

Dear Reviewer (RC1),

Thank you for your useful comments and suggestions of our manuscript. We have modified the manuscript accordingly (see the parts by highlighter marker in the manuscript), and detailed corrections are listed below point by point:

In the present paper, the researchers developed an unmanned aerial vehicle (UAV) with sensing and sampling systems for 3D measurements of air pollutant concentrations. The sensing system, equipped with microsensors and IoT devices, monitors four key pollutants and meteorological parameters in real time. The sampling system includes gas sampling kits for measuring volatile organic compounds (VOCs) using the TO-15 method. Tested in a Taiwanese industrial zone, the UAV accurately detected emissions from diverse sources. Field measurements in March and May 2023 revealed vertical pollutant distributions. Qualitative and quantitative analyses of 56 and 72 chemical species validated the platform's capability. The sampling system extends TO-15 for 3D VOC distribution measurement. This UAV platform proves valuable for managing and deciding on air pollution in industrial areas.

I appreciate the quality of the paper and find the proposed technology intriguing. Consequently, I am inclined to support the acceptance and publication of this manuscript.

✓ Thanks a lot.

Below are some minor comments that I would like to bring to your attention:

1. **Inconsistent Capitalization:** The term "Toluene" is capitalized in some instances (Line 283) but not in others. While both styles are acceptable, it is advisable to maintain consistency throughout the document.
✓ Thanks a lot. The term "toluene" has been used consistently throughout the manuscript, except for the word "Toluene" at the beginning of the sentence.
2. **Missing Determiners in Noun Phrases:** Several noun phrases appear to lack a determiner, such as "high potential" in Line 68, "sensing system" and "sampling system" in Line 90, "sensing system" in Line 104, "precision machinery park," "municipal waste incineration plant" in Line 401, etc.
✓ Thanks a lot. The articles "a" or "the" have been added to the full text of the manuscript as noun phrase determiners.
3. **Active Voice Usage:** Consider using the active voice instead of passive where applicable. For instance, in Line 130, "makes it easier for representative samples to be obtained" can be revised to "makes it easier to obtain representative samples."
✓ Thanks a lot. The last sentence of Section 2.3 "... makes it easier to obtain a representative sample" has been revised to "... makes it easier to obtain a representative sample".

4. Sentence Restructuring: In Line 103, "In the present study, a low-cost air quality monitoring kit (Air Quality Detector II, VISION) was used," could be rephrased as "The present study used a low-cost air quality monitoring kit (Air Quality Detector II, VISION)."
 - ✓ Thanks a lot. This sentence has been rephrased to "The present study used a low-cost air quality monitoring kit (Air Quality Detector II, VISION) as the sensing system in the developed UAV platform."

5. Typo Correction: In Line 238, replace "sits" with "sites."
 - ✓ Thanks a lot. The word in Line 238 "sits" has been revised to "sites".

6. Clarification: In Lines 343 and 392, consider changing "line" to "in line."
 - ✓ Thanks a lot. The word "line" in Lines 238 and 393 has been revised to "in line".

7. Verb Agreement: In Line 320, replace "was" with "were."
 - ✓ Thanks a lot. The word "was" in Line 320 has been revised to "were".

8. Pluralization: In Line 257, change "A total numbers" to "A total number of."
 - ✓ Thanks a lot. The words "A total numbers" in Line 257 has been changed to "A total number of".

9. Abbreviation Consistency: In Line 74, ensure consistency in the abbreviation of volatile organic compounds, either "VOC's" or "VOCs."
 - ✓ Thanks a lot. The word "VOC's" in Lines 74 and 137 has been revised to "VOCs".

10. Explanation Addition: In Line 437, regarding the emphasized term "high altitude" being an innovation in the study, consider adding another sentence to provide further explanation.
 - ✓ Thanks a lot. The sentence in Lines 435-437 has been rephrased to "... for the sampling and analysis of low-altitude pollutants near the ground level".

I believe addressing these minor points will enhance the clarity and coherence of the manuscript.

Overall, I support the publication of this work and look forward to its contribution to the field.

- ✓ Thank you for your comments and suggestions.

Dear Reviewer (RC2),

Thank you for your useful comments and suggestions of our manuscript. We have modified the manuscript accordingly (see the parts by highlighter marker in the manuscript), and detailed corrections are listed below point by point:

The manuscript quality is appreciable. Therefore, I suggest the acceptance and publication.

✓ Thanks a lot.

Hereinafter some minor comments.

1. One of the critical aspect while using a rotatory wing drone for air sampling and pollutant sensing and quantification, is the turbulence induced by the rotors and its influence on the air sampled, even regarding the maintenance of original distribution of VOC. In the manuscript is reported that this issue has been taken into account with the single-theodolite to compute the speed of the upper winds. Please, better explain how the method helps in the correction of this interference. An useful reference to better analyse this subject should be S. Yang et al., «Model migration for CFD and verification of a six-rotor UAV downwash,» *International Journal of Agriculture and Biological Engineering*, vol. 13, n. 4, pp. 10-18, 2020.
✓ Thanks a lot. Yang et al. (*Int. J. Agric. Biol. Eng.*13(4) 10-18, 2020) pointed out that when the drone is close to the ground, the propellers will produce downwash to affect the spraying operations. But the airflow field above the drone has little impact. In the Section 4 of original manuscript, we cited two literatures to illustrate the dispersion effect of propellers "The dispersion effects of drone propellers are small in the monitoring of atmospheric pollutants (Fan et al., 2023) but cause a large negative bias in the measurement of pollutant concentrations in plumes. (Villa et al., 2016)." To make it clearer, a new sentence "The sampling tube was at the top of the UAV because the propeller causes downwash when UAV is close to the ground (Yang et al., 2020)." has been added to the second paragraph of Section 4.
2. As a general comment, references are up to date and fitting to the research subject. To expand the overview on applications of UAVs in monitoring polluted areas, should be added the reference to F. Fumian et al., *Application of miniaturized sensors to unmanned aerial systems, a new pathway for the survey of polluted areas: preliminary results. Atmosphere* 11, 471 (2020).
✓ Thanks a lot. Three new sentences "In addition, UAV with low-cost Lidar sensor networks can provide continuous area surveillance of large spaces (Fumian et al., 2020). The UAV with sampling system can collect important samples for subsequent laboratory analysis and confirm results previously obtained from field measurements (Leitner et. al., 2023). Opportunities to collect samples of environmental contaminants expand the possibility of confirming field measurements through laboratory analysis (Pounds et al., 2011)." have been added to the second paragraph of Section 1.
3. Moreover, it should be interesting to add some references connected to the other fields of application of UAVS in remote sensing technologies enumerated, i.e., at line 31, should be interesting to add an application conducted in the defence field: Fumian et al. *Development and*

performance testing of a miniaturized multi-sensor system combining MOX and PID for potential UAV application in TIC, VOC and CWA dispersion scenarios. Eur. Phys. J. Plus 136, 913 (2021).

- ✓ Thanks a lot. The first sentence of Section 1 has been revised to "..., especially in the defence field (Zhu et al., 2021)." and a new sentence "Fumian et al. (2021) used an UAV platform with metal oxide and photo-ionization detectors to confirm the presence of specific classes of chemicals in a contaminated area." has been added to the first paragraph of Section 1.

4. Please, add some pictures or schemes of the sampling system.

- ✓ Thanks a lot. A new scheme of the sampling system "Figure 3" and its description have been added in Section 2.3.

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