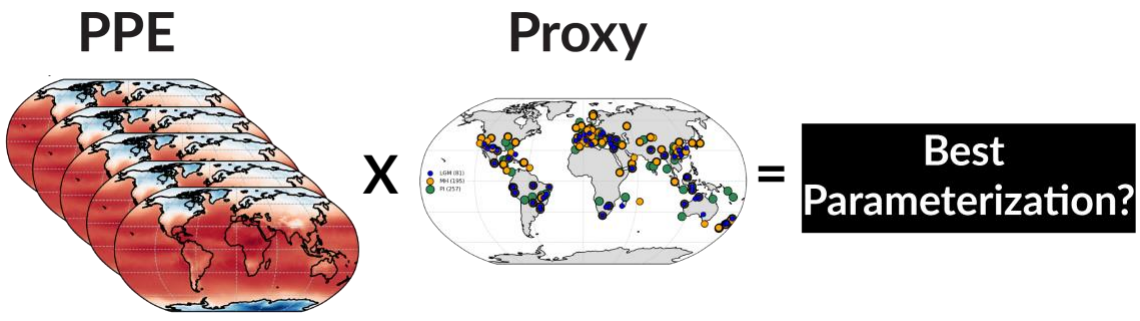
Can paleoclimate proxy archives constrain equilibrium climate sensitivity and improve our ability to predict future climate change?

Position Description

Equilibrium climate sensitivity (ECS) is a key climate metric that quantifies the rise in global mean surface temperature in response to a doubling of atmospheric CO_2 relative to pre-industrial (PI) levels. Changes in hydroclimate, temperature extremes, and other aspects of the climate system in future projections are closely tied to a model's ECS. For decades, estimates of ECS have remained wide despite improvements from using multiple lines of evidence. One persistent source of this spread is related to cloud and convective processes, which occur at scales too small to be explicitly resolved, and therefore, require parameterizations to be represented in climate models. Recently, our group demonstrated that paleoclimate records have the potential to constrain cloud and convective parameterizations in a perturbed parameter ensemble (PPE) of the atmosphere-only version of the National Aeronautics and Space Administration (NASA) Goddard Institute for Space Studies (GISS) Model E2.1 (Ramos et al., 2022; https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2021MS002893#). Based on this initial work, The Department of Environmental Science at William Paterson University (The Past Climate and Ecosystems Lab led by Dr. Michael Griffiths), in collaboration with scientists from NASA GISS-Columbia University (Drs Greg Elsaesser and Allegra LeGrande) and the University of Arizona (Dr. Jessica Tierney), invites applications for a postdoctoral scholar (2-year postdoc) to work on an NSF-funded project aimed at advancing climate model representations of cloud and convective processes by integrating paleoclimate data and model simulations using data assimilation and other data analysis tools (e.g., Machine Learning). The exact scope of the work will depend on the interests and skills of the postdoc and involve extensive collaboration with a PhD student(s) based at the University of Arizona. Generous remuneration package (Salary: $70,000/year + benefits).



Responsibilities

- Working with NASA scientists, conduct fully coupled, isotope enabled simulations for the Last Glacial Maximum (LGM), mid-Holocene (MH), and Pre-Industrial (PI) time periods using a wide ensemble of cloud and convective parameter sets (i.e., perturbed parameter ensemble, or PPE) in an updated (CMIP6-CMIP7) version of the NASA GISS climate model, GISS-E3.
- Perform paleoclimate data assimilation on these PPEs using sea surface temperature and water isotope proxies.
- Using the posteriors from the LGM, MH, and PI assimilations, identify which cloud and convection parameters provide the best match to the proxy data, then conduct present-day and doubled CO_2 experiments with these parameter sets to calculate a narrowed estimate of ECS.
- Prepare manuscripts for publication in peer-reviewed journals.
- Present findings at conferences/seminars and participate in various outreach activities.
- Supervise and mentor undergraduate and graduate students at William Paterson University, University of Arizona, and Columbia University.

Minimum Qualifications

- PhD in atmospheric sciences, climate sciences, earth system sciences or related field.
- Experience working with climate model output and large datasets.
- Knowledge and understanding of climate proxies and PSMs.
- Proficiency in coding with Python, R, MATLAB, IDL, Julia, or similar data analysis software.

Preferred Qualifications

- Familiarity with speleothem proxies and associated PSMs.
- Experience with data assimilation, machine learning, and related statistical methods.
- FORTRAN experience welcomed.

Any questions regarding the position can be directed to Michael Griffiths: griffithsm@wpunj.edu

Applications will be reviewed as received. Anticipated start date is January/February 2023.