

## ***Interactive comment on* “Semimonthly oscillation observed in the start time of equatorial Spread-F” by Igo Paulino et al.**

### **Anonymous Referee #2**

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This paper describes day-to-day changes in the onset time of the equatorial spread-F, as observed by an all sky imager and coherent back scatter radar in Brazil. It is found that the onset time occasionally shows a semimonthly (14.5d) variation. The authors present argument that the observed semimonthly variation could be due to the lunar semimonthly tide or 16d planetary wave.

I have two major concerns about this manuscript. Firstly, the introduction does not include sufficient information for the reader to understand which part of the results are new. It is stated in Page 6 Line 15, "Lunar semidiurnal tides have been pointed out as important factor to the appearance and the start time of EPBs" but there is no reference to it. If there are already such relevant studies, they must be properly cited, and more importantly, the authors should clarify what are the new results obtained in the present

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study.

My second point is about the significance of the results. The authors fit a semimonthly (14.5d) curve to data segments that are sometimes shorter than one lunar cycle (Figure 2). I do not believe that it is appropriate to perform fitting to such sparse data unless the existence of the semimonthly variation is already known or highly expected. As the authors mentioned, the spread-F shows considerable day-to-day variability, and the authors' method could easily misinterpret random variability as a semimonthly oscillation. In my view there is no convincing evidence in this paper that supports the lunar semimonthly variation of the spread-F. The following are my comments on each event.

1. September 2003 (Figure 2a) There are only six data points. It is possible to fit "any" curve to such data. Thus the good fit does not necessarily suggest the semimonthly variation of the spread-F. The results actually seem to suggest that the start time of spread-F did not change much with time during this event.
2. October 2005 (Figure 2b) This is the most interesting event among those investigated in this paper. There is a shift in the start time of spread-F to later local times by almost two hours during 22-26 October and a shift to earlier local times during 29 October-3 November. Although it is not clear at this point whether these variations have anything to do with the lunar tide or 16d PW, this event deserves more detailed investigation. For instance, the authors could check whether the PRE plasma drift velocity shows consistent behavior. The authors should also examine whether source wave (lunar tide or 16d PW) existed in the middle atmosphere during this event.
3. November 2005 (Figure 2c) This has the same issue as the September 2003 event. The data are too few, so that the fitting is not reliable.
4. January 2008 (Figure 2d) The same as 1 and 3.
5. November 2005 (Figure 3) This is the same event as 3 (Figure 2c) but there is a

discrepancy in the phase of the semimonthly variation between Figure 2c and Figure 3. That is, the extension of the fitting curve in Figure 3 does not match the one in Figure 2c. This demonstrates the fitting technique used in this study is not reliable for extracting the semimonthly variation of spread-F.

6. November 2008 (Figure 4) The observed variation is very small (<30 min). The radar data is not able to resolve such a small variation as the authors mentioned.

As a summary, fitting a semidiurnal curve to small data segments is not a justifiable method to evaluate the influence of the lunar tide or 16d PW. This needs to be fixed before the paper is considered for publication.

What the authors could do instead is to take a statistical approach. Since the authors have long-term observations (September 2000 to December 2010), they could simply sort the data according to the lunar phase at the time of the observations, just like earlier researchers did to extract lunar tidal variations in other ionospheric parameters (e.g., Matsushita, 1967).

Matsushita, S., Lunar tides in the ionosphere, *Handb. Phys.*, 49/2, 547, 1967

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