NEW GEOLOGICAL MAPS AND CRATER SIZE-FREQUENCY DISTRIBUTION MEASUREMENTS OF THE APOLLO 17 LANDING SITE. W. Iqbal[1], H. Hiesinger[1], and C. H. van der Bogert[1], [1]Institut für Planetologie, Westfälische Wilhelms-Universität, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany, (iqbalw@uni-muenster.de).

Introduction: The lunar cratering chronology based on crater size-frequency distribution (CSFD) measurements is used to derive absolute model ages (AMAs) for geological units on terrestrial bodies throughout the Solar System [e.g., 1-6]. The lunar chronology [3,4] can be reevaluated and possibly improved using modern lunar mission data [7-10] and advanced lunar sample analyses [e.g., 11]. We used Lunar Reconnaissance Orbiter Camera (LROC) images [7], the LOLA/Kaguya merged digital elevation model (DEM) [8], and spectral data from Clementine [9] and the Kaguya Multiband Imager (MI) [10] to produce new regional and local geological maps of the Apollo 17 landing site and to investigate the CSFDs of the updated units.

The Apollo 17 landing site, situated in the Taurus-Littrow valley, shows diverse geology [e.g., 12,13]. Updated $N(1)$ (cumulative number of the craters ≥1 km in diameter) values can be correlated with recent sample analyses from the landing site, which provide several calibraton points for the lunar cratering chronology curve [3,4]. For example, Hiesinger et al. (2012) [14] used areas on the light mantle deposit near the landing site to fix the age of Tycho crater to confirm its calibration point for the chronology [3,4].

Methods: We used LROC Wide Angle (WAC; 100 m/pixel) and Narrow Angle Camera (NAC; ~1.3 m/pixel) data with incidence angles of 69-76°, for detailed mapping and CSFD measurements. ISIS3 was used for the calibration and map-projection of the data [15]. CSFDs were measured for different geological units in ArcGIS with CraterTools [16], using a sinusoidal projection. We used CraterStats [17] for cumulative and relative plots with pseudolog binning. Noticeable secondary crater chains and clusters were avoided while measuring CSFDs. Randomness analysis [18] was also used to identify and avoid secondary craters.

Geological Events: Using albedo contrast on LROC data, topographical differences on the DEM, and spectral differences in the Clementine and Kaguya MI data, we mapped several geological units around the landing site at 1:800,000 and 1:143,000 scales. The geological history of the Taurus-Littrow valley can be divided into four temporal divisions: Recent, Post-Imbrian, Imbrian, and Pre-Imbrian.

The area around the landing site is heavily resurfaced by post-Imbrian or Copernican secondary crater material. The light mantle deposit adjacent to the South Massif is widely considered as a Tycho-triggered landslide. However, albedo [19] and spectral contrast [12] suggest potentially different events possibly related to seismic activities might be involved in the formation of the landslide. A seismic triggering of the landslide

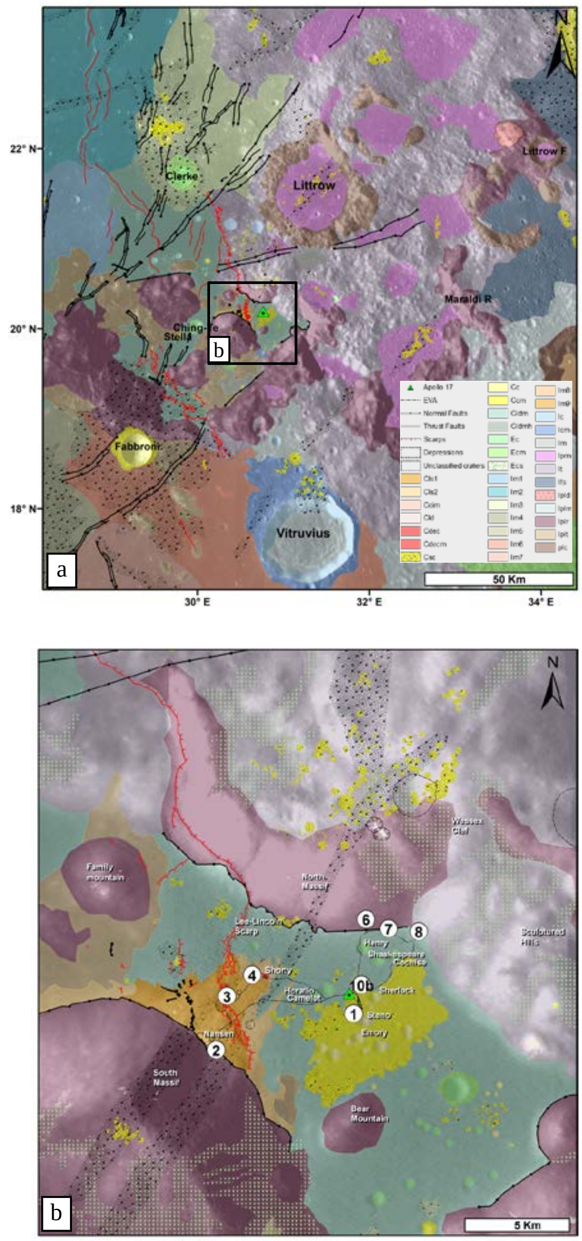

Figure 1. *(a) New geological map of the region surrounding Taurus Littrow. (b) New local geological map of the Apollo 17 landing site. The units include Imbrian and pre-Imbrian highlands, Imbrian pyroclastics and basalts, a light mantle deposit, secondary cluster, and other young crater materials. Numbers in circles show the stations covered during EVA, for the sample collection.*

seems plausible because the age of the Lee Lincoln scarp is similar to that of the light mantle deposit [14,20,21]. We also mapped other light debris deposits around the landing site, e.g., the Paint-Splatter [12].

In addition to the post Imbrian material, the Taurus Littrow valley is filled with Imbrian basalts and pyroclastics of similar ages [22,23]. We also observed via albedo and spectral contrasts, the pyroclastics overlays in the depressions and valleys of the highlands areas [12], possibly deposited due to the pyroclasitic surges. The highlands around the landing site mainly consist of Imbrian material [12,13]. However the North and South massifs may consist of pre-Imbrian Serenitatis crater wall material and ejecta material [12] covered by the Imbrian material.

CSFD Measurements: Using LRO NAC images and derived DTMs [7], we measured CSFDs of geological units around the landing site. The light mantle deposit or LMD (Cls1) is 84.0±4.5 Ma with an *N*(1) value of 7.04x10^{-5} km^{-2} (see also, [20]). This model age is similar to that measured by [14]: 85.4±4.5 Ma. The LMD (Cls1) *N*(1) values were used to calibrate the age for Tycho crater on the lunar chronology curve [3,4], because the LMD was interpreted to be related to the impact of Tycho secondaries at the top of the South Massif [e.g., 13,24]. The area around the Lee Lincoln scarp shows an age of ~75 Ma measured by [20,21], which requires reconsideration of the sequence and origin of the LMD [20]. We also determined an AMA of the Paint-Splatter feature (Cld), which has been interpreted as Tycho impact melt [13]. Unit Cld shows a model age of 32.4±5 Ma with a *N*(1) value of 2.72x10^{-5} km^{-2}, which is consistent with results of [14], who calculated AMAs of ~32-38 Ma (*N*(1) = 2.74x10^{-5} km^{-2}) for the Tycho impact melt pool ages. However, a young age for the Paint-Splatter might also be related to activity on the Lee Lincoln scarp. The mare unit and pyroclastics around the landing site have a model age of 3.70±0.037 Ga and *N*(1) of 1.03x10^{-2} km^{-2}, which are comparable with the mare and dark mantle deposit ages determined by [22,23]. The AMA of this unit is also conistent with the radiometric age of ~3.70 Ga high Ti mare basalt samples [6]. The Imbrian plains unit (Ip) around the landing site shows a model age of 3.80 Ga.

We are currently working on comparing our newly measured CSFDs to the updated radiometric sample ages and their sample locations to potentially improve the calibration points to the lunar cratering chronology [3,4].

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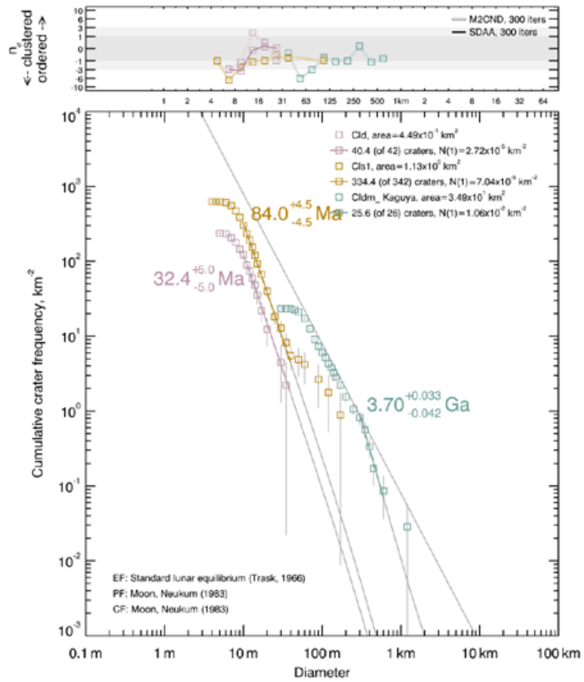

Figure 2. *CSFD measurements and absolute model ages of selected geological units at the Apollo 17 landing site: the Paint-Splatter (unit Cld in map), the light mantle deposit (unit Cls1 in map), and the underlying unit consists of pyroclastics (unit CIdm in map). All results are shown in cumulative form with cumulative age fits. The randomness analysis of the count area shows secondary crater contamination at small crater diameters (panel above each plot), which were avoided while fitting the AMAs for each unit.*

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