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Atmospheric Measurement Techniques Discussions

Interactive comment on "Empirical model of the ionosphere based on COSMIC/FORMOSAT-3 for neutral atmosphere radio occultation processing" *by* Miquel Garcia-Fernandez et al.

Anonymous Referee #1

Received and published: 18 August 2017

General comments ————————-

Overall this is an interesting paper, which provides a new 3D model of the ionosphere derived from RO excess phase delay data. It also offers a new measure of ionospheric scintillations, derived from these electron density profiles.

I find the paper to be a little short on detail as regards the generation of the electron density profiles. Likewise the nature and detection of the 'wave-like' structures which they are sometimes said to exhibit.

I do not find the usefulness of the new 'OSPI' scintillation index to be overwhelming, but the authors are clear about the evidence in support of it, so that readers can draw

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their own conclusions.

With a few exceptions the English is clear and direct. The figures are generally clear, although some of the writing is very small on my pdf version. The paper is commendably brief. I recommend it for publication, subject to some minor corrections and additions.

Specific comments ————————-

P1, L7; and P11, L7: I'm not sure it's been proved that the availability of electron density profiles will definitely increase the accuracy of inverted bending angle profiles. Perhaps you could say " ... in the hope of increasing the accuracy ...". Or give a reference to support the original contention.

P2, L10; P6, L1: The Zorro formula is for bending angles, not phase delays. (And it's an approximation to a numerically calculated integral, not an analytic evaluation of it.)

P2, Sec 2.1: Please say a little more (or give some references) for the way the excess phase data are turned into (separable) electron density distributions. Please also give some details or references for the LMS method.

P7, L5: Please explain what you mean by 'wave-like structures'. For example, where are the wave-like structures in the green curve in Fig 6?

P9, Sec 3.1: OSPI is defined as the normalised standard deviation of (ne(h+dh) - ne(h)), where h is the height of the samples and dh is their separation. Have you examined the sensitivity to dh? What value did you choose? You say 'ca 1 to 3 km'. A different value might have led to a more convincing split between the 'clean' and 'scintillating' profiles in Fig 8, from which a less arguable choice for the threshold value might have followed. Please say a little about this.

P11, L2: Please quote the correlation coefficients between OSPI and S4, and between OSPI and SNR.

Technical corrections ————————

Typos:

P1, L10: You haven't yet defined separability hypothesis, so perhaps it should be in quotes?

P1, L12; P3, L1; P11, L13: 'peel onion' –> 'onion peeling'.

P2, L5: 'over impact parameter' –> 'as a function of impact parameter'.

P4, L5: 'inf' –> infinity symbol in integral.

P4, L14: 'One of the main advantages of this criteria is that it can be applied in an automated way' –> 'One of the main advantages of these criteria is that they can be applied in an automated way'.

P5, L8: 'allows guaranteeing' –> 'guarantees'.

P5, L8: 'reducing at a minimum' –> 'reducing to a minimum'.

P7, L11: 'top latitudes' –> 'high latitudes'.

P10, L10: 'electron density' –> 'peak electron density'.

Figures:

They are all a bit small, which makes the writing hard to read (e.g. the OSPI values in Fig. 7). Some of the figures are also a little 'unpolished', e.g. they include the filename in the title (Fig. 4, Fig. 7).

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