

An experimental class license is being requested for a research radar to be deployed and operated near the University of the Virgin Islands Campus on St. Croix., pursuant to research contract ATM0541526 to UVI, Clemson University, and Cornell University from the National Science Foundation. Research will take place in support of the Arecibo Observatory run by the NSF in central Puerto Rico. A summary of the research to be performed under the contract follows.

Note that the radar in question is essentially identical to one operated by D. L. Hysell and licensed by the FCC previously. The previous callsign was WA2XVQ (file 5947-EX-PL-1997 and 0265-EX-RR-2000), assigned when the radar was operated from Anderson, South Carolina. The mode of operation under the license sought will be the same as under the previous license.

Summary

This is a proposal to investigate midlatitude sporadic E layers, layer irregularities, and so-called quasiperiodic (QP) echoes using the Arecibo incoherent scatter radar, its instrument cluster, and a new coherent scatter imaging radar to be deployed near the University of the Virgin Islands (UVI) on St. Croix. We are proposing to expand upon earlier observations from Arecibo and St. Croix made in the summer of 2002 which showed that the QP echoes arose from elongated, wavelike structures in sporadic E layers of the kind observed previously at Arecibo and tentatively associated with convection driven by neutral shear instabilities. We propose to deploy an autonomous radar in St. Croix for long-term, remote observations in collaboration with the Arecibo facility aimed at assessing the stability of the neutral mesosphere-lower-thermosphere (MLT) region, identifying the true cause of the layer structuring, and studying the plasma physics involved in producing the QP echoes. The intellectual merit of the proposal lies in the investigation of neutral/plasma coupling and other processes in this complex environmental system. Sporadic E layers and irregularities drastically affect HF and VHF radio wave propagation, and our project also addresses this often neglected aspect of space weather. Finally, our emphasis on MLT wind measurements supports that aspect of the TIMED mission.

The broader impact of our proposal is related to the educational experiences we propose to bring to the diverse undergraduate student body at UVI, as well as to graduate students at Cornell and Clemson University. Furthermore, the imaging radar we propose to place on St. Croix will add long-overdue coherent scatter capabilities to the Arecibo Observatory instrument cluster, accessible by the community for studies of sporadic E , midlatitude spread F , and meteor echoes, among other topics of general interest. The imaging radar is an innovative observing system. It will become part of the facility and add to the capabilities of the Arecibo ISR and optical instrumentation. Our proposal has the endorsement of Arecibo.

This is a multi-institution proposal with co-investigators and students from Cornell, Clemson, and UVI taking part.