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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "The FengYun-3C radio occultation sounder GNOS: a review of the mission and its early results and science applications" *by* Yueqiang Sun et al.

**Anonymous Referee #3**

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The paper provides an overview of the Radio Occultation mission on board the FengYun 3C satellite. It shows a summary of the system architecture and instrument characteristics, processing characteristics, results/validation of neutral atmospheric products (basically refractivity), ionospheric profiles (but only some results on the estimated NmF2 is provided here), on the applications of derived products (thus applications related to assimilation into NWP models, ionospheric products).

The paper is quite well structured, but it is a summary of something presented in other more detailed papers. Nice to have a summary, but the summary should include all the aspects. In this paper, and in particular in the sections related the discussion of prod-



ucts and their validation, only very few examples are provided. For the atmospheric profiles, the discussion is done only at the refractivity level (nothing is said about bending angles and their validation results, which are also very important in the RO community). For the ionosphere monitoring, it is only provided a scatter plot with estimation of correlation between NmF2 derived by processing GNOS data and ionosonde data.

All the results presented are taken by other papers (a reference is always provided), which contains a lot of other interesting information worth to be presented in a summarizing paper like this one.

This is the most critical point I'd like to address to the authors. In this form I'd reject the paper, encouraging the authors to submit a more complete one.

Then there are other major points that I'd like to put in evidence.

Sect 2.4: here you provided some hints on the Geometric Optics (GO) approach to estimate bending angles. But you are using the ROPP software, where also a more efficient wave optics (WO) approach is implemented. Not clear why you provided details on the GO one only. Are you using also the WO retrieval in the lower troposphere or not?

Sect 2.4: regarding TEC estimation. Eq 4 provides you the uncalibrated TEC. For two reasons: first, using only L1-L2, the effect of initial ambiguities is not removed. The TEC is thus completely biased. You should level it to the P2-P1 pseudorange based TEC; second, the leveled TEC should then be corrected by the receiver and transmitter differential code biases. I don't see any description of this standard way to process ionospheric observations.

Sect 2.4: always on the retrieval of ionospheric data. One problem in using the Abel inversion to obtain Ne(h), Eq 5, is the initialization at the LEO height. You should have an estimate of TEC at the LEO height. Could you discuss this?

Sect 3.1: Please use tables to summarize results/validation of POD results. The entire

section presents results in a way that is really difficult to be followed. Moreover, being this a summary, I'd like to see some results also regarding LEO velocities and clock bias estimations.

Sect 3.2: the same here. Use tables to present the results. Define clearly what is the background (true) for evaluating your relative errors. And show/discuss results also at the bending angle level

Sect 3.3: same here. Use tables and try to be more complete in the description of results obtained related the ionospheric monitoring.

Sect. 4.2: I don't understand the difference between this section and Sect 3.3. Here you should have been discussed Application of ionospheric products. Probably something more is done or will be done regarding space weather activities.

I found some typos and bad written sentences. Here a (not exhaustive) list (# shows the row number)

page 2, #10-16: reformulate, it is bad written

page 8, #6: is the open loop baseband signal sampled at 100 kHz or 100 Hz as stated in Table 1?

page 10, #8: are the ground stations used also for computing GPD/BDS orbits and clocks?

page 12, #4-8: bad written. Could you please clarify is you are using single or zero differencing? If BDS and GNOS clock stability is enough, why you have to use single differencing?

page 11, #15: What are GNSS position package data and satellite precision ephemeris data? Bad written. Why you insisted with using "precise ephemeris"? Maybe you wanted to say "precise positions and velocities"?

page 20, # 17: could you please provide further details or define better this ACC?



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