Session III. Other astrophysical areas, cosmology, nuclear physics, geophysics ...

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Observation of telescopic meteors in Nikolaev

Meteor research using TV CCD unintensified techniques was started in 2011 in Nikolaev astronomical observatory (RI NAO). The method of meteor registration is based on combined observation method developed at RI NAO. The main accent of the research is made on precise astrometry and meteoroid orbits calculation. In 2011-2016 about 10000 single station meteors were registered. In 2013 first double station meteors with low baseline were observed. The accuracy of visible radiant estimation is 0.7º with baseline 5 km, and less 0.5º with baseline 11.8 km. The accuracy of geocentric velocity estimation is 0.5 km/s.

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Monitoring of near-Earth space objects with ground-based optical and radio facilities

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Dynamics of multiple system Pluto

In 2006, the International Astronomical Union [www.iau.org] classify Pluto as a dwarf planet, and he got the number 134340 in the catalog MPC [www.minorplanetcenter.net]. In 2015, Pluto system was investigated by the US spacecraft "New Horizons" [https://www.nasa.gov/mission_pages/newhorizons/ main/index.html]. To date, on the basis of these and previous space and ground-based observations, different authors have been clarified Keplerian orbital elements of Pluto's satellites (Buie et al., 2012), (Showalter et al., 2015) and physical parameters of the system components (Stern et al . 2015), (Gipson, 2015), (Talbert et al., 2015), (Brozovic et al., 2015).

Based on new data, Brozovic et al. (2015) and Yu Jiang et al. (2016) numerically modeled the evolution of the orbits of Pluto's satellites in the interval of 800 days of age and by integrating the equations of motion Runge - Kuta 8-order and Gauss-Jackson (Peters 1981). We have this period of time has been extended to 1000 years accounted for the perturbations from the Sun and major planets, the equations of motion are integrated by Everhart 15 - order that allowed to look for secular perturbations in the motion of the system components.

Since Pluto opened five satellites and the known (Wan et al., 2001), some of them move at resonance. So, using the data on the orbital and axial rotation period of Pluto satellites, we performed a search of possible resonances between all system satellites. The result was a ratio of:

$$11\times P_{Charon} + 10\times P_{Styx} + 16\times P_{Hydra} - 20\times P_{Nix} - 12\times P_{Kerberos} \approx 0.00\ hour,$$

where P_i – sidereal periods.

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Orbital resonance in Saturn satellite and ring system

In our work, we build a model of motion of Saturn’s regular satellites and rings for study of irregular satellites which are probably captured asteroids. To achieve this goal, we investigated possible orbital resonances between satellites, computed orbital periods of rings and their possible orbital resonances with regular satellites. Also, we computed orbital periods of material points in rings divisions and their possible resonances with regular satellites.