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The distribution of ozone on Mars as measured by the NOMAD-UVIS spectrometer in Mars year 34.

Jon Mason[1], Manish Patel[1,2], James Holmes[1], Paul Streeter[1], Megan Brown[1], Graham Sellers[1], Charlotte Marriner[1], Stephen Lewis[1], Michael Wolff[3], Yannick Willame[4], Cedric Depiesse[4], Bojan Ristic[4], Ian Thomas[4], Frank Daerden[4], Ann-Carine Vandaele[4], José Juan López Moreno[5], and Giancarlo Bellucci[6]

[1]School of Physical Sciences, The Open University, Walton Hall, Milton Keynes MK7 6AA, U.K
[2]Space Science and Technology Department, Science and Technology Facilities Council, Rutherford Appleton Laboratory, Harwell Campus, Didcot, Oxfordshire OX11 0QX, U.K
[3]Space Science Institute, Boulder, CO, U.S.A
[4]Royal Belgian Institute for Space Aeronomy, BIRA-IASB, 3 Avenue Circulaire, 1180 Brussels, Belgium.
[5]Instituto de Astrofisica de Andalucía/CSIC, Granada, Spain.
[6]Istituto di Astrofisica e Planetologia Spaziali, INAF, Rome, Italy

Introduction: The spatial and temporal variation of ozone (O_3) is key to understanding ongoing atmospheric processes and transport in the martian atmosphere[1]. As a photochemically active species, O_3 has been used to validate the photochemistry of short lived species and, by extension, the water vapour cycle [2,3,4,5] and as a tracer to track the global circulation[6].

The Ultraviolet and Visible Spectrometer (UVIS) instrument[7], a channel of the NOMAD spectrometer suite[8], has been in orbit around Mars for over two years with near continuous nadir observations through the latter half of Mars Year(MY) 34 through to MY36. The UVIS observations provide high resolution spatial and temporal maps of O_3 column abundance and provides observations at different local times.

A retrieval procedure was developed, using spectral measurements over the Hartley band to obtain the O_3 column abundances. The radiative transfer simulation is performed using the discrete ordinates DISORT package[9] and we employ the 'front-end' routines (DISORT_MULTI) developed by Mike Wolff, for studies of the martian atmosphere [1,10,11]

Results: In this work we present the geographic and seasonal distribution of O_3 in the martian atmosphere as measured by UVIS between L_S = 148 and 360° in Mars Year 34 (April 2018 to March 2019). Seasonally the O_3 distribution is consistent, with low O_3 abundances in equatorial regions and higher O_3 abundances at higher latitudes in the winter season. As the martian atmosphere cools through northern spring between L_s = 350°(MY34) and L_s = 90°(MY35), due to the reduced solar insolation, we observed a steady increase in equatorial O_3, coinciding with the onset of the aphelion cloud belt. The equatorial O_3 peaks near the northern winter solstice L_s = 90°, associated with the cooler and dryer atmosphere of the martian aphelion season before reducing again as the atmosphere warms and more water vapour enters the atmosphere.

Ozone entrapment[1] is observed in large impact basins, such as the Hellas Basin and to a lesser

extent Argyre Planitia. Ozone abundances measured within Hellas can be an order of magnitude higher than the surrounding regions with abundances of 20 μm-atm observed within Hellas compared to 2-5 μm-atm in the surrounding area at aphelion. Ozone entrapment is still observed during the perihelion season, with abundances within Hellas being 5-10 μm-atm.

The UVIS dataset provides comprehensive seasonal coverage between latitudes ~74° N and 74° S and samples multiple local times at a giving location enabling unprecedented detail in the O_3 diurnal cycle.

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