NEW GEOLOGICAL MAPS OF THE APOLLO 14 AND APOLLO 16 LANDING SITES. W. Iqbal[1],T. Gebbing[1], D. Borisov[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 Apollo missions provided us with significant knowledge related to geological processes on the Moon. The Apollo landing sites are also essential calibration points for remote sensing datasets and the lunar cratering chronology, which is extensively used to derive absolute model ages (AMAs) for geological units throughout the Solar System [e.g., 1-6]. We produced new geological maps of all Apollo landing sites in our systematic series of studies [7-10] in order to test the validity of the lunar chronology [3,4]. Here, we present the updated geological maps of the two highland-related landing sites: Apollo 14 and Apollo 16.

Methods: We used several types of data for the production of the new geological maps, which include: LROC Wide Angle (WAC; 100 m/pixel) and Narrow Angle Camera (NAC; ~0.5 m/pixel) image data [11], SELENE (Kaguya) image data, a LOLA/SELENE merged digital elevation model (DEM) [12], Clementine spectral data [13], and Kaguya Multiband Imager (MI) spectral data [17].

Geology of the Apollo 14 landing site: Apollo 14 was the first manned-mission to the highlands. The lunar module Antares landed on the Fra Mauro formation (*Ifm*), which is interpreted as ejecta from the Imbrium basin (Fig. 1). The Fra Mauro formation (*Ifm*) covers older Nectarian terrain (*INt*), which appear as kipukas in the surrounding region. To the east and south of the landing site, several Nectarian-aged craters (*Nc*) (e.g Fra Mauro crater, Bonpland crater and Parry crater) are present, which also underlie the *Ifm* unit. The landing site is also surrounded by the rays from several Copernican age craters (*Cc*). Fra Mauro crater is filled with light plains material (*Ip*), and contains several patches of crypto-mare (*Imc*). The mare units in the surrounding regions are Eratosthenian (*Em1, Em2*) and Imbrian (*Im1, Im2*) in age. The geological setting of the traverse of the landing site is discussed in [18].

Geology of the Apollo 16 landing site: Apollo 16 was the second manned mission to explore the highlands and investigate the light plains that were thought to be volcanic prior to the mission. The lunar module Orion landed on the Imbrian-aged plains (*Ip,* also commonly known as the Cayley Formation), where the astronauts discovered extensive impact breccia deposits, rather than volcanic materials. This unit is surrounded by the Imbrian- and Nectarian-aged Fra Mauro formation (*Ifm*) and Descartes highlands (*INdh*), respectively. The Descartes highlands (*INdh*) mainly consist of Nectarian-aged ejecta, most likely from the Nectaris basin, that is mixed with ejecta material from younger craters. In the mapping region, this unit is covered by younger Imbrian ejecta material.

The landing site is surrounded by craters of various ages (e.g., *Nc, Ic, Ec* and *Cc*). During the traverse, samples were collected from the Copernican-aged North Ray crater, South Ray crater and Baby Ray crater.

Implications: We used all the new geological maps to select homogeneous areas for crater-size frequency distribution (CSFD) measurements for the landing sites [7-10, 19-21]. The $N(1)$ values derived via CSFD measurements are used to test the validity of the lunar cratering chronology function [7,8,22].

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Fig 1. Preliminary geologic map of the area around Apollo 14 landing site.

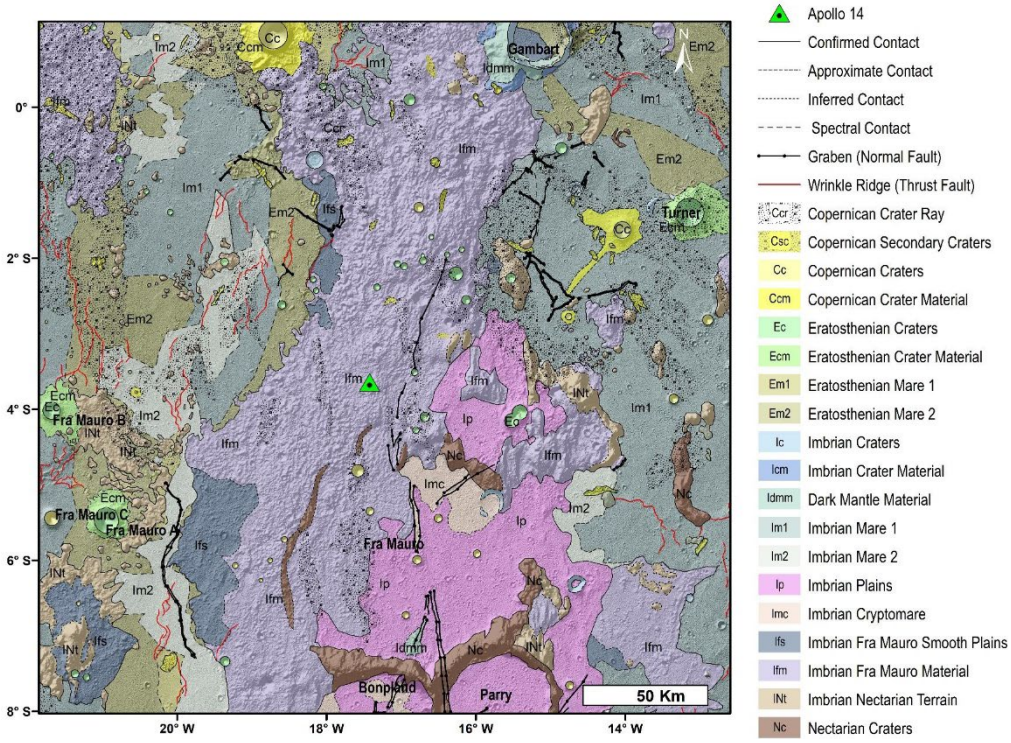

Fig 2. Preliminary geologic map of the area around Apollo 16 landing site.