18th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Space Debris Detection, Tracking and Characterization (1)

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RESEARCH ON SPACE DEBRIS OBSERVATION WITH MULTI TELESCOPES IN ANTARCTICA

Abstract

Increasing space debris has seriously threatened the safety of spacecrafts of various countries. The observation and early warning of space debris is one of the core elements of international space governance. 70% of LEO space debris is distributed in polar orbits with an orbit inclination of 80-100 degrees, so the polar region is an excellent location for space debris observation. We use rare site such as China's Kunlun Station, Taishan Station, and Zhongshan Station in Antarctica to carry out joint networking observation research on space debris, which can greatly expand the coverage of China's space debris observation network, enhance the ability of space debris threat early warning, and support International governance of space debris, will also promote the further development of Antarctic astronomy research. The astronomical observation conditions of the Antarctic observation station are superior, and the observation efficiency is significantly higher than that of mid-latitude stations. Analysis of the observation results of the CSTAR telescope at Kunlun Station in Antarctica, shows that only a single small telescope with a field of view of 20 deg^2 and an effective aperture of 100 mm has been able to observe 68.44% of the low/polar orbit large space debris (Area>1m^2) within 72 hours of continuous observation. Which fully confirms the high efficiency of space debris observation at Kunlun Station in Antarctica. We have established a space debris observation efficiency evaluation model. By comparing the real observation data and simulation data of the CSTAR telescope, 97.35% of the real observation data is included in the simulation results, which verifies the reliability of the simulation model. Based on the real observation data and simulation results, we made some hypothetical simulations and prospects. We carried out the joint network observation research on space debris by the telescopes at the three stations (Kunlun station, Taishan station, Zhongshan Station) in Antarctica, and designed the optimized scheduling observation algorithm to make the three stations cooperate in observation. Analyze the expected observation efficiency of space debris in different seasons, different telescope aperture, different directions and other factors. These works can provide support for future space debris observations in Antarctica.