

2020—2021 SPACE PHYSICS SEMINAR SERIES

STEVE: A Mystery Born of Citizen Science

STEVE (“Strong Thermal Emission Velocity Enhancement”) is an optical phenomenon of the sub-auroral ionosphere, characterized by a purplish arc extending in the magnetic East-West direction, often accompanied by a region of structured green emission (the “picket fence”). In the decades preceding the name, STEVE had been attributed to an unusual type of aurora. It took citizen scientists, and their zeal to capture beautiful images of the natural world, to provide the evidence for a new phenomenon. Initial spectroscopic measurements have revealed the purple-gray arc to have a continuum emission spectrum over the visible range, while the green component is nearly pure oxygen 557.7-nm, with no evidence of emission from impact ionization of N₂. High resolution imagery of the green emissions have revealed narrow streaks jetting across the magnetic field. None of these findings is consistent with known auroral mechanisms. Space-based measurements have shown STEVE to form in regions of extreme ion drifts (>6 km/s) and extreme plasma heating (approaching 1 eV). The response of the outer atmosphere to such drivers has not yet been fully explored. This seminar reviews what is currently known about the STEVE, and what questions remain. In doing so we highlight two experimental implications: The first is the stunning and unexpected role of citizen photographers in heliophysics discovery. The second is the suggestion of new diagnostic applications for low-light spectral imaging; observational studies of E-region turbulence have generally relied on indirect measurements using radio and radar methods. STEVE suggests that this physics may also reveal itself optically.

**Thursday, September 24th**

4:00-5:00 p.m.

See website for Zoom information

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