

Quantitative Methods: Student Work

What was the focus of your project?

For my 3rd year dissertation I looked at the relationship between sea surface temperatures (SSTs) and the intensity of pre-monsoonal tropical cyclones occurring in the Arabian Sea basin. I also considered the influences of other large-scale environmental conditions on cyclonic intensity.



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Quantitative Methods

Secondary data

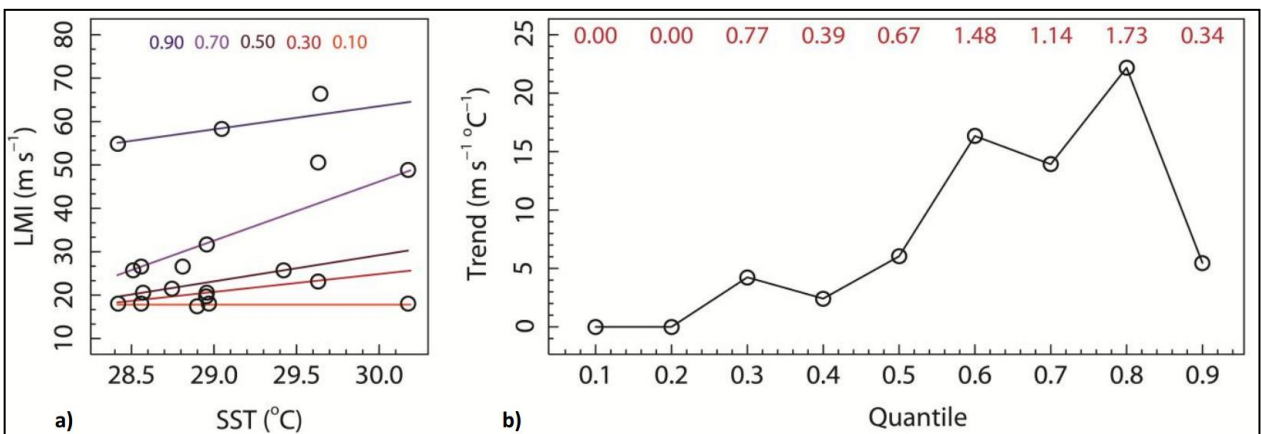
- Cyclonic intensity data for the period 1982-2010 from the International Best Track Archive for Climate Stewardship
- SST, storm-ambient vertical wind shear, sea level pressure and relative humidity data from the National Oceanic and Atmospheric Administration.

Processing the SST data

This required linear rescaling using pre-determined scale and offset values, averaging of the monthly data layers, and extraction and averaging of open ocean temperatures to produce a basin-averaged sea surface temperature estimate for each year in question.

Analysing the data

This relied on the use of **quantile regression** to model how different quantiles of the cyclonic intensity distribution changed as a function of the pre-monsoonal climate fields in question. I plotted rate parameters for changes in quantiles of the intensity distribution conditional on the predictor variables. I then calculated *t* values and confidence intervals for each estimate using a bootstrap approach.



a) Scatterplot of LMI against SST fit with linear quantile regressions for various quantiles, and **b)** Trends in best-track estimates of pre-monsoonal Arabian Sea tropical cyclone maximum wind speeds by quantile for the period 1982-2010. Trends are estimated coefficients from quantile regression and *t* values for each estimate are labelled (red).

What did you find?

The influence of sea surface temperatures on pre-monsoonal cyclonic intensity was found to be most pronounced for the strongest cyclones, with other large-scale climate fields also found to be important. The findings are interpreted as preliminary evidence of the development over recent years of a more favourable thermodynamic environment over the Arabian Sea for the intensification of the strongest pre-monsoonal cyclonic storms.