Response to referee comments

We would like to thank the referees and editor for the interest in our work and the helpful comments and suggestions to improve our manuscript. We have carefully considered all comments and the replies are listed below. The changes have been marked in the text using blue color.

Anonymous Referee #1

The behavior of Hg in the atmospheric is very important for the global Hg cycle. In this manuscript, Yin and colleagues determined TGM in Nam Co in the inland of Tibet Plateau and then used related models to address the transportation, transformation and source of TGM in the study region. This data reported in this paper is valuable because the study on the fate and transportation of TGM over the inland Tibet Plateau is almost blank. I suggest the manuscript to be accepted after minor revision.

Response: Thanks for your valuable advices and comments.

General comments:

1. Title: In the study, the authors measured the TGM concentration from January 2012 to October 2014 (< 3 years). Generally, the longer-term measurement should be over 5 years. I suggest the authors to modify the title for clarity.

Response: Thanks for your suggestion.

We modified the title to "Multi-year monitoring of atmospheric TGM at a remote high-altitude site (Nam Co, 4730 m a.s.l.) in the inland Tibetan Plateau" in lines 1-2.

2. Introduction. I suggest the authors to add some text to address the fate and transport of Hg in atmosphere, such as the redox chemistry of Hg, wet and dry deposition of atmospheric Hg and so on.

Response: Thanks for your suggestion. Changed as suggested in lines 54-56: "The global residence time of GEM is in the range of 0.5-2 years due to its high volatility, low solubility and chemical stability (Schroeder and Munthe, 1998; Shia et al., 1999). It is therefore transported globally over long distances (tens of thousands of kilometers) far from pollution sources." and lines 63-65: "RGM and Hg-P are generally depicted as local and regional pollutants, and the dry and wet deposition of RGM and Hg-P are

much faster than GEM (Schroeder and Munthe, 1998; Lin and Pehkonen, 1999; Lindberg and Stratton, 1998)."

3. Results and discussion. The present paper investigated the atmospheric TGM in a remote site. It should discuss more about the remote or rural sites, but not the urban sites.

Response: Thanks for your suggestion. Changed as suggested in lines 249-252: "The mean TGM concentration at the Nam Co Station is 1.33±0.24 ng m^{-3}, which is the lowest among all reported TGM concentrations at remote and rural sites in China (Liu et al., 2016; Fu et al., 2012b; Fu et al., 2012a; Fu et al. 2015; Ci et al., 2011; Dou et al., 2013; Zhang et al., 2015; Fu et al., 2010; Li et al., 2011; Zhang et al., 2013; Yu et al., 2015; Fu et al., 2008; Chen et al., 2013)."

4. Conclusion. I suggest the authors to shorten the conclusion.

Response: Thanks for your suggestion. We removed "The background TGM variation at the Nam Co Station was jointly regulated by surface-air flux and dilution in the planetary boundary layer in the diurnal cycle." as suggested.

Specific comments:

L67-72: The present paper focuses on the TGM in remote region, but the authors discussed a lot about atmospheric Hg in urban region. As mentioned above, I suggest he authors to address the fate and transport of Hg in the atmosphere. If the authors like to discuss the atmospheric Hg concentrations in different regions, it is more reasonable to discuss TGM in background or remote regions.

Response: Thanks for your suggestion. Changed as suggested in lines 63-65: "RGM and Hg-P are generally depicted as local and regional pollutants, and the dry and wet deposition of RGM and Hg-P are much faster than GEM (Schroeder and Munthe, 1998; Lin and Pehkonen, 1999; Lindberg and Stratton, 1998)." and lines 73-77: "Measurements of atmospheric mercury at background and remote sites in China include the following sites: Wuzhishan (2011-2012), Mt. Changbai (2008-2010), Mt. Waliguan (2007-2008), Mt. Ailao (2011-2012), Shangeri-La (2009-2010) and Mt. Gongga (2005-2006) with

concentrations ranging from 1.58 to 3.98 ng m^{-3} (Liu et al., 2016; Fu et al., 2012b; Fu et al., 2012a; Fu et al. 2015; Zhang et al., 2015; Fu et al., 2008)."

L107-109: This information is too general. I suggest to delete this paragraph in the revised manuscript.

Response: Thanks for your suggestion. We removed this paragraph.

L219-221: As mentioned above, it is not reasonable to compare to the urban and industrial regions. I suggest to compare the data to some rural or background sites in China.

Response: Thanks for your suggestion. Changed as suggested in lines 249-252: "The mean TGM concentration at the Nam Co Station is 1.33±0.24 ng m^{-3}, which is the lowest among all reported TGM concentrations at remote and rural sites in China (Liu et al., 2016; Fu et al., 2012b; Fu et al., 2012a; Fu et al. 2015; Ci et al., 2011; Dou et al., 2013; Zhang et al., 2015; Fu et al., 2010; Li et al., 2011; Zhang et al., 2013; Yu et al., 2015; Fu et al., 2008; Chen et al., 2013)."

Figure 1 and Table S1: I suggest the authors to remove all urban sites and use the global map to show the distribution of TGM or GEM concentrations in the remote and rural sites around the world. In the Table S1, most sites labelled as remote sites should be changed to the rural site. Don't forget the study in the ocean.

Response: Thanks for your suggestion. Table S1 was changed as suggested in supplementary material.

Figure 4: I suggest the authors to delete this figure. If they like to keep, try to merge all figures into one figure.

Response: Figure 4 was merged into a single figure as suggested in line 883.

Figure 8. Move to supplementary material.

Response: There was also some hesitation about the relevance of the box model from referee #3. However, referee #2 thought that there were important results that should be included in the conclusions. We have expanded the explanation for the use of the box model in Sec 2.4 to clarify the importance of the result. In brief, a model based on expected processes was not able to characterize the diurnal profile, but an alternative model with simple inputs was found that reproduced the measurements accurately. We believe that this is an important part of the model that will help in improving future models of reactions and processes affecting GEM and RGM.

Figure 10. Remove the line for no data. When there is no data, it should show blank.

Response: Thank you for pointing this out. Figure was modified as you suggested.