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Reply on CC1

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-AC2, 2021

REVIEWER: ``The paper remain significant in understanding the drivers and structuring 0f ionospheric irregularities once initiated. The paper can be accepted for publications but only after a minor revision to the current state. The minor revision is categorized into major corrections and minor corrections. ''

AUTHORS: Thanks for the contributions from Dr. Joseph Olwendo, who kindly revised our manuscript.

REVIEWER: ``How significant is the 5\% value of contribution of M2to the zonal drift velocity? why is the non-negligible. this aspects should be highlighted in the revised manuscript.''

AUTHORS: This contribution is relevant because, on average, it is always present with 5% of the EPB zonal drifts. Additionally, M_2 is one of the important features for the day-to-day variability of the EPB.

REVIEWER: ``what is the scientific explanantion regarding the solar activity and seasonal variations of M2. For example can you expalin why M2 is sttronger during solar max and vice versa.''

AUTHORS: It was the most polemic point of this manuscript. However, there are in the literature a couple of works that have pointed out the geomagnetic lunar tide as solar dependent (e.g., Yamazaki and Kosch, 2014). Regarding the ionospheric tide, there are not many reports on it. Assuming that the M_2 in the EPB zonal drifts is a combination of these two tides (geomagnetic and ionospheric), we expect that the M_2 can be solar dependent as well. Regarding the seasonality, the lunar tide in the MLT is stronger in the December solstice and there were observed enhancement of the M_2 associated with SSW events, which are typical from that period of the year.

REVIEWER: ``apart from M2 which plays only 5\% of the driving forces in the

zonal drift, which are the other drivers accountiong for 95\% in the zonal drift. ''

AUTHORS: The main contribution comes from the solar tide. However, it was observed contributions from other atmospheric waves (gravity and planetary waves, e.g., Abdu et al.,2009, Vadas and Fritts, 2009, Taori et al., 2011, Abdu et al., 2015). There are contributions from the ionosphere-magnetosphere interactions (e.g., Abalde et al., 2009) and we must consider the PRE dynamics (e.g., Kelley and Dao, 2018; Eccles et al., 2015) and the neutral wind daily variation as well (Saito and Maruyama, 2009).

REVIEWER: ``Last but not least, the authors should run the revised manuscript in spelling and grammar check before resubmiiting.''

AUTHORS: Thank you for the suggestion. We have done it.

REVIEWER: ``lines 2-3: "strong day to day .....near the equator" rewrite the sentence to improve clarity lines 13-14: "they consist.....ionosphere. the sentence lacks clarity and must be rewritten. lines 14-15: Changes in lines 13-14 must be matched by a revison in lines 14-15 too for clarity. lines 20-21: PRE in wrongly defined in this section and must be revised. lines 34: the sentence is hanging and is not well connected to the rest. revise this part. The authors should scrutinize the rest of the articles by rrunning the revised version on speclling and grammar check. the above are just afew glaring cases.''

AUTHORS: Thank you for the minor revision. We have revised all of them.

REFERENCES:

Abalde, J. R., Sahai, Y., Fagundes, P. R., Becker-Guedes, F., Bittencourt, J. A., Pillat, V. G., Lima, W. L. C., Candido, C. M. N., and de Freitas, T. F.: Day-to-day variability in the development of plasma bubbles associated with geomagnetic disturbances, J. Geophys. Res.-Space, 114, A04304, https://doi.org/10.1029/2008JA013788, 2009.

Abdu, M. A. and Brum, C. G. M.: Electrodynamics of the vertical coupling processes in the atmosphere-ionosphere system of the low latitude region, Earth Planets Space, 61, 385–395, https://doi.org/10.1186/BF03353156, 2009.

Abdu, M. A., de Souza, J. R., Kherani, E. A., Batista, I. S., MacDougall, J. W., and Sobral, J. H. A. (2015), Wave structure and polarization electric field development in the bottomside *F* layer leading to postsunset equatorial spread *F*, *J. Geophys. Res. Space Physics*, 120, 6930– 6940, doi:10.1002/2015JA021235.

Eccles, J. V., St. Maurice, J. P., and Schunk, R. W.: Mechanisms underlying the prereversal enhancement of the vertical plasma drift in the low-latitude ionosphere, J.

Geophys. Res.-Space, 120, 4950–4970, https://doi.org/10.1002/2014JA020664, 2015

Kelley, M. C., & Dao, E. V. (2018). Evidence for gravity wave seeding of convective ionospheric storms possibly initiated by thunderstorms. J*ournal of Geophysical Research: Space Physics*, 123, 4046– 4052. https://doi.org/10.1002/2017JA024707

Saito, S. and Maruyama, T.: Effects of transequatorial thermospheric wind on plasma bubble occurrences, Journal of the National Institute of Information and Communications Technology, 56, 257–266, 2009.

Taori, A., Patra, A. K., and Joshi, L. M.: Gravity wave seeding of equatorial plasma bubbles: An investigation with simultaneous F region, E region, and middle atmospheric measurements, J. Geophys. Res.-Space, 116, A05310, https://doi.org/10.1029/2010JA016229, 2011

Vadas, S. L., Taylor, M. J., Pautet, P.-D., Stamus, P. A., Fritts, D. C., Liu, H.-L., São Sabbas, F. T., Rampinelli, V. T., Batista, P., and Takahashi, H.: Convection: the likely source of the medium-scale gravity waves observed in the OH airglow layer near Brasilia, Brazil, during the SpreadFEx campaign, Ann. Geophys., 27, 231–259, https://doi.org/10.5194/angeo-27-231-2009, 2009.

Yamazaki, Y. and Kosch, M. J.: Geomagnetic lunar and solar daily variations during the last 100 years, Journal of Geophysical Research: Space Physics, 119, 6732–6744, https://doi.org/https://doi.org/10.1002/2014JA020203, 2014.