Supporting Information for "MAVEN/NGIMS Dayside Exospheric Temperatures over Solar Cycle and Seasons: Role of Dayside Thermal Balances in Regulating Temperatures"

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Introduction

The question of using a linear (least-squares) fit to capture the Mars solar cycle/seasonal trend of dayside Texo is important to address because the NGIMS scale height temperature data has a rather large scatter as shown in Figure 1. The adequacy and uniqueness of a computed linear fit for such a large scatter would be legitimate for a data distribution that is both homogeneous and representative (enough data points to capture the full distribution). We address the homogeneous nature of the data distribution here.

For a robust linear fit, the NGIMS scale height temperature data must follow the same distribution along the independent variable domains (e.g. EUV radiation and SZA). If the data distribution looks the same for any sub-sample along the X direction, then the data has a homogeneous distribution. Figure S1 illustrates this analysis, and shows that NGIMS scale height temperatures were found to be statistically homogeneous along the EUV and SZA scales. In both cases, the data obeys a normal-like distribution with varying mean but constant variance. Statistical homogeneity and the large size of the data set allows us to apply a linear regression and moving averaging in our final analysis.

Figure S1. Panel S1-A illustrates the distribution for temperature for different subsets of the data. Each subset captures a different EUV bin (0.5 mW/m^2 bin size). The data follow similar distributions that are skewed by the mean. Panel S1-B shows the distribution of temperature deviation from the mean for each EUV bin. All data subsets show a constant variance around the mean. Alternatively, we do the same exercise but for SZA, with bins of 20 degrees each as indicated in the legend. Panel S1-C again shows the data follow similar distributions that are skewed by the mean. Panel S1-D shows a constant variance around the mean for each SZA bin. The results confirm a homogeneous normal-like distribution for both EUV and SZA scales.