## General Comments

This paper discusses the bias characteristics and noise features of AWS observations and presents assimilation test results. I believe the study can serve as an important reference for future applications of AWS data. The manuscript is generally well written, and the methodology and primary conclusions appear reasonable.

However, several issues require clarification before the paper can be considered for publication.

## Specific Comments

### 1. Use of Quasioptics in AWS

The statement: "to simplify the design and save weight, the AWS radiometer forgoes quasioptics that many heritage instruments rely upon to co-locate antenna beam patterns on the ground (Albers et al., 2023)" may cause confusion. AWS does employ quasioptics, but it does not include a flat reflector. The current wording could be interpreted as implying that AWS does not use quasioptical components at all. The authors are encouraged to revise this statement to more accurately describe the instrument configuration.

### 2. Scan Geometry Description

The description of the AWS scan geometry appears to be inaccurate: "AWS rotates at 50.4 rpm and produces 145 observations per scan line from 2.5 ms integration time." According to Eriksson et al. (2025), during a 1.19-second constant scan period, a total of 185 samples are collected: 145 Earth-view samples, 15 OBCT samples, and 25 cold-sky samples. Please double-check and revise this description to ensure consistency with the referenced literature.

### 3. CI Screening Results for Channel 4

The screening results for AWS Channel 4 differ significantly between land and ocean surfaces. Based on Figure 4, the CI screening algorithm appears to perform better over ocean than over land, particularly for the low V-band channels. For example, over land, some of the removed samples appear to include not only cloud-contaminated pixels but also pixels that resemble clear-sky conditions. Additionally, the screening results exhibit some artificial structures and nearly all of the land samples have been screened out except for the scan-edge, which is actually not affected by the screen algorithm. Please provide further explanation for these differences and the potential causes of the apparent artifacts.

### 4. Scene-Dependent Bias in Channel 4

From the original O–B results for AWS Channel 4 shown in Figure 4, a scene-dependent bias is observed, particularly a warm bias over high-latitude regions. Is this bias primarily caused by

calibration-related errors, background model errors, or other factors? Please discuss the possible root causes.

### 5.    Equation (3): Zenith-Angle-Dependent Noise Term

In Equation (3), it is unclear how the zenith-angle-dependent noise term is calculated. Additional details would be helpful for readers. Since the scaling factor equals 1 at nadir, the scaled noise is identical to the noise at nadir. It would therefore be helpful to explicitly state that this term is defined relative to the noise at the nadir position. Furthermore, the authors should provide a clearer explanation of all terms in the equation. As mentioned, the second term is intended to remove the scan-angle-dependent noise feature after superobbing. Clarifying the formulation would help readers better understand the results presented in subsequent sections.

### 6.    Scan-Angle-Dependent Noise After Superobbing (Figure 9)

In Figure 9, the scan-angle-dependent noise appears to increase after superobbing, which is opposite to the expected behavior described by the authors. Please provide an explanation for this result.

### 7.    White vs. Non-White Noise Characteristics

The manuscript states: "For a purely white noise distribution, effective noise should decrease as a function of $1/\sqrt{N}$." What does the non-white noise component look like for AWS observations? If significant non-white noise (e.g., 1/f noise) exists in the original samples, striping noise could become more prominent after superobbing due to the suppression of white noise. It would be beneficial to include a discussion of potential non-white noise characteristics in AWS and their implications for the superobbing results.