**STANDARDIZING SCALE HEIGHT COMPUTATION OF MAVEN NGIMS NEUTRAL DATA**

M.K. Elrod[1,2], M. Slipski[3], S. Stone, M. Benna[4,2]. [1] University of Maryland, College Park, [2] NASA Goddard Space Flight Center (meredith.k.elrod@nasa.gov), [3] LASP, University of Colorado, [4]University of Maryland Baltimore County, Baltimore County

**Introduction:** The MAVEN NGIMS team produces a level 3 product which includes the computation of Ar scale height an atmospheric temperatures at 200 km. In the latest version (v06_r01) this has been revised to include scale height fits for CO2, N2 O and CO. Members of the MAVEN team have used various methods to compute scale heights leading to significant variations in scale height values depending on fits and techniques within a few orbits even, occasionally, the same pass. Additionally fitting scale heights in a very stable atmosphere like the day side vs night side can have different results based on boundary conditions. Currently, most methods only compute Ar scale heights as it is most stable and reacts least with the instrument.

**Figure 1:**

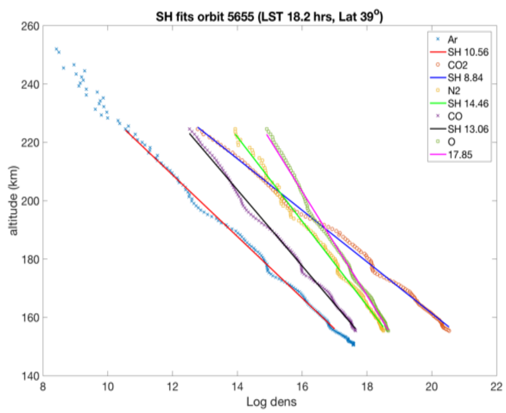


**Fig1—**Fits of log(density) vs. altitude of MAVEN NGIMS data from inbound passes. Ar (blue), CO2 (red), N2(gold), CO (magenta), O (lime) with scale height linear fits to the log density. The waves in the data causes higher variability in the fits.

**Figure2**

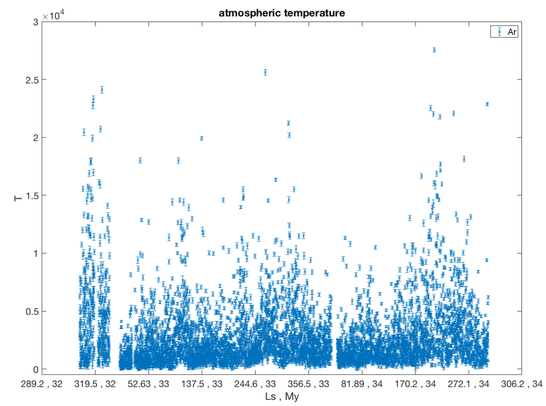


**Fig2-** Atmospheric temperature derived from the Ar scale heights using H = mg/kT. This computes an overall average atmospheric temperature for the upper atmosphere but does not take into account the temperature variations expected from the high density variations.

**Figure 3 (Scale Height v orbit)**

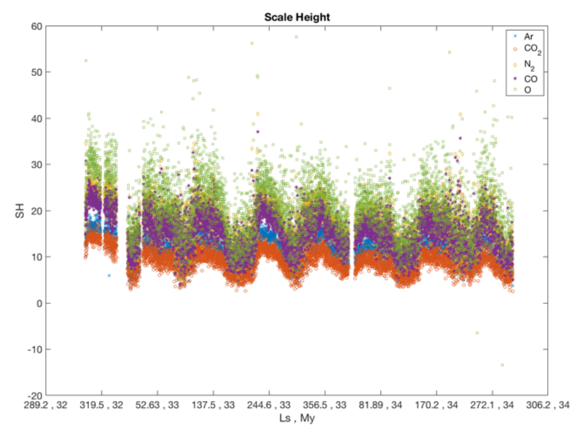


**Fig 3-**Scales heights of all 5 species fit from figure 1 plotted over the 2 complete My that MAVEN has been in orbit at Mars (My 33 & 34). The higher scatter in the scale heights at the end of my34 is due to the onset of PEDE 2018a.

**Method:** The NGIMS team has chosen to expand these fitting techniques to include fitted scale heights for $CO_2$, $N_2$, CO, and O. Having compared multiple techniques, the method found to be most reliable for most conditions was determined to be a simple fit method. We have focused this to a fitting method that determines the exobase altitude of the CO2 atmosphere as a maximum altitude for the highest point for fitting, and uses the periapsis as the lowest point and then fits the altitude versus log(density). The slope of altitude vs log(density) is -1/H where H is the scale height of the atmosphere for each species. Since this is between the homopause and the exobase, each species will have a different scale height by this point. This is being released as a new standardization for the level 3 product, with the understanding that scientists and team members will continue to compute more precise scale heights and temperatures as needed based on science and model demands.

**Summary:** Additionally, we examine these scale heights for variations seasonally, diurnally, and above and below the exobase. The atmosphere is significantly more stable on the dayside than on the nightside. We have found a jog or kink in the atmosphere in several atmospheric profiles slightly above the exobase indicating a change in the scale height between the super and supra- exobase temperatures. Waves are more prevalent on the night side and terminator sides making scale height fits more difficult. As a result we have added confidence level and error to the derived temperatures from these scale height fits to the level 3 product for reference.

**References:** Elrod, Meredith; Benna, Mehdi, MAVEN Neutral Gas and Ion Mass Spectrometer Data, urn:nasa:pds:maven_ngims, (2014)