**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Detection and mapping of polar stratospheric clouds using limb scattering observations" *by* C. von Savigny et al.

Anonymous Referee #2

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1. General comments

In the paper of von Savigny et al., the authors demonstrate that SCIAMACHY limb measurements can succesfully be used to identify PSCs. The method that is used is intuitive and straightforward. It is based on a color index approach, where the ratio of two irradiances at two different wavelengths is calculated. Subsequently, the ratio of the color indices at two adjacent tangent altitudes is calculated, and a treshold is defined above which the color index ratio identifies the presence of a PSC. When the geolocation of identified PSCs is superimposed on UKMO temperature maps, one can clearly observe that the data points coincide with low temperature values (below 195 K). From the temporal evolution of the PSC cloud top, it is deduced that the slow de-

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scent of the stratospheric temperature minimum above Antarctica is the main driver for the observed descent of PSCs. The scientific content of this paper is interesting and relevant, and the authors have clearly demonstrated their point. Therefore I think this paper is very well suited for publication in Atmospheric Chemistry and Physics. Only a few corrections or additions should be made.

2. Specific comments

In section 3 (Methodology), the authors say that LIMBTRAN simulations where performed for (a) a pure Rayleigh atmosphere, (b) background aerosol conditions, (c) moderate volcanic conditions and (d) high volcanic aerosol conditions. Are these different conditions implemented in LIMBTRAN, or did you use external data from a model or other experiments? If the latter is the case, can you specify the data that you used?

In subsection 4.2 (Temporal evolution of PSC altitude), you state that the sedimentation of PSC particles can be excluded as an explanation for the apparent descent of PSC cloud top altitude, since sedimentation speeds are too large (1 km/h). However, the question then arises as why the PSCs do not simply disappear in a relatively short time. Perhaps you can include some additional short explanation, this would make things more clear.

On Fig. 5, we can observe that the PSC altitude (as defined in the text, actually a measure for the PSC top altitude) coincides with the center of a temperature minimum zone, that decreases with time. This is a little bit strange. If we assume that PSCs can exist below 195 K, we would expect the cloud top curve to be located a few kilometers higher. One possible explanation can be found on Fig. 2. By simple visual inspection of the left panel, we would find a cloud top altitude of about 26.5 or 27 km. On the right panel however, the color index ratio exceeds the treshold (1.3) at 23.5 to 24 km, one data point lower in comparison with the left panel. This problem would be solved if the color index ratio would be defined as:

$theta(TH + dTH) = Rc(TH)/Rc(TH+dTH)$

In this way, all cloud top curves would experience an upward shift of a few kilometers (the tangent altitude grid spacing). I do not want to say that the paper has to be changed, this is only a remark. The definition of the used color index ratio is clear from the paper. Only the association with 'PSC top altitude' is a bit misleading.

On Fig. 7, we observe histograms of temperatures at the derived PSC locations. An immediate interpretation leads to strange conclusions. At higher temperatures (above about 200 K), no PSCs are identified (except for a few outliers). We conclude that no PSCs form at higher temperatures, a conclusion that is correct. Below about 184 K, the histogram is zero again, leading to the conclusion that no PSCs form at extremely low temperatures. This conclusion is false. The reason that the histogram goes to zero at low temperatures is most likely that the geographical regions where these low temperatures occur, are small, and therefore undersampled by SCIAMACHY. Maybe you can add a sentence to explain this. Perhaps it would have been better to present the histogram of number of PSC occurences, normalized with the total number of measurements at the associated temperature (percentage of PSC occurences at a given temperature, a probability density distribution). Most likely, the histogram will be almost 100 percent below 195 K.

3. Technical corrections

Section 2 (SCIAMACHY on ENVISAT): change '1 March 2002' to 'March 1, 2002'.

Figure 4: the titles, labels and color bars are very difficult to read on a printout. It is probably better to increase the size of the figure.

Kind regards, keep up the good work!

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 7169, 2005.

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