

Interactive comment on “Sodankylä ionospheric tomography dataset 2003–2014” by J. Norberg et al.

Anonymous Referee #2

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The presented dataset is useful (and hence so is its presentation) for tomographic studies on the mid-long time scale (one solar cycle), since ionospheric tomography data on a long enough time scale are still rare.

My general comment is that Section 2 could be made longer, to include a more detailed description of the conception of the data set. Also the discrepancy with IRI results requires more explanation.

My specific comments below mainly concern the explanations. Furthermore I have a few editorial comments.

Comments:

Page 2, line 25: The phase shift is proportional to the *integrated* number density.

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Page 3, line 2: Please provide some references which explain why the problem is ill-posed, and what can be done about it. Maybe also use some more words to explain it in this paper.

Page 4, line 9-10: Up to which latitude can GPS signals be used for direct measurements of the ionosphere? It seems strange that it's not possible in Finland, since they have been used for ionospheric tomography in Finland, e.g. by van de Kamp, *Annales Geophysicae*, 31, 75-89, 2013, doi:10.5194/angeo-31-75-2013. So please nuance this argument more.

Page 4, line 15: What is “global ocean”?

Page 4, line 23: Please provide more info on these “indirect measurements” of hmF2.

Page 5, section 2: Please provide more information. For instance, some specific questions: How many COSMOS satellites are there / are you using? What is the time resolution of the data? Is VTEC resolved only for the locations of the stations? (The text seems to suggest this.) It should be possible to do it also for the locations in-between. Are the data publicly available anywhere?

Page 6, line 1-2: “In Fig. 2 the number of satellite overflights are plotted against satellite elevation.” Please move this sentence to before your choice of 60° minimum elevation (previous page), because figure 2 still contains all elevations.

Page 6, line 5-11: The part “The orbital altitude of COSMOS satellites ... start from June 2004.” contains information about the geometry of the setup that would be useful to know earlier in this section. Please move it, for instance, to after the first sentence of the second paragraph of this section (after “... is tilted slightly eastwards”).

Page 6, line 12-13: Please provide more information on how the IRI data were integrated. Vertical, or along the signal paths? Between which heights were they integrated? Figure 9 (see below) seems to suggest you calculated the IRI results along the satellite paths. But since you are looking at VTEC at a certain location, it would

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be better not to include in the IRI results the same artefacts of the motion of the satellites as you have in the VTEC data. If you would have IRI results in a fixed location, a comparison with your measurements would enable you to verify that this artefact is negligible.

Page 6, line 17: Please give the exact definition of “summer” “winter” and “equinox” used here. Which start dates and end dates exactly?

Page 7, line 20: Can you calculate how a period of 105 minutes leads to the shift in daily times as observed in figure 9?

Page 7, line 23: Please provide some thoughts on the cause of the 40% discrepancy, in particular whether you think IRI is overestimating or the tomography results are underestimating.

Page 19, figure 9: Why do the IRI data contain the same periodicity as the tomography data? Is it because you are calculating VTEC along the satellite paths?

Page 19, figure 9: In the lower graph, a relative difference (i.e. absolute difference divided by one of the two) would be more useful than the absolute difference, to evaluate the performance.

Editorial comments:

Several places: The words “descending” and “ascending” are misleading; the satellites are not really going down or up. Please replace these terms by “southward” and “northward” respectively.

Page 2, line 9: “three-to-five” → “three to five”

Page 3, line 7: “development, similar” → “development, a similar”

Page 4, line 2: “stabile” → “stable”

page 4, line 20: “in data” → “in the data”

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Please rearrange the figures in the order in which they are referred to. This means moving figure 2 to after figure 4 (and of course, change their numbers accordingly).

Page 5, line 16: “the direction is tilted eastwards” is not really clear. I would suggest to write: “eastwards from south”.

Page 5, line 20: “As in” → “Since in”

Page 7, line 15: remove “the differences between” (‘indistinguishable’ means that differences are invisible.)

Page 7, line 28: “11-13 MLT” is inconsistent with the caption of Figure 10: “11-14 MLT”.

Page 8, line 14: “higher of” → “higher than”

Page 8, line 21: “consists only” → “consists of only”

Interactive comment on Geosci. Instrum. Method. Data Syst., 5, 385, 2015.

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