

## **Answer to the comments from the Anonymous Referee #2**

Firstly, would like to thank you very much for your kindly comments and for your time. Followings are our simple answer to your comments, also you can check the detail answers from our revised manuscript.

1. Comment 1 (P1345: Based on the title of this revised manuscript, one would assume that the main emphasis is on a continuous measurement of soil CO<sub>2</sub> efflux by employing two independent yet complementary methods. Then, the prerequisite would be the intercomparison of the two methods to eliminate (or quantify) the potential biases prior to any assessment or integration.)

Answer: We have made carefully intercomparisons of the two measurement results and pointed the potential biases caused by the measurement systems. We presented the results, particularly, in the sections 5.1, 5.2, and 5.3.

2. Comment 2 (P1346: Regrettably, the abstract (and the rest of the manuscript) is still out of focus and provides no clear results on either the comparison or the integration for the annual efflux. Heterotrophic contribution, rain events, and Q<sub>10</sub> are in fact distracting the focus of the presentation, which are not necessary to highlight here. In this sense, the objective (2) mentioned on P1348 should be given the last priority. The authors should give more thoughts and discussions on the objective (3) as the second priority to (1). Consequently, the logic of the order of presentation does not make sense in the abstract, which is also pointed out by the other reviewer. What is the reason and scientific basis for dividing the data by warm and cold seasons in the comparison?)

Answer: We have changed our thoughts and focus our ideas on the comparison of results measured by the two approaches. You may can find the details in the sections of 5.1, 5.2, and 5.3. On the other hand, compared to the traditional manual measurements, as both of the chamber and gradient system conducted high temporal resolution (hourly) measurements, they could catch many continuous ecosystem process signals (e.g. soil temperature, seasonality of root and heterotrophic respiration). From the signals, we could partitioning the soil CO<sub>2</sub> efflux into autotrophic and heterotrophic respiration, as well as we could be able to analyze the contributions of winter respiration and rainfall events to the annual efflux. Furthermore, we discovered that biotic factor (root respiration) dominated the

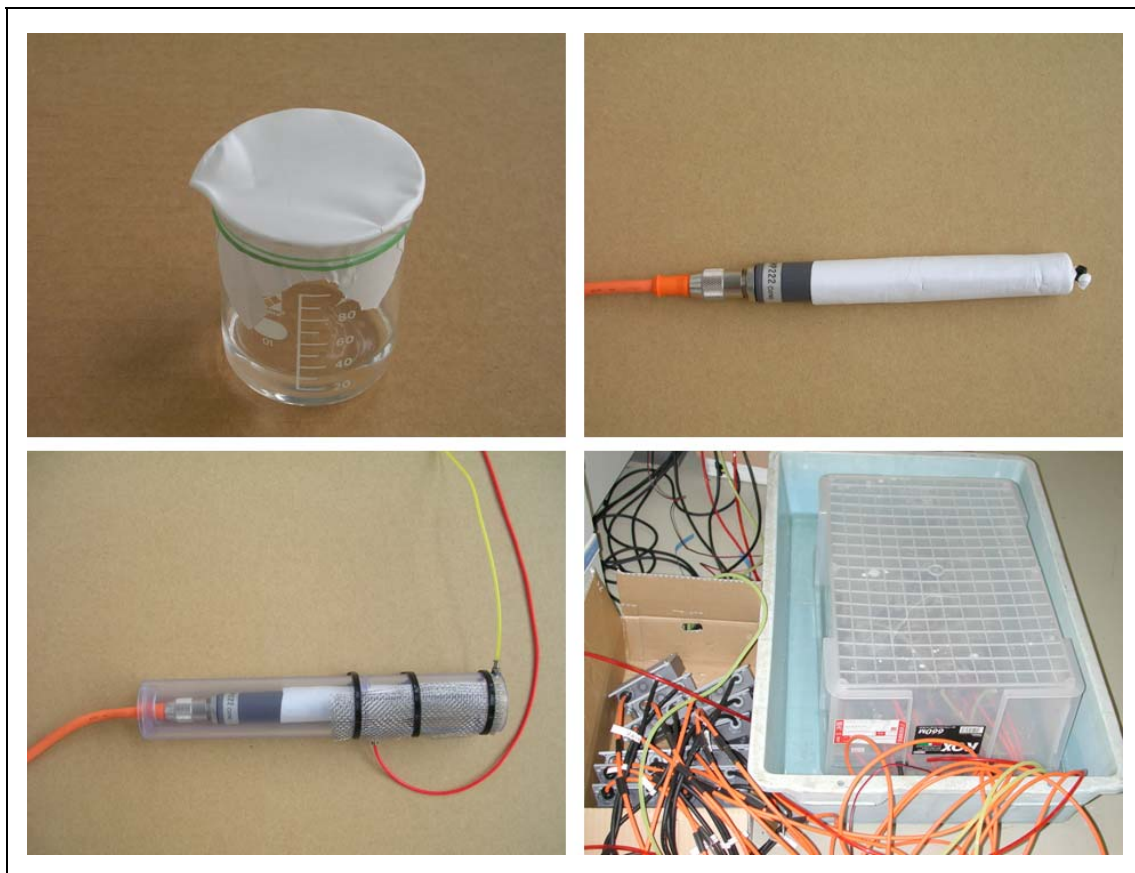
variation of soil CO<sub>2</sub> efflux during the warm season, and abiotic factor (temperature) mainly controlled the decomposition and thus drove the soil CO<sub>2</sub> efflux during the cold season. Therefore, Q10 showed large seasonal variation.

3. Comment 3 (P1347-1348: In the introduction, there should be more literature reviews on the history, weakness and strength of the gradient technique used in this study.)

Answer: Yes, we did it.

4. Comment 4 (P1352-1354: The authors should provide more discussion and justification of the representativeness of the gradient measurement and the validity of the assumptions made in this study.)

Answer: Before the field investigation, we calibrated twelve Vaisala CO<sub>2</sub> sensor in our laboratory with the Vaisala technician (Christer Helenelund, Product Line Manager) and their Japanese contributor (Norio Akiyama) (Photo 1). We found that the sensors matched very well to the Li-Cor IRGA (LI-840) under the dry condition, but they



showed very high sensitivity to high humidity. The sensors were re-calibrated by the Vaisala before we installed them in the field. Recently, we have made a re-calibration for three of the sensors (Photo 1) and presented the results in our revised manuscript. Because of this gradient method has been gained a very popular approach for measuring soil CO<sub>2</sub> efflux, we hope our results will give some useful suggestions to their studies.

5. Comment 5 (P1355-1359: First, the results on the inter-comparison between the two methods should be provided before presenting any other results. Then, the authors should determine if they could in fact combine these two methods to come up with one data set. Accordingly, the order of presentation should be (using the current subsections): comparison of the two methods, sections 3.5, 3.7, 3.1, 3.2, 3.3, 3.4, and 3.6.)

Answer: Thank you very much. We have revised our manuscript according your suggestions.