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Local time variations of the Venusian hydrogen corona

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Abstract

Atomic hydrogen in the upper atmosphere of Venus is produced by chemical reactions involving hydrogen bearing molecules such as H2O. Due to its low mass, atomic hydrogen can reach high altitudes and become the dominant species in the Venusian exosphere. The density of atomic hydrogen retrieved by Pioneer Venus Orbiter from H+ measurement of the ion mass spectrometer indicated large diurnal variation of the hydrogen content with a peak of density near 4:00 local time (1). The large dayside/nightside ratio ~ 1000 was attributed to the wind system induced from temperature contrast. First dayside observations of the atomic hydrogen Lyman-alpha resonant line performed by the UV spectrometer SPICAV (2) aboard Venus Express suggested a lower ratio ~ 30 between morning side and evening side (3). In this presentation, we will present several recent observations of the Venusian hydrogen corona obtained by SPICAV at different local times at nightside to investigate more accurately the diurnal variations of the Venusian hydrogen corona.

1. Introduction

Several observations of the Venusian hydrogen corona have been performed by SPICAV/VEX at the nightside. The observed emission is the sum of three components, the emission of the cold hydrogen population, dominant on the disk, the emission of the hot hydrogen population, partly absorbed by the cold hydrogen and the emission of the interplanetary medium, partly absorbed by the cold hydrogen population at limb.

2. Data analysis

To derive the hydrogen content, we use our radiative transfer model and compare a serie of parametrized models with the observations and derive the best set of parameters. Comparison of one observation and the best fit is displayed in Fig.1

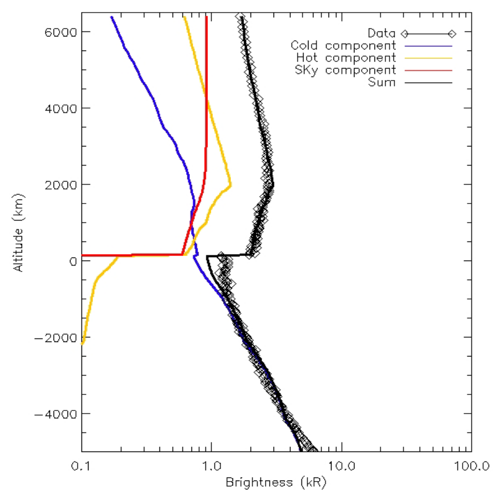

Figure 1 Comparison of the observed brightness profile (diamonds) and the model (black solid line). The profile on the disk could be better reproduced with a 3D density model. The increase of the hot hydrogen emission and the sky brightness with altitudes results from the decrease of the absorption by the cold hydrogen population.

Such a comparison will be done for other observations to study the diurnal variations of the Venusian hydrogen corona.

3. Summary and Conclusions

We analyze the first observation of the nightside hydrogen corona from SPICAV-UV data. Cold, hot and sky emissions are needed to reproduce the limb profile from 0 to 6000 km. The hydrogen density derived on the nightside is larger than the hydrogen density derived on the dayside for both cold and hot hydrogen populations. Further investigates are needed to check if it is a permanent feature or a temporal effect.

References

[1] Brinton., H.C. et al. : Venus Nighttime hydrogen bulge, Geophys. Res. Lett., Vol. 7, pp. 865-868, 1980.

[2] Bertaux, J-L., et al.: SPICAV on Venus Express : Three spectrometers to study the global structure and composition of the Venus atmosphere, Planet. Space Sci., 55, 1673-1700, 2007.

[3] Chaufray, J-Y. et al. : Hydrogen density in the dayside venusian exosphere derived from Lyman-alpha observations of SPICAV on Venus Express, Icarus, 217, 767,2012