Comparisons of UV Emissions in Mars’ Dawn and Dusk Twilight Glow Using MAVEN’s IUVS Instrument

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Sun’s radiation

Twilight glow
Data

• MAVEN = Mars Atmosphere and Volatile EvolutioN mission, launched in 2013.

• IUVS = Imaging Ultraviolet Spectrograph.
1. CO Cameron

2. CO2+ Ultraviolet Doublet (UVD)
Solar Zenith Angle (SZA)
Solar Zenith Angle (SZA)

Specified range for twilight glow:

$75^\circ$ – $95^\circ$ SZA.
Methodology
1st step of sorting out
2nd step of sorting out
3rd step of sorting out

CO CAM graph is similar to this one
4th step of sorting out

Optimal range of SZA:

69° – 75° SZA.
Results
Peak intensities of CO2+ UVD and CO CAM were similar… as expected 😞

There is no vast difference between dawn and dusk twilight glows!
1. Hydrogen  2. Oxygen 130.4  3. CO Cameron  4. CO2+ Ultraviolet Doublet (UVD)
Separation of Orbits

Orbits 3927 – 4057

Orbits 3960 – 3989

Early Orbits

Orbits 4041 – 4069

Late Orbits
H in Early Orbits

Model
O in Early Orbits

Peak Intensity of O130.4 in Early Orbits

- Dawn scans
- Dusk scans

Model

[O] vol. mixing ratio (mol/mol)

Altitude [km]

Peak Intensity [kR]

Local time (Martian hour)

North latitude (degrees)
H in Late Orbits

Model

![Graph showing peak intensity of H in late orbits with data points for dawn and dusk scans.](image1)

![Map showing [H] vol. mixing ratio (mol/mol) with geographic coordinates.](image2)
O in Late Orbits

Model
Sorted out 6500+ orbit data files to fit our criteria of SZA:

• There is no significant difference in variability of CO2+ UVD and CO CAM bands between dawn and dusk twilight glows, as expected.

• There is significant variability in H and O in the earlier group of orbits, which matches the models.

• There is no significant variability in H, however there is in O in the latter group of orbits, which doesn’t match the models, maybe dust storm is the reason (speculation).