



2014-03-18 update

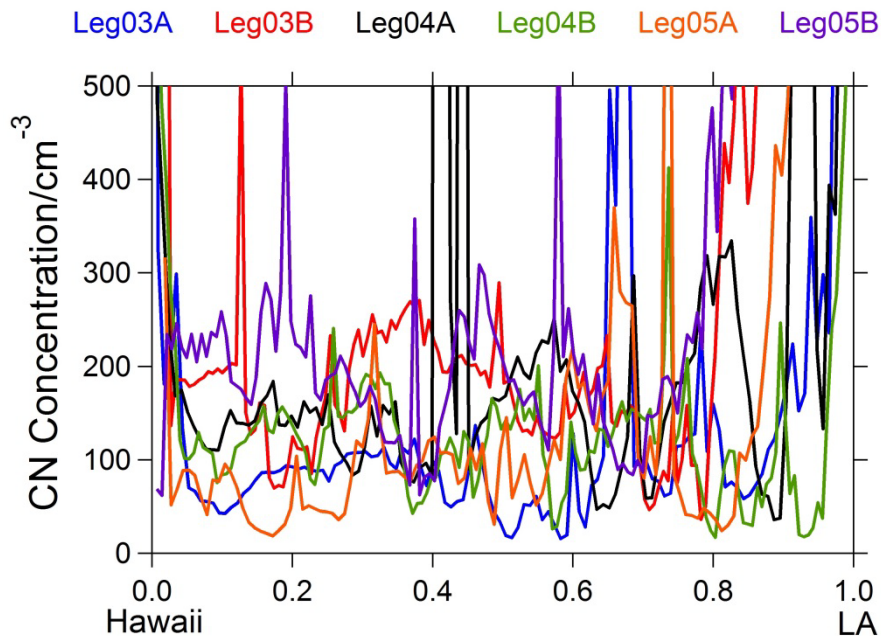
A newsletter for non-scientists (and scientists) interested in MAGIC

MAGIC was a field program funded and operated by the Atmospheric Radiation Measurement (ARM) Climate Research Facility of the U.S. Department of Energy. The ARM MAGIC webpage is <http://www.arm.gov/sites/amf/mag>. All previous updates and other MAGIC information can be found at <http://www.bnl.gov/envsci/ARM/MAGIC/>.

Last week I was at the Atmospheric System Research (ASR) Science Team Meeting. ASR is the part of the U.S. Department of Energy (which is in charge of the national laboratories) that sponsors scientific research on the data obtained during MAGIC (among other topics). It was an exciting conference, and great to connect with scientists from around the world, many of whom I get to see only once or twice a year. I chaired a session on MAGIC that was well attended – I counted about 90 people at the start of the meeting. I gave a summary of MAGIC status and news, and presented a few results on aerosol measurements taken during MAGIC. There were seven other presentations, and it is clear that a number of investigators have already done a lot of work with MAGIC data. There were also about a dozen posters on topics that made extensive use of MAGIC data, and several people expressed interest in working on results from MAGIC. Two graduate students, Xiaoli Zhou from McGill University in Montreal and Trevor Ferguson from University of Utah, gave presentations that involved MAGIC data to the entire Science Team, and both talks were well received. Also, Xiaoli and Courtney Laughlin, a graduate student from Penn. State who gave a presentation at the MAGIC session last fall, won awards for their posters. My congratulations to them, and thanks to everyone who spoke on MAGIC or had MAGIC posters.

This spring two students are interns in my department here at Brookhaven National Laboratory: Bunheng Ty, who will be attending graduate school in physics this fall, and Anastasia Maydanov, a chemistry major who will be a senior at Northeastern University this fall. Ty has been working on a project involving particles in the atmosphere that contain carbon, and Anastasia has worked on analyzing MAGIC data. She has done a wonderful job making graphs for posters and presentations for me. I asked her if she would write something about her experience here so far, and she agreed. Her story follows.

It's just over halfway through my internship here at BNL. In some ways it feels like I've been here for much longer, and in others it feels like I just started! For the first half of my time here, I helped Ernie analyze MAGIC data. The first step in this process was to familiarize myself with IGOR, a programming language. I had absolutely no programming experience prior to this, so it seemed a bit daunting at first. However, after reading the manual a bit, enlisting help from Ty (another intern), and a lot of trial and error, I had some success! I wrote programs to average particle concentration values from the Condensation Particle Counter (CPC) and Ultra High Sensitivity Aerosol Spectrometer (UHSAS) for various time intervals (1 minute, 10 minutes, 1 hour). I also found the average particle diameter values from UHSAS data. There were a lot of spikes in the concentration data for both the CPC and UHSAS. Averaging over an hour smoothed out these spikes, but sometimes the UHSAS concentration would still be higher than the CPC concentration. This is concerning because the CPC should count all particles with diameters greater than 10 nm, while the UHSAS counts particles with diameters greater than 55 nm, so the CPC counts should always be higher. In the future, data from another instrument called the Particle Soot Absorption Photometer (PSAP) will be analyzed to see whether the spikes correspond with ship exhaust plumes. The PSAP traps particles on a filter and records the change in optical transmittance throughout time. This additional information should help identify the source of the spikes.

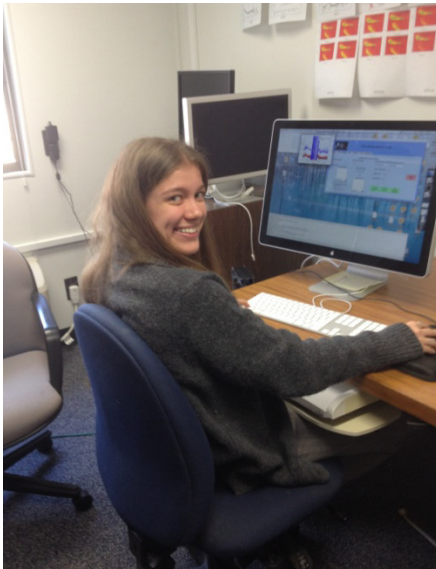


Aerosol number concentrations measured by the CN (another term for CPC) counter on various legs during MAGIC.

An example of CPC concentrations averaged over an hour for several legs is shown above. A leg is one trip across the Pacific- "A" legs are from LA to Hawaii and "B" legs are from Hawaii to LA. Therefore, the graph contains data from three round trips. Concentrations are in particles per cubic centimeter (about half the volume of a sugar cube). As you can see, most concentrations fall between 100 and 300 particles per cubic centimeter. These are extremely low values, signifying that clean air is being sampled. For comparison, concentrations in a city can be in the thousands per cubic centimeter. We found no strong geographical patterns over the open ocean and a lot of variability between legs.

I also graphed size distributions from the UHSAS, which gave us an idea of what size particles were prevalent during the various legs. I found working with actual data much more rewarding than the programming aspect, although that may be partially due to the fact that I started out having no idea what I was doing. What I have learned will be valuable for any future programming and data analysis, regardless of whether I go into atmospheric science or another field.

Now I have moved on from MAGIC and am working with Art Sedlacek, another scientist in the department, on Single Particle Soot Photometer (SP2) data from India, looking for patterns in the myriad of data. As much as I enjoyed working with the MAGIC data, it's nice to get a taste of something new. Regardless of what I'm working on, I am always learning new things at work, in seminars, and from coworkers. So far it has been a great experience and I'm looking forward to the next month and a half here!



Anastasia Maydanov

Anastasia has been great to work with, and I appreciate all her help on analyzing the data and making graphs. I'm trying to convince her that she wants to go to graduate school in atmospheric chemistry – we'll see if I'm successful!

As I mentioned in the last update, I'm organizing the First MAGIC Science Workshop, which will be held here at BNL in May. I'll write more on that in future updates.

Ernie Lewis
2014-03-18

Please address any questions or comments to elewis@bnl.gov.