The Venus OH Nightglow Distribution

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The first identification of the OH airglow in the terrestrial mesosphere was made in 1950 by *Meinel* [1950]. Recently, the unexpected presence of the OH nightglow was observed in the Venus mesosphere by *Piccioni et al.* [2008] using a limb profile from the Visible and Infra-Red Thermal Imaging Spectrometer (VIRTIS) instrument on board the Venus Express spacecraft. They clearly identified the (1-0) and (2-1) transitions at 2.80 and 2.94 µm, respectively and the (2-0) band at 1.43 µm. Additional bands belonging to the $\Delta v=1$ sequence also appear to be present longward of the (1-0) band. In a preliminary study of characteristics of the OH emission distribution, *Gérard et al.* [2010] pointed out a correlation between the OH($\Delta v=1$) and the $O_2(a^1\Delta)$ nightglow intensities. In *Soret et al.* [2010], the full dataset of VIRTIS-M limb observations of the OH Venus nightglow has been corrected from the thermal emission of the planet and analyzed to determine its characteristics. Based on 3328 limb profiles, the study shows that the emission is highly variable. No clear dependence of the airglow layer altitude versus the antisolar angle is established. The peak brightness appears to decrease away from the antisolar point even if the variability at a given location is very strong. Some correlation between simultaneous observations of the intensity of the OH and the $O_2(a^1\Delta)$ emissions has also been detected, presumably because atomic oxygen is a common precursor to the formation of $O_2(a^1\Delta)$ and O_3, whose reaction with H produces excited OH. A relation given in the one-dimensional photochemical model of *Krasnopolsky* [2009] has been used to link the OH and the $O_2(a^1\Delta)$ airglows through the hydrogen flux at 130 km. It appeared that using a constant flux did not fill well the simultaneous OH and O_2 observations. Either the flux has to vary with the distance to the antisolar point or other dimensions have to be involved.

Gérard, J.-C., L. Soret, A. Saglam, G. Piccioni, and P. Drossart (2010), The distributions of the OH Meinel and O2(a1Δ-X3Σ) nightglow emissions in the Venus mesosphere based on VIRTIS observations, Adv. Space Res., doi:10.1016/j.asr.2010.01.022.

Krasnopolsky, V. A., Venus night airglow: ground-based detection of OH, Observations of O2 emissions, and photochemical model, Icarus, 2010, in press.

Meinel, A. B. (1950), OH emission bands in the spectrum of the night sky, Astrophys. J., 111, 565-564.

Piccioni, G., P. Drossart, L. Zasova, A. Migliorini, J.-C. Gérard, F. P. Mills, A. Shakun, A. García Muñoz, N. Ignatiev, D. Grassi, V. Cottini, F. W. Taylor, S. Erard and the VIRTIS-Venus Express Technical Team (2008), First detection of hydroxyl in the atmosphere of Venus, Astronomy and Astrophysics, 483-3, L29, doi:10.1051/0004-6361:200809761.

Soret, L., J.-C. Gérard, G. Piccioni, and P. Drossart (2010), Venus OH nightglow distribution based on VIRTIS limb observations from Venus Express, Geophys. Res. Lett., 37, L06805, doi:10.1029/2010GL042377.