2014 Workshop: effects of forcing from above and below

Long title
Case study of atmospheric-ionospheric effects caused by forcing from below and above
Conveners
A. Maute
L. Goncharenko
Jeffrey Forbes
Description

The coupling of the lower to upper atmosphere-ionosphere is complex, dynamic, and not well understood. During the last extreme quiescent solar minimum effects of strong, persistent metereological disturbances could be measured in the ionosphere. Using observations and numerical models progress could be made in explaining the possible coupling mechanisms between the lower and the upper atmosphere, e.g., changes in the background atmosphere, in the tidal and wave spectrum and propagation, modification of the electric field, and thermospheric composition. However, during the current solar maximum period it is an even greater challenge to attribute atmospheric-ionospheric effects to meteorological forcing or solar wind variations. To advance our understanding of this system-level problem, the proposed workshop focuses on two periods with strong persistent meteorological disturbance during January 2012 and January 2013. From January 23-30 2012 a solar proton event period occurred while there was a minor Stratospheric Sudden Warming with a zonal wind reversal after January 13 and an elevated stratopause in February. In January 2013 a major Stratospheric Sudden Warming was observed with the polar zonal wind reversal on January 7 and an elevated stratopause. However, during January 2013 the solar radio flux increased significantly to 170 sfu and with Kp of 4+ it was not a geomagnetically quiescent period.

We welcome contributions based on observational and numerical studies about the two time periods that seek to understand if and how atmospheric-ionospheric effects can be ascribed to forcing from above or below. The following questions will be addressed and will guide the course of this workshop:

- Are effects due to forcing from above and below competing against each other, enhancing, or adding? Are there similarities between the January 2012 and 2013 time periods?
- Can specific spatial and temporal changes in the atmosphere-ionosphere system suggest forcing origin from above or below?
- What observations are needed to identify the source of the disturbance?
- How can numerical models and observations be combined to help understand these interactions?

Agenda

13:30-13:45 Astrid Maute (10-15 min): Meteorological and geospace conditions during the 2012 and 2013 SSW periods

13:45-14:00 Larisa Goncharenko (10-15 min): Observations during the 2012 and 2013 SSW period

14:00-14:15 Nick Pedatella (10-15 min) Simulations of MLT and ionosphere variability during sudden stratospheric warmings

General contributions:

Maura Hagan (~5 min) Pseudo-Tides in the Upper Atmosphere during the April 2010 Solar Geomagnetic Storm

Tzu-Wei-Fang (~5min) Solar cycle effects on the 2009 SSW event

Specific to these periods

Marc Hairston (~ 5 min) C/NOFS data for 2012/2013

Endawoke Yizengaw* (~ 5 min) measured and derived equatorial drifts at different longitude sectors for 2012/2013

Koki Chau (~5 min) solar and lunar tides in the lower thermosphere for 2013 based on radars

Qian Wu (~ 5 min) model data comparison for the 2013 SSW- FPI and TEC

Houjun Wang (~ 5 min) Whole Atmosphere Model (WAM) Simulation of the 2012 and 2013 Stratospheric Warming

Valery Yudin* (~5 min) SSW 2013 as simulated by WACCMX/GEOS5

Irfan Azeem* (~5min) 2013 period from the ionospheric perspective

15:00-15:30 Summary of discussion, results and future steps

Justification

During the current solar maximum phase it is important to focus on the comparative importance of the effects due to geospace forcing versus effects due to meteorological forcing. However, it is not clear if and how atmospheric-ionospheric effects can be attributed to specific forcing. The workshop will foster exchange and collaborations between observational investigations and numerical studies, and bring together researchers from the troposphere-stratosphere-mesosphere-thermosphere-ionosphere-magnetosphere system by studying specific time periods. We plan on having two longer contributions/presentations to introduce the topic (also to students), and then short presentations with accompanied discussion to address the question from an observational and modeling perspective. Possible contributors will be contacted beforehand to solicit contributions. The workshop theme directly pertains to the CEDAR strategic thrust #1: “Encourage and undertake a systems perspective of geospace” and thrust #5 “Fuse the knowledge base across disciplines”. The workshop will address the energy transfer from the lower to the upper atmosphere as well as from the magnetosphere to the atmosphere-ionosphere, which is embedded in CEDAR strategic thrust #2 “Explore exchange processes at boundaries and transitions”.

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