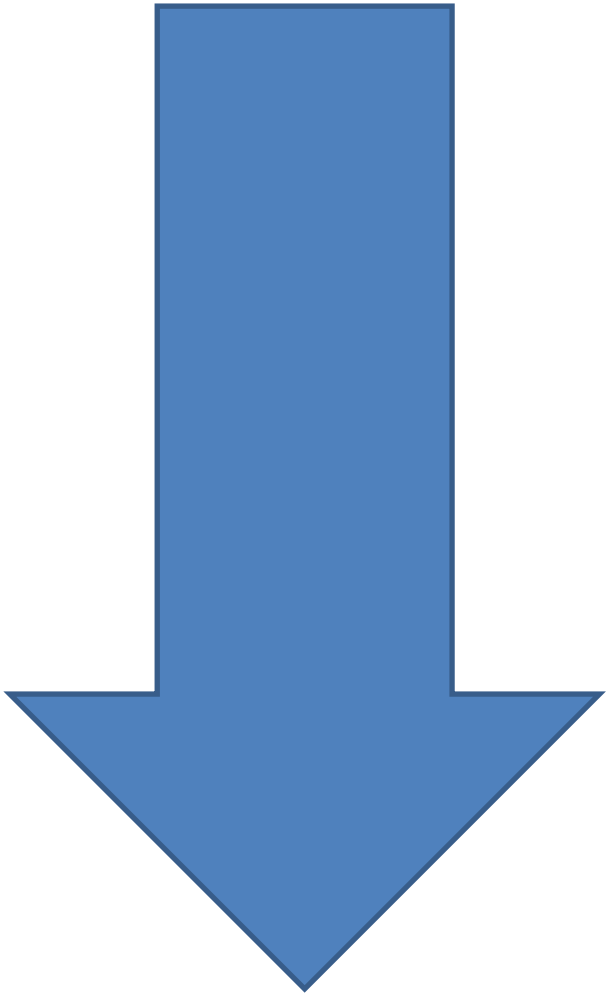
Wrap-up of Session II

Drought Prediction and Science at Multiple Time-scales

Wenju Cai

13:00-17:35	Session II **Drought Prediction and Science at Multiple Time-Scales**	Chair: Dr. Wenju Cai
13:00-13:30	Did Climate Change-Induced Trends Contribute to the Australian Decade-Long Millennium Drought?	Keynote – Dr. Wenju Cai (Commonwealth Scientific and Industrial Research Organisation /Australia)
13:30-13:55	Weekly to Decadal Predictability of Northwest Indian Ocean Rim Precipitation and Implications for Seasonal Drought Forecasting	Dr. Andy Hoell (Uni. Of California at Santa Barbara/USA)
13:55-14:20	IRI Forecast System and Drought Prediction: Providing Climate Information at Multiple Time-Scales	Dr. Nicolas Vigaud (International Research Institute for Climate and Society /USA)
14:20-14:40	**Coffee Break**	
14:40-15:10	Utilization of Dynamic Seasonal Climate Predictions for Drought Monitoring and Prediction Activities at NCEP/CPC	Dr. Jae-Kyung Schemm (National Oceanic and Atmospheric Administration /USA)
15:10-15:35	ENSO Index and Its Relationship to Standardized Precipitation Index (SPI) in the Maritime Continent	Mr. Amsari M. Setiawan (Agency for Meteorology, Climatology, and Geophysics /Indonesia)
15:35-16:00	Case Study of 2011/2012 Spring Rainfall in Taiwan	Dr. Jung-lien Chu (National Science and Technology Center for Disaster Reduction /Chinese Taipei)
16:00-16:20	**Coffee Break**	
16:20-16:45	An Assessment of Future Dryness over Korea Based on the Regional Climate Projection under A1B Emission Scenario	Dr. Eun-Soon Im (Center for Environmental Sensing and Modeling /Singapore)
16:45-17:05	TBA	Prof. Dennis Lettenmaier (Univ. of Washington/USA)
17:05-17:35	**Wrapping-up and Discussion**	

Multiple Time Scales



Climate Change

Decadale to Inter-annual

Seasonal

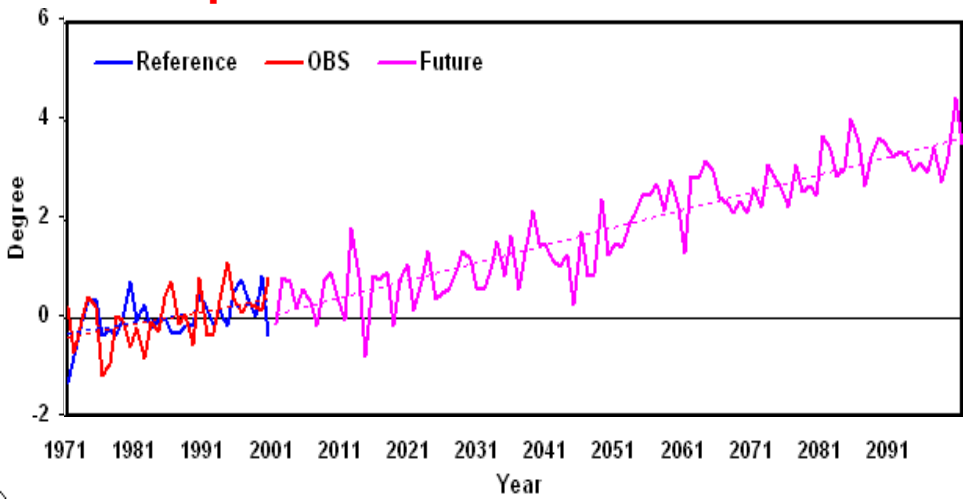
Monthly

Submonthly

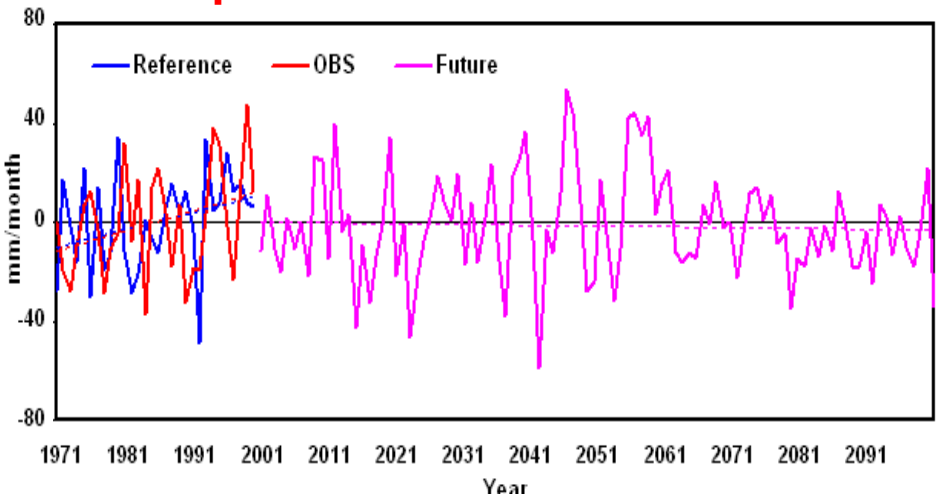
Future Drought

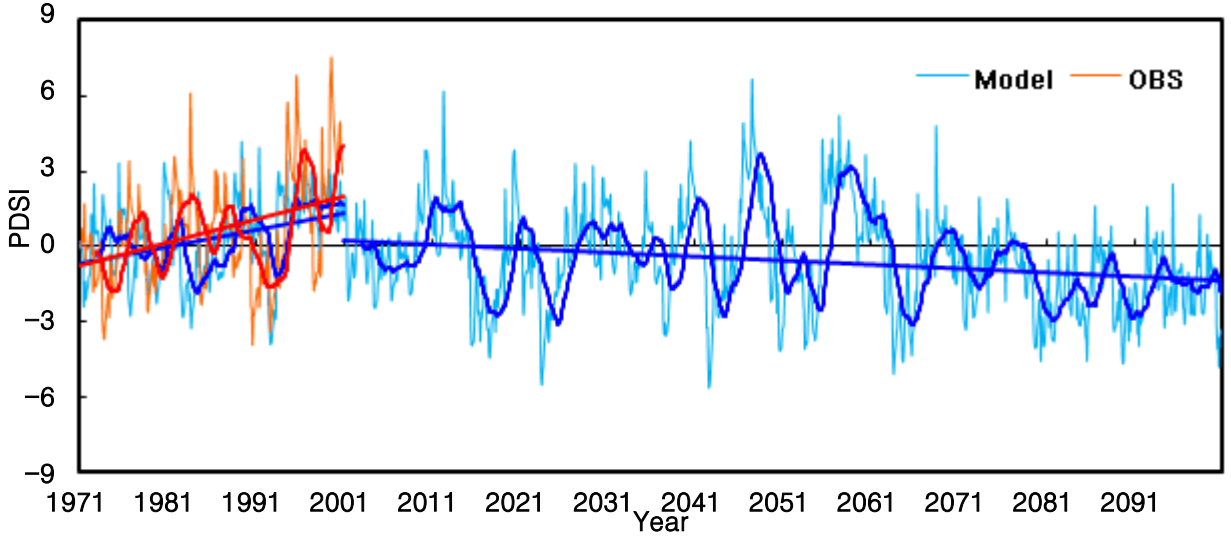
Long-term Trend on PDSI

Temperature



Precipitation



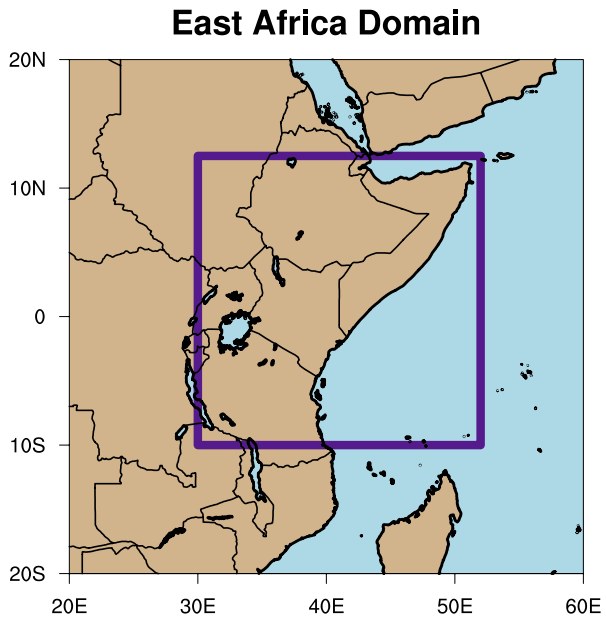


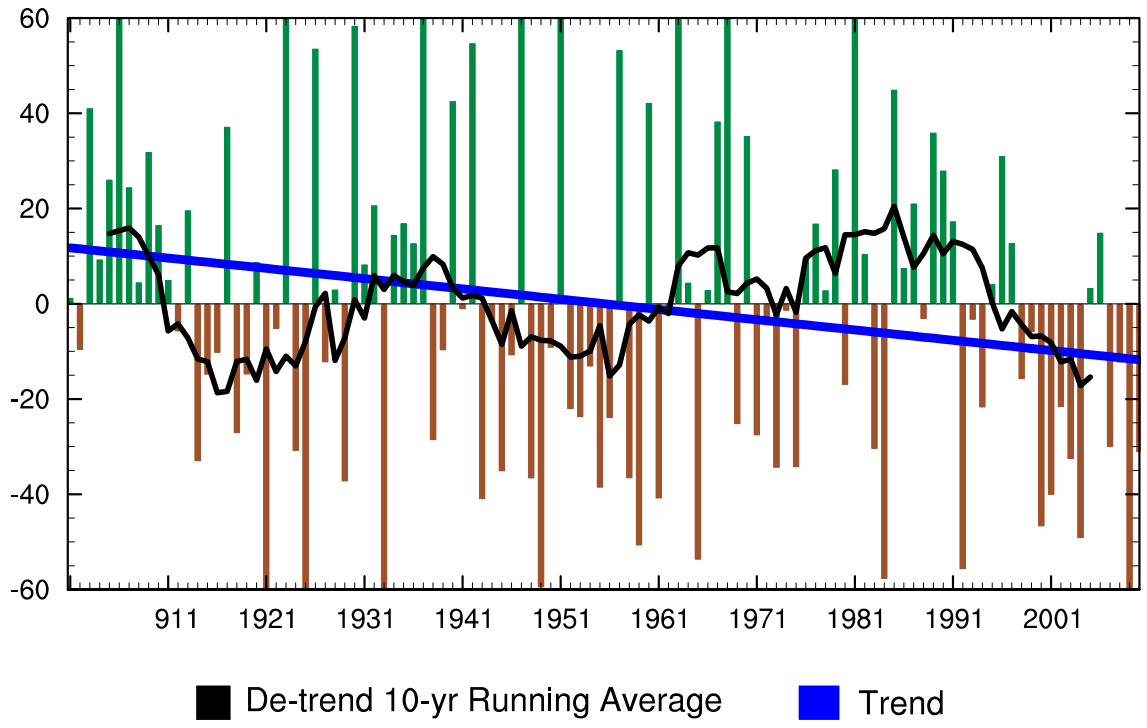
From Andrew

- The climates of Western Asia, the Middle East and East Africa are strongly influenced by Indo-Pacific climate variability operating on weekly to multi-decadal time scales
- Improved climate forecasts rely on our ability to understand how Indo-Pacific climate modes individually and synchronously force climate variability
- Improved climate forecasts are critical to food security over Western Asia, the Middle East and East Africa

Long-Term Variability of East Africa Rainfall

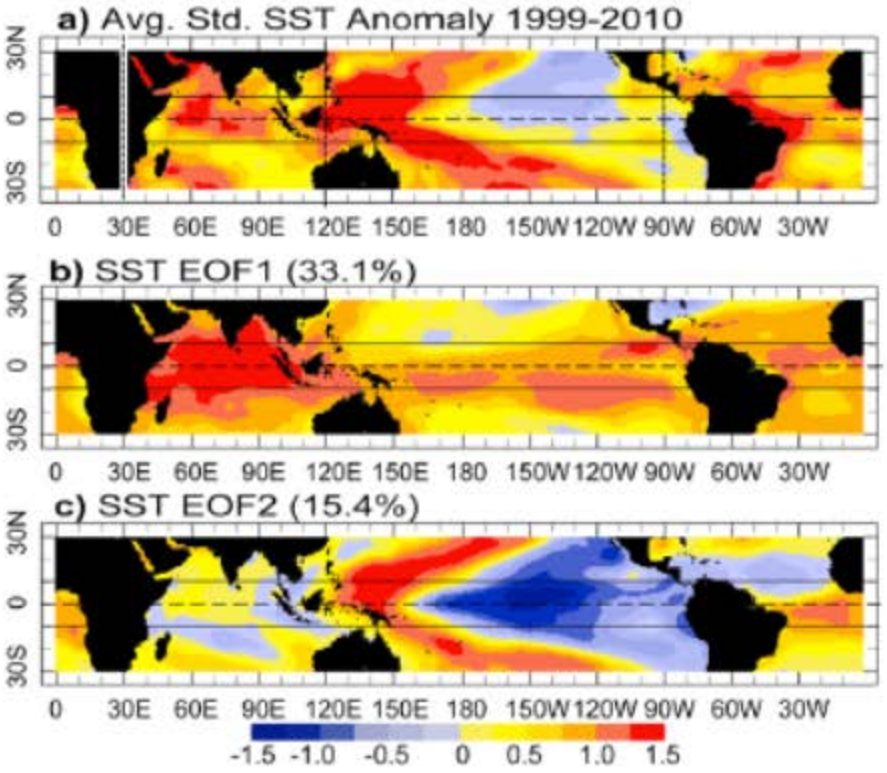
East Africa demonstrates decadal-scale and trend-scale precipitation variability during March-May

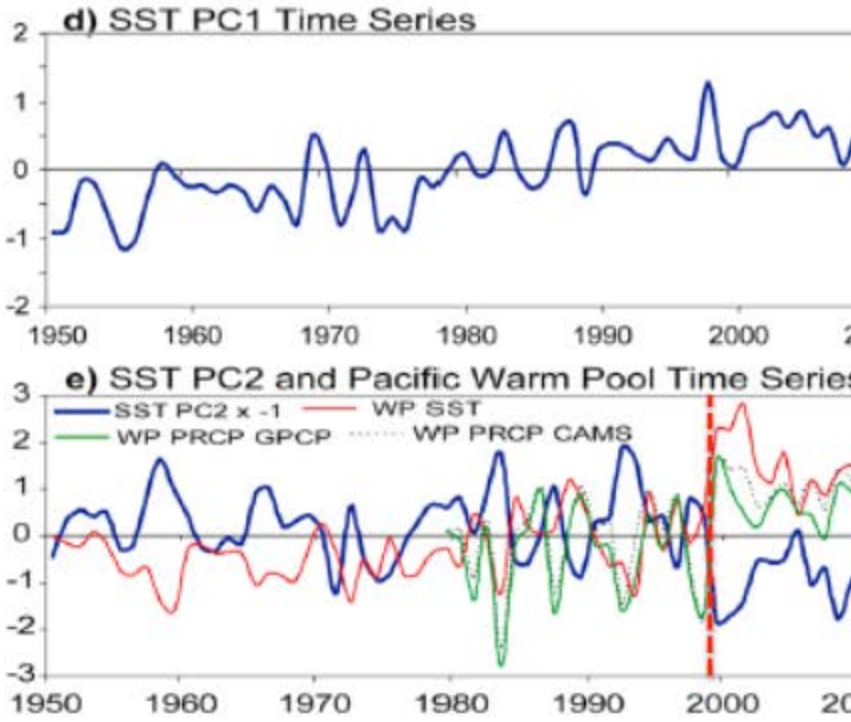




Hoell et al., Submitted to *Climate Dynamics*

Relationships with global SSTs

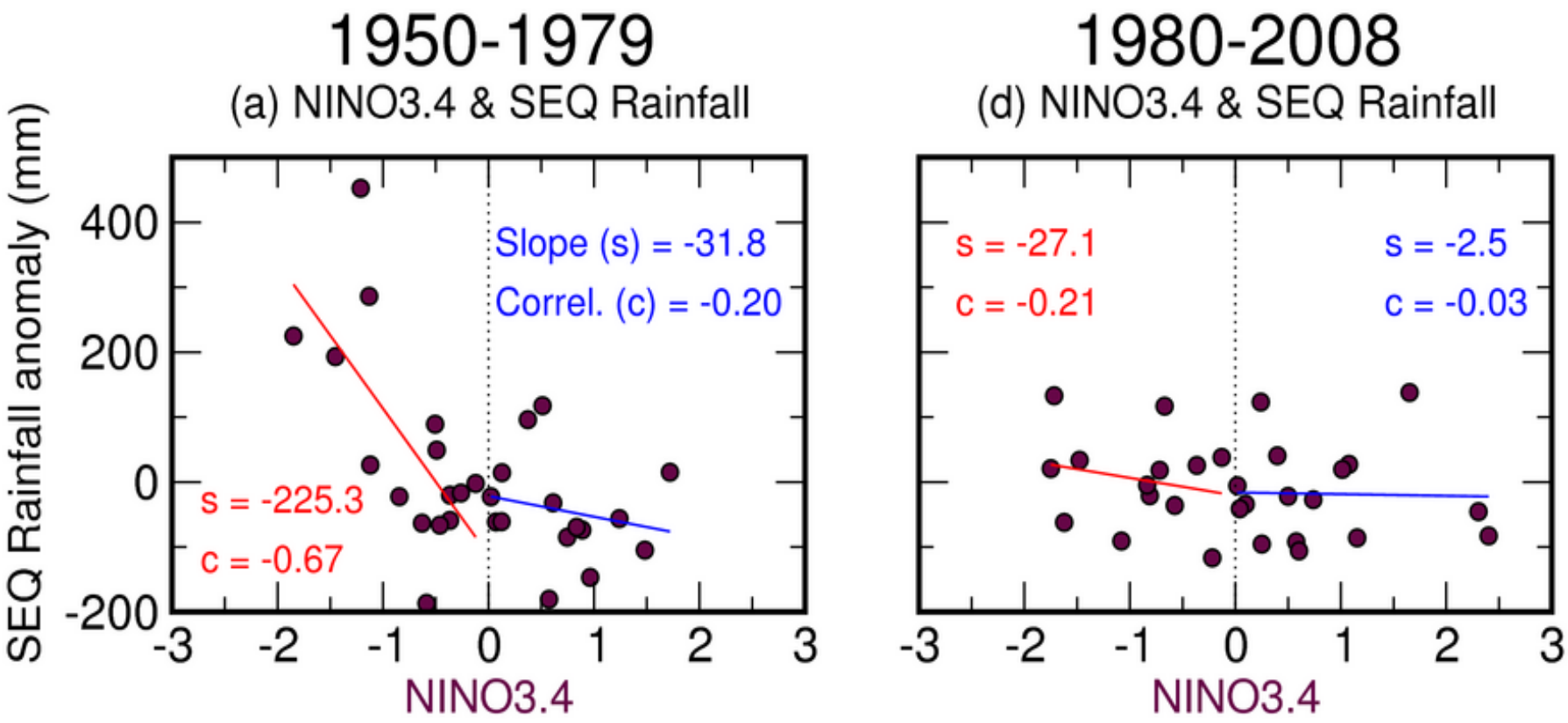




a) **Post 1999 SST anomalies** characterized by **highest loadings in the Pacific**

b) **EOF1** typical of the **warming trend** within the global ocean

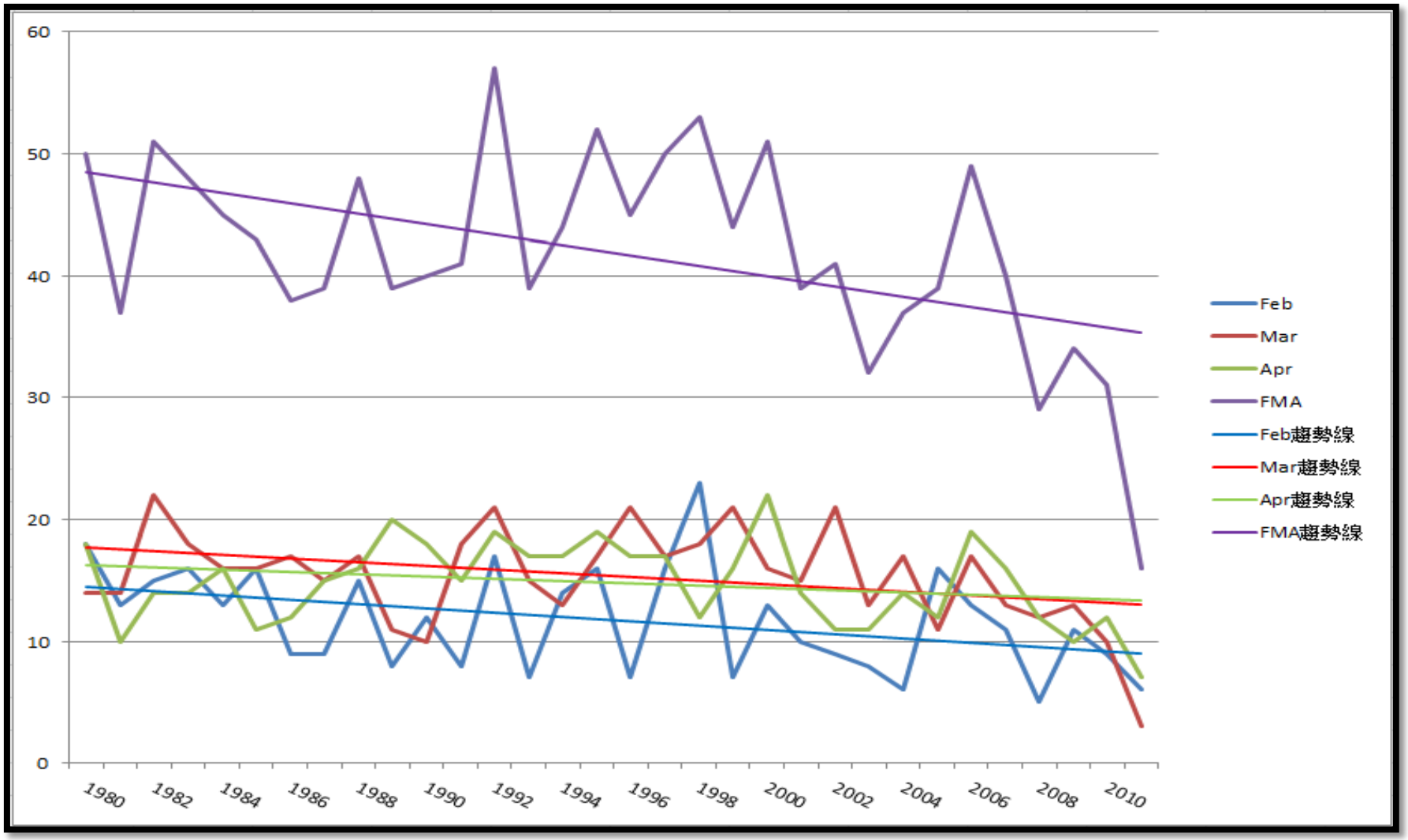
c) **EOF2 similar to post 1999 anomaly pattern** & shows an **abrupt shift in 1999**


1950-1979
(a) NINO3.4 & SEQ Rainfall
SEQ Rainfall anomaly (mm)
400
200
0
-200
-3
-2
-1
0
1
2
3
NINO3.4
Slope (s) = -31.8
Correl. (c) = -0.20
s = -225.3
c = -0.67
1980-2008
(d) NINO3.4 & SEQ Rainfall
s = -27.1
c = -0.21
s = -2.5
c = -0.03
NINO3.4

Case study of spring rainfall in 2011/2012(cont.)

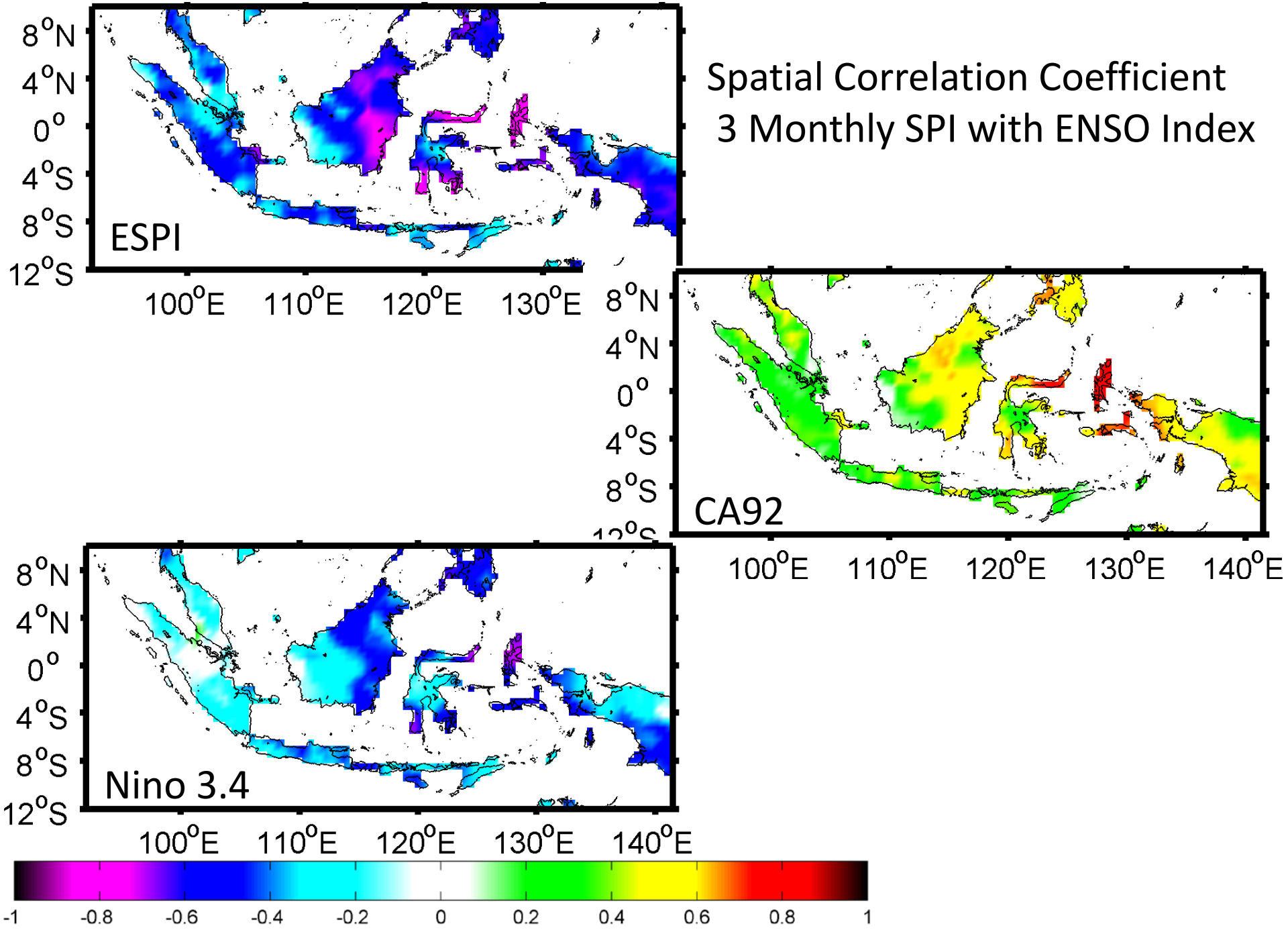
Taiwan

Day of frontal activity (1980~2011)



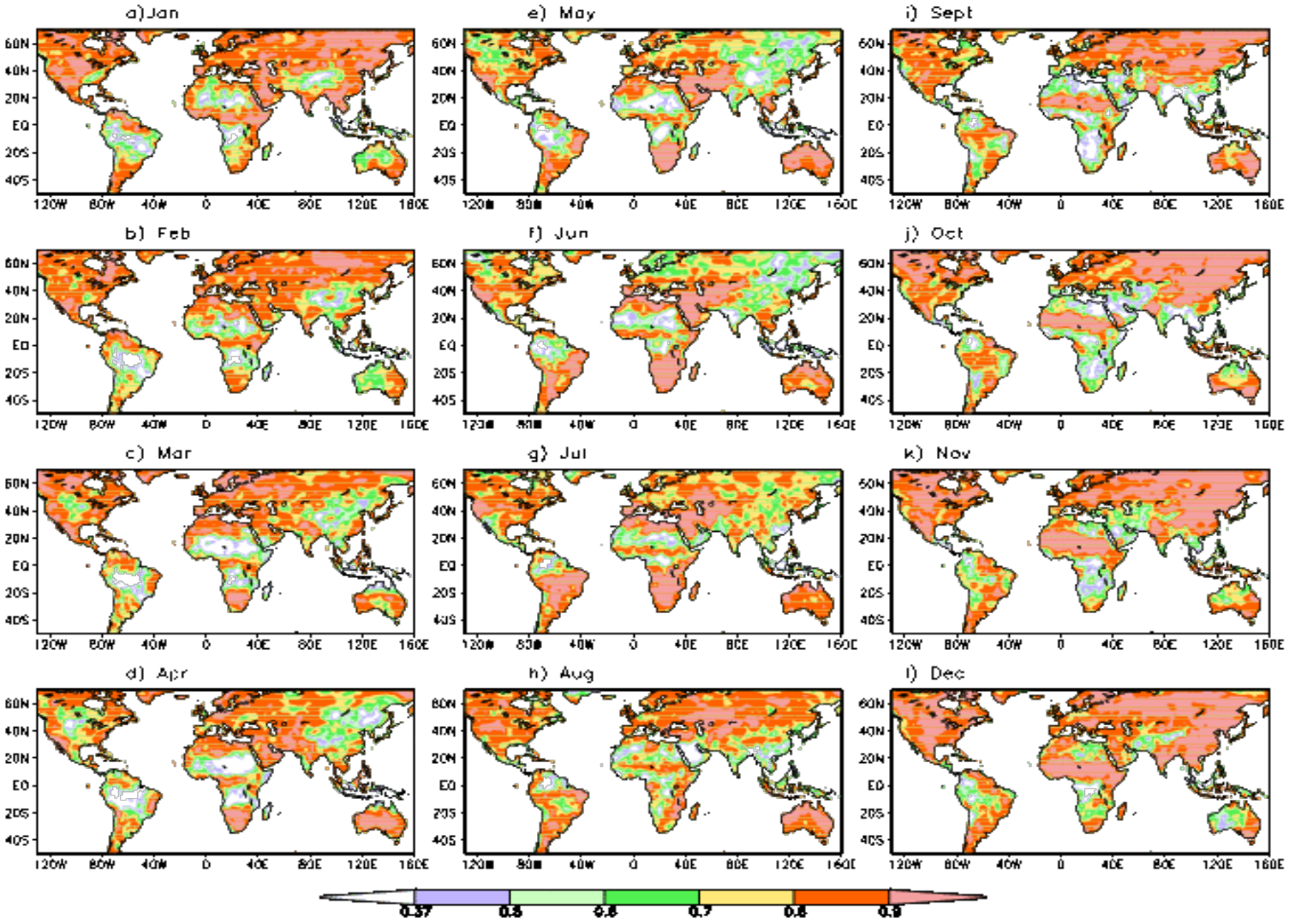
Various ENSO Indices

- ENSO Precipitation Index (ESPI);
- Cheliah and Arkin OLRA ENSO Index (CA92);
- Eastern Central Pacific Outgoing Longwave Radiation Anomaly Index (ECP-OLRA);
- Sea Surface Temperature Anomaly (SSTA) Nino 1 +2, Nino 3, Nino 4, Nino 3.4;
- Southern Oscillation Index (SOI);
- Oceanic Nino Index (ONI),
- the Japan Meteorological Agency SSTA ENSO Index (JMA-SSTA);
- Multi-variate ENSO Index (MEI)
- Trans Nino Index (TNI)


Spatial Correlation Coefficient
3 Monthly SPI with ENSO Index
ESPI
CA92
Nino 3.4
8°N
4°N
0°
4°S
8°S
12°S
100°E
110°E
120°E
130°E
140°E
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

SPI3 Corr. Score; 1-month lead

High skill contribution from obs



On sub-monthly predictions

Particularly important where **initial conditions** & **intra-seasonal oscillations** are **strong** while **seasonal predictability** is **relatively weak** (ex. Asian monsoon regions)

- **Goal:** fill the gap between medium-range & seasonal forecasts
- **Aim:** evaluate sub-monthly forecast skill from a few GCMs
- **Objective:** identify sources of sub-monthly predictability and examine their contributions to forecast skill (i.e. MJO vs ENSO)