

## ***Interactive comment on “Atmospheric diurnal and semi-diurnal variations observed with GPS radio occultation soundings” by F. Xie et al.***

### **Anonymous Referee #1**

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Referee comment on: ‘Atmospheric diurnal and semi-diurnal variations observed with GPS radio occultation soundings’, by F. Xie, D. L. Wu, C. O. Ao and A. J. Manucci.

#### General Comments:

This paper uses COSMIC temperature data to investigate the diurnal and semi-diurnal tide in the troposphere and stratosphere. The authors use two years of data (2007-08) to show the global changes in amplitude and position of the tides. The different tidal phenomena in different latitude regions are investigated in detail. The authors have performed a comprehensive analysis of the tides observable with COSMIC. However there are some points to consider before the manuscript may become ready for acceptance.

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#### Specific Comments:

1) The semi-diurnal tide is investigated in addition to the diurnal tide. From the Figures presented (especially Figure 2), it seems that the amplitude and phase measurements are too small to examine with the resolution of COSMIC. I am not convinced of the robustness of the semi-diurnal tidal results presented here and in later figures. The phase structure in Figure 2 is very noisy. How did you obtain the annual median phases? Were the phases unwrapped before determining the medians? The phase of the semi-diurnal tide should show a coherent structure in height. See the results for the three wind components in this altitude region by Riggins et al. (J. Geophys. Res. 2002, doi: 10.1029/2001JD001216). I would expect something similar for the temperature component. Based on the results presented in the manuscript, I suggest removal of the semi-diurnal tidal results.

2) What is the uncertainty of the COSMIC temperature and refractivity data at various altitudes? Do these uncertainties exceed the amplitudes of the semi-diurnal tides at certain altitudes? (It may also be that the uncertainties exceed the amplitudes of the diurnal tides around the upper troposphere as well, although at least here the phases show consistent values)

3) Throughout the manuscript, the approximate altitudes of given pressure levels are presented in parentheses afterwards which becomes distracting. I suggest plotting the approximate altitudes on the right hand y-axes of the appropriate Figures and then refraining from giving the altitudes in the text.

4) P25419, line 26. Where are seasonal (winter / autumn) profiles of diurnal amplitude shown, or how are they distinguishable in Fig 1a?

5) P25426, line 11. A reference is needed for the CMAM tides.

#### Technical Corrections:

1) p25410, line 18 ‘solar’

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- 2) p25410, line 24, 'by persistent daily'
- 3) p25415, line 4 'the cold, dry upper troposphere...'
- 4) p25418 line 9 'among tropical...'
- 5) p25418 line 13 ' against some earlier...'
- 6) p25419 line 17 'showing local minima'
- 7) p25422 line 5 'two maxima'
- 8) p25426 line 19 'COSMIC'
- 9) p25427 line 3 'Although the six COSMIC satellites...'

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