Determining the relationships between Sea Surface Temperatures (SST), Sea Surface Temperature anomalies (SSTA) and Precipitation for Trinidad and Tobago

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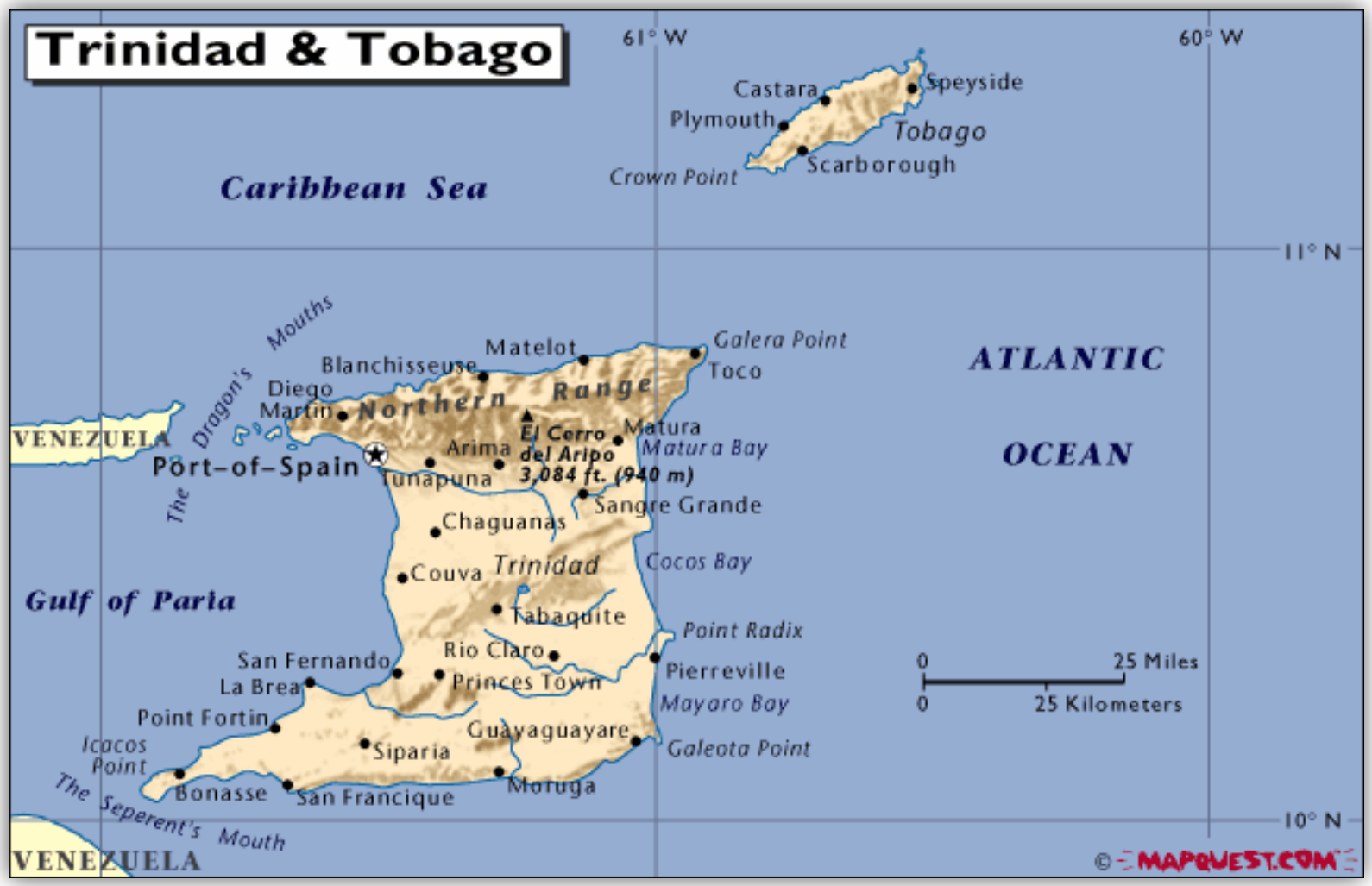
Outline

- Introduction
- Rainfall studies
- Research question & Aim
- Methodology
- Results
- Analysis
- Conclusion
- References
- Acknowledgements

Introduction

Source: www.google.com/imgres?imgurl=http://geology.com/world/caribbean-map.gif&imgrefurl

Introduction



Source: http://www.scuba-diving-smiles.com/map-of-trinidad-andtobago.html

Rainfall Studies for Trinidad

AUTHOR	TITLE	ANALYSIS
Dunlop, W. R (Feb1925)	Rainfall Correlations in Trinidad	Statistical (correlations)
Dunlop, W. R (May 1925)	Rainfall Correlations in Trinidad	Statistical (correlations)
Bliss, E.W (1929)	A Study of Rainfall in the West Indies	Statistical (correlations & regression analysis)
Crüger, H. E (1931)	Meteorology of Trinidad	
Garstang, M (1959)	Tropical Island Rainfall A Study of the Rainfall Distribution of Trinidad, West Indies	Description of rainfall patterns
Wehekind, L (1953)	Rainfall Reliability In Trinidad	

AUTHOR	TITLE	ANALYSIS
Granger, O. E. (1982)	Climate fluctuations in Trinidad, West Indies & their Implications for Water Resource Planning	Statistical (running means, cumulative residuals & spectrum analysis)
Harripaul, D. (2000)	Satellite derived Sea surface Temperatures for Trinidad and Tobago over the period January 1987 to December 1998	Statistical(climatology, standard deviations, yearly averages)
Stone, R.J. (2001)	Changing Seasonal rainfall patterns in Trinidad: Myth or Reality?	Statistical (sample autocorrelation, runs test, Wald-Wolfowitz test)
Stone, R.J. (2003)	Impact of El Niño Southern Oscillation on Dry-Season rainfall in Trinidad	Statistical (parametric one-way analysis of variance (ANOVA)& Kruskal –Wallis (K-W) test (non parametric))

Research Question

- What is the relationship between the climatic factor sea surface temperature & Trinidad & Tobago's precipitation and

- Does the El Niño Southern Oscillation (ENSO) affect its precipitation?

Aim

- To determine the relationship between sea surface temperatures and precipitation for Trinidad and Tobago
- To determine if the ENSO affects our precipitation and how

Methodology

DATA & PROCESSING

- SST data sets:

  Satellite AVHRR derived data sets

  Time span: 1985 – 2009

  Spatial Resolution: 0.044° (latitude) x 0.044°(longitude)

  Temporal Resolution: Monthly

- Precipitation data sets:

  Piarco Meteorological Station data sets

  Time span: 1985 – 2006

  Temporal Resolution: Monthly

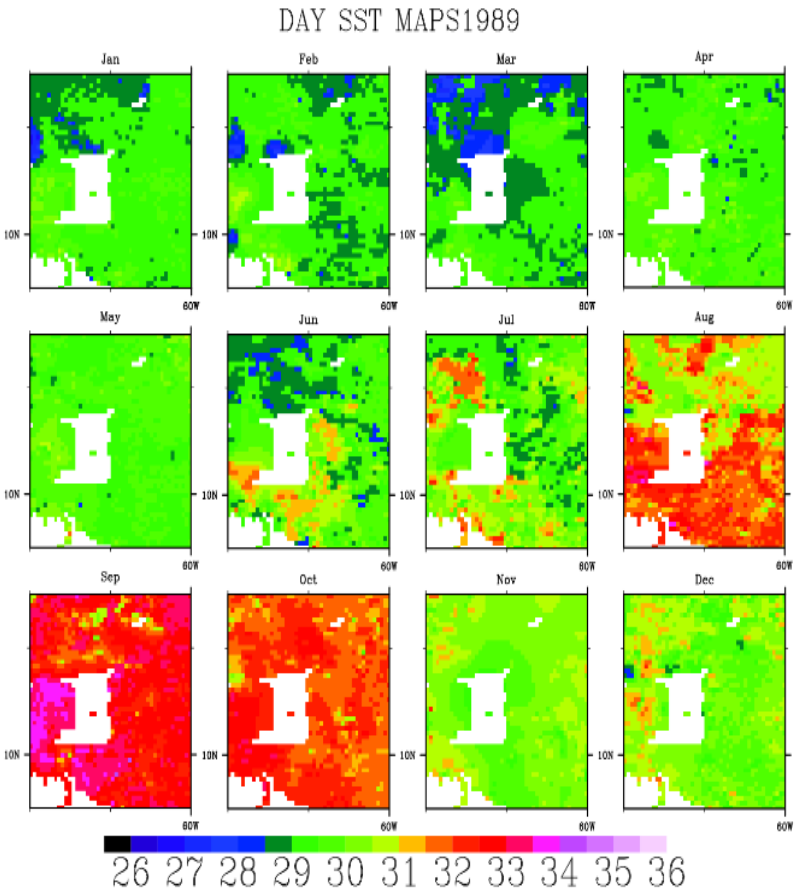
Methodology

ANALYSIS TECHNIQUE

- Statistical Approach:
  - Correlations
  - Empirical Orthogonal Function (EOF)

PRELIMINARY RESULTS

Day SST Maps


DAY SST MAPS1989
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Apr
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60W
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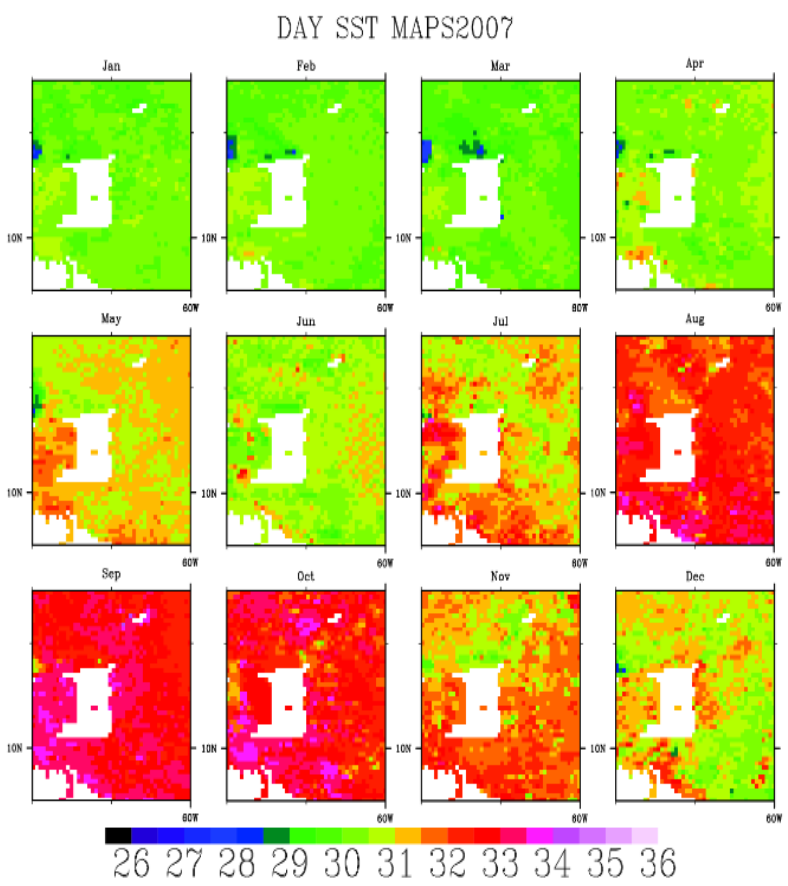
DAY SST MAPS2007
Jan
Feb
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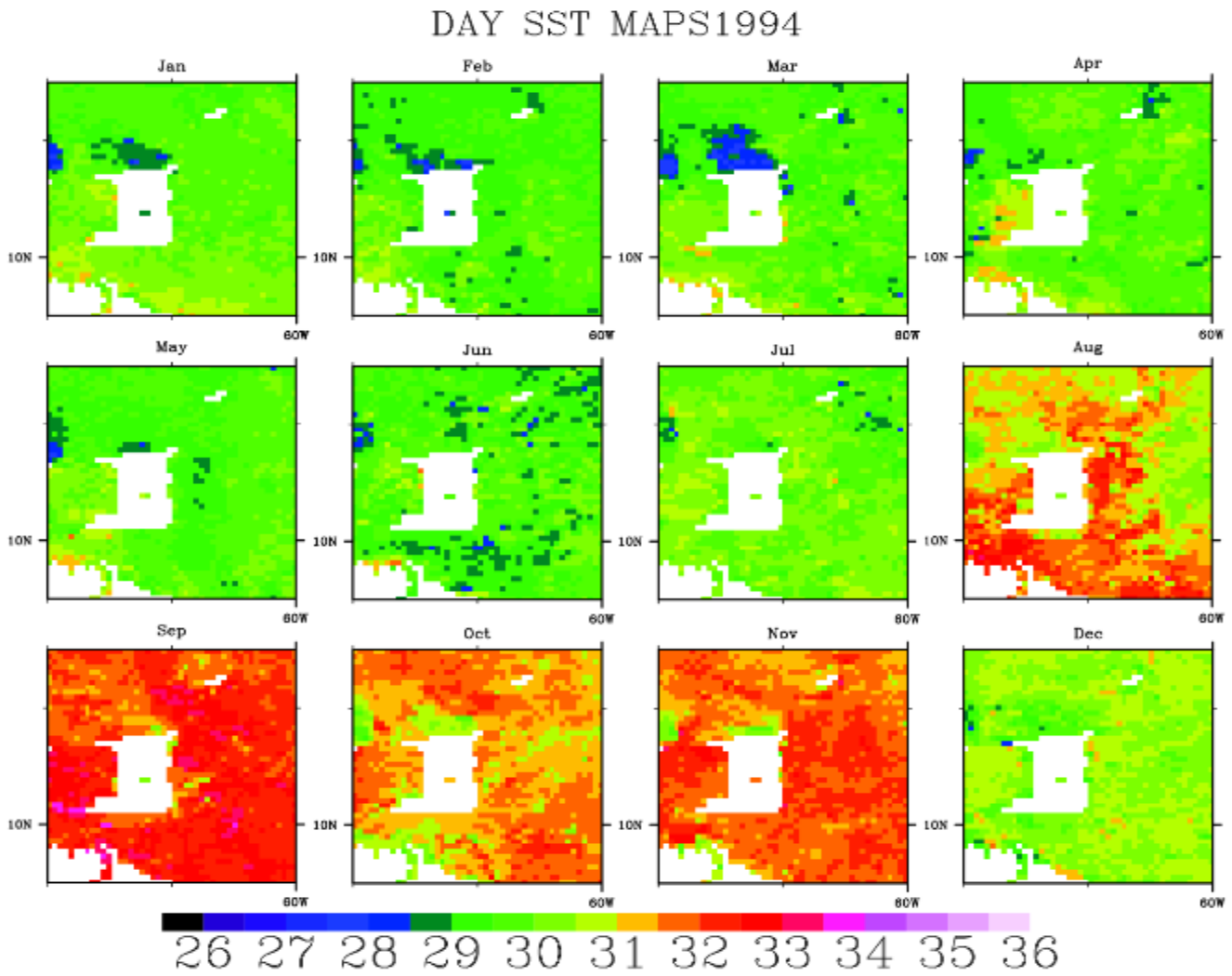
26 27 28 29 30 31 32 33 34 35 36

El Niño Year


DAY SST MAPS1994
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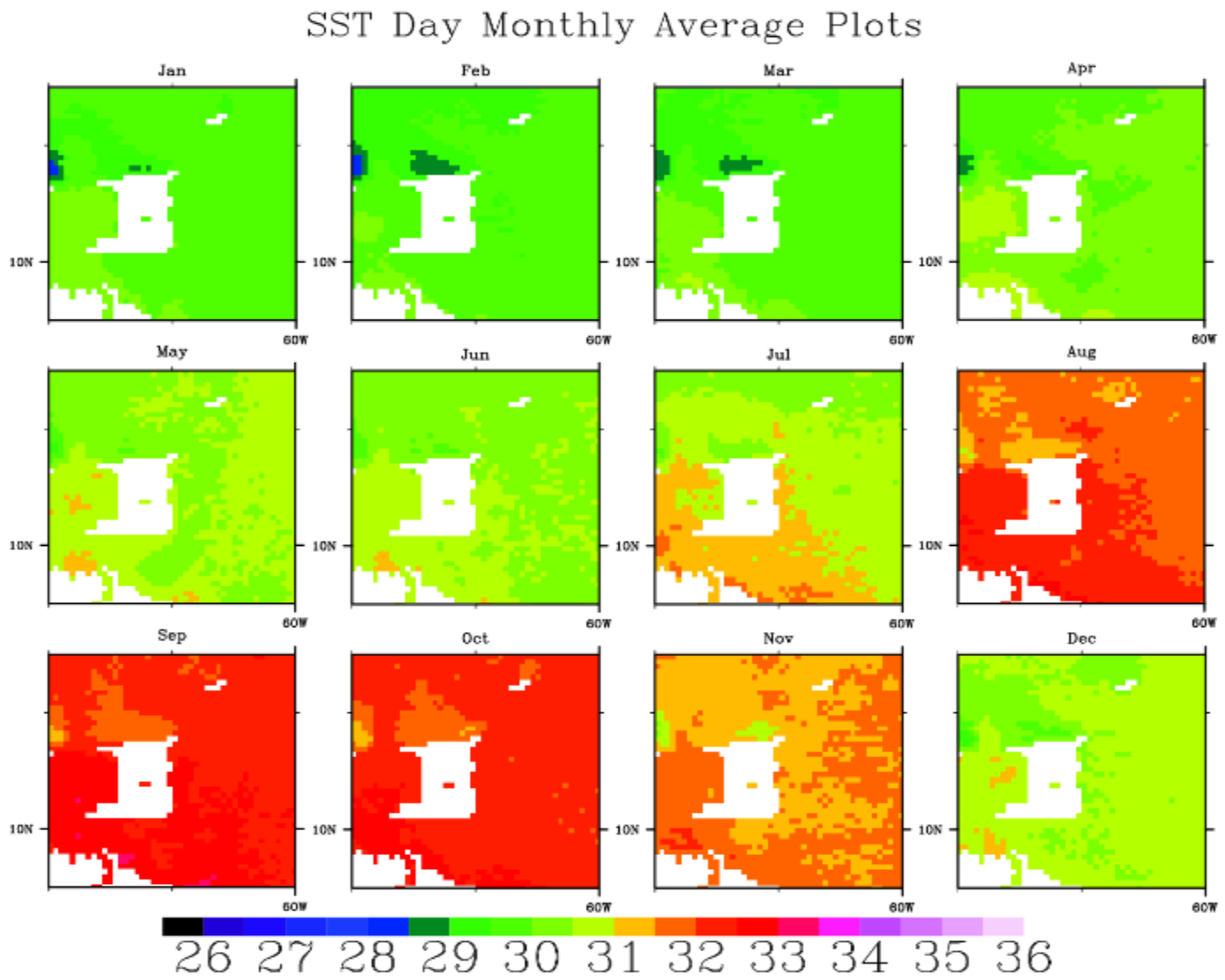
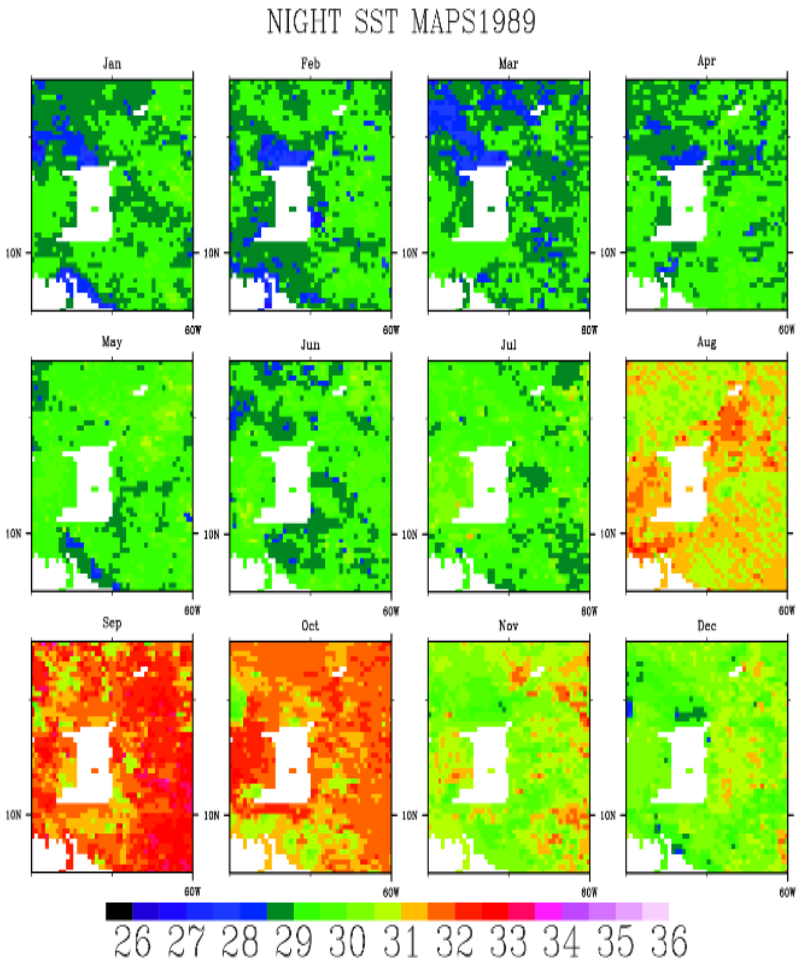
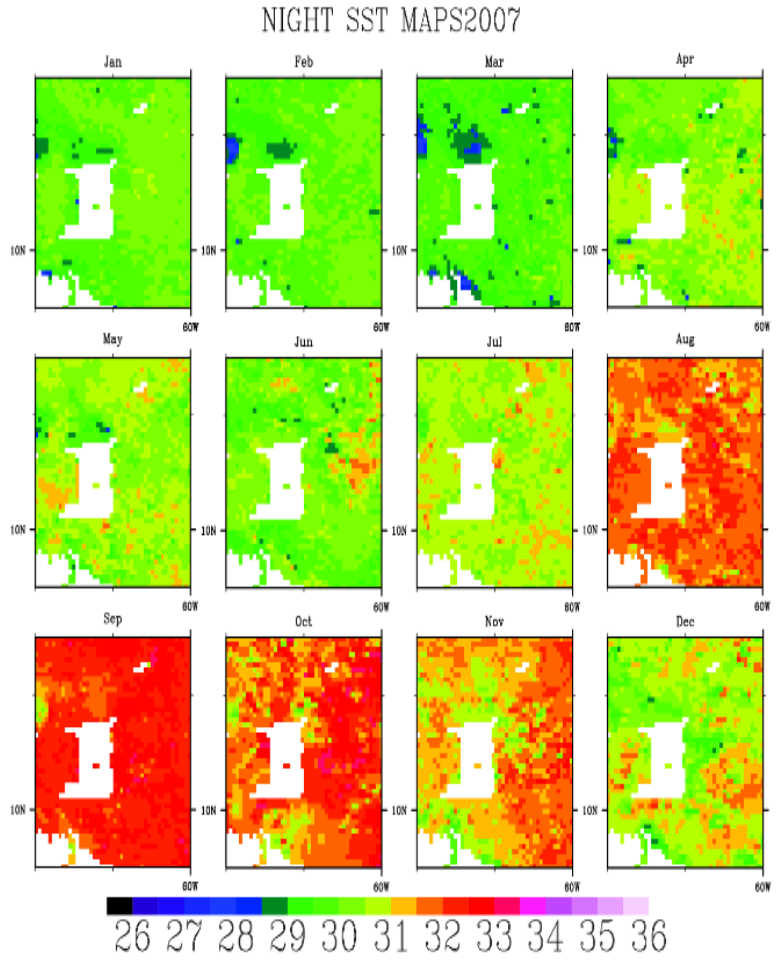
SST 25 Year Climatology Map

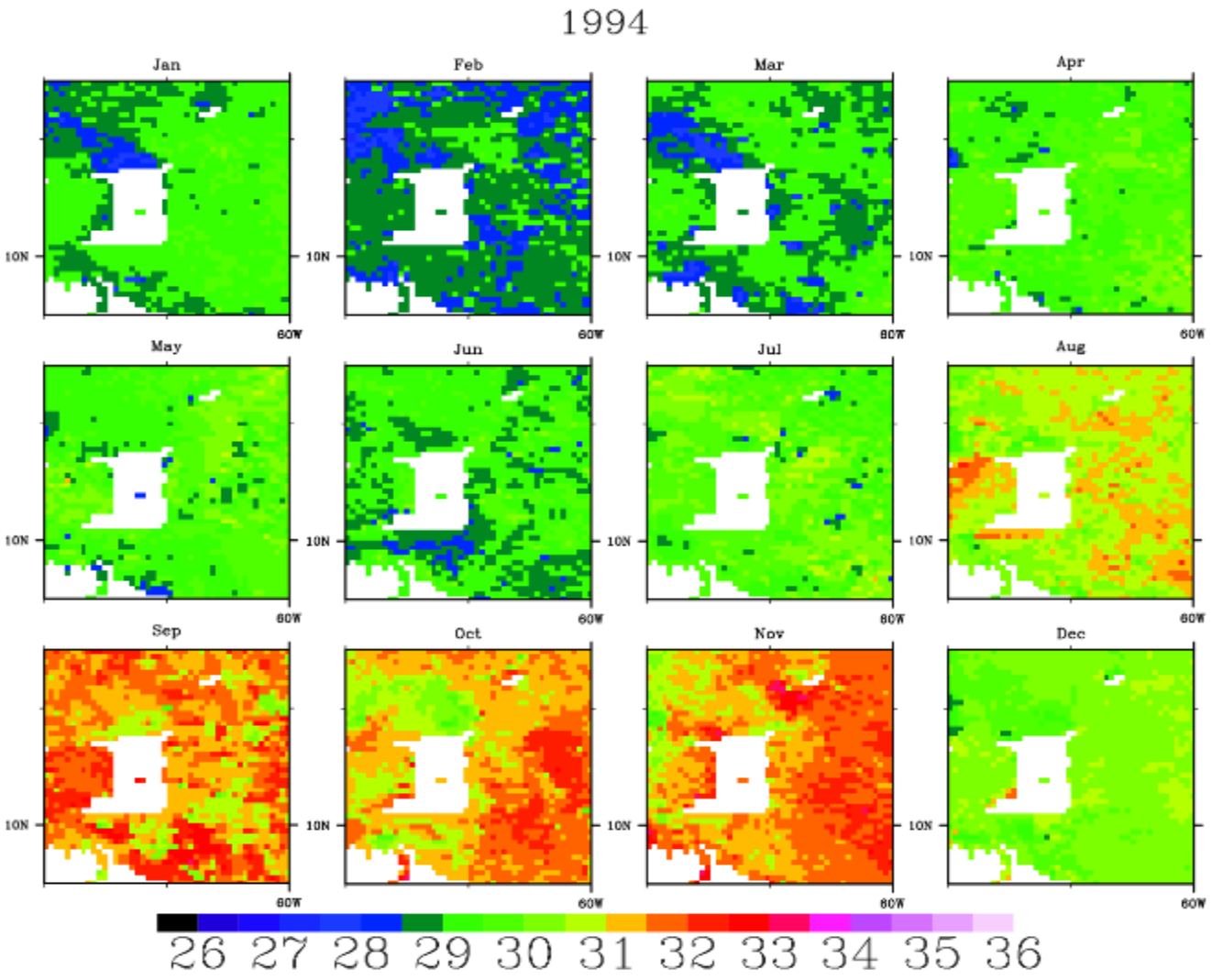


Night SST Maps





El Niño Year


1994
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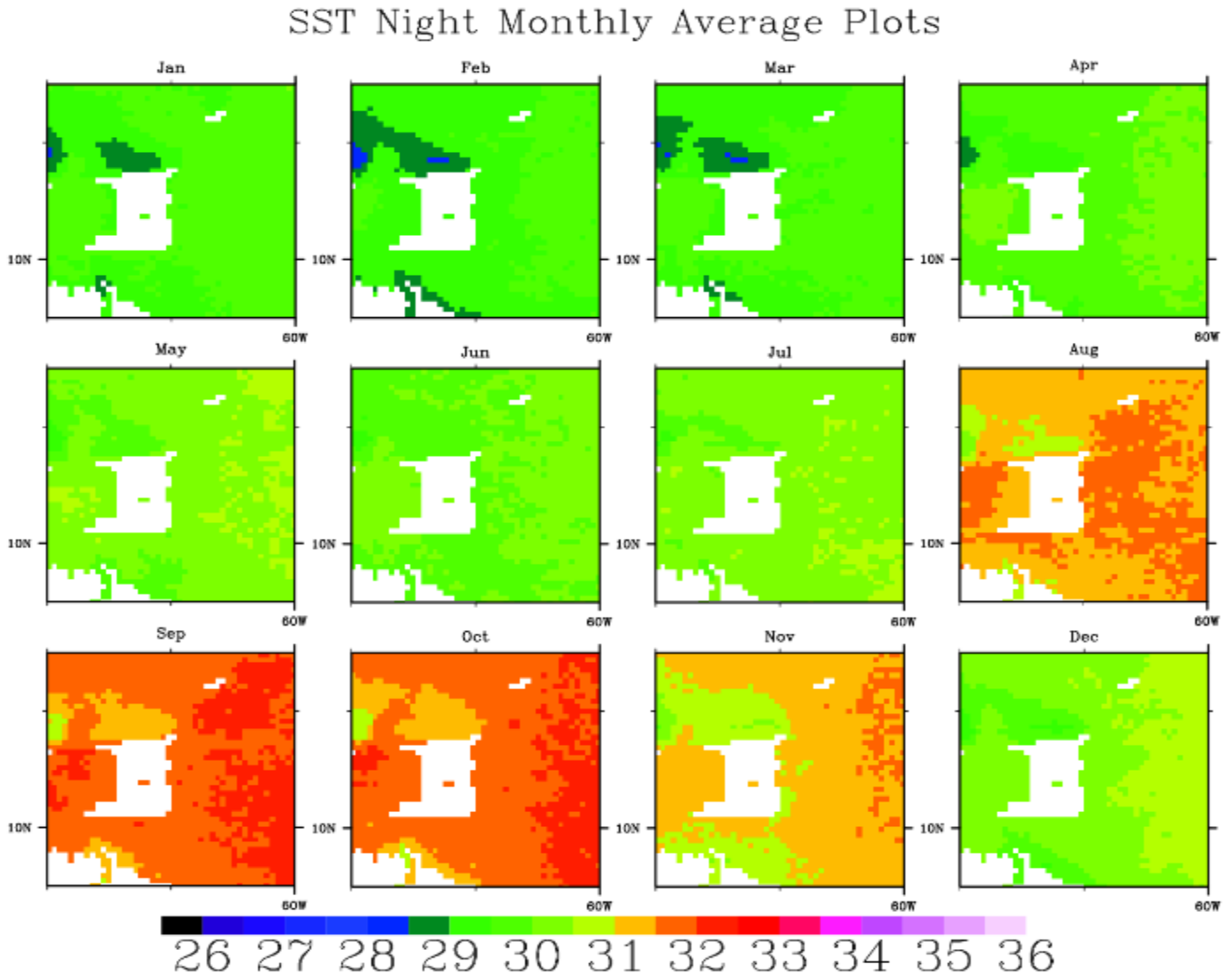
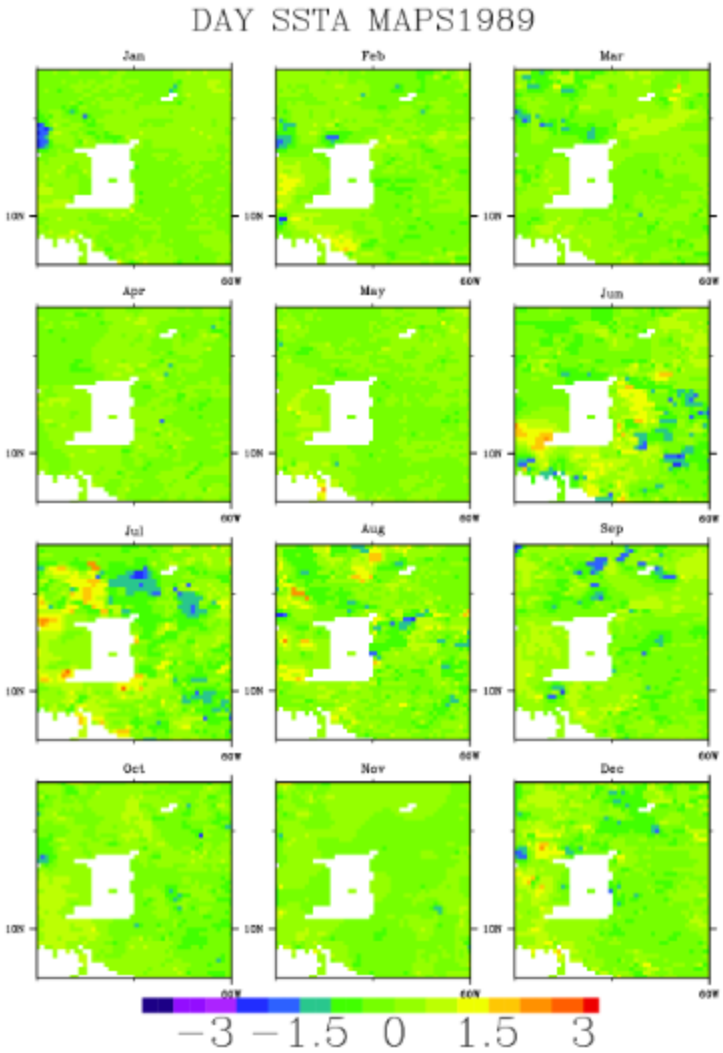
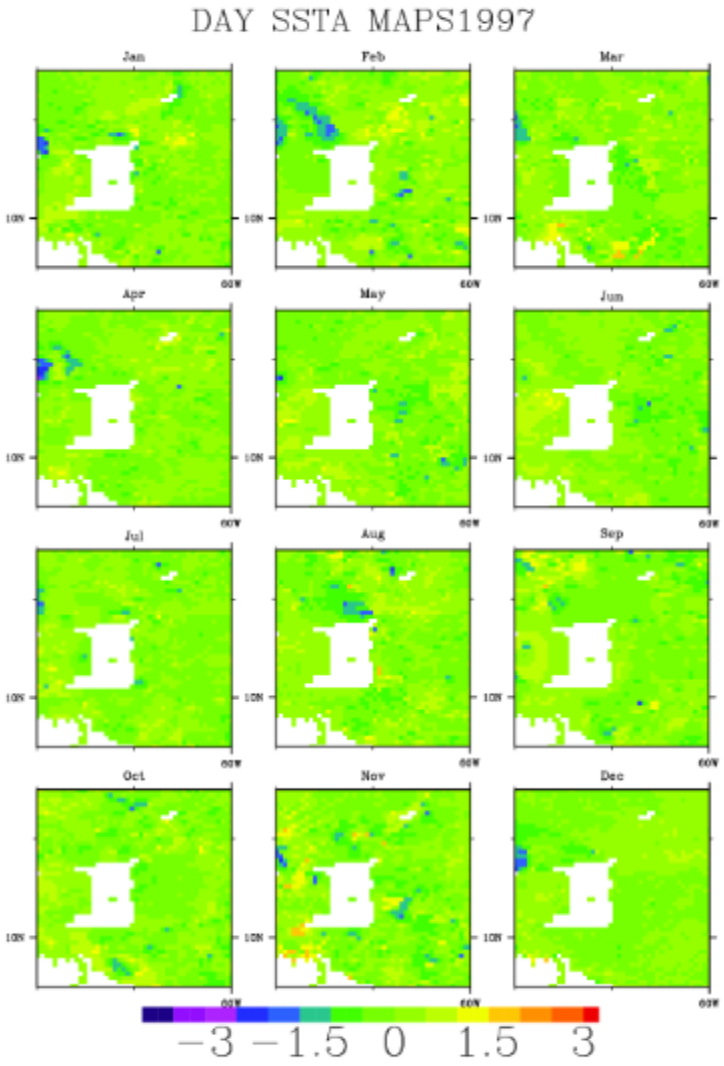
SST 25 Year Climatology Map

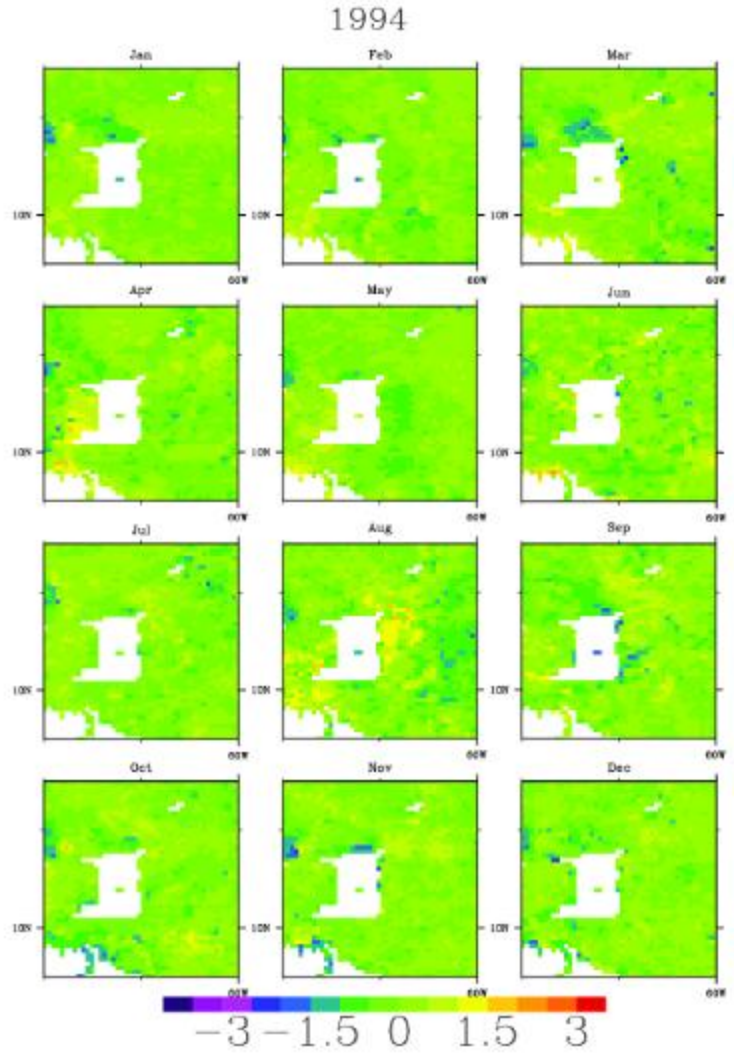


Day SSTA Maps

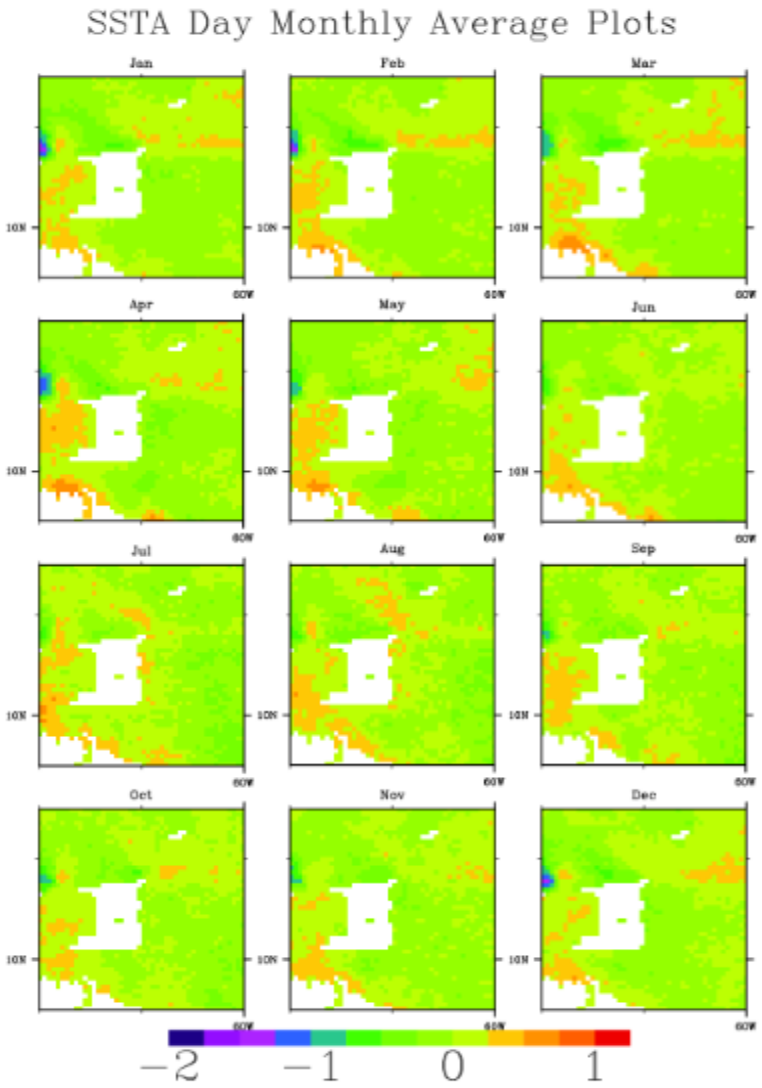




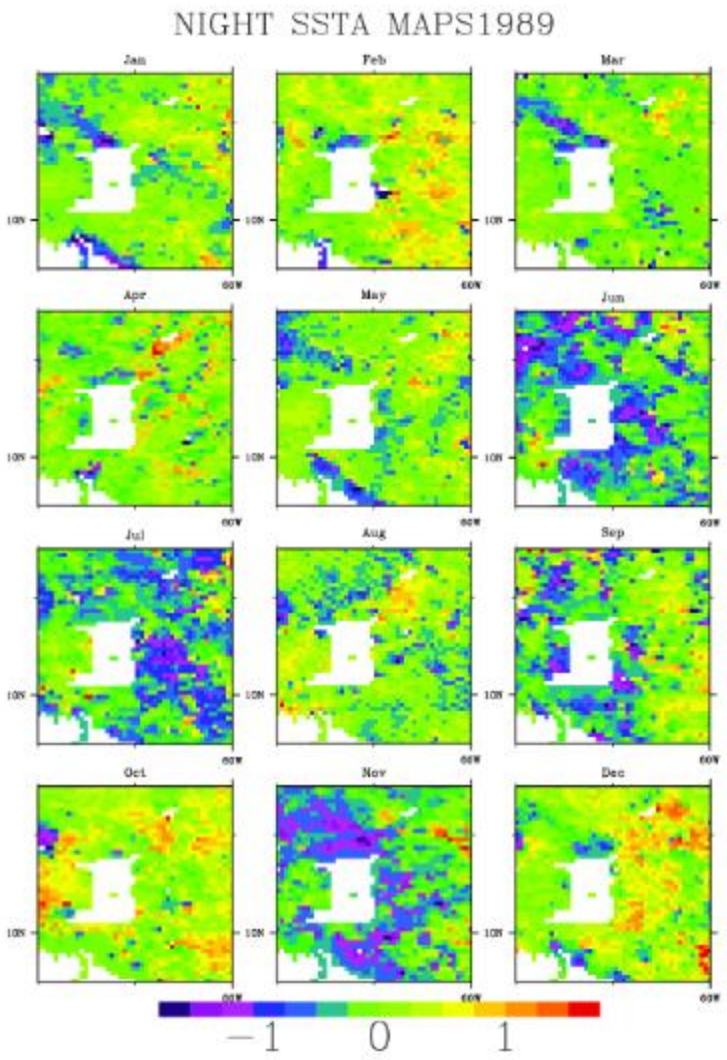
El Niño Year

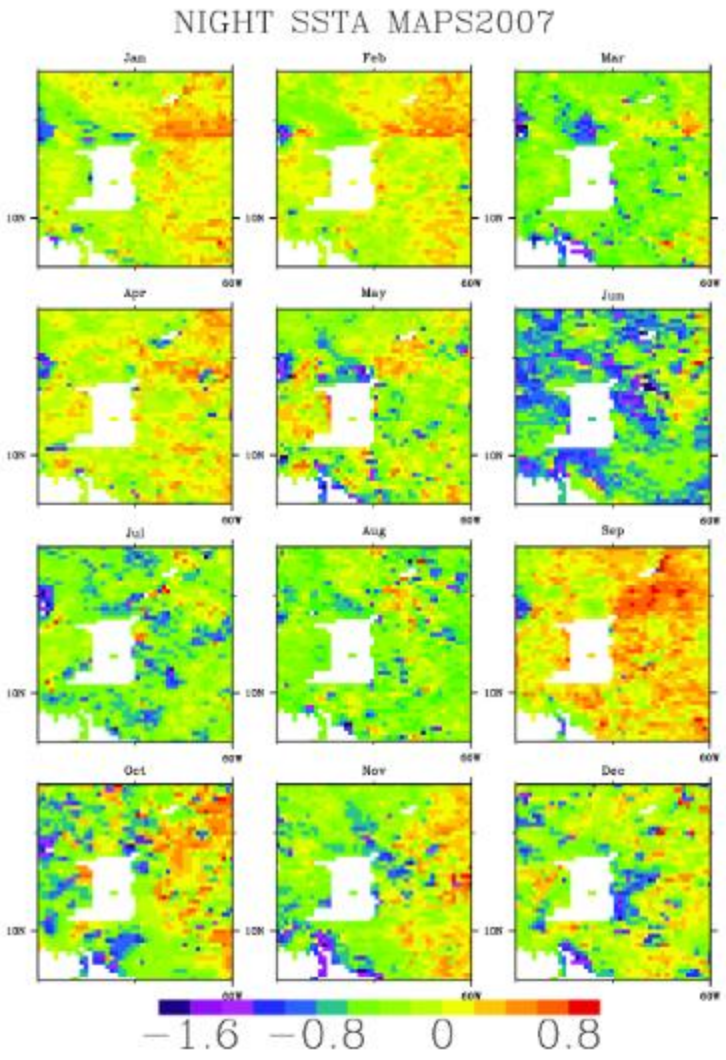


SSTA 25 Year Climatology Map

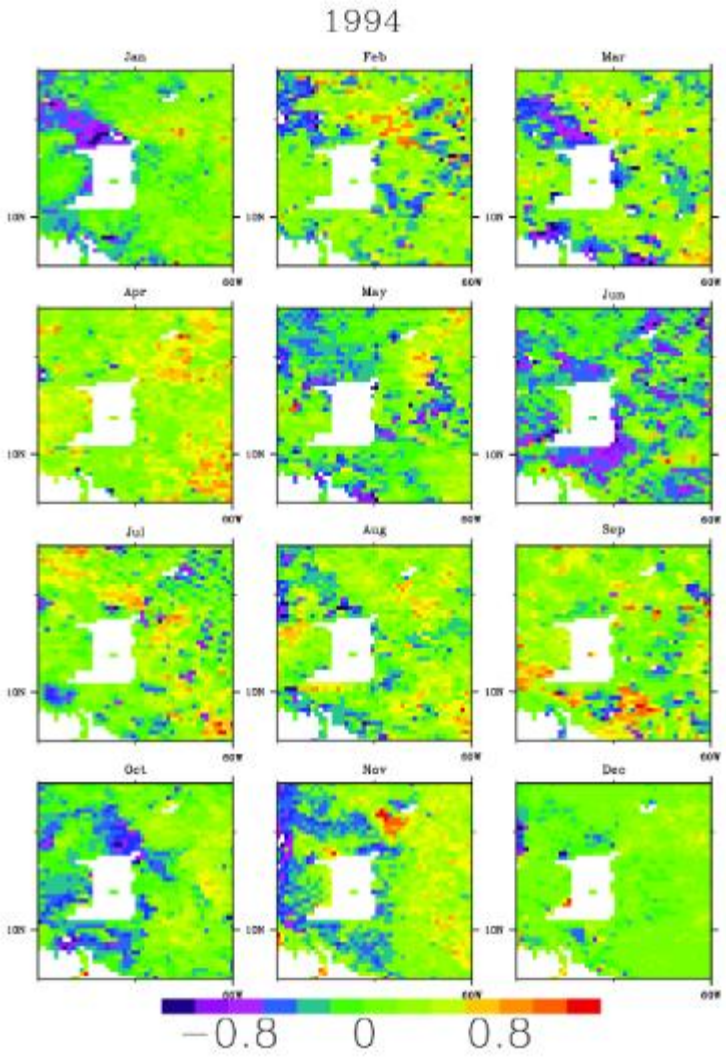


Night SSTA Maps

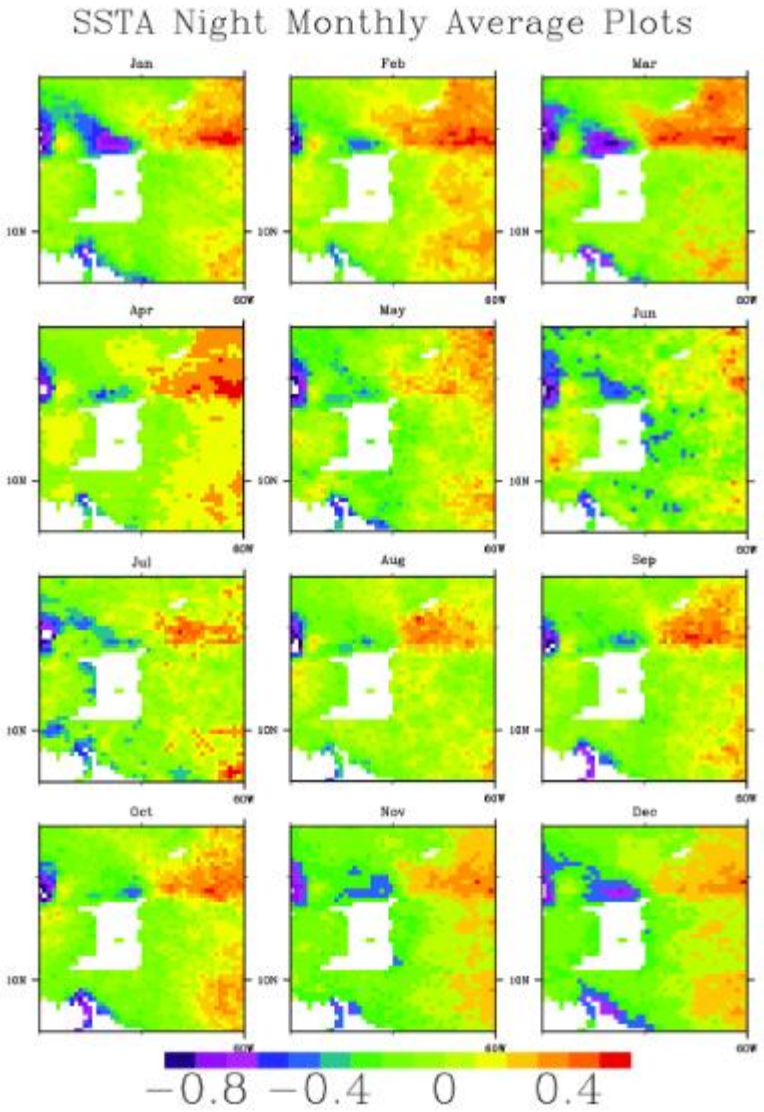




El Niño Year



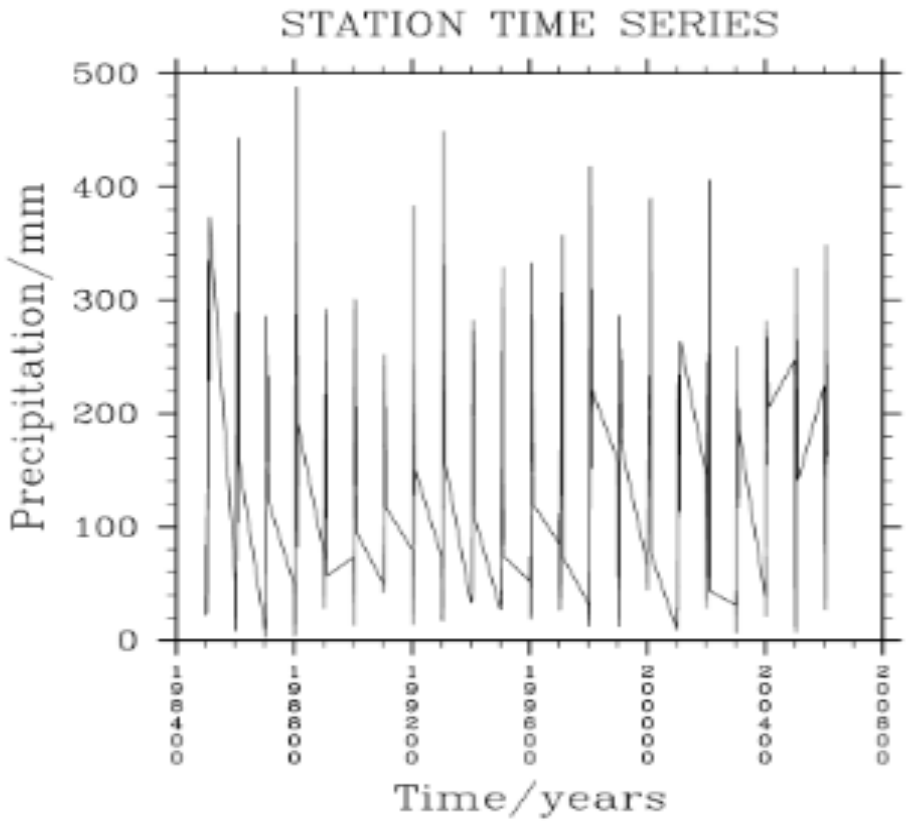
SSTA 25 Year Climatology Map



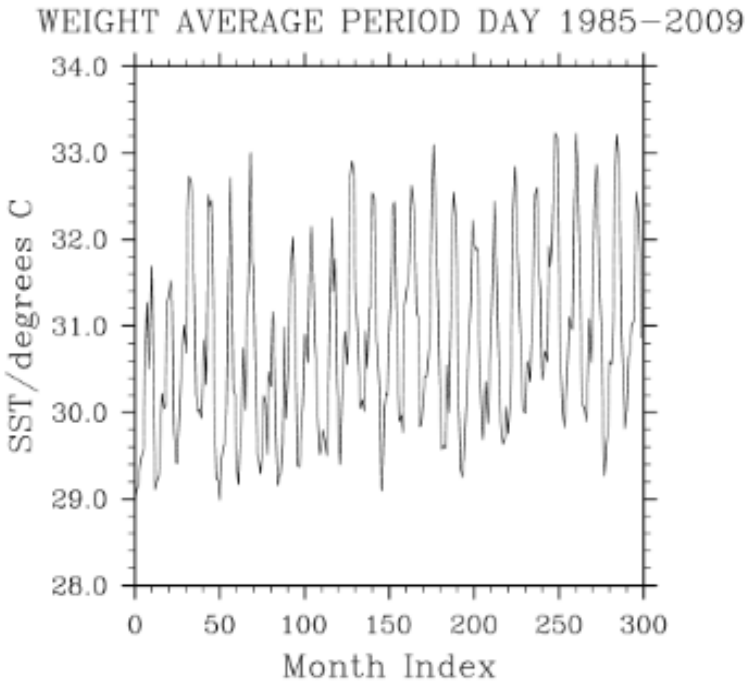
ANALYSIS OF PRELIMINARY RESULTS

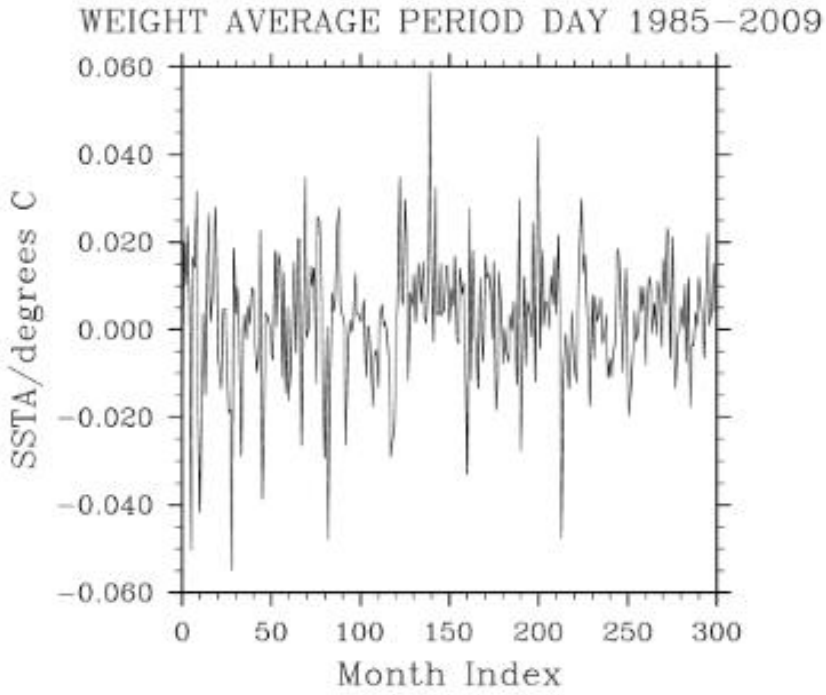
TIME SERIES MAPS: PRECIPITATION, SST, SSTA, SSTA INDEX & ONI

Precipitation Time Series For Piarco Station 1985-2006

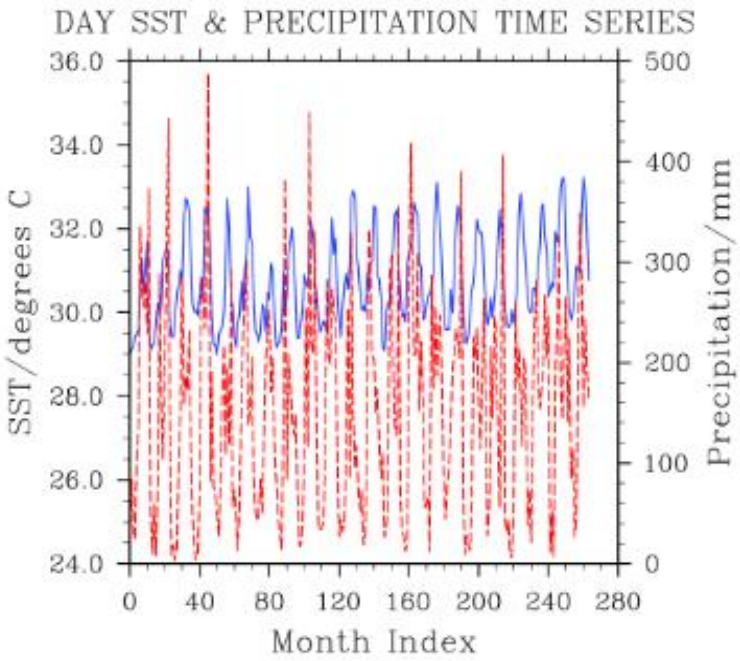


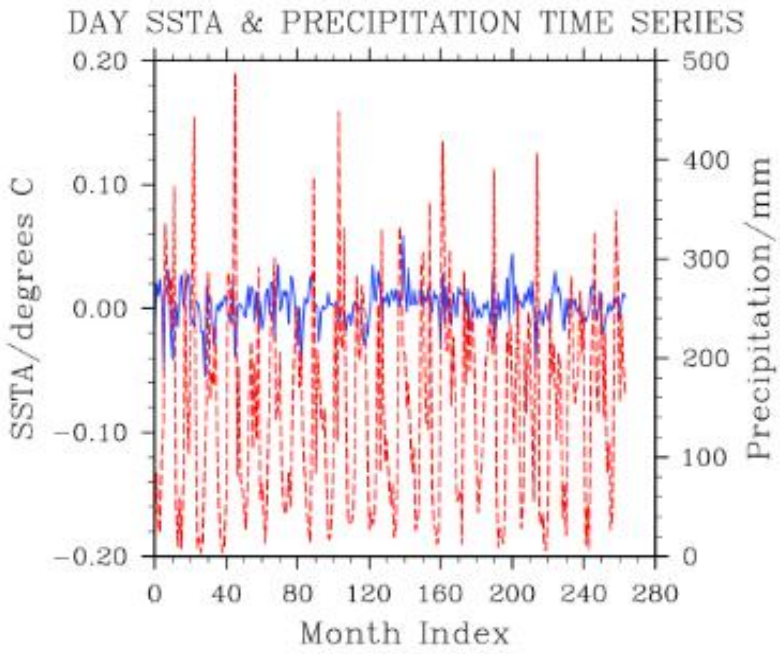
Day SST & SSTA Time Series





Day SST & SSTA vs Precipitation Time Series

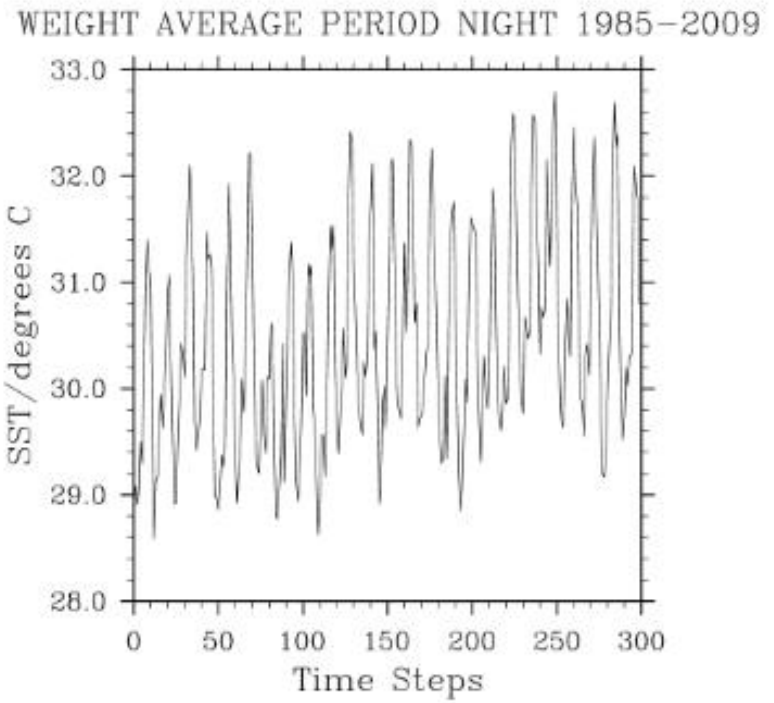


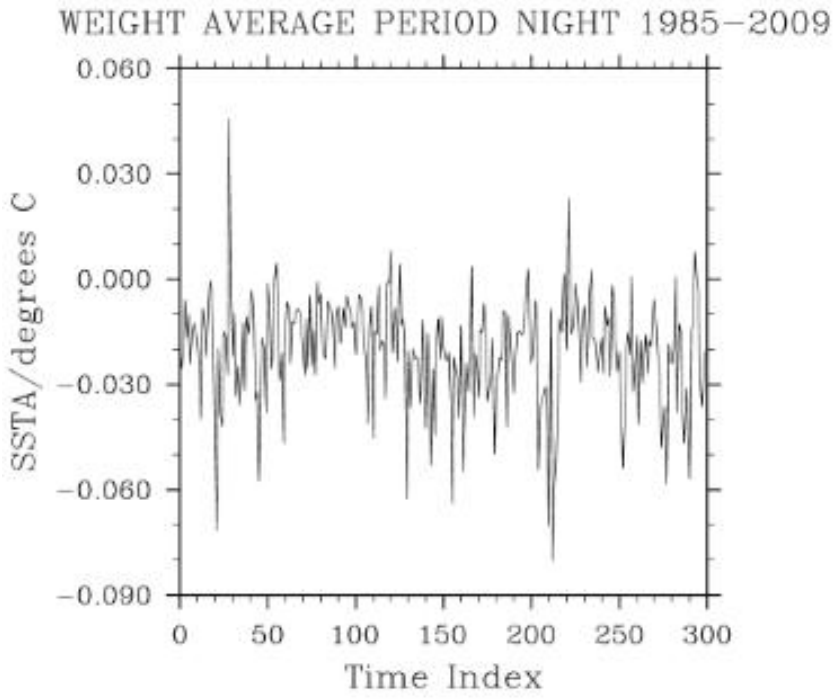


Red – precipitation

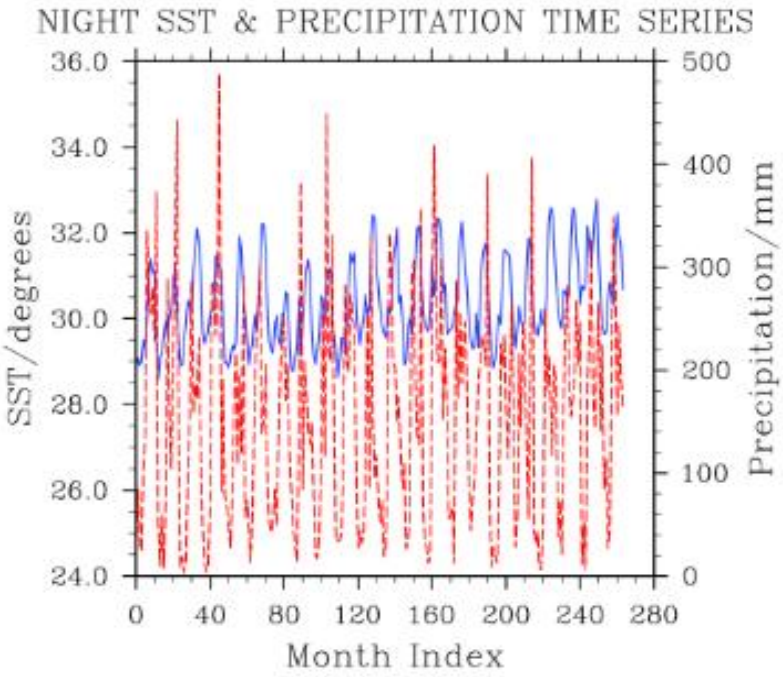
Blue – SST/SSTA

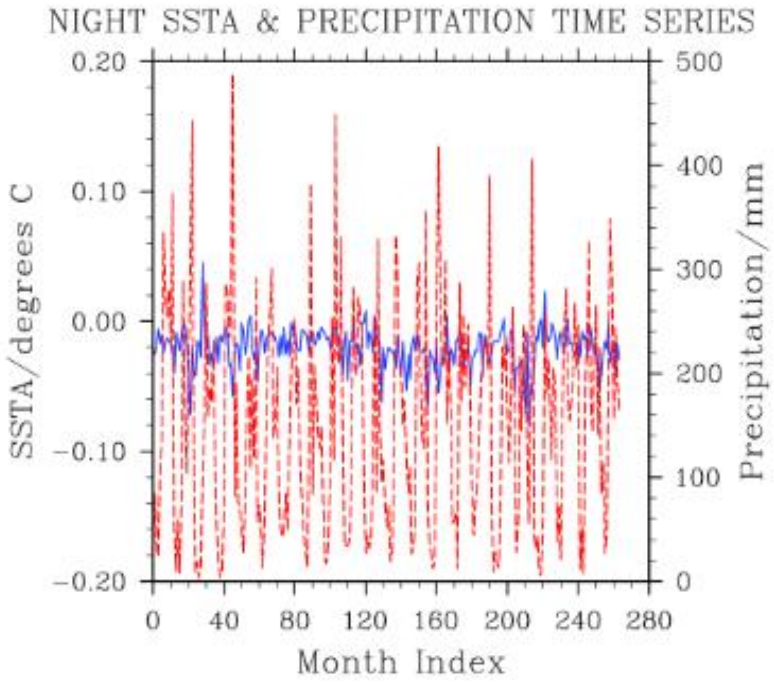
Night SST & SSTA Time Series





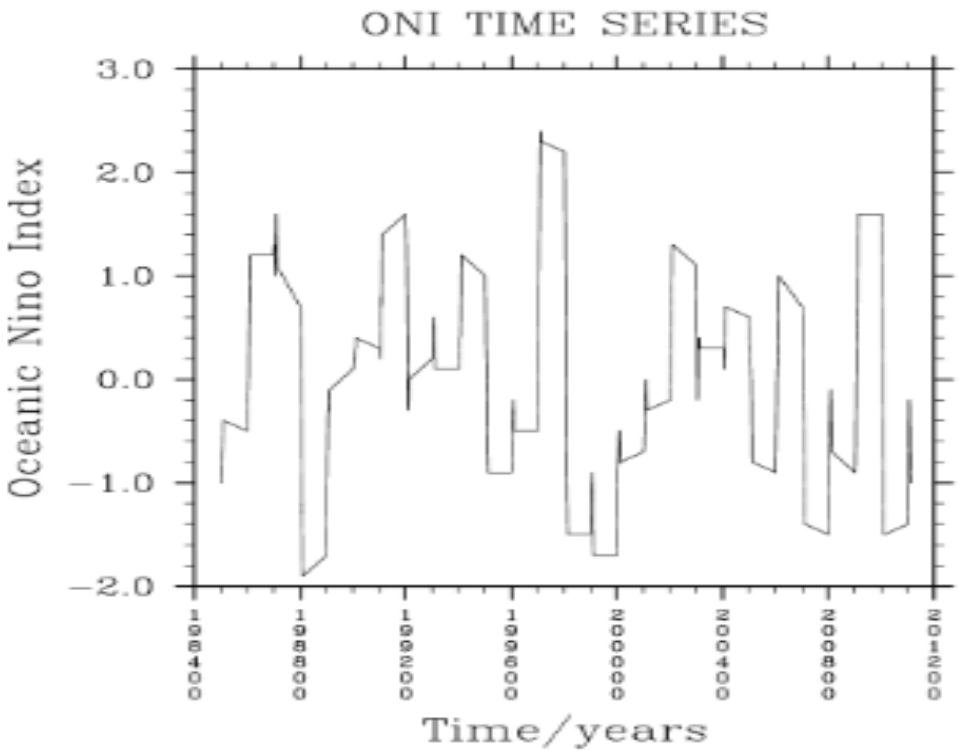
Night SST & SSTA vs Precipitation Time Series



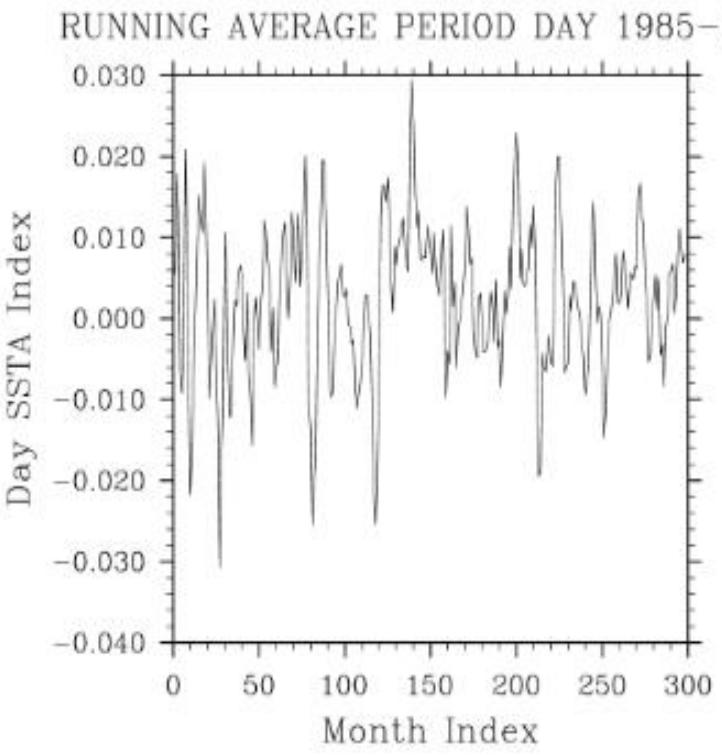


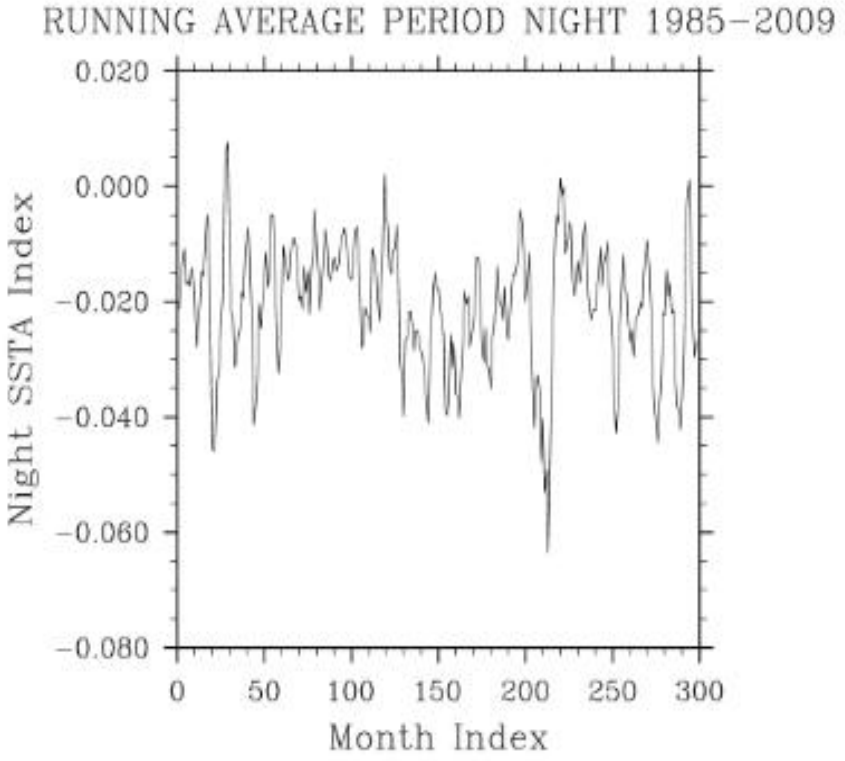
Red – precipitation Blue – SST/SSTA

Oceanic Niño Index Time Series

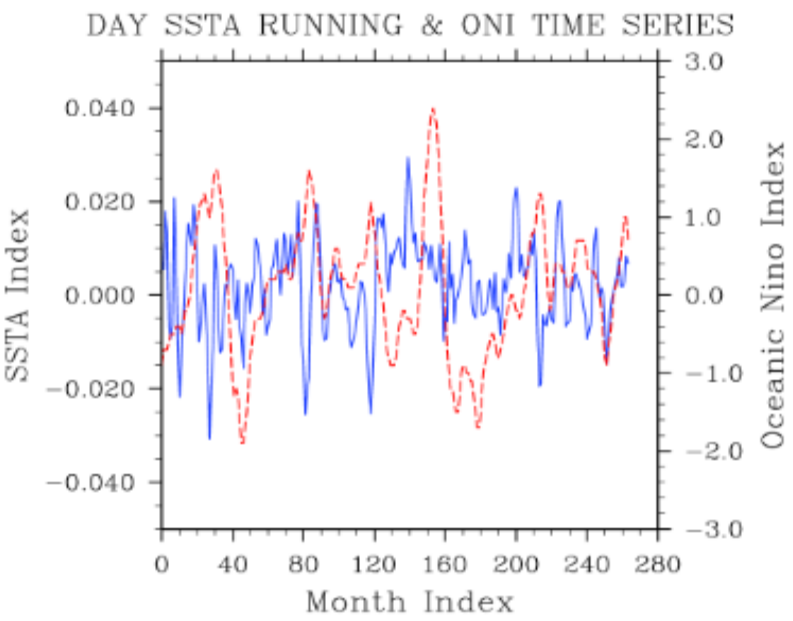


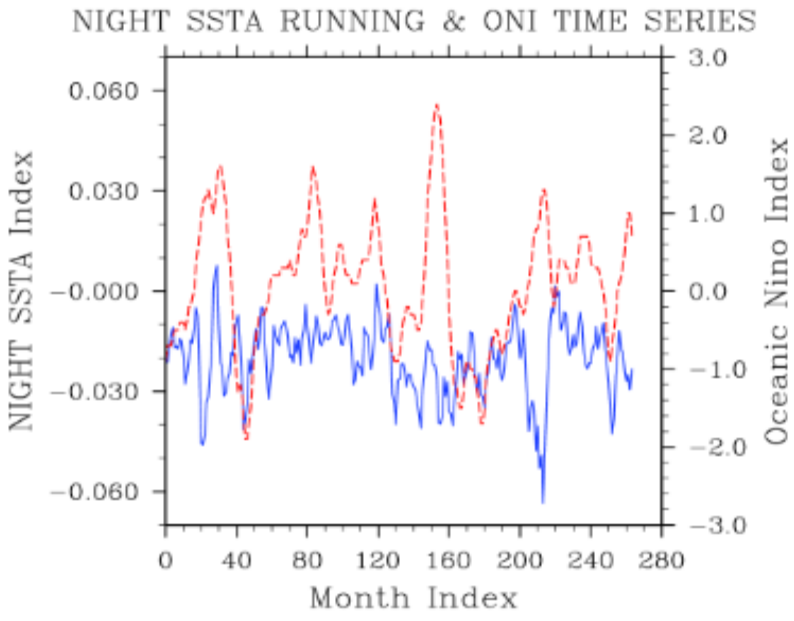
SSTA Index Time Series





SSTA vs ONI Time Series

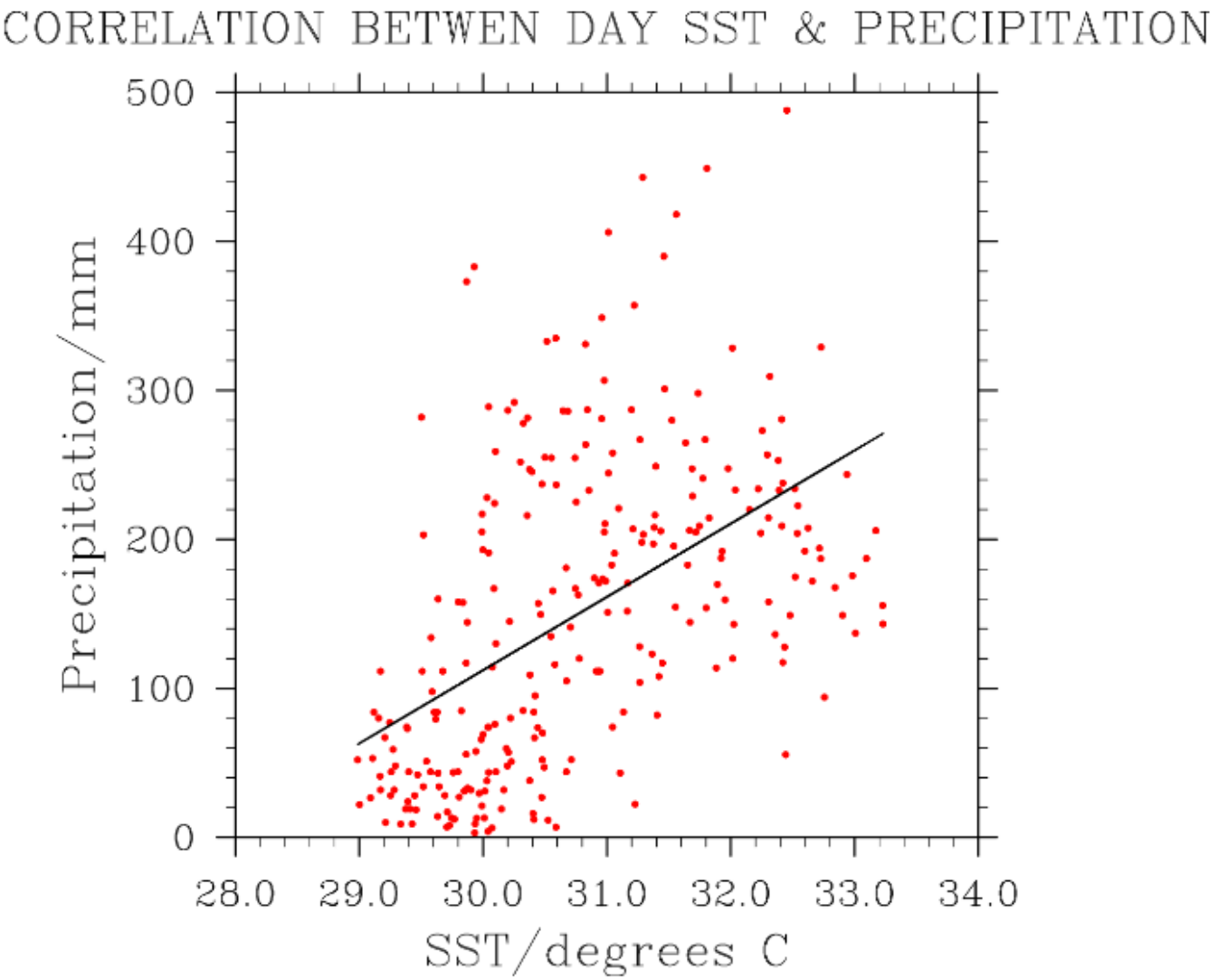




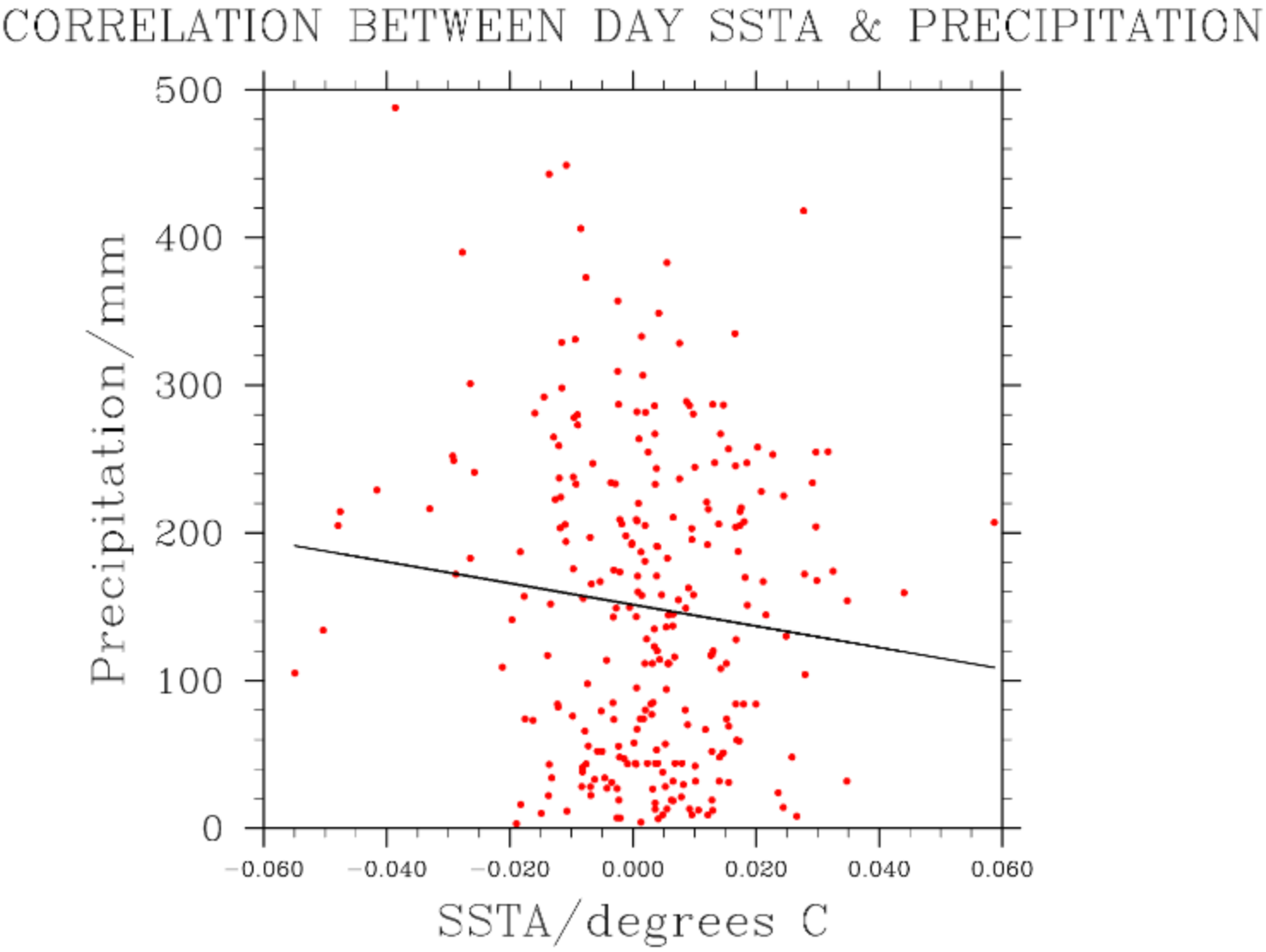
Red – ONI

Blue – SSTA Index for Day/Night

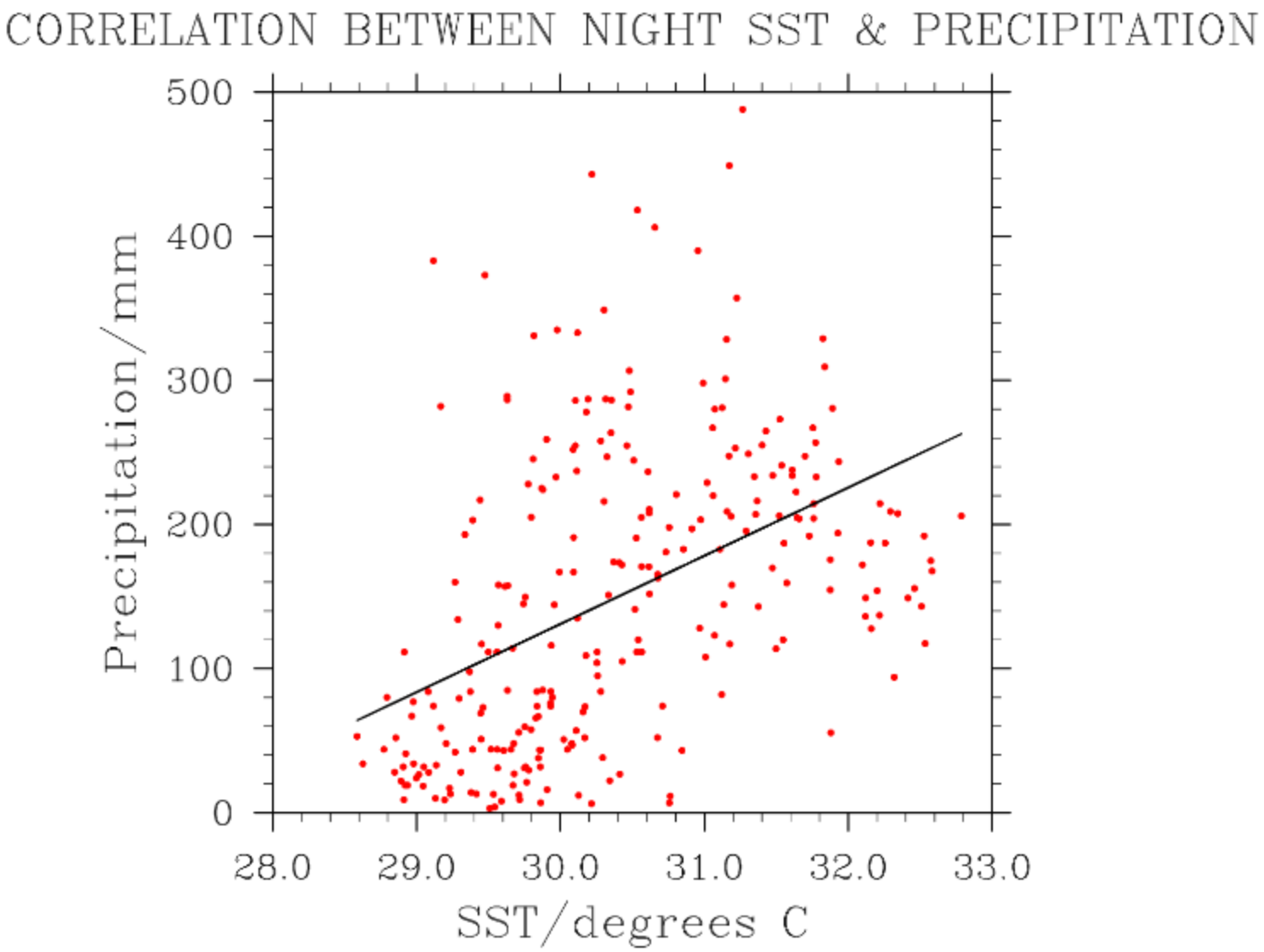
CORRELATION MAPS: PRECIPITATION, SST, SSTA, SSTA INDEX & ONI



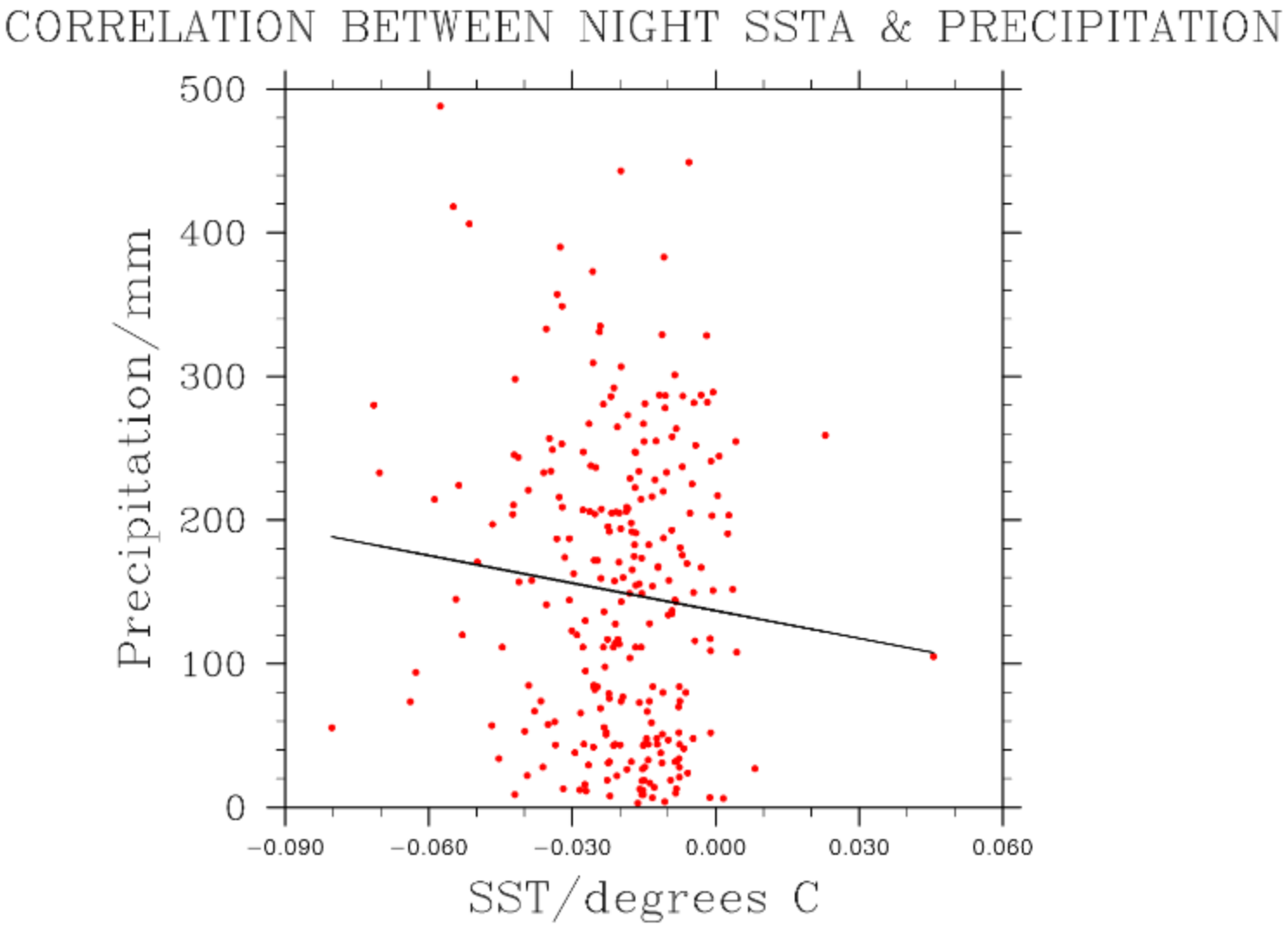
Correlation value: 0.506



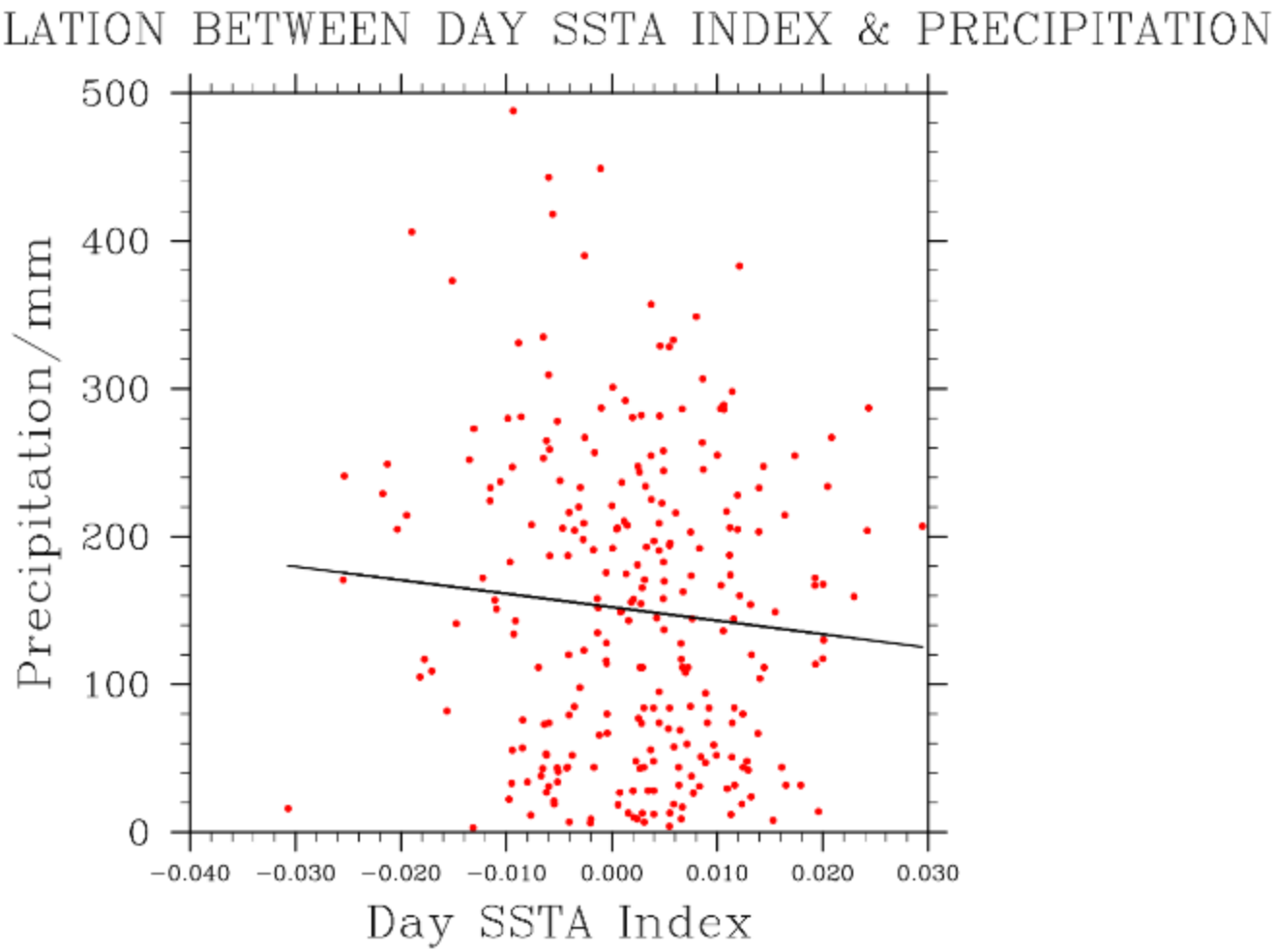
Correlation value: -0.1075



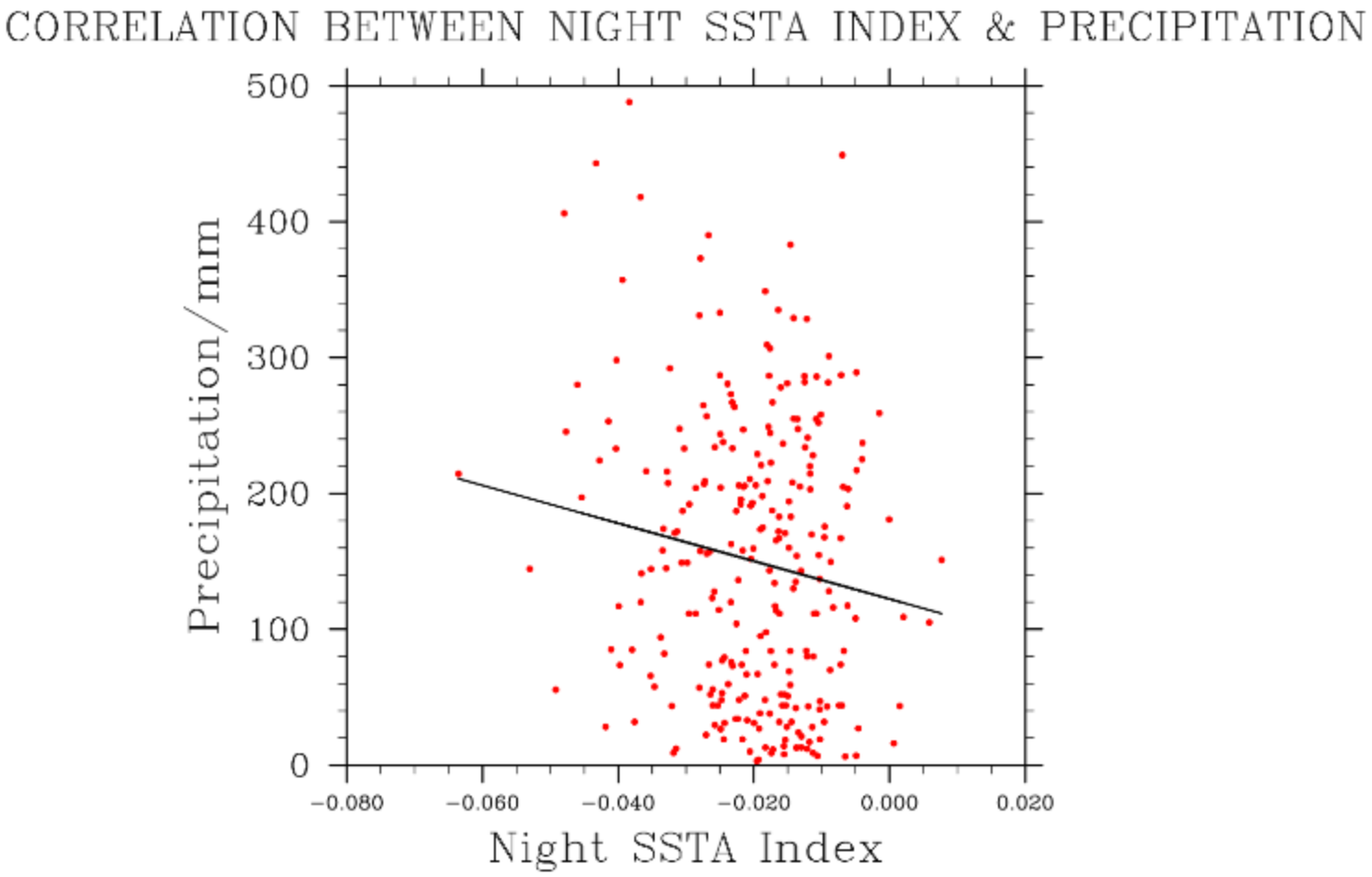
Correlation value: 0.4543



Correlation value: -0.0937



Correlation value: -0.0185



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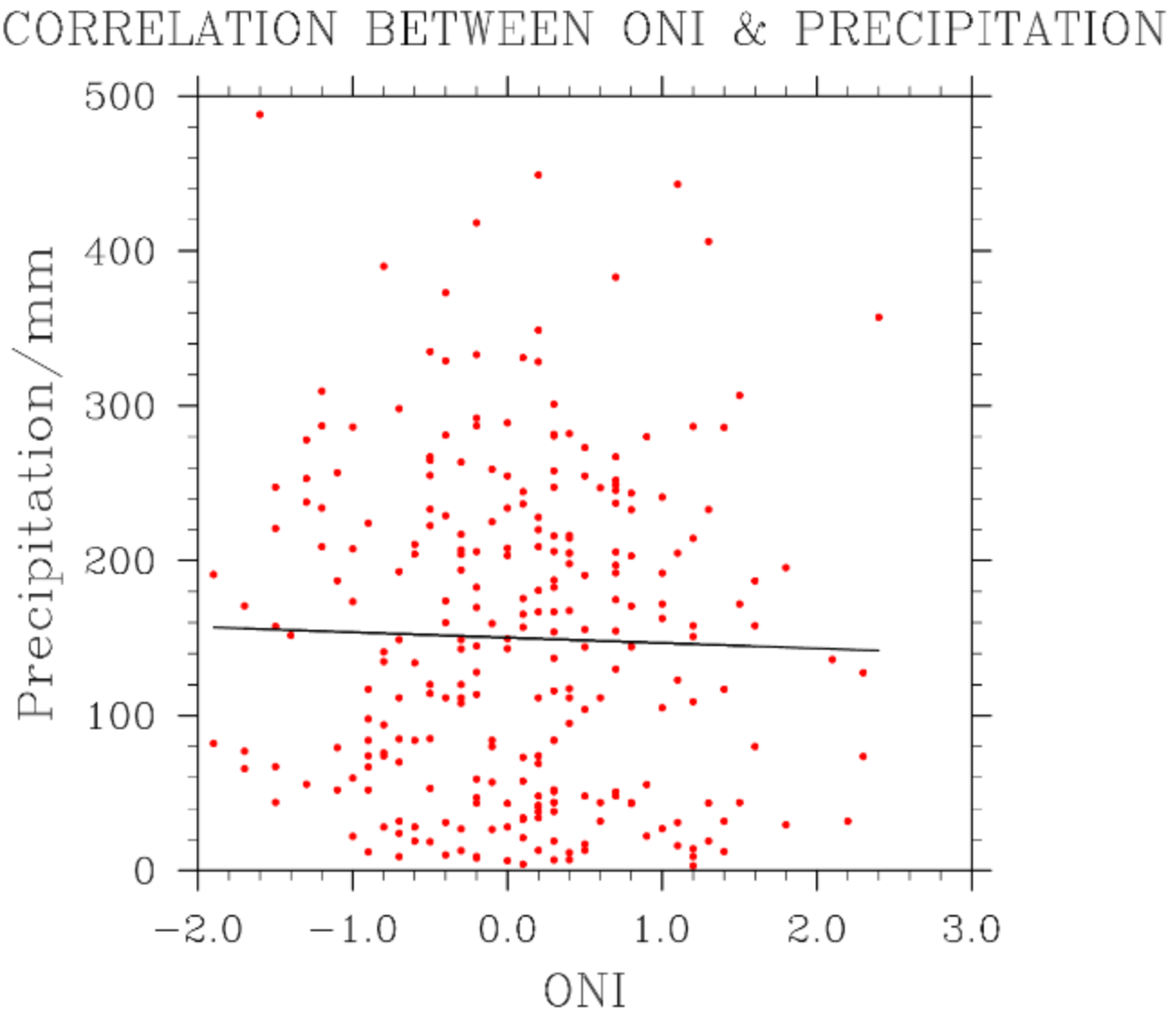

Correlation value: -0.0280

CONCLUSION

- The warmest sst month is experienced in September
- December is assumed to be a transition month
- SST show a stronger correlation to precipitation than SSTA
- The ONI appears to have no significant influence on Trinidad and Tobago's precipitation
- Future work:

  - performing EOF analysis

  - quantifying the effect of SST on Trinidad and Tobago's precipitation and the effect of El Niño

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- _____ 1925b. "Rainfall Correlations." Nature, 115: 802

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- Ms. Stasha Balkisson, (EPL,UWI)

- TWAS, ICTP
- Department of Physics, UWI
- EPL, UWI
- Family & Friends

Any Questions