2015 Workshop: Dynamical and Chemical Wave Coupling

Long title
Understanding Dynamical and Chemical Coupling from Tides, Planetary and Gravity Waves
Conveners
Loren Chang
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Description

In this session, we solicit abstracts related to the aforementioned dynamical and chemical phenomena involving both models and observations. In addition to results and future work, we encourage speakers to present their perspectives on the following questions, with an emphasis of soliciting community consensus for future collaborative work:

- What coupling mechanisms have been demonstrated to occur in models and observations?
- How can such instances of coupling be detected using various observational platforms and / or model improvements?
- What events would be suitable for coordinated community observation and modeling?

The latter portions of these sessions will be devoted to an open town hall meeting discussing the three aforementioned questions from the perspectives of neutral dynamics, chemistry, and electrodynamics. Brief follow-up presentations and an open exchange of ideas are encouraged for this segment.

Agenda

- **Maura Hagan**: Numerical simulations of thermospheric responses to forcing from above and below (pdf)
- **Scott England**: A comprehensive survey of atmospheric quasi 3 day planetary-scale waves and their impacts on the day-to-day variations of the equatorial ionosphere (pdf)

- **Xiaoli Zhang**: Lunar Tide in the Thermosphere and Weakening of the Northern Polar Vortex
- **Jian Du**: Momentum budget of diurnal tides - a closer look at tide- mean flow, tide-planetary wave, and tide-gravity wave interactions
- **Vu Nguyen**: Observations of Secondary Wave Manifestation Arising from Quasi Two Day Wave-Migrating Diurnal Tide Interaction (pdf)
- **Yan-Yi Sun**: Ground-coupled air waves from earthquake

Discussion: Instances and Studies of Wave Coupling Events

- **Jim Russell**: Examples of vertical coupling throughout the atmosphere observed by SABER, CIPS, other satellite instruments and ground-based systems
- **Dave Fritts**: The Doppler Wind and Temperature Sounder (DWTS): A new satellite instrument that would enable studies of wave coupling from ~17-200 km
- **Huixin Liu**: Thermosphere responses to SSWs simulated by GAIA model
- **Irfan Azeem**: Detection and Characterization of Atmosphere-Ionosphere Coupling Using Multi-Instrumented Observations of Gravity Waves
- **Cissi Lin**: Implementation of Spectral Gravity Wavefield to the Global Ionosphere Thermosphere Model (GITM) (pdf)

Discussion: Advances in Instrument and Model Development

- **William Ward**: ROSMIC, a new project in the SCOSTEP VarSITI program (pdf)

Justification

Atmospheric waves are crucial to the transport and deposition of momentum and thermal energy throughout the middle and upper atmosphere, can alter ionospheric electrodynamics through modulation of dynamo wind fields, and can also drive composition changes through mixing effects associated with their propagation and dissipation. Recent modeling and observational studies have found that such effects can drive variability on seasonal and shorter time scales, as in the cases of planetary wave periodicities modulating dynamo tidal wind fields and the ionosphere, as well as thermospheric composition changes coinciding with tides, planetary and gravity wave driven mixing above the turbopause. In preparation for future work, community discussion and coordination is required to understand and identify the relative importances and instances of variability from the above coupling

mechanisms through both observations and modeling of the MLT and IT systems. It is desired that this workshop will allow for participants to form collaborations for targeted observational and modeling studies of specific wave coupling phenomena to be executed in the coming year.

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