SMARTnet: A Sensor for Monitoring the Geostationary Ring

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Abstract.

As the number of space debris is increasing not only in lower Earth orbits but also in the geostationary ring, it becomes mandatory for any satellite operator to gain information in this regime for avoiding any collision. Space debris in geostationary orbits may be observed with optical telescopes whenever the objects are illuminated by the Sun. Other than radar, that requires very large dishes and transmission powers for sensing high-altitude objects, optical observations do not depend on active illumination from ground and can be performed with notably smaller apertures. The detection size of an object depends on the aperture of the telescope, sky background and exposure time. As a typical example, a 2s exposure time and a sky background of 17-18mag per square arcsecond is assumed. Simulations show that for a telescope with an aperture of 50cm and a field-of-view of 2° x 2°, objects down to approximately 50cm can be observed. This size is regarded as a threshold for the identification of hazardous objects and the prevention of potentially catastrophic collisions in geostationary orbits.

In close collaboration with the Astronomical Institute of the University of Bern (AIUB), the German Space Operations Center (GSOC) is building a new small aperture telescope to demonstrate the feasibility of optical surveillance of the geostationary belt. The telescope will be located in the southern hemisphere and complement an existing telescope in the northern hemisphere already operated by AIUB. Together, the two telescopes provide an optimum coverage of European GEO satellites (including the COMSATBw-satellites at longitudes 13,2° E and 63° E) and enable a continuous monitoring independent of seasonal limitations. South Africa or Namibia has been chosen as possible locations for the telescope. The telescope shall be operated completely automatically with a permanent data connection to GSOC. The automated operations should be demonstrated covering the full range of activities including scheduling of observations, telescope and camera control as well as data processing. Subject to a successful validation of the demonstrator telescope, the build-up of fully global Network of Small Aperture Robotic Telescopes (SMARTnet) will be pursued. In this paper, preliminary results are presented and discussed.