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Comment on angeo-2021-70

Anonymous Referee #1

Referee comment on "Temporal and altitudinal variability of the spread F observed by the VHF radar over Christmas Island" by Ricardo Yvan de La Cruz Cueva et al., Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2021-70-RC1>, 2022

Revision of "Time and altitude Spread F echoes distribution over Christmas Island VHF radar" by Cueva et al.

This manuscript presents a short report on the altitudinal and temporal distribution of Spread F echoes in the equatorial region. The authors used VHF radar data from Christmas Island and investigated the solar cycle dependence of the time of occurrence and concentration height of equatorial Spread F (plumes). This topic is within the scope of the Annales Geophysicae and the results sound interesting. However, I would suggest major revisions before the final publication. Please see the following some of my concerns. It that can help the authors in the conduction of the revision process:

1. The title is confusing, I guess that "Temporal and altitudinal variability of the Spread F observed by a VHF radar over Christmas Island" sounds better for the purpose of the manuscript.
2. Several sentences of the manuscript are not written in the usual English language, producing some misunderstanding. So, I suggest a deep revision of the concepts. A strong example is that: the work investigates Spread F from VHF radar echoes. Sometimes, the authors say that they are investigating "Spread F echoes" that is correct, but sometimes, they refer simply as echoes and it can make confusion in the reader. I suggest using the same term in all sentences or define all the terms that could have the same meaning.
3. The definition of season presented in the lines 99-100 is not correct. It can produce different interpretations for the results. For instance, the Summer usually starts on 21 June and ends on 22 September. In my opinion, if the authors would like to emphasize the seasonal effects on the Spread F, they should use the correct definition for the season. Additionally, it can be interesting for the discussion because they will be able to make comparisons with other observations (previous works) that use the correct definition of the seasons. Only after these corrections, we can examine the real effect of the season on the Plumes over Christmas Island. I have other

observations to make on this topic that are presented in the manuscript, but I prefer to see whether the correct definition of the season will not address those points.

4. The authors are suggesting that the occurrence of Spread F are inversely proportional to the solar cycles. They must explore this result more and try to explain how it can be explained physically.

5. Is Figure 4 really necessary in the Conclusion section? Why do not the author include it in the result and Result and Discussion section to explore better the results?

6. Line 59: "large data" => "long term data".

7. What is "SRI" in line 71?

8. Line 74: Please, explain what is the reason to use the North beam of the radar only.

9. Lines 85-89: I guess it can be removed to another section. It is not necessary in the Data analysis description

10. Lines 91-94: The authors must remind that the disturbed dynamo is another phenomenon that can produce unexpected behaviour in the dynamics of the F region at low latitudes in addition to the prompt penetration electric field..

11. Lines 112-116: This paragraph could be shifted to a place after the presentation of the results. It could help the author in the discussion.

12. Line 131: "... provided by Digisondes." I could not see those profiles in the chart of Figure 3 and 4.

13. Lines 174-177: I do not agree with the author that it is clear in Figure 4.

14. Lines 179-181: I guess these conclusions are not totally supported by the results. However, after the revision of the seasons, the authors can do a check.