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Interactive comment on "Ionosonde Total Electron Content Evaluation Using IGS Data" *by* Telmo dos Santos Klipp et al.

Anonymous Referee #2

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Report on the paper "Ionosonde Total Electron Content Evaluation Using IGS Data" by Telmo dos Santos Klipp et al. angeo-2019-131 The manuscript compares the "Ionosonde Total Electron Content, ITEC", derived from groundbased ionogram measurements, with the "International GNSS Service (IGS) vertical-TEC, vTEC" for a low latitude/equatorial region. The authors use two years of ionogram data from a 5-station Digisonde network in Brazil. Avoiding the mistake made by some of the previous analyses, the authors made careful use of the "confidence level" information contained in the Digisonde ionograms to filter out questionable ionogram data. This careful analysis of the difference between ITEC and vTEC focussing on the equatorial ionosphere anomaly (EIA) region should be published if appropriate revisions and corrections can be made. Here are the major concerns. 1. The authors state that "they noticed" that

ITEC systematically underestimates vTEC, and they explain this by claiming that the ITEC profile integration stops at 900 km. Both claims are not quite correct. Firstly, the original ITEC paper by Reinisch and Huang [2001], which the authors have cited, shows that the height integration for the ITEC calculation goes to infinity, and is not stopped at ∼900 km. The Digisonde calculations of ITEC assume an ïĄą-Chapman topside profile with constant scale height Hm. Secondly, extensive studies by Belehaki et al. [e.g., 2004, 2012] had shown as early as 2004 that the Digisonde ITEC systematically underestimates vTEC; Belehaki's explanation was that a constant scale height Hm (calculated from the bottomside profile for heights near hmF2) makes the topside profile decay too rapidly with height. They concluded that the plasma above about 900 km is practically not included in the Digisonde's ITEC value. Instead of saying "they noticed" the underestimate, it might be more correct to say that the Belehaki et al. results were "confirmed" to also apply in the equatorial region. 2. Since the authors try providing a comprehensive review of the ITEC technique, why do they not mention the "Vary-Chap topside profile" that was introduced by Reinisch et al. [2007] based on a topside scale height H(h) that varies continuously with height h, see also Nsumei et al. [2012]. 3. What is the meaning of RMSE in eq. (1)? The "error" is defined as the "difference between TEC values". Which TEC values? Is the error defined as the deviation from a mean? The mean over what samples? It would be helpful if the authors would provide a clear description, and explain what is plotted in Figures 6 and 7. 4. The paper makes a clear point in emphasizing that any high-volume data analysis depends on the availability of automatically processed data, and of automatically generated data confidence scores, this is very good and important. The Brazilian Digisondes have used the ARTIST-5 autoscaler (as stated on p3/25), so why is there such lengthy discussion of the performance of ARTIST 4.0, 4.5, and AUTOSCALA when none of these were used for the analysis of the 2016-2017 data reported in this paper? A short note may suffice to alert the reader. (By the way, older Digisonde data can be automatically reprocessed with ARTIST-5 using SAO-Explorer. Have you checked whether AUTOSCALA determines hmF2, which is a required input for the construction of the topside profile in Eq.

2?). 5. Figures 7c and 7d introduce the “Maximum Altitude” and ”Plasma Frequency”. How is the Maximum Altitude defined?

Some minor concerns: Careful proofreading of the text is required, e.g. gaped echoes traces → gapped echo traces, etc. It would be useful to systematically refer to “ITEC” (as derived from ionograms) and “vTEC” or “IGSTEC” (obtained from IGS maps), or similar notation, which would make it easier for the reader to follow the discussions.

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