

A Survey for Small Solar System Bodies with Wide-Field Optical Images

Tsuyoshi Terai[1]; Yoichi Itoh[2]

[1] Earth & Planetary Sciences, Kobe Univ.; [2] Grad. School Sci/Tech, Kobe Univ.

The small solar system bodies are believed to be remaining survivors of planetesimals made in the early solar system and hold the state at that time. It is considered that their spatial distribution is influenced by past gravitational perturbation by giant planets and their size distribution keeps the size distribution of planetesimals and the history of their collisional evolution. Therefore, it is a great clue to investigate the orbital evolution of planets and small bodies in the formation process of the solar system. We are planning to make statistical discussions in detail about their spatial and size distributions by detecting a number of small objects.

Because the small bodies orbit near the Earth, they appear to move against background stars. Although more than three images are usually used in detection of moving objects in order to determine the orbit and to prevent false detections. To get such data, however, we must do observation aimed at a survey for small bodies. It is necessary for examining the detail distributions to use deep and wide-field data obtained by a large telescope, but it is difficult to use it dedicatedly.

Therefore, we detect them with only two images as one pair. It makes it possible that we also make use of the data by observations for other purposes than surveys for small bodies, such as galaxy survey, so that we can find many moving objects efficiently. We have originally devised a method for the analysis and have developed the automatic detection program to make it rapid to analyze large amount of data and to keep the detection accuracy constant.

We used the data of the wide-field galaxy survey, COSMOS (Taniguchi *et al.*, 2005), taken by Suprime-Cam on the Subaru Telescope. The ecliptic latitude of the field is -10 degrees. We have analyzed 52 images (5.2 square-degrees) obtained with r' -, i' - and z' -band from three times observations for three months, and detected 546 moving objects. The limiting magnitude of r' -band reached 25.0 mag. The obtained spatial distribution of the main-belt asteroids shows similar features to that of known asteroids. The cumulative size distribution is well fitted by power-law with index of 1.20 ± 0.04 between the diameters from 0.4 to 2 km, which agrees with past researches.