



Ages of Lunar Light Plains

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Light plains are characterized by their relative smoothness and lower crater densities (compared to the highlands), and their occurrence as crater fills. They also exhibit highland-like characteristics, such as high albedos (in comparison to mare basalts) and their geological and stratigraphic setting. Despite the long history of investigating light plains, there are still numerous open questions concerning their mode of emplacement, their mineralogical composition, their ages, and their origin.

We dated 16 light plains with crater size-frequency distribution (CSFD) measurements. All dated regions were previously identified as light plains in the geologic maps [1-5] and either mapped as smooth light plains (Ip) or light plains with undulatory surfaces (INp). The studied light plains occur both inside and outside the South Pole-Aitken (SPA) basin within a latitudinal band between $\sim 36^\circ$ and $\sim 75^\circ$. In particular, we investigated the following smooth light plains: Janssen (40.82°E , -44.96° ; Ip [1]), Nishina (-170.8°E , -44.57° ; Ip [2]), South of Nishina (Ip [2]), Obruchev (162.43°E , -38.67° ; Ip [2]), Oresme (169.22°E , -42.61° , Ip [2]), Schrödinger (132.93°E , -74.73° ; Ip [3]), Nearch (39.01°E , -58.58° ; Ip [3]), Nasmyth (-56.39°E , -50.49° ; Ip [3]), Manzinus (26.37°E , -67.51° ; Ip [3]), Klaproth (-26.26°E , -69.85° ; Ip [3]), Phocylides (-57.31°E , -52.79° , Ip [3]), Buffon (-133.53°E , -40.64° ; Ip [4]), Roche (136.54°E , -42.37° ; Ip [5]). We also dated the following light plains with undulatory surfaces: Koch (150.33°E , -42.13° ; INp [2]), Garavito (156.78°E , -47.21° ; INp [2]), Eötvös (134.43°E , -35.61° ; INp [5]).

Our CSFD measurements resulted in absolute model ages of 3.71 to 4.02 Ga for all investigated light plains, thus confirming the Imbrian and/or Nectarian ages of the geologic maps [1-5]. We only dated three INp light plains, but they appear to have ages that are close to the upper limit, i.e. 3.96-4.02 Ga. However, further CSFDs of INp light plains are necessary to corroborate this preliminary observation. In general, our new absolute model ages are similar to model ages derived for light plains north of Mare Frigoris (3.65-4.0 Ga) [6], light plains within the SPA basin (3.43-3.81 Ga) [7], and light plains in the surroundings of the Orientale and Imbrium basins (3.8-4.3 Ga) [8]. The ages are not only similar, but also show similar ranges. While our model ages vary by about 300 Ma, model ages of [6,7] exhibit ranges of ~ 350 Ma and ~ 380 Ma, respectively. Ages of [8] show a somewhat wider range of ~ 500 Ma. From this wide range in ages it has been concluded that a formation of the light plains by a single event (i.e. Orientale or Imbrium) is unlikely [6-8].

References:

[1] Wilhelms and McCauley (1971), USGS I-703; [2] Stuart-Alexander (1978), USGS I-1047; [3] Wilhelms et al. (1979), USGS I-1162; [4] Scott et al. (1977), USGS I-1034; [5] Wilhelms and El-Baz (1977), USGS I-948; [6] Köhler et al. (2000), LPSC 31, #1822; [7] Thiessen et al. (2012), LPSC 43, #2060; [8] Neukum (1977b), Moon 17, 383-393.