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Comment on angeo-2021-38

Anonymous Referee #1

Referee comment on "Influence of the semidiurnal lunar tide in the equatorial plasma bubble zonal drifts over Brazil" by Igo Paulino et al., Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2021-38-RC1>, 2021

Review of "Influence of the semidiurnal lunar tide on the equatorial plasma bubble zonal drifts over Brazil" by Paulino et al (angeo-2021-38)

The paper presents an analysis of OI6300 airglow emissions to determine the semidiurnal lunar tide (M2) contribution to the zonal drifts of equatorial plasma bubbles (EPBs). Analysis of the airglow observations demonstrates that the M2 contributes ~5% to the EPB zonal drift variability. The M2 contribution to the EPB zonal drift variability is also found to vary with season and solar cycle. EPBs exhibit significant day-to-day variability, which is important to understand due to their negative impacts on various technologies. The present study is thus a useful contribution to present understanding of the EPB variability, and would be suitable for publication. There are, however, several aspects that I believe need to be clarified prior to publication. More detailed specific comments are provided below.

Major Comments:

1. In lines 56-57, the authors state "The observations were made between September 2000 and April 2007, centered at new moon periods, resulting in thirteen nights of data per month." The authors should explain why the observations are restricted to the thirteen days of observations that are centered on the new moon periods. I believe that this is due to the instrument being unable to observe EPBs during the full moon. Restricting the data to new moon periods also limits the lunar local times that can be observed, potentially making the fits to the lunar semidiurnal tide less certain. This limitation should be clearly explained in the text.
2. It is unclear based on the description provided in Section 2 if the analysis places any restriction based on geomagnetic activity. This should be clarified in the text.
3. Results are presented for Southern Hemisphere summer as well as the equinoxes. Is

there a reason why results are not presented for winter?

4. One of the conclusions, and intriguing aspects, of the study is the solar cycle dependence, which shows larger M2 amplitudes in the EPB zonal drifts during solar maximum compared to solar minimum. This is opposite what may be expected if the EPB zonal drifts are driven by the in-situ tide that is anticipated to be smaller during solar maximum. I believe that the authors should discuss this result in more detail. In particular, it is important to consider the fact that the analysis was performed for a longer period of solar maximum (September 2000 to December 2002) versus solar minimum (January to April 2007). This has the potential to influence the results and should be clearly discussed. Additional discussions of any previous investigations into the solar cycle variations of the lunar tide in the ionosphere-thermosphere should also be included.

Minor Comments:

1. Line 6: "dependents" should be "dependent"

2. Line 21: "motvement" should be "movement"

3. Lines 36-37: The sentence beginning with "As the PRE (vertical motion) ..." is unclear and should be rewritten.

4. Line 130: "during he" should be "during the"

5. Line 135: "200 to 2007" should be "2000 to 2007"