

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-647

Anonymous Referee #2

Referee comment on "Occurrence of polar stratospheric clouds as derived from ground-based zenith DOAS observations using the colour index" by Bianca Lauster et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-647-RC2>, 2022

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General comments.

This work shows a systematic method to obtain information about the presence of PSCs using the colour index (CI) from the measured sky spectra. This method requires a previous survey at each location to obtain the threshold CI value averaged between SZA 93° and 94.5° that indicates the presence of PSCs. It also depends on the wavelength used to calculate the IC. A long series of data is required to obtain the appropriate statistics to apply this method.

The method is applied to experimental spectra recorded at two polar stations in the Arctic and Antarctic with a very impressive set of measurement data. The results are also compared with satellite data.

Applying this method the seasonal occurrence of the PSCs for both stations is obtained and discussed and the distribution of the PSC occurrence for the whole data series is presented.

I find this work very consistent and recommend its publication with some comments. I find especially relevant the time series of PSC occurrence for such a long data series in these two different locations and the influence of volcanic aerosol in the PSC occurrence at Kiruna.

Minor comments:

- Page 5, line 138. It is not clear to me what exactly the "standard" configuration is. Does it refer to a horizontally homogeneous PSC layer? In this case, the three scenarios defined in figure 1 are for a homogeneous PSC layer but with different extent? Later in the same paragraph, you mention again the homogeneous case referring to figure 1a. This is a bit confusing for me, it seems that homogeneous is not the same as the "standard" configuration. Please explain this in more detail in the text.
- Figure 1 caption. Please don't include an explanation about the interpretation of the figure in the caption, please, consider make this explanation in the text.
- Figure 6. The caption doesn't correspond to the legend in the figure. In the caption blue means baseline as in the figure is red. Please, revise this.
- On page 8 line 241, in the discussion on the occurrence of PSCs in November in Neumayer, have you considered that this method might overestimate the positive "detection" of PSCs? When compared to the satellite data below, the IC in the UV also overestimates the occurrence of PSCs in September with respect to CALIOP. Even the seasonal cycle captured by CALIOP and by this method are different. While CALIOP obtains a maximum occurrence in July, by this method the maximum is obtained in September. Then, looking at figure 11, I feel that the difference may be caused by the type of PSC. Perhaps the altitude of the layer is different for the different PSC types and your method is not capturing it (just lucubrating)?
- In page 9, line 280. You say that the seasonal cycle captured by UV-CI is in good agreement with the one captured by CALIOP, but as I commented previously, is not. UV-CI presents an absolute maximum in September whereas CALIOP records it in July in Neumayer and it is the same for Kiruna (but in January and April). Please, rewrite this.
- Figures from A2 to A4, should be from B2 to B4.