



# ATOCC COLLOQUIUM

## Welcome!

Please join us for the next ATOC Colloquium on **Friday, Jan. 23** from **11:00 AM–12:00 PM**, which will be held in **SEEC S228** and simulcast over **Zoom**. This week's colloquium features three ATOC graduate students/postdocs, **Maxwell Elling, Joshua Gooch, and Kara Hartig**.

### **Maxwell Elling ▶ Tropical oceans drive Malawi's malaria risk**

Transmission of malaria, one of the world's deadliest infectious diseases, is highly sensitive to environmental conditions. Understanding the large-scale climate patterns that influence these conditions is crucial for developing forecasting tools, which could be especially valuable for prevention in low-resource nations like Malawi. Previous research has often focused on statistical correlations between local weather and disease trends but has rarely explored the underlying physical climate mechanisms. Here we show that two distinct ocean-based climate patterns are the primary drivers of interannual malaria variability in Malawi. A warm tropical Atlantic leads to wet conditions in Malawi and increased malaria cases. In contrast, a warm Indian Ocean drives hot, dry conditions and reduced malaria cases. We find that soil moisture is the crucial link between these remote climate drivers and local disease dynamics. By identifying these climate drivers and the physical processes that link them to disease outbreaks, our work provides a foundation for building physically grounded, reliable early warning systems.



### **Joshua Gooch ▶ Dynamical and Microphysical Drivers of Activation and Snow Growth from Ground-Based Seeding in Complex Terrain**

This study used a model-based analysis with the Weather Research and Forecast model Weather Modification Module (WRF-WxMod) to examine how thermodynamic, microphysical, and dynamical conditions influenced ground-based silver iodide (AgI) cloud seeding during Intensive Observation Period 7 (IOP7) of the Seeded and Natural Orographic Wintertime Clouds – the Idaho Experiment (SNOWIE). This case featured a shallow cloud layer (2.3–3.3 km MSL) with cloud temperatures ranging between  $-7.5$  and  $-14.3$  °C and widespread available liquid water content, indicating a favorable microphysical environment for cloud seeding. Terrain-driven updrafts and downdrafts produced fixed wave patterns that strongly influenced the vertical transport of AgI. Although only 0.02% of released AgI was activated—and most (93.9%) remained inactivated within valley layers below 2.1 km MSL—the model showed that AgI was activated within 5–10 min after release, with snowfall from seeding developing 50–60 min later, roughly 30 km downwind from the ground generators. AgI pathways followed midlevel SW–WSW winds, revealing distinct activation patterns based on generator location: high-elevation generators near cloud base efficiently injected AgI into the SLW cloud and supported rapid downwind snow growth, while low-elevation generators were hindered by persistent downdrafts that trapped AgI in valleys until farther downwind, where upslope flow enabled eventual activation. These results demonstrate how generator elevation and local dynamical structures critically modulate seeding efficiency in complex terrain.



### **Kara Hartig ▶ Field Notes from Antarctica**

Kara and John spent a month in Antarctica last fall. They may not have gotten to take the data they intended to, but they did take a lot of cool photos, see a lot of cool things, and do some fun McGyvering to get temperature measurements on the ice shelf, the highlights of which will be shared with you all.



**Zoom:** <https://cuboulder.zoom.us/j/4713174822?omn=91211981454> **Passcode:** ATOC

## About the ATOC Colloquium

The Department of Atmospheric and Oceanic Sciences (ATOCC) Colloquium is typically held **every other Friday** from **11:00 AM–Noon**. 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/postdocs. If you would like to nominate a speaker (including self), please email the ATOCC Colloquium Committee Chair, Prof. Jianghanyang (Ben) Li (Jianghanyang.li@colorado.edu). Please visit [www.colorado.edu/atoc/colloquium](http://www.colorado.edu/atoc/colloquium) for further details.