SOME QUESTIONS OF THE IDENTIFICATIONS OF THE ARTIFICIAL SATELLITES

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Identification of satellites is the complicated problem. One of the possible way to solve this problem is a determination of orbit of the object. However, additional information is often necessary. Such information could be received from the electrophotometric observations of satellites. The Lviv Astronomical Observatory and observation station of INASAN RAS (Zvenigorod Astronomical Observatory) have instruments for such a type of observations.

INTRODUCTION

In the last decades the problem of "cosmic debris" has became very actual. A quantity of artificial satellites and debris in cosmos are increasing in time. Therefore, observations and identifications of all the bodies flying in near Earth space were conducted at the Astronomical Observatory, Ivan Franko National University of Lviv, Ukraine (LNU), and at the Zvenigorod Observatory of Astronomical Institute of RAS, Moscow, Russia (ZO). These institutions are engaged in the works on photometric observations of the low orbit objects.

INSTRUMENTS FOR ELECTROPHOTOMETRIC OBSERVATIONS OF ARTIFICIAL SATELLITES

As the base for making photometric observations ZO and LNU have used the mounting and optics of laser ranger systems (ZO – from the LD-3 and LNU – from LD-2). In LNU self-made electrophotometer with the two 34 cm objectives was mounted. The pulses from photomultipliers are transmitted to selection and operation processing block, where amplifying, discrimination and transformation of current-code during the integration time as well as transmission to IBM computer for saving and visualization take place. In parallel the pulses from quartz clock are supplied with an accuracy of 0.001 sec. Observations of the North Polar Sequence standard stars showed the penetrating ability of $9\overset{m}{.}97$ in filter V and $9\overset{m}{.}78$ in B. The TV-camera SIM-ICCD-05 as a light-receiver was used in ZO for photometric observations. The TV signal is transferred to a computer by special video card and than is processed and wrote to file. Penetrating ability for stars is $10\overset{m}{.}45$ and for fast moving objects (low-orbit satellites) is $9\overset{m}{.}2$ with optics of guide telescope of LD-3 (D=250 mm, D:F=1:5).

RESULTS OF PHOTOMETRIC OBSERVATIONS

Various satellites were observed and light-curves were obtained with the described electrophotometer of LNU and TV-photometer of ZO. They were – Ajisai, Topex, GFO, Ers-1, Ers-2, Cosmos-2344, Geos-3, Spot-1, Spot-2, Spot-4, 92083 A, 95066 A, 96072 A, and others. As a rule the photometric observations were made for the objects with known orbital data and shapes. So, they are not real "space debris". But observations of satellites with a priori known shapes give the possibility to compare some details of experimental light-curves with details on surfaces of the objects and make the first step for solving the reverse problem – to define the shape of the object from its light-curve. As examples of the obtained light-curves, the light curves of the Topex satellite observed at LNU and at ZO are demonstrated in Fig. 1 and Fig. 2, respectively. In ZO the changes of period of rotation of some satellites were analysed. For the Cosmos-2344 satellite the rotating period has changed from 71.58 seconds in 1998 to 94.66 seconds in 1999.

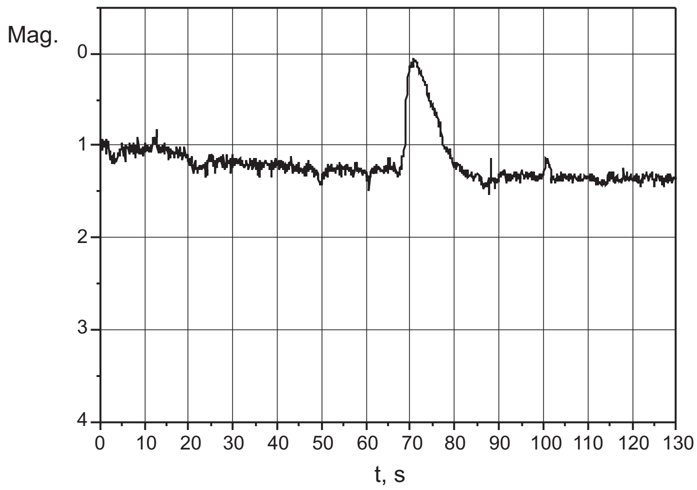

Figure 1: The light-curve of the TOPEX satellite in filter V received on May 9, 1999 in the LNU at 19:35 UT. The location of the satellite, observer and Sun is such that it gives a flash on the curve

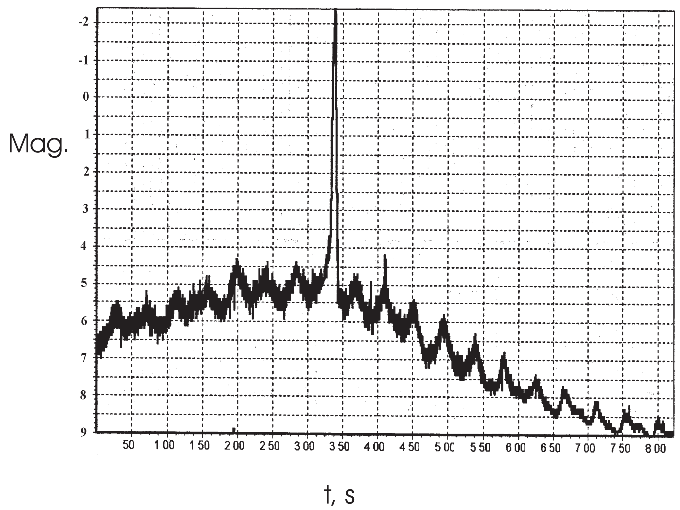

Figure 2: The light-curve of the satellite 97028 obtained at the ZO on April 17, 1999 at 22:42–22:58 UT. A flash produced by solar-panel is well seen

CONCLUSIONS

The photometric observations are one of the ways, which allows to get an additional information about a behaviour of object on orbit and its shape. It is important part of work when solving the problem of space debris.