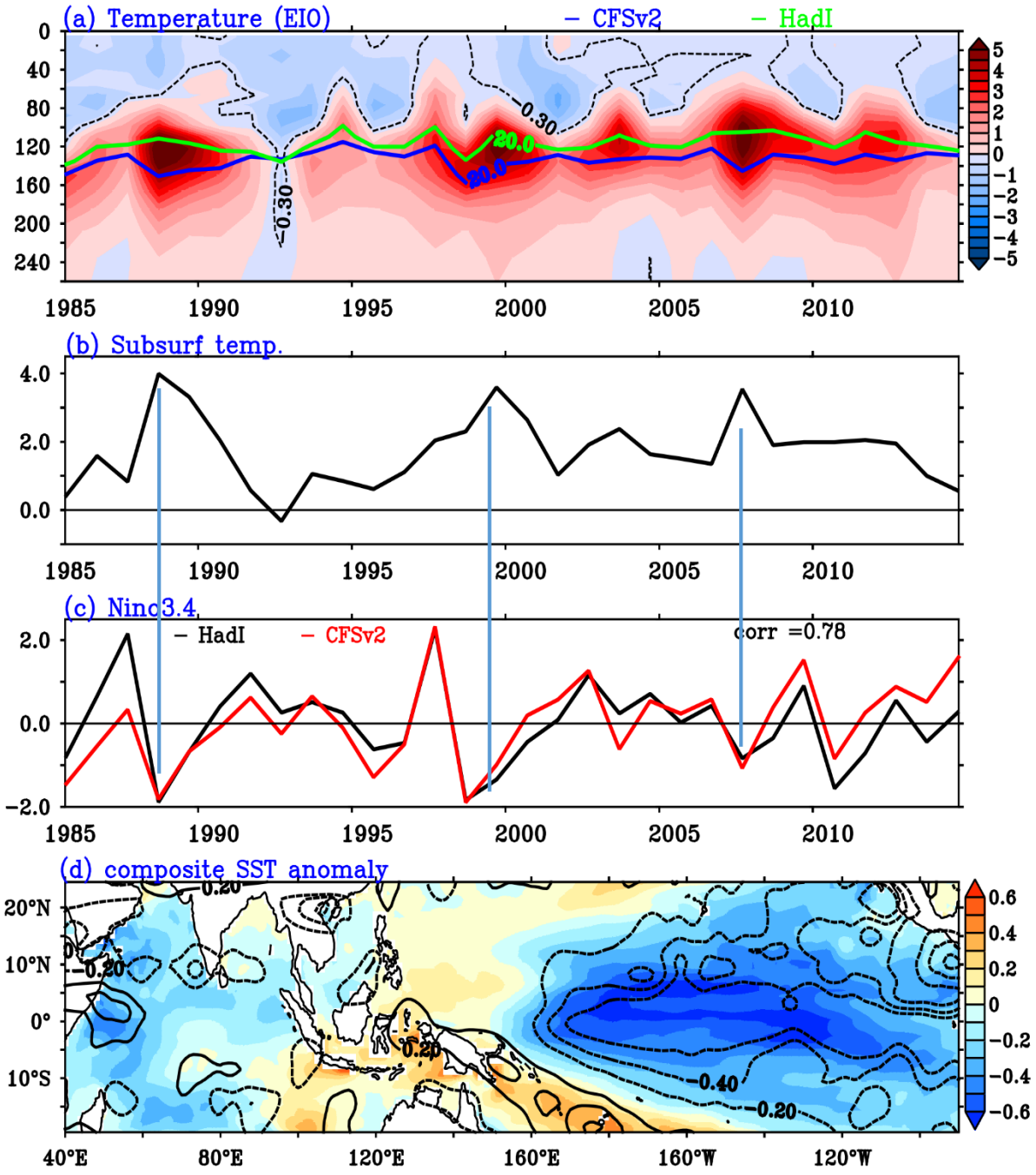
Boreal summer (JJAS) mean state of precipitation, winds of surface and 850 hPa winds and Sea surface temperature



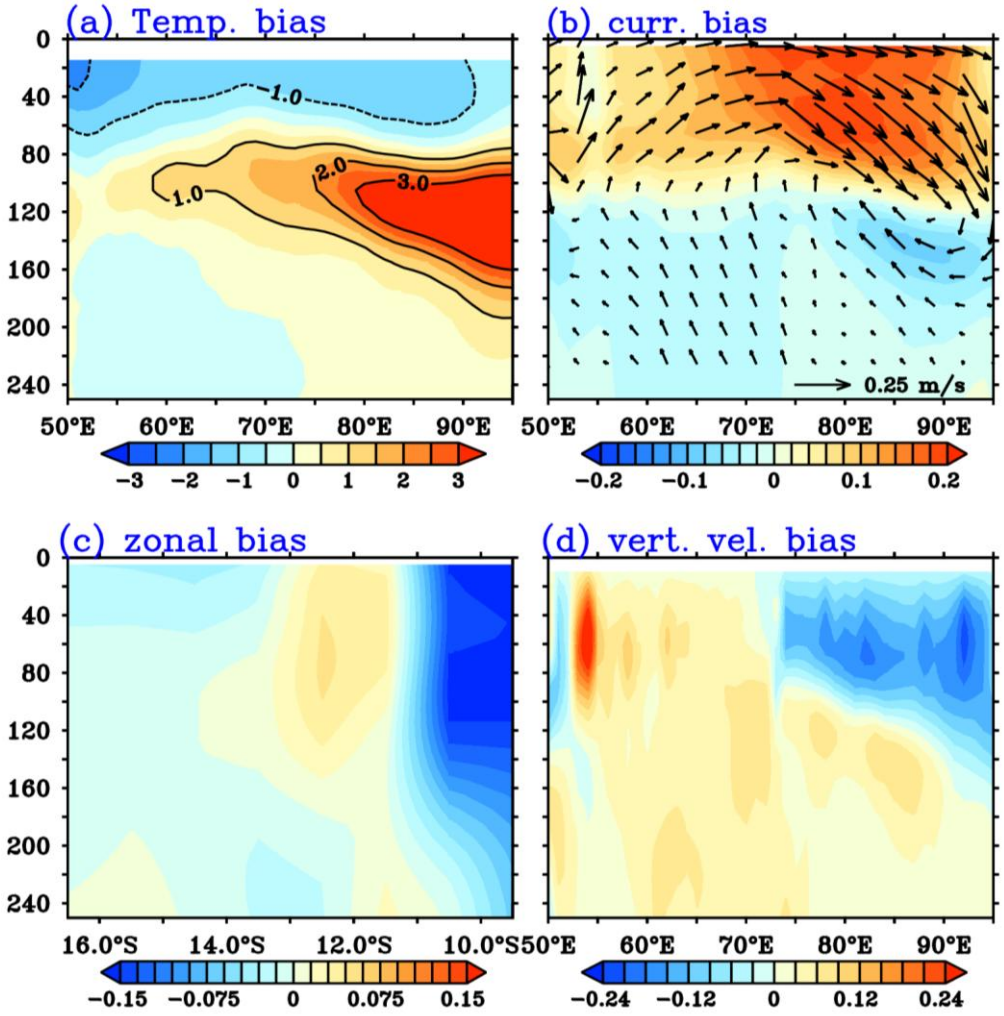
JJAS mean bias of SST, Subsurface temperature, heat content, winds currents and precipitation



Depth – longitude biases of temperature and currents of upper 250 m depth.


(a) Temperature (EIO)
– CFSv2
– HadI
0
40
80
120
160
200
240
-0.30
20.0
20.0
-0.30
5
4
3
2
1
0
−1
−2
−3
−4
−5
1985
1990
1995
2000
2005
2010
(b) Subsurf temp.
4.0
2.0
0.0
1985
1990
1995
2000
2005
2010
(c) Ninc3.4
– HadI
– CFSv2
corr =0.78
2.0
0.0
−2.0
1985
1990
1995
2000
2005
2010
(d) composite SST anomaly
20°N
10°N
0°
10°S
0.20
0
-0.20
0.20
-0.40
-0.20
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
40°E
80°E
120°E
160°E
160°W
120°W

Composites of strong warming years



Summary

- ***Maximum warm subsurface temperature mean bias greater than 3°C is noted over the EEIO region in CFSv2.***

- ***SLP gradient with positive (negative) bias in the western EIO (eastern EIO) supports westerly winds bias over the equator in summer.***

- ***This westerly winds bias induces strong eastward current bias in the upper 100 m over the EIO region, which causes for accumulation of warm water over the EEIO and punched down to subsurface with deep the thermocline.***

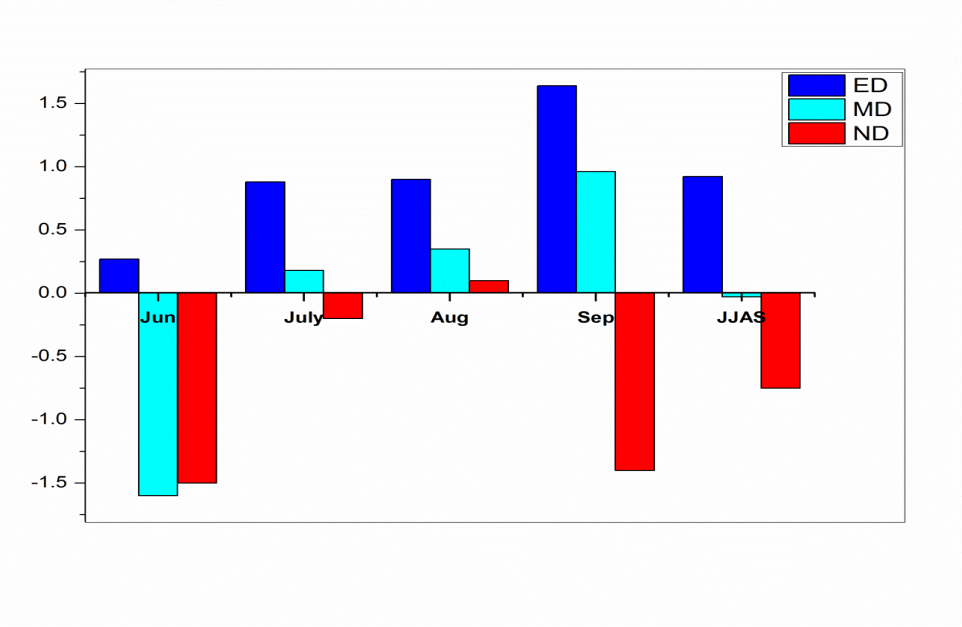
- ***Maximum warm bias associated with interannual events could contribute for mean bias in the model***

Thank you

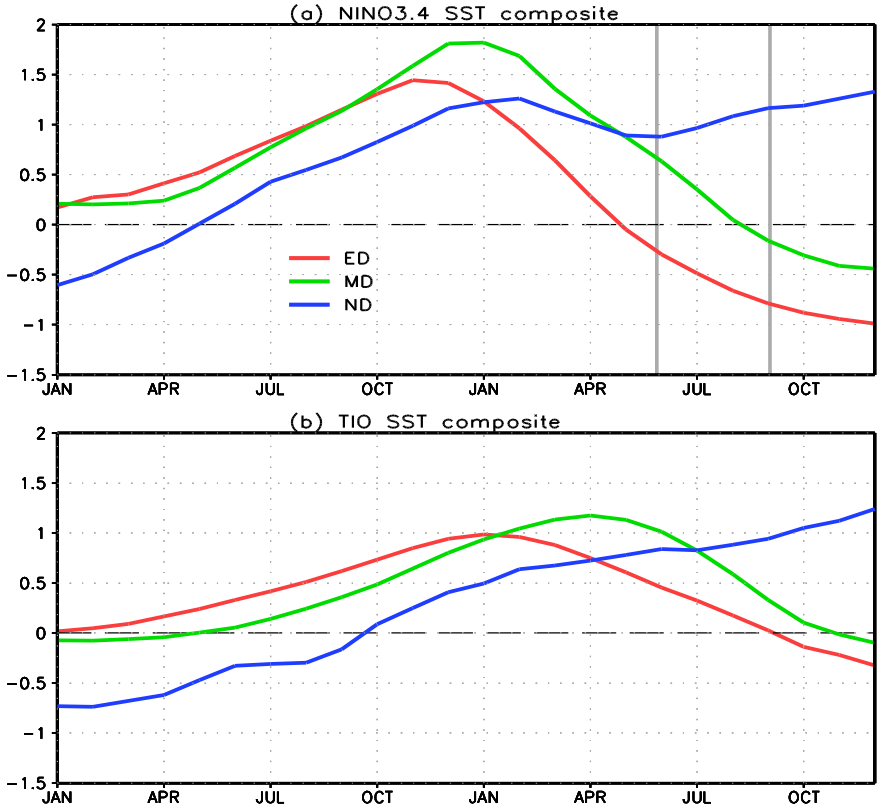
Differences in decay of El Nino and their impact on ISMR

- **Based on nearly 142 years of HadISST data, 40 El Niño events are identified which peaked during winter (DJF).**
- **As the focus of this study is on boreal summer season, we classified El Niño decays into three categories (types) with respect to ISM season as (1) Early Decay (ED, decaying during spring), (2) Mid-summer Decay (MD, decaying during summer (June to September) (3) No Decay (ND, no decay in summer) based on the following criteria.**
- **El Niño events are selected if normalized SST anomalies of Nino 3.4 region ≥ 0.6 in DJF (December to February).**
- **Early decay (ED) years are selected if Nino 3.4 SST anomalies are zero or negative during the following March to May.**
- **Mid-summer decay (MD) if Niño 3.4 SST anomalies are zero or negative between June and September,**
- **No decay (ND) events, Niño 3.4 positive SST anomalies persist till the following December.**

Classification of El Niño	Years
Early Decay (ED) (Decaying before spring and turn into a La Niña)	1896-1897, 1902-1903, 1905-1906, 1923-1924, 1941-1942, 1953-1954, 1958-1959, 1963-1964, 1969-1970, 1972-1973, 1977-1978, 1987-1988, 1994-1995, 2002-2003, 2006-2007, 1965-1966, 1997-1998
Mid –Summer Decay (MD) (Decaying mid-summer and turn into a La Niña)	1877-1878, 1888-1889, 1911-1912, 1914-1915, 1925-1926, 1930-1931, 1946-1947, 1965-1966, 1982-1983, 1991-1992, 2004-2005
No Decay (ND) (Not a significant decay in summer)	1876-1877, 1895-1896, 1904-1905, 1913-1914, 1918-1919, 1939-1940, 1940-1941, 1952-1953, 1957-1958, 1968-1969, 1976-1978, 1986-1987

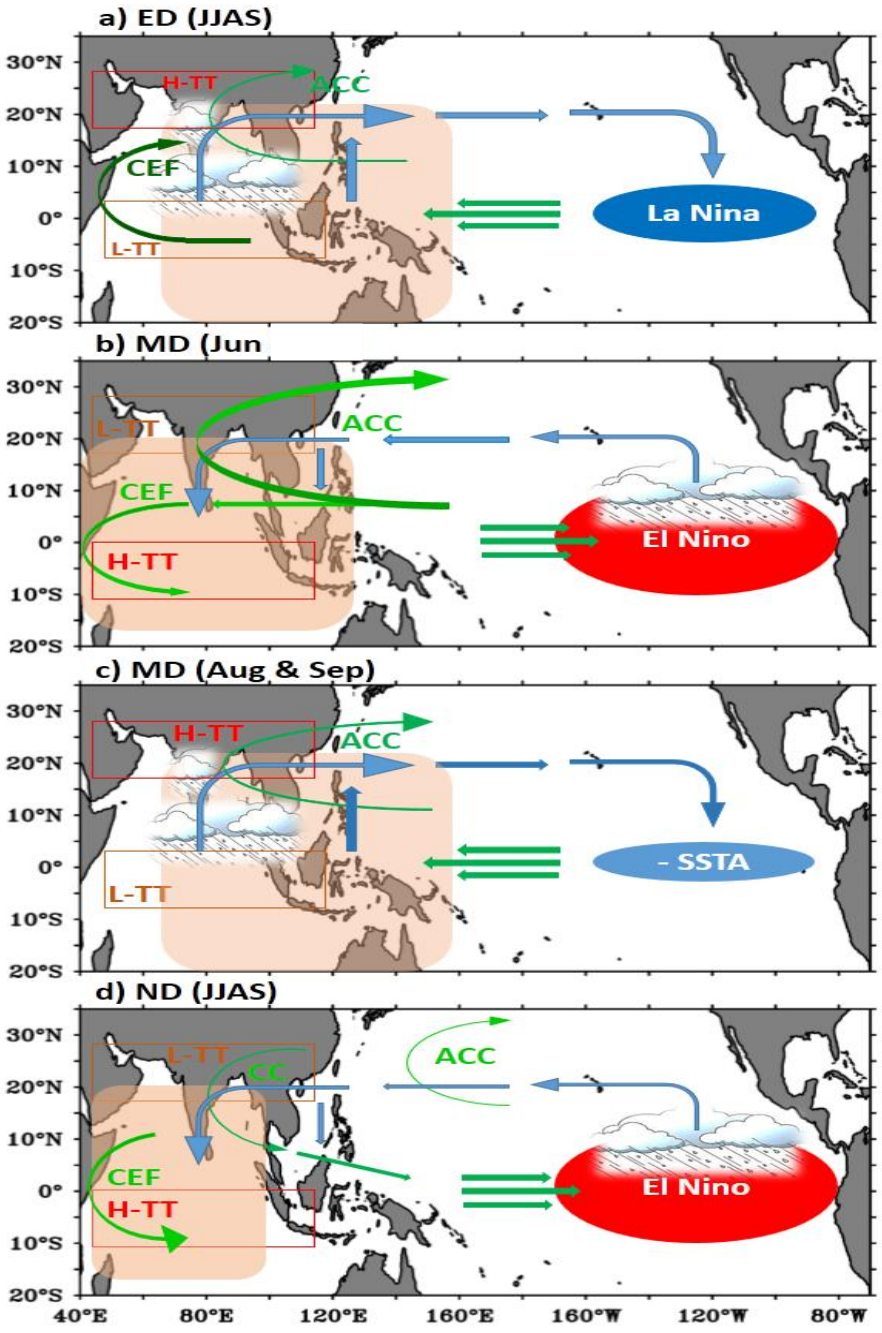


Composite of monthly and seasonal rainfall anomalies (IMD, mm/day) averaged over the Indian Subcontinent.



Composite of observed normalized Niño 3.4 SST (°C) and TIO SST anomalies for early decay (ED) years, mid-summer decay (MD) years, no decay (ND) years. Dashed line represents standard deviation.

(Chowdary et al. 2016a)



Schematic diagram of factors responsible for changes in ISM rainfall

(a) ED seasonal mean,

(b) June in MD years,

(c) August and September in MD years

(d) ND seasonal mean

Green arrow represents low level circulation and blue arrows represent Walker circulation. Rectangular box dark red (light red) represents high (low) troposphere temperature (H-TT and L-TT). Thickness or brightness of color represents the intensity. ACC is anticyclone circulation, CC is cyclonic circulation and CEF is cross equatorial flow.