2025 Workshop: New opportunities for sounding rocket ITM studies

Long title
New opportunities for addressing outstanding problems in magnetosphere-ionosphere-thermosphere physics using sounding rockets launched from Alaska
CEDAR-GEM
Conveners
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Description

The most dramatic impacts of space weather and magnetosphere-ionosphere-thermosphere coupling occur at high latitudes, extending from the sub-auroral zone up to the polar cap. As a result, the recent 2024 Decadal Survey highlighted many high priority science objectives and questions relating to these latitudes. Alaska is the only part of the United States from which the observations required for these studies can routinely be made. As a result, a broad range of facilities and instrumentation is already deployed in Alaska, including the PFISR radar, the HAARP facility, and the Poker Flat Research Range (PFRR). The latter two of these are owned and operated by the Geophysical Institute (GI) of the University of Alaska Fairbanks. While PFRR is ideally located for conducting rocket missions to study phenomena occurring within the auroral oval, the GI is now partnering with Alaska Aerospace Corporation (AAC) to expand the options for rocket missions to include studying regions both equatorward and poleward of the auroral oval. AAC operates the state-owned Pacific Spaceport Complex Alaska (PSCA) in Kodiak AK (57.8 N Lat). The new GI/AAC partnership seeks to leverage increasing DoD interest in hypersonic launch to make upgrades to PFRR including the procurement of a portable launch rail and other launch support equipment. At PSCA, AAC has developed a portable Range Safety and Telemetry System (RSTS) which could be deployed across Alaska to support NASA and other sounding rocket missions launched from locations other than PFRR. Potential launch sites include the PSCA in Kodiak and locations further

north such as Oliktok Pt on the Arctic Ocean. While PFRR is an ideal location for aurora observations, PSCA provides potential opportunities to study subauroral phenomena including: Sub-Auroral Polarization Streams (SAPS); Sub-Auroral Ion Drifts (SAID); and newly discovered Strong Thermal Emission Velocity Enhancement (STEVE). Depending on the launch vehicle, a sounding rocket launch from northern Alaska may be able to reach the ionospheric footprint of the northern hemisphere magnetospheric cusp. Goals of this workshop are partly to notify the community on these potential new launch locations in Alaska. But the main objective is invite suggestions and discussion relating to new science investigations that might be enabled by these expanded launch possibilities.

Agenda

- 10:00-10:15, Bob McCoy, Session overview; New infrastructure in Alaska to support sounding rocket missions
- 10:15-10:30, Cathy Hesh, Report from the NASA Sounding Rocket Program Office
- 10:30-10:45, Rob Pfaff, Report from the sounding rocket science community
- 10:45-10:50, Paul Bernhardt, HAARP-VLF: Rocket Profile of HAARP-HF Amplified VLF Waves
- 10:50-11:00, Magdalina Moses, Possibilities for multipoint sub-auroral investigations using the telemetered PIP-Bob ejectables
- 11:00-11:10, Pablo Reyes, PFISR observations during the AWESOME sounding rocket launches
- 11:10-11:20, Mark Conde, Initial results from the March 2025 AWESOME sounding rocket mission
- 11:20-11:30, Kristina Lynch, Sub-auroral sounding rocket missions?
- 11:30-12:00, Discussion

For virtual participation, please use the login details below:

https://alaska.zoom.us/j/81524127801

Justification

The expected increase in options for sounding rocket launch locations in Alaska is not widely known in the CEDAR and GEM communities. While these new options for rocket launch locations are expected to be available shortly, the cost of actually deploying the launch support hardware to a new site may not be justified if it is only

done in support of one mission. Thus, a major goal of the workshop will be to host discussion of scientific themes and problems that could be addressed through an extended multi-mission campaign. For example, sub-auroral ITM coupling and physics is of considerable current interest, and could form an ideal theme to be addressed by an extended launch campaign.

Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace
Explore exchange processes at boundaries and transitions in geospace
Explore processes related to geospace evolution
Develop observational and instrumentation strategies for geospace system studies
Workshop format
Short Presentations
Panel Discussion
Round Table Discussion
Keywords
ounding rocket, sub-auroral, cusp, MI coupling
Focus Group and Group Leader

MESO -- Mesoscale drivers of the nightside transition region: ionospheric and magnetotail evaluations. Workshop convener: Bea Gallardo-Lacourt

· MPEC -- Magnetospheric Sources of Particle Precipitation and Their Role on Electrodynamic Coupling of Magnetosphere-Ionosphere-Thermosphere Systems. Workshop convener: Doğacan Ozturk

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