

## ***Interactive comment on “Equatorial Plasma Bubbles Developing Around Sunrise Observed by an All-Sky Imager and GNSS Network during the Storm Time” by Kun Wu et al.***

**Kun Wu et al.**

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Reviewer comment:

This paper reports all-sky airglow and GNSS-TEC observations of plasma bubbles forming around the sunrise terminator during the recovery phase of a magnetic storm. This represents a contribution to the study of magnetic-storm effects on ionospheric disturbances. Therefore, this paper is worth publishing in the journal following minor revision as described below:

Reply: We are grateful to the reviewer for useful comments on our manuscript. All the

C1

comments from you and also the other reviewer have been considered in the revised manuscript. And with the corrections made, we hope it's accepted for publication in Annales Geophysicae now. Thank you very much!

Reviewer comment:

'Break' and 'recombination' are nonstandard terminology for the phenomena the authors describe; for 'break' people usually say 'bifurcation', and for 'recombination', 'merging'. Actually, the 'break' that appears in the all-sky images looks to me like it could be the development of another bubble, or possibly the emergence of an arm on the side of their main bubble. These phenomena were discussed in detail, with simulations, by Huang et al. (Huang, C.-S., J. M. Retterer, O. de La Beaujardiere, P. A. Roddy, D. E. Hunton, J. O. Ballenthin, and R. F. Pfaff (2012), Observations and simulations of formation of broad plasma depletions through merging process, *J. Geophys. Res.*, 117, A02314, doi:10.1029/2011JA017084.)

Reply: Thanks for your suggestions. After reading your comments and some references, we found it was inappropriate for using 'break' and 'recombination' in the manuscript. So, we used 'bifurcation' and 'merging' to replace 'break' and 'recombination', respectively. Besides, we also cited related reference in the revised manuscript.

Reviewer comment:

The variation of the zonal drift within plasma bubbles with both solar activity and geomagnetic variations was discussed by Huang and Roddy (Huang, C.-S., and P. A. Roddy (2016), Effects of solar and geomagnetic activities on the zonal drift of equatorial plasma bubbles, *J. Geophys. Res. Space Physics*, 121, 628–637, doi:10.1002/2015JA021900.), which would be a useful reference here.

Reply: Thanks for your valuable suggestions. After reading the reference, we find the viewpoint of this paper is consistent with our results. It is a very important reference for our manuscript. So, we have cited it in the revised manuscript.

C2

Reviewer comment:

Finally, the presence of bubbles around sunrise was investigated thoroughly in the in-situ observations of the plasma density by the C/NOFS satellite, and those studies should be referenced here: Huang, C.-S., O. de La Beaujardiere, P. A. Roddy, D. E. Hunton, J. O. Ballenthin, and M. R. Hairston (2013), Long-lasting daytime equatorial plasma bubbles observed by the C/NOFS satellite, *J. Geophys. Res. Space Physics*, 118, 2398–2408, doi:10.1002/jgra.50252.

Reply: Yes, we keep the same point as yours. Huang et al. (2013) reported the observations of long-lasting daytime EPBs with the C/NOFS satellite during a geomagnetic storm in which the EPBs were persistent from the post-midnight sector through the afternoon. So, we have cited it in the manuscript.

Please also note the supplement to this comment:

<https://www.ann-geophys-discuss.net/angeo-2019-122/angeo-2019-122-AC2-supplement.pdf>

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