

Progress in development of the Russian scientific optical network for space debris research

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The Pulkovo cooperation of optical observers (PULCOO) collaborates with the 8 FSU observatories along 110 degree of longitude to conduct out the observations of space debris and asteroids. The 10 telescopes were equipped with CCD cameras and GPS-receivers, provided with software for CCD frame processing and ephemeris support: 2.6-m ZTSh in Nauchny, 32-cm ZA-320 and 22-cm SR-220 in Pulkovo, 60-cm Zeiss-600 in Maidanak, 1-m Zeiss-1000 in Zelenchuk, 40-cm double Zeiss astrograph in Ussuriysk, 40-cm double Zeiss astrograph in Abastumani, 60-cm RK-600 in Mayaki, 70-cm AZT-8 in Chuguev, 1-m Zeiss-1000 in Simeiz. Few observing campaigns of GEO region were carried out in collaboration with ESOC for searching and tracking of the unknown objects. More than 60,000 measurements of PULCOO and European telescopes were collected and processed at Space Debris Data Base in KIAM Ballistic Center of Russian Academy of Science, that allowed to find about 170 GEO objects that are absent in public distributed orbital data, and to fix their orbital elements. Including the 50 small-sized fragments of space debris that were discovered in areas predicted using Pulkovo Laplace motion theory [1]. Some of these faint GEO fragments are tracked during few hundred day period. The trial observations were arranged in Tarija, Bolivia. The test GEO survey demonstrated the high performances of new SR-220 in Nauchny (300 square degrees/hour, 100% detection of catalogued objects up to 15 star magnitude). Two more such telescopes were ordered for future usage in Far East and Moldova. The research was supported with INTAS 03-70-567.

[1] Kiladze, R.I., Sochilina, A.S. On the new theory of Geostationary satellite motion. *Astronomical and Astrophysical Transactions*, Vol. 22, Nos. 4-5, August-October 2003, p. 525-528.