REU Boot Camp Week 1
Processing and Visualization of Climate Data

Instructor:
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Learning Goals:

1. Learn to read, process, and visualize climate data on LEAP-Pangeo
2. Understand climate concepts, such as ‘seasonality’ and ‘climatology’
3. Get familiar with the unstructured E3SM dataset and prepare to use it for climate analysis & ML tasks

Schedule

The workplan for the week is on the following page. Students will have lectures in the morning and complete the reading & exercise tasks in the afternoon. We’ll mainly follow the book An Introduction to Earth and Environmental Data Science and workshop 2023 Train-the-Trainer Bootcamp Day 1: Climate and Geospatial Data Analysis by Prof. Ryan Abernathey.

Requirements

During the tutorial, students are expected to follow the instructor's steps and run the provided example code on LEAP-Pangeo Hub. We encourage students to work in groups for lab practice and assignments, and actively participate in discussion and presentation sessions. Our objective is not only for students to acquire fundamental skills for climate research but also to cultivate a collaborative learning environment where knowledge is shared and absorbed.

Schedule			
Day	**Time**	**Topic**	**Assignments & Reading**
1	9:30 – 9:40	Intro of REU Week1	Reading: more Xarray data loading and plotting Assignment #1: Xarray Fundamentals with Atmospheric Radiation Data
	9:40 – 9:55	Intro of LEAP-Pangeo & Python environment management	
	9:55 – 10:05	Intro of climate data	
	10:05 – 10:40	Basic Xarray	
	10:40 – 10:50	Break	
	10:50 – 11:50	Basic Xarray	
	11:50 – 12:00	Lab practice; Q & A	
2	9:30 – 10:00	Student presentation of Assignment #1	Reading: a. An advanced example b. Pandas Groupby Assignment #2: a. More Xarray with El Niño-Southern Oscillation (ENSO) Data b. Making maps with cartopy
	10:00 – 10:15	Advanced Xarray	
	10:15 – 10:30	Greetings from faculty advisors	
	10:30 – 10:40	Break	
	10:40 – 11:30	Advanced Xarray Maps and projections with Cartopy	
	11:30 – 12:00	Lab practice; Q & A	
3	9:30 – 10:00	Student presentation of Assignment #2	Reading: a. CMIP, b. E3SM, c. parametrization Assignment #3: Exploration of the REU dataset (work in pairs, finish 2+ analysis)
	10:00 – 10:20	Git on JupyterHub	
	10:20 – 10:40	Intro to Earth System Models and CMIP6	
	10:40 – 10:50	Break	
	11:00 – 11:30	Intro of REU demo dataset	

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	11:30 – 12:00	Lab practice; Q & A	
4	9:30 – 9:50	Group1 presentation of REU analysis	Reading: Adventures in Physics-AI Climate Modeling and Full AI Weather Prediction with Mike Pritchard Assignment #4: a. Pandas Groupby with Hurricane data b. Push 4 assignments to your Github repository and add @YuHuang3019 as the collaborator
	9:50 – 10:10	Group2 presentation of REU analysis	
	10:10 – 10:30	Group3 presentation of REU analysis	
	10:30 – 10:40	Break	
	10:40 – 11:00	Group4 presentation of REU analysis	
	11:00 – 12:00	Lab practice; Q & A	