

Interactive comment on “First climatology of polar mesospheric clouds from GOMOS/ENVISAT stellar occultation instrument” by K. Pérot et al.

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General comments:

A new data set of noctilucent cloud (NLC) observations from the stellar occultation instrument GOMOS on ENVISAT is presented in this paper. GOMOS' two photometers, which in addition to starlight measure the sunlight scattered from the Earth's limb in daytime, are used to detect NLC.

Four seasons (2002 – 2006) of NLC measurements from each hemisphere are shown. Issues and challenges arising from the instrument's viewing geometry and the satellite's orbit are indicated and discussed along with the advantages and opportunities with this new data set.

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The paper is well structured, descriptions are clear and the message is straightforward. An additional satellite data set of NLC is definitely a valuable contribution to the NLC (and middle atmosphere) scientific community. I recommend this paper to be published and only have minor comments, which are listed below.

Specific comments:

1) Page 25600, line 24 -25: The sentence that reads “They occur at latitudes greater than 55. . .” Consider adding the word “typically” before “occur” - the clouds are sometimes seen at lower latitudes.

2) Page 25601, line 7 – 8: Consider exchanging the word “attenuation” with “breaking” since the word attenuation can be a bit misleading: (the gravity waves break and deposit the momentum they carry onto the background flow, hence distorting the local (geostrophic) balance, which in turn lead to the meridional poleward flow in the summer mesosphere - and, by continuity, upwelling above the pole.)

3) Page 25604, line 5 - 6: Are the photometers’ signals integrated over the wavelength range 470 - 520 nm, and 650 - 700 nm, respectively?

4) Page 25604, line 28 - 29: In the sentence that reads “. . . as will be described in the next section” – here it would be helpful to be more specific. Thus, I suggest adding “3.2” after the word “section”.

5) Page 25605, line 5 – 20: In this paragraph, the differences between the viewing conditions in the NH and SH are discussed. Are the number of observations at latitudes lower than 80° approximately the same for the two hemispheres? If not, is it possible to quantify the differences (e.g. percentage differences in number of observations)? Is the latitudinal distribution of the observations roughly the same (except for pole-ward of 80°, as already explained in the text)?

6) Page 25608, line 13-20: From my understanding, a 3rd degree polynomial is fitted to each and every profile (with or without clouds). Each fitted curve (the dashed lines,

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which are referred to as the modeled curves) is then compared to its corresponding ‘original’ profile (i.e. the one that it was fitted to) – is this correct? Or are all the profiles least-square fitted to one and the same modeled (cloud free) curve? It is not clear from the text that the polynomial fit is carried out on profiles containing clouds, but from Figure 4, it looks like this is the case. This could be clarified a bit further. Also, it is a bit unfortunate that the dashed lines in Figure 3 are not distinguishable – the first impression is that these curves are accidentally missing or that the legend is wrong. It might help if the dashed lines are made thicker and the solid lines are made thinner. This is however not critical, since an explanation is given in the text. It would be helpful to indicate the wavelengths of the blue and the red curves in the figure caption (Figure 3 and 4).

7) Page 25611, line 7 – 14 and Table 1: In the table it appears like the NH season 2005 started unusually late – on June 22 (day +1 relative to solstice). From figure 8 and further reading of the paper, this late start seems to be connected to lack of data rather than a delayed onset of the NLC season. It would be good to point that out already here, in this paragraph.

8) Page 25612, line 24: In the sentence that reads “Lübken et al. (2009) also found a significant decrease in the occurrence frequency in 2005...” - Is the ‘also’ in that sentence related to the NH season 2005 as observed by GOMOS (e.g. significantly smaller occurrence frequencies than the other NH seasons, as shown in Figure 6)? If it is, it might be worth pointing out the reduced amount of data for this season (see previous comment) once again.

9) Page 25612, line 25-27: As I understand it, the variation between 5% and 85% (and 10% - 50% in the SH) is related to the intra-seasonal changes in occurrence frequency, and not to the year-to-year variability – is this correct? This could be clarified, e.g. by removing “from year to year” on line 27 (or replace it with e.g. “within a season”).

10) Page 25613, line 1-5: How are the observations distributed between 65° and 75° N

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compared to 65° and 75° S (see previous comment 5)? Are there, for example, more observations at the higher latitudes in the NH than in the SH in this latitude band? If the observations are relatively evenly distributed in these latitude bands, or distributed in a similar manner, the comparisons between the hemispheres should be adequate.

11) Page 25614, line 20: I suggest adding “(bottom)” after the word “second” for clarification.

12) Page 25615, line 5 – 9: Could you specify the range of scattering angles covered in the NH and in the SH, respectively? Also, I think the differences between the hemispheres will be reduced rather than amplified (line 8) by GOMOS viewing geometry: the SH clouds, which in general are considered to be dimmer and less abundant than the NH clouds, will ‘benefit’ from being viewed at smaller scattering angles – dimmer clouds may be detected in the forward regime, which might add to the frequency of occurrence. The same (but reversed) arguments apply for the NH: fewer clouds may be detected in the backward scattering regime.

Note: SCIAMACHY is viewing the PMC in the forward scattering regime in the NH and in the backward scattering regime in the SH, so exactly opposite to what GOMOS observes – it might be fruitful to compare occurrence frequencies measured by the two data sets in the future; such a comparison could perhaps reveal possible biases in occurrence frequencies due to differences in scattering angles and, if there is a bias, could help to quantify it.

Technical corrections:

1) Page 25601, line 27: skip the “the” before the word “NASA” so that it reads ‘in 2007 by NASA, . . .’

2) Page 25603, line 23: Since GOMOS is still operating, I suggest to change “operated” to “is operating” (or “has been operating”) and add “has” before “collected”; ‘Since then, it is operating smoothly and has collected almost 700 000 occultations.’

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- 3) Page 25610, line 25: drop the “the” before “space”; ‘clouds at the edge of space’
- 4) Page 25615, line 8: the sentence is more clear if the word “considering” is left out; ‘Consequently, this instrumental effect should. . .’
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