Quantification and simulation of extreme events in BREE IAM

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Introduction

• Joined the BREE team on August 2019

• IAM postdoc

• 1st Year Focus
  Extreme events ➔ Lake blooms
  • Changes in Skewness
  • Persistence of Extremes
What is Skewness and Why is Important

• Skewness is a measure of the asymmetry of the probability distribution about its mean

• Changes in skewness affect the shape of the distribution.
Hypothetical Results

- Dry GCM
- Wet GCM
Motivation

• Extreme Events & Climate Change
• Effects on Fresh Water Systems
• Coupled Natural & Social Systems

Motivation

• Most studies focuses on mean and variance and neglect skewness.

• How changes in higher-order moments of projected temperature and precipitation could affect the development of blooms?

Figure source: Gavin Schmidt, http://www.realclimate.org/index.php/archives/2017/07/joy-plots-for-climate-change/
Study Area
Approach

Skewness

Peaks over Threshold

L-moments & Gen. Pareto Distribution

Development of Scenarios

BREE Integrated Assessment Model
Peaks over Threshold

- Exceedances: Peaks over threshold

Subjectivity is introduced Unfeasible for the amount of data involved
Preliminary Results
• Sample L-moments of GCM-based Exceedances

Dry GCM (IPSL-CM5AMR)
Wet GCM (NorESM1-M)
**Preliminary Results**

- GCM-based Modeled Exceedances

![Graphs showing GCM-based modeled exceedances for RCP 4.5 and RCP 8.5 for dry and wet GCMs.](image-url)
Development of Scenarios

- Total precipitation constant
- Extremes increase

Feedback?

- Total precipitation increase
- Extremes increase

- Total precipitation constant
- Extremes decrease
Moving forward

• Automated techniques for Extreme Value Analysis

• Design scenarios for changes in skewness in precipitation and temperature

• Perturb downscaled ERA5 (Reanalysis Dataset) for precipitation and temperature

• Sensitivity Analysis
THANK YOU!

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