Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)


PPS23-03 Room:A02 Time:May 25 14:45-15:00

# Impact history in the last 3 billion years based on the lunar rayed craters

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The Moon preserves the impact history in the last 4.0 Ga as the cratering record, which provide important information to understand collisional and orbital evolutions of small bodies in the solar system. Standard lunar cratering chronologies have been based on combining radiometric ages of Apollo and Luna samples and crater densities of landing sites. However, the impact history cannot be resolved in the past 3.0 Ga because of the absence of samples with radiometric age ranging from 3.0 to 1.0 b.y. On the other hand, from crater density of lunar rayed craters and statistics of terrestrial craters it has been suggested hypotheses that the cratering rate has increased or decreased in recent.

In this study, we determined relative ages of rayed craters using SELENE/TC image data to place constraints on the cratering rate in the last ∼1 Ga. Formation age of the surface of the planet can be estimated by crater counting, based on the idea that old area have more craters than young area. We performed crater counting on the ejecta blanket of 67 rayed craters larger than 20 km in diameter. The results indicate that 27 rayed craters are younger than the crater Copernicus, whose the formation age is estimated as 0.81 Ga from the Apollo 12 samples.

Based on the crater density of rayed craters younger than Copernicus, the average cratering rate for craters larger than 10 km in diameter in the past 0.81 Ga is estimated to be $5.56 \times 10\text{-}4$ $km^{-2}y^{-1}$, which is 0.66 times lower than that in the past 3.2 Ga. The main source of impactors in the Earth-Moon system is the main asteroid belt located between the orbits of the Mars and Jupiter. The decreasing cratering rate revealed in this study indicates that the total number of asteroids in the main belt has been decreasing for last 3.0 Ga.

Keywords: Moon, crater, cratering chronology