2016 Workshop: Ionosphere Thermosphere Interactions

Long title
Ionosphere-Thermosphere Interactions: Modeling and Observations
Conveners
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Description

The multiple roles of atmospheric terrestrial weather in defining the thermospheric dynamics and in setting up the ionospheric electric wind dynamo are now recognized as critically important for the development of the next generation models of a fiduciary thermosphere and ionosphere. To this end, models of the whole atmosphere are now integrating ionosphere modules as interactive components. The importance of planetary waves, migrating and non-migrating tides, and gravity waves, and more generally the role of atmospheric weather in defining thermospheric and ionosphere variability from short-term to inter-annual time scales are topics of relevance for this session. Model simulations require observational validation and can help support interpretation of observations. Available and upcoming ground-based and satellite observations will be valuable for the validation and comparative studies, and we seek contributions that discuss long records of data -- as key indicators of several ionospheric coupling mechanisms (recombination chemistry and electrodynamics) and physical processes (climate change) over decadal time scales -- as well as short term variations.

Agenda

Thursday 13:30-15:30

1. F. Sassi : Thermosphere-Ionosphere Coupling at NRL (pdf)
2. HL. Liu: Verification and Validation of WACCM-X Model Results (pdf)
3. R. Garcia: Fast, large-scale waves in the MLT observed by TIMED/SABER (pdf)

4. M. Dahdly: Seasonal dependence of high latitude upper atmospheric winds: A climatological study based on ground and space based instruments (pdf)
5. K. Zawdie: Modeling the Daily Variability of the Midlatitude Ionosphere with SAMI3/WACCM-X (pdf)
6. Q. Zhu: Simulations of vertical ion-drag effect on neutral winds and compositions at low and middle latitudes (pdf)
7. TW. Fang: Impact of midnight thermosphere dynamics on the equatorial ionospheric vertical drifts (pdf)
8. Discussion

Friday 8:00-10:00

1. J. Emmert: Interminimum changes in global total electron content and neutral mass density (pdf)
2. A. J. Mannucci: Global and Regional Electron Content (pdf)
3. C. Valladares: LISN Observations over the American Continent (pdf)
4. L. Qian: Effects of the Equatorial Ionosphere Anomaly on the Inter-Hemispheric Circulation in the Thermosphere (pdf)
5. N. Pedatella: Impact of semidiurnal tidal variability during SSWs on the mean state of the ionosphere and thermosphere (pdf)
6. Discussion

Justification

The CEDAR Strategic Vision (2011) identifies the upper atmosphere as an “interaction region” where dynamics, energetics and in general coupling with the lower atmosphere are prominent processes. Thus, “an outstanding challenge in terrestrial upper atmosphere research is specifying the state of the space-atmosphere region (SAIR) at a particular time and location”. This is echoed by the National Academy of Sciences (NAS) in the Decadal Survey 2013-2022 where it is recognized that a determination of “the dynamics and coupling of the Earth’s magnetosphere, ionosphere and atmosphere and their response to solar and terrestrial inputs” is a prominent scientific goal. Beyond the mere speculative research, however, space weather has also relevant societal impacts, both for the civilian and military operations: from protecting the Nation’s power grid to ensuring global telecommunications, from being able to predict disruptions to GPS signals to ensuring continuous communications for commercial airline routes at polar latitudes. For this reason the National Science Foundation (NSF) in the Geospace Plan (2013)

expects the scientific community to “confront challenges in space weather specifications and forecasting”, whose solution requires “an integrated system approach … which takes advantage of the modeling and instrumentation advances”.

Confronting these scientific challenges requires a concerted and integrated effort involving modelers, experts on the observational side and scientists who develop data assimilation systems; these concerted efforts are necessary not only to understand how variable the upper atmosphere is but also how to integrate the observed variability in fiduciary forecasts In order to make progress beyond the mere compartmentalized advances and address the above challenges expressed by CEDAR, NSF and NAS, this workshop wants to promote discussions in the community on (1) the range of variability in the observed upper atmosphere and how well that is captured by our most advanced models; and, (2) which observational datasets can be identified to illustrate the upper atmospheric variability on different times scales, from day-to-day to inter-annual or even decadal scales. The ultimate goal of this workshop is to define a methodology or process in which observations inform models to address the challenges from NSF, NAS and CEDAR.

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