

Synthetic study of ionosphere lower boundary forcing using TIE-GCM

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Abstract

In this study, we use the general circulation model TIE-GCM as well as different synthetic lower boundary forcing conditions to investigate the behavior of the lower Thermosphere Ionosphere (TI) system. The lower boundary forcing is synthetically generated to artificially mimic different atmospheric conditions and then used as input for TIE-GCM. The influence of these conditions on the TI system will be analyzed by investigating different thermosphere as well as ionosphere parameters. The goal of this study is to improve the understanding of the importance of the different (internal vs. external) driving mechanisms in the TI system.

TI – Parameter for different lower boundary forcing runs

Model Setup (TIEGCM 2.0)

- Horizontal resolution run (2.5x2.5)
- Heelis convection model
- OMNIweb solar forcing
- 27. September 2013 – 12:00 UTC

Synthetic lower boundary conditions

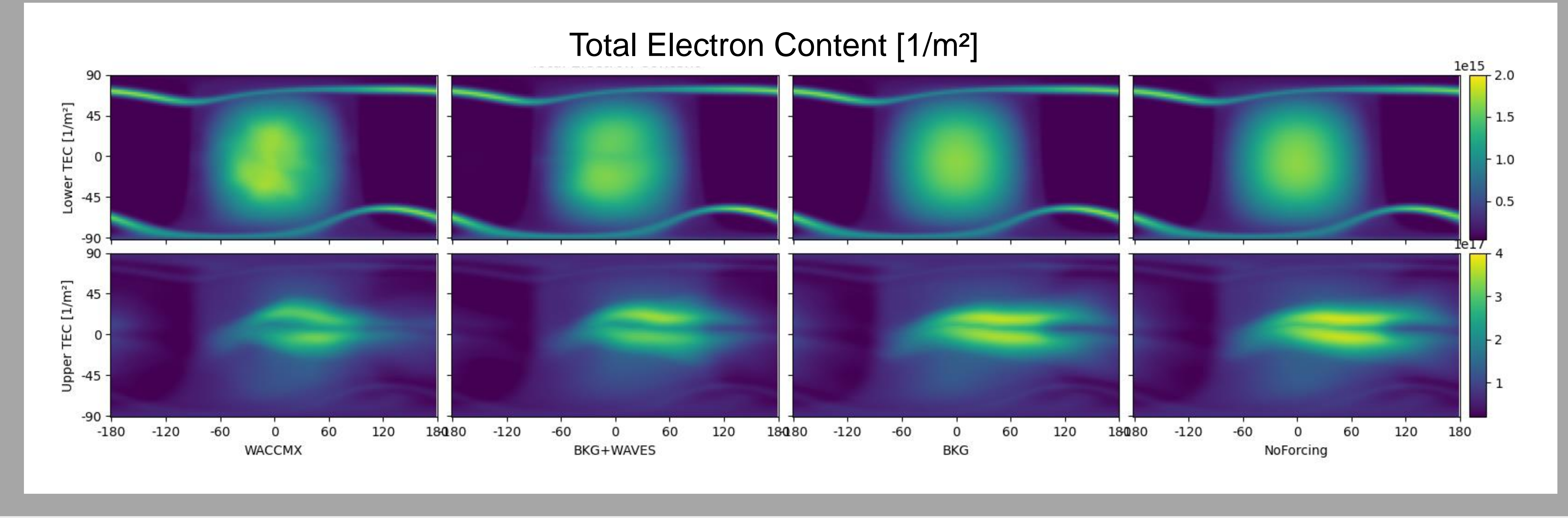
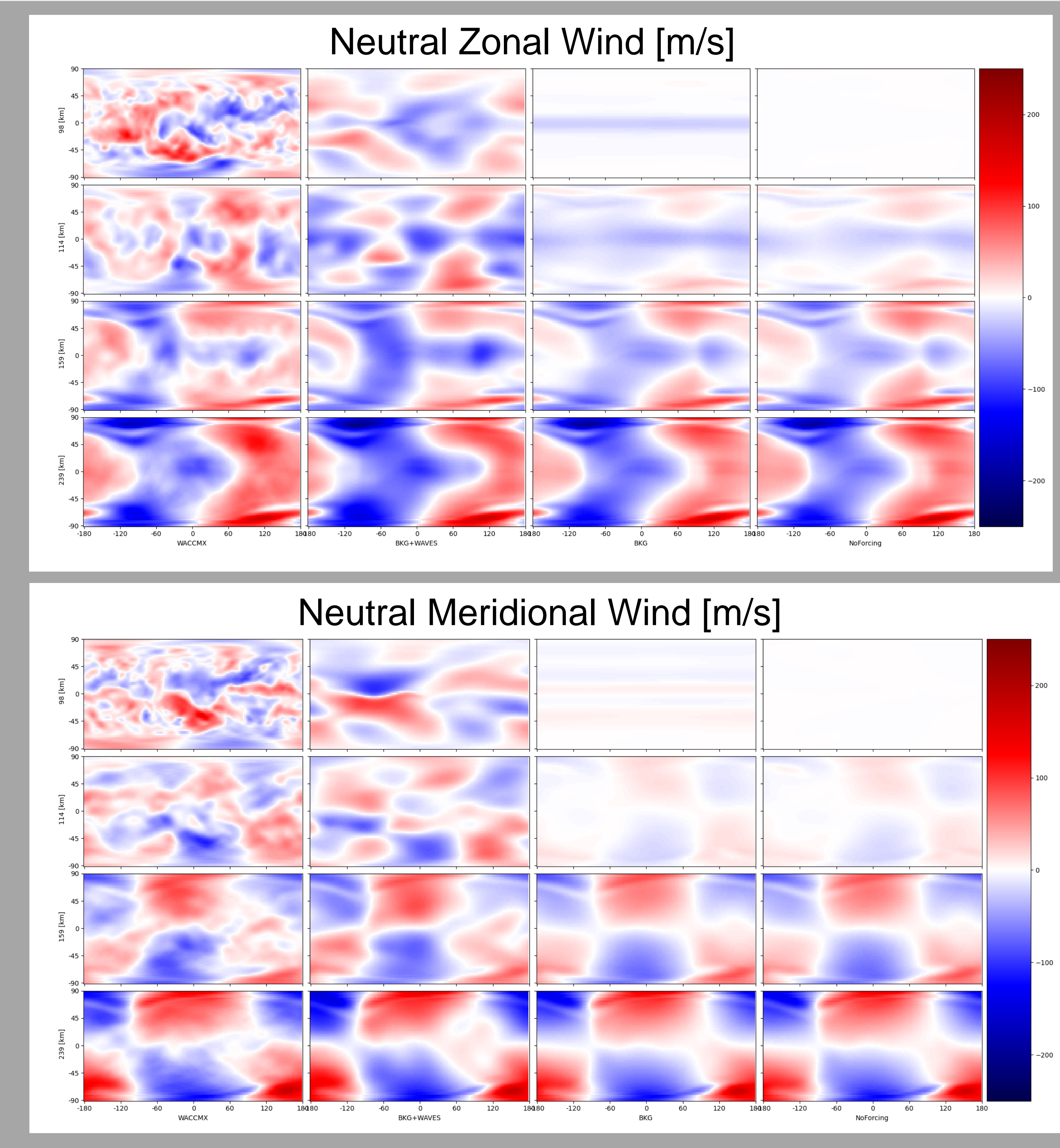
- WACCM-X
 - WACCM-X result at lower TIE-GCM boundary
 - Converted into SABER/TIDI input files (only WACCM-X input)
- Climatology + Wave (BKG+WAVE)
 - Horizontal Wind Model + NRLMSIS (HWM_MSIS)
 - Global Scale Wave Model (GSWM)
- Climatology (BKG)
 - Horizontal Wind Model + NRLMSIS (HWM_MSIS)
- No lower boundary forcing

Neutral winds (figures on the right)

- WACCM-X lower boundary forcing resolves much smaller scales
- Impact of lower boundary forcing on neutral winds only important below 250km

Total electron content (figure below)

- General structure very similar, but effect of lower boundary on TEC visible (no forcing vs WACCMX)
- Small scale structures of WACCMX run visible in upper row of TEC integrated up to 150km
- TEC difference as large as factor of 2



References:
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