Effect of the Gulf of Mexico on Precipitation Over the United States

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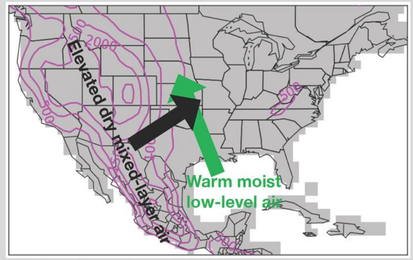
INTRODUCTION

The Gulf of Mexico serves as a warm-moist basin providing moisture and warm air into the inland region, necessary for generating precipitation in the US.

However, this role of the Gulf of Mexico has yet to be examined explicitly, and hence we are uncertain about the quantitative influence of the Gulf of Mexico on rainfall over the United States.



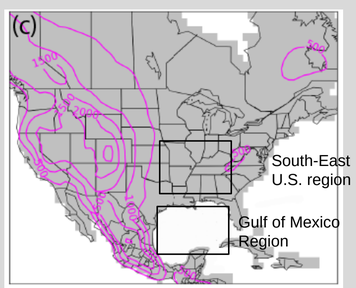
Adapted from Li et al. 2021

QUESTION

To what extent does the Gulf of Mexico affect precipitation over the United States

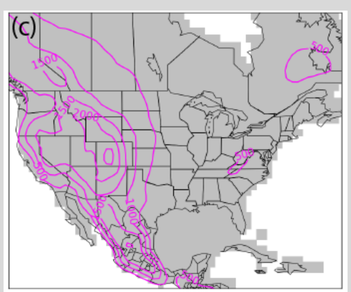
METHOD

We run the CAM6 model on the two set-ups described below, simulating the global climate from year 1980 - 2014



Adapted from Li et al. 2021

Control setup – Earth-like climate state. The two regions of interest – the Gulf of Mexico region, and the south-east region are marked



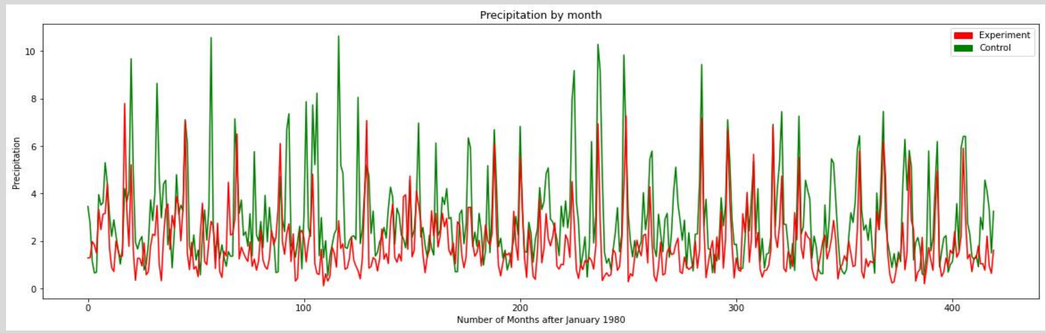
Adapted from Li et al. 2021

Experiment setup – the Gulf of Mexico is filled with grasslands

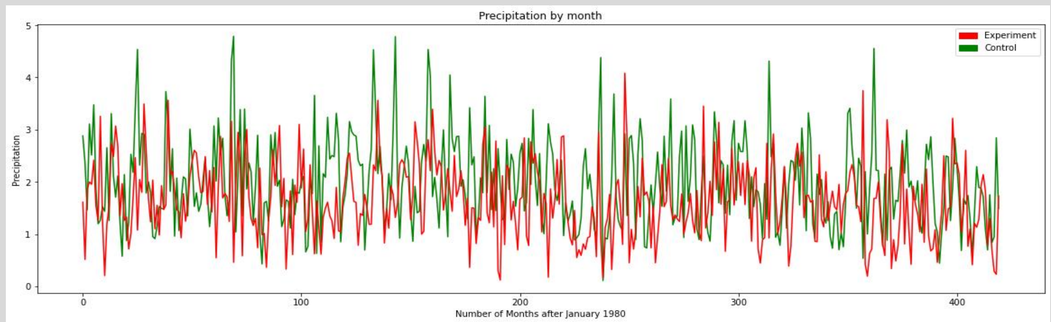
RESULTS

Overall, we notice a significant decrease in precipitation in the experimental run in every region

Precipitation time series in the Gulf of Mexico region

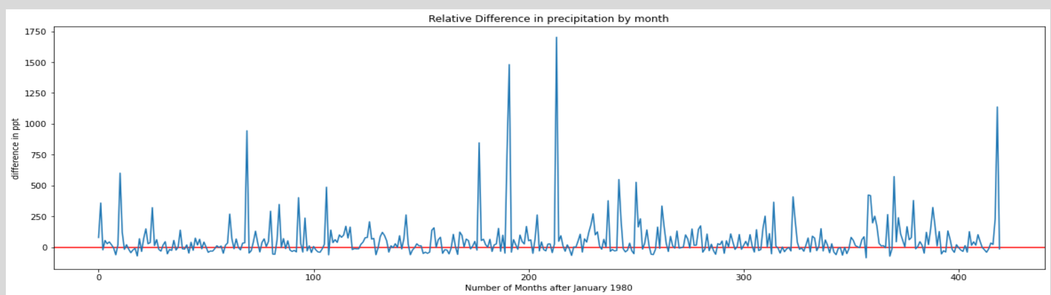


Precipitation time series in the South-East region



Relative precipitation in the south-east region calculated as follows:

$$\frac{control - experiment}{experiment} * 100\%$$



FUTURE DIRECTION

- More inland subdomains
- Seasonal Analysis
- Analysis of moisture transport to determine the cause of variation in precipitation

ACKNOWLEDGEMENTS

Purdue ITAP supercomputing resources

REFERENCE

Li, Funing, et al. "The role of elevated terrain and the Gulf of Mexico in the production of severe local storm environments over North America." *Journal of Climate* 34.19 (2021): 7799-7819.