Reply to Comments from: Anonymous (Referee #2)

1. This paper analyzed the long-term trends of gaseous elemental mercury (GEM) concentrations at Cape Point between September 1995 - December 2005 and since March 2007 until June 2015. The paper focuses on the changing trend sign between 2004 and 2007. The authors concluded that the trend at Cape Point is qualitatively consistent with the trend changes in other observation sites and suggests a change in worldwide mercury emissions. Overall, the analysis is very straightforward and the paper is clearly written. However, I found the analysis might be a bit overly simplified and too qualitative. Some specific comments are given below. First, I can see that the measurement data at Cape Point is part of the GMOS and is an important dataset. But it is hard for me to see what the novelty of this paper is because the authors always stated that the results of this study are consistent with previous studies.

Reply: *The paper reports a reversal of trend of atmospheric mercury at Cape Point from a downward trend in the years 1995 – 2004 to an upward trend since March 2007 and tries to provide an explanation for it. Changing downward trends have been reported for atmospheric mercury concentrations and mercury wet deposition in the northern hemisphere, but Cape Point data is the only data set long enough to establish trends in the southern hemisphere.*

2. The comparison with emission inventory is quite weak. The authors tried to link the increase trend of GEM levels measured at Cape Point during 2007-2015 with the study of Zhang et al (2016), which indicated that the global mercury emissions had increased very slightly during 2000-2010, that is, by +5%. This is farfetched because the emissions given by Zhang et al. and the measurements are different years.

Reply: *We are aware of temporal mismatch between the trend since March 2007 until June 2015 and the emission estimates of Zhang et al. (2016) until 2010 and the problems with general attribution of trends in concentrations to trends in emissions. To ascribe the trend of mercury concentrations to the trends of emissions one needs a) emission estimates made with the same methodology over the years and b) emission estimates whose period matches the period of the monitoring. Emission estimates which fulfil both conditions are difficult to get. The more recent emission estimates tend to use improved methodology, i.e. are not consistent over the time. Because of methodical differences emission estimates by different authors are not consistent*

and cannot be compared. Emission inventories are also usually made with a delay of several years when the statistical input data are available. We are not experts on emissions inventories and have thus to rely on published work. To the best of our knowledge the estimate of worldwide emissions by Zhang et al. (2016) for 2010 is the most recent one which fulfil both conditions.

3. Line 30-33: The trend change is qualitatively consistent with the trend changes in GEM concentrations observed at Mace Head, Ireland, and in mercury wet deposition over North America suggesting a change in worldwide mercury emissions. This is a very important selling point for this paper. However, I wonder if this can be applied to worldwide emission. And more importantly, this should be supported by the data of Hg emissions or at least the drivers for Hg emission change. However, there is almost no analysis or discussions on the changes of Hg emissions in the paper.

Reply: *We have added a paragraph discussing the trends in worldwide mercury emission inventories. Lines 252-261 in the revised manuscript.*

4. Seasonal changes of biomass burning shall be discussed in more details and a more quantitative way if possible.

Reply: *We used CO measurements as a tracer for different seasonal trends of biomass burning but the result was inconclusive. As mentioned in the text, CO concentrations are highly variable and thus need longer periods to establish significant trends. Also mentioned in the text are large differences between estimates of mercury emissions from different authors.*

5. Line 259-262: This statement needs support of detail analyses.

Reply: *The hypothesis of biomass burning being the cause of different seasonal trends is discussed in the paragraph after line 262.*

6. Finally, the authors repeated some sentences in a few places of the paper. For example, Line 83-85 "According to Zhang et al. (2016) the worldwide anthropogenic emissions decreased from 2890 Mg yr^{-1} in 1990 to 2160 Mg yr^{-1} in 2000 and increased slightly 84 to 2280 Mg yr^{-1} in 2010 " was repeated in Line 250-252, and stated again in the conclusions. The downward trend during 1995-2004 was repeated for many times. The conclusions repeated the statements

in results and discussions. And there are many sentences in the abstract same as that in conclusions. Therefore, the authors shall short the paper by deleting the repetitive sentences.

Reply: *We followed the recommendations of both reviewers to shorten the paper by merging the sections "Results" and "Discussion".*