Measuring the variation and distribution of ozone in the martian atmosphere

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MEASURING THE VARIATION AND DISTRIBUTION OF OZONE IN THE MARTIAN ATMOSPHERE

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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.

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