



ATOC COLLOQUIUM

Welcome!

Please join us for the next ATOC Colloquium on **Friday, February 10** from **11:00 AM–12:00 PM**, which will be held in **SEEC S228 and simulcast over Zoom**. This week's colloquium features ATOC graduate students, **Clairy Reiher, Cole Persch, and Tessa Gorte**. Please join us for coffee beginning at 10:45 AM and stay for lunch from Illegal Pete's afterwards.

Clairy Reiher ▶ **An Analysis of North American Polar-Subtropical Jet Superpositions that Coincide with High-Impact Weather Events**

A vertical superposition of the polar and subtropical jet streams constitutes a unique synoptic-scale environment with the potential to induce high-impact weather, including anomalously strong surface cyclones that are accompanied by heavy precipitation and strong winds. In this study, we pair a climatology of jet superpositions with climatologies of atmospheric rivers and surface cyclones to determine the frequency with which these features accompany jet superpositions. We subsequently use the association of surface cyclones and atmospheric rivers with jet superpositions to construct two subsets of jet superpositions: a set of "high-impact" events that are likely to induce high-impact weather, and a set of "null" events that are unlikely to induce high-impact weather. Composite analyses are then performed to identify discriminating environmental factors between high-impact and null events, and how these factors influence jet superposition dynamics.

Cole Persch ▶ **The Impact of Orbital Precession on Carbon Flux in the Southern Ocean**

Orbital precession has been statistically linked to glacial cycles via its influence on the cryosphere, but its direct impact on the atmospheric CO₂ record is less well-known. The Southern Ocean is an important driver of atmospheric CO₂ due to its rapid carbon outgassing and has been shown to respond to precession. This work seeks to test for a link between precession and carbon outgassing in the Southern Ocean that would explain the 21 kyr power found in the historical atmospheric CO₂ record. A set of Earth System Models have been run with different orbital parameters to isolate the impact of precession on carbon outgassing in the Southern Ocean. Setting the Northern-Hemisphere winter solstice to occur at the perihelion of Earth's orbit results in enhanced carbon outgassing in the Southern Ocean due to the Southern Hemisphere Westerlies shifting poleward.

Tessa Gorte ▶ **Antarctic Ice Sheet Discharge Drives Large Scale Southern Ocean Circulation Changes**

Multidecadal satellite observations indicate that the Antarctic Ice Sheet is losing mass at an accelerating rate. Containing enough water in the form of ice to raise global mean sea level by nearly 70 m, capturing this rapid mass loss is crucial for accurately modelling our global climate system; however most models fail to do so for lack of an active ice sheet component for Antarctica. In this project, we create two simulations using the Community Earth System Model version 2 -- one with constant freshwater discharge from the AIS and one with an AIS freshwater forcing that mimics findings from satellite observations -- to explore the potential impacts of pseudo-realistic AIS mass loss both locally and globally. We find that the increased AIS freshwater discharge has extensive impacts on the Southern Ocean; affecting the temperature and density structure of the internal ocean as well as engendering changes to the ocean-atmosphere heat flux over the course of the 21st century.

Zoom: <https://cuboulder.zoom.us/j/97845417945>

Passcode: ATOC

About the ATOC Colloquium

The Department of Atmospheric and Oceanic Sciences (ATOC) Colloquium is typically held **every other Friday** from **11:00 AM–12:00 PM**. Colloquia alternate between the following formats: (A) Full-length talk by a faculty member or invited speaker, (B) Three conference-length talks by graduate students or postdocs. If you would like to nominate a speaker (including self), please email the ATOC Colloquium Committee Chair, Prof. Andrew Winters (andrew.c.winters@colorado.edu). Please visit www.colorado.edu/atoc/colloquium for further details.