COMPOSITIONAL VARIATION IN REGOLITH FROM APOLLO 17 DRIVE TUBE 73002 J.L. Valenciano[1], C. R. Neal[1], M. D. Neuman[2], K. Wang[2], B. L. Jolliff[2], C. K. Shearer[3], and the ANGSA Science Team, [1]Department of Civil and Environmental Engineering and Earth Sciences, University of Notre Dame, Notre Dame, IN 46556, USA [2]Department of Earth & Planetary Sciences and the McDonnell Center for the Space Science, Washington University in St. Louis, MO 63130, USA [3]Institute of Meteoritics, University of New Mexico, Albuquerque, NM, USA (jvalenc2@nd.edu)

Introduction: Apollo 17 drive tube 73002 was collected at station 3 (**Fig. 1**) and were stored under unique conditions. University of Notre Dame (ND) and Washington University in St. Louis (WUSTL) have collaborated to produce whole rock chemical data during the first dissection of tube 73002. These data were used to determine the composition variation that appear down the drive tube using components: high titanium (Hi Ti) mare basalt, noritic impact melt breccia (Nor IMB), anorthositic norite (An Nor) and KREEP basalt [1].

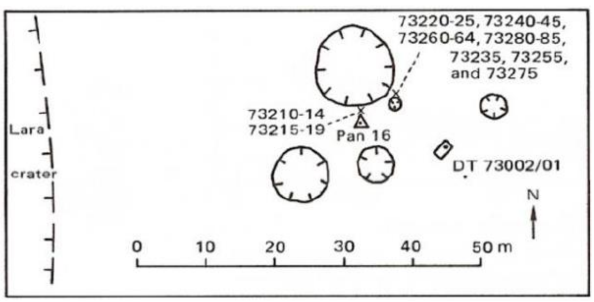

Figure 1: Schematic drawing showing the location of 73002 and 73001 was collected relative to other station 3 samples [2]

Methods: Subsamples of 50 mg aliquots of regolith were analyzed for major and trace elements, with ND analyzing the upper portion of the drive tube and WUSTL the lower portion, with samples from some intervals in common to check for consistency. Samples were ground to a fine powder and then digested in a mixture of concentrated HNO_3 and HF at ~110 ˚C for 5 days. WUSTL used approximately 5-10 mg of their samples to generate a fused bead to determine major elements by EPMA.

ND data were collected using a process similar to that in [3]. Major and minor element data were collected by ICP-OES (Perkin Elmer Optima 8000 Prep 3) at the Center for Env. Science & Technology (CEST); trace element data were collected using ICP-MS using a Nu Plasma Attom at the Midwest Isotope & Trace Element Research Analytical Center (MITERAC). For major elements an internal standard of 10 ppm indium and a solution of known concentrations were used for signal drift corrections and, for trace elements, a solution with an array of elements of known concentrations. All samples were analyzed along with USGS reference material (BCR-2, BHVO-2, BIR-1a) to support the accuracy of the data collected.

WUSTL collected their major element data by electron microprobe using fused beads. Trace elements concentrations were calibrated using USGS reference materials, with an internal standard of 5 ppb used as a drift correction and determined through ICP-MS using a Thermo Fisher Scientific iCAP Qc [4].

Mixing calculations through least squares regression were conducted using values from [5] using a method similar to [6].

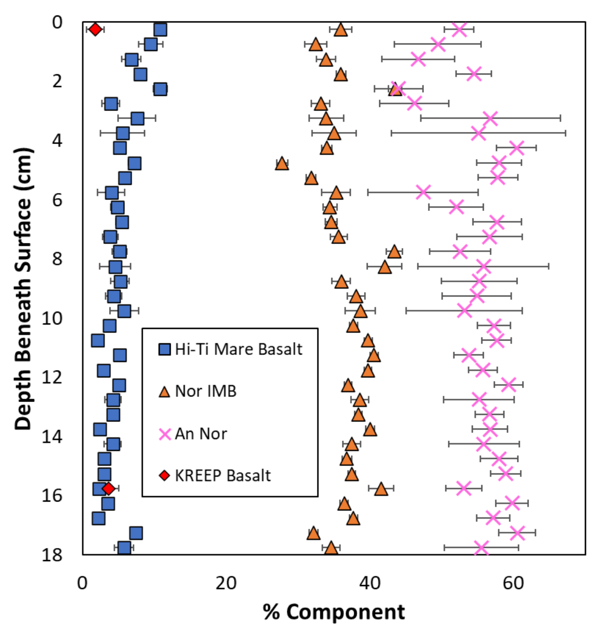

Figure 2: Graph showing the variation in composition downcore. Blue squares represent high titanium mare basalt, noritic impact melt breccia (Nor IMB) are represented by orange triangles, pink X's anorthositic norite (An Nor) and red diamonds are KREEP basalt.

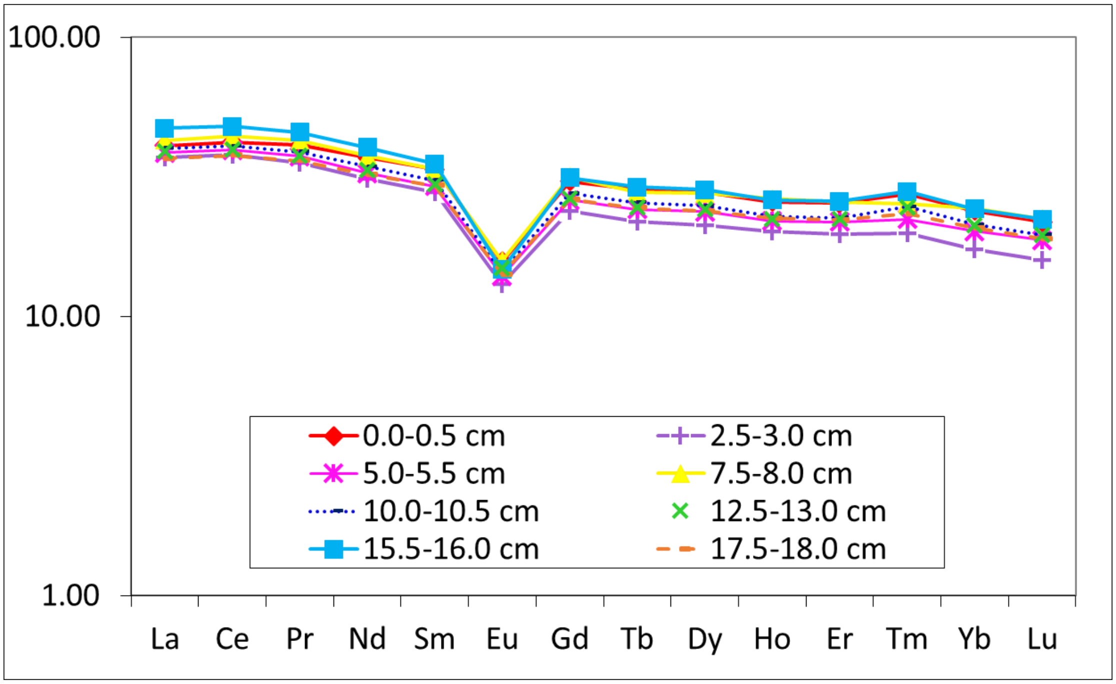

Figure 3: Graph of rare earth element (REE) data showing selected intervals from throughout 73002. Samples in intervals 0.0 – 0.5 cm, 7.5 – 8.0 cm, and 15.5 – 16.0 cm show a slight enrichment in REEs when compared to other samples from this study.

Results & Discussion: The whole-rock data from 73002 show variability down the core, but the modeling indicates this cannot be generated simply by mixing pristine lunar lithologies. Inclusion of previously processed (mixed) lithologies are needed. The intervals between the top of 73001 (0.0 – 0.5 cm) to interval 5.5 – 6.0 cm showed the most compositional variation, with lower intervals showing fairly consistent values for each of the components (**Fig. 2**). An Nor shows the comparatively consistent values, with most points being within error of each other. It is the primary component throughout the core. The highest value for Hi Ti mare basalt is 10.75%, with the lowest being 2.02%. This component shows a steady decline as it travels down the tube, which is consistent with the decline in TiO_2 percentage seen in [7]. Mixing calculations showed a relatively larger increase in Nor IMB in intervals 2.0-2.5 cm and 7.5 – 9.0 cm. KREEP basalt components were found to only be present in intervals 0.0 – 0.5 cm and 15.5 – 16.0 cm.

These two intervals, along with interval 7.5 – 8.0 cm, all show slightly higher REE values when compared to other intervals in the drive tube (**Fig. 3**). With the exception of 7.5 – 8.0 cm, which showed no statistically significant KREEP component, the other two intervals (0.0 – 0.5 cm and 15.5 – 16.0 cm) show the possible presence of a KREEP. This can be supported by this increase in REE concentration. A possible explanation for this is these intervals contained more mature regolith.

Future Work: Currently, experimentation is underway on samples from drive tube 73001, the results of which will also be presented at this meeting and compared with the 73002 results.

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