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Comment on angeo-2022-1

Anonymous Referee #2

Referee comment on "Sounding of sporadic E layers from China Seismo-Electromagnetic Satellite (CSES) radio occultation and comparing with ionosonde measurements" by Chengkun Gan et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2022-1-RC2, 2022

The paper deal with the detection of sporadic E (Es) layers on a global scale applying the radio occultation (RO) technique. For their study, the authors use data obtained from the Chinese CSES mission. The authors developed a new algorithm to detect sporadic E signatures from RO profiles. The results show that Es appears mainly at heights between 90-110km and preferably in the summer hemisphere in the local daytime hours. The comparison with co-located ionosonde measurements shows a relatively high correlation between both measurements techniques.

The results more or less confirm what we know about sporadic E layer occurrence from former global studies. The paper does not provide new knowledge on the Es phenomenon. Nevertheless, I support the publication of the manuscript after a careful revision since it introduces the valuable and widely unknown RO data set of the CSES satellite to the community. Please find my detailed comments below.

- It would be informative to add some more details about the CSES satellite. At which altitude and inclination is it flying?
- Do the RO profiles cover the whole globe? Are the data equally distributed in local time?
- Could you add some information to the "Methods" section about the altitude resolution of your RO profiles? What is the signal tracking frequency?
- Figures 4-6 are my major point of criticism: Due to the relatively low amount of RO profiles, the plots 4-6 are not very informative and deviate distinctly from existing global Es plots. I recommend increasing the grid size slightly (maybe 10° in longitude) or working with sliding windows of a bigger size.
- line 240-243: There is a contradiction between figure 6 and the text. In the text, you write that the high incidence of Es in the local afternoon is related to high solar radiation. In Fig. 4 (summer plot) the values of Es occurrence are of the same magnitude at 3-6 in the morning where there is definitely no sunshine. Could these high early morning values simply be relicts from data availability? Is an effect from the wind possible? Please comment on it.

- You show electron density profiles obtained from RO measurements. These profiles are frequently not accurate for smaller-scale ionospheric phenomena since they rely on assumptions like spherical symmetry which is not valid for sporadic E. Could you comment a bit on the assumptions used for calculating the electron density profiles here?
- Figure 8: I assume the black line is no regression but x=y line, correct? It is a little bit misleading since there is definitely an offset between both parameters simply because virtual heights are always deviating from geometric ones.
  What is the mean offset between both techniques and can this be explained by different altitude systems?
  In the lower right plot, there should be 5 couples. I only see 4. Is it convincing enough to calculate a correlation coefficient from 4-5 values only?
- Please carefully revise the complete references section. There are many typos and different styles in citing existing literature.

small improvements:
line 185-186. I assume there is a detail missing in this sentence. For me, it is hard to follow your intention.
line 201, 222, and 239: ...results with spring.... "with" is not the correct word here. Please reformulate.