

CURRENT RESEARCH

I currently hold the position of Post-Doctoral Fellow in the Atmospheric Sciences Group of the Geophysical Institute (GI) at the University of Alaska Fairbanks (UAF). This position is funded by the [NASA Micropulse Lidar Network](#) project (MPLNET). MPLNET is a federated group of MPL instruments (0.523 μm) worldwide, whose continuous 24/7 datasets are ingested, processed and archived online for near real-time dissemination to our research partners. My fellowship is a pass-through continuation of funding appropriated for me through FY2010 in the NASA Radiation Sciences program proposal that funds MPLNET.

My research objectives are designed based on my interests in cloud and aerosol macrophysical, microphysical and radiative properties. As an MPLNET Science Team member I coordinate instrument operation/calibration and direct general cloud and aerosol research for the three existing polar network sites; [Ny Ålesund](#), Norway, [Syowa Station](#), Antarctica and the [Amundsen-Scott South Pole Station](#). Aside from the lidar, baseline radiation instrument suites and meteorological stations are co-located at each site. Research activities are as follows:

- Work with the Ny Ålesund and Syowa datasets continues a relationship established in 2005 with the Japanese [National Institute for Polar Research](#) (NIPR; who own and maintain the instruments), where I was a Visiting Scientist for the month of February. I am co-author on a recent paper describing aerosol transport and radiative properties at Ny Ålesund from a northern European smoke event in spring 2006. I am lead-author on a paper in review describing the glaciation of a mixed-phase marine boundary layer cloud at Ny Ålesund as depicted in MPL measurements. We are processing both data archives for tropospheric cloud height retrievals to investigate frequency and their vertical distribution at coastal polar sites for satellite validation activities. We will soon investigate polar stratospheric cloud (PSC) event frequencies and seasonal macrophysical PSC properties for general research and CALIPSO and GLAS (NASA EOS) satellite-lidar validation.
- The South Pole dataset allows me to continue research on PSC described in my doctoral dissertation. I am extending a database on macrophysical and thermodynamic PSC properties at the South Pole to include data from 2006 and 2007, and in the process of publishing a series of papers on results from 2000 and 2003-2006. I have worked with Dr. Von Walden and Mark Ellison (U. Idaho)

to analyze boundary layer mixed-phase cloud occurrence and their radiative properties at the South Pole during summer 2000–2001. Continuation of this aspect of the South Pole experiment has been proposed, and is described below.

- Additional MPLNET lidars are operated continuously and autonomously at the Goddard Space Flight Center, Greenbelt, MD, the Chesapeake Lighthouse, near Norfolk, VA, the NOAA ESRL GMD research site at Trinidad Bay, CA, the Naval Research Laboratory, Monterey, CA, Tenerife, Canary Islands and the National Central University, Jung-Li, Taiwan. A new site is expected in 2008 on the island of Barbados, and we will support an aerosol experiment in China for Dr. Si-Chee Tsay and the [SMART-COMMIT](#) platform. Although my responsibilities do not specifically address these instruments/sites, I routinely advise on calibration/operation, datasets and research.

At UAF, I helped coordinate the effort behind a newly-funded NASA proposal for ground-measurements and infrastructure support at/near Fairbanks during the 2008 [Arctic Research of the Composition of the Troposphere from Aircraft and Satellites](#) experiment. Plans call for me to assist Dr. Glenn Shaw with instrument support and data processing (scanning mobility particle spectrometer, optical particle counter, aethalometer and Sun-photometers) for measurements at the [UAF Poker Flat Research Facility](#). Furthermore, I will assist Dr. Catherine Cahill in conducting aerosol chemical and microphysical studies using a three-stage DRUM aerosol sampling system for size-segregated measurements. The project calls for two intensive observation periods; April and July. During April, we anticipate measurements of Arctic Haze and Asian dust. In July, we hope to study biomass burning transport from fires in the boreal forests of Russia and Alaska.

PENDING RESEARCH

The following are pending proposals that I am either directly or passively involved in. It is plausible that the monies in the first proposal could be redirected to support a graduate student beginning in 2010.

- I am a Co-Principal Investigator on a pending National Sciences Foundation proposal to procure and augment an MPL instrument to make it polarization-sensitive. This work is proposed as collaborative research between UAF and the University of Maryland Baltimore County. The instrument would be deployed to the Amundsen-Scott South Pole Station. Atop the Antarctic plateau, the

presence of stable mixed-phase clouds may influence the regional water cycle and suppress what minimal precipitation that occurs. Discussed above, mixed-phase clouds have been studied at the South Pole using MPL, AERI and tetheredsonde observation. Depolarization measurements help to unambiguously distinguish liquid water droplets from ice crystals, due to shape irregularities that influence the polarization state of the backscattered energy. Furthermore, PSC are known to exist as both ice-crystals and an intermediate stage that may or may not be frozen. Identifying the occurrence of each stage is important for reconciling the seasonal evolution of PSC structure during polar night, and the conditioning of lower-stratospheric air that promotes catalytic ozone destruction with the return of solar irradiance. A depolarization MPL would be very beneficial to expanding our PSC research over Antarctica. My direct funding would commence in FY2010 with the culmination of my UAF fellowship.

- I am a Collaborator on a pending NSF proposal by Dr. Andrew Gettelman at the National Center for Atmospheric Research to examine atmospheric ice formation and deposition over Antarctica. Originally, my goal was to coordinate and analyze slant-angle (non-zenith) MPL measurements at the South Pole using a 90-degree turning mirror apparatus that is co-aligned with the instrument. These data would provide extended profiles of cloud structure in the lower troposphere and planetary boundary layer as validation datasets for in-situ measurements. However, in light of the pending proposal above, I am hopeful of also providing depolarization measurements along the slant-path in order to more accurately distinguish ice from liquid water clouds during summer.