Observing the Interplanetary Dust Particles by the Wide-field CCD Camera

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Recently, large telescopes reveal the existence of dust disks around the main-sequence stars. The closest example of the dust disk is the zodiacal cloud in our solar system. It is getting more important to know the zodiacal cloud as the tracer of unseen planets and planetesimals around the other planetary systems. Our goal is to establish the template of the relation between the dust disks and the planets through the zodiacal light observations.

Since the zodiacal light is faint and wide-spread all over the sky, our observations have done with the cooled CCD camera with the wide angle lens. We have developed a new system (WIZARD: Wide-field Imager of Zodiacal light with ARray Detector) designed for the zodiacal light observation, which consists of the very sensitive (QE=90[%] @450[nm]) and large format (2048x4096[pixels]) CCD chip and the wide angle lens (98[deg]x48[deg]), and whose photometric zero level is stable enough. We have observed the zodiacal light and Gegenschein outside the Subaru.

The interplanetary dust particles disappear within the timescale of 10^6 years due to the Poynting-Robertson effect. Regardless of this effect, there exists a dust disk in our solar system at present. So the dust particles are considered to be supplied constantly mainly from comets and asteroids. Cometary and asteroidal origin particles are observed as the dust trails and the dust bands, which are a few percent enhancement of the background zodiacal light. On the other hand, the global structure of the zodiacal light is influenced by the planetary perturbation. From the zodiacal light observations, we can examine the origin, dynamical evolution, physical properties of the interplanetary dust particles.

Based on these situations, we will review the results of the interplanetary dust observations from ground-based observatories by the wide-field camera.