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ABSTRACTS

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Effect of a solar wind on the motion of geostationary satellites from optical and radio-frequency ground-based measurements

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Solar wind (SW), being a stream of ionized particles, makes considerable effect as on physical processes in the body and atmosphere of the Earth and on motion and functional state of artificial Earth satellites.

The astronomical and radio-frequency methods developed and realized in Research Institute NAO allow to observe independently as extreme changes in the orbital positions of geostationary satellite (GSS) and its functional state, and the quality of a television signal and transmittance depending on ionosphere ionization.

Functional state of a satellite, as rotation stability of silicon batteries of GSS and rotation stability of a satellite is determined on photometric measurements of satellite brightness. The telescope system for such measurements consists of a short focal-ratio photographic objective and television CCD camera working in a mode of summation of images. The photometric light curve of GSS is processed in two stages. The first one is removal of an envelope depending on a phase angle of the Sun, and the second one is a frequency analysis for determination of stable frequencies and irregular changes in the brightness of a satellite.

The determination of orbital position of GSS, namely inclined range, is carried out by a radio-frequency method. It is based on the measurement of a time delay of a one-shot impulse (SID) of a satellite television signal (ST). The radio-frequency system consists of a satellite system of TV (aerial, receiver, tuner) and a measuring device SID (detector, summator, analyzer). The received data on the SID is processed in two stages also. The first one is removal of a regular drift between the time services of transmitting station ST and the time service of Research Institute NAO. The second one is a frequency analysis for determination of stable frequencies and irregular changes of SID.

Besides the observational functions, the developed and maintained systems allow to research physical characteristics of SW using the data of GSS with a well-known design and geometry.