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# Study of the cold oxygen corona with IUVS/MAVEN

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## Abstract

The Mars Atmosphere and Volatile Evolution Mission (MAVEN) has observed the Martian upper atmosphere for several months. The Imaging Ultraviolet Spectrograph (IUVS) is able to measure the resonance line of the atomic oxygen at 130.4 nm. From this emission we are able to derive information of the oxygen content in the Martian upper atmosphere and its variability. Atomic oxygen is a key species to better understand the chemistry, heating, dynamics and escape of the Martian upper atmosphere.

## 1. Introduction

The Mars Atmosphere and Volatile Evolution mission (MAVEN) has been recently inserted around Mars (3). This mission is motivated by the study of the Mars atmospheric erosion rates along its history. Most of the atmospheric erosion rates occur in the upper atmosphere and therefore the understanding of the energetics, chemistry and dynamics of the Martian upper atmosphere is crucial to constrain the contribution of the different escape channels to the Martian atmospheric erosion (2, 5).

The atomic oxygen, produced by photodissociation of the atmospheric carbon dioxide, becomes the main neutral species in the upper thermosphere and low exosphere of Mars.

## 2. IUVS observations

Examples of spectra measured by IUVS (4) during one orbit are displayed in Fig. 1. The two dominant lines above 150 km are the hydrogen resonance line at 121.6 nm and the oxygen resonant line at 130.4 nm.

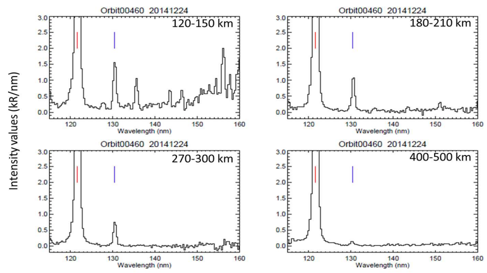


Figure 1: Examples of spectra obtained by IUVS at different altitudes.

Based on the radiative transfer model used to interpret Mars Express data (1), we have developed a fast and full inversion code to automatically derive the oxygen density and temperature at the exobase (Fig. 2)

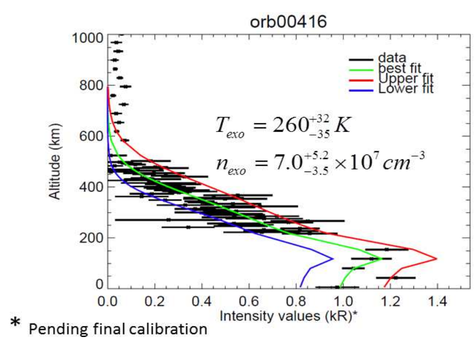


Fig. 2 Brightness profile of the O I 130.4 nm line and best fit derived The parameters of the fit are indicated on the figure.

The current absolute calibration of IUVS is still under investigation and because the O 130.4 nm is optically thick, the derived parameters vary non-linearly with the brightness. Example of the sensitivity of the derived oxygen density and temperature is given in Fig.3.

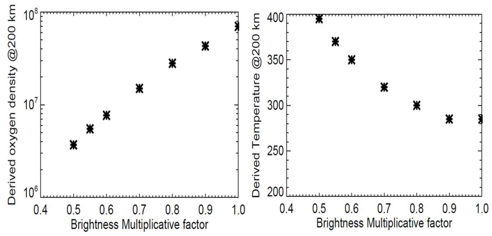


Fig. 3 Sensitivity of the oxygen density and temperature at the exobase to the absolute calibration of the instrument.

In this presentation, results obtained at several SZA will be presented as well as comparison with previous observations (Mariner, Mars Express, HST).

## 3. Summary and Conclusions

The first observations of IUVS/MAVEN of the Martian cold oxygen corona have been performed and first quantitative estimate of the oxygen density derived. The emission is systematically observed for SZA < 100° and several hundreds of profiles have been done during the first months of the mission. The comparison with previous observations show a larger brightness derived by IUVS/MAVEN compared to other instruments. These differences could be due to absolute calibration of these instruments or to change in the oxygen density in the Martian upper atmosphere.


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