

Strategies for Analysis Group

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Major issues are.....

- Parameters to be evaluated
- Spatial and temporal resolutions
- Observational data sets for validation
- Methods for evaluations

The models are reasonably good if

- Simulate seasonal cycle
- Simulate regional characteristics of precipitation field including major convergence zones, dry/wet regions etc
- Simulate typical temporal characteristics of precipitation time series

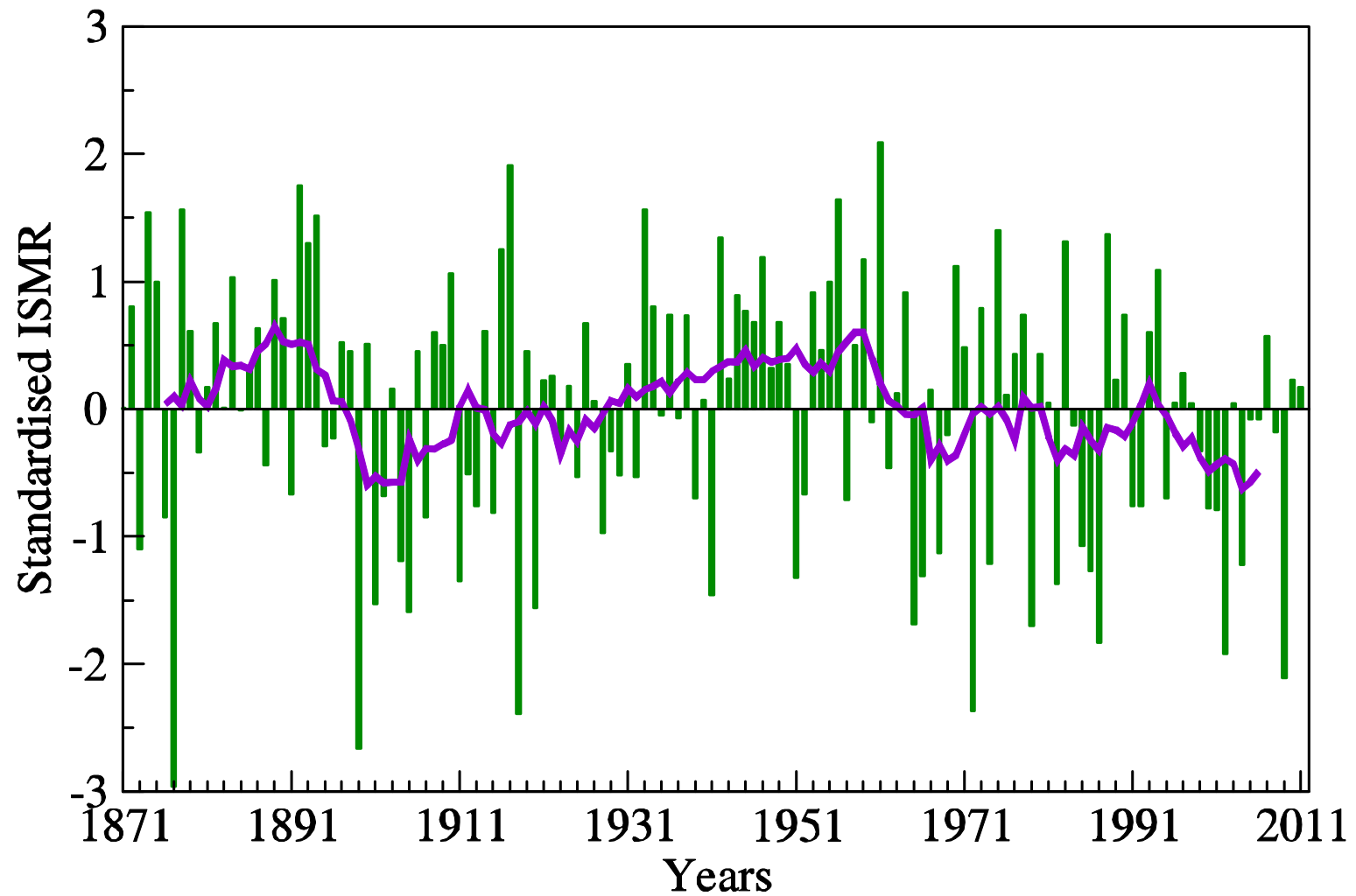
A topographic map of South Asia, showing the Indian subcontinent, the Himalayas, and the Southeast Asian archipelago. The map is rendered in shades of brown and tan, with blue representing the oceans. The text "South Asia" and its coordinates "(5-35°N, 65-95°E)" are overlaid on the map.

South Asia
(5-35°N, 65-95°E)

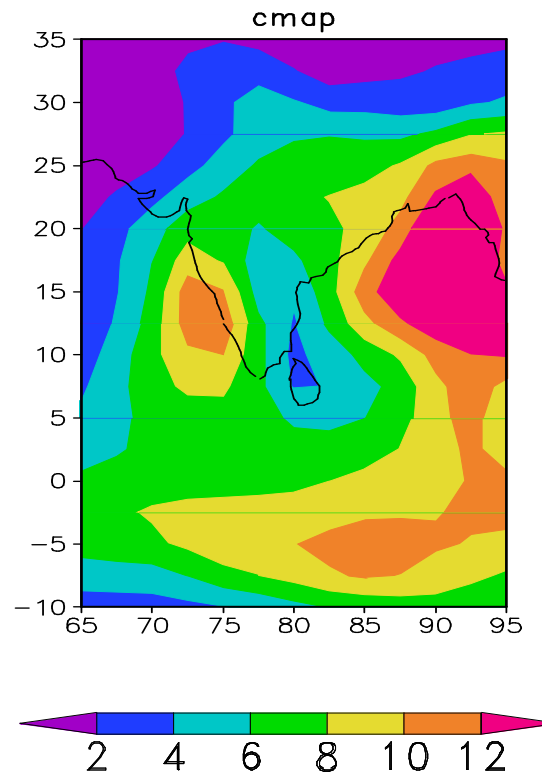
Evaluation Criteria : Precipitation , Temperature

- Seasonal Features
 - Annual Cycles**
 - Inter-annual Variability**
 - No Long-term Trends
 - Epochal variability
 - Regional characteristics** : Spatial distribution
- Intra-seasonal Features
 - Onset**
 - Low frequency Oscillations** : Strength, coherence, convection and wind variability
 - Northward propagating ISOs from Indian Ocean to 30° N ~ 30-60 days
 - Westward propagating ISOs from Bay of Bengal to North West India ~ 10-20 days
 - Eastward propagating MJOs along equator
 - Severe Weather Systems Cyclonic Disturbances** : Origin, track, pressure, maximum wind speed, landfall
- **Extremes (Max/Min/percentiles)**
 - Amplitude, frequency of daily max / min temperature
 - Frequency, intensity of daily heavy precipitation
- **ENSO-Snow-Monsoon Tele-connections**

Inter-annual Variability of AIMR (1871-2011)



Observed Mean pattern of AIMR (CMAP)



The major observed features of the Indian summer monsoon rainfall are:

-primary continental rain belt extending from the Bay of Bengal across the Indo-Gangetic plains corresponding to the monsoon trough and the low pressure systems

-secondary oceanic rain-belt near the equatorial regions around 5° S

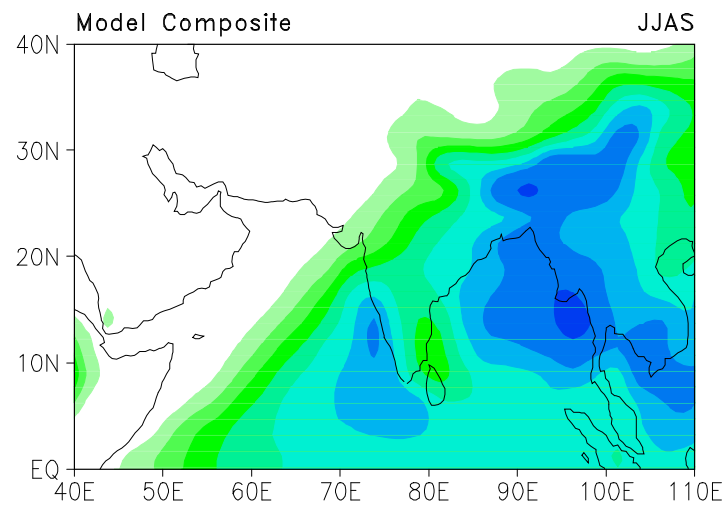
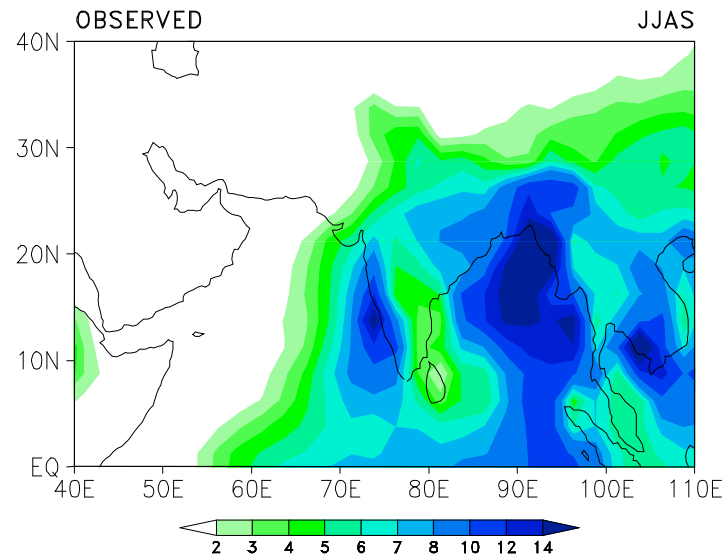
-west coast rainfall maximum due to the western ghats orographic barrier

-maximum rainfall over northeast India associated with the Himalayan orography

-low rainfall over northwest India

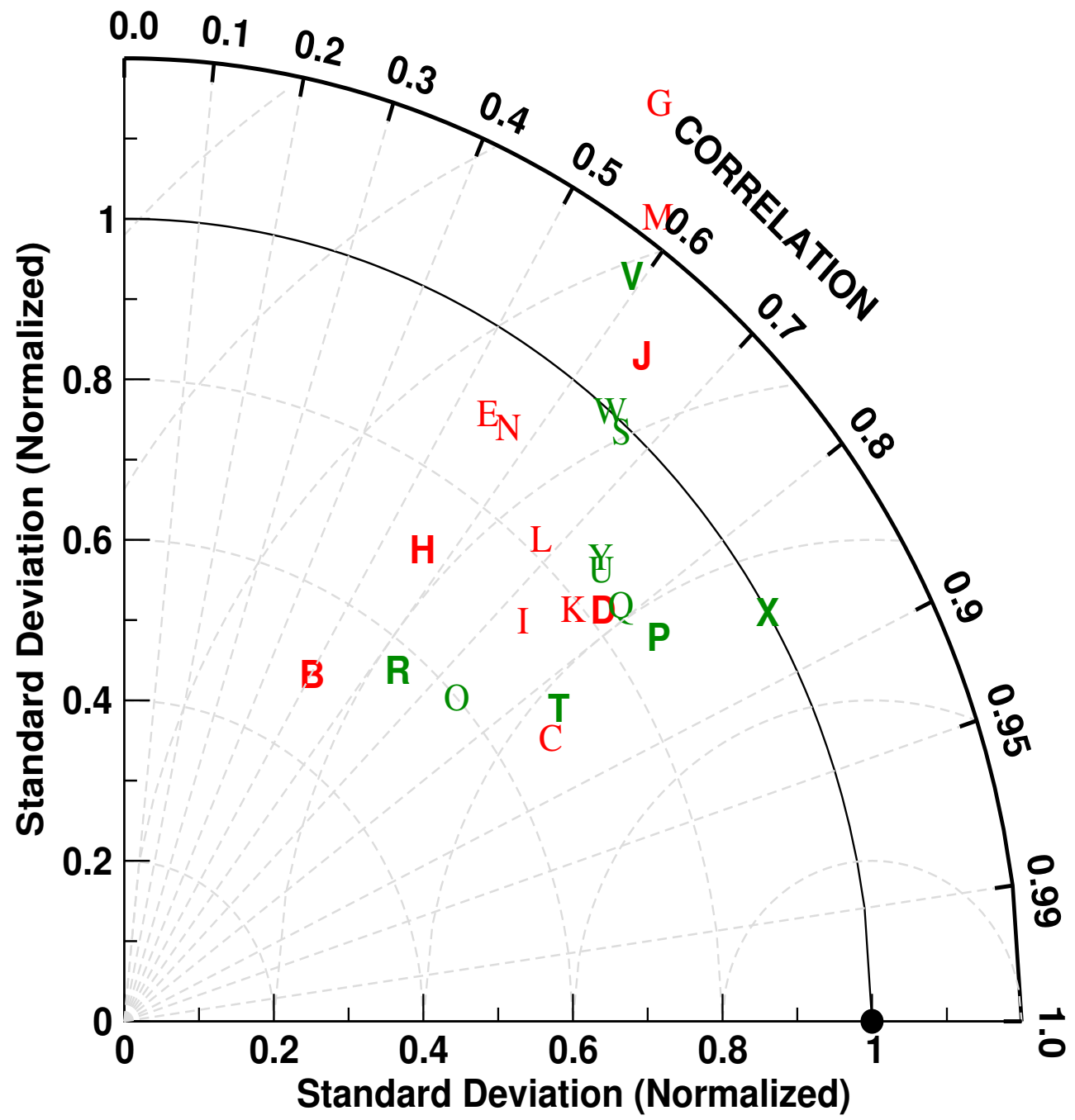
-low rainfall over the southeast peninsula

Observed and model Ensemble mean rainfall during summer monsoon season



Taylor Diagram

- Taylor diagram (Taylor 2001) is a graphical summary of how closely a set of patterns matches observations.
- The similarity between two patterns is quantified in terms of their correlations, their centered root mean square error and the amplitude of their variations (represented by their standard deviations).



- OBS
- A BCC
- B CSR
- C GF0
- D GF1
- E GIA
- F GIH
- G GIR
- H IAP
- I IPS
- J MRI
- K NCC
- L NCP
- M UKG
- N MME
- O BCR
- P CCM
- Q CCM2
- R CNR
- S ECH
- T ECO
- U INM
- V MIH
- W MIM
- X UKC
- Y MME

ENSEMBLES

- Represents new source for studying the range of plausible climate responses to a given forcing
- Can be generated by
 - Collecting results from range of models
 - generating multiple model versions within particular model structure by varying internal model parameters (perturbed physics ensembles)
- Serves to filter out biases of individual models and only retains errors that are generally pervasive. Always in better agreement with observed than individual models

Hence the major requirements are.....

- The models should be able to reproduce main spatial features and teleconnections
- Models should capture interannual, intra-seasonal and diurnal variability
- Development of regionally specific metric for model evaluation
- The methods for quantification and reduction of uncertainties in model simulations