

Notes for *Increased variability of eastern Pacific El Niño under greenhouse warming*

Introduction

- EP (Eastern Pacific) ENSO is the most damaging, so predicting the impact of climate change on it is very important
- Global warming is modifying the structure/dynamics of the Pacific ocean, leading to increased rainfall variability, but impact on ENSO is not clear
- Models are having trouble agreeing on the impact of climate change on EP ENSO variability because the major method of measuring EP ENSO (Nino3 index) is not applicable to all models in the same way
- This study shows that EP ENSO variability is predicted to increase, and that Nino3 index is ineffective for measuring EP variability

Distinguishing SST Anomaly Centers

- Ran EOF analysis on observed SST records, used the first 2 principal components to represent CP and EP ENSO index
- Quadratic relationship between representations of EP and CP ENSO
- Generated indices representing strength of EP and CP ENSO
- EP is skewed toward El Niño, CP is skewed toward La Niña.

Nonlinear Dynamics Generate Skewness

- Skewness of C-index represents CP ENSO favoring La Nina
- Opposite with E-index
- Calculated spacial pattern of C-index and E-index
- Examined changes to ocean dynamics using pattern

Skewness Determines the Anomaly Center

- Applied previous process to CMIP5 models
- EP anomaly center varies greatly between models.
- Anomaly center is region of greatest skewness
- most models are able to simulate skewness, but not totally accurately
- Selected only models which are able to simulate nonlinear relationship between pc1 and pc2

Variability Increases at the EP-ENSO Center

- compared SD of E-index in models between past and future
- Increased E-index variability in the future
- Use of pc-indexes versus sst mean to capture ENSO greatly improves inter-model consensus on increase.

Stratification Change Boosts Dynamic Coupling

- increased warming in the equatorial pacific leads to stronger atmospheric convection
- Higher stratification leads to increased instability, allowing ENSO events to be triggered more easily
- Partial agreement on increase in CP ENSO

Conclusion

- Contrasts to previous studies which found that models disagree on changes to ENSO under global warming
- Use of EOF analysis is more flexible and can account for intermodel differences in region of greatest anomaly.
- Predicts increased enso-associated extreme weacher.