



# ATOC COLLOQUIUM

## Welcome!

Please join us for the next ATOC Colloquium on **Friday, October 14** 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 student, **Becca Baiman**, as well as **NCAR ASP Postdoctoral Scholars, Hristo Chipilski** and **Carlos Martinez**. Please join us for coffee beginning at 10:45 AM and stay for lunch from Illegal Pete's afterwards.

### Becca Baiman ► A Circumpolar View of Synoptic Drivers of Atmospheric Rivers Reaching Antarctica

Despite being rare events, atmospheric rivers (ARs) influence variability in surface mass balance of the Antarctic ice sheet. Therefore, identifying the environmental factors that produce high-impact ARs over Antarctica may allow us to better understand changes to the surface mass balance of Antarctica in the future and how this will influence total ice sheet mass balance. Here, we attempt to provide a circumpolar view of AR-favorable synoptic environments by constructing longitudinal profiles of 500-hPa geopotential height anomalies during AR events. We then create a catalog of analog, non-AR environments that most closely match the geopotential height distribution during AR time steps. The subsequent analysis compares the geopotential height anomaly profiles from timesteps with and without ARs (1) to identify what conditions result in ARs versus no ARs, given a similar environment (2) to connect the variability of AR environments to the variability of their impacts on Antarctica.

### Hristo Chipilski ► Invertible Neural Networks for Nonlinear Ensemble Filtering

Operational data assimilation (DA) methods used for initializing Earth system models are based on restrictive linear-Gaussian assumptions that can produce large analysis biases and subsequent degradation of the forecast performance. Here, I will exploit the mathematical structure of invertible neural networks to address this problem. Specifically, I will derive a new nonlinear ensemble DA method which shows superior performance over the classical ensemble Kalman filter (EnKF) for a challenging toy problem.

### Carlos Martinez ► An Evaluation of the Seasonal Hydroclimate of the Caribbean within CESM and other CMIP6 Models

The Caribbean and Central America hydroclimate is understudied and complex in part due to its data sparsity, varied topographies, and multi-faceted interactions with tropical and mid-latitude forcings. Recent work developed a refined and comprehensive understanding of the observed hydroclimate that has yet to be explored in global circulation models. This study investigates the simulation of the Caribbean hydroclimate using a suite of station and gridded observational datasets, the Community Earth System Model (CESM) high resolution (0.25x0.25°), version 1-LE & (large ensemble) and 2-LE (0.9x1.25°), and CMIP6HighResMIP experiments. The climatologies (1983-2014) of the annual rainfall cycle and total moisture fluxes, and climatological regressions of SSTs, sea-level pressure (SLP), and zonal/meridional low-level winds onto indices of seasonal Caribbean rainfall totals are calculated to investigate inter-model differences. Generally, fully coupled CESM and CMIP6 simulations underestimate precipitation across the Caribbean, with some improvements using high-resolution (<0.5°) simulations. The underestimations are largest during the Early-Rainy Season (ERS; mid-April to mid-June). Precipitation biases in AMIP experiments are smaller, regardless of their spatial resolution, suggesting precipitation is improved when observed SST is used. A moisture divergence bias associated with a stronger/west-displaced North Atlantic Subtropical High (NASH), and a weaker / southern displaced Intertropical Convergence Zone (ITCZ) suggest a contribution from regional and large-scale dynamics in CESM and CMIP6 to the dry bias. The findings emphasize the importance of higher-resolution models for simulating the hydroclimate in the Caribbean, highlight the complex small-to-large scale interactions that need to be addressed in global circulation models to accurately simulate the regions' hydroclimate, and provide implications for future climate projection and prediction studies.

**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](mailto:andrew.c.winters@colorado.edu)). Please visit [www.colorado.edu/atoc/colloquium](http://www.colorado.edu/atoc/colloquium) for further details.