The observation scenario of Muses-C AMICA (Asteroid Multiband Imaging CAmera) and its imaging test

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The Japanese asteroid mission, MUSES-C, is not a pure science mission but a technology demonstration one to a near-Earth asteroid.   The new technological items to be proved in this mission are interplanetary ion-engine performance, autonomous spacecraft control, sampling at the low-gravity asteroid surface, and high-speed Earth reentry.

On the scientific aspect of the mission, it is expected to not only collect surface materials of the target S-type asteroid, 1998SF36, but also observe its surface multispectrally and obtain geological and geomorphological information.   Other scientific observations such as detail near-infrared spectroscopy and chemical analysis by the X-ray fluorescence spectrometer are also carried out.

The multiband imaging camera of Muses-C is the system of Optical Navigation Camera (ONC-T) with seven-band filters and four polarizers, and the name of AMICA (Asteroid Multiband Imaging CAmera) is that for the total system of ONC-T plus filters and polarizers as one scientific instrument of the mission.

The AMICA seven-band filters nearly are equivalent to the seven filters of the ECAS (Eight Color Asteroid Survey) system which has been applied to ground-based asteroid spectroscopy for many years.   Once the target asteroid's spectroscopic data by using AMICA are obtained, they can be easily compared with many ECAS asteroid data for detail discussions.

AMICA also has four polarizers, which are located on one edge of the CCD chip (covering 200 x 200 pixels each). Using the polarizers of AMICA, we can measure polarization of the asteroid.

Since December 2000, AMICA science team has tested the AMICA prototype model to examine its performance for multicolor imaging and polarimetry of meteorite and analogous materials.   Lunar multicolor imaging by AMICA-PM was also carried out.

We used the pellets of clinopyroxene and gypsum powders for spectroscopic test of AMICA.   The reflectance was calculated as the ratio of the standard and unknowns.   In the case of the moon observation, we compared the reflectanc of Mare Serenitatis with that of the target area (Mare Tranquilitatis).   This type of comparison was applied to the lunar spectroscopy by McCord et al. (1972), but the standard area in Mare Serenitatis is too small to be precisely targeted on low-magnification AMICA images.

In this presentation, we briefly report the outline of AMICA observation of the target asteroid, and the results of AMICA-PM multiband observations of mineral specimens and the moon.

Reference: Lunar Spectral Types: McCord, T. B. et al. JGR 77, 1349-1359 (1972)