Monsoon intra-seasonal active/break cycles, Part 2 (Techniques to isolate MISO)

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Part-II Topics

1. Identification of Active Break Spells
2. Composite method
3. Lag Regression/Lag Correlation based Method
4. Filtering Based Method
5. Self Organizing Map Based Method
6. EOF based Method
7. Practical Examples

Part-III

- **Real Time Monitoring of MISO with EOF technique.**
- **Example of MJO analysis with SOM**

Properties of MISO (Recap)

- Northward Phase Propagation
- 30-60 day frequency
- Spatial Structure > 5000km
- Existence of multiple scales
- No theory as such like MJO

Techniques to isolate should take care of that

Technique-I

- **Hovmoller Diagram**

  A diagram that shows isopleths of atmospheric variation, such as pressure or thickness, usually averaged over a band of latitude.
  Time is usually on one axis, longitude the other. This product demonstrates the progression of large-scale atmospheric features over a long period of time.

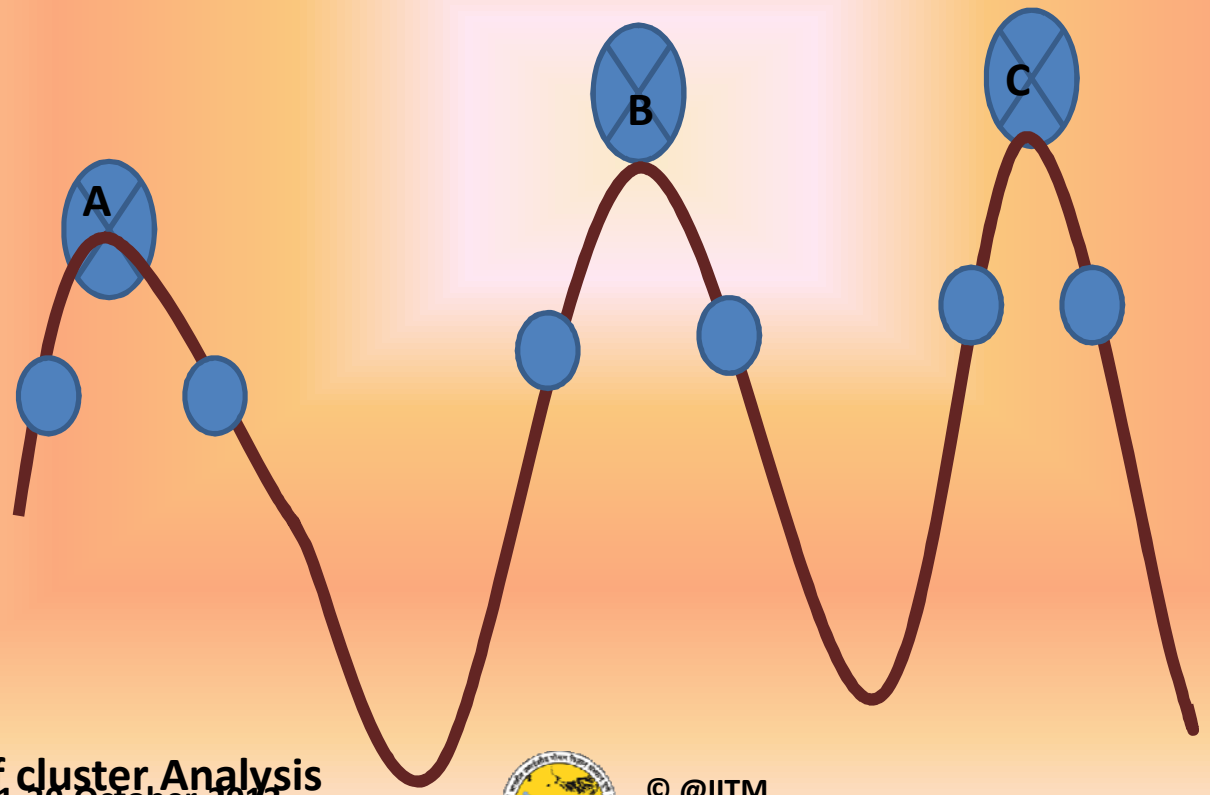
- Probably the starting point of numerous studies and researchers for decades

Technique -2

- **Lag Composite technique**

Assumption*: the wave is *space-time

at each grid point and spatially coherent



This is a type of cluster Analysis

Steps for Lag-Composite Technique

- Get a reference time series.
- Decide what should be the range of value for which days are to be selected or clustered.
- Isolate the days from the time series lying within this range.
- Create composite for any variable for these days.
- Create lag/lead composite

An Example using NCL

- Data
- Program

Lag Correlation

- **Correlation can be used to isolate spatial coherence.**
- **MISOs have large spatial scales => implies spatial coherence.**
- **Identify the days from the reference time series as earlier.**
- **Create the lag composite as earlier**

Lag Regression

- **Regression of the reference time series with respect to the times series of all the grids**
- **Isolates *linear component* of MISO.**
- ***Solves the* Regression equation:**

Y=M*X + C, (least square fit)

An Example using NCL

- **Data**
- **Program**

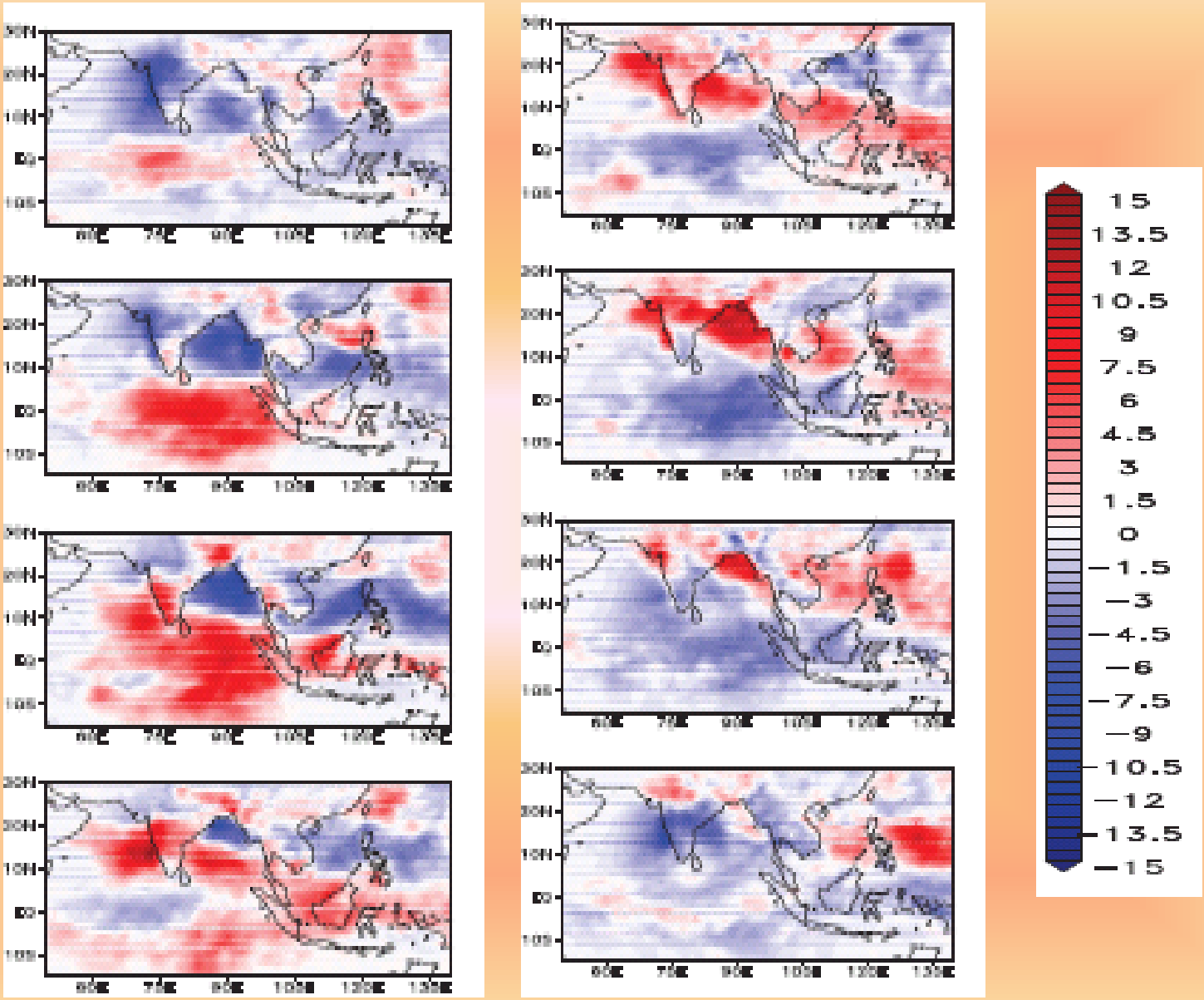
EOF method (Suhas et al., 2012)

- The need for an EOF method arises for real time monitoring of ISO like the MJO.
- Also it is needed for validation of dynamical model results in real time (operational forecasting).

Steps

- Selection of Data
- Creation of Data matrix

Some Results



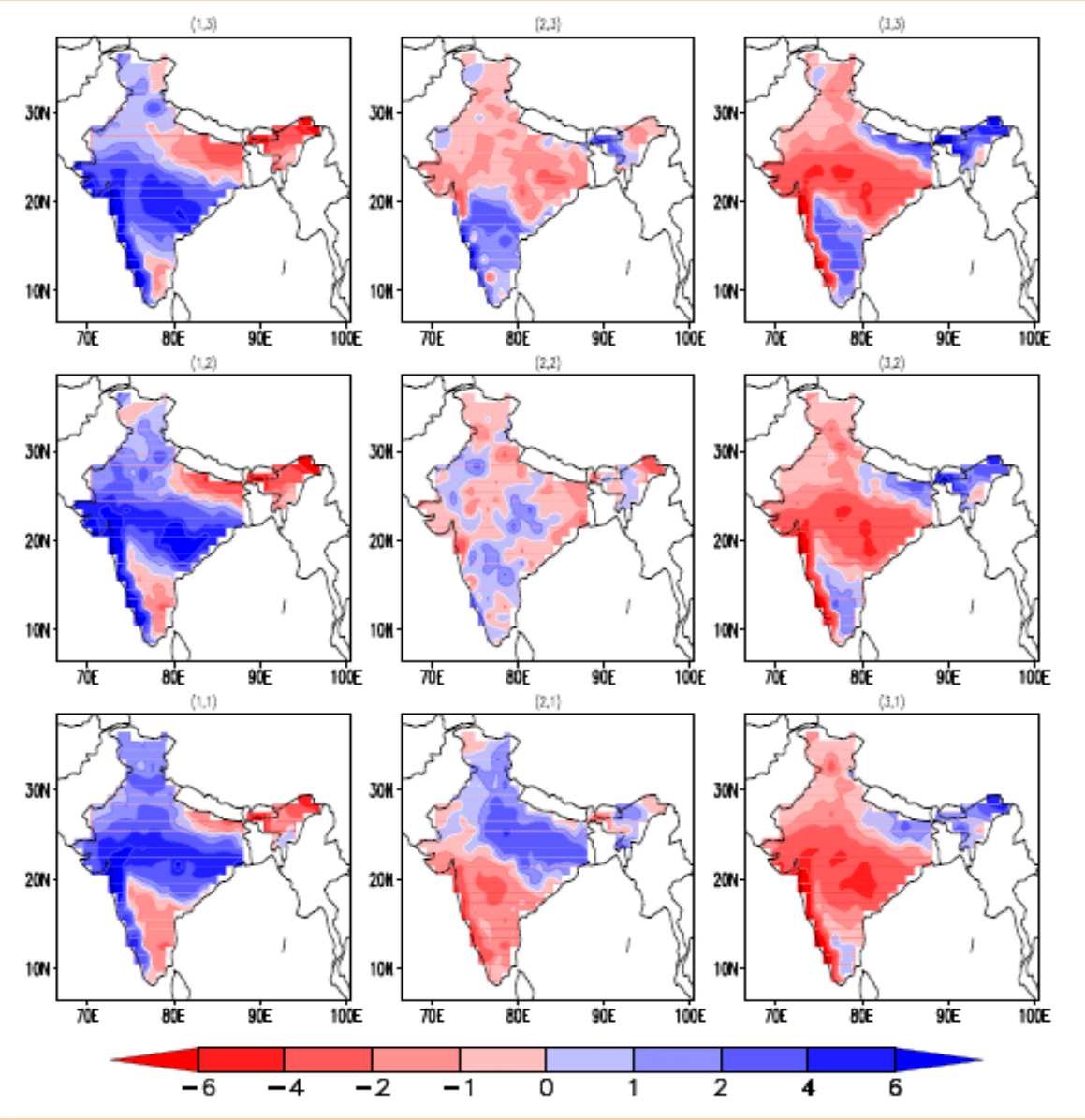
Self Organizing Map Based method

- Need For Non-Linear Techniques
- Local Principal components Analysis

Practical Example

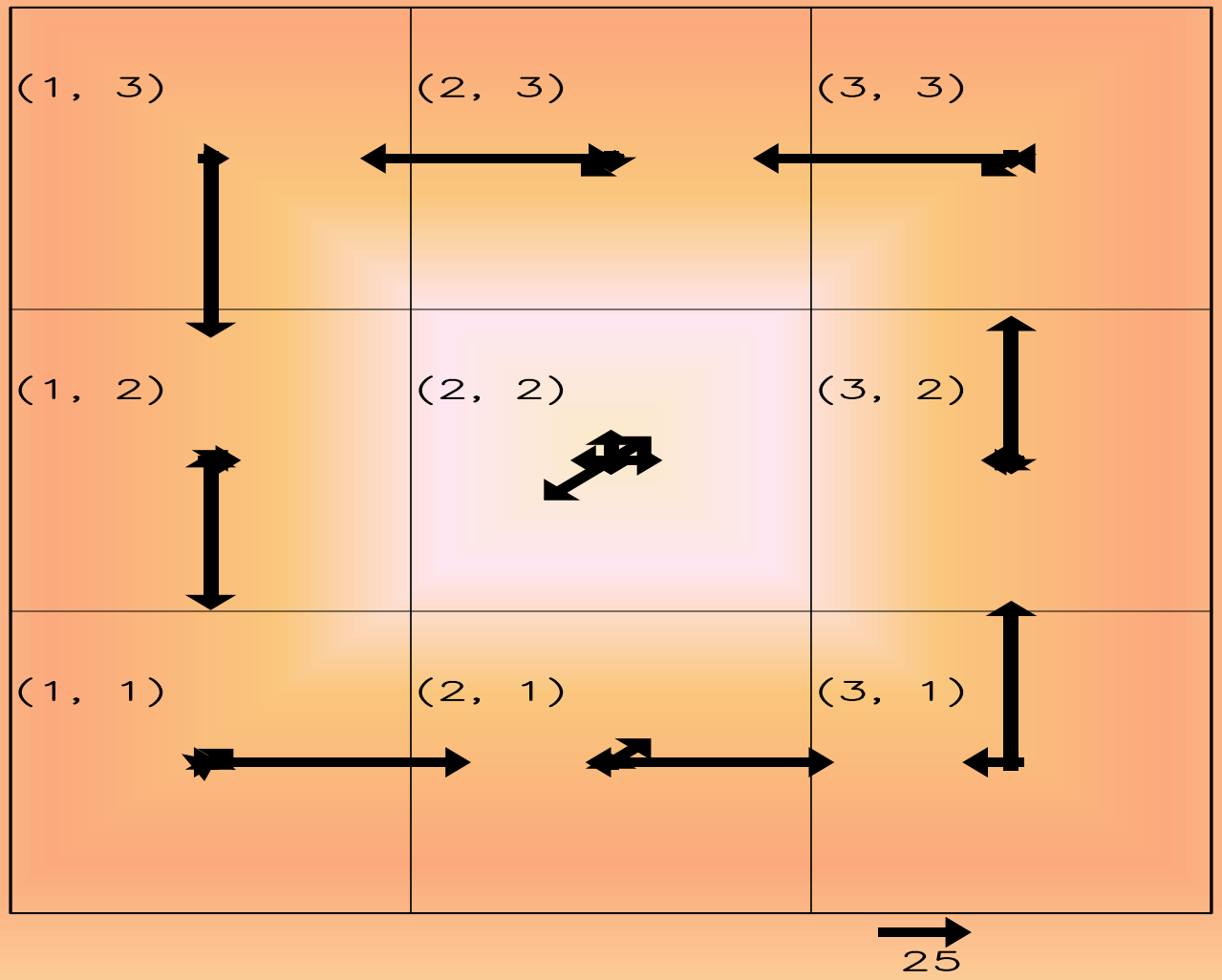
- **Software GrADS, Fortran 90**
- **Data: India Met. Department Daily data**

Plot Should Look Like This:



Active-Break Cycle

Direction of Propagation



Central Node (2,2)

- **What can be said about the central node?**
- **Significance of Central Node**

Conclusion

- There can be several techniques to isolate the MISO.
- The choice of each technique depends on the application.

Part-III

- **Real Time monitoring of the Monsoon Intraseasonal Oscillation using**

Extended Range Prediction Group at IITM:
Dr. A. K. Sahai (Program Manager)

Dr. S. Abhilash, Dr. Susmitha Joseph, Dr. Rajib Chattopadhyay
Ms. Sharmila Sur, Ms. Nabanita Borah

How MISO is computed:

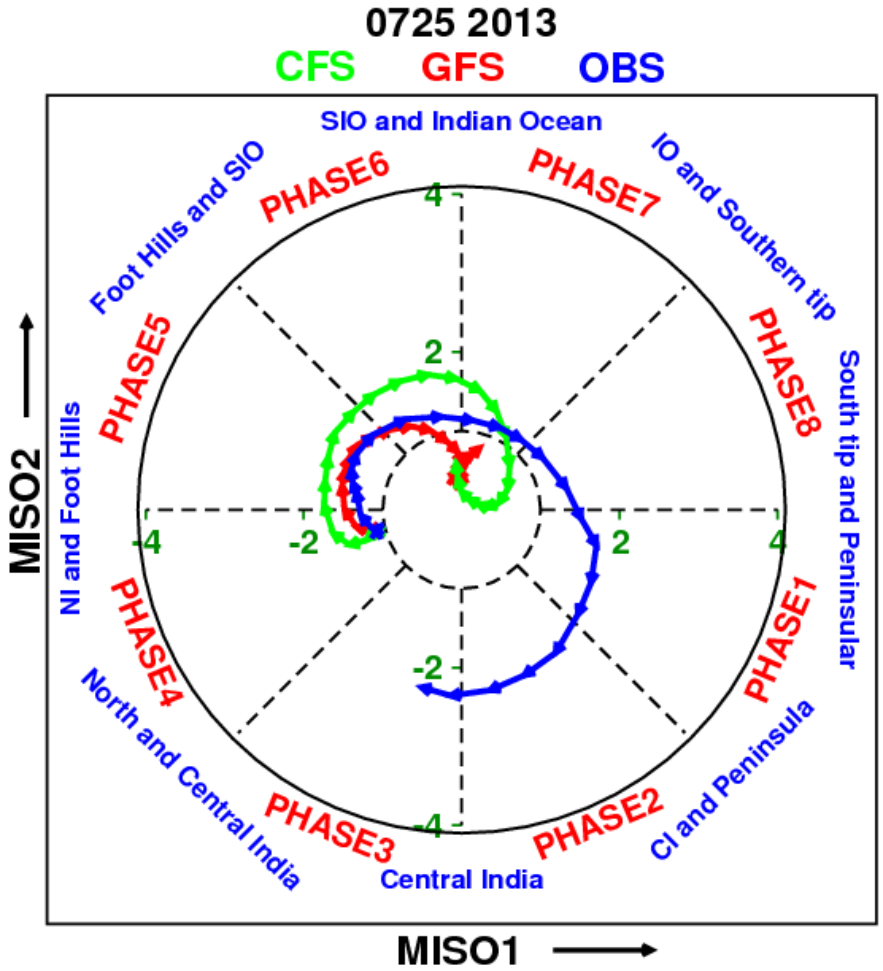
(ref: Suhas etal., *Clim. Dyn*. 2012)

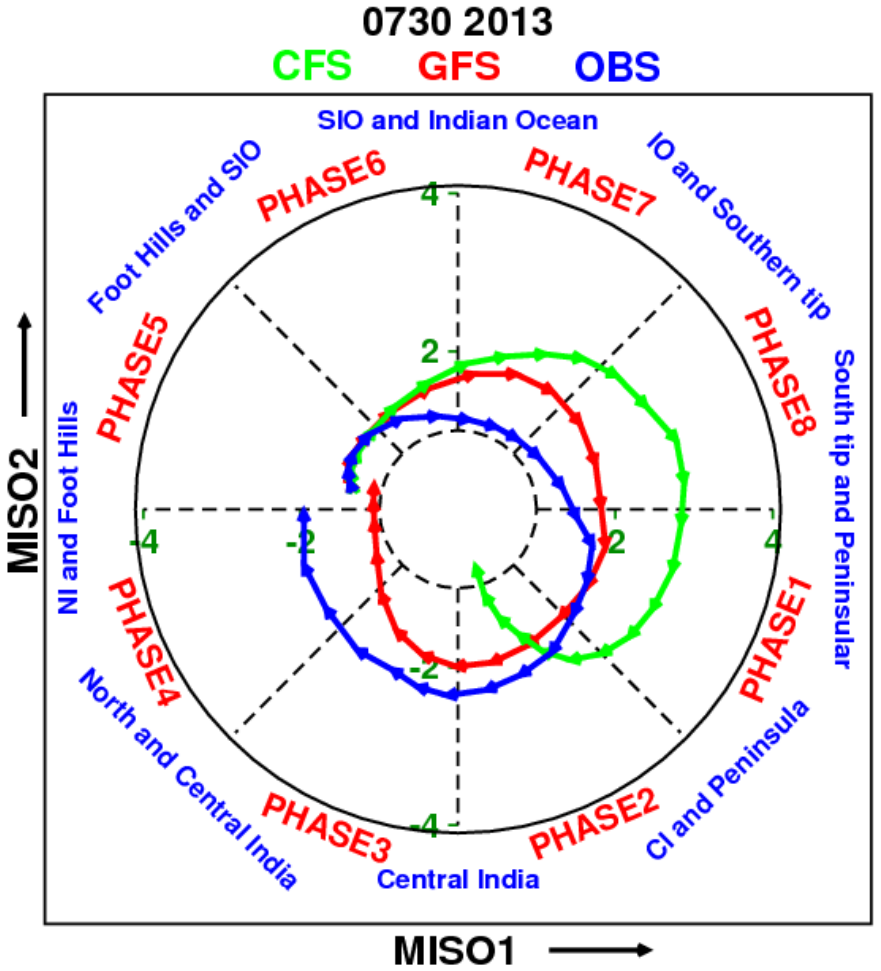
- **Extended EOF analysis is carried out similar to Wheeler and Hendon 2004 using standardized rainfall anomalies up to lag -15 days, averaged between 60-95E for the latitudes -12 to 30. The rainfall anomalies for the lag days are appended side by side to create the extended data matrix.**

- **The EOF analysis is carried out using IMD-TRMM merged data from 1998-2011. The real time data for 2013 is projected onto the EOFs created from the 14 years of past data.**

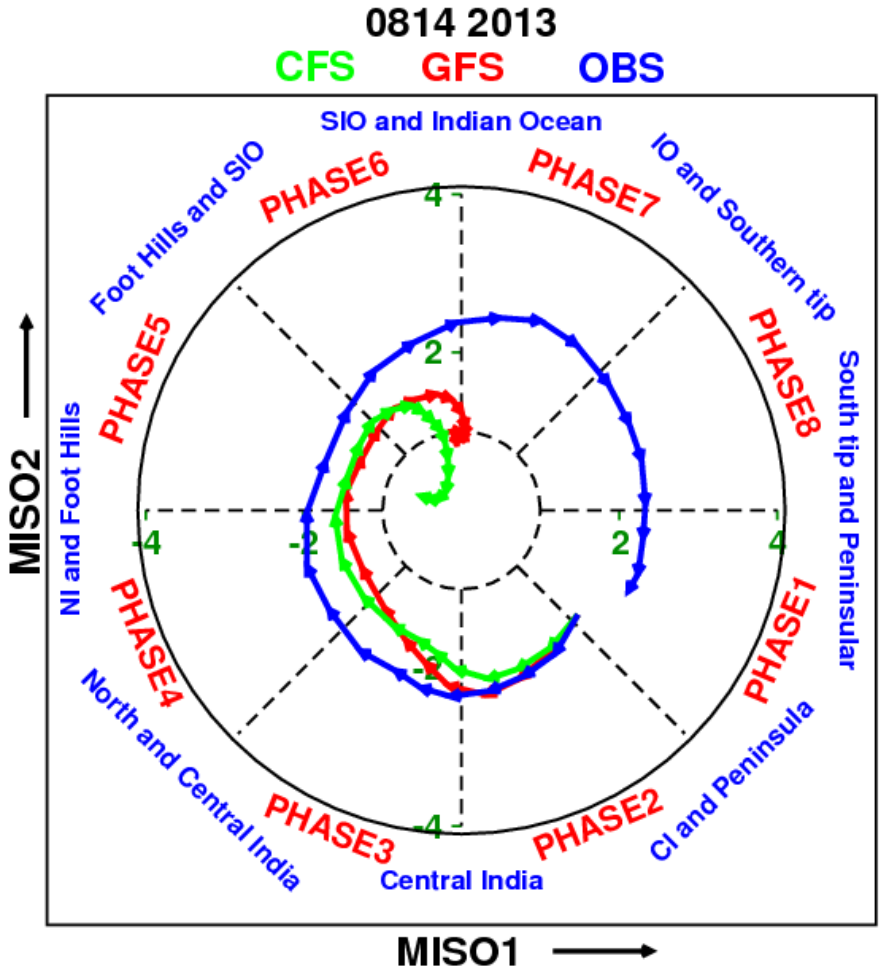
- **The amplitude of EOF1 and EOF2 (PC1 and PC2) are plotted in a PC1/PC2 phase space similar to Wheeler Hendon 2004 to get an idea of the evolution of ISO and its strength.**

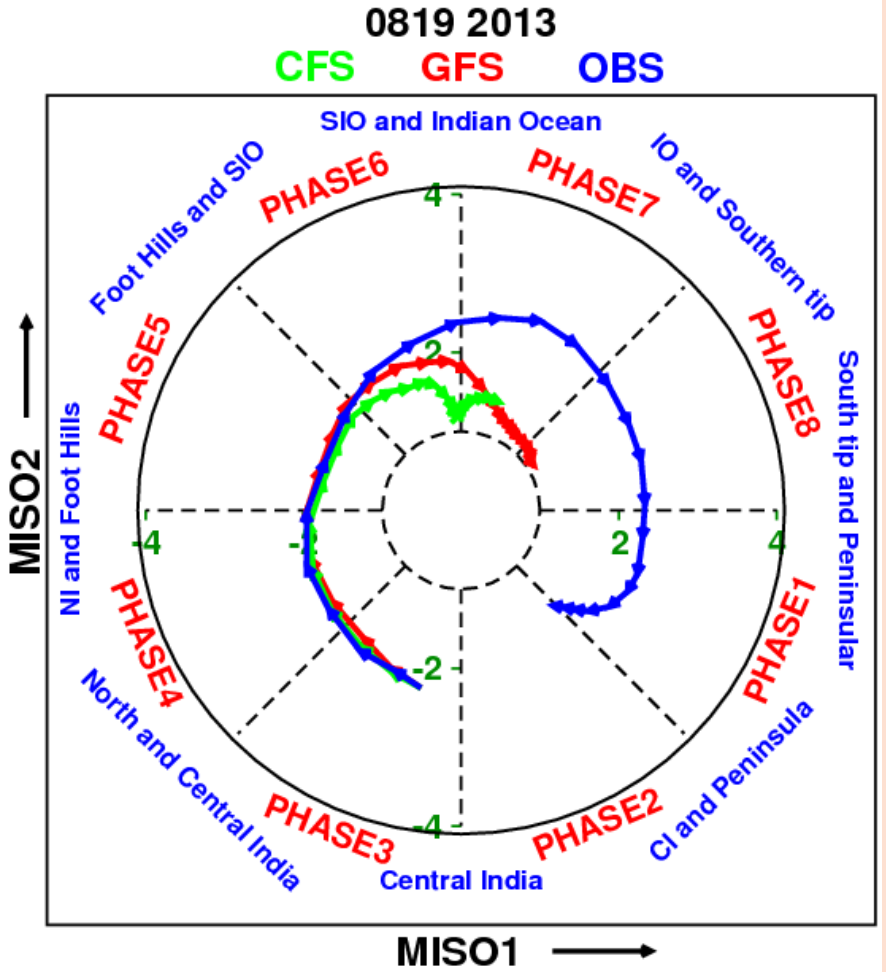
Not So Good Cases





2013 Strong Active phase
good cases





- More forecasts are available in:

http://www.tropmet.res.in/erpas/index.php

Thank You