Thermospheric Structure and Variability of the Mars Terminator from MAVEN/EUVM Solar Occultations

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Abstract:

The Extreme Ultraviolet Monitor (EUVM) onboard the Mars Atmosphere and Volatile EvolutioN (MAVEN) orbiter measures thermospheric density from about 110 to 200 km via solar occultations using its 17-22 nm channel, in addition to EUVM's primary solar irradiance measurement. The EUVM solar occultation data record ranges from late 2014 through 2021, spanning a large fraction of a solar cycle and 3 Mars years. Features inherent to solar occultations, namely their insensitivity to absolute calibration and inherently fixed local time, allow for the characterization of long-term variability of the upper atmosphere. In this presentation, we show observed variations in thermospheric density and temperature with solar cycle and season. In particular, we quantify the sensitivity of exospheric temperature to solar EUV irradiance and show that the Dawn terminator tends to be more sensitive to solar EUV forcing than the Dusk terminator. We discuss possible causes of this feature and what insights it provides to the climatology of the Mars upper atmosphere. Additionally, we show how thermospheric density varies with latitude at the terminator, and how this structure changes with season and local time. Underlying causes of prominent features, such as higher density at high latitude dawn, are discussed.