

Answers to Review #1

General comments:

This manuscript presents a technically rigorous and operationally relevant assessment of instrumental uncertainties associated with state-of-the-art HATPRO-Gen5 microwave radiometers. The study is well-conceived, timely, and aligns with current efforts across initiatives such as ACTRIS, GRUAN, and E-PROFILE to establish standardized, high-quality microwave radiometer (MWR) networks for both research and numerical weather prediction applications.

The work is particularly valuable for its:

- Systematic breakdown of key uncertainty sources (radiometric noise, calibration repeatability, drift/jumps, inter-instrument biases, and radome degradation).
- Use of long-term datasets and controlled calibration campaigns.
- Practical framework for operational traceability (e.g., "time to dry" metric, OmB-based quality control).

- Thank you for that nice comment. We're glad you appreciate our hard work.

Technical suggestions:

- Figure 3, Page 11

The current color choices for representing radiometric noise (red, orange, and purple) are difficult to differentiate. Consider using a more contrasting palette to enhance clarity.

- Done.

- Page 14, Line 398 (you mean line 414)

The phrase "this makes it hard to quantify these jumps meaningfully" could be more formally written as, for example, "This limits the ability to reliably quantify calibration-induced drifts."

- Changed.

- Page 17, Section 4.3

It would be helpful to specify that the repeatability tests were carried out during clear-sky and fair-weather conditions, along with relevant environmental parameters such as temperature and humidity, to support interpretation of the results.

- Line 499 in Section 4.3 already states that. We think that the exact temperature and humidity during the test are not important to the overall result as long as the conditions are favorably (fair weather, minimal cloud cover) and stay the same during the whole procedure. Nevertheless, we added the temperature and humidity conditions during that day.

- Page 18, Line 538

The phrase “biases are not readily detectable by operators” could be expanded with a short note that “side-by-side intercomparison are rarely feasible in operational networks” for clarity.

- Added.

- Page 23, Figure 12 Caption

Specify whether the “time to dry” metric is site-specific or generalizable. Indicate environmental dependencies (e.g., UV exposure, rain intensity).

- The degradation process is highly dependent on the weather conditions of the site (rain intensity, hail, UV exposure). This is already stated in lines 632 to 634. Nevertheless, we added more context to the caption.
- Added air pollution to line 634.

- Page 24, Line 650

Consider rephrasing: “a radome replacement is necessary if the time to dry is longer than 10 min” → “We recommend replacing the radome once the drying time consistently exceeds 10 minutes under standard operating conditions.”

- Changed.

- Page 24, Section 5

The textual list of actions is valuable but could be presented more clearly by providing a summary table. Possible columns for the table: Action, Uncertainty addressed, Recommended frequency, Operational burden (e.g., Low, Medium, High), Priority (Essential / Recommended / Optional).

- Expanded Table 3 on page 24 according to your suggestion.

Conclusion

The paper is clearly written, well organized, and meets the high standards expected by Atmospheric Measurement Techniques. With minor revisions as outlined below, the manuscript is fully suitable for publication.