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Presentation Notes

1 General:

- Remember to say meaning of axes and colors
- Talk slower
- Less detail in results, more in intro?

2 Title

3 Introduction

Climate Change and Variability

- Climate change: long term trends in temp, etc (fig: red line)
- Climate variability: short (a few years) change in climate (fig: blue line)
  - May be cyclical or random

Climate Forcing

- External factors that affect climate change and/or variability
- List factors, ghg, aer, bmb, lulc
- Sources:

  - ghg: industry, livestock
  - aer: industry, volcanoes (smoke, dust, sulphites?)
  - bmb: wildfires
  - lulc: deforestation, agriculture, desertification
- Greenhouse effect
  - gasses and particulates affect atmospheric chemistry and sunlight reflection/absorption
  - ghg absorbs "blanket" trapping heat (fig: orange arrows)
  - aer reflects in upper atmosphere blocking heat out. (fig: yellow arrows)
  - bmb, lulc affect reflection, absorption on surface (fig: yellow arrows)

El Niño (ENSO)

- Temperature of the pacific ocean
- Cold -> La Niña
- Hot -> El Niño
- Entire cycle: ENSO (El Niño/Southern Oscillation)
- Affects humans: hot year, dry year, cold year, wet year
- Figure: temperature differences between strong La Niña year and strong El Niño year
  - Blue=colder, red=warmer
  - Point out California hot for El Niño (wildfires)

Method: Climate Simulation

- Main way of making predictions
- Predictions of forcing levels are fed to computers
- Computers simulate climate on a grid of data containing temperature and much more
- Predictions are usually run many times

- My contain biases but are quite well tested

Review of Literature

- Slide is notes

Gap

- Slide is notes

Questions

- What, why, how
- Slide is notes

4 Data, Methods, and Results

Methods Overview

- Slide is notes

Role of Mentor and Student

- Slide is notes

Model Setup

- Slide is notes

Measuring ENSO Intensity

- Make sure you talk about what Niño 3.4 index is: number that represents how strong El Niño is at each time
- Windowed variance calculates amount of variability of the Niño 3.4 index ie how intense the ENSO cycle is

ENSO is Becoming Stronger

- Graph axes and colors CESM1 and CESM2
- Both have increase in ENSO intensity
- Slowdown/decrease after 2050
  - Aerosol emissions

Influence of Aerosols and Greenhouse Gasses

- Data source: single forcing ensembles
- Explain figure axes, subplots
- Biggest, constant increase in GHG
- Significant changes in AER, but not one direction
- Insignificant changes for others
- Takeaway

Correlation With Ocean Temperature

- Calculated correlation coefficient with ocean temp. and ENSO amplitude
- CESM1 only so far
- Plot:

  - Cross section of pacific along equator, x:lon, y:depth, color:correlation
  - Positive coefficient in surface layer, negative coefficient in subsurface layer
  - Stratification
  - More work necessary

Wavelet Analysis

- WA = mathematical process that takes a signal and derives changes to each frequency over time
- Plot:
  - axes, color, subplots
  - Confirm results from previous steps

I conducted a wavelet analysis to identify changes to specific frequency bands of ENSO. One way of thinking about wavelet analysis is using a radio to listen to a variety of frequencies, all at once, except with data rather than radio waves. So figure 7 shows, the power, similar to loudness, of the ENSO signal where the period is greater than three years and less than three years, for both the CESM1 and CESM2. Looking at CESM1, much of the increase in power over the 20th century is in the longer-period band, meaning that much of the increase in ENSO intensity is happening in the lower frequencies. Looking at CESM2, one interesting feature is that the decreasing strength we saw earlier is mostly happening in the longer frequency. These results suggest that longer frequency ENSO is more succeptible to climate change than ENSO with a faster cycle.

5 Conclusion

Conclusions and Discussion

- Slide is notes

Application, Limitation, and Next Steps

- Slide is notes

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References