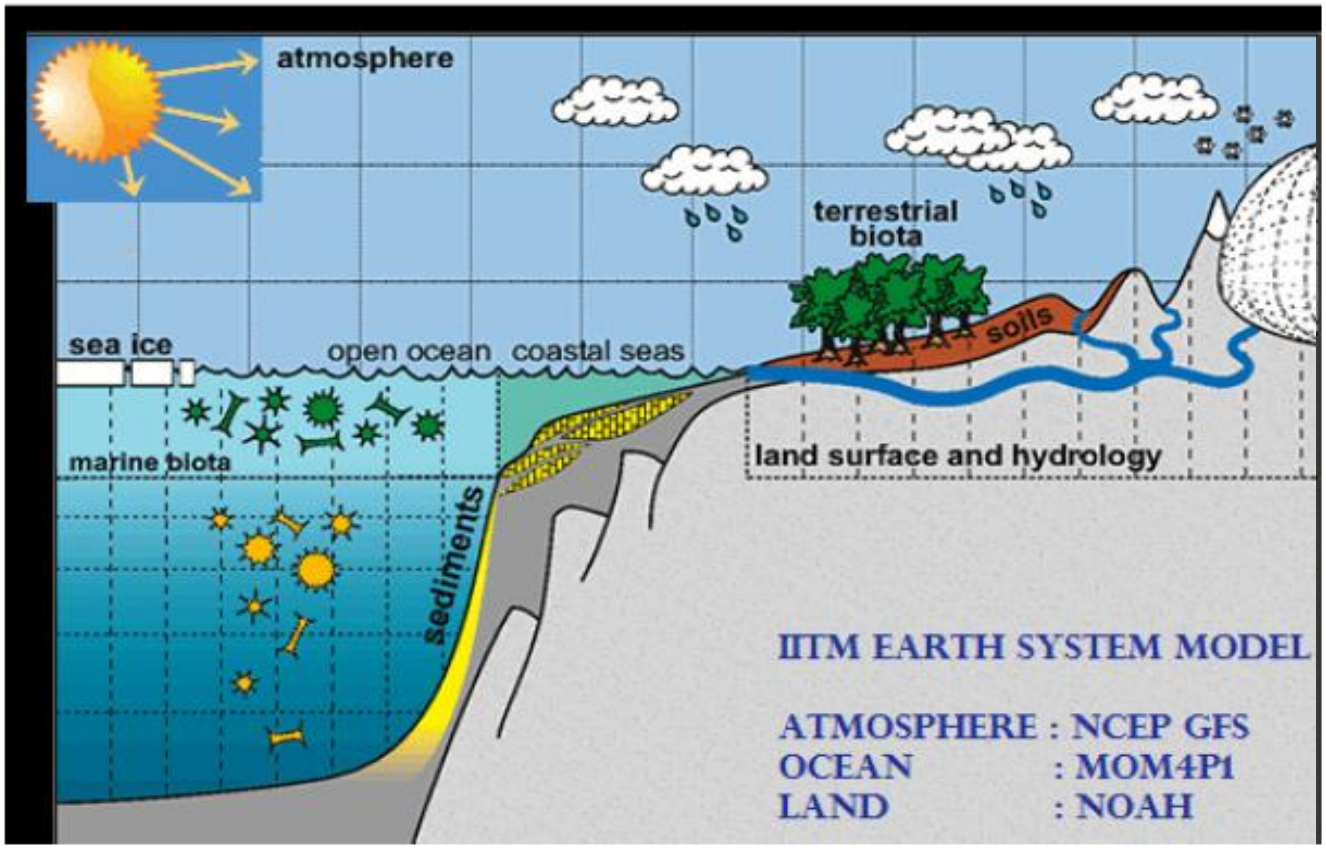
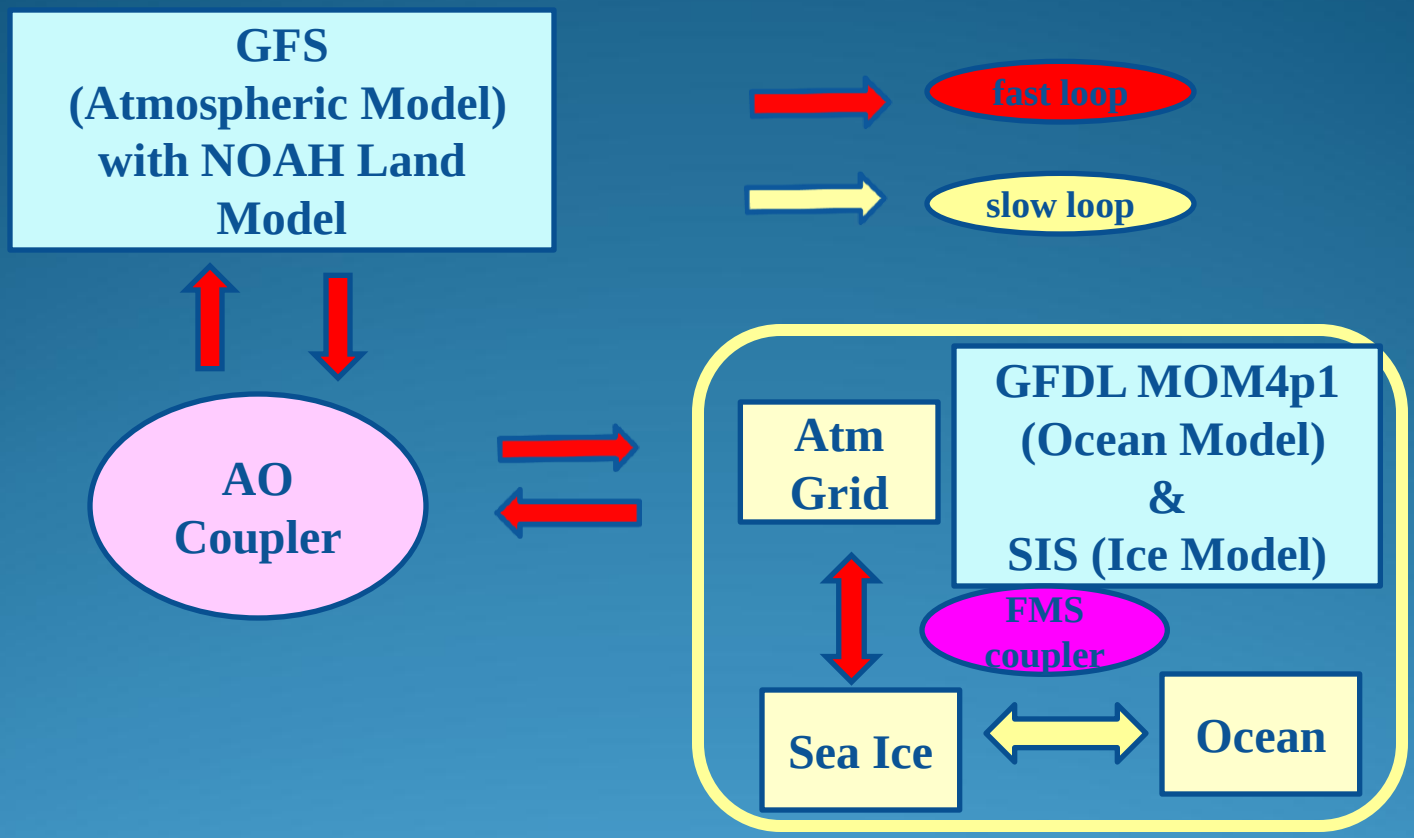
IITM Earth System Model



Swapna Panickal
Centre for Climate Change Research
Indian Institute of Tropical Meteorology, Pune, India
E-mail: swapna@tropmet.res.in

IITM-ESM



Atmosphere	Ocean	Land
T62 (192x94, ~2deg), 64 levels, latlon grid	Tripolar, (360x200, ~ 1 deg), 50 levels with BGC	T62 (192x94), 4 levels, latlon grid

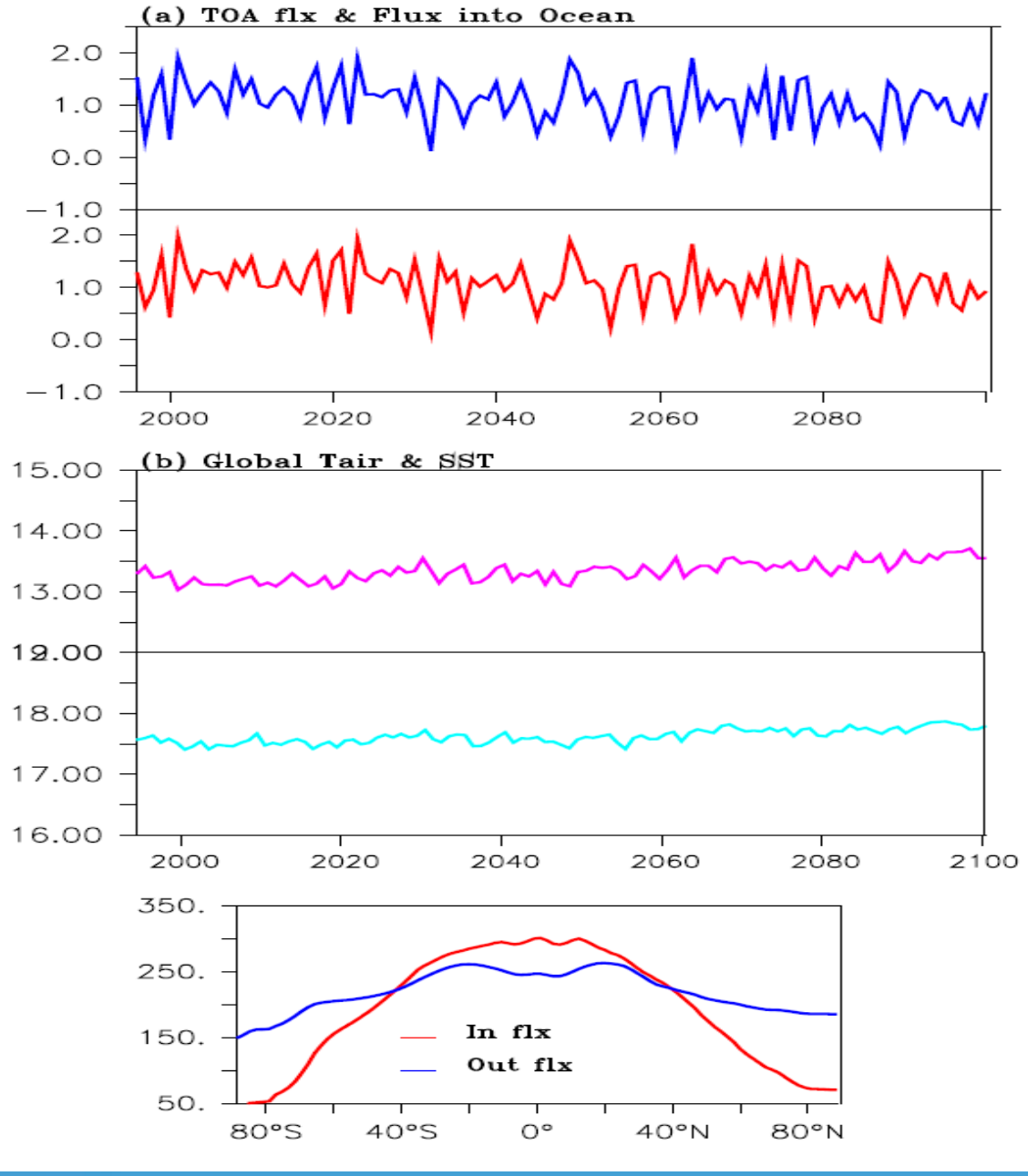
Scalability : 8 Simulation Year Per Day (SYPD)

Status of incorporation of forcing fields

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	No		
Biomass Burning	No		
GHG Emissions	No		
Land-use	yes	testing	testing
GHG concentrations	Yes	testing	testing
Ozone concentrations	yes	testing	testing
Nitrogen deposition	No		
Simple plume aerosol	yes	testing	testing
Solar	yes	testing	testing
Stratospheric aerosol	yes	testing	testing
AMIP SST and SIC	yes	testing	testing

PI Control run : Initial Results

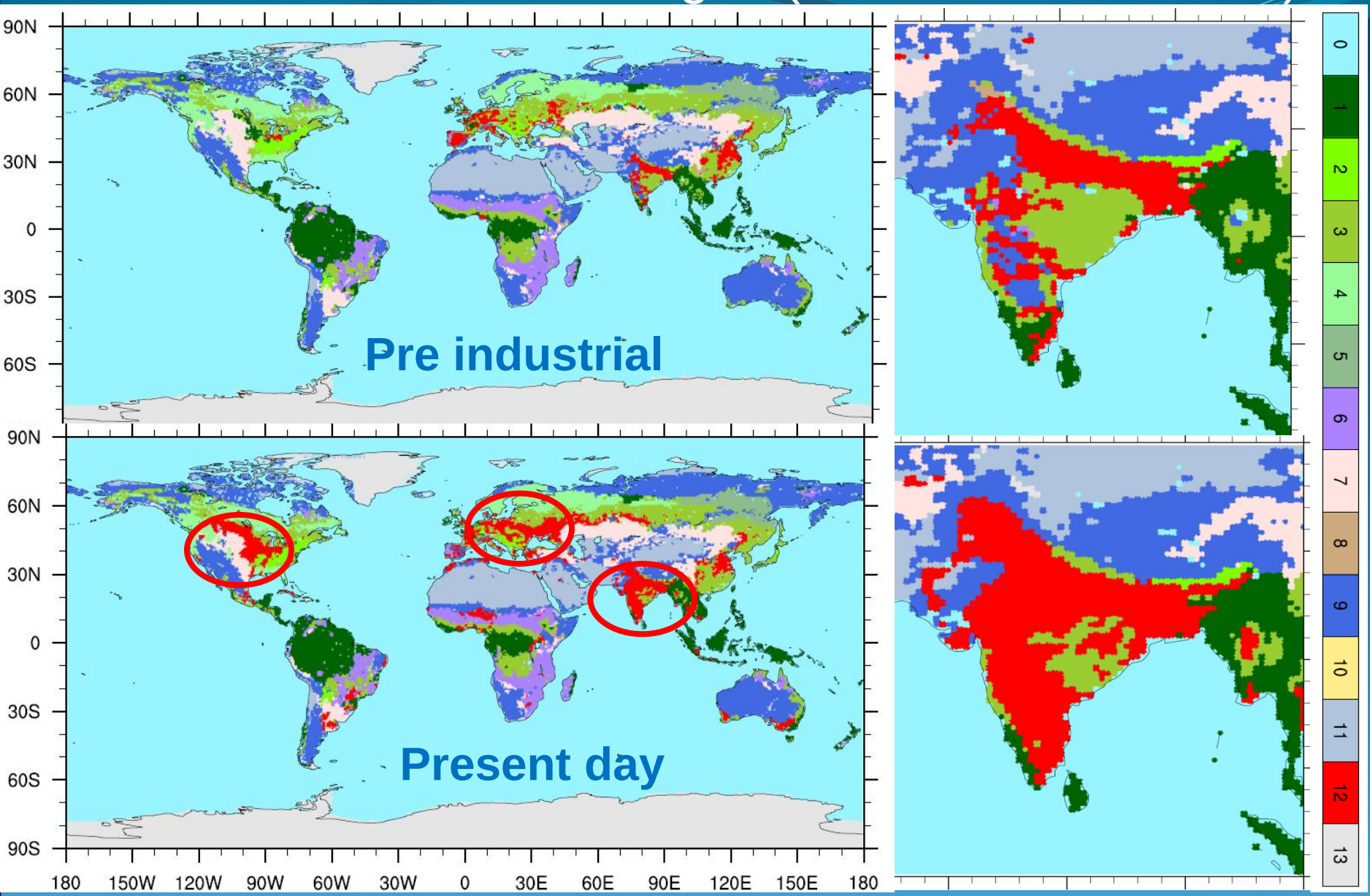
Global Mean Features



Energy Balance		
TOA	1.02	Difference
Surf	1.01	0.01

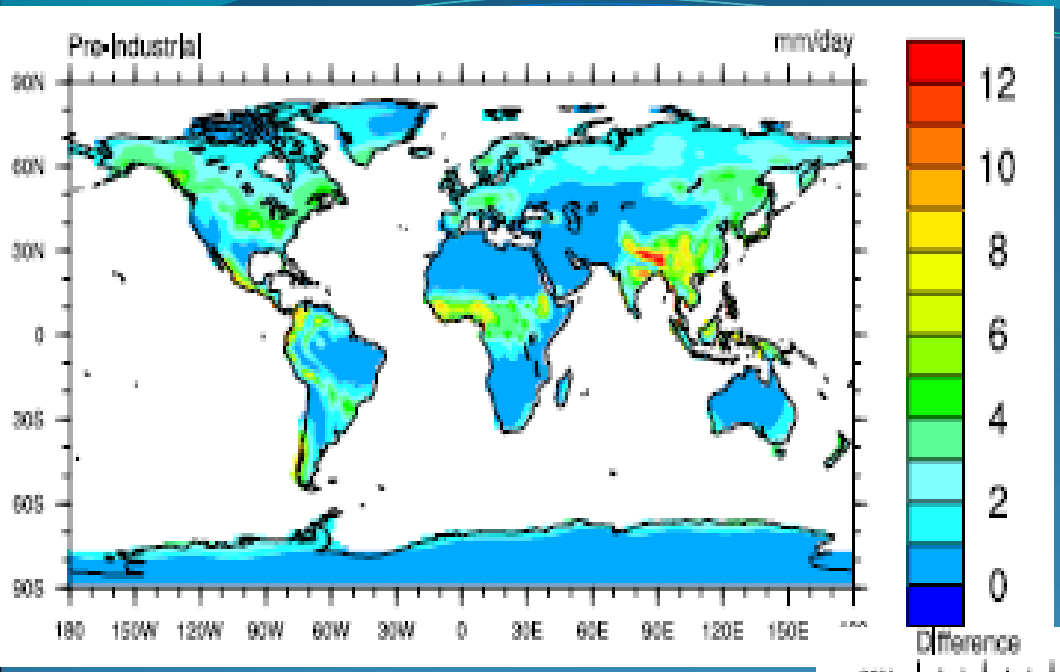
Air Temp & SST	
Temp	13.5
SST	17.5

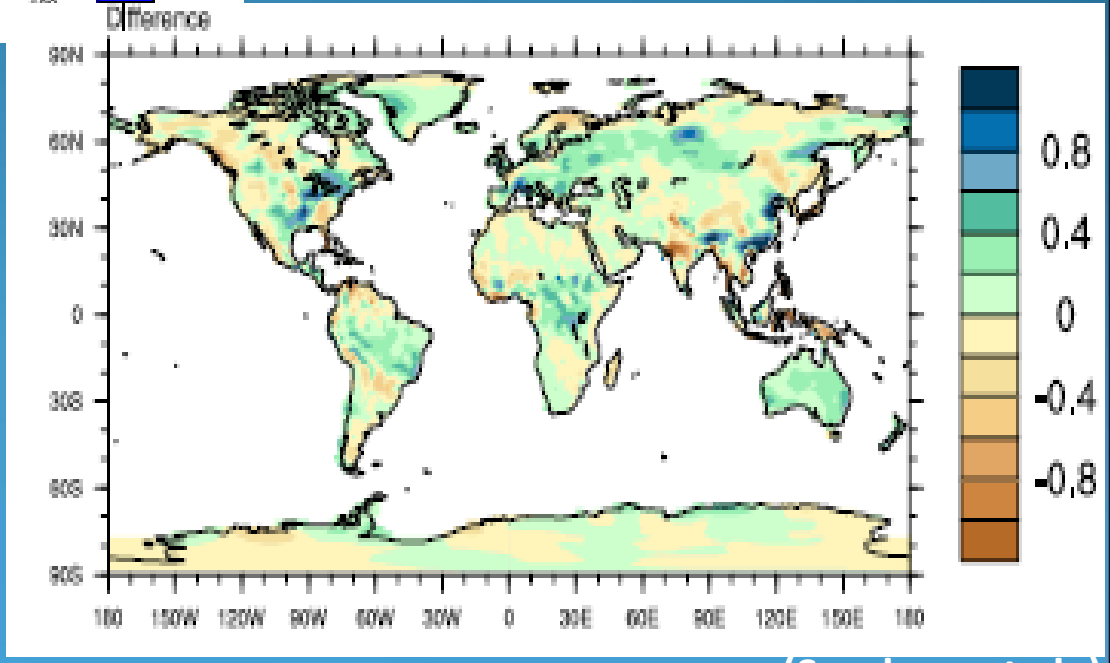
Land use/land cover changes (LUHv1, Hurtt., 2016)



0 waterbodies	3 mixedforests	6 savannas	9 openshrubs	12 crops
1 Evergreen Broad	4 Evergreen Needle	7 grasslands	10 Tundra	13 snowice
2 DecIduousBroad	5 DecIduous Needle	8 shrubs	11 Barren	

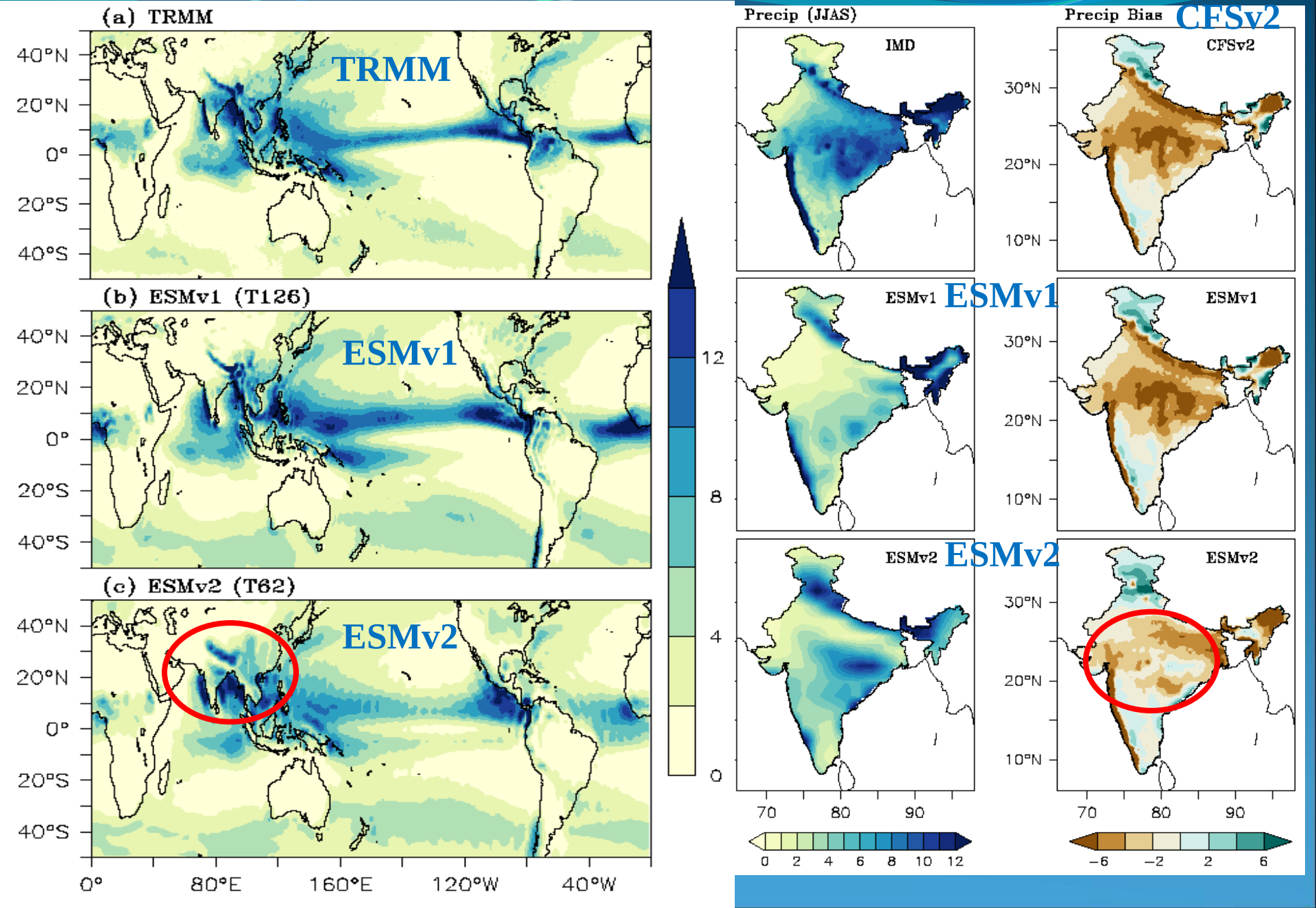
Precipitation response to Land use/land cover changes



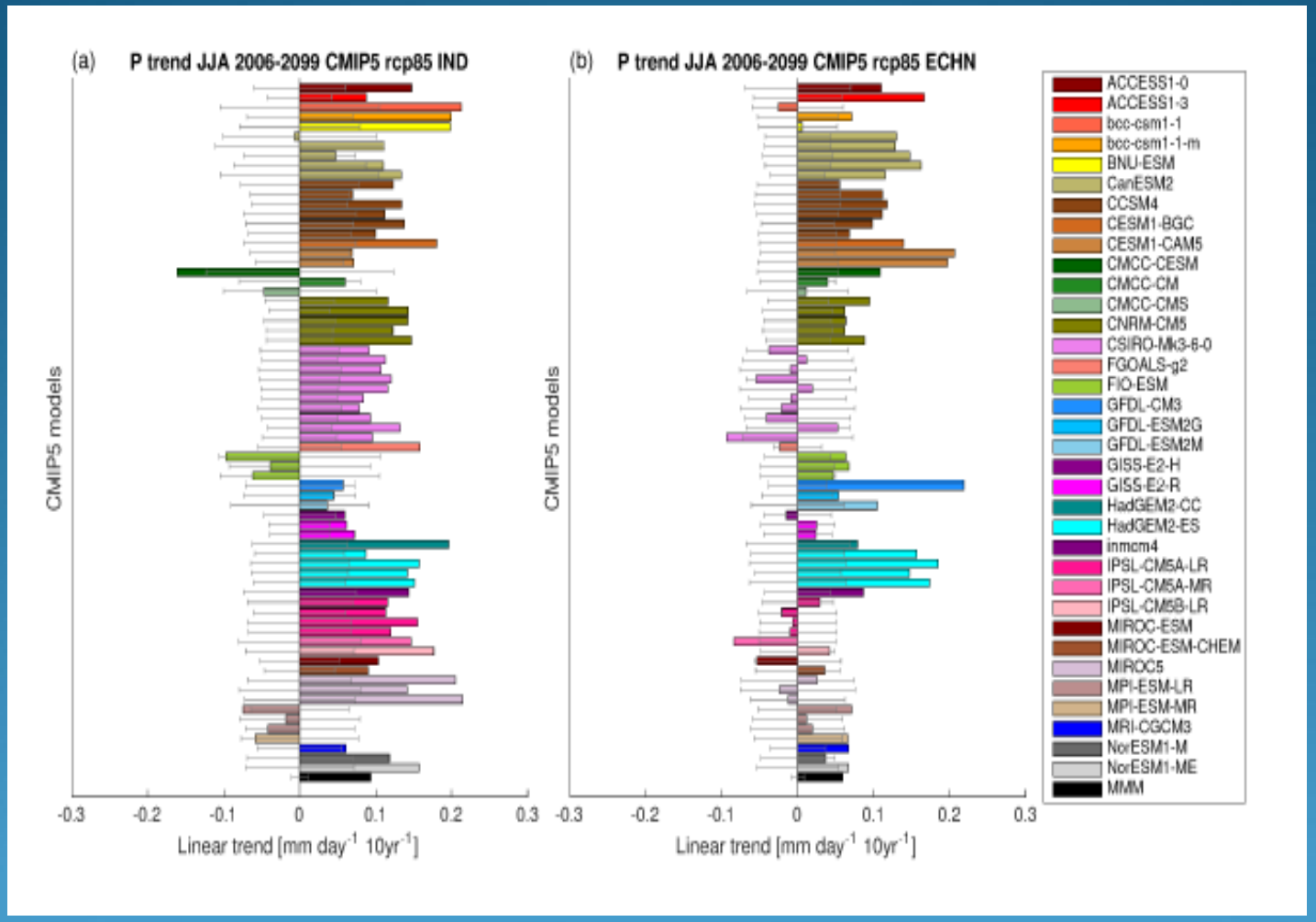


(Sandeep et al.)

Boreal summer monsoon (JJAS) precipitation (mm day^{-1})

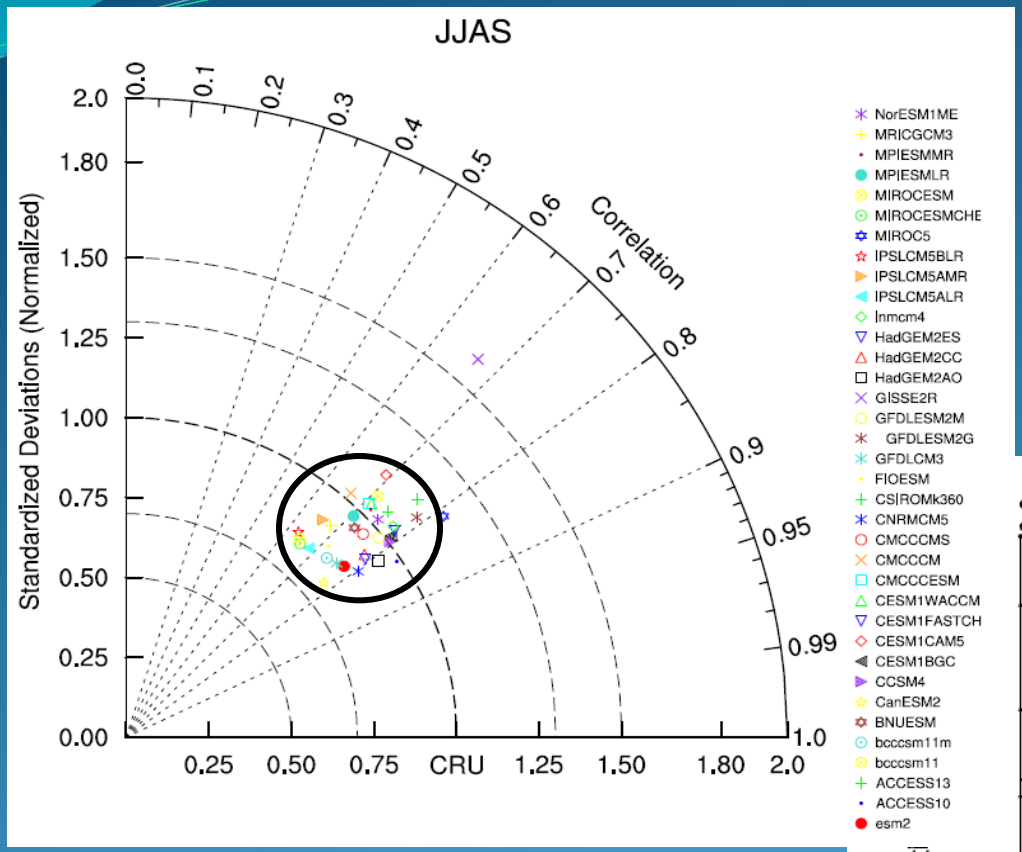


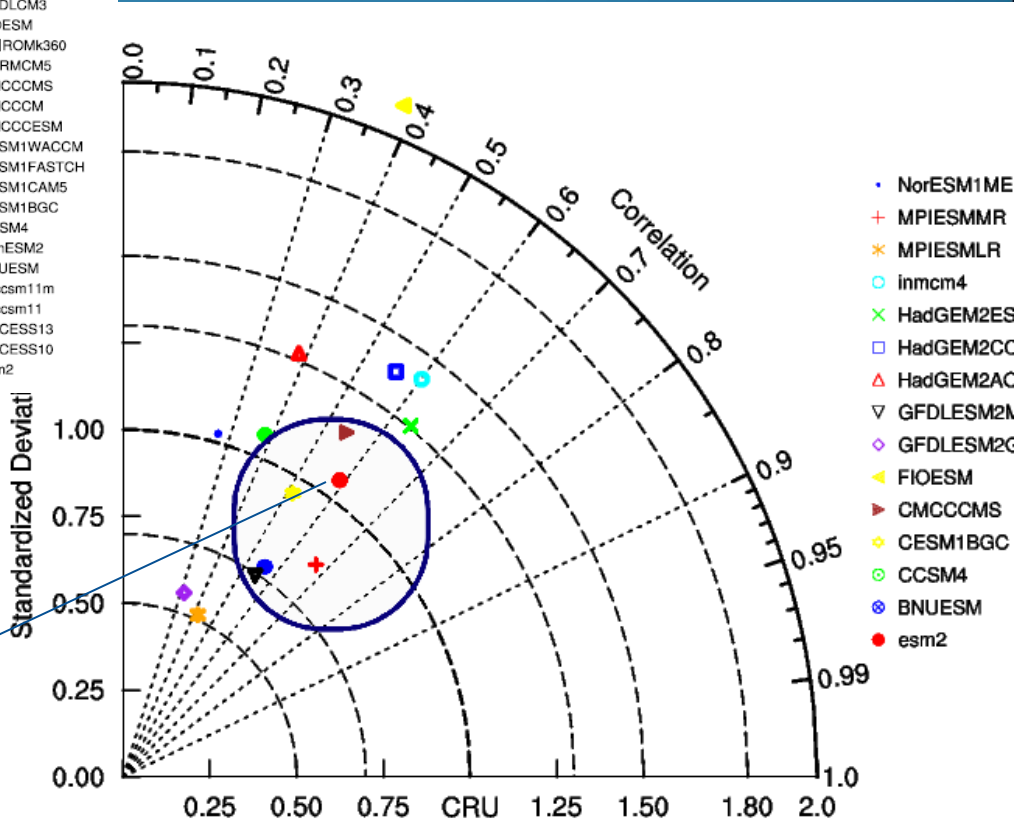
The linear trend of area averaged land precipitation from 2006 to 2099 for India and eastern China from CMIP5 Models



- Most models show an intensified Asian monsoon rainfall,
- There is substantial model spread. (Li and Ting, 2016)

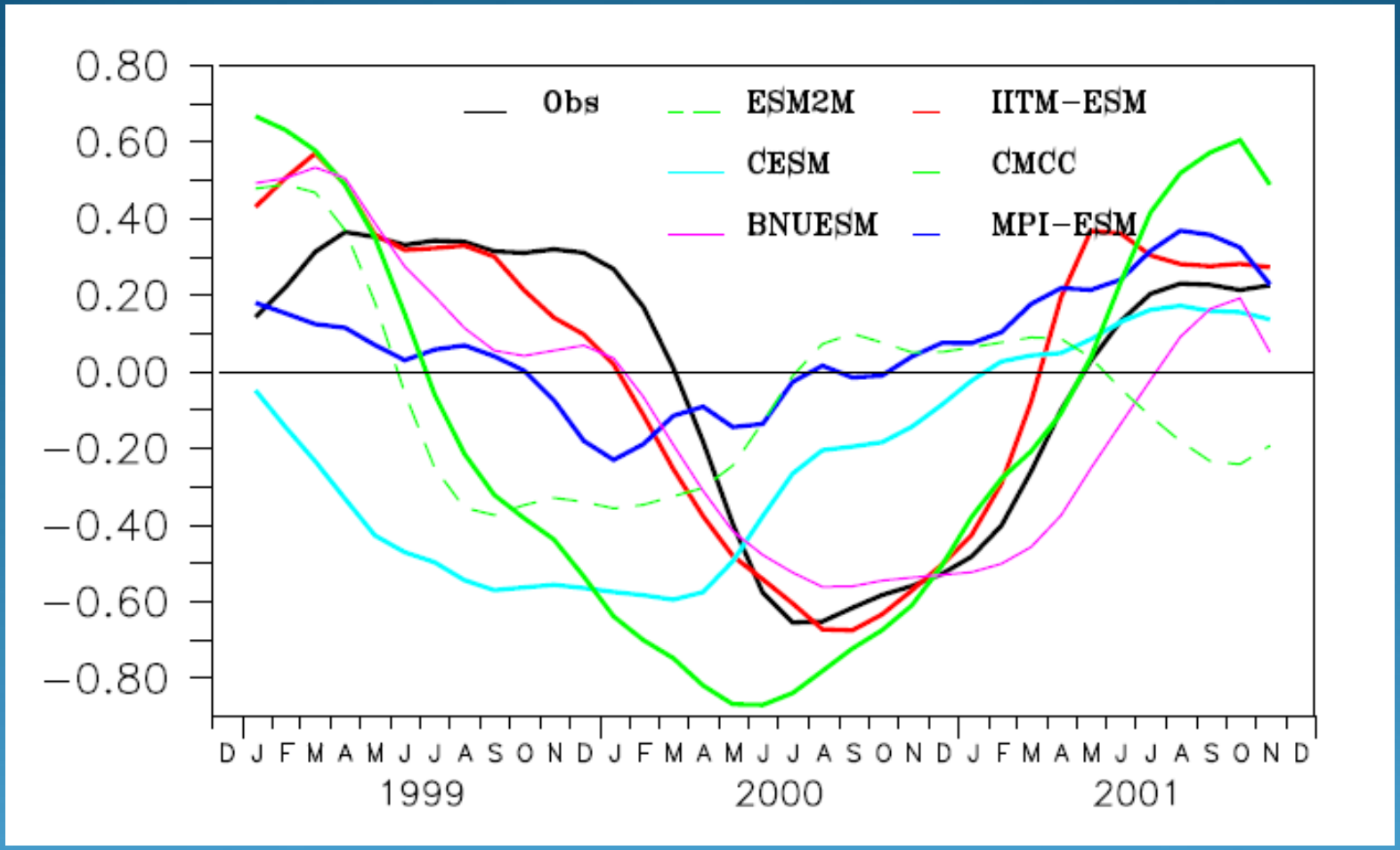
Mean Summer Monsoon Precipitation and its Variability over India





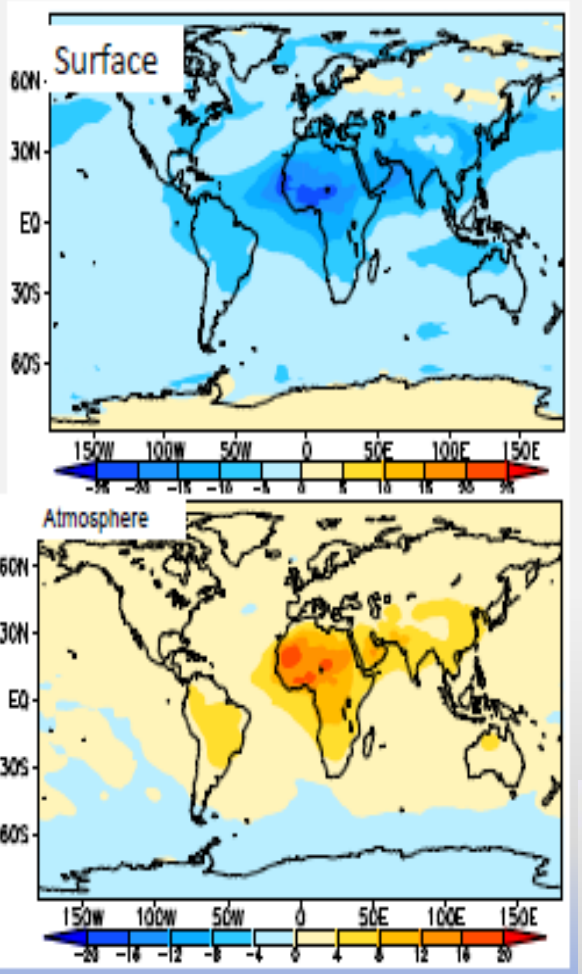
IITM ESM

ENSO-Monsoon teleconnection in CMIP5 Models



Climate response to naturally occurring troposheric aerosols simulated by the IITM-ESM

Solar Radiative forcing for clear sky

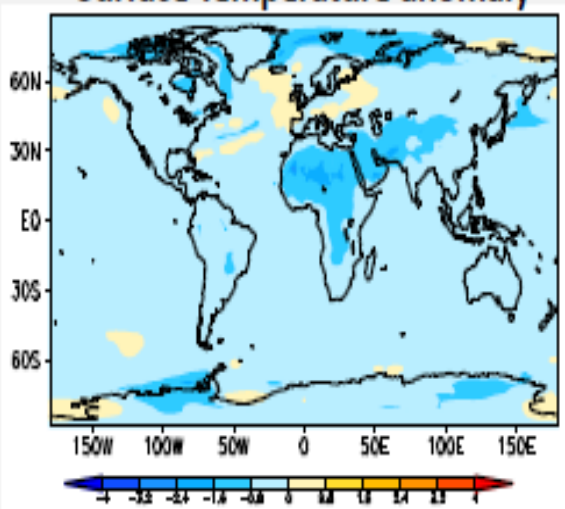


- ✓TOA direct solar radiative flux for clear sky conditions indicate negative forcing over tropics
- ✓The Surface radiative forcing show considerable decrease over regions with high natural aerosol loading
- ✓The atmospheric radiative forcing show an increase in absorption of solar energy over high aerosol regions

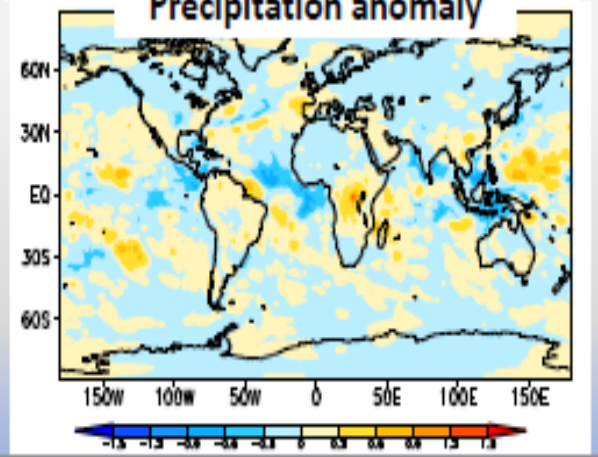
- ✓Surface temperature response indicates cooling over almost entire globe , specially over northern hemispheric continents
- ✓Precipitation anomaly shows a reduction over various tropical region s like South Asia and equatorial Atlantic

Surface Temperature & Precipitation Change

Surface Temperature anomaly



Precipitation anomaly



(Ayantika et al..)

Thank you