Chengfei He

Department of geography, The Ohio State University

EDUCATION

2017 – Present **The Ohio State University**
PhD candidate, Climate Modeling and dynamics
- Research Topic: Climate change from LGM to present day

2015 – 2017 **University of Wisconsin-Madison**
PhD candidate, Climate Modeling and dynamics
- Research Topic: Mechanism of compensation between atmosphere and ocean heat transport, 2017-Present; Radio-carbon cycle development in CESM, 2016;
- PhD qualifying exam: High Pass (2.25/3.0)
- GPA: 3.93/4.0

2013 – 2015 **Nanjing University of Information Science and Technology**
Master Degree, Numerical weather prediction
- Research Topic: Using multi-model forecasts to better quantify uncertainties in prediction and to reduce errors in model post-process (i.e. improve Tropical cyclone prediction)
- Master thesis: Comparison of Multi-model Ensemble Forecasts at surface and 500hPa based on the Kalman filter method
- Major Courses: Advanced Atmospheric Numerical Simulation, Advanced Atmospheric Circulation
- GPA: 3.75/4.0

2009 – 2013 **Nanjing University of Information Science and Technology**
Bachelor of Science, Atmospheric science
- Bachelor thesis: The linear relationship between SST in Indian ocean and Asian High
- Major Courses: Principle of Synoptic Meteorology, Dynamic Meteorology, Atmospheric Physics, Numerical Weather Forecasting, Applied Meteorology etc.
- GPA: 3.72/4.0

PROJECT EXPERIENCE

XCESM, March 2017 – Present

XCESM is a spare-time project aiming to provide an easy-to-use package in Python ecosystem to diagnose CESM output. XCESM is under developing and currently it has features:

- diagnose AMOC, PRECP, d18O (only support for iCESM), Heat transport etc.
- regrid POP2 output to linear grids
- compute global average on any variable
- quick plot on global map
- and more.

More information can be found at Github: https://github.com/Yefee/xcesm

GCMAverager, January 2017 – February 2017

GCMAverger is a lightweight post process package designed for large amount general circulation model(GCM) outputs using parallel computing. It is originally designed to post process a long run from the community earth system model (CESM), who generated hundreds of TBs data. GCMAverager is a xarray-based project, therefore python 2.7, 3.4, 3.5, and 3.6 are supported. Right now, GCMAverager primarily can

- extract variables from time slice history files into time series files
- compute annual (decadal) and seasonal mean for model outputs from time slice or time series files.

More information can be found at Github: https://github.com/Yefee/gcmaverager

Radio-Carbon cycle in CESM, October 2016 – December 2016

Building a radio-carbon cycle into CESM to better track ocean currents and sea-air interaction etc. A brand new radio-carbon module is developed into CAM (atmosphere model in CESM), and two additional radio-carbon isotopes are added into POP2 (ocean model in CESM). The separated two parts are coupled via coupler. More information can be found at Github: https://github.com/Yefee/Coupled-RadioCarbon & https://github.com/Yefee/RadioCarbon_Cycle

Hosing Module for CESM, November 2016

A hosing module is developed in CESM for a transient simulation to simulate the climate change from Last Glacial Maximum (LGM) to present.

RESEARCH EXPERIENCE

Understanding Mechanism of compensation between atmosphere and ocean heat transport, January 2017 – Present

Bjerknes (1964) hypothesized that the Atmosphere heat transport (AHT) and ocean heat transport (OHT) variability should compensate each other, or the so called Bjerkness compensation (BJC). Based on Coupled GCMs, BJC response has been found valid in climate

models. However, there are also many studies where the BJC response has been found invalid, with the AHT and OHT changes in the same direction (Anti-BJC response, AJC). In a coupled ocean-atmosphere energy balance model, we show that a BJC response is forced by a perturbation of the surface heat flux, while the AJC response is forced by a perturbation on the net heat flux into the coupled ocean-atmosphere system. More essential questions are answered in our paper, which is going to be submitted to Science in the near future.

Transient simulation of Last Deglaciation in isotope enabled CESM, November 2016 – Present
ITRACE is a transient simulation to simulate the climate change from LGM to present. It is fairly similar to TRACE-21ka, but in a more sophiscated earth system model with isotope enabled (iCESM 1.3), which has higher resolution, more comprehensive parameterization and fully coupled earth systems. The simulation speed is slow (roughly 20yr/d), so we only have a small set of the output right now, and some information can be found here: https://github.com/Yefee/LGM-check. Quite a lot of tools (like XCESM, GCMaverager) I developed is going to handle the large amounts of outputs.

Multi-model Prediction of tropical cyclones, September 2014 – June 2015
Using multi-model forecasts, I build a statistical tool to better predict the track of tropical cyclone. The approach is based on Kalman-filter.

Publications

Zhengyu Liu, **Chengfei He.** (2017) Forcing Mechanism of the Partitioning of Atmospheric and Oceanic Heat Transports. To be submitted to Science.

Zhengyu Liu, Haijun Yang, **Chengfei He**, Yingying Zhao. (2016) A Theory for Bjerknes Compensation: The Role of Climate Feedback. Journal of Climate 29:1, 191-208.

Chengfei He, Xiefei Zhi, Qinglong You, Bin Song, Klaus Fraedrich (2015) Multi-model ensemble forecasts of tropical cyclones in 2010 and 2011 based on the Kalman Filter method. Meteorology and Atmospheric Physics 127:4, 467-479.

Awards

National Scholarship for Graduate students, 2015
Outstanding poster in 21st Chinese annual meteorological symposium, 2014
Second Prize in Jiangsu Division of National computer programing competition, 2012

Skills

- Strong foundation in data analysis
- Model developing experience
- Master at MATLAB, Python and Fortran
- Good at R, Julia and C
- UI Design