# 2018 Workshop: High Latitude TI Coupling

Long title
Exploring High Latitude Thermosphere and Ionosphere Variability and Coupling using Ground-based, Space-based, and Modeling Studies – Current Understanding, Observational Challenges, and Outlook
Conveners
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Description

Earth’s magnetosphere, ionosphere, and thermosphere form a closely coupled system. Magnetospheric processes (such as Joule heating and auroral precipitation) deposit a significant amount of energy at high latitudes which directly and indirectly perturbs the mean state of the high latitude ionosphere and thermosphere system. It also perturbs ion-neutral energy and momentum coupling over a wide range of spatial and temporal scales. Even though a considerable amount of research effort has been focused on exploring and understanding the complex coupling dynamics between the high latitude ionosphere and thermosphere over the past two decades, it is still one of the long-standing challenges of global space weather research. Both the large-scale and small-scale responses of the thermosphere and ionosphere to geospace drivers are still poorly characterized observationally. Furthermore, current understanding of thermosphere-ionosphere climate is immature, particularly with respect to mechanisms for long-term changes. Empirical and assimilative modeling efforts show inconsistencies among observations and between observations and first-principle models. Well calibrated observations and better validated models will be needed to address these problems. This workshop aims to address these challenges by fostering collaborative efforts among present and future research activities. To this end we invite short presentations of data analysis (ground-based and space-based) and modeling (data assimilation and physics-based) results on high latitude thermosphere-ionosphere variability and coupling.

Agenda

**Astrid Maute (UCAR)** - Aspects of Simulating MI Coupling in General Circulation Models by Specifying Field-Aligned Current

**Andrew Kiene (UAF)** - High-resolution local measurements of F-region ion-neutral coupling, temperatures, and Joule heating rates using SuperDARN and ground-based optics

**Changsup Lee (KOPRI)** - Comparison study on mesospheric wind and temperature measured by Fabry-Perot interferometer and meteor radar at King Sejong Station, Antarctica

**Stephen Kaeppler (Clemson)** - Preliminary Results from a Long Term Investigation of E-region Thermospheric Winds using PFISR

**Qingyu Zhu (UTA)** - Variability of electric field and particle precipitation at different scales and the correlation between them

**Don Hampton (UAF)** - Thermal effects on fine-scale FPI wind measurements

**Miguel Larsen (Clemson)** - Neutral vertical winds at high latitudes: some unexplained behavior

**Kate Zawdie (NRL)** - Simulating Traveling Ionospheric Disturbances at High Latitude

**Manbharat Singh Dhadly (NRL)** - Longitudinal Variation in Thermospheric Winds - Southern High Latitudes

**Mike Ruohoniemi (VT)** - Evidence of ion-neutral coupling in subauroral plasma drifts

Justification

The focus of this workshop is to address high latitude coupling of Earth’s ionosphere and thermosphere (one of the long-standing challenges of the global space weather research) system utilizing observational data (current and past ground-based and space-based) and modeling (data assimilation and physics-based) studies. The workshop description is aligned with Strategic Thrust#1 and Thrust#2 in the CEDAR Strategic Plan. The workshop also directly addresses Strategic Thrust #3 (Geospace Evolution), and the Strategic Thrust #6 task of fusing observations into sophisticated

inference. The workshop also addresses Science Challenge 3 of the Decadal Survey for Solar and Space Physics: “Understanding the space environments of Earth and other solar system bodies and their dynamical response to external and internal influences”.

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