P144-020 **Room: 304** **Time: May 17 9:15-9:30**

Low energy ion distribution around the Moon

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More than a year has passed since MAP-PACE onboard KAGUYA (SELENE) started continuous observation of the low energy charged particles around the Moon from 100km-altitude polar orbit. MAP (MAgnetic field and Plasma experiment) was developed for the comprehensive measurement of the magnetic field and three-dimensional plasma around the Moon. MAP consists of MAP-LMAG (Lunar MAGnetometer) and MAP-PACE (Plasma energy Angle and Composition Experiment). MAP-PACE consists of 4 sensors: ESA (Electron Spectrum Analyzer)-S1, ESA-S2, IMA (Ion Mass Analyzer), and IEA (Ion Energy Analyzer). Since each sensor has hemispherical field of view, two electron sensors and two ion sensors that are installed on the spacecraft panels opposite to each other can make full 3-dimensional measurements of low energy electrons and ions. One of the ion sensors IMA is an energy mass spectrometer. IMA measures mass identified ion energy spectra that have never been obtained at 100km altitude around the Moon. The newly observed data show characteristic ion distributions around the Moon. Besides the solar wind, MAP-PACE-IMA discovered four clearly distinguishable ion distributions: 1) Solar wind ions reflected/scattered at the lunar surface, 2) Solar wind ions reflected by magnetic anomalies on the lunar surface, 3) Ions that are originating from the solar wind ions reflected/scattered at the lunar surface and are picked up and accelerated by the solar wind convection electric field, and 4) Ions originating from the lunar surface/lunar atmosphere. The flux of the solar wind ions scattered at the lunar surface is less than about 1% of the incident solar wind ions. They have lower energy than the incident solar wind ions since part of the energy is lost when solar wind ions collide with the Moon surface. Though solar wind consists of alpha particles as a second major component, the scattered ions consist of almost no alpha particles. When KAGUYA flys over South Pole Aitken region, where strong magnetic anomalies exist, solar wind ions reflected by magnetic anomalies are observed. Different from the ions scattered at the lunar surface, these reflected ions have nearly the same energy as the incident solar wind ions. When reflected ions are observed, the simultaneously measured electrons are often heated and the incident solar wind ions are sometimes slightly decelerated. The reflected/scattered ions are picked up by the solar wind convection electric field and they are accelerated viewed from the Moon reference frame. Since these ions have initial velocity that is as fast as the incident solar wind ions, the maximum possible acceleration is three times the solar wind velocity that is different from the pickup acceleration of the ionized neutral particles that has been observed around comets where the maximum acceleration is twice the solar wind velocity. Another important discovery of IMA is the first in-situ measurements of the alkali ions originating from the Moon surface/atmosphere. The ions generated on the lunar surface by solar wind sputtering, solar photon stimulated desorption, or micro-meteorite vaporization are accelerated by the solar wind convection electric field and detected by IMA. The mass profiles of these ions show heavy ions including C^+, N^+, O^+ and Na^+/Mg^+, K^+/Ar^+. These heavy ions are also observed when the Moon is in the Earth's magnetotail where no solar wind ions impinge on the lunar surface. This discovery strongly restricts the possible generation mechanisms of the ionized alkali atmosphere around the Moon.