Reply to Anonymous referee #2

All co-authors thank the reviewer for the comments and corrections which helped improve the manuscript.

Definition of cloud fraction in 3 layers. My understanding is that GOCCP low-, mid-, and high-level cloud fraction is based on pressure layers: low-level (P > 680 hPa), middle-level (440 < P < 680 hPa) and highest-level (P < 440 hPa). However, in this study height is used instead of pressure (Lines 120-122, Table 1). It is not clear if a different type of processing has been done for this study. This needs clarification.

In the new version of the manuscript, we reprocessed AEOLUS low-, mid-, and high-level cloud covers based on pressure layers, in order to stay consistent with CALIPSO-GOCCP low-, mid-, and high-level cloud covers. The pressure layer thresholds are still P < 440 hPa for high-level clouds, 440 < P < 680 hPa for mid-level clouds, and P > 680 hPa for low-level clouds.

Section 2.3. I'm confused by this section. CALIPSO and AEOLUS overlap, so why not compare cloud retrievals during the overlapping period? That would avoid the impact of internal variability.

This section has been elaborated to clarify this specific point : the AEOLUS product we use is only made for 2020 and the CALIPSO-GOCCP product is affected by low laser shots after 2018 leading us to only take into account the 2008-2018 decade for inter-annual variability of clouds.

Use of daily-averaged input data for COSP calculations. There is no discussion on the impact of this choice. A better motivation for this choice is needed. It would be interesting to see differences between daily averages calculated from 3-hourly inputs and daily-averaged inputs. Are these differences small enough with respect to other sources of uncertainty considered?

Other studies have been conducted with LMDZ (Chepfer et al. 2008) in the literature and have shown that the impact of using averages of hourly or three-hourly outputs, compared to daily means, is negligible in the assessment of model biases. Moreover, the diurnal variability expected is much smaller than the model bias itself (for a comparison between AEOLUS and CALIPSO accounting for the diurnal cycle, see Titus et al., 2025).

I may be misinterpreting the results, but Figure 7h doesn't seem to match with the results shown in Figure 8. Figure 7h shows less AEOLUS cloud fraction nearly everywhere above between 4000m and 8000m altitude, but Figure 8d shows an excess of AEOLUS mid-level cloud with respect to CALIPSO.

This was an error in the altitudes that have been taken into account during the processing of the cloud covers. We corrected it and updated the figure 8. The results of the mid cloud covers observed by AEOLUS are now in accordance with the cloud fractions shown in the figure 7.

L45: that is involved -> that participates

L70: inclinaison. Typo that appears many times in the manuscript. I'd recommend replacing all instances of 'inclination' with 'off-nadir pointing angle' to avoid confusion with the inclination of the satellite orbit.

L122: global median of high cloud cover -> median of global-mean high-cloud cover. There are other instances in the text, please correct.

L192: cloud detection threshold s. Capital S is used before in reference to the detection threshold. Please use consistent notation.

Table 2. Please use Greek letters for 'eta' and the wavelength 'l'.

We thank you for pointing out these technical issues. We have taken them into account in the paper.