2012 Workshop: CEDAR ETI Modeling Challenge

Long title
CEDAR Electrodynamics Thermosphere Ionosphere (ETI) Modeling Challenge
Conveners
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Dave Berrios
Description

In an effort to assess accuracy of IT model predictions against observations, CEDAR community has been leading the CEDAR Electrodynamics Thermosphere Ionosphere (ETI) Challenge since 2009. During the last three years, the result of the first round of CEDAR ETI Challenge were published in one paper in Space Weather, and one more paper is in preparation (details about the first round of the Challenge are available at http://ccmc.gsfc.nasa.gov/support/CETI2010/. Last year, the Challenge was expanded to include global TEC/NmF2/hmF2, Joule heat, and climatological study (information on 2011 GEM-CEDAR Challenge is available at http://ccmc.gsfc.nasa.gov/challenges/GEM-CEDAR/).

In the workshop this year, we will discuss the role of drivers on IT model results. To study the effect of different drivers, we encourage IT modelers to perform simulations for the December 2006 event with different models for the ionosphere potential pattern: 1) Weimer 2005 using 15-min averages of the IMF input parameters lagged -5 to -20 min provided by the NCAR and the CCMC; 2) AMIE provided by Aaron Ridley (University of Michigan); 3) Global magnetosphere models provided by the CCMC. Please contact Aaron Ridley or Masha Kuznetsova if you need assistance to get ionospheric potentials from AMIE and/or global magnetosphere models.

List of the physical parameters to be used for metrics studies:
1. Global Electron Density
• TEC from ground-based GPS in eight 5° geographic longitude sectors
• NmF2 from COSMIC in eight 5° geographic longitude sectors

• hmF2 from COSMIC in eight 5° geographic longitude sectors
2. Vertical and horizontal drifts at Jicamarca (VperpN and VperpE)
3. Neutral density at the CHAMP orbit (Nden)
4. Electron density at the CHAMP orbit (Eden)
5. NmF2 from LEO satellites (CHAMP and COSMIC) and ISRs
6. hmF2 from LEO satellites (CHAMP and COSMIC) and ISRs
7. Temperature Tn obtained by Fabry-Perot Spectrometer at 250 km (Resolute Bay, Canada)
8. Ne at 300 km (Millstone Hill, Sondrestrom, EISCAT, Svalbard ISRs)
9. Ion vertical velocity at Sonderstrom ISR
10. Neutral winds obtained by Fabry-Perot Spectrometer at 250 km (Resolute Bay, Canada)
11. Te at 300 km (Millstone Hill, Sondrestrom, EISCAT, Svalbard ISRs)
12. Ti at 300 km (Millstone Hill, Sondrestrom, EISCAT, Svalbard ISRs)

Model output frequency:
• 15 min for Global TEC/NmF2/hmF2
• 1 min for Neutral and Electron densities at the CHAMP orbit
• For NmF2 and hmF2 (5 and 6) from LEO satellite, model output is required at the time and location at which maximum electron density (obtained occultation measurements) occurs that are not on the satellite track.
• 5 min for the rest of parameters

Locations where the measurements are taken (for example, satellite trajectories, locations of ISR stations, location at which maximum electron density (obtained occultation measurements) occurs) can be found at http://ccmc.gsfc.nasa.gov/challenges/GEM-CEDAR/measurements.php.

Time interval of the December 2006 event study:
2006/12/13 (doy 347) 00:00 UT - 12/16 (doy 350) 00:00 UT

In addition, we will discuss climatology study for the time interval from Nov 21 2007 to Jan 20 2008. For the climatology study, global TEC/NmF2/hmF2 (possibly separated by day and night), global neutral density at 400km (possibly also at 250 and 550 km), vertical and horizontal drifts at Jicamarca, and neutral density at the CHAMP orbit will be considered. The model output will be the same for the climatology as for the December 2006 event run, except for 1 hour output frequency.

Topics for review and discussions:
• Role of drivers on ionosphere model results
• Global TEC/NmF2/hmF2 metrics study
• Climatology study (Nov 21 2007 to Jan 20 2008)
• Future plans

Agenda

TEC/NmF2/hmF2 metrics study

1. Ja Soon Shim – 2006 Dec. event (16:00-16:15)
2. Barbara Emery et al. – Climatology Assessment of Ionosphere/Thermosphere Models in Low Solar Flux Conditions for the CCMC CEDAR Challenge (16:15-16:30)

Role of different drivers

1. Aaron Ridley – GITM results with different drivers (16:30-16:45)
2. Ja Soon Shim – Preliminary results of effects of different drivers on IT model results (16:45-17:00)
3. David Berrios – Kameleon Support for Space Weather Model Framework (SWMF) Ionospheric Data (s/w to update high-latitude drivers) (17:00 -17:20)

Discussion (17:20-17:40)

1. Suitable metrics for TEC comparison
2. Tools for driver swap

GEM-CEDAR modeling challenge (17:40-18:00)

1. Masha Kuznetsova – report on Joule Heating and Poynting flux metrics study from GEM challenge and future plans for MI-coupling study

Justification

There is an increasing need for a quantitative systematic evaluation of the current state of various IT modeling approaches. This workshop will facilitate collaboration among modelers, data providers and research communities in order to address the differences between various modeling approaches, to track model improvements over time, and to provide feedback for further model improvement.

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