

Reviewer Comments

The authors have done a commendable job in addressing the reviewer comments and have significantly improved the manuscript by adding new sections relevant to the region. I recommend the paper for publication after minor revisions, as outlined below.

Authors' Reply

We sincerely thank the reviewer for the careful second-round evaluation and the positive assessment of the revised manuscript. We are encouraged that the reviewer finds the manuscript substantially improved and suitable for publication after minor revisions. All comments have been carefully addressed as detailed below.

Comment 1

Please provide the full forms of OMI, TROPOMI, and GEMS in the abstract.

Reply 1

Thank you for the suggestion. The full forms of all satellite instruments have now been included in the Abstract at first mention:

- Ozone Monitoring Instrument (OMI)
- TROPospheric Monitoring Instrument (TROPOMI)
- Geostationary Environment Monitoring Spectrometer (GEMS)

The Abstract has been revised accordingly.

Comment 2

Line 174: The description of the uncertainty filtering needs clarification. The method appears to use both criteria rather than an “or” condition. It first retains medium- and low-quality data with uncertainties below the threshold, and additionally includes data with higher absolute uncertainty if their relative uncertainty is $\leq 10\%$. Please check/revise this section for clarity and accuracy.

Reply 2

We thank the reviewer for identifying this ambiguity. We agree that the previous wording could be misinterpreted. The description has now been revised to clarify that the filtering procedure first retains observations with absolute uncertainties below the dynamically derived thresholds and additionally retains observations with higher absolute uncertainty when their relative uncertainty is $\leq 10\%$.

The revised text now reads:

“Matched observations were retained when both DS and SS absolute uncertainties were below the dynamic thresholds. In addition, observations exceeding the absolute uncertainty thresholds were retained if both relative uncertainties were $\leq 10\%$.”

This revision more accurately reflects the QC framework following Rawat et al. (2025).

Comment 3

Lines 180–195: One paragraph is repeated. Please remove the duplicate.

Reply 3

Thank you for noticing this duplication. The repeated paragraph has been removed from the revised manuscript.

Comment 4

Figure 3: Please label the QF categories clearly as (0, 10), (1, 11), and (2, 12) in the figure.

Reply 4

We appreciate the helpful suggestion. Figure 3 has been revised to explicitly label the quality-flag categories as:

- High quality: QF = (0, 10)
- Medium quality: QF = (1, 11)
- Low quality: QF = (2, 12)

This clarification has also been added to the figure caption for improved readability.

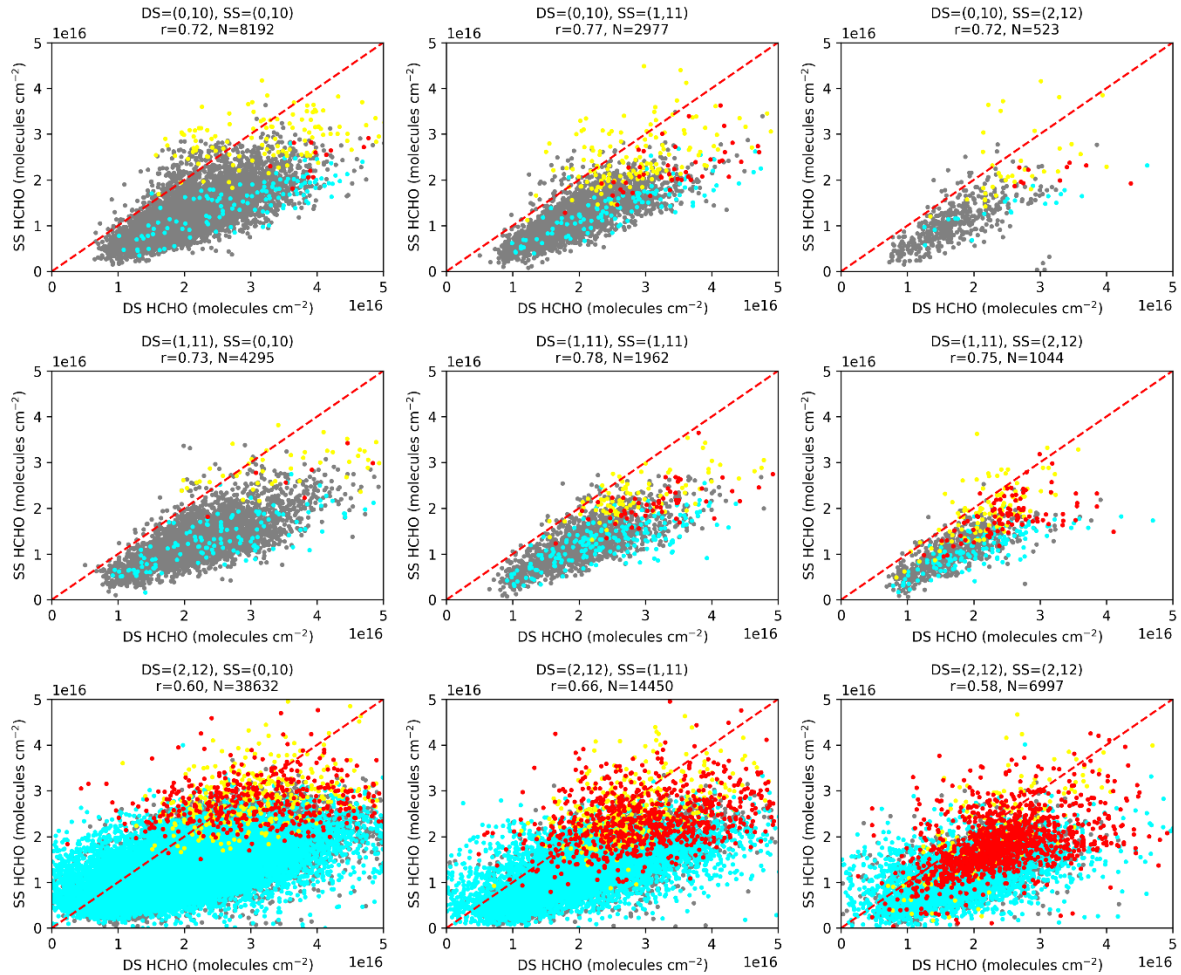


Figure 3. Nine-panel plot of correlation between contemporaneous Pandora HCHO column amounts: direct-sun (DS) vs sky-scan (SS) for each quality category, following the Rawat et al. (2025, AMT) QC method at Bangkok station. Panels are organized according to grouped Pandora quality-flag (QF) categories: high-quality [QF = (0,10)], medium-quality [QF = (1,11)], and low-quality [QF = (2,12)] retrievals for both DS and SS observations. Each panel shows the scatter of DS vs SS HCHO (molecules cm^{-2}), with points color-coded by uncertainty thresholds: gray = both below cutoff, cyan = DS above cutoff, yellow = SS above cutoff, red = both above cutoff. The red dashed line represents the 1:1 relationship, and the correlation coefficient (r) and number of matched observations (N) are indicated in each panel. Corresponding nine-panel correlation analysis for the other stations are provided in Figures S1–S4.

Comment 5

Figure 5: Please remove the color coding in panels 5b and 5d. After applying the QC, all observations are usable, so the PGN quality flags are no longer needed. I suggest using a single color and reporting total observations instead of percentages. Alternatively, you may choose to retain the current presentation if you feel it adds value.

Reply 5

We thank the reviewer for this thoughtful suggestion. After careful consideration, we decided to retain the quality-flag distributions in panels 5b and 5d because we believe they continue to provide useful diagnostic information regarding the composition of the retained datasets after QC filtering.

Although all retained observations satisfy the uncertainty-based QC criteria, the original PGN quality flags still provide insight into the relative contribution of high-, medium-, and low-quality retrievals within the filtered datasets. This is particularly relevant for interpreting site-dependent retrieval behaviour, especially at stations such as Agam where lower-quality categories remain relatively important even after QC filtering.

To improve clarity, we have revised the figure caption to explicitly state that all observations shown after QC are considered usable for analysis, and the retained QF categories are presented for diagnostic interpretation rather than as an indication of unusable data.

The revised caption of Figure 5 now reads:

“Figure 5. Percentage distribution of quality flags (QF) for Pandora HCHO observations at five Southeast Asian stations (Singapore, Bangkok, Bandung, Agam, and Pontianak). The stacked bar charts show the relative contributions of high-quality (QF = 0, 10), medium-quality (QF = 1, 11), and low-quality (QF = 2, 12) retrievals for both direct-sun (DS) and sky-scan (SS) measurements, before and after quality control (QC). Each panel represents a different dataset: (a) DS before QC, (b) DS after QC, (c) SS before QC, and (d) SS after QC. Percentages are calculated relative to the total number of observations for each station. Although all observations shown after QC satisfy the uncertainty-based filtering criteria and are considered usable for analysis, the retained QF categories are presented to illustrate the composition and retrieval characteristics of the filtered datasets across different stations and viewing geometries.”

We believe this presentation provides additional insight into the behaviour of DS and SS retrievals across different tropical environments.