2020 Workshop: ACTIVE EXPERIMENTS

Long title
New Techniques for Active Experiments Workshop
Conveners
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Description

There is still much to learn about the dynamics of Earth's atmospheric regions, and the ionosphere has presented particular challenges. In recent years, new techniques in active experiments have provided great opportunities for both in situ and remote sensing of ionospheric conditions. Ionospheric modification experiments using high-power HF radio waves, chemical releases from sounding rockets, or particle beams emitted from satellites have induced upper atmosphere phenomena that have been observed only sporadically in the natural undisturbed ionosphere, if at all.

For example, high-power HF radio waves incident on the ionosphere can generate artificial aurora or airglow. HF-enhanced plasma and ion lines observed with radar induce scintillations or otherwise affect radio propagation by creating plasma density irregularities due to complex interactions between the powerful HF transmissions. Two HF facilities are currently operating in US territory, the high-latitude HAARP facility in Alaska and the Arecibo Observatory in Puerto Rico at mid-latitude. HAARP is the most powerful and flexible ionospheric heater, with sweeping frequencies and multi-beam modes. Arecibo has the largest gain, up to 26 dB, and has the additional advantage of being collocated with the Arecibo ISR. Both facilities provide diagnostic optical and radio instrumentation for detecting ionospheric modification effects.

Chemical releases into the natural ionosphere can also induce scintillation and airglow, in addition to other unique effects. Recent sounding rocket experiments have demonstrated that artificial ionospheric layers can be created through chemical releases.

This workshop will convene experimentalists to present some of their recent results and explore the potential of developing new techniques for future experiments.

This will be an active workshop for all participants who will, after brief introductory remarks from the conveners and 1-2 slide lightning presentations from some participants, self-select to break out into three groups for round-table discussions: (1) opportunities and ideas for future experiments and campaigns, (2) results and data from previous campaigns, and (3) advancements in theory and modeling. Following each group of talks, participants will be encouraged to engage in moderated discussions to share results, resolve theoretical and experimental difficulties, and plan for future collaborative work.

Agenda

-- 1. *Opportunities and ideas for future experiments and campaigns*

-- >> A. Arecibo HF Facility and ISR Update (Christiano Brum, University of Central Florida Arecibo Observatory)

-- >> B. HAARP Update (Robert McCoy, University of Alaska Fairbanks Geophysical Institute)

-- >> C. Developments in Spacecraft Charge Neutralization During Active Charged Particle Emission (pdf) (Grant Miars, University of Michigan)

-- 2. *Results and measurement data from previous experiments*

-- >> A.(WITHDRAWN) Satellite Observations of Strong Plasma Wave Emissions Associated with the Cygnus Spacecraft Engine Burn (Paul Bernhardt, Naval Research Laboratory)

-- >> B. ELF/VLF wave generation at HAARP: Experiment and Theory (Robert Moore, University of Florida)

-- >> C. Arecibo HF Heating Campaign Results (pdf) (Peter Sultan, MITRE Corporation)

-- >> D. Aeronomy and space physics research through ionospheric modification (David Hysell, Cornell University)

-- >> E. Plasma background conditions during a descending layer event at Arecibo (Eliana Nossa, Naval Research Laboratory)

-- >> F. Geomagnetic Field Impacts on Stimulated Electromagnetic Emission Second Harmonic Generation (Augustine Yellu, Virginia Tech)

-- 3. *Advancements in theory and modeling*

-- >> A. (none)

* Community discussion

* Concluding remarks

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