Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)


PPS25-07 Room:102B Time:May 22 15:45-16:00

# Estimation of space weathering rates on the H chondrite parent body based on reflectance spectra

Takaaki Misu[1*], Tomoki Nakamura[1], Yuki Kimura[1], Ryosuke Nakamura[2], Sho Sasaki[3], HIROI Takahiro[4], Keisuke Nagao[5]

[1]Graduate School of Science, Tohoku University, [2]National Insitute of Advanced Science and Technology, [3]RISE Project Office National Astronomical Observatory of Japan, [4]Department of Geological Sciences, Brown University, [5]Graduate School of Science, University of Tokyo

Space weathering is one of alteration processes ongoing on the asteroid surface. The airless bodies of the asteroid are irradiated by solar wind and damaged by micrometeorite bombardment. These two effects change the optical properties of the asteroid surface. The reflectance spectra of S-type asteroids, the ordinary chondrite parent bodies, become darker and redder by space weathering.

We estimated space weathering rates from correlation between the changes of reflectance spectra and the surface ages of the S-type asteroids by using two H type ordinary chondrites, Tsukuba and Zag. These meteorites are regolith breccia meteorites. Regolith breccia was formed on the asteroid surfaces, thus it is a mixture of two components. The light fragments came from the asteroid interior, and they preserve the original color of rocks. The dark matrix was suffered space weathering, and it shows darkening characteristic of weathered rocks. We compared two portions, light and dark portions, and estimated the space weathering effects.

First, we studied mineralogy and chemical composition of the two meteorites. The results from EPMA analysis found that light portions and dark portions have the same chemical composition. The reflectance spectra of the meteorites were measured in national observatory. We confirmed the differences of the reflectance spectra between the two portions. The most characteristic difference was the depletions of absorption features of silicates in the dark portion resulted from space weathering. We used Modified Gaussian Model (MGM) and quantitate the degrees of depletion of the absorption bands in the reflectance spectra. Moreover, we tried the quantification of the effects of Fe nanoparticles on the reflectance spectra by using the multiple scattering models.

Noble gases mass spectrometry revealed that parents body exposure ages of meteorites. We combined two results, the differences of the reflectance spectra and the differences of parent body exposure ages between dark and light portions in the two H chondrites, and calculated the space weathering rates.

The reflectance spectra of S-type asteroids show variable absorption features of silicates depending on the degrees of space weathering. Based on the reflectance spectra of S-type asteroids and the space weathering rates obtained in this study, we succeed to estimate surface ages of some S-type asteroids. In this way, we will obtain the surface ages of many S-type asteroids and elucidate the history and evolution of asteroid belt.