

Optical Observations of Satellites and Space Debris at the Bisei Spaceguard Center

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Following the launch of the Sputnik in 1959, artificial objects of 20,000 tons or more, such as rockets or satellites created by humans, launched into space. Some of defunct satellites, entire spent rocket stages, and explosion fragments have re-entered the atmosphere of the Earth and burn out. On the other hand, most of those objects keep being tossed around the Earth and become 'Space Debris.' It is said that there are 10,000 or more Space Debris which turn around the Earth certainly. They are threats to other satellites under operation.

Recently, on January 11, 2007, China performed an anti-satellite weapons test with a ballistic missile. The event created more than 700 pieces of space debris big enough to be tracked. It is reported that there is a risk that these debris approach the orbit of satellites in Low-Earth Orbit (LEO), such as the International Space Station or a Japanese Earth-observing satellite, ALOS (DAICHI), launched last year.

The most basic steps to avoid collisions between space debris and operating satellites are to decide their orbit by the observations, and to watch their movement. The United States Space Surveillance Network (SSN) and the Russian Space Surveillance System (SSS) mainly carried out space-debris observations using ground-based telescopes.

In Japan, the Bisei Spaceguard Center and the Kamisaibara Spaceguard Center were built in Okayama Prefecture, to conduct optical and radar observations of space debris, respectively.

Since 2000, the start of the Bisei Spaceguard Center, we have carried out optical observations for the orbit decision of the satellites and space debris, by the request from JAXA (formerly NASDA). One-m and 50-cm optical telescopes are mainly used to survey the Geostationary-Earth-Orbital (GEO) satellites and debris. Additionally, we observed the MIR satellite just before its fall to the ground and determined its semi-major axis of orbit with an accuracy of about 10m, using our observation data. To achieve the result more, we examine new observation technique such as tracking observations of the LEO objects.

Here, we introduce the activity of the Japan Spaceguard Association, mainly optical observations in the Bisei Spaceguard Center.