Multispectral Imaging and Hyperspectral Profile of the First Dissection for Core 73002. Lingzhi Sun[1], Paul Lucey[1], Abigail Flom[1], Charles Shearer[2], Ryan Zeigler[3], Juliane Gross[3] [1]Hawai'i Institute of Geophysics and Planetology, Dept. of Earth Sciences, University of Hawai'i at Mānoa, 1680 East-West Rd. Honolulu, HI 96822, USA, lzsun@higp.hawaii.edu, [2]Institute of Meteoritics, Department of Earth and Planetary Sciences, University of New Mexico, Albuquerque, New Mexico 87131, USA, [3]Astromaterials Acquisition and Curation Office, NASA Johnson Space Center, Houston, TX, 77058 USA.

Introduction: The double drive tube 73001 and 73002 were collected at Station 3 during the EVA 2 of Apollo 17 mission, located near the rim of Laura crater, on the light mantle southwest of Taurus-Littrow valley [1-3]. Core 73002 is the upper segment, and it sampled about 20 cm; core 73001 is the lower segment, and it has been curated under vacuum since its return. In December 2019, the Apollo Next Generation Sample Analysis (ANGSA) team opened core 73002, beginning to examine the first of the two pristine core samples. As part of the preliminary examination, spectral imaging scanning and hyperspectral measurements of the cores are being carried out by the University of Hawaii, supported by the CAAAS (Consortium for the Advanced Analysis of Apollo Samples) team of ANGSA and the curatorial facility. In this work, we will be presenting some preliminary results of imaging obtained during the first dissection of core 73002.

Methods: The multispectral imaging camera covers six wavelengths (Table 1), including some of the bands used by the Clementine UVVIS camera, LRO WAC and KAGUYA Multiband Imager. The spatial resolution is about 60 μm/pixel. The hyperspectral profiles are acquired by an Analytical Spectral Devices (ASD) spectrometer, with wavelengths covering 500 – 2500 nm at 10 nm spectral resolution, substantially overlapping M^3 from Chandrayaan-1, the Spectral Profiler on board Kaguya, and the large lunar soil spectral datasets measured at RELAB. Ultimately, the hyperspectral profiles will be obtained at 1 mm spatial resolution during the dissection process to provide hyperspectral data throughout the whole core volume.

Preliminary Results: Fig. 1 shows images of the whole core 73002 during the first dissection. The upper side of the images is closer to the surface side on the Moon, and the arrow in Fig 1a marked the dissection progress at the time of the data collection. The images show very fine grained lunar regolith. For the multispectral results, the 570 nm reflectance image (Fig. 1b) shows systematic darkening from bottom to top of the core, and the false colored image (R=750 nm/415 nm, G=750 nm/950 nm, B=415 nm/750 nm) in Fig. 1c shows that soils closer to the surface tend to be spectrally redder. Both of them suggesting an increasing maturity with decreasing depth along the core, while we don't observe strong systematic variations in multispectral color along the core.

For the hyperspectral profile, we measured 17 spots along the center of the core at 1 cm intervals (areas circled out in Fig. 1a). The reflectance spectra are shown in Fig.2. The distances are indicated by the scale on the core receptacle inside the curation box, and larger numbers are closer to the surface side shown in Fig. 1a. Reflectance spectra in Fig. 2 show that the soils closer to the surface have lower reflectance, indicating a systematic darkening effect along the core, consistent with the multispectral imaging results.

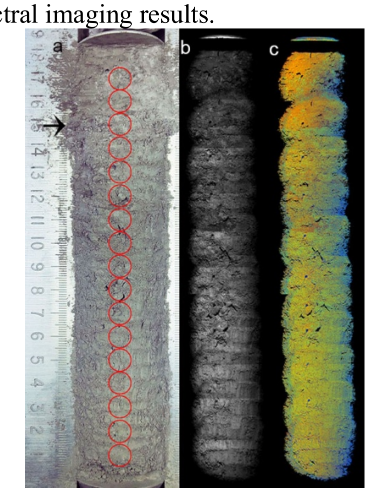

Fig. 1 Core 73002 images during the first dissection. (a) phone image, red circles are hyperspectral profile footprints, the scale is shown on the left, and the arrow indicates dissection progress. (b) 570 nm reflectance. (c) false colored image of the core, R=750 nm/415 nm, G=750 nm/950 nm, B=415 nm/750 nm.

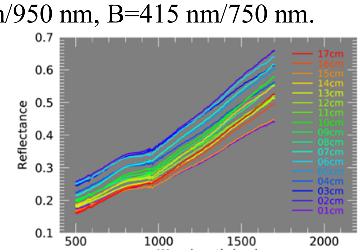

Fig.2 Reflectance spectra along the core, and the centimeter values refer to the scale shown in Fig. 1a.

References: [1] Butler P. (1973), MSC 03211. [2] Allton J. H. (1989), JSC-23454, pp97,Curator's Office, JSC. [3] Duke M.B. and Nagle J.S. (1976), JSC09252 rev. Curators' Office.