Welcome!

Please join us for the next ATOC Colloquium on **Friday, February 9** from **11:00 AM–12:00 PM,** which will be held in **SEEC S372A/B and simulcast over Zoom**. This week's colloquium features ATOC graduate students **Vikas Hanasoge Nataraja, McKenzie Hawkins, and James Kasic.**

Vikas Nataraja ▸ Go With the Floe: A Lagrangian Approach to BRDF/Albedo Retrieval for Arctic Sea Ice in the Context of the Upcoming NASA ARCSIX Aircraft Campaign

The albedo of Arctic sea ice and snow-covered surfaces is of fundamental importance for the surface energy budget, and therefore melt and freeze processes during the Arctic summer and shoulder seasons. The surface albedo can be obtained from the angular integration of the Bidirectional Reflectance Distribution Function (BRDF), which in turn can be derived from multiple sequential, cloud-cleared overpasses from imagers that provide surface reflectance at a given (fixed) location for a range of sun-sensor geometries. Since the late 1990s, the MODerate resolution Imaging Spectroradiometers (MODIS) and the Visible Infrared Imaging Radiometer Suite (VIIRS) have provided a BRDF/albedo product for land surfaces (including snow- and ice-covered areas). However, the standard product is not available for sea ice because (1) the low contrast between clouds and bright surfaces (such as ice and snow) poses a challenge for cloud detection and clearing, and (2) ice floes drift over time, which challenges the fixed surface assumption. We propose a novel technique to characterize the surface of drifting sea ice floes and snow by combining long-standing data sets from passive shortwave satellite imagery with machine learning algorithms to track the ice floes in an object-oriented approach, and therefore literally "going with the floe". The upcoming NASA ARCSIX Aircraft Campaign will further help to quantify the contributions of clouds, aerosols, and precipitation to the Arctic summer surface radiation budget and sea-ice melt of a region of interest, which in turn provides a new source of validation for our Lagrangian approach. By isolating the role of radiation in snow/ice processes, our proposed approach combined with ARCSIX will enhance our capabilities in the challenging conditions of the Arctic and enable more accurate estimates of the cloud-radiative effect and ice-albedo feedback.

McKenzie Hawkins ▸ Bridging the Gaps: A CubeSat's Capability to Enhance Earth's Radiation Budget Observations from Space

We report novel comparative analyses between a principally Sun-observing CubeSat and the Clouds and Earth's Radiant Energy System (CERES) to complement future Earth Radiation Budget (ERB) missions in space. The ERB involves absorbed and reflected solar radiation and emitted thermal radiation. The imbalance in the ERB remains uncertain and is fundamental for understanding climate change. Satellite remote sensing provides ERB observations from space. CERES data represents twenty years of state-of-the art continuous ERB records. The Compact Total Irradiance Monitor (CTIM) was a nadir-viewing, 6U CubeSat that used novel vertically aligned carbon nanotube (VACNT) bolometers to principally measure the Total Solar Irradiance (TSI) of the Sun. CTIM also pointed to Earth for opportunistic radiation observations during its seventeen-month lifespan in orbit. New longwave radiance comparative analyses between CTIM and CERES instruments show agreement between the two different platforms for radiance measurements.

James Kasic ▸ Dual Comb Spectroscopy – Open Path Greenhouse Gas Measurements in New York City

Dual comb spectroscopy (DCS) is an emerging remote sensing technique able to quickly measure broad spectra absorbance with extremely high spectral resolution. Recent studies have shown that DCS can measure H2O, CO2, and CH4 simultaneously and with less than .05% errors in outdoor environments. From July to November 2023, a NIST DCS system was deployed in New York City to measure over-city greenhouse gas emissions. At the same time, many other atmospheric profiling measurements were taking place in NYC as part of the CUPiDS and AEROMMA campaigns, including point sensors and aircraft also measuring CO2 and CH4. This provides an opportunity to evaluate how DCS measurements can be implemented to bolster other measurement techniques and provide additional insight. This talk will introduce DCS, show initial results from the NYC deployment, and discuss how the DCS may be used alongside other measurements.

Zoom: https://cuboulder.zoom.us/j/93794324385 **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.