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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Application of Fengyun 3-C GNSS occulation sounder for assessing global ionospheric response to magnetic storm event" *by* Weihua Bai et al.

Anonymous Referee #1

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This paper reports on retrieval of NmF2 (peak electron density) derived from GNOS (combined GPS + Beidou navigation products). It compares the retrieved NmF2 to ionosonde data. Fengyun is in a sun-synchrous orbit at 836 km, with an inclination of 98.8 degrees. GNOS can track up to 6 GPS satellites and 4 Beidou satellites at any given instant. Daily retrievals are about 220 from GPS and 130 from Beidou. Eqn. 1 is stated to eliminate clock differences and other instrumental biases.

365 day period between oct 1,2013 and sep 20, 2014 used. Figure 4 compares NmF2 measurements from the GNOS GPS occultation and Figure 5 shows those produced by GNOS BDS occultation.

The comparison between these two figures is the only thing I find in this paper that

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Discussion paper

could be called a "new finding." The differences between these two figures should be discussed in detatil.

What is new and different about this paper. I see that 1) it provides data from the Fengyun 3-C occultation sensor, and that this satellite is adequately described in the paper. 2) it is using a combined Beidou and GPS sensor.

1) The authors do not adequately describe the Beidou constellation, signals or frequencies. Beidou is still a relatively new system and has not been well-referenced in the literature yet. Why are the results between Beidou and GPS different? The authors should discuss this in detail and provide more background introduction to Beidou. 2) Not enough background material was provided. In particular, the paper by Hararulema and Carelse (2016). Their paper was published before yours and discusses the first long-term comparison between RO and ionosonde NmF2 and hmF2 data during storm conditions. THey also provide results (a similiar finding to yours) that NmF2 and hmF2 agree to within 21% and 9% (1 standard deviation), respectively. They also saw that maximum deviations for both NmF2 and hmF2 occur during high solar activity periods 3) I do not think that equation 1) eliminates all the biases. There are both satellite and receiver biases (differential delay differences between the two frequencies) that are not eliminated in this equation. Please discuss. Add or discuss these references in the paper. Reference: John Bosco Habarulema and Suné Arlene Carelse, (2016) Long-term analysis between radio occultation and ionosonde peak electron density and height during geomagnetic storms NmF2, HmF2 4110 Geophysical Research Letters 10.1002/2016GL068944

Other papers which should be mentioned are also given here: Habarulema, J. B., Z. T. Katamzi, and E. Yizengaw (2014), A simultaneous study of ionospheric parameters derived from FORMOSAT-3/COSMIC, GRACE, and CHAMP missions over middle, low, and equatorial latitudes: Comparison with ionosonde data, J. Geophys. Res. Space Physics, 119, 7732–7744, doi:10.1002/2014JA020192.

Garcia-Fernandez, M., M. Hernandez-Pajares, J. M. Juan, and J. Sanz (2003), Improvement of ionospheric electron density estimation with GPSMET occultations using Abel inversion and VTEC information, J. Geophys. Res., 108(A9), 1338, doi:10.1029/2003JA009952. Yue, X., W. S. Schreiner, J. Lei, S. V. Sokolovskiy, C. Rocken, D. C. Hunt, and Y.-H. Kuo (2010), Error analysis of Abel retrieved electron density profiles from radio occultation measurements, Ann. Geophys., 28, 217–222.

Yue, X., W. S. Schreiner, C. Rocken, and Y. H. Kuo (2011), Evaluation of the orbit altitude electron density estimation and its effect on the Abel inversion from radio occultation measurements, Radio Sci., 46, RS1013, doi:10.1029/2010RS004514.

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