

# **2025 Workshop: Science Opportunities with the Upcoming Carruthers Mission**

Long title

Science Opportunities with the Upcoming NASA Carruthers Geocorona Observatory Mission

CEDAR Regular Workshop

CEDAR-GEM

Conveners

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Description

The Carruthers Geocorona Observatory, a NASA Heliophysics Science Mission of Opportunity, is scheduled to launch in September 2025. From its vantage in halo orbit around the Earth-Sun L1 Lagrange point, it will provide the first comprehensive measurements of Earth's global exospheric hydrogen (H) density distribution at both high spatial resolution and high temporal cadence throughout its 2-year primary mission. Knowledge of exospheric H density is crucial for understanding atmospheric escape partitioning among kinetic pathways, including the polar wind, as well as Earth's dynamic response to geomagnetic storms, which is mediated by charge exchange between exospheric hydrogen atoms and trapped ion populations. Exospheric H density specification is also required for magnetospheric ENA image inversion and interpretation of X-ray emission data. In this session, the Carruthers science team will provide a brief overview of the mission concept and data products that will be available to the community and solicit talks that explore science investigations using this unique data set.

Justification

The Carruthers Geocorona Observatory will provide unprecedented constraints on a key geospace state parameter, exospheric hydrogen density, whose specification is needed for a wide range of scientific investigations (atmospheric evolution, polar wind, ring current decay, plasmaspheric refilling) and for the accurate analysis of data acquired by other sensing systems (ground-based visible airglow sensors, ENA

cameras, and X-ray imagers). Historical observations of exospheric density are extremely sparse and physics-based modeling is notoriously challenging, so the Carruthers mission fills a longstanding measurement gap. With its scheduled launch being imminent, a joint CEDAR/GEM session this year is both timely and valuable, by introducing the community to the mission data products that will be available soon and by identifying opportunities to enhance the mission science return through external collaborations.

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Explore exchange processes at boundaries and transitions in geospace

Explore processes related to geospace evolution

Fuse the knowledge base across disciplines in the geosciences

Manage, mine, and manipulate geoscience/geospace data and models

Workshop format

Short Presentations

Include a virtual component?

Yes

Keywords

exosphere, polar wind, ring current, storms

Focus Group and Group Leader

Lara Waldrop

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