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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "Electron density profiles probed by radio occultation of FORMOSAT-7/COSMIC-2 at 520 and 800 km altitude" *by* J. Y. Liu et al.

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Dear Editor and Referee,

We would like to thank you for your comments on the manuscript entitled "Electron Density Profiles Probed by Radio Occultation of FORMOSAT-7/COSMIC-2 at 520 km and 800 km Altitude". Our responses to your comments are as follows:

REFEREE RESPONSE:

"This paper answers a question: how does the satellite orbit altitude affect the Abel



retrievals? Through the analysis of the RO observations obtained at different COSMIC orbit altitudes and simulation study, the authors find the effect of satellite altitude on the Abel inversion is not significant. Generally speaking, this study would have been valuable if this question had never been answered before. However Yue et al. [2011] has investigated this question, as announced clearly in their abstract, "Simulations based on COSMIC observations using NeQuick model indicate that the solar activity and the satellite orbit altitude variations will not influence the ratio of the successfully retrieved electron density profiles to the observed occultation events and the relative Abel inversion error of the electron density as well". This study therefore seems a bit redundant, and not good enough for publication. 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 oc- cultation measurements, Radio Sci., 46, RS1013, doi:10.1029/2010RS004514. "

Response: Yue et al. (2011) carry out simulations based on F3/C observations using NeQuick model and indicate that the solar activity and the satellite orbit altitude variations will not influence the ratio of the successfully retrieved electron density profiles to the observed occultation events and the relative Abel inversion error of the electron density as well. Their study seems to suggest that the electron density profiles retrieved from the satellites at 500 and 800 km are identical. To valid the above inference, the authors conduct an unrealistic OSSE by comparing the electron density profiles retrieved from satellites at 800 km altitude and those from satellites with identical sounding geometries but at 500 km altitude. Figure 1 shows that the electron density profiles retrieved by the satellite at 500 km tend to be smaller than those at 800 km altitude in the EIA region but are greater than these in the magnetic equator and/or poleward sides of the EIA crests. These discrepancies result from the spherical symmetry assumption of Abel inversion in the EIA region (Liu et al., 2010a). By contrast, Fig. 4 (in manuscript) shows that the electron density profiles retrieved by the satellite at 500 km are very different from those at 800 km altitude, especially in the EIA region.

Note that in Fig. 4 (in manuscript) the sounding geometries are adopted from the F3/C observation. This further indicates that the differences of the sounding geometry at 500 and 800 km altitude satellites could significantly influence the retrieved electron density profiles by using Abel inversion. It should be noticed that the sounding geometry effect was not investigated by Yue et al. (2011). Thus, it might not be justified to comment "This study therefore seems a bit redundant, and not good enough for publication."

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 1615, 2015.



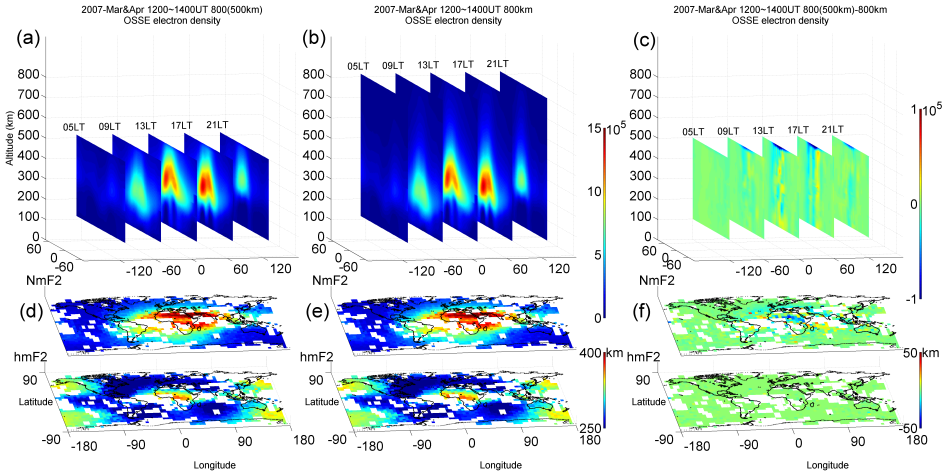


**Fig. 1.** The Abel inversion OSSE electron density, NmF2, and hmF2 observed from 500 km and 800 km altitude satellites, which their sounding geometries are identical, and their difference.