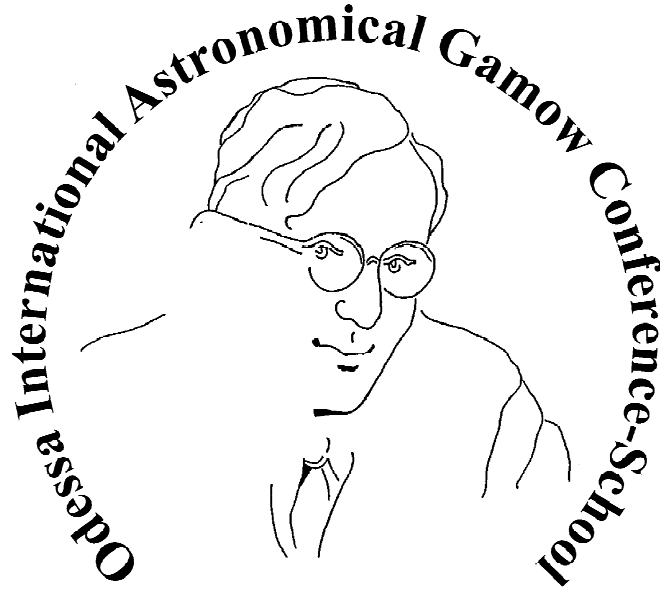
22-nd Gamow International Astronomical Conference "ASTRONOMY AND BEYOND: ASTROPHYSICS, COSMOLOGY AND GRAVITATION, ASTROPARTICLE PHYSICS, RADIO ASTRONOMY AND ASTROBIOLOGY"



ABSTRACTS

August 22-26, 2022
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ABSTRACTS
Англійською та українською мовами

PHOTOMETRIC, POLARIMETRIC, AND SPECTRAL OBSERVATIONS OF COMET C/2014 B1 (SCHWARTZ) WITH PERIHELION DISTANCE 9.56 AU

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We present results of the comprehensive optical observations of the unique disk-like comet C/2014 B1 (Schwartz) with perihelion distance 9.56 au. Quasi-simultaneous long-slit spectra, as well as photometric and polarimetric images with g-sdss and r-sdss filters, were obtained with the 6-m telescope of the Special Astrophysical Observatory on 2017 January 23. The BVR photometric observations of the comet were also obtained at the 2-m telescope of the Peak Terskol Observatory (North Caucasus) on 2017 January 31. We did not reveal any molecular emissions in the spectra. Two nearly linear jets oriented along the position angles of 179°± 1° and 350°± 1° were detected in the coma. Our data demonstrate that the observed disk-like shape of the coma and position of jets remained unchanged, despite the changing observational geometry, for more than 4 years. The most realistic model for explanation of such stable orientation of jets is the existence two active sources located near the north and south poles of the rotating nucleus whose diameter was determined being between 7.6 and 12.2 km depending on the albedo, 0.1 and 0.04, respectively. High activity of the comet is characterized by the high dust production $Af\rho$ which significantly varied, from 4440 to 3357 cm between 2017 January 23 and 31. A significant difference between the radial surface brightness profiles of jets and the ambient (undisturbed by the jets) coma is found. The color of the cometary dust is redder than that of the Sun: on January 23, $V-R = 0.58^{m} \pm 0.05^{m}$, and on January 31, $B-V = 0.85^{m} \pm 0.05^{m}$ and $V-R = 0.54^{m} \pm 0.05^{m}$. The color of the jet structures is much redder than of the ambient coma. Very red color of the nucleus ($V-R = 0.93^{m} \pm 0.19^{m}$) was derived. There are spatial variations of the color and polarization over the coma. The near-nucleus coma is characterized by a low negative degree of polarization (−1% at the phase angle 2.1°) and red color (up to ~ 0.7^{m}), while at the periphery, at about 100000 km, there is a high negative polarization (–6.5%) and a bluer color ($0.6^{m} – 0.45^{m}$). Our modeling showed that the observed trends in color and polarization, as well as the brightness profiles, can be explained by fragmentation of aggregated particles, formed by CO_2/H_2O ices, silicates and organics, which are of radius ~ 1 mm near the nucleus and ~ 10 micron at the periphery.

CHARACTERIZATION OF "HOT POPULATION" OBJECTS IN THE KUIPER BELT

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Most planetesimals formed at distances of 15-30 a.u. were gravitationally ejected from the Solar system as a result of the migration of the giant planets, but a small part remained, captured by Jupiter and the Kuiper belt. As a result, we can now observe such a variety, in terms of physical and dynamical characteristics, in the Trojan asteroids of Jupiter and in the Kuiper belt.

Planetesimals captured by the Kuiper Belt are a "hot population" now. The term "hot" do not refer to the temperature of bodies, but characterize the orbit of objects. ~120,000 objects larger than 100 km. in diameter are known in the "hot population". This population is characterized by an orbital inclination greater than 5 degree and a large eccentricity.

The main task of the work, based on physical and dynamic characteristics, is to search of the same properties Trojan asteroids of Jupiter and objects from the "hot population" of the Kuiper belt, which supposedly migrated earlier from the same region of the original orbit of Neptune. In the work will use data from ground-based observations and space missions.

THE ORBITAL CALCULATION CORE SERVICE AS PART OF AN UKRAINIAN SPACE SURVEILLANCE AND TRACKING SYSTEM

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Space surveillance and tracking (SST) systems are complex. For example, the European space surveillance and tracking system can separate into subsystems: sensory, processing, and services. This work will discuss the features of developing the Ukrainian national processing system in the SST domain.

The processing system in the SST domain is itself complex. In it, separated components can be distinguished, such as:

- observational information storage,
- the value and quality analysis of observations,
- orbit determination and propagation,
- storage of orbital elements and satellite position ephemeris,
- orbital information analysis,
- etc.

The development of the whole processing system in the SST domain requires the involvement of a lot of human and material resources. Many components of the processing system have independent values. Their development can produce using a less team with fewer material costs. Thus, we come to the idea of developing the entire processing system in the form of independent and consistent development of autonomous components. One of the architectural approaches that satisfy this task is microservice architecture.

This work describes our general architectural approach to making the processing system as a set of autonomous microservices. An important part of our approach is the voluntary and independent participation of microservices developers in the making processing system. As part of this approach, we present a microservice for basic orbital calculations. At this milestone, the orbital calculation core service already provides services for orbit propagation of artificial satellites, the quality analysis of optical measurements of equatorial coordinates, and some other auxiliary services in test mode.

KHARKIV DATABASE OF ASTEROID ABSOLUTE MAGNITUDES

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We present a database of the absolute magnitudes of asteroids named the Kharkiv Asteroid Absolute Magnitude Database (KhAAMD). The database includes a homogeneous set of the absolute magnitudes for about 400 asteroids in the new *HG*1*G*2 magnitude system. We performed a comparative analysis of the asteroid absolute magnitudes between the Kharkiv database and other main magnitude databases (MPC, Pan-STARRS, ATLAS, PTF, and Gaia). We show that the PanSTARRS absolute magnitude dataset has no systematic deviations and is the most suitable for the determination of diameters or albedos of asteroids. For the MPC dataset, there is a linear trend to overestimate the absolute magnitudes of bright objects and underestimate the magnitudes of faint asteroids. The ATLAS dataset has both a systematic overestimation of asteroid magnitudes and a linear trend. We propose the equations, which can be used to correct for systematic errors in the MPC and the ATLAS magnitude datasets. There are possible systematic deviations of about 0.1 mag for Gaia and PTF databases but we have insufficient data overlapping with our data for a definitive analysis.

MONITORING OBSERVATIONS OF COMET 29P/SCHWASSMANN–WACHMANN 1 DURING 2012-2019

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We present the results of photometrical observations of comet 29P/Schwassmann-Wachmann 1 for 17 nights from 2012 to 2019 at the Lisnyky observational station of Taras Shevchenko National University of Kyiv. Apparent magnitudes and dust productivity level in filter R were calculated. Middle and height dust activity of the comet is characterized by Afρ proxy which varied from 1246 to 17563 cm during all periods of observation. Based on the morphological analysis, we detected four jet-like structures in the coma on almost all dates. Using the geometrical model for the jet structure interpretation during all observation sets, we obtained following results: the nucleus rotation period of 57±2 days, the rotational axis orientation, the locations of active regions for four jet-like structures within a narrow belt near the equator.

M-TYPE DOMINATED MAIN BELT ASTEROID FAMILIES

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In the entire terrestrial collection of meteorites, irons compose less than 5%, but at the same time they represent one of the most heterogeneous groups of meteorites in terms of isotopic compositions.The vast majority of iron meteorites belong to only 4 groups, each of which presumably comes from a single parent body. We can expect the presence of at least several families of metallic asteroids formed as a result of catastrophic collisions with the ejection of numerous fragments. Such collisions with numerous fragments should have led to the formation of asteroid families. As it is assumed that the iron meteorite parent bodies can exist among M-type asteroids, we searched for families containing M-type asteroids. The main goal of our analysis was to search for M-type dominated asteroid families. We have analyzed all known asteroid families with more than 100 members according to the Nesvorny database together with their albedos and colors based on the latest version of the WISE catalogue and the new catalog of asteroid brightness measurements, obtained based on the processing of all available SDSS images. Results of our analysis will be presented and discussed.