

Kaguya observation of oxygen ion precipitation from the Earth to the Moon

*Shoichiro Yokota¹, Yoshifumi Saito¹, Naritoshi Kitamura¹, Masaki N Nishino², Hideo Tsunakawa³

1.Japan Earospace Exploration Agency Institute of Space and Astronautical Science, 2.Nagoya University, 3.Tokyo Institute of Technology

It is widely believed that the Moon was formed due to the impact between the Earth and a planet-sized body, which we have called Theia. In order to confirm that the impact had taken place, many studies was done by numerical modeling and measuring the ratios between the isotopes. Theoretical models proposed that the Moon would form mostly from Theia, and thus would be expected to be compositionally different from Earth. However measured isotope ratios are similar between the Earth and Moon. Measured isotope ratios and theoretical models had conflicted with each other. Recent isotope measurements used lunar samples from the Apollo 11, 12 and 16 missions and found significantly higher levels of $^{17}\text{O}/^{16}\text{O}$ than Earth's counterparts.

One of the reasons of the similarity of the isotope ratio is isotope exchange with water from the Earth especially in lunar samples arrived via meteorites. We propose the other reason, oxygen ion transport from the Earth to the Moon, because many satellites such as GEOTAIL and STEREO observed the oxygen ion escape from the Earth in the Earth's magnetotail.

KAGUYA, a Japanese lunar orbiter, conducted scientific observation in 100 km altitude in 2008. An ion mass analyzer on KAGUYA detected oxygen ions coming from the Earth to the Moon in the Earth's magnetosphere. Here we show the amount of the oxygen ion transport estimated by using KAGUYA data and discuss the effect to measuring the isotope ratios.

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