

Ann. Geophys. Discuss., author comment AC1
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Reply on RC1

Igo Paulino et al.

Author 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-AC1>, 2021

REVIEWER: ``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. ``

AUTHORS: Thank you for revising our manuscript and for the valuable suggestions that certainly will improve our paper.

REVIEWER: ``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.``

AUTHORS: The reviewer is right. That is a technical limitation because the all sky imager is sensitive to the Moon light. We have just explained it in the manuscript. Regarding the "...making the fits to the lunar semidiurnal tide less certain", the reviewer is right as well, however, choosing the 13 day in a month is enough to cover a full period of the oscillation as can be seen in Figure 1-3. Additionally, the presented results used a long period of observation which made possible a confident statistical analysis. Thank you for the comment and we have also added some words on this point in the manuscript.

REVIEWER: ``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."

AUTHORS: Thank you for the important comment. We have included the information in the manuscript that there were no magnetic disturbed days from the analysis. The M_2 appeared in the EPB zonal drifts independent of the geomagnetic influence, this is relevant for this work. Furthermore, during the high solar activity, when there is more influence of magnetic storms in the ionosphere, the amplitudes of the M_2 were higher.

REVIEWER: ``3. Results are presented for Southern Hemisphere summer as well as the equinoxes. Is there a reason why results are not presented for winter? "

AUTHORS: Thank you for the comment. Yes, the EPBs over Brazil have preferred occurrence from September to March. During the winter, the EPBs develop in a few nights ([https://doi.org/10.1016/S1364-6826\(02\)00089-5](https://doi.org/10.1016/S1364-6826(02)00089-5)), which is not statistically significant to compute the M_2 . We have also included a statement in the manuscript.

REVIEWER: ``4. One of the conclusions, and intriguing aspects, of the study is the solar cycle dependence, which shows larger M_2 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. "

AUTHORS: We agree with the Reviewer #1 that it is necessary to expand this discussion. It was the main concern of the other reviewers as well. We have made some comparisons as suggested by the Reviewer #1 and we will revise this topic according to the suggestions of the Reviewers # 2 and # 3 (It will be presented soon). Regarding the second concern, we have used 16 months during the LSA, which we believe to be enough to avoid short term variability in the M_2 . However, we agree with the reviewer that it is important to mention this difference in the manuscript.

REVIEWER: ``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'; Line 135: '200 to 2007' should be '2000 to 2007'. "

AUTHORS: We appreciate the correction from the reviewer. We have performed all of them in the manuscript according to the suggestions.