

ICON Data Product 4.1: HME The Lower Boundary for TIE-GCM

This data product contains the lower boundary of TIE-GCM including zonal wind, meridional wind, temperature, and geopotential height. Tidal structures obtained from ICON-MIGHTI observations are fitted to Hough Mode Extension (HME). Global tidal perturbation field are reconstructed using ICON-HME at 97 km. ICON-MIGHTI winds and temperature from 94 km to 102 km in the latitude range of 10°S-40°N are used to fit to the HME. To cover all local time for tidal analysis, ICON-MIGHTI data are accumulated with a 35-day window. HME has been widely used and tested before, and detailed HME methodologies are summarized in *Forbes et al.* [1994] and *Oberheide et al.* [2011]. HME for ICON and application to TIE-GCM simulation is summarized in *Forbes et al.* [2017] and *Maute* [2017], respectively, and sensitivity of HME fitting to the data coverage can be found in *Cullens et al.* [2020].

Dimensions

NetCDF files contain variables and the dimensions over which those variables are defined. First, the dimensions are defined, then all variables in the file are described. The dimensions used by the variables in this file are given below, along with nominal sizes.

Dimension Name	Nominal Size
lat	74
lon	144
time	24
mtimedim	3

Variables

Variables in this file are listed below.

Variable Name	Description	Unit	Dimension
UN	Reconstructed zonal wind tidal structure at 97 km. Reconstructed field contains superpositions of diurnal tides (DW2 to DE3) and semi-diurnal tides (SW4 to SE3).	m/s	lon, lat, time
VN	Reconstructed meridional wind tidal structure at 97 km. Reconstructed field contains superpositions of diurnal tides (DW2 to DE3) and semi-diurnal tides (SW4 to SE3).	m/s	lon, lat, time
TN	Reconstructed temperature tidal structure at 97 km. Reconstructed field contains superpositions of diurnal tides (DW2 to DE3) and semi-diurnal tides (SW4 to SE3).	K	lon, lat, time
Z	Reconstructed geopotential height tidal structure at 97 km. Reconstructed field contains superpositions of diurnal tides (DW2 to DE3) and semi-diurnal tides (SW4 to SE3).	m	lon, lat, time
lat	Latitude	degree	lat
lon	Longitude	degree	lon
time	Hours since 0 UT		time
UT	Universal Time		time
year	Year		time
day	Day of year		time
mtime	[Day, hour, min]		time, mtimedim

Acknowledgement

This is a data product from the NASA Ionospheric Connection Explorer mission, an Explorer launched at 21:59:45 EDT on October 10, 2019, from Cape Canaveral AFB in the USA. Guidelines for the use of this product are described in the ICON Rules of the Road (<http://icon.ssl.berkeley.edu/Data>).

Responsibility for the mission science falls to the Principal Investigator, Dr. Thomas Immel at UC Berkeley: Immel, T.J., England, S.L., Mende, S.B. et al. Space Sci Rev (2018) 214: 13.
<https://doi.org/10.1007/s11214-017-0449-2>

Responsibility for the validation of the L1 data products falls to the instrument lead investigators/scientists.

- * EUV: Dr. Eric Korpela : <https://doi.org/10.1007/s11214-017-0384-2>
- * FUV: Dr. Harald Frey : <https://doi.org/10.1007/s11214-017-0386-0>
- * MIGHTI: Dr. Christoph Englert : <https://doi.org/10.1007/s11214-017-0358-4>, and
<https://doi.org/10.1007/s11214-017-0374-4>
- * IVM: Dr. Roderick Heelis : <https://doi.org/10.1007/s11214-017-0383-3>

Responsibility for the validation of the L2 data products falls to those scientists responsible for those products.

- * Daytime O and N2 profiles: Dr. Andrew Stephan : <https://doi.org/10.1007/s11214-018-0477-6>
- * Daytime (EUV) O+ profiles: Dr. Andrew Stephan : <https://doi.org/10.1007/s11214-017-0385-1>
- * Nighttime (FUV) O+ profiles: Dr. Farzad Kamalabadi : <https://doi.org/10.1007/s11214-018-0502-9>
- * Neutral Wind profiles: Dr. Jonathan Makela : <https://doi.org/10.1007/s11214-017-0359-3>
- * Neutral Temperature profiles: Dr. Christoph Englert : <https://doi.org/10.1007/s11214-017-0434-9>
- * Ion Velocity Measurements : Dr. Russell Stoneback : <https://doi.org/10.1007/s11214-017-0383-3>

Responsibility for Level 4 products falls to those scientists responsible for those products.

- * Hough Modes : Dr. Chihoko Cullens : <https://doi.org/10.1007/s11214-017-0401-5>
- * TIEGCM : Dr. Astrid Maute : <https://doi.org/10.1007/s11214-017-0330-3>
- * SAMI3 : Dr. Joseph Huba : <https://doi.org/10.1007/s11214-017-0415-z>

Pre-production versions of all above papers are available on the ICON website.
<http://icon.ssl.berkeley.edu/Publications>

Overall validation of the products is overseen by the ICON Project Scientist, Dr. Scott England.

NASA oversight for all products is provided by the Mission Scientist, Dr. Jeffrey Klenzing.

Users of these data should contact and acknowledge the Principal Investigator Dr. Immel and the party directly responsible for the data product (noted above) and acknowledge NASA funding for the collection of the data used in the research with the following statement : "ICON is supported by NASA's Explorers Program through contracts NNG12FA45C and NNG12FA42I".

These data are openly available as described in the ICON Data Management Plan available on the ICON website (<http://icon.ssl.berkeley.edu/Data>).