This paper contains some interesting results such as the OClO layer in the equatorial stratosphere, but the main weakness of the paper is that the focus of this 'climatology' paper is not on the OClO number densities. In fact, it seems unlikely that the authors retrieved OClO from the annual or monthly SCD profiles in the equatorial region, since they are not discussed. I estimate that ~800 inversions would be required.

Annual: 18 latitudes * 9 years = 162 profiles

Monthly: 12 months * 6 latitudes * 9 years = 648 profiles (everywhere except Antarctic, overestimate)

+ 3 months * 1 latitude * 9 years = 27 profiles (Antarctic)

If the authors choose not to revise the paper in terms of OClO number density climatologies, they should state whether the reason(s) was due to computing time required, lack of retrieval automation, the quality of the inverted profiles, etc.

The altitude of the SCD peak will generally lie below the altitude of the number density peak. So discussion of layer altitudes should either be in terms of number density or the authors must specify in each instance that they are referring to an SCD peak height. Statements such as "the presence of an OClO layer (...) at about 35 km" in the abstract are a bit misleading. There are other misleading statements in the paper as well (see Scientific comments below).

Scientific comments:

P3513 - The authors should also discuss denitrification which involves hydrolysis of N_2O_5 to form nitric acid.

P3513L7- credit to the authors for making this point

P3516 - The mission baseline scenario is not too relevant. From Fig. 1, it appears that "coverage" is near-global (50°N-80°S) and takes several months to achieve. This statement is misleading.

P3519L17 – This is not the cause. The difference in transmittances is more likely related to colder air (smaller air densities) inside the vortex than outside of it. The transmittance difference between the two modes is 0.06. This implies that 23% (= 1-0.2/0.26) of the 404 nm light at a tangent height of 20 km is absorbed by OClO. This is easily 2 orders of magnitude more than OClO absorbed could explain without even considering transmittance changes due to NO_2.

P3519L23 – What is used to weight the median transmittance? Provide a reference for the jackknife method.

P3520 – I appreciated having Eq. 3. Using the reduced χ^2 statistic, the authors should consider whether a 2nd order polynomial is sufficient to account for the slowly-varying component, particularly for the 355-425 nm window. It may not be a coincidence that the window with the smallest residuals is the one with the narrowest fitting window. Furthermore, the authors should test the impact of not detrending the absorber cross-sections of OClO, NO_2, and O_3. They may be throwing away valuable information

particularly for the 355-425 nm window in doing so. As well as comparing residuals, it makes sense for the authors to check whether the OClO SCDs from the 355-381 nm window are biased relative to the other windows.

P3521 “extracted from the jacobian matrix”. Please elaborate.

P3521 – How small do the SCD errors get (best-case altitude and latitude)?

P3522 – The reason it is not easy to validate is that measurements by balloons are geographically sparse. It does not have to do with the fact that this product is “new”.

P3523 – For validation, it is not clear whether the mission-average or the year of the correlative balloon flight is used when using the 20-day window. The authors should try both and go for the one that provides better agreement and explicitly state whether the 20 day window is for one year or all years. The authors should also look at whether the transmittances have a bimodal nature during this 20-day window (if they have not done so) and state this explicitly. If the authors separate the modes, the authors should state that they are picking the “in the vortex” mode. The authors should also try increasing the latitude range to 60-90°N (entire polar region) and then could try reducing (to <20) the number of days in the window. The trend over 20 days, particularly in early March is not linear. Between January and February, relative decreases may be more minor, whereas between February and March, the decrease can be 1 order of magnitude in some years. The authors could use their monthly time series to find the mission-averaged monthly variation and use it to weight the date of the window center. I suggest this because the low bias for the Sirius occultation could be a result of the window center. The lack of bias for the Alnilam case may be a fluke.

P3524 – include error bars for all number densities on this page.

P3524 – Mention why the vertical sampling of the two AMON profiles is different.

P3524L10 – “for the entire altitude range” -> “for most of the altitude range” (see e.g. 27.5 km).

P3524L14 – The 2 km vertical resolution of SALOMON is not the likely cause of difference in OClO number density peak height. The vertical resolution for GOMOS is 1.7 km (for vertical occultations), so there is consistency between the vertical resolutions of the instruments. Furthermore, the SALOMON measurement at 20 km that has a 2 km vertical resolution, depending on the shape of the averaging kernel, will likely be sensitive to the true number density in the 19-21 km range and the GOMOS one at 18 km will be sensitive to the true profile between ~18 km and ~19 km. A more likely explanation is that the peak height “can vary according to the” specific “area of the vortex”.

P3524L21 – “very well ... slightly less well” -> “well ... less well”. This statement is repeated in p3528L8. Also the conclusion of sufficient quality for scientific use depends on the application. I would be willing to use GOMOS OClO number density data to study seasonal evolution of peak height, but I do not feel the community knows enough from comparing with these three correlative profiles whether we can do quantitative comparisons with models to identify problems with these models.

P3525 – As with the abstract, analysis of the layer height should use inverted data.

P3526L14 – Is this the maximum at any tangent altitude (15-45 km)?

P3526L16 – The number density range is much narrower than the SCD range. I would expect the opposite. As in previous comment, what do 5 and 9 e-7 cm^{-3} represent? Are they the maximum monthly-mean number density for each year at any altitude?

P3527- see 1st scientific comment (p3513): $N_2O_5 + H_2O \rightarrow 2\ HNO_3$

P3527L6 – One or two months in austral autumn appear in some years.

P3527L11 – The range of number densities is more reasonable given the range of SCDs, but still oddly small. I wonder if there is a retrieval issue that also led to the decision to not retrieve in equatorial regions.

P3527L22 – If you retrieved OClO number density profiles and uncertainties for each month, you could see if it is significantly higher than the 'background' level in those time periods. If you don't bother with inversions, you could still more compare the SCDs to see if the enhancements are statistically significant considering respective uncertainties.

Fig. 6 – The GOMOS error bars seem driven by natural (OClO) variability. This is a good sign.

Editing:

P3514L7- "by the solar radiation" -> "by solar radiation"

P3514L22 "Nox" -> "NO_x"

P3516 Figures 1, 2, and 3 appear at the end of the manuscript in the following order: third, first, second, but the corresponding captions are in the correct order.

P3517L6 "algorithm"-> "algorithms"

P3517L12 "find"-> "found"

P3518L25 "A total number of (...) has been" -> "A total of (...) have been"

P3519L9 "representativity" -> "representativeness"

P3519L17 "All the cases..." -> "All cases..."

P3521L25 – "retrieval errors" -> "SCD errors"

P3522L16 – "GOMOS products" -> "GOMOS OClO product"

P3523L5 – "kernel matrix (a triangular square matrix)" -> "pathlength matrix (a triangular matrix)"

P3523L5 "profiles" -> "profile"

P3523L7 “method” -> “methods”

P3523L21 “chosen located between 60° and 75° ... in a 20 days window...” -> “located between 60° and 75° latitude... in a 20-day window”

P3525L13-14 “in spring ...” -> in spring.”

P3525 “become dominant and explain” -> “becomes dominant and explains”

P3526L12- “observed” -> “observe” (the past tense is inappropriately used in narration on occasion, when the authors should use the present).

P3526L23 – “important” – “severe”

P3527L2 “remove” -> “removed”

P3527L4 “reaction of formation” -> “formation”

P3527L12 “south pole” -> “south polar region”

P3528L12 “observed a strong increase” -> “observe a strong annual cycle”

P3528L22 “particular” -> “major” (to not contradict p3527L21)

P3528L23 “well observed” -> “strong”

P3528L25 “really promising” -> “promising”

P3531L10 “NO2” -> “NO_2”

P3535 “measurements” -> “transmittance measurements”

Fig. 4 caption: “occulation” -> “occultation”

Fig. 6 panel titles: “North pole” -> “North polar”

Fig. 7 – Could you state the latitude range of these plots in the caption or in the text? Also, the centers for your latitude bands are not stated: this could go on p3518.

Fig. 10 – Could you use solid lines (not dashed) for half of the years? It is very difficult to follow the monthly variation in a given year. A log scale for the y-axis might be a better solution.