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Retention time of crater rays materials in Mare Humorum

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Surfaces of astronomical objects are scarred with millions of impact craters. Impact craters are the remains of collisions between, for example, asteroids, comets, or meteorites and the Moon. Such objects hit the Moon at a wide range of speeds, and impact craters are formed. Relatively fresh craters have crater rays. Crater rays are obviously bright streaks of materials that we can see extending radially away from host craters. The most recently formed craters on the lunar surface have bright and more or less radial rays, which are usually superimposed over all other terrains. In general, rays are bright because they excavate immature soils.

Lunar crater rays disappear over time, and it is considered that the reason of it is space weathering that is a process of surface materials being altered by exposure of solar wind, cosmic rays, and micrometeorite bombardments. Wilhelms et al. (1987) and Werner and Medvedev (2010) described the crater rays disappearance occurs in about 1.1 Gyr and 750 Myr, respectively. However, as a result of analyzing the retention time of the crater rays of highlands, it turned out that the new result time was longer than the time from the previous studies (Suzuki, 2011).

This study focuses on space weathering effect to understand why the disappearance time of the crater rays in highlands is longer. We suppose that a degree of space weathering relates to iron content on the lunar surface. Lunar highlands are iron-poor areas. In contrast, lunar maria are iron-rich areas. The purpose of this research is to investigate that crater ray disappearance time in maria is different in lunar highlands. We examined the time in Mare Humorum which is filled in iron-rich basaltic materials. As a result, the disappearance time of crater rays in Mare Humorum is 250 Myr (2.0 Gyr at highlands). This implies that the space weathering effect depends on the iron content on the lunar surface.

Keywords: crater, ray, space weathering