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Introduction: The Mars Atmosphere and Volatile Evolution (MAVEN) orbiter will have been at Mars for five Earth years and over two Mars years by October 2019. Over this time, the solar activity has declined from moderate to minimum conditions, and the MAVEN remote and in-situ measurements have spanned all latitudes, longitudes and local times; visiting many locations on multiple occasions. MAVEN measures neutral thermospheric density and/or temperature with 4 instruments, the ACCelerometer (ACC) [1], the Neutral Gas and Ion Mass Spectrometer (NGIMS) [2], the Imaging UltraViolet Spectrograph (IUVS) [3] and the Extreme Ultraviolet Monitor Solar Occultations (EUVM-SO) [4], which can span 3-4 different locations during any given orbit. Each of these four instruments has individually advanced the understanding of the structure and variability of the Mars thermosphere, but leveraging the measurements of all four instruments simultaneously has been limited to date. It is the aim of the MAVEN Neutral Data Working Group (NDWG) to combine measurements from the four aforementioned instruments to provide a more global view of the Mars thermosphere and thereby provide insight into the structure and variability of the Mars thermosphere beyond what can be achieved with any of these instruments alone.

Data: Figure 1 shows where the four MAVEN neutral instruments make their measurements for a sample orbit that has periapsis on the dayside. The NGIMS and ACC instruments make measurements in-situ during the periapsis orbit segment; the actual periapsis point for this orbit is shown with a green square. The IUVS instrument makes limb-scans in the direction orthogonal to the space-craft trajectory at distances from ~100 to 1500 km from the spacecraft. And the EUVM-SO measurements are inherently constrained at the terminator, in this case making measurements at dawn near the north pole and dusk near the south pole.

Technical Objectives: The primary objective of the MAVEN NDWG is to produce a merged dataset of neutral measurements. In order to do this, the various instruments need to be cross-calibrated. This is achieved by comparing the various measurements at similar locations, seasons and solar activity—a task that is complicated by the fact that, aside from NGIMS and ACC, the measurements are separated in space at any given time. We present initial cross-calibration results and discuss the cross-calibration methodology in this study.

Science Enhanced or Enabled: The combination of all MAVEN data will enable or enhance a range of studies. Some applications include: constraining observations of tides and waves with observations at multiple local times and/or locations; studying large scale structures that result from global circulation patterns such as polar warming with multi-point observations; advancing the understanding of global scale impacts of space weather events such as solar flares and coronal mass ejections on the thermosphere; and advancing atmospheric models by creating a reference atmosphere in the near term, and source data for assimilative models in the long term.