Dear Editors and Reviewers:

Thank you for your letter and the reviewers' comments concerning our manuscript entitled “Fluxes, patterns and sources of phosphorus deposition in an urban-rural transition region in Southwest China” (acp-2022-388).

Those comments are all valuable and helpful for revising and improving our paper, as well as the important guiding significance to our research. Based on the comments, we made major revisions, please see the marked parts in the marked-up version. The main corrections in the paper and the responses to the reviewer's comments are as flowing:

A response to the comments made by reviewer#1

Q1: That is why the sentence “the lowest fluxes were found in February 2015 (0.00~0.00 kg P hm^{-2} mon^{-1})” (L177-178 in the revised manuscript) should be deleted or modified.

A: Thank you very much for your comments. We modified the sentence “*the lowest fluxes were found in February 2015 (0.00~0.00 kg P hm^{-2} mon^{-1})*” to “*the lowest fluxes were found in February 2017 (0.00~0.00 kg P hm^{-2} mon^{-1})*” on page 10, in L183.

Q2: Adding “(atmospheric wet, dry, and total P deposition)” would be preferable after “three types of depositions”, i. e., three types of depositions (atmospheric wet, dry, and total P deposition) (L195).

A: Thank you very much for your comments. We added “*(atmospheric wet, dry, and total P deposition)*” on page 11, in L201-202.

Q3: Suggest a modification like: “the contribution of wet and dry deposition to the total deposition was impacted by the solubility of P depositions and meteorological factors.” (L268-269)

A: Thank you very much for your comments. We modified the sentence “*the*

contribution of depositions was impacted by the solubility of P depositions and meteorological factors." to "*the contribution of wet and dry deposition to the total deposition was impacted by the solubility of P depositions and meteorological factors.*" on page 14, in L275-277.

A response to the comments made by reviewer#2

Q1: The external input of anthropogenic phosphorus is important for natural ecosystems. To date, the measurements of dry phosphorus deposition are quite sparse than wet deposition or bulk deposition. While this manuscript aims to collect wet and dry deposition concurrently, which may enrich the database of the global phosphorus deposition pattern. However, the sampling method used in this study was not well designed and thus the results have large uncertainties. For example, the authors stated that "a cover on the top of the collectors was manually closed during rainfall events to eliminate influences from wet deposition", this seems unbelievable if done manually for nearly one thousand rain events during the two sampling years. In addition, the authors can not correctly sample wet deposition during rainfall events, if no automatic monitoring sampler was used, because dry deposited materials will collected with open sampler. As a result, the wet deposition in this study was not well separated from dry deposition, and vice versa, leading to large uncertainties in the observations. Overall, this manuscript is like a data report rather than research article, and the novelty is not well clarified yet.

A: Thanks very much for your comment. We know automatic monitoring samplers would produce more accurate data. But it is basically impossible for us to set up automatic samplers at 9 points due to financial constraints. The manual sampling method has been made to balance the need for accurate estimation and constraints in time and cost. In the old manuscript, the manual sampling method was not described clearly. We only collected dry deposition and wet deposition for 5 consecutive days per month, respectively, not for the whole month. And more than 1,000 mixed samples were collected continuously each month, with dry and wet deposition each accounting for half. Meanwhile, all sampler managers are trained and paid a monthly

management fee based on sample quality. And the results of this study showed that the wet deposition was close to the results of the study which collected deposition by an automated wet-dry sampler (*He et al., 2011; He, J., Balasubramanian, R., Burger, D. F., Hicks, K., Kuylenstierna, J. C. I., and Palani, S.: Dry and wet atmospheric deposition of nitrogen and phosphorus in Singapore, Atmospheric Environment, 45, 2760–2768, https://doi.org/10.1016/j.atmosenv.2011.02.036, 2011.*), indicating that the manual sampling method did not overestimate wet deposition. More details of the sampling method were added in the new manuscript, please see it on pages 7-8, in Line 122 to Line 141.

"*Dry deposition was determined by the aqueous surface method (Anderson and Downing, 2006). Briefly, three pre-clean glass cylinders (inner diameter × height of 10.5 cm × 14.5 cm) were used as dry collectors at each site. All the collectors were placed 1.2 m above the ground with no obstacles and tall buildings around each site. A stainless-steel net (pore size, 0.02 × 0.02 m^2) was used to avoid any disturbance and pollution from birds and crops. The cylinder was filled with ultrapure water and examined if a refill was needed on 4 or 6 h basis (4 h in summer and 6 h in other seasons) to keep the water depth at a level of about 10 cm (Wang et al., 2016). Dry deposition sampling was conducted for five consecutive days at the end of the month, avoiding continuous rainfall as much as possible. Samples were collected in pre-clean glass bottles with lids at 8:00 am during these 5 days periods. In case of rainfall, the lid on top of the collector was manually closed to eliminate the effect of wet deposition. At the end of sampling every month, samples collected on 5 days were mixed and transported to the laboratory to determine total P (TP) concentrations on the same day.*

Five consecutive days per month with a relative frequency of rainfall events were selected for wet deposition collection, based on weather forecasts every month. Wet deposition was collected at the end of each rainfall event (Oladosu et al., 2017), If the volume of samples (100 mL) collected in one rainfall event was too little, samples from continuous rainfall events were pooled as one mixed sample. The duration (min) and rainfall capacity (mm) were recorded for each rainfall event. Rainfall samples

collected monthly were mixed and transferred to the laboratory to determine total P (TP) concentrations on the same day.

During the sampling period, a total of 1026 deposition samples were collected, with half of the dry and half of the wet deposition samples. Changes in sample volume and air exposure were minimized. Moreover, river water samples from the Xihe River (103°39'57" E, 30°36'02, XB) were collected to measure the P concentration."

In addition, supplementing the rather sparse database by direct monitoring of dry phosphorus deposition is one of the main objectives of this study, but a more important research objective of this study is to compare the differences in P deposition under multiple land uses and its causes. We believed that a basically unified sampling method can address the later questions. Few studies have analyzed the sources of P deposition based on the relationship with land use. This study found that the fluxes of dry P deposition were increased with the agro-facility, town, and paddy field areas, but decreased with the forest and country road areas, which was the novelty of this research article. It is important for understanding the process of regional P deposition and regional P management with "source/sink" land use.

Last but not least, your question is very reasonable. We agree with your comment that automated sampling will reduce the uncertainty of the results. Therefore, we have added automatic dry and wet deposition samplers at a sampling site (103°40′15″ E, 30°32′36″, QQ) where they are available, and have been collecting data on P deposition since February. However, historical data cannot be re-collected, and the automatic collector cannot cover the entire urban-rural transition zone, so the data from this study are still important and valuable.