2025 Workshop: Advancing Neutral Wind Measurements: New Instrumentation and Recent Discoveries

Long title
Advancing Neutral Wind Measurements: New Instrumentation and Recent Discoveries
Conveners
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Description

This session brings together researchers and engineers developing and utilizing instrumentation for neutral wind measurements in the upper atmosphere. We will focus on recent advances in both ground-based and space-based measurement techniques, emerging technologies, and significant findings from new observation platforms. The session aims to foster collaboration between instrument developers and data users to enhance our understanding of neutral winds and their coupling with other atmospheric phenomena. Topics will include:
• Fabry-Perot interferometers and their deployment
• Recent advances in satellite-based wind measurement techniques
• Multi-instrument coordinated observational campaigns
• Data processing and analysis methodologies for improved wind measurements
• Current challenges and future directions in neutral wind instrumentation and measurements
Presentations will emphasize both technical innovations and scientific discoveries, with particular attention to cross-disciplinary applications and data integration opportunities.

Agenda

- 16:00-16:10 **S. Mrak** TeraHz Limb Sounder development
- 16:13-16:23 **Y. Zhu** Dual-Channel Optical Interferometer

- 16:26-16:36 **J. Meriwether** The 20 cm MaxFPI - the Arecibo equivalent of an FPI in the 21st century
- 16:39-16:49 **M. Joon** Reconstructed 3D Full Components of Neutral Wind using Tri-Static SDI Observations
- 16:52-17:02 **M. Urco** Estimation of four-dimensional winds from multistatic meteor radar observations using physics-informed machine learning
- 17:05-17:15 **J. Vierinen** Dissipation Rates of Mesospheric Stratified Turbulence From Multistatic Meteor-Radar Observations
- 17:18-17:28 **L. Navarro** Highlights of Argentina FPI observations
- 17:31-17:41 **T. Immel** ICON/MIGHTI
- 17:44-17:54 **C. Acomb** GEMINI/auroral plasma-neutral interaction

Justification

The neutral winds play a critical role in understanding atmospheric dynamics, plasma transport, and energy distribution throughout the upper atmosphere. In recent years, new ground-based and space-based neutral wind measurement capabilities have come online, providing unprecedented spatial and temporal coverage of neutral winds. These advancements come at a crucial time when the community is increasingly recognizing the importance of neutral-ion coupling and its effects on space weather. Additionally, long-term neutral wind data sets are becoming valuable for studying climate change impacts at various atmospheric levels.
Given the multidisciplinary nature of neutral wind studies, this session will encourage cross-fertilization of ideas between instrumentation specialists, data analysts, and modelers. This aligns with CEDAR's mission to foster collaborative research on the upper atmosphere and its coupling to other regions.
The recent 2024 Decadal Survey for Solar and Space Physics highlights the importance of measuring and understanding neutral winds in Earth’s mesosphere and thermosphere. Discussion of this need features prominently in the reports from the panels on the Physics of Magnetospheres (DS §C), on the Physics of Ionospheres, Thermospheres, and Mesospheres (DS §D), and on Space Weather Science and Applications (DS §E).

Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace

Explore exchange processes at boundaries and transitions in geospace
Develop observational and instrumentation strategies for geospace system studies
Manage, mine, and manipulate geoscience/geospace data and models
Workshop format
Short Presentations
Keywords
neutral winds, instrumentation, measurements
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