



2013-07-25 update

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

MAGIC is 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/>.

Leg14 was by all measures a great success. The instruments behaved well, seas were calm, and we survived our weather balloon launch schedule of one every three hours for the entire trip. My cohorts on the cruise were Pat Dowell and Mark Smith, the two technicians, and Trevor Ferguson, a graduate student from University of Utah. Pat and I took the night balloon launches, and Mark and Trevor took the day ones. They did five launches per day and we did three, but often there were more of us at a launch. The techs also had their regular chores, so they were busier than on most legs. We worked Trevor hard (the techs always work hard), but he seemed to enjoy it. Besides the balloon launches, he did psychrometer readers (for relative humidity calibrations), helped the techs with chores, and did whatever else we could find for him. He was always cheerful and never complained – a great sailing companion.



L to R: Trevor Ferguson, Pat Dowell, and Mark Smith celebrating after fixing the radar table.

Balloon launches were the main activity of the trip. On the way to Honolulu, the winds were behind us and at about the same speed as the *Spirit* (our ship), which made launching easy. We had 32 successful launches out of 34 attempts, and one of the unsuccessful ones was an instrument malfunction. Of course, on the way back the winds were in our face at roughly twice our speed. Still, we had 34 successful launches out of 44 attempts, and most of the launches attained heights of more than 17 miles. I think this is great. Finding the best location on the ship to launch was a challenge, and we experimented with a variety of sites, chosen based on wind direction (and on how lucky we felt).



The pictures show some of the locations. The left picture shows Pat releasing a balloon from the lower deck on the side of the *Spirit*. The middle one shows Trevor having just released one near the “bucket,” the canvas container that we use to fill the balloon. Notice the height and location of the containers; the challenge is clearing them without the balloon or sonde making contact (in those instances, the container usually comes out the better). The picture on the right shows Mark launching at night, with the sonde rotating over the balloon. When this occurs it often prevents collision with the containers.



Mark Smith showing the bucket



Trevor Ferguson with a balloon ready to go

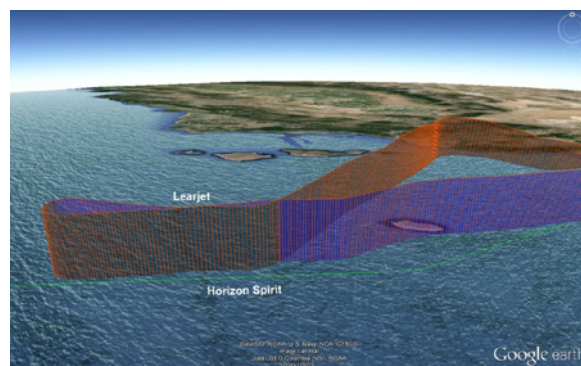
ARM (which funds and operates the MAGIC field campaign) has a blog, run by Areyee Bhattacharya at Pacific Northwest National Laboratory (<http://www.arm.gov/news/blog>), which has posts on MAGIC and other field campaigns, and on other items as well. I send her a note from Long Beach just before we left on Leg14 and also one from Hawaii when we arrived, both with more pictures, which she posted at <http://www.arm.gov/news/blog/post/21902> and <http://www.arm.gov/news/blog/post/21959>. Keep up the good work, Areyee!

During the summer the stratocumulus cloud deck is at its maximum off the coast of California, and for the first two days out we didn't see the sun (we didn't see it much after that either). Stratocumulus clouds form a nearly uniform cover, as opposed to cumulus, which are the puffy clouds typically seen in the summer. The transition between these two cloud types between California and Hawaii is the main scientific focus of MAGIC. Above the clouds, at one to several thousand feet, there is often an abrupt increase in temperature and corresponding decrease in relative humidity, as the overlying air is much warmer and drier. This so-called inversion was sometimes very pronounced: in one instance the temperature jumped from 11.1°C (52°F) to 25.1°C (71°F) and the relative humidity dropped from 100% to 26% between 485 m and 612 m (1600 feet and 2000 feet), and in another the temperature increased from 7.4°C (45.3°F) to 17.0°C (62.6°F) between 1131 m and 1155 m (3710 feet and 3790 feet).

There was one disappointing aspect to the cruise. I was in touch with Paul Lawson of SPEC, Inc., a company in Colorado which has a Learjet outfitted with state-of-the-art instruments on its nose, wings, and belly to measure cloud properties, just before the cruise and we realized that we had a possibility of a flyover during which the Learjet could fly directly over the ship and take measurements in the clouds, while at the same time we would be measuring the same cloud properties with our radars and instruments. This would have been a great data set, and we were very excited about this possibility. Logistics were challenging, as Paul was in Switzerland or somewhere (he's all over the place) and I was on the ship, with limited communications, but we worked things out and the morning of the day we were to arrive in port in Los Angeles the Learjet, including Paul and his crew, flew from Boulder, CO to Long Beach, we talked on the satellite phone, and then they flew over the ship. I had an aircraft radio and was in communication with him on the plane. He was at 20,000 feet above the ship and ready to fly into the clouds, but the military refused to let him go below 5500 feet. We had checked all the closures and warnings ahead of time, but apparently the military often changes things at the last minute (the *Spirit* also had to divert its course due to this last minute change), and as a consequence the Lear had to turn around and fly back to Boulder with no cloud measurements. It was a heartbreaker. Paul, thanks for trying – it was a great effort.



SPEC Learjet



Learjet and Spirit tracks

My students survived quite well without me around. They kept themselves busy and made lots of progress in my absence, proving a) what motivated students they are, and b) how little they need me around. I'll talk more about them next time. Once again, and I can't state it often enough, it's great working with great people – the techs, Trevor, my students and coworkers here, the Captain and crew of the *Spirit*, and all the other people with whom I have been involved in MAGIC.

I'll close with two more pictures showing beautiful atmospheric phenomena. The picture on the left was taken from the ship, and the one on the right, taken in Hawaii, shows a double rainbow. Notice that the order of the colors is reversed in the second rainbow.



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