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REVIEWER'S REPORT

Manuscript No.: IJAR-52206 Date: 11/6/2025

Title: RESEARCH OF CONCENTRATIONS OF POLLUTANTS IN THE VERTICAL PROFILE OF THE ATMOSPHERE OF THE ZENICA VALLEY USING UNMANNED ARIEAL VEHICLES

Recommendation:

Accept as it is .....

Accept after minor revision.....

Accept after major revision .....√.....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality			√	
Techn. Quality			√	
Clarity		√		
Significance		√		

Reviewer Name: Ahmed M. Saqr **Date:** 11/6/2025

Reviewer's Comment for Publication.

(*To be published with the manuscript in the journal*)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

This manuscript provides important new insights into the impact of temperature inversion layers on urban air quality in the Zenica valley, utilizing unmanned aerial vehicles for detailed vertical profiling of particulate matter and SO_2. Its principal strength lies in demonstrating how pollution becomes trapped below inversion layers, with dramatic concentration increases during prolonged inversion events. The use of high-resolution drone-based measurements offers a valuable methodological advance for air quality assessment in orographically complex regions. These findings have clear implications for local air quality management and the design of monitoring networks.

Detailed Reviewer's Report

Thank you for inviting me to review the manuscript entitled "Research of Concentrations of Pollutants in the Vertical Profile of the Atmosphere of the Zenica Valley Using Unmanned Aerial Vehicles" for the International Journal of Advanced Research (IJAR). This work provides valuable new data on the vertical distribution of particulate matter and SO_2 in a complex

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valley environment, leveraging drones to fill an important measurement gap during inversion and non-inversion events. While the manuscript addresses a significant urban air quality issue with clear real-world implications, substantial revisions are needed for methodological transparency, quantitative analysis, and clarity of presentation. I therefore recommend major revision.

Major Comments
1. Abstract
Can the abstract be revised to quantitatively summarize the range of pollutant concentrations observed, the typical inversion heights, and the most significant findings?

Please add a clear sentence on the broader implications for air quality management or forecasting.

2. Introduction
The introduction offers a thorough literature review, but could you more clearly articulate the specific research gap your study addresses, especially in terms of quantifying the impact of inversion on pollutant trapping?

Please explicitly state your research objectives and hypotheses at the end of this section.

3. Materials and Methods
The types of drones and sensors are described, but more methodological detail is required: What was the vertical resolution of measurements? How were sensors calibrated in the field and how was background contamination minimized?

Were meteorological parameters (wind, humidity) measured in parallel? If not, discuss how their absence might impact interpretation.

Please describe any QA/QC procedures, data processing steps, and criteria for accepting/rejecting measurement profiles.

4. Measurement Design (Section 2.1)

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REVIEWER'S REPORT

Provide more information on the temporal resolution (i.e., how many flights per day, at what times, under which specific atmospheric conditions).

Explain why Banlozi, Kamberovića polje, and Institute locations were chosen and whether they capture the full valley heterogeneity.

5. Figures and Data Presentation
Figures (especially 3, 4, 5) need higher resolution and clear axis labels (include measurement units, legend for PM types, altitude scale).

Add a location map with all measurement points, local sources, and valley topography for geographic context.

For Figure 6 (PM10 time series), add meteorological overlays (e.g., temperature inversion days, wind direction, etc.) to support interpretation.

6. Results
Can you provide descriptive statistics (means, maxima, minima) for pollutant concentrations for inversion vs. non-inversion periods at all heights?

The discussion notes sharp declines above the inversion, but please quantify the gradients and their variability across different events and locations.

7. Data Analysis and Interpretation
Is any statistical analysis conducted to test the significance of differences between inversion and non-inversion periods? If not, consider adding t-tests or ANOVA.

Can you estimate, or at least discuss, the correlation between inversion strength (temperature gradient) and pollutant accumulation/dispersion?

8. Discussion
Compare your findings with those from similar orographically complex sites (beyond the cited studies) and discuss the limits of generalization.

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REVIEWER'S REPORT

Discuss limitations: e.g., what is the potential error in vertical measurements? How might different meteorological scenarios (wind, moisture) influence findings?

Suggest how this approach could be used for regular monitoring or integration into air quality forecasting in the Zenica valley and similar locations.

9. Conclusion
Condense the main findings into clear, actionable recommendations (for monitoring, policy, or urban planning), and explicitly link back to your initial objectives.

Outline priority directions for future work, particularly year-round or real-time inversion monitoring.

Minor Comments
Abstract:
Define all abbreviations at first use (PM_1, $PM_{2.5}$, SO_2, etc.) and proofread for minor grammatical inaccuracies.

Introduction:
Shorten/rephrase overly long sentences and ensure concise, direct language throughout.

Methods:
Specify maximum flight ceiling, sensor response time, and data averaging protocol.

Location Map (Figure 2):
Add a legend, scale bar, and north arrow for clarity.

Figures:
Ensure all color palettes are accessible to color-blind readers; use consistent labeling and legends across all graphics.

Results:

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REVIEWER'S REPORT

Add the number of measurement flights and profiles obtained per site to clarify dataset representativeness.

Tables:
If available, consider including a summary statistics table (mean, min, max, SD) for pollutant concentrations at various heights and periods.

References:
Carefully check for completeness, up-to-date sources, and correct formatting in line with journal guidelines.