OZONE MAPPING ON MARS : FIRST RESULTS FROM MAVEN IUVS.

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Introduction: Ozone (O_3) on Mars is a product of the CO_2 photolysis by ultraviolet radiation ($\lambda < 200$ nm). It is destroyed with a timescale of less than ~1 hour during the day by the H, OH, and HO_2 radicals. This tight coupling between O_3 and HO_x species makes ozone a sensitive tracer of the odd hydrogen chemistry that stabilizes the CO_2 atmosphere of Mars, and ozone measurements offer a powerful constraint for photochemical models. Ozone is also expected to be anticorrelated to water vapour, the source of hydrogen radicals HO_x. At high latitudes in winter, the absence of H_2O prevents the production of HO_x and the chemical lifetime of ozone may increase up to several days. In these conditions, the ozone column abundance usually reaches its largest values of the Martian year (up to 50 μm-atm); Martian ozone then turns into a measurable tracer of the polar vortex dynamics.

IUVS observations: The Imaging Ultraviolet Spectrograph (IUVS) is one of nine science instruments aboard the Mars Atmosphere and Volatile and Evolution (MAVEN) spacecraft [1]. MAVEN was launched on November 18th, 2013 and arrived at Mars on September 21st, 2014. In the apoapse imaging phase of each 4.5h-orbit, the spacecraft motion carries the IUVS lines-of-sight across the Martian disk while the scan mirror is used to make transverse swaths. This observation mode provides IUVS with a unique mapping capability of the solar ultraviolet flux backscattered and/or absorbed by the Martian surface and atmosphere. For each spatial bin, using an algorithm directly inspired from that in use to process the SPICAM/Mars Express data [2], the ozone vertically-integrated column is then derived from the IUVS brightness observed in its MUV channel (180-340 nm). The apoapse MUV pipeline also produces surface albedo and dust opacity maps.

First results: This paper will present an overview of the first six months of ozone mapping by IUVS. We will describe the main features of the ozone column distribution as well as its variation with time, which is already visible in the 1-month period following the Mars orbit insertion of MAVEN (Figure 1). The IUVS observations will also be compared to SPICAM ozone data obtained at the same season. Finally, we will test our quantitative understanding of the Martian ozone by comparing these first results from IUVS to the latest version of our three-dimensional model with photochemistry [3].

References: [1] McClintock, W. E. et al. (2014) *Space Sci. Rev.,* doi10.1007/s11214-014-0098-7. [2] Perrier, S. et al. (2006) *J. Geophys. Res.,* 111, doi: 10.1029/2006JE002681. [3] Lefèvre, F. et al. (2008) *Nature,* 454, 971-975.

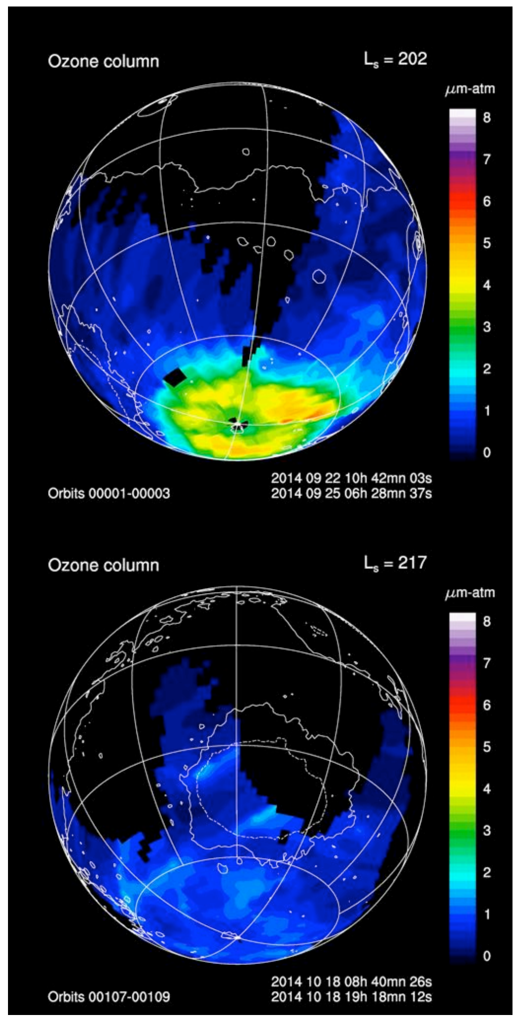

Figure 1. Evolution of the ozone column (μm-atmosphere) on Mars as observed by MAVEN/IUVS between L_s = 202° (top, 22-25 September 2014) and L_s = 217° (bottom, 18 October 2014). Maximum values are of ~5 μm-atmosphere, to be compared to the Earth globally-averaged O_3 column of ~3 mm-atm.