Wavelet Analysis (Current results)

- Separate ENSO record into changes in period over time.
- Increase in power in late 21st century agrees with previous results.
- In CESM1, increase in ENSO intensity is mainly strengthening of longer-period cycle.
- In CESM2, longer-period ENSO weakens after 2025.

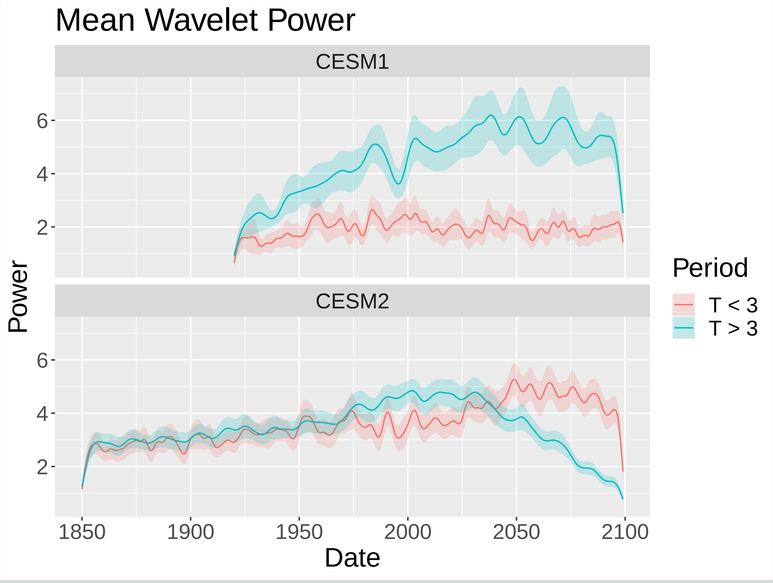

Figure 1: Wavelet power spectrum for the Niño 3.4 index in the fully-forced CESM1 and CESM2 ensembles

Discussion

- Rising greenhouse gas levels increase Pacific Ocean stratification, strengthening ENSO cycle.
- Aerosol influence is nonlinear because aerosol levels are not purely increasing.
- Stronger ENSO may lead to greater temperature variability and extreme weather.
- CESM1 and CESM2 conflict in their prediction of the changes to ENSO's frequency.

Limitations and Applications

Limitations:

- Niño 3.4 index shown to be inaccurate for some models (Cai et al., 2018).
- CESM may contain biases.

Application: to improve our ability to predict ENSO and help people prepare for increased likelihood of extreme weather.

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- Software used: R, ncdf4, zoo, dplyr, ggplot2, WaveletComp, reshape2, nco.

Role of Mentor and Student

Student:

- Analyze raw data on computer
- Produce graphics for analysis and publication
- Write documentation
- Identify key features of results

Mentor:

- Review student writing
- Interpret results in the context of climatology
- Conduct parallel analysis
- Provide raw data from facility

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