El Niño Prediction Through the Analysis of Water Temperature at Different Depths

Sebastian Rosales, Dr. Sam Shen-Distinguished SDSU Professor, Dr. Ricardo Sakai-Howard Professor
San Diego State University, Howard University

Introduction

- El Niño is a natural occurring phenomenon related to a periodic increase in sea surface temperature along the pacific equator
- This periodic warming affects the rainfall patterns from Indonisia all the way to the west coast of South America
- This can have devastating effects for the people in those regions since it can cause droughts and contribute to the spread of disease
- My research focuses on finding ways of improving the prediction of El Niño, in hope that we can take prevention measures to lessen the effect of El Niño in the regions talked above

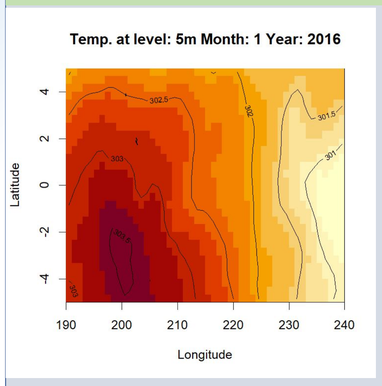
Methodology

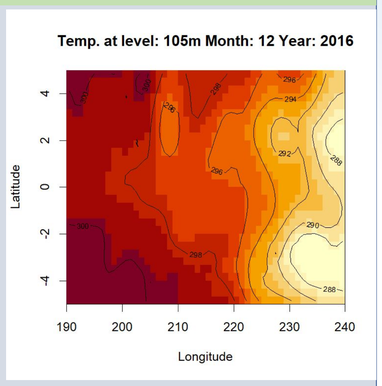
- Utilize NOAA NCEP Global Ocean Data Assimilation System (GODAS) data for sea temperature from 1982 to 2019
- Created a function in R that will extract the values that I need from the netcdf files, these being depth, the sea temperature at these depths, lastly obtain it from specific longitude and latitude values
- Create another function that will obtain the mean of the temperature for every month of every year from 1982 up to 2019

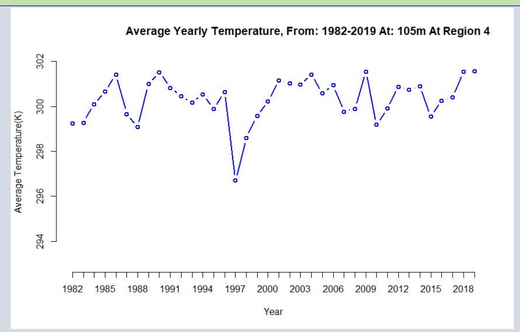
$$Monthly\ Mean[a] - \frac{\sum Monthly\ Means}{Total\ Months} = Anomaly\ Index$$

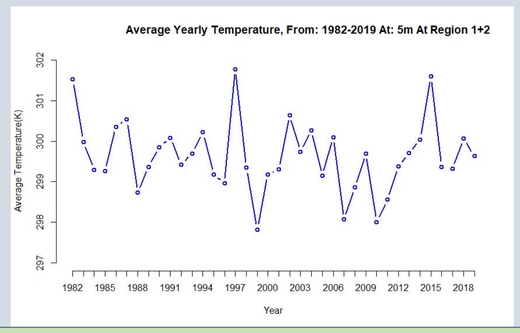
- Calculate correlation coefficient
-

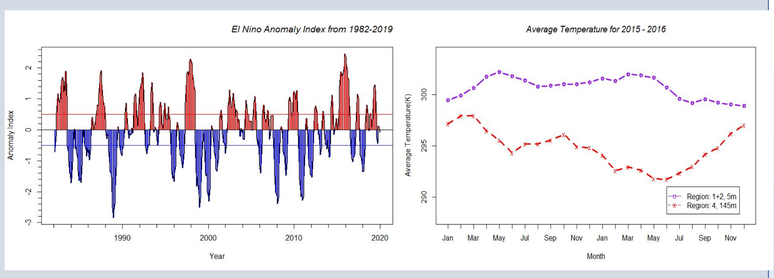
Results

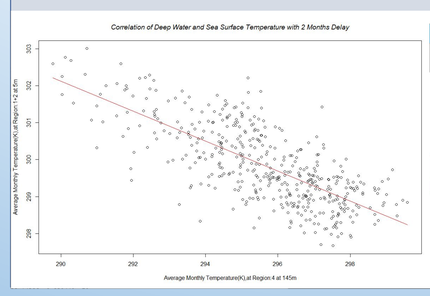




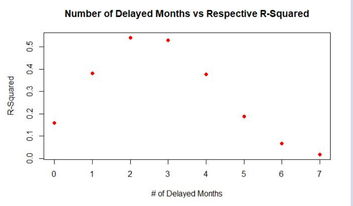








Slope	Std. Error	T-Value	P-Value	R-Squared
-0.4048674	0.01749427	-23.14286	9.84×10^{-79}	0.5423



Conclusion

- In conclusion, there is an inverse relationship between the deep water in Region 4 to the surface water at Region 1+2
- I have explored the relationship of the deep sea water temperature at Region 4 and surface water temperature at Region 1+2 and Region 3.4
- I learned how to work with netcdf files in R
- Lastly, I learned what it means to work on research with the NOAA mission in mind

References

Data:
https://psl.noaa.gov/cgi-bin/db_search/DBListFiles.pl?did=98&tid=84088&vid=1913

Information Reference:

Trenberth, Kevin & National Center for Atmospheric Research Staff (Eds). Last modified 21 Jan 2020. "The Climate Data Guide: Nino SST Indices (Nino 1+2, 3, 3.4, 4; ONI and TNI)." Retrieved from https://climatedataguide.ucar.edu/climate-data/nino-sst-indices-nino-12-3-34-4-oni-and-tni.

Acknowledgments

This research is supported by the National Oceanic and Atmospheric

Administration, Educational Partnership Program, U.S. Department of Commerce,

under Agreement No. NA11SEC4810003.

We thank our colleagues from The Science Research Development Center who

provided us with the Unnamed Aerial Vehicles that greatly assisted the research.

Also, I would like to thank NCAS-M ETSP, Howard University, and San Diego State

University. I would also like to thank my advisors and mentors, Dr. Samuel Shen and Dr. Ricardo Sakai.