

NSF grant summary information

Federal Agency and Organization Element: 4900

Federal Grant or Other Identifying Number Assigned by Agency: 2012994

Project Title: Collaborative Research: CEDAR - Experimental and Theoretical Investigation of Midlatitude Ionospheric Instability

PD/PI Name: Miguel F Larsen, Principal Investigator

Recipient Organization: Clemson University

Project/Grant Period: 09/01/2020 to 08/31/2023

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* What are the major goals of the project?

The project is an investigation of the most common types of space-weather phenomena at middle latitudes: sporadic E layers (Es), medium-scale traveling ionospheric disturbances (MSTID), and plasma irregularities associated with mid-latitude spread-F conditions (MSF). While these phenomena have been known to radio scientists for many decades, recent, incisive observations have provided new insights into the underlying processes. The research supported by the grant includes an expanded observing program with an expanded observing network across North America. In support of the observations we are carrying out more comprehensive numerical modeling and simulation to aid in the interpretation of the results.

Key questions pertain to 1) the nature of the plasma instabilities at work in the midlatitude ionosphere, 2) the role of neutral dynamics, 3) the nature of the coupling between the E and F regions, and 4) how these phenomena vary with latitude.

Major Activities:

Major activities include the installation and operation of two coherent scatter imaging radars operating at frequencies near 30 MHz, one at Zeman Lab located near Ithaca, NY, and one at the Clemson Atmospheric Research Lab located near Clemson, SC. The Zeman radar was installed first and became operational in 2020. The Clemson radar was installed in the spring of 2021. Both radars will be operated together during the summer at the peak of the summer Sporadic E season. For some of the observations, the Millstone Hill incoherent scatter radar located in Massachusetts will provide supporting measurements as well.