Supporting Information for

The high-altitude peaks of atmospheric ozone as observed by NOMAD/UVIS onboard the ExoMars Trace Gas Orbiter Mission

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1. An intercomparison with the ozone vertical profiles retrieved by the Open University

We here report intercomparisons between the results of this work and a parallel study performed using the same observations from the NOMAD/UVIS instrument (Patel et al, this issue). The two studies use a similar spectral inversion technique to convert the spectral transmittance of the Hartley band into number densities of ozone at the respective tangent altitudes. To allow a one-to-one comparison between the two UVIS retrievals, the ozone abundances are interpolated at the same tangent altitude, longitude and latitude.

The seasonal distribution of the vertical abundance of ozone in the northern hemisphere is shown in Figure S1. The ozone enhancement in the 45 - 55 km altitude range between L_s = 0 and 10°, L_s = 30 and 45°, L_s = 55 and 70° is well observed in this work (GSFC retrievals, Figure S1, upper panel) and the parallel study by the Open University (OU retrievals, Figure S1, lower panel). The high-altitude abundances of ozone between 45 and 60 km are well reproduced in both studies during northern summer and early southern spring (L_s = 130 and 190°). The high-altitude peak seen at L_s = 350° between the 40 and 50 km altitude is well depicted in both studies.

In the southern hemisphere (Figure S2), the general behavior of ozone and the key features of the high-altitude peak of ozone from both retrievals are almost identical. Notably, the more prominent ozone peak compared to its counterpart in the north in the altitude range 40 – 55 km is consistent between the two studies and it persists throughout southern fall and winter (L_s = 0 - 170°). A minor difference appears between L_s = 110 and 140° where slightly lower ozone abundances (within 10%) from the OU retrievals (Figure S2, lower panel) are observed compared to the UVIS retrievals in the current study (Figure S2, upper panel).

The intercomparison between this work and the parallel study indicates good quality of the retrieved profiles, which validates the retrieval approach and the presented results.

References

Patel, M.R., Sellers, G., Mason, J.P., Holmes, J.A., Brown, M.A.J., Lewis, S.R., Rajendran, K., Streeter, P.M., Marriner, C., Hathi, B.G., Slade, D.J., Leese, M.R., Wolff, M.J., Khayat, A. SJ., Smith, M.D., Clancy, R.T., Aoki, S., Piccialli, A., Vandaele, A. C., Daerden, F., Thomas, I.R., Ristic, B., Willame, Y., Depiesse, C., Bellucci, G., and Lopez-Moreno, J.-J. The vertical

distribution of ozone on 1 Mars in MY34/35 from ExoMars TGO/NOMAD observations. *Journal of Geophysical Research- Planets*, this issue.

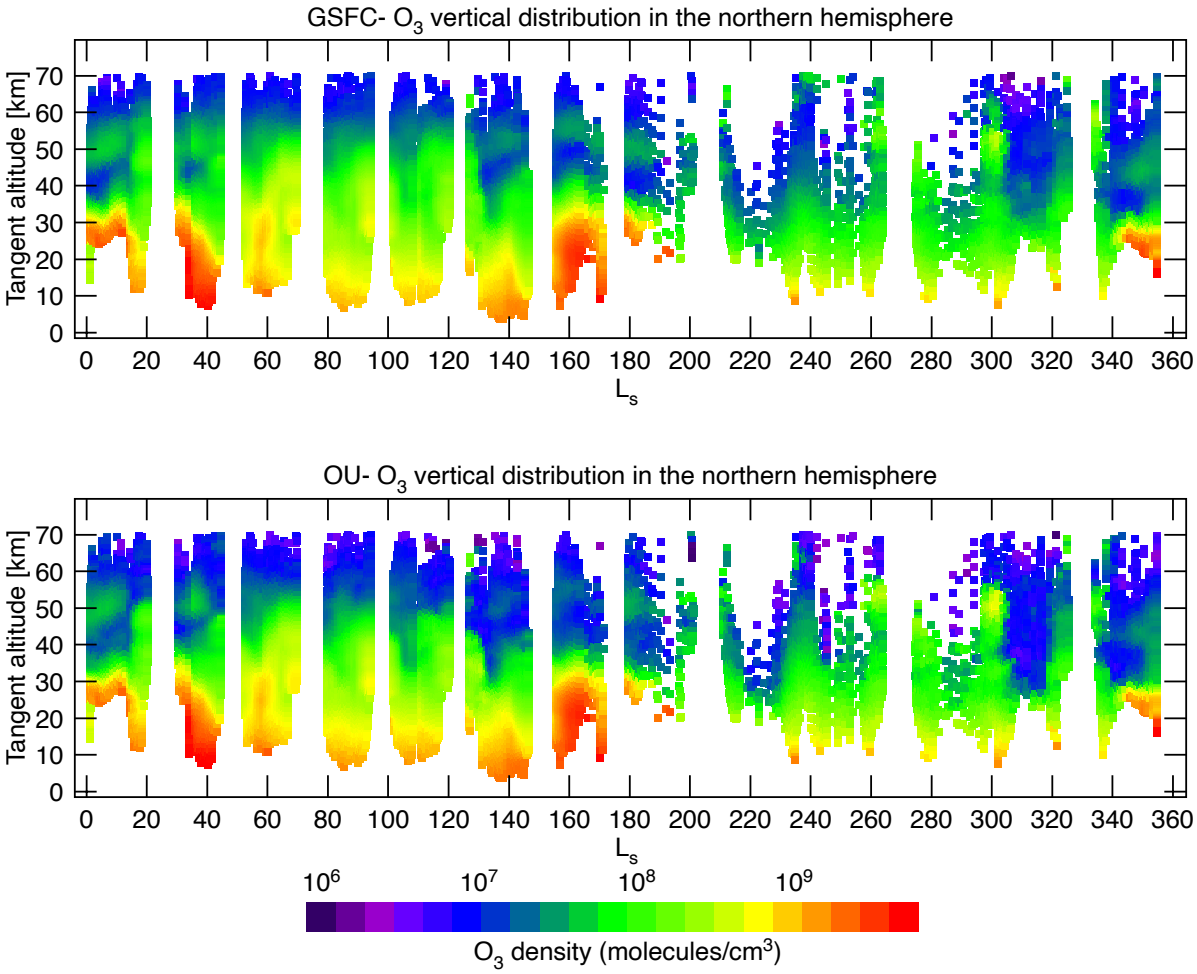

Figure S1: Seasonal distribution of the retrieved vertical O_3 abundance (molecules/cm^3) in the northern hemisphere from UVIS retrievals as presented in this work (GSFC, upper panel) and the Open University (OU, lower panel). The results are shown after applying a two-dimensional convolution of ΔL_s= 5 ° in the local time dimension (x axis) and Δz = 3 km in the altitude dimension (y axis). The high-altitude peaks of ozone are visible during northern spring and summer (southern fall and winter).

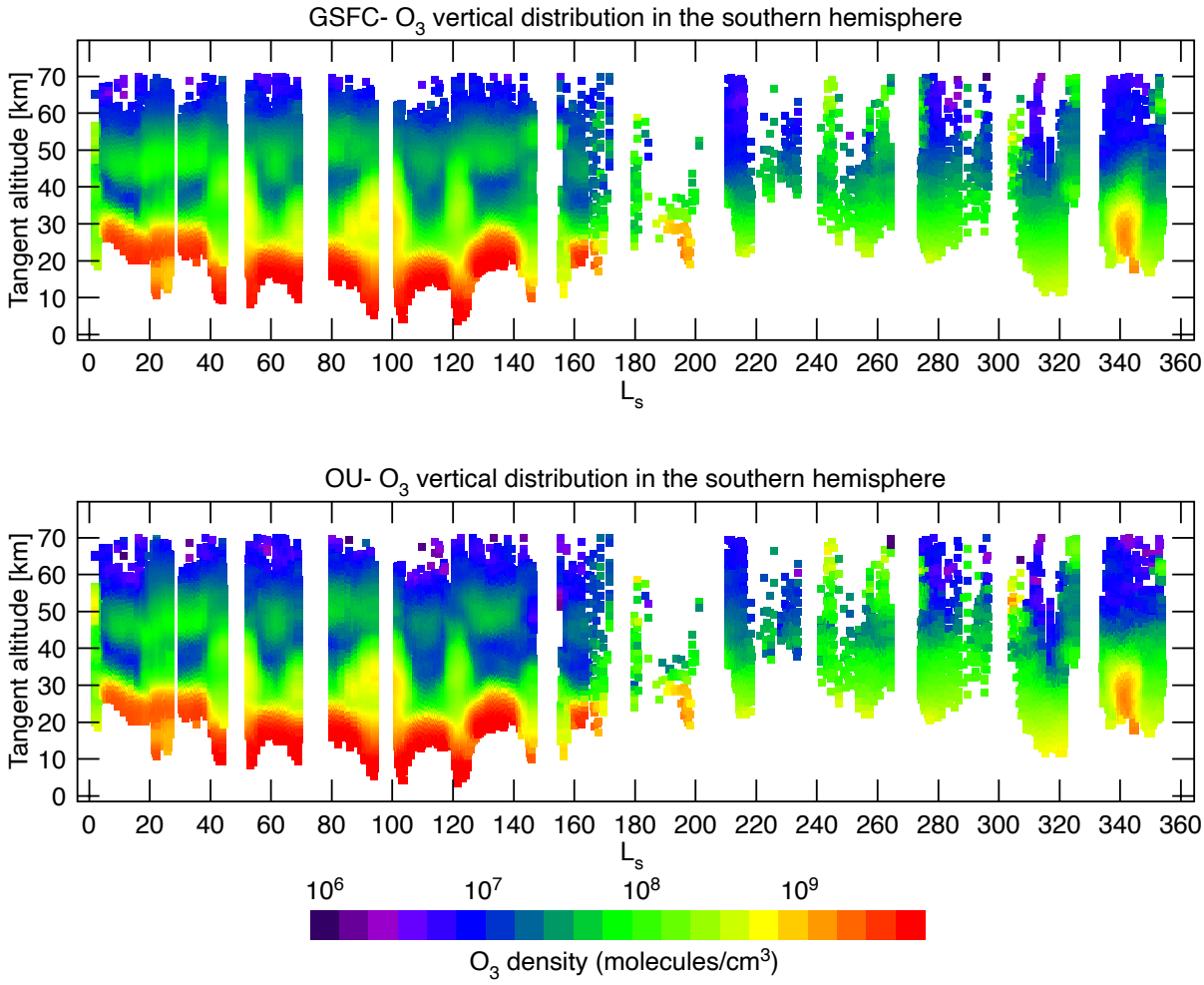

Figure S2: Seasonal distribution of the retrieved vertical O_3 abundance (molecules/cm^3) in the southern hemisphere from UVIS retrievals as presented in this work (GSFC, upper panel) and the Open University (OU, lower panel). The results are shown after applying a two-dimensional convolution of $\Delta L_s = 5$ ° in the local time dimension (x axis) and $\Delta z = 3$ km in the altitude dimension (y axis). The high-altitude peaks of ozone are visible during northern spring and mid-summer seasons (southern fall and mid-southern winter).