NEW GEOLOGICAL MAP AND ABSOLUTE MODEL AGES FOR THE APOLLO 15 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, which is based on crater size-frequency distribution (CSFD) measurements calibrated to lunar sample ages, is widely used to derive absolute model ages (AMAs) for geological units throughout the Solar System [e.g., 1-6]. In our systematic series of studies [7-10], we are testing and improving the validity of the lunar chronology [3,4], with the latest lunar mission and sample analysis data [11-15]. Here, we describe our new geological map of the Apollo 15 landing site, as well as new and updated CSFD measurements for geological units where samples were collected. The new calibration points will be gained by correlating derived *N*(1) (cumulative number of the craters ≥1 km in diameter) values of our new geological map units with recently determined sample ages [16].

Methods: The new geological map was produced using LROC Wide Angle (WAC; 100 m/pixel) and Narrow Angle Camera (NAC; ~0.5 m/pixel) data [11], which have incidence angles between 55-80°. Along with the LRO data, we also used SELENE (Kaguya) image data and a LOLA/SELENE merged digital elevation model (DEM) [12]. Clementine [13] and Kaguya Multiband Imager (MI) data [17] were used to spectrally map different units. CraterTools [18] in ArcGIS was used to measure CSFDs on the mapped geological units. Later, Craterstats [19] was used to plot and fit the CSFDs using pseudolog binning, in cumulative and relative plots. Secondary crater chains and clusters were recognized with randomness analyses [20].

Geological Events: The Apollo 15 landing site is to the east of Hadley Rille, near the rim of the Imbrium basin, and provides important calibration points for the lunar cratering chronology [3,4]. In the mapped area, Imbrian-aged geological units include the Imbrium basin rim (*Icr*), Imbrium basin ejecta (*Ifm-lt, Ifm-st, and Ifs,* mapped on the basis of topographical differences), and Imbrian plains (*Ip*). Contrary to previous studies [e.g., 21,22], no pre-Imbrian material is noticed in our map. The mapped area contains various Eratosthenian- and Imbrian-aged mare units [23]. The area around the landing site was significantly resurfaced by ray and secondary crater materials from both Autolycus and Aristillus craters [21,22]. Hadley Rille is partially filled by young volcanic material. The network of rilles to the south and north of the Hadley rille are older and filled with plains and mare.

CSFD Measurements: We modified Neukum's (1983) count areas according to our new geological map, to gain geologically homogeneous mare units. Neukum (1983)[3] named the selected counting areas

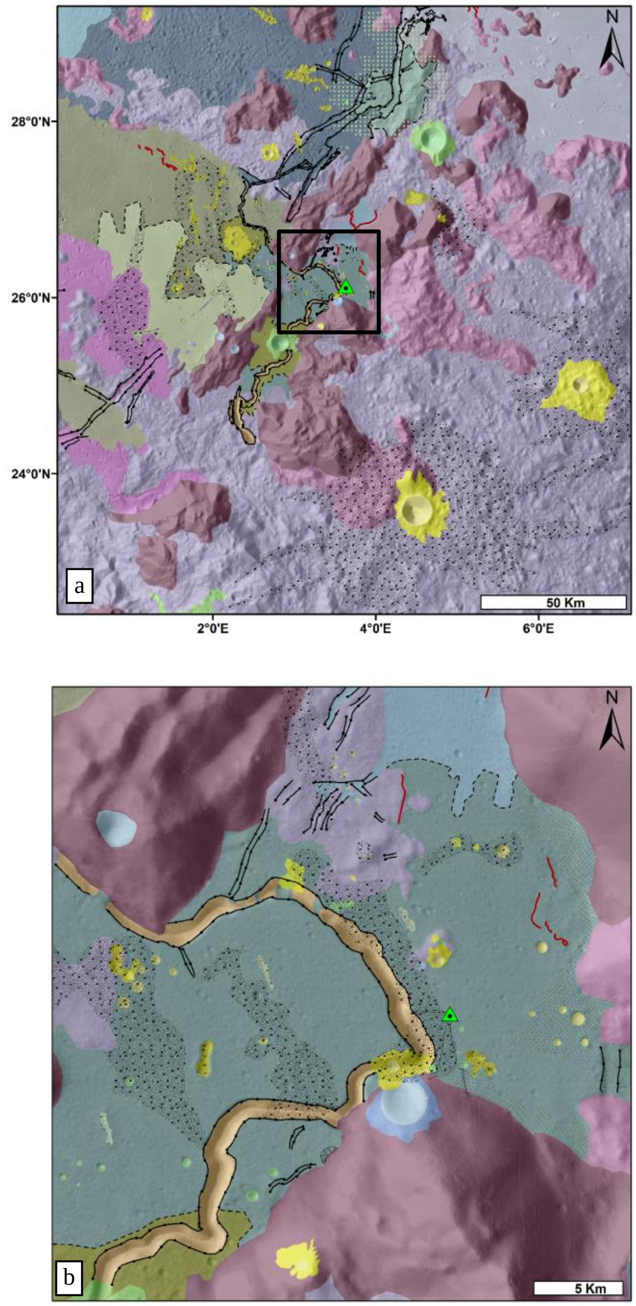

Figure 1. *(a) Preliminary regional geological map around the Apollo 15 landing site. (b) Preliminary detailed local map of the Apollo 15 landing site showing Imbrium basin units including: Imbrian basin rim (Icr), Imbrium basin ejecta (Ifm-lt. Ifm-st), Eratosthenian and Imbrian mare units, Hadley Rille material, and various generations of craters and their materials.*

A, B, C, and E; the landing site lies in area B. We measured the CSFDs in these areas using LRO WAC image data. Areas A and B lie on the same mare unit (*Im1)* and have $N(1)$ values of 2.99×10^{-3} km^{-2} and 2.98×10^{-3} km^{-2}. Thus, the absolute model ages (AMAs) for the areas A and B are ~3.23 Ga and ~3.22 Ga, respectively. Neukum (1983)[3] used an $N(1)$ value of $3.2 \pm 1.1 \times 10^{-3}$ km^{-2} and age ~3.28 Ga for the lunar cratering chronology calibration [3]. With our new map, we found that the originally selected Area C consists of various geological units. After modification of the area, we determine an $N(1)$ value of 1.72×10^{-3} km^{-2}, which may represent young crater material. Modified area E has two $N(1)$ values of 3.55×10^{-3} km^{-2} and 7.88×10^{-3} km^{-2}, representing two mare units with AMAs of ~3.37 Ga and 3.64 Ga, respectively. Recent sample analyses determined ages of ~3.26 Ga for olivine normative basalts and ~3.35 Ga for quartz normative basalts [16].

We will use Kaguya and LRO NAC data for further CSFD measurements around the landing site. Later, we will compare the measured values with the updated sample analyses to gain representative calibration points for the lunar cratering chronology [3,4].

Acknowledgements: WI and HH were funded by the German Research Foundation (Deutsche Forschungsgemeinschaft SFB-TRR170, subproject A2) and CvdB was supported by EU H2020 project #776276, PLANMAP.

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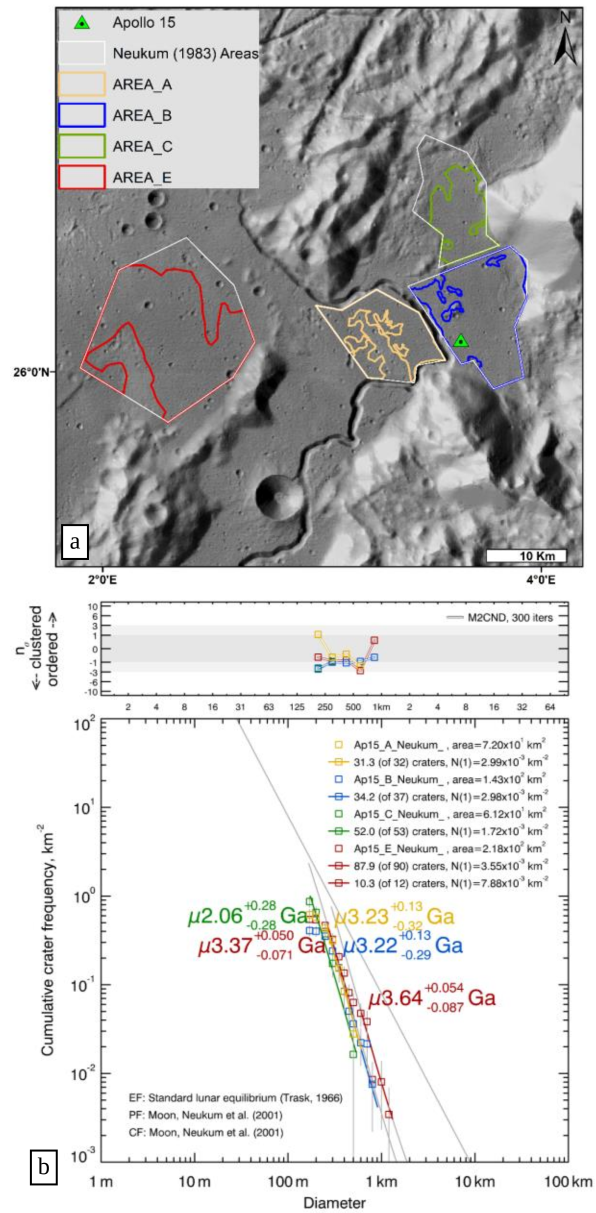

Figure 2. *Counting areas and resulting absolute model ages around the Apollo 15 landing site. (a)The white areas were used by [3] for the calibration of the original lunar cratering chronology, whereas the colored areas are newly modified on the basis of our new geological map. The landing site lies in area B. (b) CSFD measurements and absolute model ages of modified areas A (yellow), B (blue), C (green) and E (red), are shown in cumulative form. The panel above shows the randomness analysis of the count area, which is used to avoid contamination by clusters of secondary craters.*