SLITLESS SPECTROSCOPY OF SMALL SOLAR SYSTEM BODIES ON A DARK CLOUD CURTAIN
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Introduction: The spectroscopic observations of Small Solar System Bodies (SSSBs) have been energetically performed for large SSSBs. Meanwhile, for small SSSBs regarded as collisional fragments, almost no systematic spectroscopic observations have been done, because of their faintness and inaccurate orbits. However, recently the Suprime-Cam brought in new grism filters, then it enabled us to obtain spectra of moving objects up to R~23 mag with 80 min exposures, with low dispersion of 50A, with the wavelength coverage of 4500-8600A. The Suprime-Cam can detect about 100 moving objects (R<~25 mag) in the one FOV (34’x27’), and obtain the spectra of a few tens objects simultaneously (R<~23 mag). It is unprecedentedly efficient spectroscopic observations for moving objects so far. One of difficulties of slitless spectroscopy is contamination with background objects. In order to overcome this difficulty, we have had a nice idea that we use a dark cloud of our galaxy as a curtain to avoid contamination from background objects. This poster shows our first trial of slitless spectroscopy by using the Subaru telescope and Suprime-Cam grisms.

Observations: We observed the ρ Oph region (centered at RA.16:27:24.2, Dec. -24:25:06 J2000)[1] with the Blue grism (4500-7000A) and Red grism (6250-8600A). For calibrations, we also took B, R, i-bands images at the same night. We observed LDS749B for flux calibration and Landolt stars of SA107 for photometric calibration. For wavelength calibrations, we used QSOs and the absorption line of A-band of stars (7619A) for Red grism and the Hel line of LDS749B for Blue grism. We used Dome flat. For orbit determination, we observed the ρ Oph region in additional two nights, but only for ~10 minutes in R band in each night.

Detected Moving objects: In the first survey in 2009 May, a total of 283 SSSBs with R<25 mag were detected in R-band images and the spectra of 37 objects with R<23 mag were obtained. In the second survey in 2010 June, a total of 366 SSSBs with R<25 mag were detected and the spectra of 12 MBAs with R<23 mag were obtained. Then we divided detected objects into asteroid groups (inner, middle, outer belt, Hilda, Jupiter Trojan and TNO) by their apparent motions. We classified asteroids into 4 types by their grism spectra. Based on our preliminary results, in the inner belt (2.0<a(AU)<2.6), the S- and C-types dominate over other types while the middle belt (2.6<a(AU)<3.0) and the outer belt (3.0<a(AU)<3.5) have variety of asteroid types. Our preliminary analysis so far indicates that there are more Q types in the middle belt than in other region of the main belt. This might mean that there is one of supply sources of Q type (meteorite) in the middle belt.

Fig. 1 A part of image of the slitless spectroscopy with the Suprime-Cam. One can see the images of stars, MBAs and a TNO and their spectra. Most of the spectra are free from overlapping. The image and spectra of MBAs are elongated along their motion during exposure.

Fig. 2 Examples of the blue and red spectra from grism observations