

Anonymous Referee #1

The latitudinal dependence of the fractional refractivity deviation on the choice of the parameter β is an intriguing feature of the present analysis. In the subtropics at altitudes between 1 and 2 km the sensitivity (in particular for $3 < -10$ km/rad) is larger compared to the latitude band -10°S to 10°N . An obvious question is if this latitudinal dependence is correlated with the latitudinal dependence of strong (horizontal) refractivity gradients extracted from ECMWF meteorological fields.

Yes, as visible from the manuscript, the latitudinal dependence is correlated with strong horizontal gradients of refractivity both in the real atmosphere and in ECMWF meteorological fields.

Second, I would suggest to improve the graphical representation of the results by splitting the right panel in Figs. 3 to 11 into two panels, one showing the CT2 results ($\beta = 0$ km/rad) and the other the difference between CT2A and CT2.

Ok, we agree this improves the visual presentation of the results. We hence added one more panel with the CT2A–CT2 difference.

Technical corrections:

Page 2, line 46:

"a short-wave asymptotical solution" → "a short-wave asymptotic solution"

OK.

Page 2, line 51:

Gorbunov et al. (2004) probably should read Gorbunov and Lauritsen (2004b).

OK.

Page 3, line 69:

"which is known the Bouger law" → "which is known as Bouguer's law"

OK.

Page 4, line 117:

"although it may have multiple projections to the axis of time t ,"

I would suggest instead "although it may not be single-valued with respect to time t ," or similar.

OK.

Page 5, line 138:

"instant frequency" $\rightarrow$ "instantaneous frequency"

OK.

Page 7, line 173:

"This transform is performed under the application of the procedure of the stationarization of the transmitting satellite [...]" I suggest to rephrase this sentence.

The sentence is rephrased as follows: "This transform is preceded by the stationarization..."

Page 7, line 186:

I assume here $\tilde{u}(\xi)$ should read $\tilde{u}(\sigma)$ instead.

Yes.

Page 8, eqn. 18: A closing bracket is missing.

OK.

Page 9, line 226:

[Gorbunov2004b] probably should read (Gorbunov and Lauritsen, 2004b).

Ok, rectified. We had missed the LATEX citation command here.

Page 10, line 263:

"The difference in the results of the application of these WO methods is less significant than the difference coming from other parts of RO data processing systems, [...]" I suggest to add a reference.

Ok, we added two references:

Gorbunov, M. E.; Shmakov, A. V.; Leroy, S. S. & Lauritsen, K. B. (2011), 'COSMIC Radio Occultation Processing: Cross-center Comparison and Validation', *J. Atmos. Oceanic Technol.* **28**(6), 737--751.

Gorbunov, M. E.; Benzon, H.-H.; Jensen, A. S.; Lohmann, M. S. & Nielsen, A. S. (2004), 'Comparative analysis of radio occultation processing approaches based on Fourier integral operators', *Radio Sci.* **39**(6), RS6004.

Page 11, line 282: [Arnold1978] → (Arnold, 1978)

Again rectified in LATEX. The LATEX citation command was inserted.

Page 11, line 299 and page 12, line 304: [Gorbunov2019] is not listed in the reference section.

It is, once again, a missing citation command. We carefully rechecked overall and found that further corrections of this type were needed for [Zou2019] and [Gorbunov2009a, Zou2019]. We hence also have corrected these.

Page 19, line 407:

"COSMC-ECMWF" → "COSMIC-ECMWF"

OK.

Page 21, line 476 and 478: "Intoduction" → "Introduction"

We found this to have been a typo in our BIBTEX data base, which also has been corrected.