MAGIC

2012-03-20

I spent last week at a conference in Arlington, VA and chaired a session on the MAGIC deployment. I discussed what we learned on the Leg0 trip to and from Hawaii, as did Brad Orr and Mike Reynolds, who were also on the trip, and others gave presentations on the status of the radars that will be used, the stable table that is being built and will keep one of the radar pointing vertically as the ship moves, and other instruments that will be deployed. The presentations were very informative, and there was considerable discussion on a variety of topics such as radar calibration.

Conferences such as this are an important part of science, as they provide a chance for face-to-face communications with colleagues that cannot be provided by email or skype. There are several days of catching up with former (and possibly future) coworkers, going out to dinner with groups and meeting other people with similar interests, and planning projects and discussing results. These meetings are invigorating, overwhelming, and exhausting, all at the same time. At this one, other deployments (past, present, and future) were discussed, results were presented, and much networking was done. Attendees at the conference come from other national laboratories, industry, and universities. I got to see funding managers, PR personnel, other MAGIC investigators, those in charge of physically installing the radars and other equipment, those responsible for modifying the instruments so they can be used in the marine environment (i.e., on a ship), those who are in charge of quality control, dissemination, and archiving of the data from MAGIC, and others who are involved or interested in MAGIC in one way or another. The latter group includes other scientists and students who want to use the data from MAGIC, those interested in what we learn so they can apply that knowledge to future marine deployments, and those who want to collaborate in one form or another. There were many people whom I sought out because they had knowledge of instruments or experience of other sorts that I needed; this would have been difficult or impossible if everyone weren't in the same physical location.

Radar calibration was a major topic of discussion, and, as it turns out, performing such a calibration is quite a challenge. Radars send out microwaves or radio waves that bounce off of objects such as raindrops or cloud drops, and the signal that is returned to the detector provides information on the composition, size, and motion of the objects. Radar calibration involves pointing the radar at a target with a known response (called a cross section) so that when the radar is operating, the return signal can be used to determine the cross section of what is providing this signal (i.e., how big and/or how many raindrops or cloud drops are being detected). The target has to be

sufficiently far away that the radar can send a beam out, then switch to receiving mode before the signal comes back. Although this sounds simple, there are several complications. Calibration must be done once the radar is in place (on the ship) because one of the principal reasons a radar may go out of calibration is by being dropped or banged, as might occur during shipment or while being loaded by a crane. The radars weigh up to several hundred pounds, so they are not easily maneuverable, and even if they could be pointed at a target, they are difficult to sight (as the radar beam is not visible). Additionally, the radars are in a shipyard that contains large cranes and lots of other metal ships and containers, all of which will scatter some of the radar signal back and affect the calibration. Finally, the radars are pointed vertically, and have a beam width of roughly 0.1 degrees (this corresponds to 9 feet at a distance of one mile). Thus, calibration requires putting a known target several hundred yards above the radar and knowing that it is in the beam without having other objects interfering - think of pointing a laser beam that you can't see upward and holding something in place several tenths of a mile above it to reflect the beam back at you.

I was told that in the old days, one calibration method was to shoot BBs (small copper spheres) vertically and hope some made it into the beam. In these post-9/11 days, however, guns in shipyards are rather frowned upon, and nobody wants BBs to be raining down on them on deck. Remote-controlled or real helicopters with a ball suspended beneath them were also suggested, but there are issues with these suggestions too. I thought that perhaps we could get a trained homing pigeon to over above the radars in the beam, but that idea didn't fly (sorry, I couldn't resist that one). This is not an insurmountable problem, but it's certainly a challenge.

In closing, I call your attention to two websites that recently posted something on MAGIC:
http://scienceblogs.com/brookhaven/2012/03/launching_weather_balloons_in.php
and
http://www.arm.gov/news/blog/post/17144.
Using these web locations as a start and going backwards, you can find other postings of interest in a number of fascinating aspects of science.

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2012-03-20
Please address any questions or comments to elewis@bnl.gov.
All updates and other MAGIC information can be found at http://www.ecd.bnl.gov/MAGIC.html.