



2014-01-29 update

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

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>. Information on MAGIC and all previous updates can be found at <http://www.bnl.gov/envsci/ARM/MAGIC/>.

This is the first MAGIC update in quite some time, and as there are several people new to this distribution list, I will provide brief descriptions of MAGIC and these updates to get everyone up to speed. I was the Principal Investigator of MAGIC, a field program funded and operated by the Atmospheric Radiation Measurement (ARM) Climate Research Facility of the U.S. Department of Energy whose goal was to measure properties of clouds and precipitation, aerosols, radiation (which in this context refers to infrared, visible, and ultraviolet light, and not to radioactivity), and atmospheric structure in the Eastern North Pacific. Three radars and three 20-foot vans filled with computers, supplies, and other instruments were deployed on the Horizon Lines cargo container ship *Spirit* from September, 2012, to October, 2013 as it made regular voyages between Los Angeles and Honolulu. We have been off the ship for a bit over a year now, and scientists are analyzing the data and writing papers using these data.

As Earth receives nearly all its energy in the form of radiation from the sun (which as noted above refers here to infrared, visible, and ultraviolet light), and emits energy to space in the form of infrared radiation, anything that affects the transfer and absorption of radiation in the atmosphere will affect Earth's energy balance and thus our climate. Clouds play a dominant role in this regard; they reflect some of the incoming solar energy back to space, and they also absorb and re-radiate back downward some of the energy emitted by Earth (which is why it is typically warmer on a cloudy night than on a clear night). Aerosols are collections of small particles in the atmosphere that are composed of dust, sea salt (from whitecaps at the ocean surface), industrial pollutants, and other substances, and every cloud drop forms around an aerosol particle; thus the size and composition of these particles are important to the study of clouds and cloud formation. Atmospheric structure is important as it helps determine when and where clouds will form. Thus, to understand Earth's climate it is necessary to study those topics that were the focus of MAGIC: clouds, aerosols, radiation, and atmospheric structure, and as scientists, to study something typically means that we must first measure it.

I started these updates with the goals of keeping my family and friends (non-scientists and scientists alike) informed on MAGIC activities, but additionally I wanted to use these updates as a forum to describe how science works and what scientists do, and to attempt demonstrate how science explains the world. Other scientists read these updates, and they have been quick to correct me when I have written things that are incorrect, for which I am very grateful – this is how science works, and it's great to have other people checking to ensure that I am not making mistakes, and informing me when I am.

I plan to start writing these updates again, with a frequency of about one per month. I have another distribution list on MAGIC Science News for those interested in MAGIC and MAGIC science, with the goals of providing information on data from the MAGIC campaign, conferences and workshops with sessions on MAGIC, and publications that use MAGIC data. As there was considerable overlap between the two distribution lists, I have included everyone on the MAGIC Science News list on this one. If anyone does not wish to receive either of these emails, please contact me at [elewis@bnl.gov](mailto:elewis@bnl.gov) and I will remove you from the list(s). Conversely, if you know of anyone who would like to be included on the MAGIC update distribution list, please send me their email and I will include them.

These updates are fun for me and I often learn things I didn't know previously when I write them. In past updates I have discussed climate and weather, how clouds form, how fast raindrops fall, how radars work, and other topics I found interesting. All previous MAGIC updates can be found at <http://www.bnl.gov/envsci/ARM/MAGIC/updates.php>. Topics that I plan to write about in future emails include the different layers of the atmosphere, different types of energy, energy fluxes, polarization (e.g., how polarized sunglasses work, etc.), and perhaps MAGIC-2. Stay tuned!

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Please address any questions or comments to [elewis@bnl.gov](mailto:elewis@bnl.gov).