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Comparative Analysis of the Measured and Modeled Equatorial Thermospheric Wind Climatology

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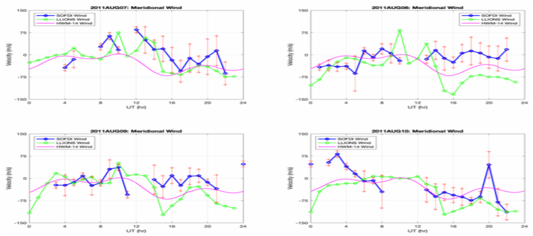
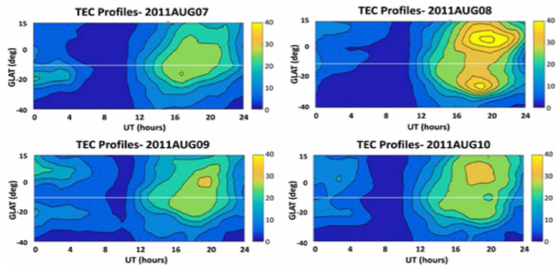
Wind on EIA Asymmetry:



The blue (green & magenta) curve with circles is the observed (modeled) meridional wind velocity by SOFDI (LLIONS & HWM-14), and the vertical red lines represent the error bars of the measured wind as a function of UT.

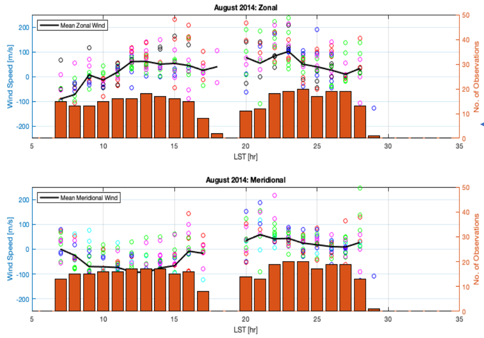


Contour plots of total electron content (TEC) distribution corresponding to days of top figure. The white horizontal line represents the location of the geomagnetic equatorial line.

Takeaway: The equatorial ionization anomalies (EIAs) corresponding to weak meridional winds seem the most symmetric. The strength, latitudinal extension, and symmetry/asymmetry of the equatorial anomaly crests are significantly controlled by the winds.

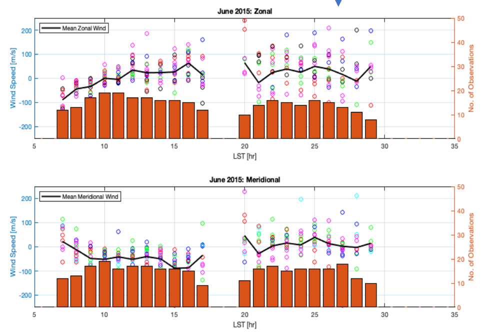
SOFDI Wind Climatology:

- Second-generation, Optimized, Fabry-Perot Doppler Imager (SOFDI).
- Operating in Huancayo, Peru (Geo:12.1°S, 75.3°W; Mag: 1.9°N).
- Utilized the OI 630-nm emission for wind measurements.
- Designed to measure both day and nighttime thermospheric winds.



August, 2014

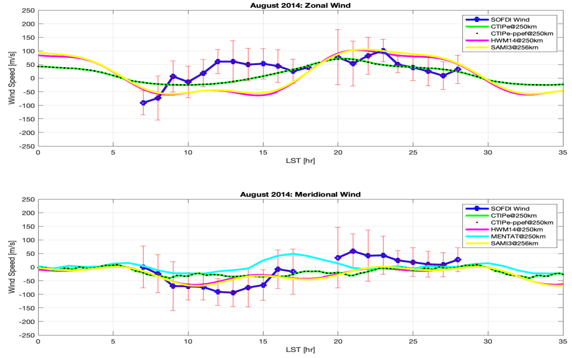
June, 2015



The SOFDI winds into 1-hour time bins (colored circles), the black curve represents the monthly mean wind, and the red bar graphs showing the no. of observations that are done in each hourly bin.

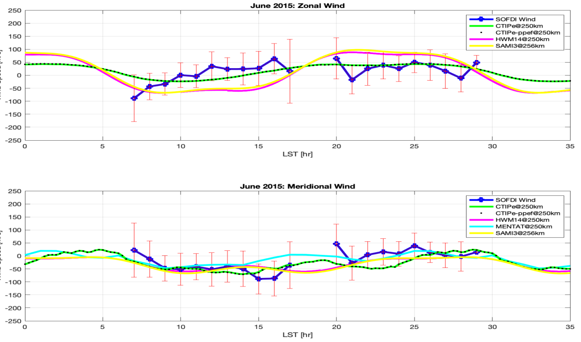
Takeaway: SOFDI wind data system can be used as a benchmark for validating various thermospheric/ ionospheric wind models and also be used as inputs or boundary conditions for physics-based models of the upper atmosphere.

Comparison: Measured and Modeled Wind Climatology



August, 2014

June, 2015



The blue (green, black, magenta, cyan, & yellow) curve with circles is the observed (modeled) zonal and meridional monthly averaged wind components into 1- hour time bins by SOFDI (CTIPe, CTIPe-PPEF, HWM-14, MENTAT, & SAMI3), and the vertical red lines represent the error bars of the observed winds.

Takeaway:

- The overall agreement between the observed and modeled wind results is very good. The measured SOFDI meridional winds correspond well to modeled (LLIONS, CTIPe, CTIPe-PPEF, HWM-14, SAMI3, and MENTAT) wind results, EXCEPT for the daytime eastward winds seen in the 630-nm emission.
- The daytime monthly mean of the SOFDI zonal winds matched better with CTIPe results than that of other models. Moreover, the CTIPE-PPEF model gives storm time responses of the thermosphere. The neutral wind components are similar to that obtained from CTIPe model since observed days are not significantly disturbed.

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