

Open Research Online

The Open University's repository of research publications and other research outputs

Measuring the variation and distribution of ozone in the martian atmosphere

Conference or Workshop Item

How to cite:

Brown, Megan; Patel, Manish; Lewis, Stephen and Bennaceur, Amel (2019). Measuring the variation and distribution of ozone in the martian atmosphere. In: 8th Conference of Astrobiology Society of Britain, 25-26 Apr 2019, Newcastle University.

For guidance on citations see [FAQs](#).

© [not recorded]

Version: Not Set

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's [data policy](#) on reuse of materials please consult the [policies page](#).

oro.open.ac.uk



MEASURING THE VARIATION AND DISTRIBUTION OF OZONE IN THE MARTIAN ATMOSPHERE

M. A. Brown¹, S. R. Lewis¹, A. Bennaceur¹ and M. R. Patel¹

¹ The Open University, Milton Keynes (megan.brown (at) open.ac.uk)

In this project, ozone will be retrieved and mapped in the Martian atmosphere using nadir and occultation UV observations from the NOMAD instrument. The aim is to further understand the vertical, temporal and spatial distribution of ozone and how this affects or is affected by other atmospheric species including water vapour, water ice clouds, and photochemical radicals.

Ozone is a trace gas in the Martian atmosphere, and it can be used to infer water vapour through its anticorrelation and, under certain conditions, track global meridional circulation patterns [1]. It can be used to derive concentrations of trace gases through its photochemical reactions which are otherwise difficult to measure, such as HO_x and O radicals [2]. These species are short lived and highly reactive, including to any potential organic species, biological or otherwise. Furthermore, they are responsible for the stability of carbon dioxide, the primary component of the atmosphere [3]. Investigating the distribution of ozone, therefore, can help determine the photochemistry of these radicals and their formation and destruction.

NOMAD (Nadir and Occultation for Mars Discovery) is an instrument aboard the ExoMars Trace Gas Orbiter. It reached Mars in 2016 and entered science mapping orbit in March 2018 [4, 5]. One of its primary objectives includes mapping trace gases in the atmosphere such as ozone and HO_x species. It aims to retrieve transient, temporal and spatial data from the ultraviolet region using the UVIS spectrometer. These retrievals, coupled with a GCM, will then be used to study Mars' climate to better understand its diurnal, seasonal and potentially interannual variations.

This will allow us to find out how ozone is influenced and further develop our understanding of the processes such as the water cycle and photochemistry in the Martian climate.

References

1. Clancy, R.T. and H. Nair, *Annual (perihelion-aphelion) cycles in the photochemical behavior of the global Mars atmosphere*. Journal of Geophysical Research: Planets, 1996. **101**(E5): p. 12785-12790.
2. Bertaux, J.-L., et al., *SPICAM on Mars Express: Observing modes and overview of UV spectrometer data and scientific results*. Journal of Geophysical Research: Planets, 2006. **111**(E10).
3. Lefèvre, F., et al., *Three-dimensional modeling of ozone on Mars*. Journal of Geophysical Research: Planets, 2004. **109**(E7).
4. Patel, M.R., et al., *NOMAD spectrometer on the ExoMars trace gas orbiter mission: part 2— design, manufacturing, and testing of the ultraviolet and visible channel*. Applied Optics, 2017. **56**(10): p. 2771-2782.
5. Vandaele, A.C., et al., *NOMAD, an Integrated Suite of Three Spectrometers for the ExoMars Trace Gas Mission: Technical Description, Science Objectives and Expected Performance*. Space Science Reviews, 2018. **214**(5): p. 80.