Application of SOM Technique on Classification of Seasonal Cycle of Indian Summer Monsoon

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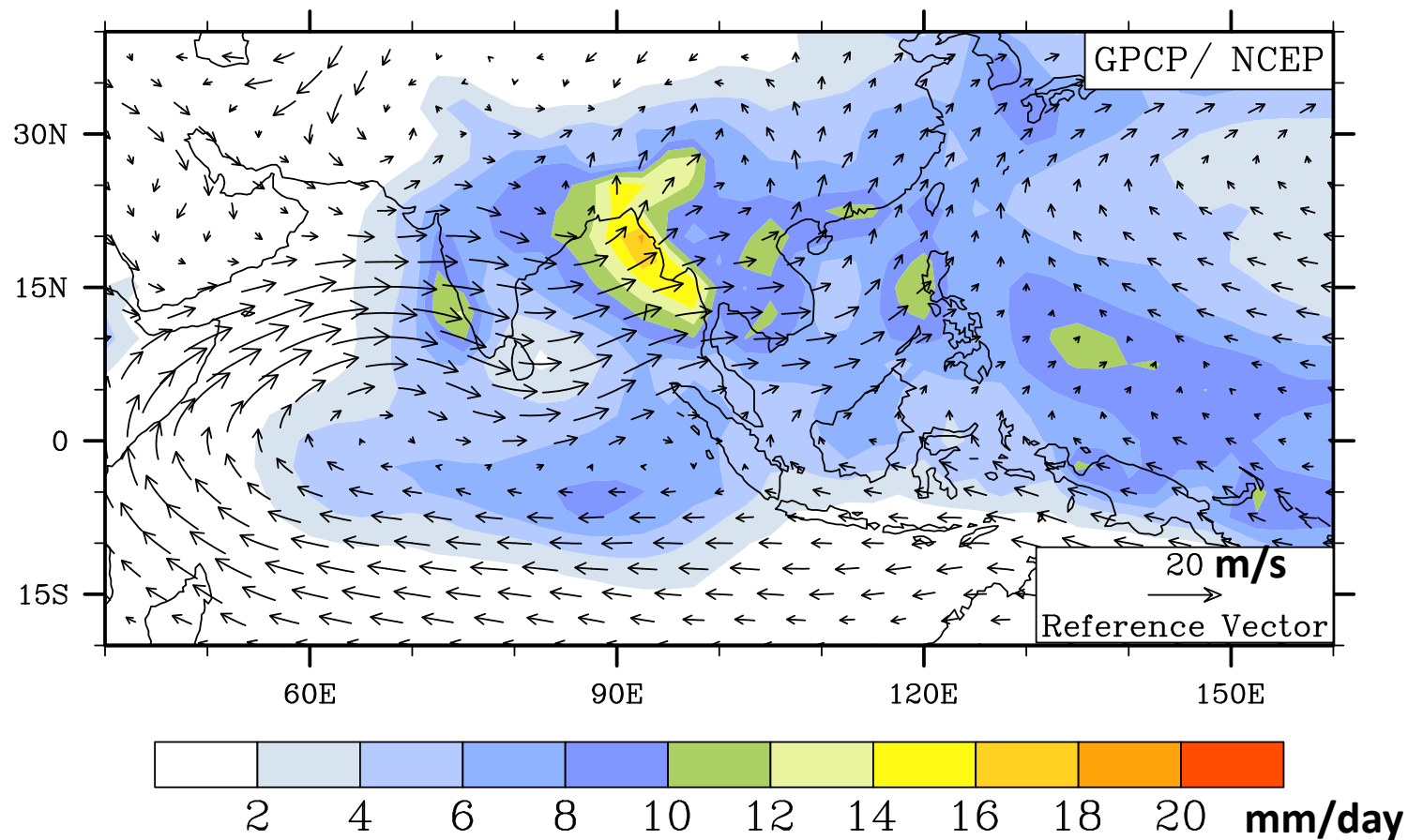
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Outline

- **Introduction**
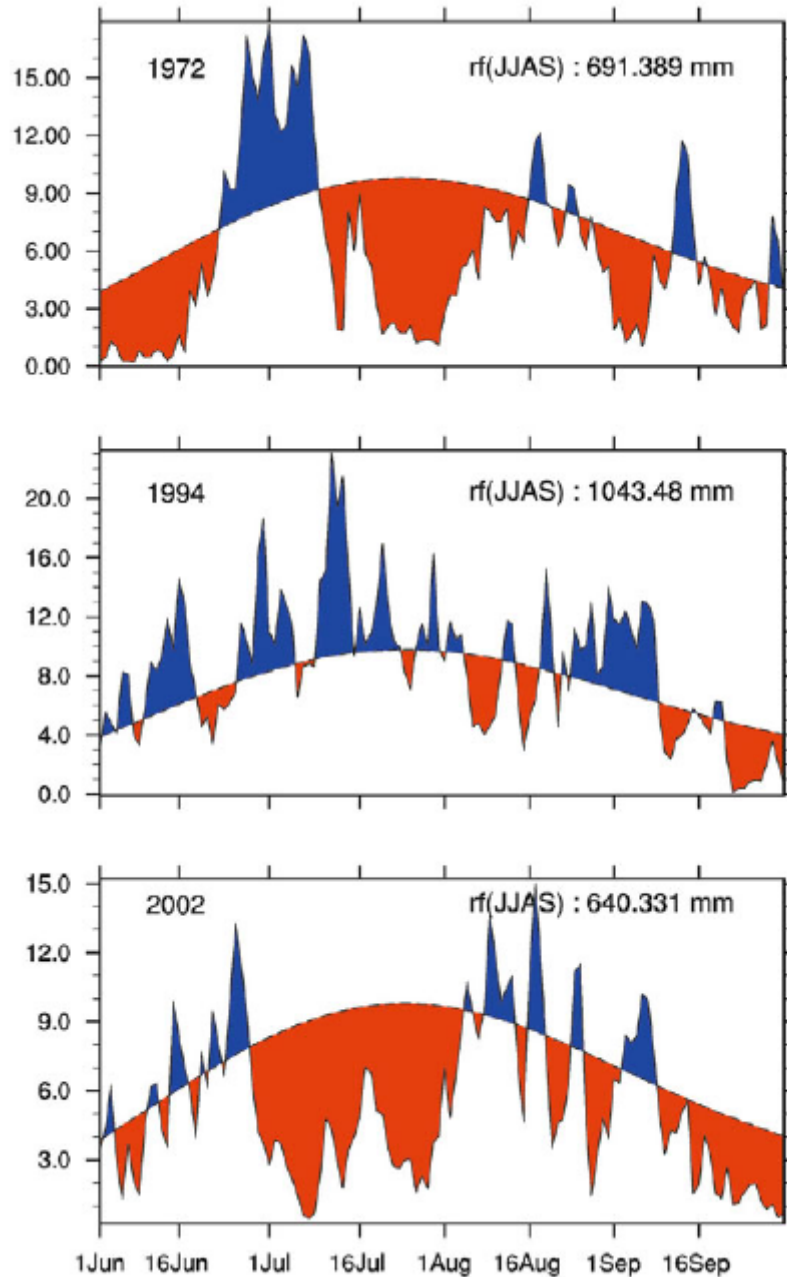- **Data & Methodology**
- **Results**
- **Concluding remarks**

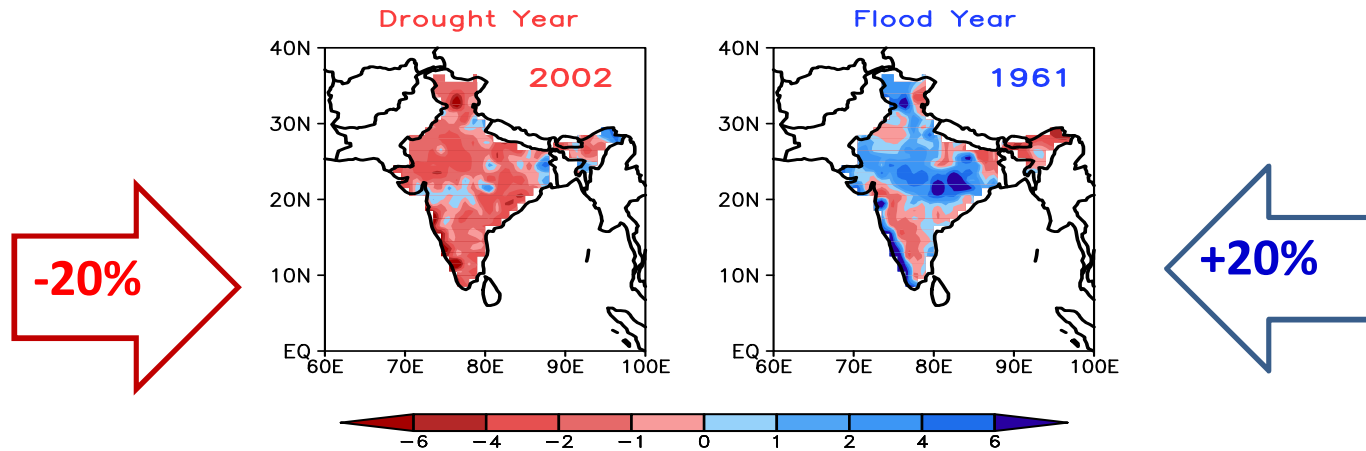- Indian Summer Monsoon (June – July – August)

Interannual variability

Red : above normal or wet spells
Blue: below normal or dry spells

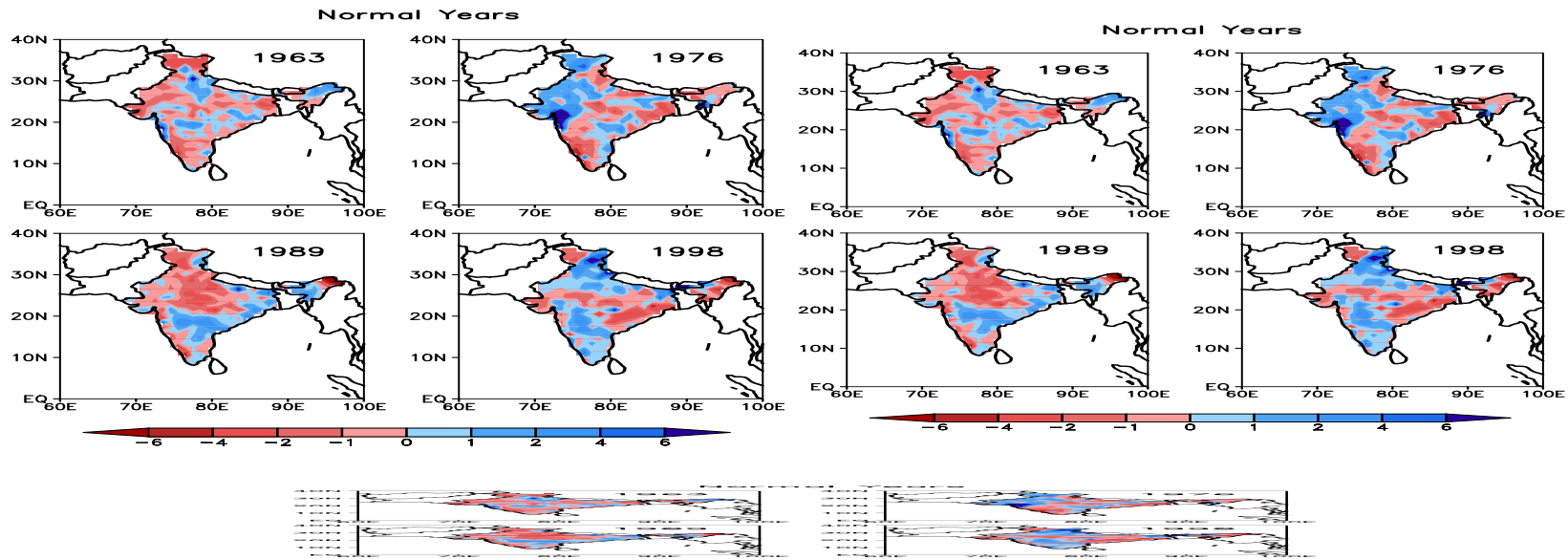These active(wet) and break (dry) spells constitute the **Intra-Seasonal Variability (ISV)**.

Figure courtesy : Goswami 2005
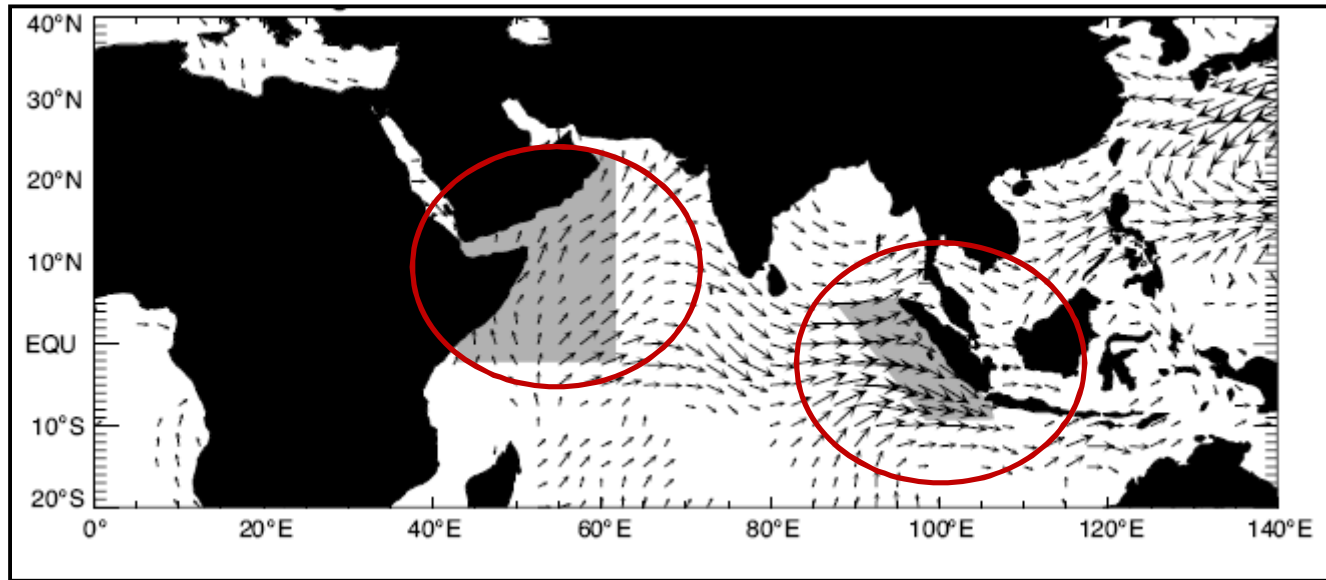
Seasonal (JJAS) Rainfall Anomaly (**Extreme Years**)

Seasonal (JJAS) Rainfall Anomaly (**Normal Years**)

Air – Sea Interaction

Strong – Weak years

Regions of enhanced upwelling/downwelling

2 m s⁻¹

© Webster, 2006

Notable Interannual variability in the atmosphere-ocean coupled system

Data

DATA	Rainfall	Wind	SST
Type	IMD daily	NCEP-NCAR	ERSST monthly
Resolution	1° X 1°	2.5° X 2.5°	2° X 2°
Source	National Climate Centre, IMD	http://www.cdc.noaa.gov/	http://www.cdc.noaa.gov/
Period	1951-2010 (60 years, JJA (92 days/year))		

SOM Clustering

1. **Construction of the data matrix: Use daily IMD land grid averaged data.**

    Data Range JJA for 60 years (Total Time point : 60 X 92)

Year 1	Day 1	Day 2	.....	Day N
....				
Year N				

2.   **SOM training with 3x2 lattice structure (starting with randinit)**
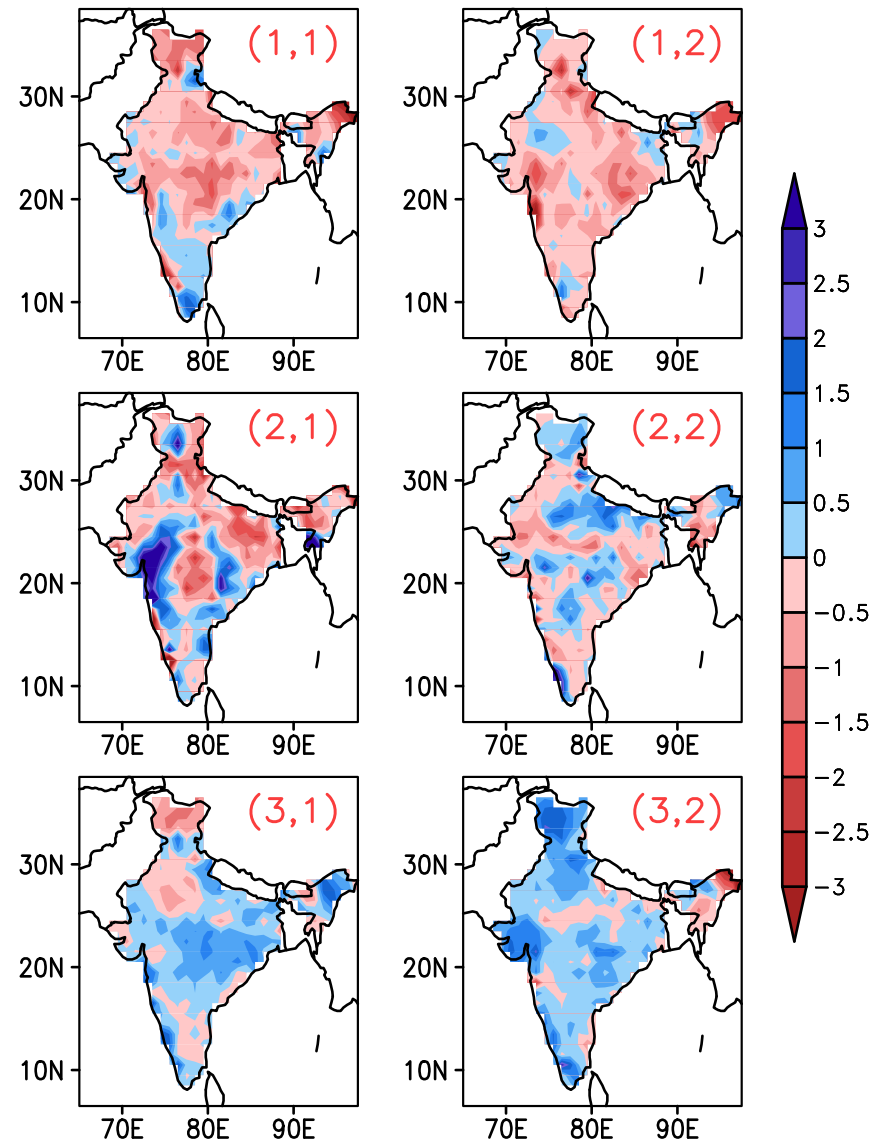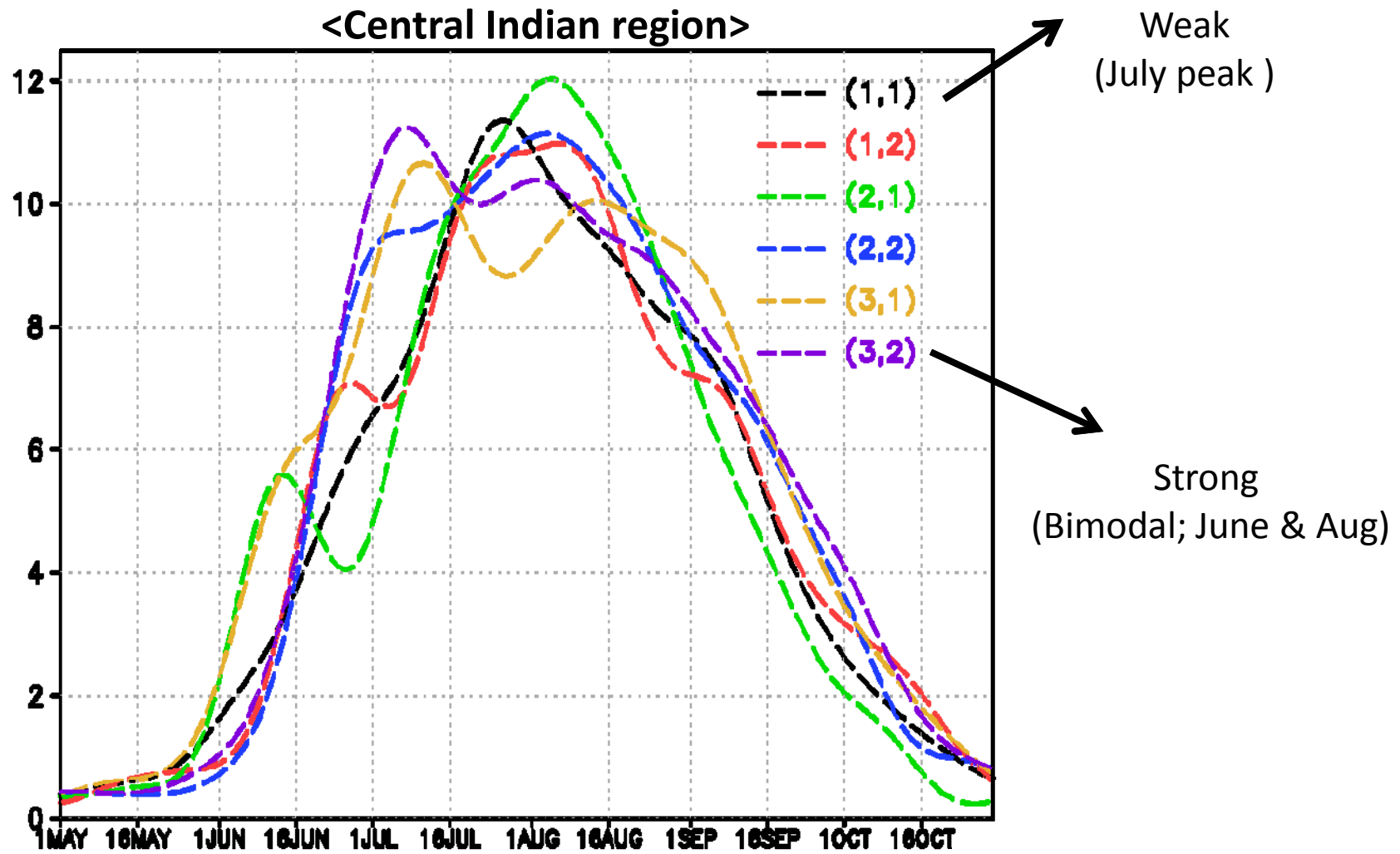
3.   **SOM trained clustering of days in 6 nodes**

SOM

- Reduce large no. of data into a small number of representative patterns that capture a large fraction of variability
- 6 (3x2) SOM patterns
- 2D grid with similar patterns nearby and dissimilar patterns widely away.

(1,1)	(1,2)
13 (21.7%)	**10** (16.7%)
(2,1)	(2,2)
3 (5%)	**5** (8.3%)
(3,1)	(3,2)
14 (23.3%)	**15** (25%)

Classification: Seasonal (JJA) Rainfall Anomaly

Variation in Seasonal Cycle

<Central Indian region>

Legend:
- (1,1) — black
- (1,2) — red
- (2,1) — green
- (2,2) — blue
- (3,1) — orange
- (3,2) — purple

Weak (July peak)

Strong (Bimodal; June & Aug)

Seasonal anomaly : Low level (850hPa) circulation

Anomalous
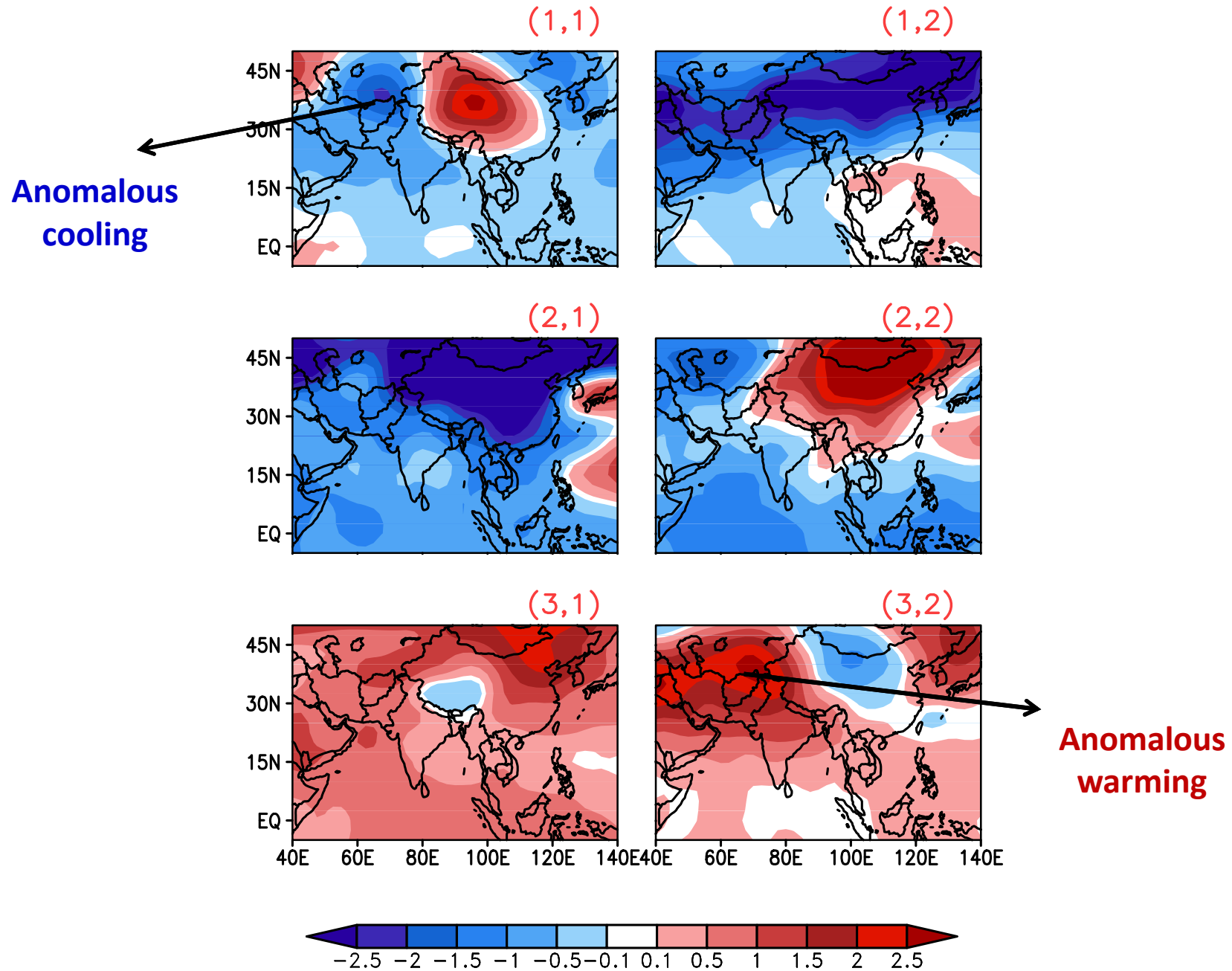anti-cyclonic
circulation
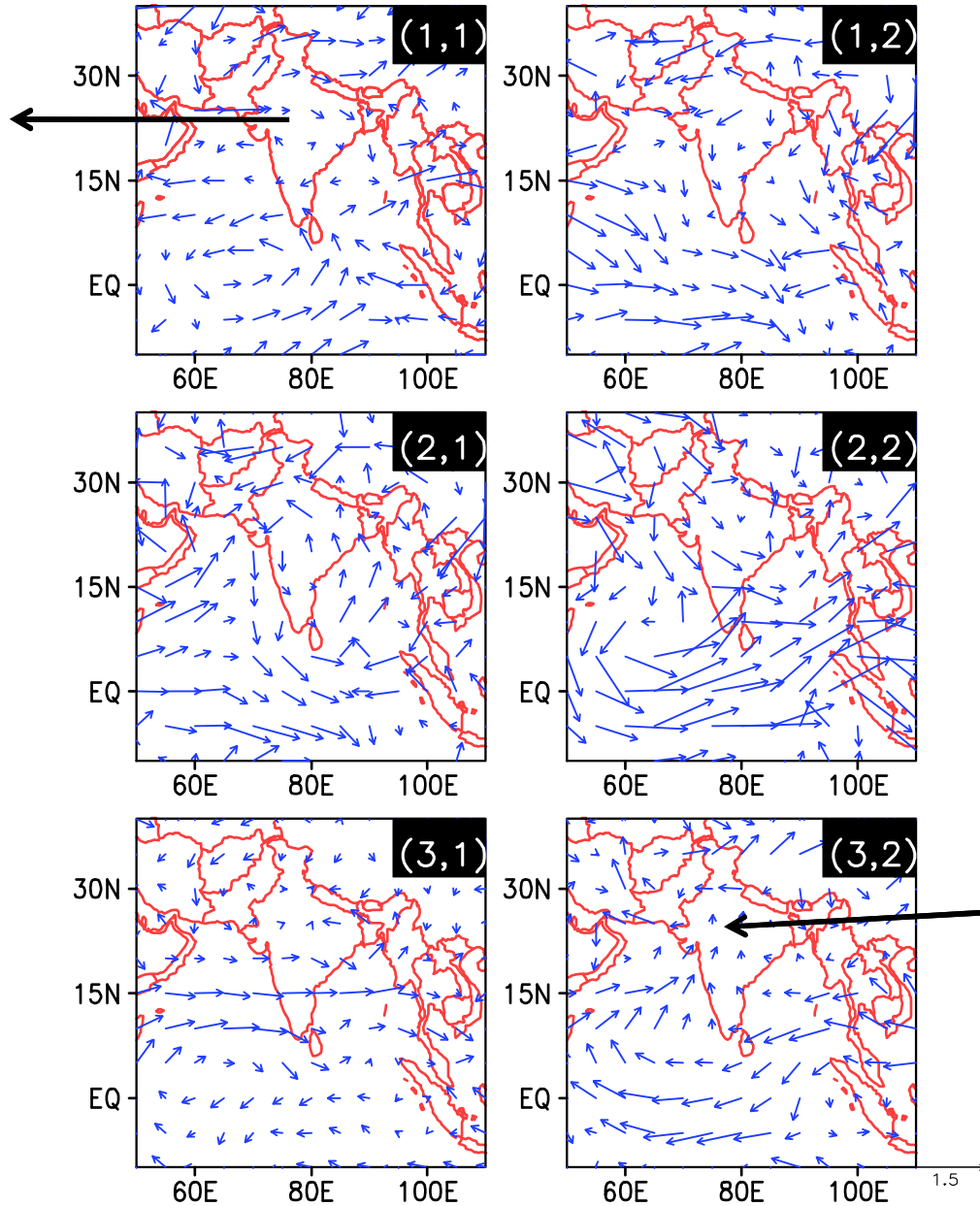
Anomalous
cyclonic
circulation

(1,1) (1,2)
(2,1) (2,2)
(3,1) (3,2)

Tropospheric Temperature (TT)
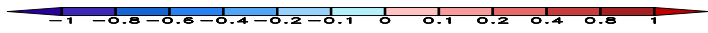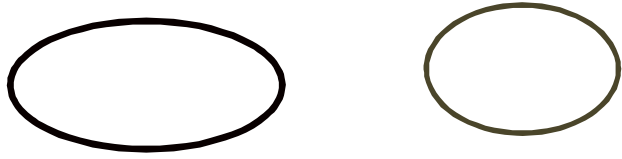
<200-600 hPa>   **Xavier et al. QJRMS, 2007**
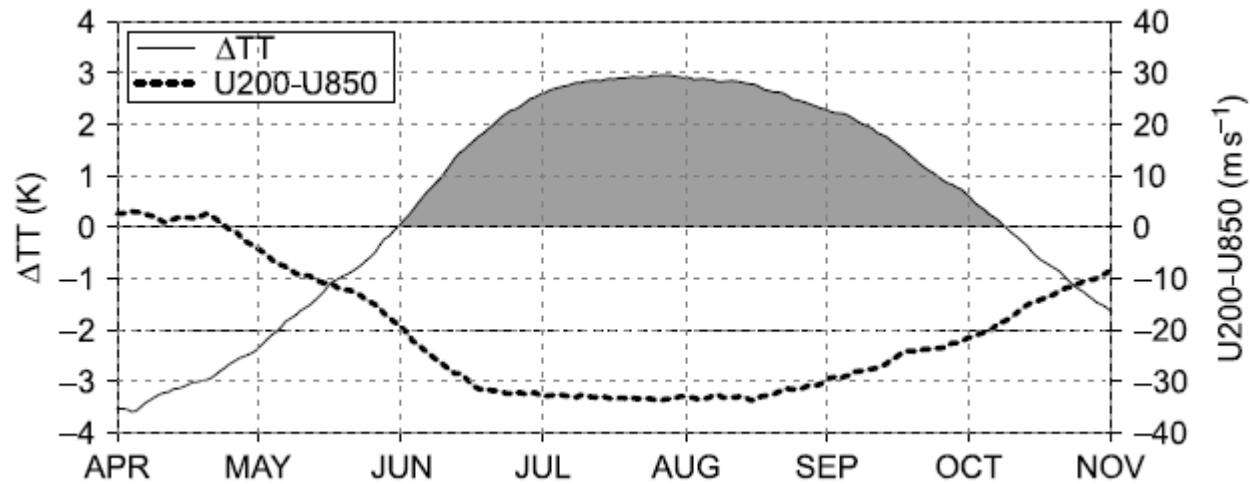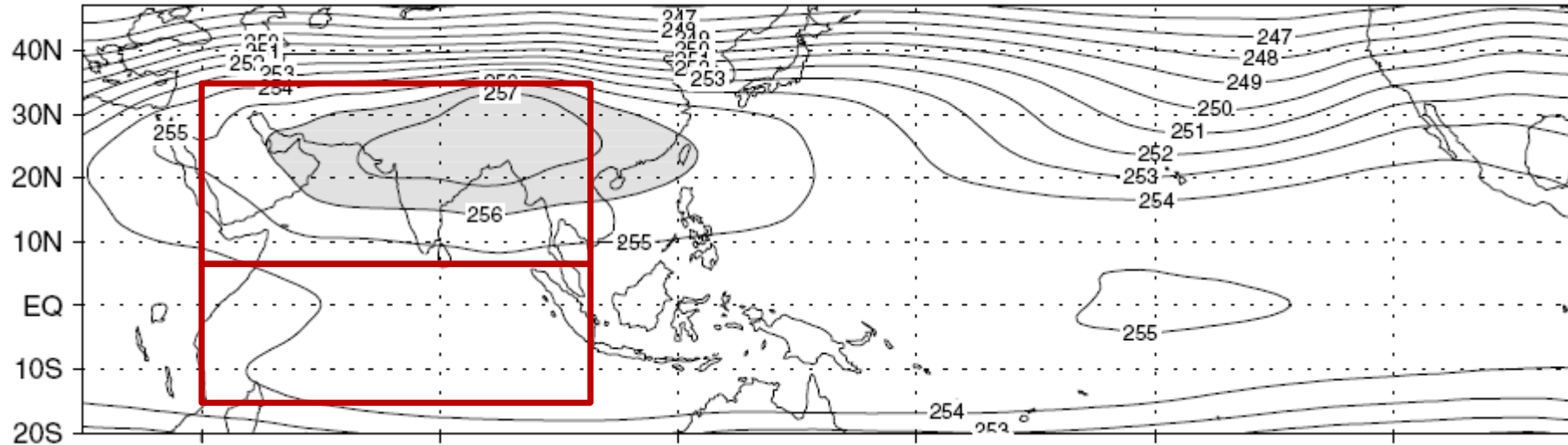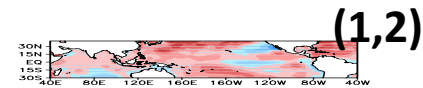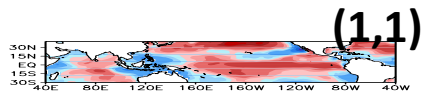
Tropospheric Temperature (JJA anomaly)

Seasonal anomaly: SST
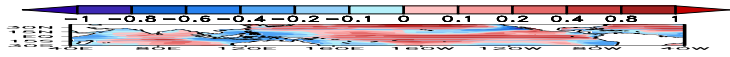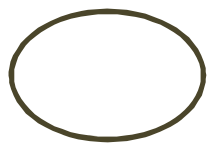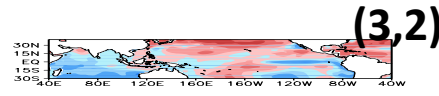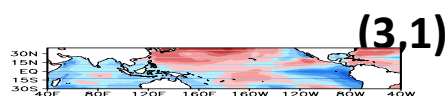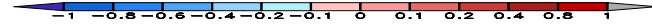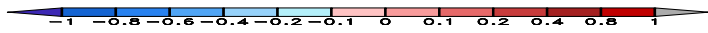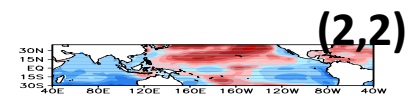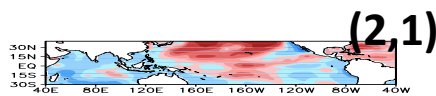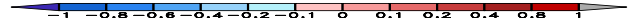
Concluding Remarks

➢ SOM is used to capture the year to year seasonal variability of Indian Summer Monsoon based on seasonal cycle of rainfall.

➢The seasonal cycle clusters the data in quite distinct groups with different rainfall anomalies.

➢The TT index shows different regions of activity (positive anomalies) in different clusters.

➢Interesting variations in seasonal cycle

➢ SOM is capable to capture the Indian summer monsoon seasonal variability quite distinctly.

THANK YOU