Response to Anonymous Referee #1

Comment1:

The focus of their study is an artificial pond, with a concrete bottom and water input from rain and street run-off. I do agree, that these anthropogenic structures also emit methane (in this case substantially), the importance of similar structures in China, Asia or worldwide should be discussed. (and not a comparison to beaver ponds in Canada)；

Response1：

We agree with the reviewer and acknowledge his comment. This type of urban pond with a concrete bottom is quite common in China and certainly in many other parts of the world. In the revised manuscript, we will highlight the prevalence of this type of artificial ponds in China. We will specifically compare our results with those from studies in comparable systems.

However，the reviewer believed that our results were not comparable to those of natural ponds, which we do not fully agree with. Despite the widespread and increasing abundance of urban ponds, little research has been done on methane emissions from such systems. Comparison of observed methane fluxes from urban ponds to fluxes from natural ponds, which are considered as global hotspots of methane emissions, provides a valuable context for the discussion of our findings. The substantial emissions that we observed in a city pond in China, potentially stimulates further research on geographic and climatic controls of methane emissions from urban ponds.

Comment2:

The fact that methane production and methane fluxes are enhanced with increasing temperature is nothing new, and this study does not reveal any further insights here. - The same is rue for the influence of organic matter, for which phosphate content is taken as proxy in this study. The more organic material can be degraded, the higher is the methane production.

Response2：

The reviewer is right and studies have shown that both temperature and organic matter affect CH_4 emissions from water bodies. Yet, those studies often relied on short term (30 min) measurements at monthly intervals and did not resolve diurnal variations. Meteorological variables such as temperature, air pressure, and solar radiation can change over timescales of minutes to seasons, which can affect the emissions. Our study, with

high frequency flux measurements (half-hourly monitoring for 1 day， each month for one year), may have a higher probability of detecting direct temperature effects than studies using less frequent measurements, presumably being less influenced by seasonal primary productivity. In addition, our study not only analyzed the effects of temperature and eutrophication level on methane release, but also further explored the synergistic effects of temperature and eutrophication on methane release. Finally, environmental drivers of methane emissions from urban ponds are largely unknown and our results show that both temperature and trophic state are important drivers of methane emissions from urban ponds. This can contribute to future studies exploring the role of urban ponds in the global carbon budget and for predictions for changes under the influence of climate change and urban development.

Comment3:

Other aspects which from a ecologic point of view could have been more interesting have not been taken into account, such as the influence of precipitation or street run-off, absence of vegetation and fauna(?), or as it is a man-made construction which measure could be taken to reduce the methane emission?

Response3：

The reviewer's Suggestions are very good. However, we did not consider rainfall and street runoff, and we chose sunny weather for in situ field monitoring every time. There are no large aquatic plants in the water we study, but there are microscopic algae and some aquatic animals in the water, and we don't really consider the influence of plants and animals. That's probably what we're going to focus on in the future. The observed correlation to phosphorous concentration, which is an important environmental driver, suggests that methane emissions can potentially mitigated by reducing nutrient input and eutrophication to urban ponds. We will highlight this aspect in the revised discussion section of the manuscript.

Comment15:

L371 to my knowledge the calculation of the methane flux and k600 only relates to the water temperature but not air temperature.

Response15:

Yes, the calculation of the methane and k600 only relates to the water temperature not air temperature. However, the physical processes that determine the gas exchange velocity (near-surface turbulence) are complex. Their main environmental drivers (wind, convection, flow,…) differ among different aquatic systems and largely unknown for shallow ponds. Much effort has been spend the quantification of gas exchange velocity as a function of potential environmental drivers, including wind speed, current velocity, water temperature, air temperature and many other.