I would like to thank the reviewers for their comments which have helped us to improve the manuscript and make it a more useful work for other researchers. I have addressed their comments as follows (indicated in blue as in the revised manuscript).

Reviewer 1

The author introduces a new method to detect optically thin high clouds from twilight observations at a single wavelength. The method is based on previous work by the same author where they used the color index calculated from the ratio at two wavelengths. It can often be confirmed by visual experience after sunset, when optically thin cirrus clouds light up in bright red and become visible, and the reason for this coloring is nicely explained in the manuscript. The new method which uses only one wavelength rather than the ratio of two, is clearly explained. Sensitivities to all relevant parameters are tested. The method is based on a fast single scattering model which is verified by an accurate Monte Carlo model. I recommend publication of the manuscript after considering the following minor points:

-The description is quite long, and the main points of the manuscript are sometimes hidden by the wealth of equations and information. One way to improve that would be to shorten the first section which deals with the two-wavelengths method and focus on the new part, the single wavelength method.
*Author response: Section 2 (The color index approach) has been substantially shortened by removing the former Figure 1 together with its associated discussion and by condensing the description of the conventional two-wavelength CI approach. These modifications place greater emphasis on the new single-wavelength formalism developed in this work.

-line 85: it is argued that cloud layers extending over hundreds of km are unrealistic. This is relevant because of the long path of the radiation through the atmosphere. While it is certainly correct that the same cloud extending over hundreds of km is unrealistic, but the long pathlength in fact implies that the detection at one place can be affected by high clouds several hundred kilometres away. This would have an effect on the detection efficiency of the method because the absence of an observation of a cloud above the observer could either be caused by (1) actually no cloud being there, or (2) a distant cloud blocking the path of the radiation on it's long way to the observer.
*Author response: We agree with the reviewer that, because of the long twilight optical path, clouds located several hundred kilometres away may also influence the radiation reaching the observer. However, the objective of the present work is to investigate the physical origin of the CI maximum under the simplified assumption of a single localized cloud. Accounting for multiple cloud layers distributed along the solar path would require prior knowledge of their locations and optical properties, which are generally unknown in practical observations. To make this assumption explicit, the corresponding sentence has been revised as follows:

‘*Assuming that the cloud under study is the only cloud present in the atmospheric scene, treating it as a spherical shell rather than as a localized layer would imply that, for SZA >90, the direct solar radiation interacts twice with the cloud (see Fig. 2)*’

-Figure 1: The normalisation of the CI curves helps to better plot them on the same axis? In principle I would prefer the non-normalised curves because they would illustrate the "red-ness" of the sky. Also the sharp drop is puzzling. It is explained later in the text but it would help to have a brief explanation of the reason for the sharp drop towards larger SZA.

*Author response: We thank the reviewer for this comment. Following the reviewer's earlier recommendation to simplify Section 2 and focus on the new methodology introduced in this work, Figure 1 has been removed from the revised manuscript. Consequently, this comment is no longer applicable.

-line 215, eq 16: true, but a hint that this directly follows from the evaluation of the derivative of the ratio in eq (4) would be helpful.
*Author response: The text has been revised to explicitly indicate that Eq. (16) is obtained by differentiating the ratio defined in Eq. (4) with respect to the SZA and setting the derivative equal to zero. This makes the origin of Eq. (16) more explicit.

-Figure 7: I was a bit surprised that water vapor was not included. Water vapor has strong absorption bands in particular in the right red block which is nearly free of absorption by NO2 and O3. Most of the water vapor is located in the atmospheric boundary layer between 0 and 2km but the zenith radiance has to pass through it in any case.
*Author response: We thank the reviewer for this comment. We agree that, as originally written, the text accompanying Fig. 6 of the revised mauscript could give the impression that NO2 and O3 constitute the only atmospheric absorbers relevant to CI retrievals. This was not the intended message. The purpose of Fig. 6 of the revised mauscript is simply to illustrate how gaseous absorption can complicate the selection of the two wavelengths used to compute the CI, rather than to provide an exhaustive list of all relevant absorbers. The text has therefore been revised to clarify this point, explicitly stating that, depending on the atmospheric conditions and the vertical distribution of the absorbing species, other gases, such as H2O, may also need to be considered. In particular, the sentence:

‘*Figure 6 illustrates this limitation by showing the absorption cross sections of NO2 (green) and O3 (blue), derived from Burrows et al. (1998) and Molina and Molina (1986).*’

Has been replaced by:

‘*Figure 6 illustrates this limitation by showing, as representative examples, the absorption cross sections of NO2 (green) and O3 (blue), derived from Burrows et al. (1998) and Molina and Molina (1986).’*

And at the end of the paragraph, immediately after "*which limits the available wavelength combinations for CI-based retrievals.*", the following sentence has been added:

‘*It is important to note that the absorbers shown in Fig. 6 are representative of the atmospheric conditions considered in Gomez-Martin et al. (2021). Under different atmospheric conditions, other absorbers, such as H2O, may also need to be taken into account if their vertical distribution extends sufficiently high to influence the CI-based retrievals.*’

-Figure 12: It wasn't very clear to me here that you look for the crossing between the Rayleigh and the total curve to identify cloud height. Maybe it is mentioned in the text and I missed it but you may mention it directly when you describe Figure 12 in the text.
*Author response: We agree with the reviewer that this point was not sufficiently clear in the original manuscript. The paragraph describing Fig.12 has been revised to clarify that "The retrieved value of SZA_{max} is determined by the intersection between the cloud and Rayleigh relative-variation curves." Please see the revised manuscript.

-In the Conclusions I was wondering if you could give a lower threshold for the optical thickness of the clouds to define a detection limit? You study a number of optical thicknesses up to 0.3 but I'm not sure about the lower end.

*Author response: We agree that the minimum detectable cloud optical depth is an important parameter from an observational point of view. However, such a detection threshold depends on the characteristics of the observing instrument and therefore cannot be defined universally. To avoid possible confusion, the Conclusions have been revised to explicitly state that the single-scattering approximation becomes increasingly accurate as the cloud optical depth decreases, while the comparison with the Monte Carlo model demonstrates that it remains valid for cloud optical depths up to $\tau C \approx 0.3$. In particular, the text:

'*The single-scattering methodology (SSM) was compared with a reference Monte Carlo (MC) radiative transfer model previously used for twilight studies in the atmospheres of the Earth, Mars, and Titan. The comparison shows that the single-scattering approximation provides similar results for cloud optical depths up to* $\tau c \approx 0.3$.'

has been replaced by:

'The single-scattering methodology (SSM) was compared with a reference Monte Carlo (MC) radiative transfer model previously used for twilight studies in the atmospheres of the Earth, Mars, and Titan. As expected, the single-scattering approximation becomes increasingly accurate as the cloud optical depth decreases, while maintaining a good agreement with the Monte Carlo model for cloud optical depths up to $\tau C \approx 0.3$*.'*