BOOK OF ABSTRACTS

Actual Questions of Ground-based Observational Astronomy

MAO - 195

Mykolaiv, September 26-29, 2016

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
RESEARCH INSTITUTE “MYKOLAIV ASTRONOMICAL OBSERVATORY”

ACTUAL QUESTIONS OF GROUND-BASED OBSERVATIONAL ASTRONOMY

International Conference

ABSTRACT BOOK

September 26-29, 2016,
Mykolaiv, Ukraine

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Ministry of Education and Science of Ukraine
Research Institute "Mykolaiv Astronomical Observatory"
Ukrainian Astronomical Association

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The Book of Abstracts contains abstracts of presentations to the International Conference "Actual Questions of Ground-based Observational Astronomy" to be held in Mykolaiv, Ukraine, on September 26-29, 2016. Methods and technical means of ground-based observations, IVOA role in modern research and actual problems of ground-based astronomy are presented.

GENERAL INFORMATION

The International Conference "Actual Questions of Ground-based Observational Astronomy" (MAO195) will be held in Research Institute "Mykolaiv Astronomical Observatory", Mykolaiv, Ukraine on September 26-29, 2016.

The conference is organized to discuss methods and technical means of ground-based observations, IVOA role in modern research, actual problems of ground-based astronomy as well as history of astronomical research. Working languages are English, Ukrainian and Russian.

Main Topics of the Workshop:

- Methods, technical means and software for ground-based observations and data processing.
- Use of IVOA technologies for solution of modern astronomical problems.
- Results of data processing for ground-based observations.
- History of astronomical research.

Information about Participants:

- General number of registered participants – 48;
- General number of represented organizations – 22;
- Number of submitted papers – 38;
- Number of authors of submitted papers – 84.

Search for commensurability of asteroidal systems with planets was performed, as a result, it was found that the asteroid (363599) 2004 FG11 moves in resonance with the Earth at a ratio of 1: 2 and the error is 0.041159 days. For a more strict definition of sustainability movement asteroidal systems, we used the three-body problem. We determine the radius of the Hill sphere for each system near perihelion points. The calculation results showed that all of the satellites in the asteroidal system are deep in Hill areas. For example, in a satellite system Heracles (5143) moves in an orbit semi-major axis with respect to 4 km main component, while Hill sphere radius is 348 km.

Next, we examined the motion of satellites in binary systems, for which the period of axial rotation is well known. Comparison of centrifugal and gravitational acceleration on the surface of these satellites, assuming a spherical shape showed that for most of its surface loose bodies cannot hold . We performed a numerical simulation of trajectories for particles leaving the surface of the satellite in the double asteroid system.

MONITORING OF THE ORBITAL POSITION OF A GEOSTATIONARY SATELLITE BY THE SPATIALLY SEPARATED RECEPTION OF SIGNALS OF DIGITAL SATELLITE TELEVISION

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The report presents results of the determination of the orbital position of geostationary satellite «Eutelsat-13B», obtained during 2015-2016 years by the results of operation of European network of stations of reception of

DVB-S signals, incoming from the satellite. The network consists of 5 stations located in Ukraine and Latvia. The distances between the stations along latitude and longitude are about 1000 km. The stations are equipped with a radio engineering complex developed by the RI "MAO". The measured parameter is a time difference of arrival (TDOA) of the DVB-S signals to the stations of the network. The measurements of TDOA are synchronized by GPS time marks. The determination errors of TDOA and satellite coordinates, obtained by the measured values of TDOA and using the method of multilateration and a numerical model of satellite motion, are equal 2.6 m, 1500 m and 100 m respectively. The method of multilateration is used to calculate Cartesian coordinates of the satellite in the WGS84 coordinate system. The numerical model is used to determine redial, tangential and normal coordinates of the satellite in a local orbital frame. Software implementation of the model is taken from the free space dynamics library OREKIT.

A NON-GRAVITATIONAL EFFECT AND SPIN ORIENTATION OF KILOMETRE-SIZED MAIN BELT ASTEROIDS

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Determining spin directions of asteroids - a rather difficult task Today, only about 200 asteroids have identified spin orientations. For some asteroids it can determine the spin directions by precise calculations of the evolution of the orbits.

Numerical calculations of the orbital evolution of the MBA asteroids from 2005 to 2016 were carried out. The calculation results analysis leads to the conclusion that in our days an influence of non-gravitational effects (NGE) of cometary nature becomes apparent in motion of a significant portion (at least 5%) of the main belt asteroids up to 40 km. Such NGE causes the increase of the semi-major axes of orbits of the low-albedo asteroids with respect to the semi-major axes of orbits of bodies with the large albedos.

Change an asteroid semi-major axis should depend on the spin direction. Therefore the calculations may indicate on the spin direction (prograde or retrograde) for several tens of asteroids.