

Student-Led Radar OTG Node in Puerto Rico Gets Dramatic Real-world Test

Outcome/accomplishment: A student team from the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA), an NSF-funded Engineering Research Center (ERC) headquartered at the University of Massachusetts, Amherst, with its partner the University of Puerto Rico, Mayagüez, successfully installed and tested new Center-developed weather-monitoring technology that can observe dangerous storms more accurately, in harsher conditions, and at a lower cost than traditional radar equipment. Their test, conducted at the American and Caribbean Olympic Games of Mayagüez, observed a severe weather event and allowed an earlier forecast to be made by the National Weather Service, resulting in a delay of the Games and probably preventing injuries.

Impact/benefits: The “off-the-grid” (OTG) weather-monitoring technology installed by the CASA students will allow researchers to more closely monitor the lower atmosphere, where dangerous weather takes place. Unlike Doppler radar systems, OTG nodes are relatively inexpensive and modified to operate in the event of a power loss, making them more reliable during severe weather that could knock out Puerto Rico’s electrical grid. The OTG system is expected to improve weather forecasting, and the testing helps develop the next generation of researchers while reaching out to populations underrepresented in the sciences and engineering.

Explanation/ background: Because of the Earth’s curvature and terrain features, traditional radar technology cannot monitor the lower troposphere (below 10,000 feet), which is where dangerous weather takes place. In western Puerto Rico, this means that severe weather events, such as a 2005 waterspout, can go completely unnoticed on the National Weather Service’s NexRAD Doppler radar system. Students and faculty at CASA have been working to close this “weather gap” with a system of low-cost radar nodes modified to transmit data wirelessly and maintain operations even when cut off from external power sources. The OTG system was successfully tested by CASA students during the Central American and Caribbean Olympic Games of Mayagüez, in July 2010.

ENG TECHNICAL INFORMATION

Four portable low-power x-band radars, modified and installed by CASA students, provided meteorological data for western Puerto Rico to the National Weather Service (NWS) office in San Juan. It is the first time ever that a marine radar modified for weather applications and operating with renewable energy was deployed and operated.

The Central American and Caribbean Games provided a real-world test of the power of the testbed. The CASA students were asked to support the games with their OTG radar network. During the games, three OTG nodes operated almost continuously, collecting data to be archived; and on the first day of the Games, the system helped identify a squall line that had been misreported as a tornado. The student network succeeded in imaging the damaging windstorm that impacted the Games, causing significant damage. Data from their radars were transmitted to the NWS office in San Juan, allowing earlier warnings to be issued and the Games to be delayed until the threat had passed. Researchers expect that OTG radars will improve

weather forecasting in Puerto Rico's west coast and, eventually, in other countries with complex topography and a need for low-cost radar systems.



Students install solar panels to provide power for the OTG radar system in Mayagüez.