OMEGA OBSERVATION OF A DOUBLE OZONE LAYER IN THE SOUTHERN HEMISPHERE OF MARS.

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Introduction: Ozone is a minor constituent of the Martian atmosphere and determining its vertical distribution can improve our knowledge about the planet photochemistry and atmosphere circulation. The O_2 emission band at 1.27 µm in the OMEGA [1] spectra can be used to retrieve the O_3 abundance [2]. In this work we retrieved the vertical profiles for an OMEGA limb observation in the southern hemisphere where a double ozone layer is clearly visible.

Dataset: The OMEGA dataset used in this study is taken from orbit 1176, Ls = 130°. It scans the planet limb in the ingress on the night side (local time LT 2.22^h, northern hemisphere) and on the day side at its egress (LT 14.35^h, southern hemisphere). Figure 1a shows the 1 µm image. It has been taken on the southern rim of Argyre. On Figure 1b the O_3 apparent abundance map is reported. The highest values (red color, apparent ozone abundance > 25 atm µm) are found on a spot in the left side of the image, where the lower values of the incidence angle are found. The weaker layer at higher altitude are points with apparent ozone abundances between 0.84 and 2.4 atm µm. The vertical profiles of ozone shown on Figure 2 have been obtained with an onion peeling method. Concerning the CO_2 quenches, which reduces the O_2 molecules at altitude below 20 km, we considered three values for the quenching parameter k: (1) $k = 0$ (no quenching); (2) $k = 0.7 \times 10^{-20}$ cm^3 s^{-1} (lower limit [2]); (3) $k = 2 \times 10^{-20}$ cm^3 s^{-1} (upper limit [3]). This profile has been retrieved in the middle of the image field.

Discussion: The first and more intense layer is observed for altitudes below 35 km, the second layer is weaker and it is uniformly located at ~ 47 km, with a thickness of about 10 km. According to [4] this second higher layer in the day side can be a consequence of vertical propagation of gravity waves which enhances the transport of ozone in their breaking region, and favors the formation of an ozone layer just above their breaking level. For comparison we report the profile from the northern hemisphere at night side. No ozone at altitude higher than 35 km is observed in this case.

References: [1] Bibring J.P. et al. (2004) ESA SP-1240. [2] Zasova L et al. (2006) mamo.conf..521Z. [3] DeMore et al. (1997) *ChemicalKinetics and Photochemical Data for Use in Stratospheric Modeling*, JetPropulsion Laboratory, Pasadena. [4] Chessefiere E. et al.(1994) *Planet Space Sci.*, 42, 10, 825-830.

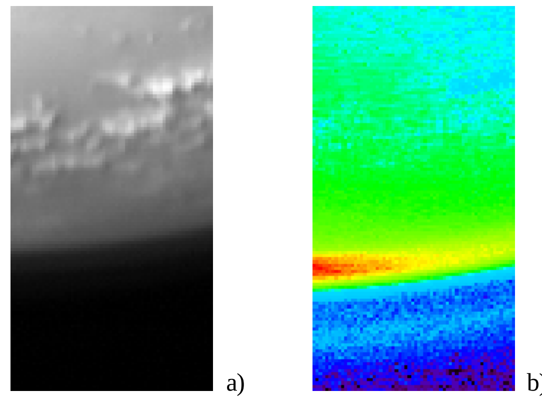

Figure 1 – a) OMEGA albedo map. – b) Ozone apparent abundance map (atm µm).

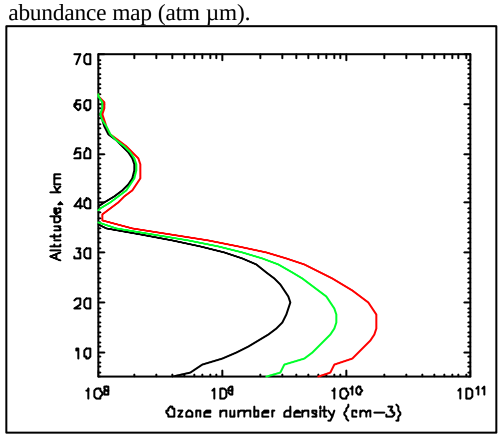

Figure 2 – Vertical profiles of ozone on the southern hemisphere, $k = 0$ (black curve), $k = 0.7 \times 10^{-20}$ cm^3 s^{-1} (green curve), $k = 2 \times 10^{-20}$ cm^3 s^{-1} (red curve).

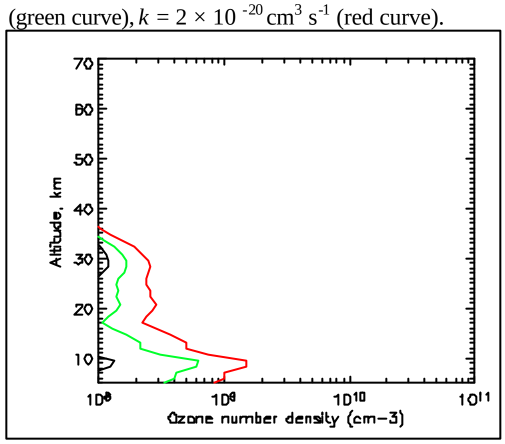

Figure 3 – Vertical profiles of O_3 on the night side of orbit 1176 obtained with $k = 0$ (black curve), $k = 0.7 \times 10^{-20}$ cm^3 s^{-1} (green curve), $k = 2 \times 10^{-20}$ cm^3 s^{-1} (red curve).