VÝSKUM ASTEROIDOV A KOMÉT NA ASTRONOMICKOM ÚSTAVE SAV

MAREK HUSÁRIK

ASTRONOMICKÝ ÚSTAV SAV, T. LOMNICA

BEZOVEC 2020

2. OKTÓBER

BRIEF HISTORY OF COMET AND ASTEROID RESEARCH

- 1943 – starting of comet discoveries and meteor research
- 1946 – discovery of the first comet Pajdušáková-Rotbart-Weber
- 1946-1959 – 70 new comets discovered over the world, 18 from Skalnate Pleso (Honda-Mrkos-Pajdušáková, Tuttle-Giacobini-Kresák, 1957 V Mrkos,...)
- 1964 – asteroid observations and astrometry

CURRENT RESEARCH AT THE INTERPLANETARY MATTER DEPARTMENT

- Investigation of the activity, physical and dynamical evolution of selected cometary nuclei
- Color photometry, lightcurves, and modelling of shapes of the asteroids
- Study of transfer orbits, interrelations and evolution among different populations regarding near-Earth objects
- Study of the structure of the outer part of the Oort cloud and the Edgeworth-Kuiper belt
- Study of structure and dynamics of meteoroid streams, evolution of their parent bodies, the distribution of meteoroid particles in the inner Solar System, search for meteoroid streams of asteroidal origin, search for hyperbolic and interstellar meteoroids
- Operation of the all-sky bolide cameras within the European Fireball Network
- Study of meteorite properties
- Study of the physical and chemical properties of asteroid/comet surfaces and their relevant terrestrial analogs, simulation of effects of space weathering in laboratory conditions
- *The IAU Meteor Data Center (MDC) operates at the AI SAS under the auspices of Division F (Planetary Systems and Bioastronomy) of the International Astronomical Union (IAU). The MDC is responsible for the designation of meteor showers, for the efficient collection, (computation,) checking and dissemination of trajectory observations and orbits of meteors. It acts as a central depository for meteor orbits obtained by photographic, video and radar techniques.*

0.61-M NEWTON REFLECTOR

- Focal ratio *f*/4.3
- CCD SBIG ST-10XME + Johnson-Cousins UBVRI
- New cometary filters 365nm, 387nm, 525nm
- New CCD FLI Proline + Bessel UBVRI (now mounted on 1.3-m)
- FOV 19’x13’, resolution 1.069”/px (2x2 binning)

- Mountain weather, stronger winds
- Typical seeing cca 3”–5”
- Mag errors <0.05 for 17 mag asteroids

1.3-M RITCHEY-CHRETIEN

- Monolithic mirror aperture diameter 1.3-m
- Zerodur optics or sital material to minimize thermal expansion
- Focal ratio *f*/8
- Alt-az mount
- Both Nasmyth foci equipped with field derotators
- Absolute pointing accuracy better than 5’’
- **Nasmyth 1** – CCD 4k×4k pixels, class 1
- **Nasmyth 2** – fiber-optic spectrograph with a CCD camera, including the guiding system and the calibration unit

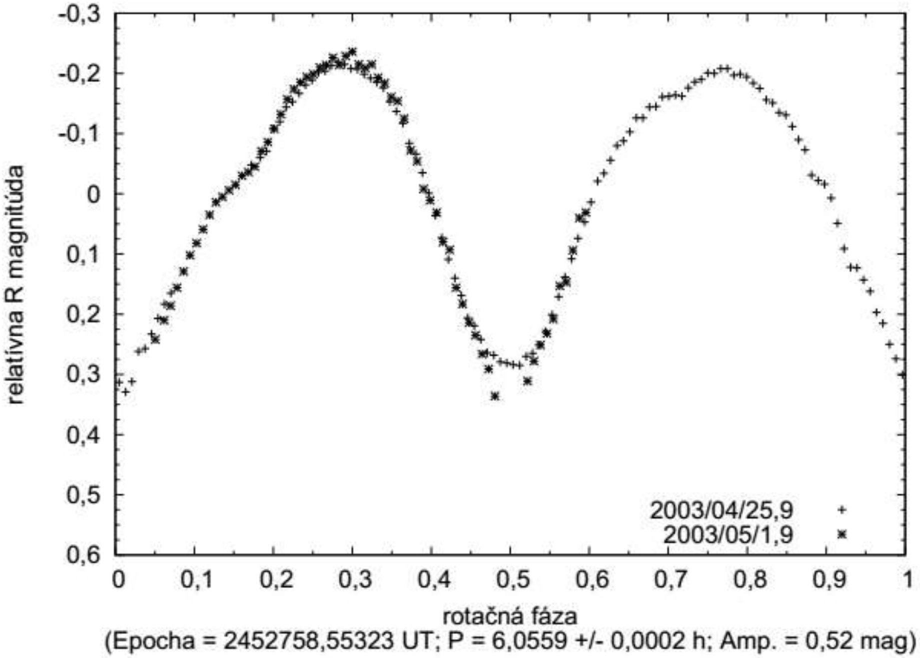
- FOV 10’x10’, resolution 0.57”/px (2x2 binning)
- Seeing <1.5”
- Mag errors <0.02 for 18 mag asteroids
- Spectrograph suitable for <11mag @ 900s exposure

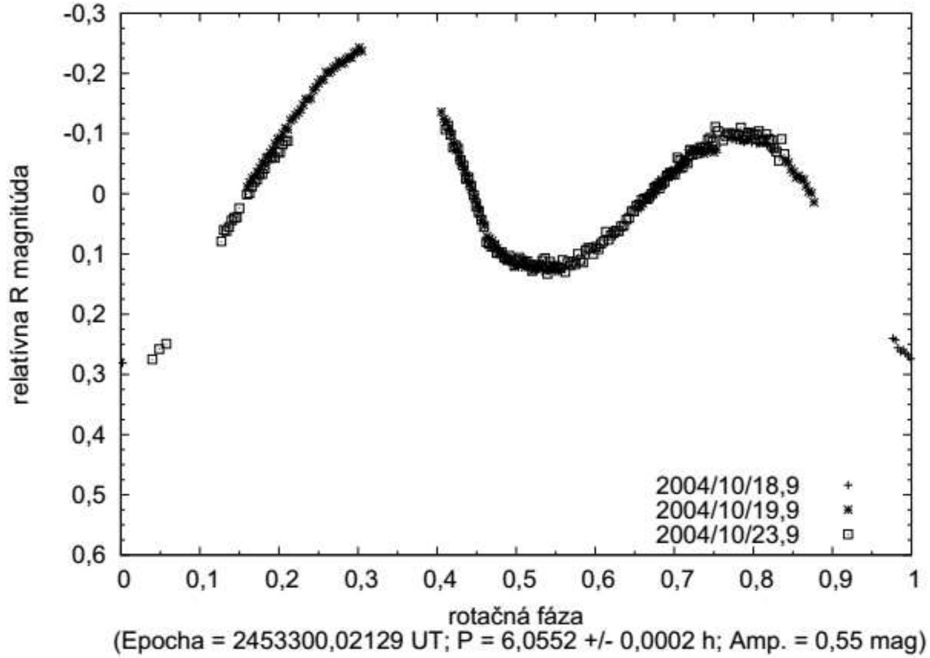
Research on asteroids

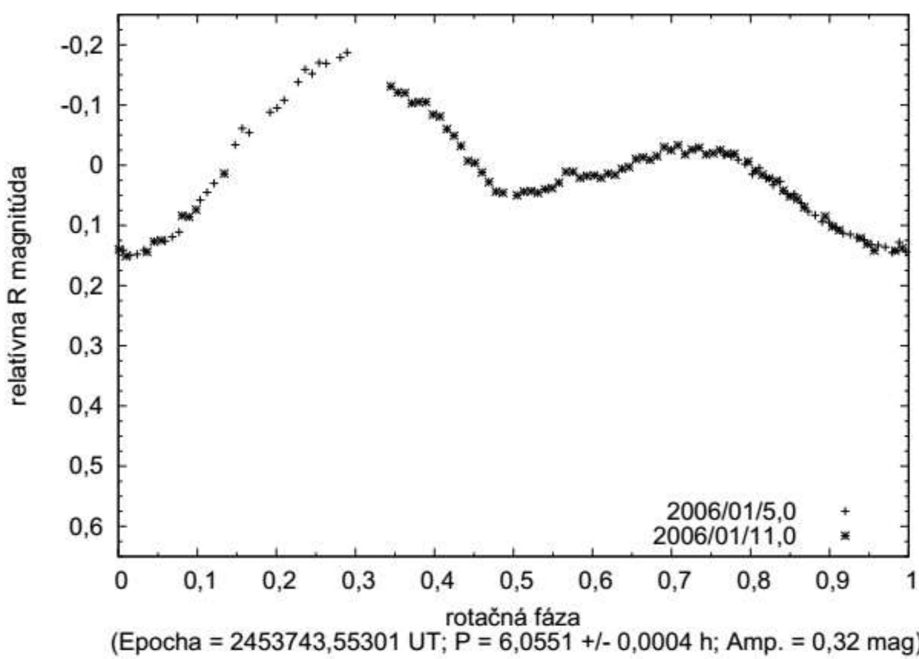
Photometry, astrometry, colors, sizes, models of MBAs and NEAs

CCD PHOTOMETRY OF THREE SELECTED ASTEROIDS (MY PHD THESIS)

- Selection of some asteroids from the database with known periods < 6 hr and amplitudes > 0.2 mag
- Estimation of rotational periods, amplitudes, finding spin axis orientation or north pole, sense of rotation, and construction of 3D shape
- Selected asteroids: *Moskva, Mora, and Tulipa*

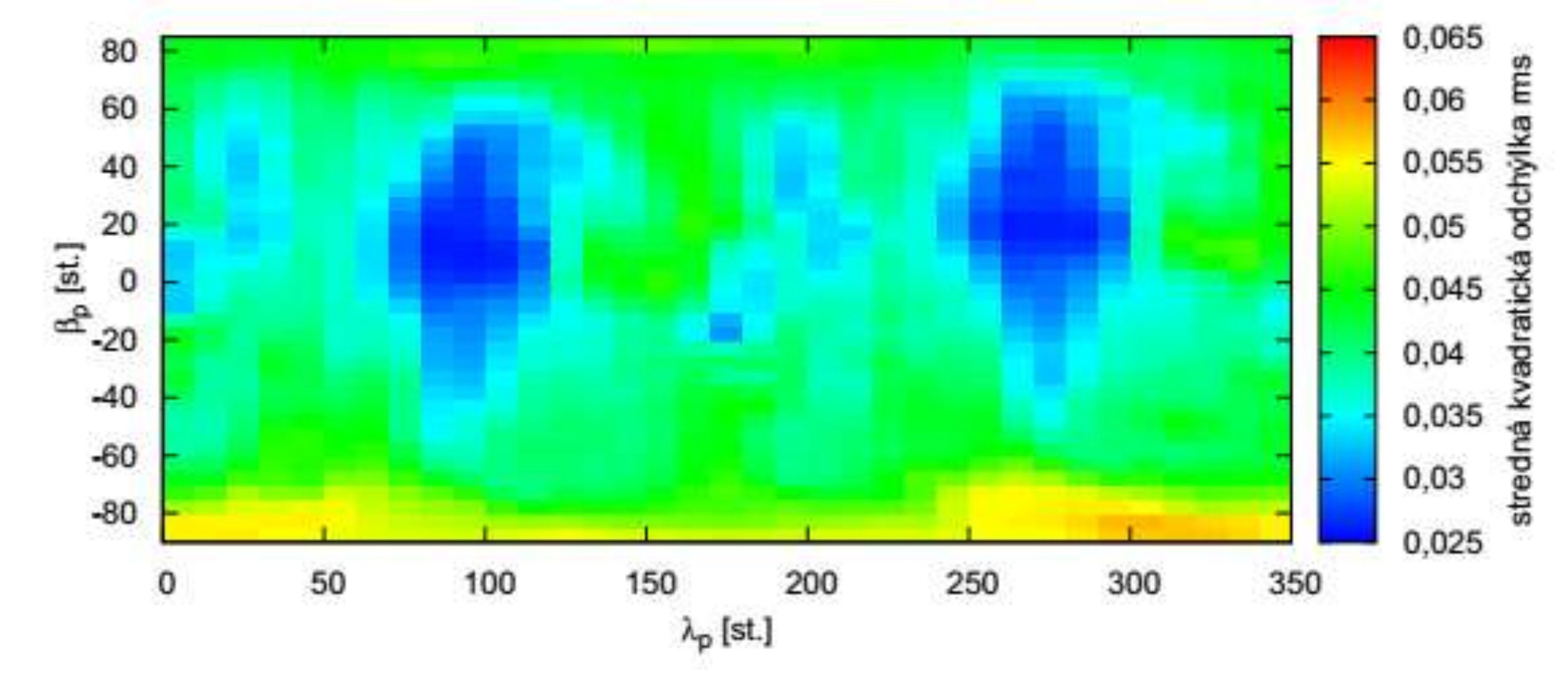




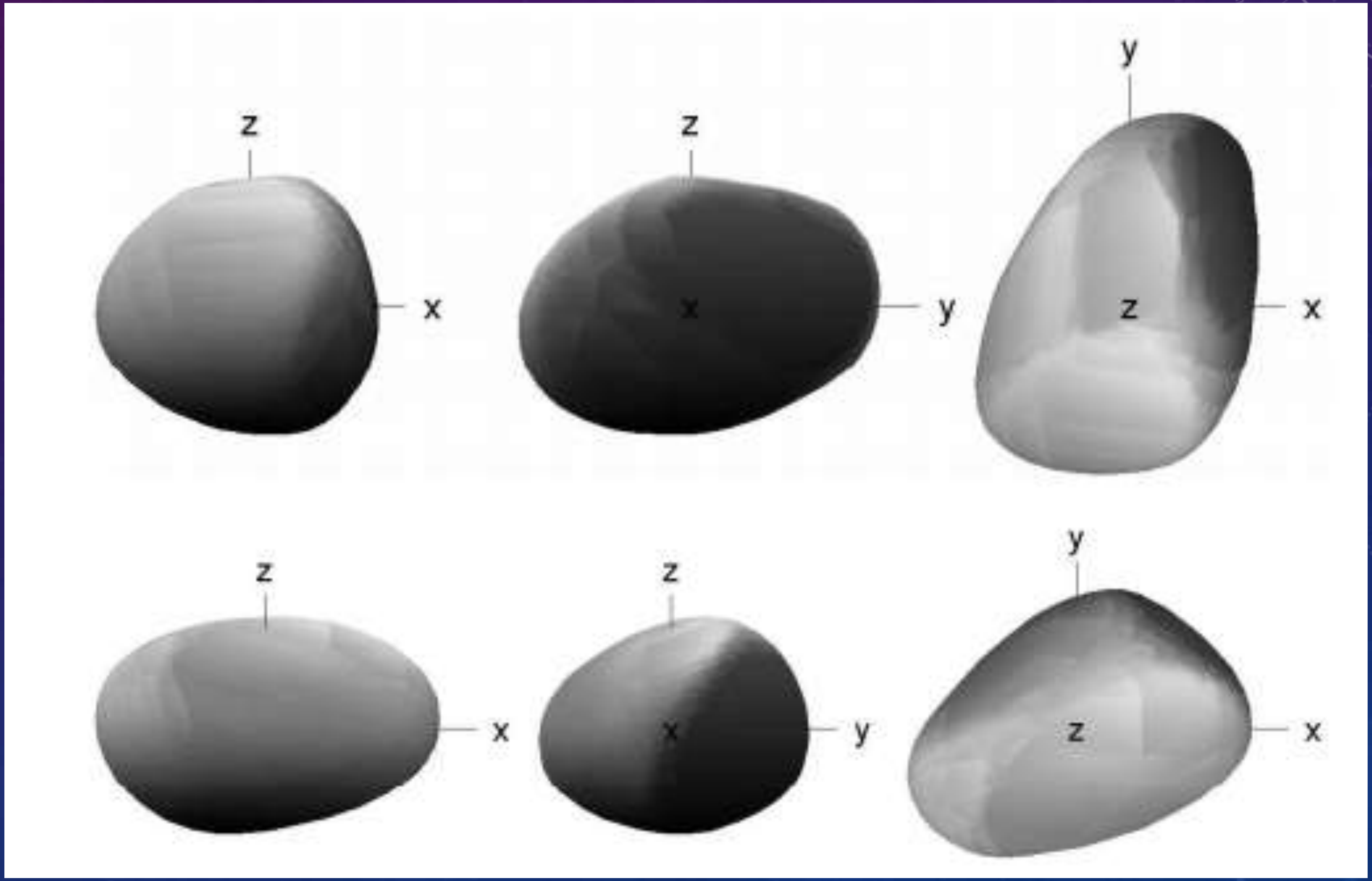


Lightcurves of Moskva in three different apparitions

POSITION OF NORTH POLE OF ASTEROID MOSKVA



3D SHAPE MODEL OF ASTEROID MOSKVA



MODELS OF ASTEROIDS ERMOLOVA AND SILVER

Earth Moon Planets (2016) 119:35–45
DOI 10.1007/s11038-016-9498-x

CrossMark

Lightcurve Analysis, Shapes and Spins of Asteroids Ermolova and Silver from Long-Term Observations

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Received: 18 February 2016 / Accepted: 17 October 2016 / Published online: 24 October 2016

Abstract We present lightcurves, shapes, and 3D convex spin-axis models for two main-belt asteroids: (3657) Ermolova and (5325) Silver. The photometric data were obtained at the Skalnaté Pleso Observatory (High Tatras, Slovakia) only. The models were obtained with the lightcurve inversion process using combined dense photometric data from the apparitions in 2006, 2010, and 2013 for Ermolova and in 2006, 2010, and 2013 for Silver. The analysis of the resulting data found sidereal periods and possible ecliptic pole solutions (J2000.0). Currently, only 1592 models are known for 907 asteroids. Knowledge of individual asteroid shapes and spin axes is vital for the understanding the Solar System.

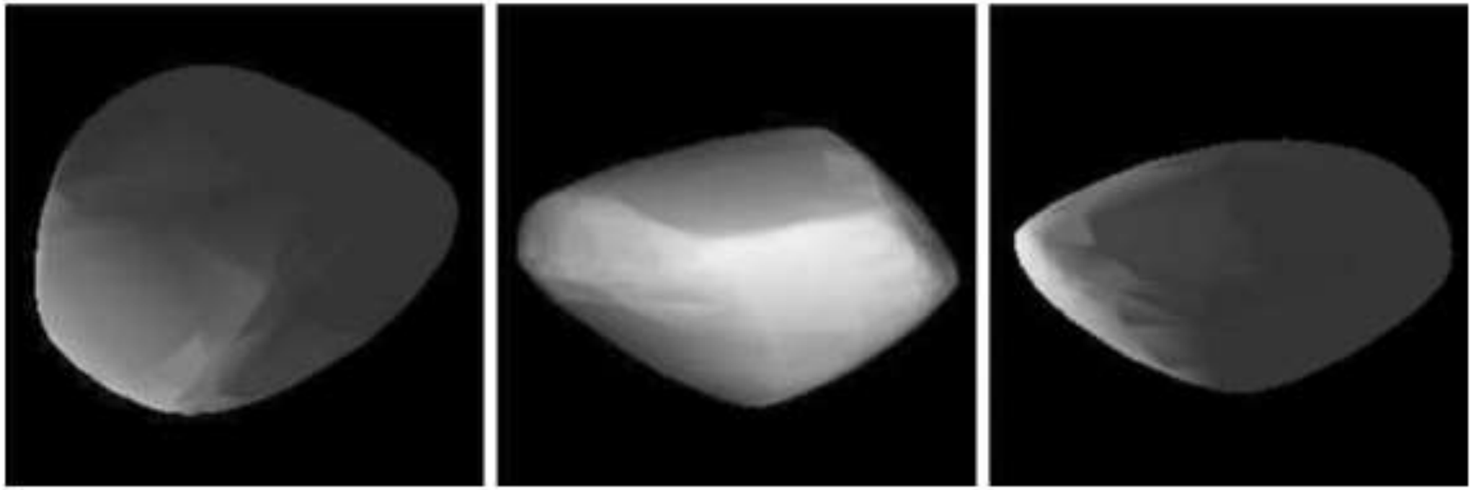
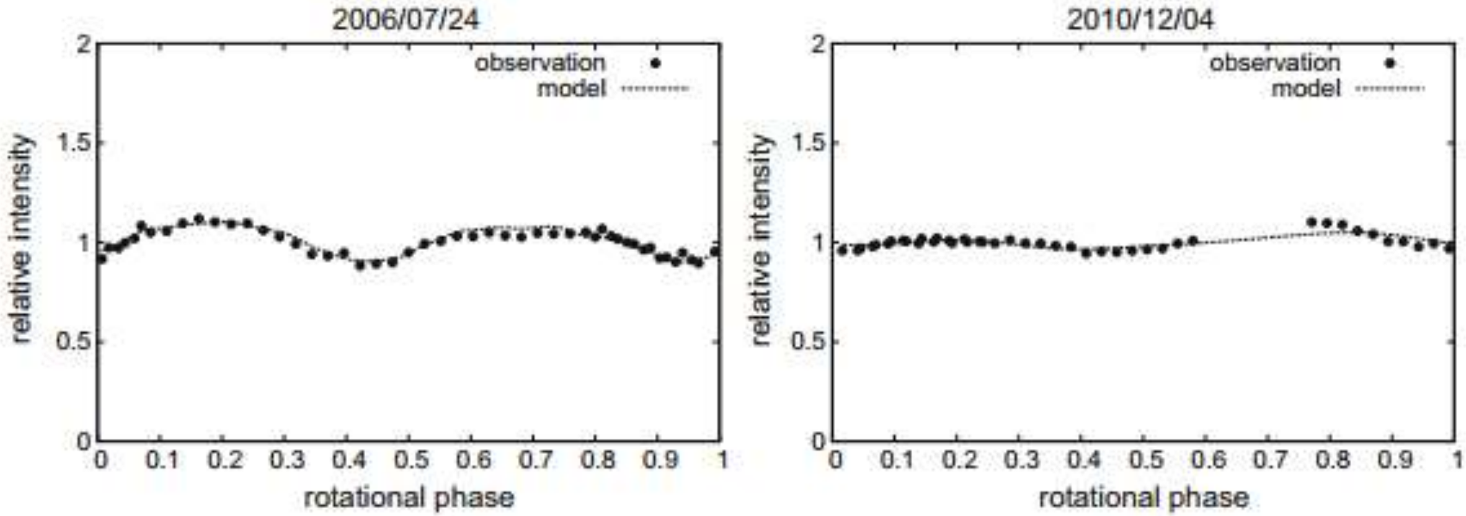


Fig. 6 The shape model of the asteroid Ermolova. On the *left* is shown north pole view, in the *middle* and *right* the equatorial viewing and illumination geometry with rotational phases 90° apart. This solution is for pole determination at $(259°, -35°)$



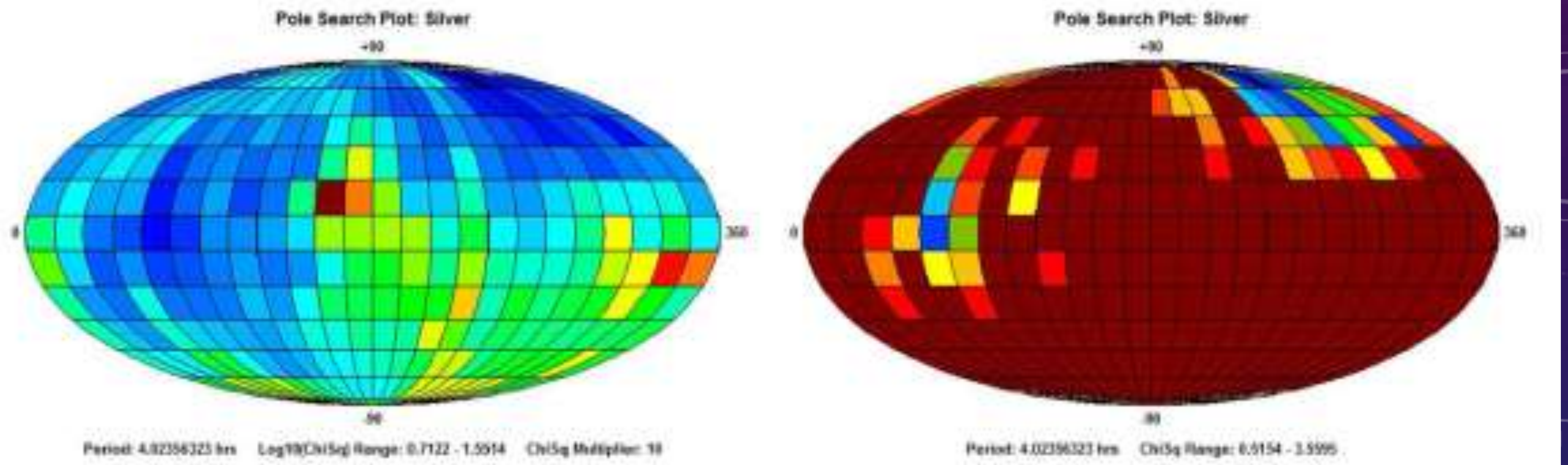


Fig. 12 χ^2 residuals between the synthetic and observed lightcurves of asteroid Silver for spin-vector coordinates covering the entire celestial sphere. Description of color coding is the same as in Fig. 5

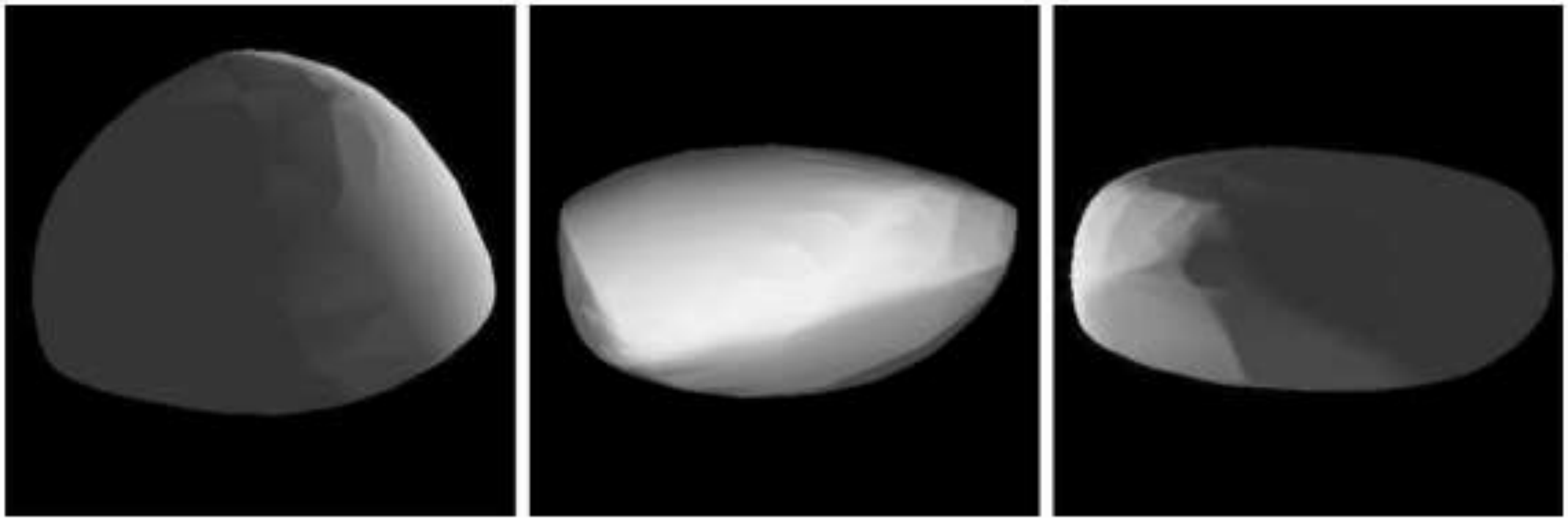


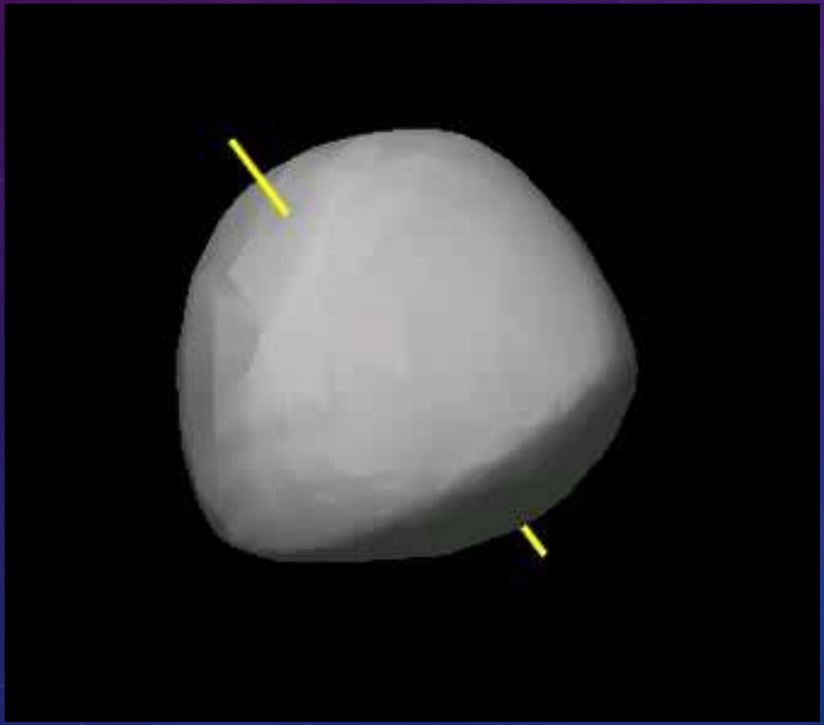
Fig. 14 The shape model of the asteroid Silver. The viewing geometry is the same as in Fig. 7

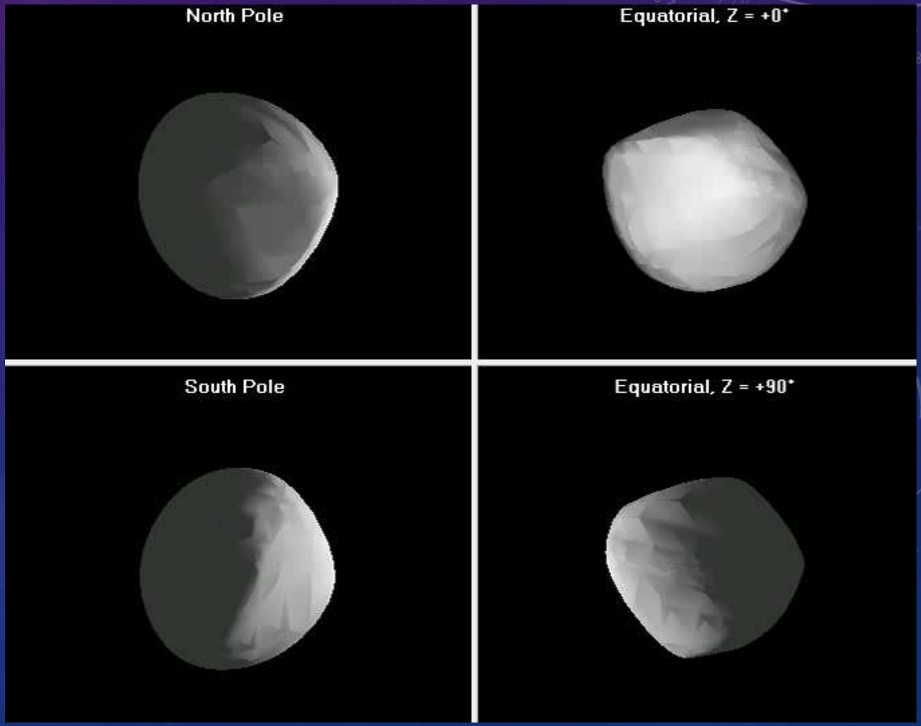
3200 PHAETHON

Cooperation of three observatories

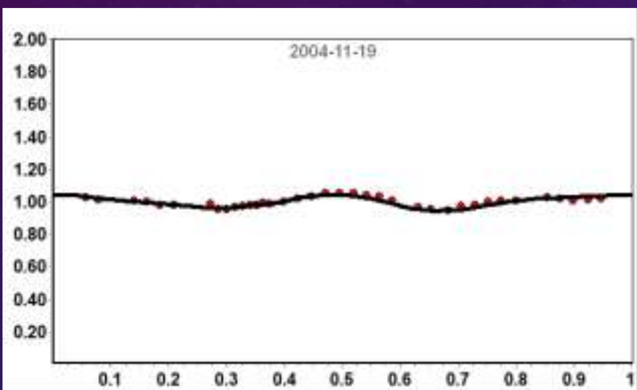
- 0.61-m Newton at Skalnate Pleso Observatory,
- 2-m Ritchey-Chretien-Coude Telescope at Terskol Observatory, Russia,
- 1-m Zeiss at Sanglok Observatory, Tajikistan

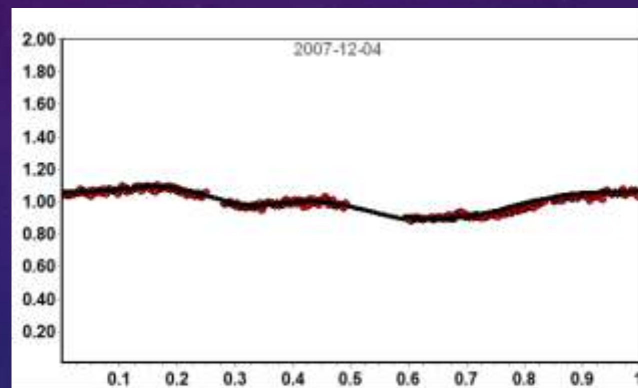
3D SHAPE MODEL OF PHAETHON

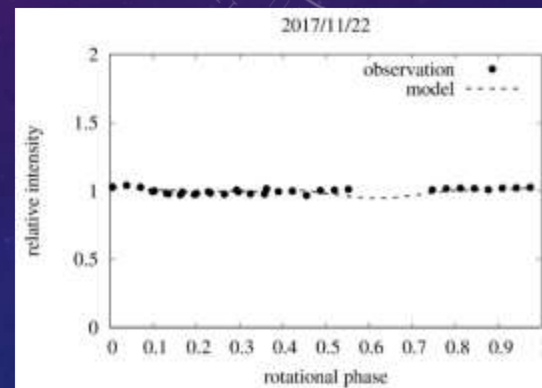


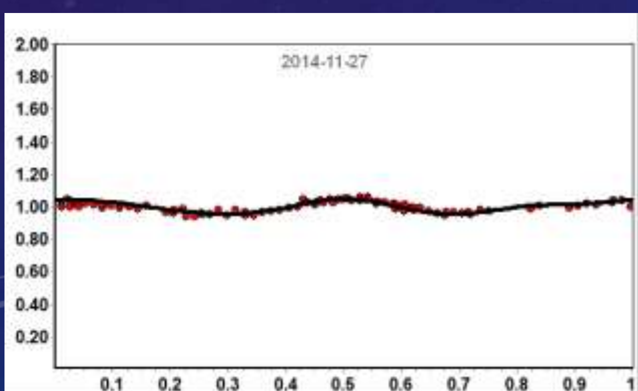


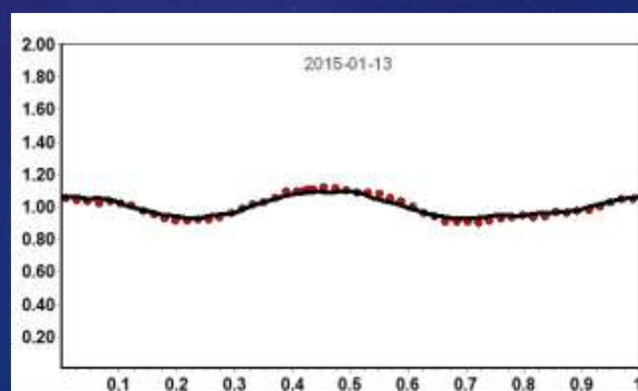
COMPARISON OF OBSERVED VS MODELED PHOTOMETRY

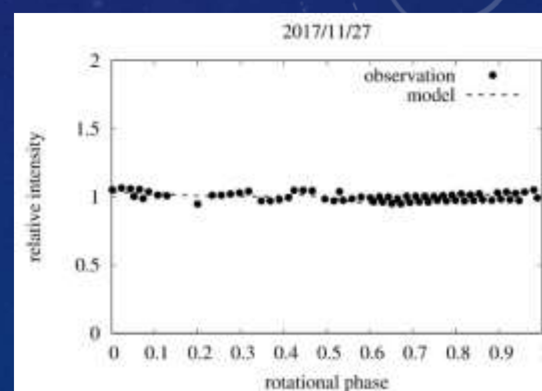




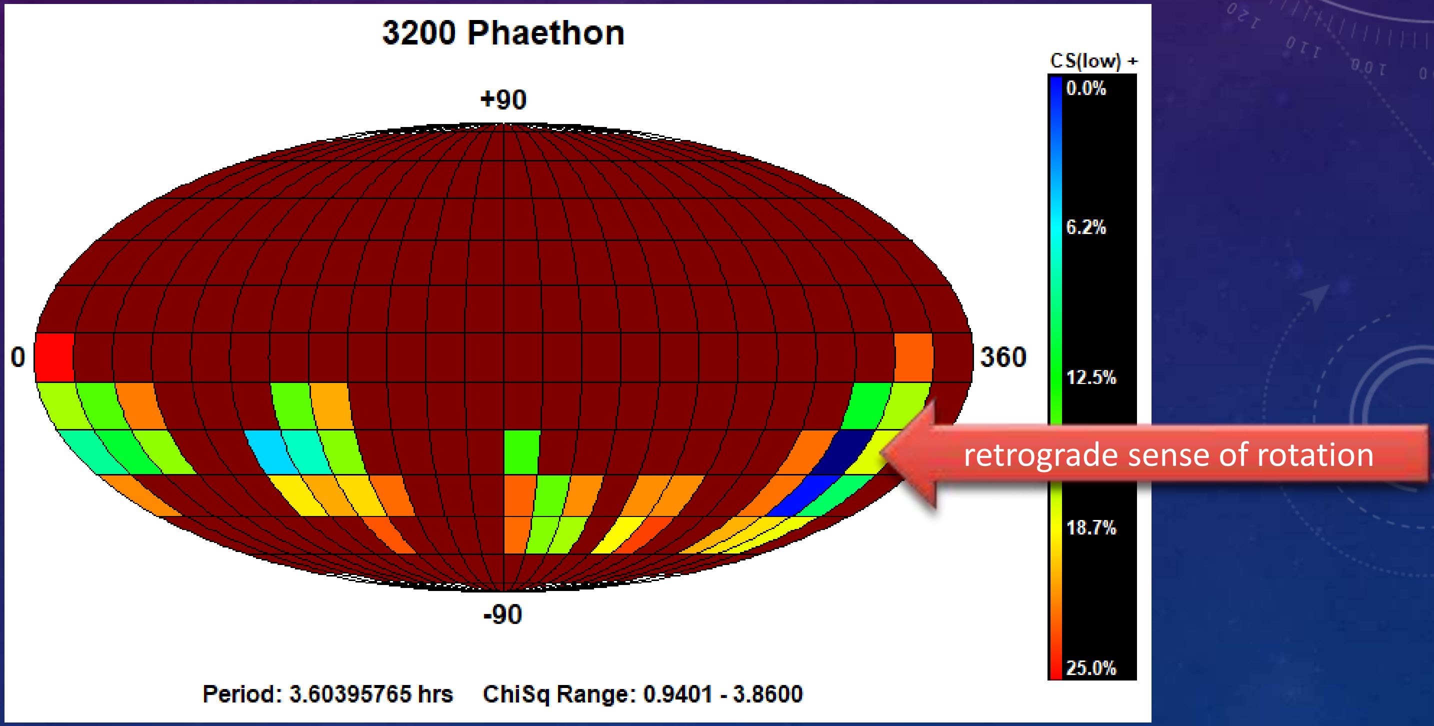








NORTH POLE OF PHAETHON



2005 UD

- *Child of Phaethon* - Dynamical association with Phaethon and 1999 YC
- Similar surface composition as Phaethon, similar color indices (*B-V* 0.69, *V-R* 0.37)
- Large member of Phaethon-Geminid stream complex, probably the parent body of daytime Sextantids
- Co-product of Phaethon observational campaign for planned mission *DESTINY+* (JAXA) in 2022

Observation campaign of (3200) Phaethon and (155140) 2005UD in 2017-2018

Collaborators

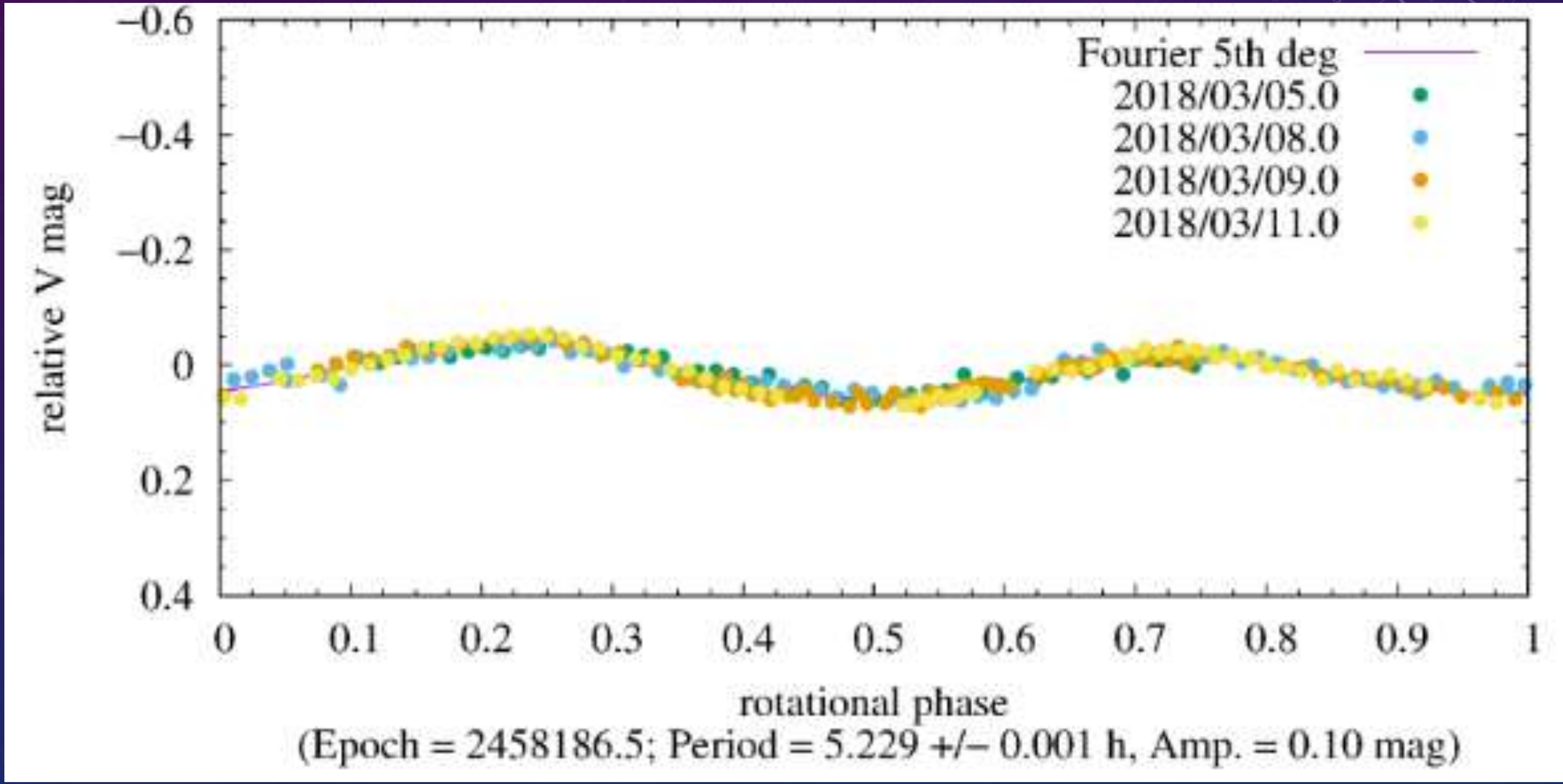
F. Yoshida, R. Ishimaru, K. Ishibashi, P. Hong, T. Arai (PERC/ChiTech), R. Okazaki, T. Sekiguchi, H. Naito, M. Imai, T. Ono (Hokkaido University of Education), S. Urakawa (Japan Spaceguard Association, Bisei Spaceguard Center), Y. Shinnaka (Kyoto Sanyo Univ.), T. Tanigawa (Sumoto high school), T. Yanagisawa, H. Kurosaki (JAXA), S. Abe, R. Kato (Nihon Univ.), N. Natira, T. Nishiumi (Univ. of Tokyo), M. Ishiguro (Seoul National University), M.-J. Kim, Y.-J. Choi, H.-K. Moon (KASI), D.-H. Kim, H.-J. Lee, S.-M. Lee (Chungbuk National University), Zhong-Yi Lin (Institute of Astronomy, National Central University), Xiaobin Wang (Yunnan Observatories, CAS), A. Serebryanskiy, M. Krugov, I. Reva (Fesenkov Astrophysical Institute), O. Burkhonov, E. Kamoliddin (UBAI), A. Peyrot, J-P. Teng (Les Makes Observatory), Y. Krugly (Institute of Astronomy of V.N. Karazin Kharkiv National University), I. M. Volkov (SAI MSU, INASAN), I. V. Nikolenko, S. I. Barabanov (INASAN), M. Kaplan, O. Erece (Akdeniz university), A. Sonka, S. Anghel (Astronomical Institute of Romanian Academy, Bucharest University), M. Birlan, F. Vachier, J. Berthier (Observatoire de Paris, IMCCE, CNRS), A. Klotz (CNRS-OMP-IRAP), P. Thierry (Auragne Observatory), O. Ivanova, M. Husarik (Astronomical Institute of the Slovak Academy of Sciences), E. Kuznetsov, D. Glamazda, G. Kaiser, E. Koren, V. Krushinsky, A. Popov, A. Shagabutdinov, Y. Vibe (Ural Federal University), M. Lazzarin, V. Petropoulou, I. Bertini, F. La Forgia (University of Padova), Migliorini, A. (INAF-IAPS), J. Vaubaillon (Observatoire de Paris), T. G. Wilson (University College London, Isaac Newton Group), O. Vaduvescu (Isaac Newton Group, Instituto de Astrofísica de Canarias), M. Popescu, Julia de Leon (Instituto de Astrofísica de Canarias), V. Lorenzi (Fundación Galileo Galilei - INAF, Instituto de Astrofísica de Canarias), M. Granvik (University of Helsinki / Luleå University of Technology), A. Penttilä (University of Helsinki), K. O. Muinonen (University of Helsinki / National Land Survey of Finland), T. Kareta (Lunar and Planetary Laboratory, University of Arizona), V. Reddy, D. S. Lauretta, B. Sharkey, C. Hergenrother (LPL), J. A. Sanchez (PSI), T. Linder (Astronomical Research Institute), O. Kuhn, A. Conrad (Large Binocular Telescope Observatory), N. Moskovitz (Lowell Observatory), J. Masiero, A. Mainzer, L. Benner, M. Brozovic, S. Naidu, J. Giorgini (NASA JPL), E.L. Wright, D. Jewitt (UCLA), P. Taylor, E. Rivera-Valentin, S. Bhiravarasu, B. Aponte-Hernandez (Lunar and Planetary Institute), S. Marshall, F. Venditti, A. Virkki, L. Zambrano-Marin (Arecibo Observatory & University of Central Florida), C. R. Sanchez-Vahamonde (University of Western Ontario)

Observatories and telescopes

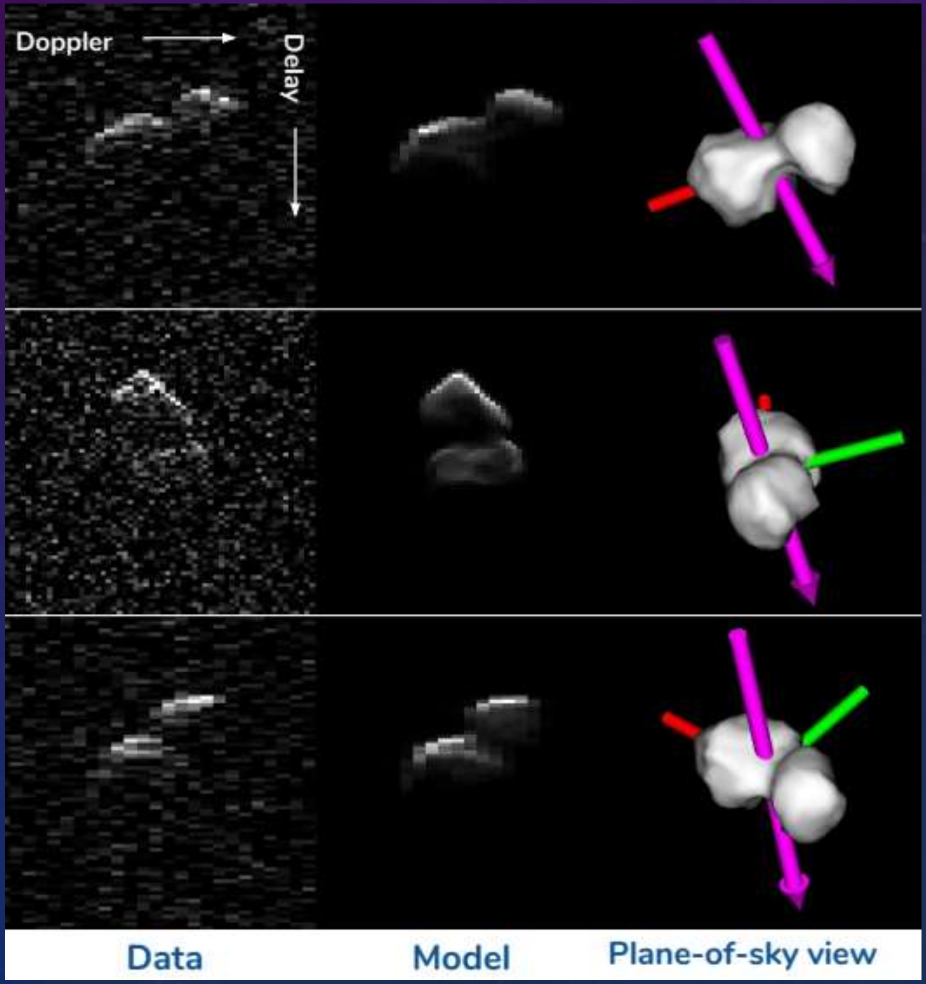
NEAR-EARTH ASTEROID 1981 MIDAS

- Campaign/call of the Arecibo Radar Observatory in Portoriko
- High-amplitude lightcurves in literature and some authors
- Our data shows low amplitude in lightcurves
- Indication of highly elongated shape

LOW AMPLITUDE OF BRIGHTNESS CHANGES



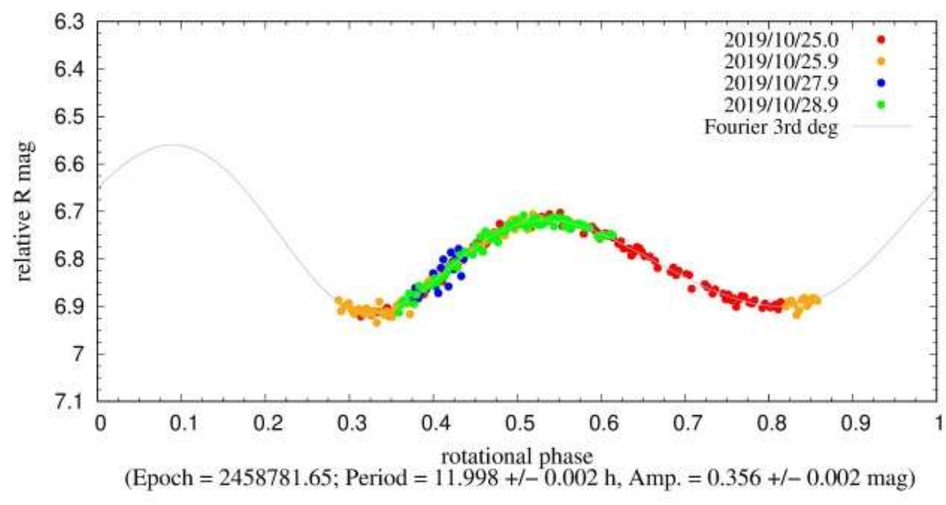
RADAR DATA AND SYNTHETIC SHAPE OF MIDAS



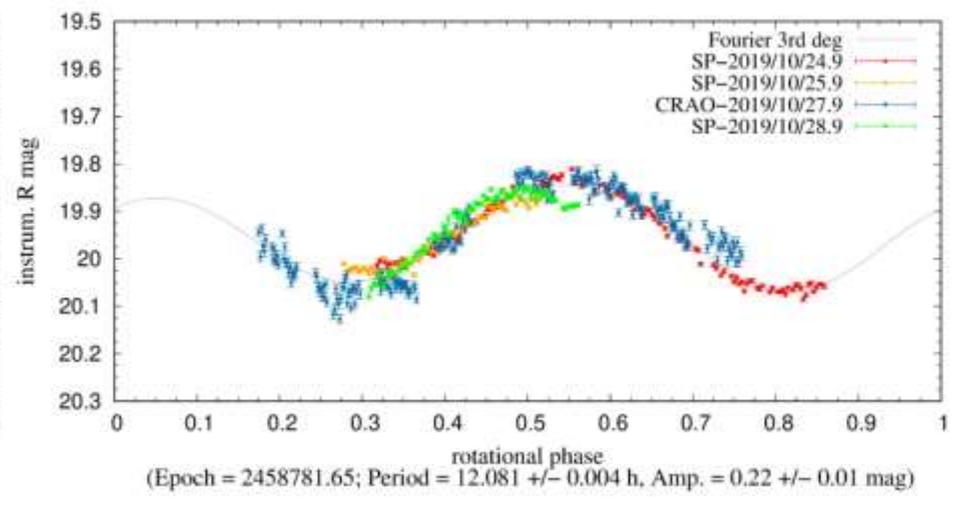
RESULTS FROM RADAR AND OUR DATA

- Two lobes separated by a neck which, at its thinnest point, is about 60% of the width of the lobes.
- Dimensions of 3.5 x 2.0 x 2.0 km. A volume-equivalent diameter of about 2.4 km.
- A rotation pole located of (48°±10°, -60°±10°)
- Sense of rotation is retrograde.
- Confirmed the lightcurve-derived rotation period of 5.23 hours.

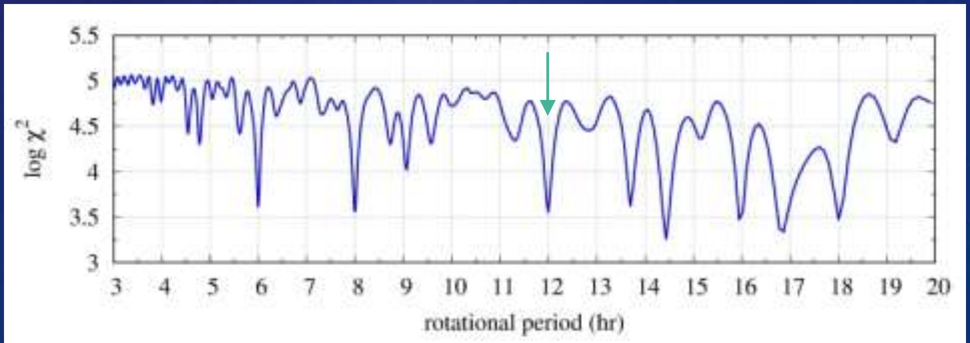
NEA 1998 HL1



2019/10/25.0
2019/10/25.9
2019/10/27.9
2019/10/28.9
Fourier 3rd deg
relative R mag
rotational phase
(Epoch = 2458781.65; Period = 11.998 +/− 0.002 h, Amp. = 0.356 +/− 0.002 mag)

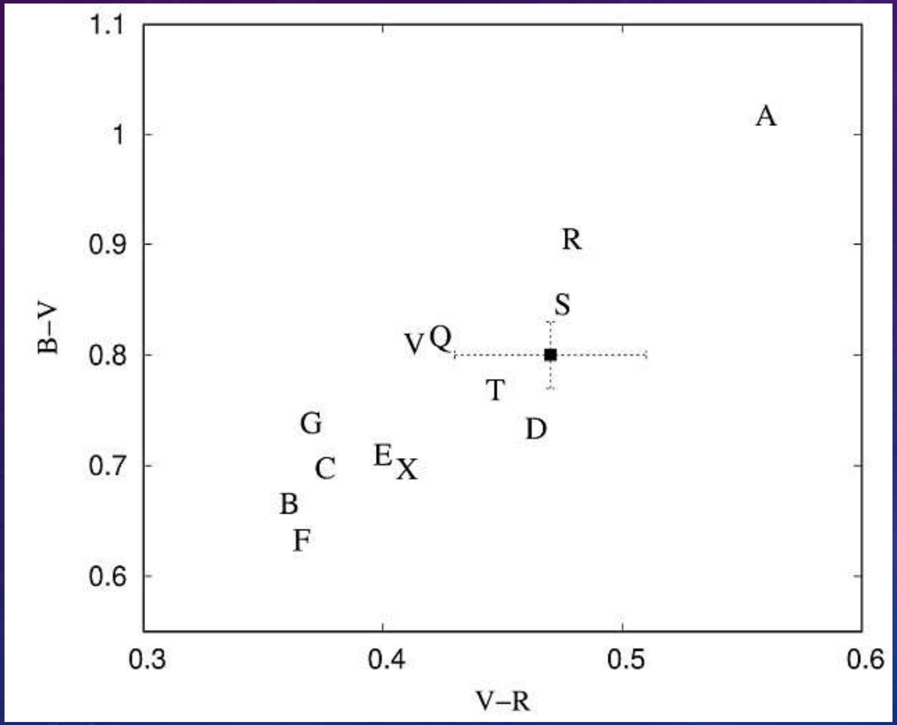


Fourier 3rd deg
SP−2019/10/24.9
SP−2019/10/25.9
CRAO−2019/10/27.9
SP−2019/10/28.9
instrum. R mag
rotational phase
(Epoch = 2458781.65; Period = 12.081 +/− 0.004 h, Amp. = 0.22 +/− 0.01 mag)



log χ²
rotational period (hr)

TAXONOMY AND SIZE OF 1998 HL1



- Assuming an albedo 0.405 with absolute magnitude from our observations, we estimated the mean diameter of asteroid at $\boldsymbol{D = 304^{+110}_{-54}}$ **meters**.
- Using an albedo derived from polarimetry $p_V = 0.35 \pm 0.05$ and absolute magnitude $H_V = 19.18$, we find diameter $\boldsymbol{D = 326^{+26}_{-22}}$ **meters**.

PHOTOMETRY OF ASTEROID SCHEILA AFTER IMPACT

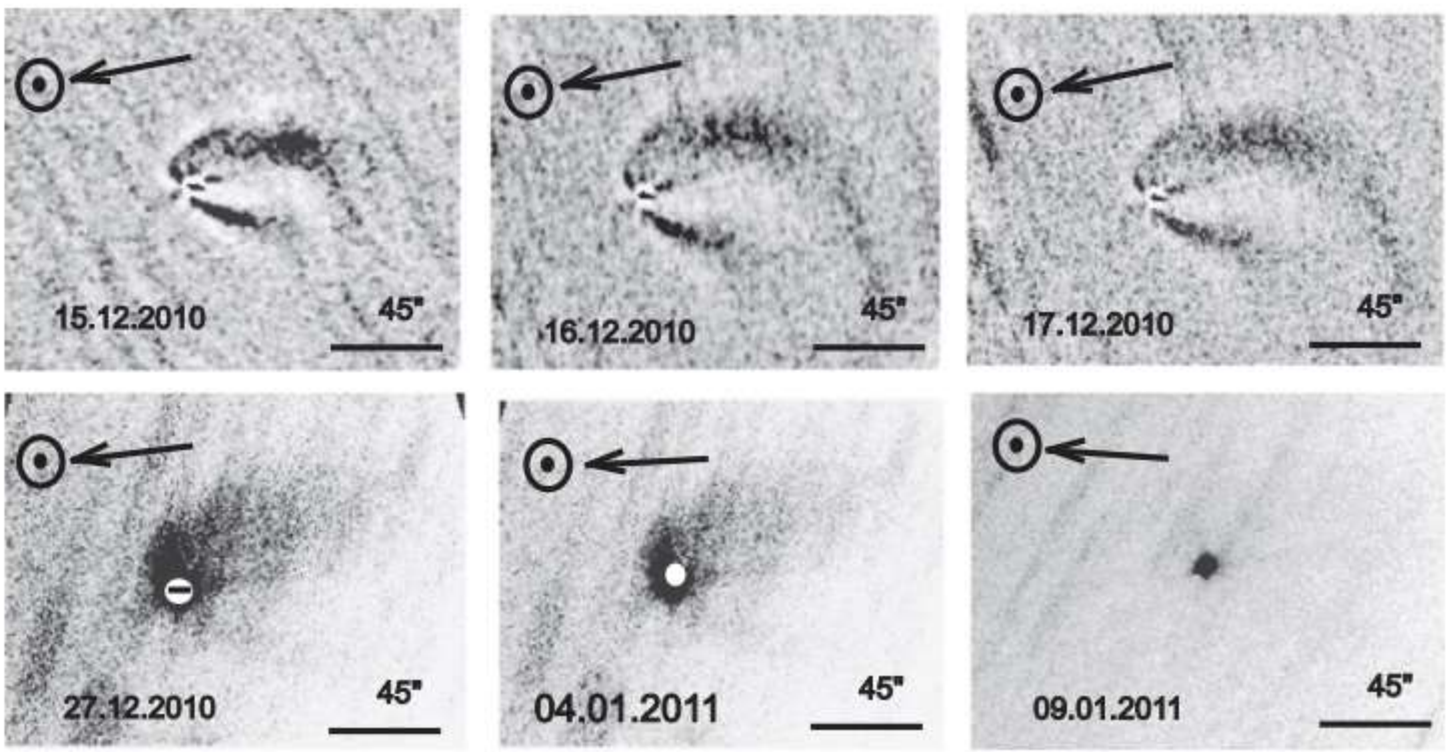


Fig. 3. R band images of (596) Scheila taken in six nights and processed with digital filters. The structure of outburst is changed during the time of observation. After January 9, 2011, we could not detect the dust environment. We observed Scheila as a stellar object.

COMPOSITE LIGHTCURVE OF SCHEILA

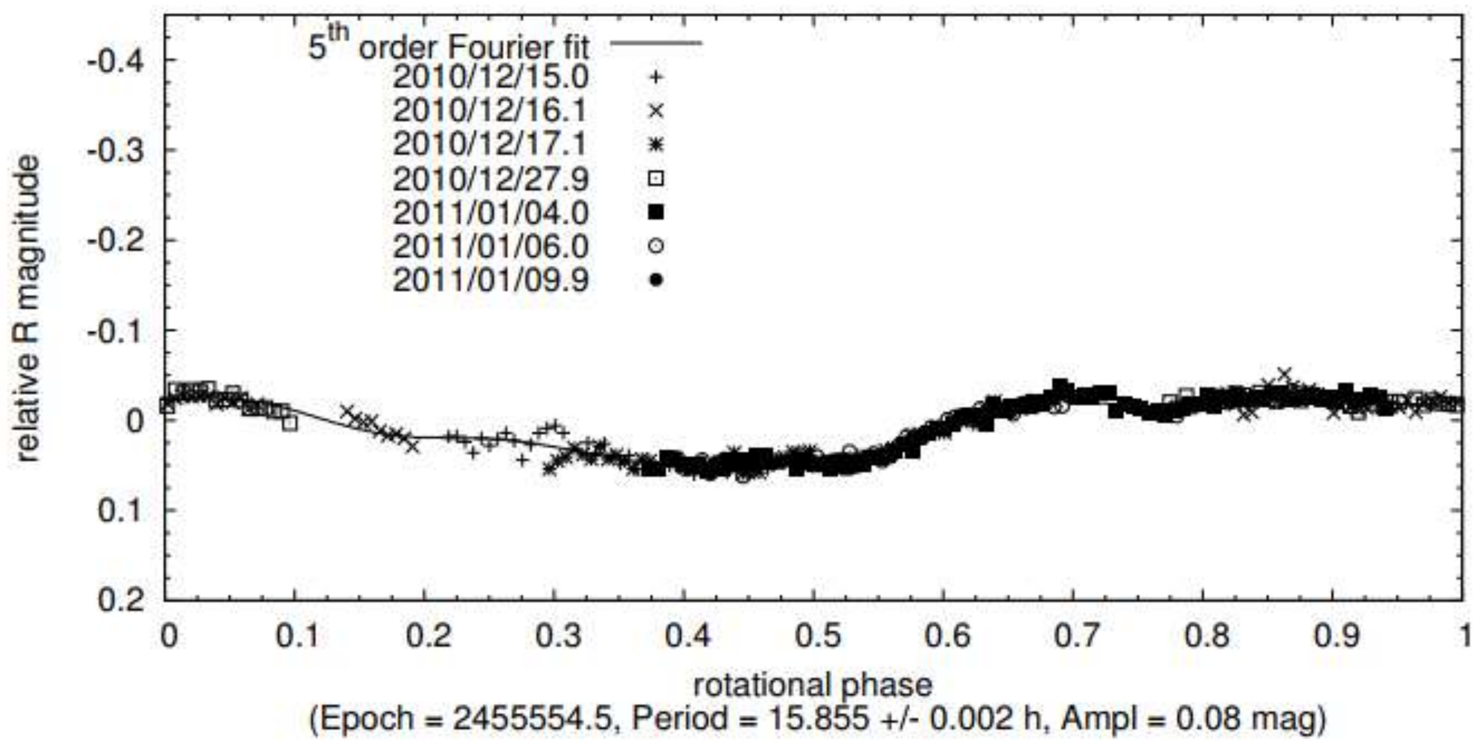


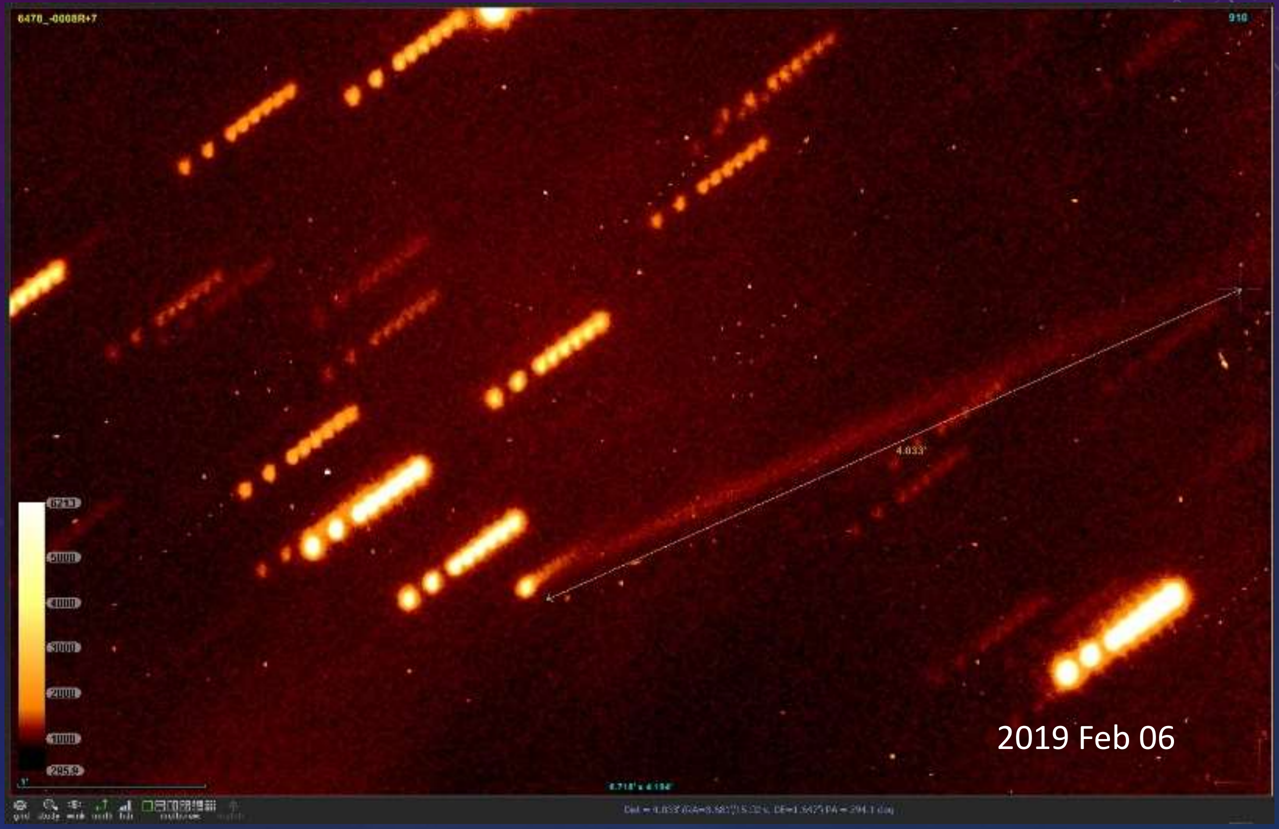
Figure 4. The composite lightcurve of Scheila from 7 nights.

8. Results

We found that:

(1) The morphology of outburst of the asteroid changed during the period of our observation.
(2) The radius of the asteroid is estimated to be 51.2 ± 3.0 and 50.6 ± 3.0 km.
(3) The mass of dust ejecta is estimated to be $(2.5-3.4) \times 10^7$ kg. This estimate was obtained considering the different parameters of the size, density, and velocity of dust grains.
(4) In the 10-day time interval before the latest estimated time of collision between the Scheila and an impactor, Scheila passed closely (within 0.15 AU) around the orbits of two periodic comets, 127P and P/2005 K3. If these comets produce their meteoroid streams, the impactor could be a member of one of these streams.
(5) In the 10-day time interval before the collision, Scheila also passed closely (within 0.2 AU in this case) around the orbits of 108 other main-belt asteroids. However, no perihelion distance of these objects was short and, thus, any thermal stress of surface material leading to a production of potential meteoroid stream could be expected. Most probably, the impactor did not originate from an asteroidal stream.
(6) In near future, Scheila will again pass near the collision point on December 6.7, 2015 (JDT=2 457 363.2), December 9.9, 2020 (TJD=2 459 193.4), and December 16.0, 2025 (TJD=2 461 025.5).

ACTIVE ASTEROID GAULT



- Phocaea family
- Diameter during active phase ~3.9 km (our data from 2020 shows ~2.9 km)
- *Afrho* ~20 cm
- *V-R* = 0.44 mag (taxon. type S)

LIGHTCURVE OF GAULT

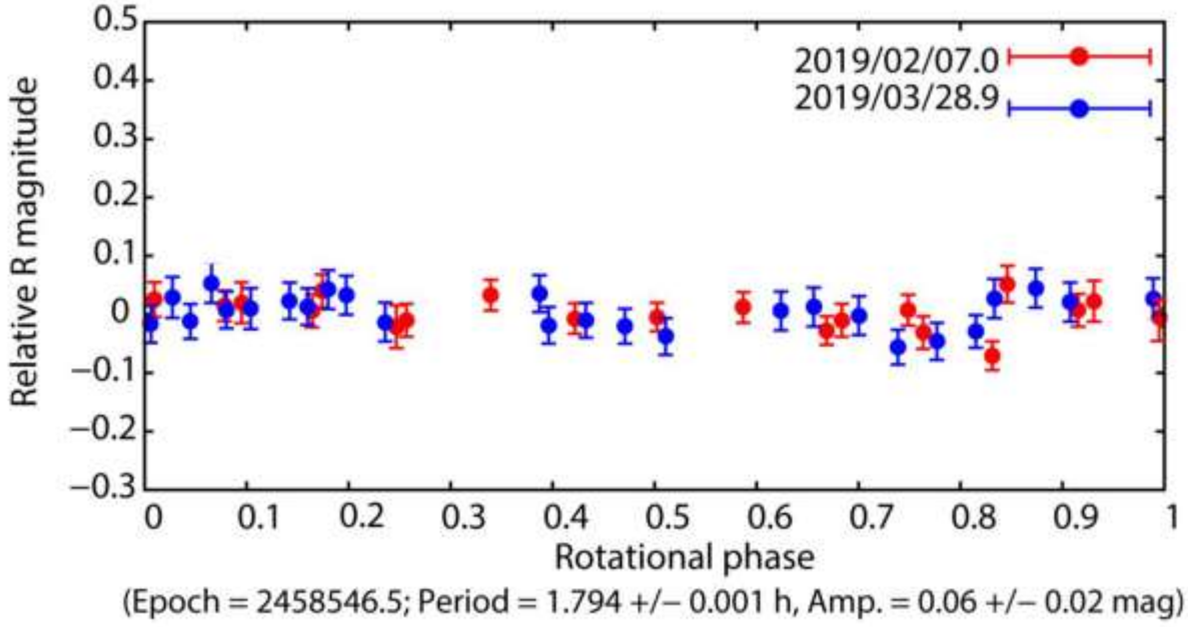


Figure 7. Composite light curve of the AA Gault (based observations at Skalnaté Pleso Observatory). Representative magnitude error bars (±0.019 mag) are shown. The mid-time of the observational runs are shown in the legend.

Monthly Notices
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ROYAL ASTRONOMICAL SOCIETY

MNRAS **496,** 2636–2647 (2020)
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Activity of (6478) Gault during 2019 January 13–March 28

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ABSTRACT

We present the results of photometric observations of active asteroid (6478) Gault performed at heliocentric distances from 2.46 to 2.30 au and geocentric distances from 1.79 to 1.42 au between 2019 January 15 and March 28. Observations were carried out at the 2.5-m telescope of SAI MSU (Caucasian Mountain Observatory) on 2019 January 15 and at the 1.3 and 0.61-m telescopes (*SPb*) on 2019 February 6 and March 28, respectively. The direct images of the

CAMPAIGN *PHOTOMETRIC SURVEY FOR ASYNCHRONOUS BINARY ASTEROIDS*

- PI Petr Pravec from Ondřejov
- The goal of the survey is to discover asynchronous binary asteroids among small asteroids with *D*<10 km (*H*≥12) in near-Earth, Mars-crossers, and inner-main belt (*a*<2.50 AU) orbits. Smaller objects are to be preferred but the minimal requirement of photometric errors of 0.03 mag or better is to be held. During the observational window, the asteroid should be observable at airmass lower than 2 for at least a few hours on each night and the photometric accuracy of 0.03 mag or better should be achievable during it.
- Part of campign is focused on paired asteroids (YORP and BYORP effect)

FIRST BINARY ASTEROID DISCOVERED AT SP

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                                      Electronic Telegram No. 270
Central Bureau for Astronomical Telegrams
INTERNATIONAL ASTRONOMICAL UNION
M.S. 18, Smithsonian Astrophysical Observatory, Cambridge, MA 02138, U.S.A.
IAUSUBS@CFA.HARVARD.EDU or FAX 617-495-7231 (subscriptions)
CBAT@CFA.HARVARD.EDU (science)
URL http://cfa-www.harvard.edu/iau/cbat.html


(9260) EDWARDOLSON
    M. Jakubik and M. Husarik, Skalnate Pleso Observatory; J.
Vilagi, S. Gajdos, and A. Galad, Modra Observatory; P. Pravec
and P. Kusnirak, Ondrejov Observatory; W. Cooney, J. Gross
and D. Terrell via Sonoita Research Observatory (Sonoita, AZ);
D. Pray, Greene, RI; and R. Stephens, Yucca Valley, CA, report
that photometric observations obtained during Oct. 6-30 show
that the minor planet (9260) is a binary system with an orbital
period of 17.785 +/- 0.003 hr.  The primary rotates with a
period of 3.0852 +/- 0.0001 hr, and its lightcurve amplitude of
0.11 mag is indicative of a nearly spheroidal shape.  Mutual
eclipse/occultation events that are 0.08-0.15 mag deep indicate
a secondary-to-primary mean-diameter ratio of 0.27 +/- 0.03.


NOTE: These 'Central Bureau Electronic Telegrams' are sometimes
      superseded by text appearing later in the printed IAU Circulars.

                          (C) Copyright 2005 CBAT
2005 November 2                (CBET 270)              Daniel W. E. Green
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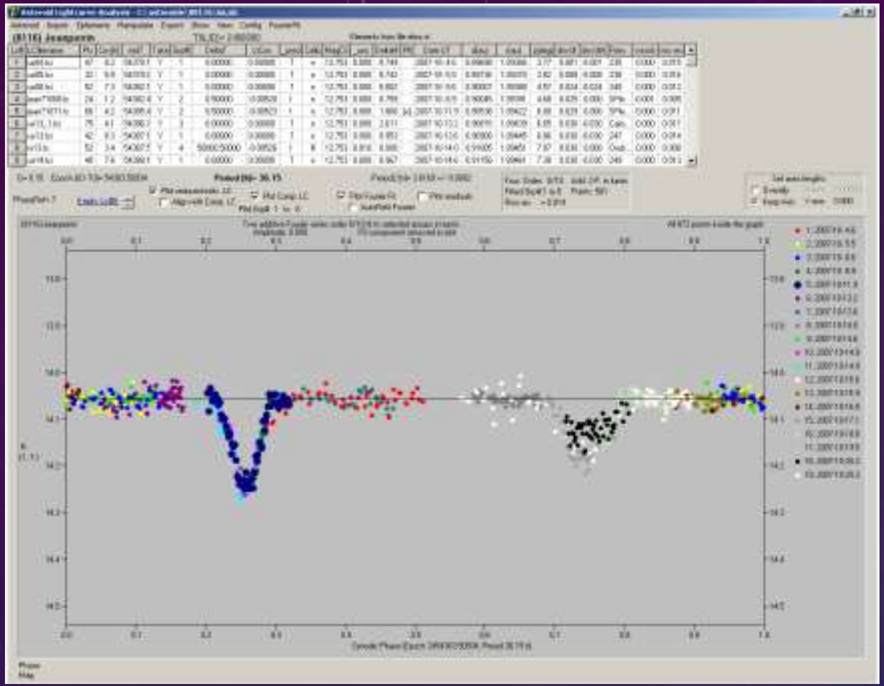
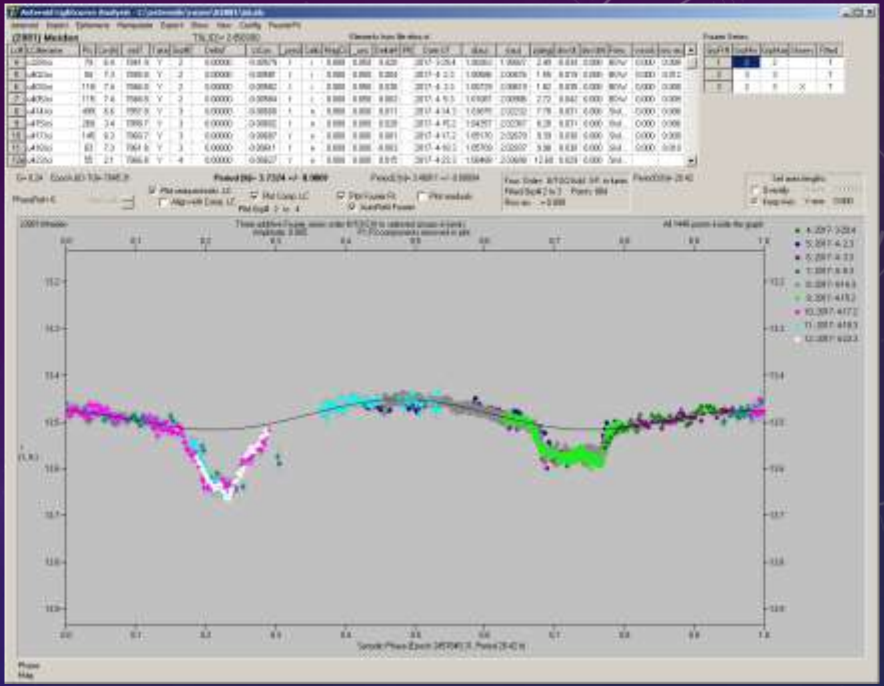
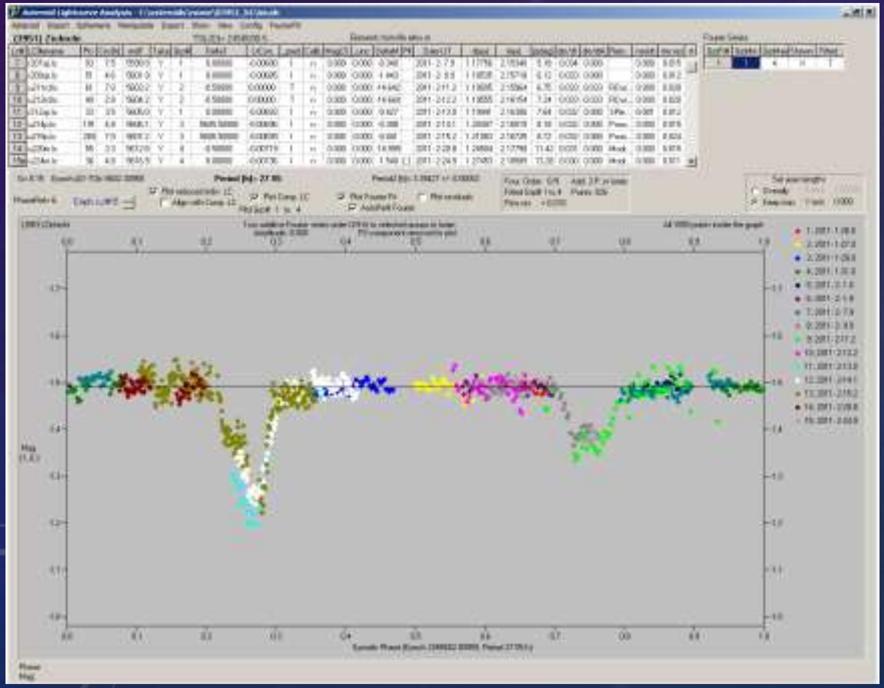
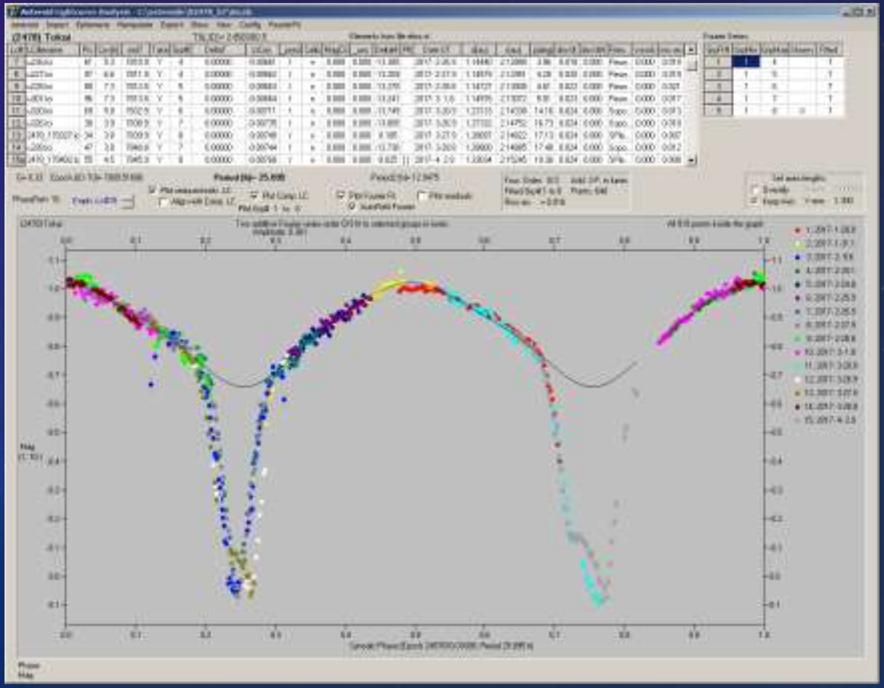
Other discoveries:
Arlon, Zichichi, Sevastopol, Zenon, Sugano, Kiuchi, Huntress, Montecorvino,...

Observations of binaries in next apparitions due to changing geometry – evolution of lightcurves and mutual events (eclipses/occultations) and modeling of orbits:
Fehrenbach, Schlesinger, Arlon,...









Icarus 197 (2008) 497–504

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Spin rate distribution of small asteroids

P. Pravec[a,*], A.W. Harris[b], D. Vokrouhlický[c], B.D. Warner[d], P. Kušnirák[a], K. Hornoch[a], D.P. Pray[e], D. Higgins[f], J. Oey[g], A. Galád[h,a], Š. Gajdoš[h], L. Kornoš[h], J. Világi[h], M. Husárik[i], Yu.N. Krugly[j], V. Shevchenko[j], V. Chiorny[j], N. Gaftonyuk[k], W.R. Cooney Jr.[l], J. Gross[l], D. Terrell[l,m], R.D. Stephens[n], R. Dyvig[o], V. Reddy[p], J.G. Ries[q], F. Colas[r], J. Lecacheux[s], R. Durkee[t], G. Masi[u,v], R.A. Koff[w], R. Goncalves[x]

Icarus 218 (2012) 125–143

Contents lists available at SciVerse ScienceDirect

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Binary asteroid population. 2. Anisotropic distribution of orbit poles of small, inner main-belt binaries

P. Pravec[a,*], P. Scheirich[a], D. Vokrouhlický[b], A.W. Harris[c], P. Kušnirák[a], K. Hornoch[a], D.P. Pray[d], D. Higgins[e], A. Galád[a,f], J. Világi[f], Š. Gajdoš[f], L. Kornoš[f], J. Oey[g], M. Husárik[h], W.R. Cooney[i], J. Gross[i], D. Terrell[i,j], R. Durkee[k], J. Pollock[l], D.E. Reichart[m], K. Ivarsen[m], J. Haislip[m], A. LaCluyze[m], Yu. N. Krugly[n], N. Gaftonyuk[o], R.D. Stephens[p], R. Dyvig[q], V. Reddy[r], V. Chiorny[n], O. Vaduvescu[s,t], P. Longa-Peña[s,u], A. Tudorica[v,w], B.D. Warner[x], G. Masi[y], J. Brinsfield[z], R. Gonçalves[aa], P. Brown[ab], Z. Krzeminski[ab], O. Gerashchenko[ac], V. Shevchenko[n], I. Molotov[ad], F. Marchis[ae,af]

Icarus 267 (2016) 267–295

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Binary asteroid population. 3. Secondary rotations and elongations

CrossMark

P. Pravec[a,*], P. Scheirich[a], P. Kušnirák[a], K. Hornoch[a], A. Galád[a,b], S.P. Naidu[c], D.P. Pray[d], J. Világi[b], Š. Gajdoš[b], L. Kornoš[b], Yu.N. Krugly[e], W.R. Cooney[f], J. Gross[f], D. Terrell[f,g], N. Gaftonyuk[h], J. Pollock[i], M. Husárik[j], V. Chiorny[e], R.D. Stephens[k], R. Durkee[l], V. Reddy[m], R. Dyvig[n], J. Vraštil[a,o], J. Žižka[o], S. Mottola[p], S. Hellmich[p], J. Oey[q], V. Benishek[r], A. Kryszczyńska[s], D. Higgins[t], J. Ries[u], F. Marchis[v], M. Baek[v], B. Macomber[w], R. Inasaridze[x], O. Kvaratskhelia[x], V. Ayvazian[x], V. Rumyantsev[y], G. Masi[z,aa], F. Colas[ab], J. Lecacheux[ab], R. Montaigut[ac], A. Leroy[ac], P. Brown[ad], Z. Krzeminski[ad], I. Molotov[ae], D. Reichart[af], J. Haislip[af], A. LaCluyze[af]

The Astronomical Journal, 151:56 (12pp), 2016 March

doi:10.3847/0004-6256/151/3/56

CrossMark

THE SCHULHOF FAMILY: SOLVING THE AGE PUZZLE

David Vokrouhlický[1], Josef Ďurech[1], Petr Pravec[2], Peter Kušnirák[2], Kamil Hornoch[2], Jan Vraštil[1], Yurij N. Krugly[3], Raguli Ya. Inasaridze[4], Vova Ayvasian[4], Vasili Zhuzhunadze[4], Igor E. Molotov[5], Donald Pray[6], Marek Husárik[7], Joseph T. Pollock[8], and David Nesvorný[9]

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ABSTRACT

The Schulhof family, a tight cluster of small asteroids around the central main belt body (2384) Schulhof, belongs to a so far rare class of very young families (estimated ages less than 1 Myr). Characterization of these asteroid clusters may provide important insights into the physics of the catastrophic disruption of their parent body. The case of the Schulhof family has been up to now complicated by the existence of two proposed epochs of its origin. In this paper, we first use our own photometric observations, as well as archival data, to determine the rotation rate and spin axis orientation of the largest fragment (2384) Schulhof. Our data also allow us to better constrain the absolute magnitude of this asteroid, and thus also improve the determination of its geometric albedo. Next, using the up-to-date catalog of asteroid orbits, we perform a new search of smaller members in the Schulhof family, increasing their number by 50%. Finally, the available data are used to access Schulhof's family age anew. We now find that the younger of the previously proposed two ages of this family is not correct, resulting from a large orbital uncertainty of single-opposition members. Our new runs reveal a single age solution of about 800 kyr with a realistic uncertainty of 200 kyr.

Key words: celestial mechanics – minor planets, asteroids: individual (Schulhof)

Icarus 304 (2018) 110–126

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Asteroid clusters similar to asteroid pairs

P. Pravec[a,*], P. Fatka[a,b], D. Vokrouhlický[b], D.J. Scheeres[c], P. Kušnirák[a], K. Hornoch[a], A. Galád[a,d], J. Vraštil[a,b], D.P. Pray[e], Yu.N. Krugly[f], N.M. Gaftonyuk[g], R.Ya. Inasaridze[h], V.R. Ayvazian[h], O.I. Kvaratskhelia[h], V.T. Zhuzhunadze[h], M. Husárik[i], W.R. Cooney[j], J. Gross[j], D. Terrell[j,k], J. Világi[d], L. Kornoš[d], Š. Gajdoš[d], O. Burkhonov[l], Sh.A. Ehgamberdiev[l], Z. Donchev[m], G. Borisov[m], T. Bonev[m], V.V. Rumyantsev[n], I.E. Molotov[o]

Icarus 333 (2019) 429–463

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Asteroid pairs: A complex picture

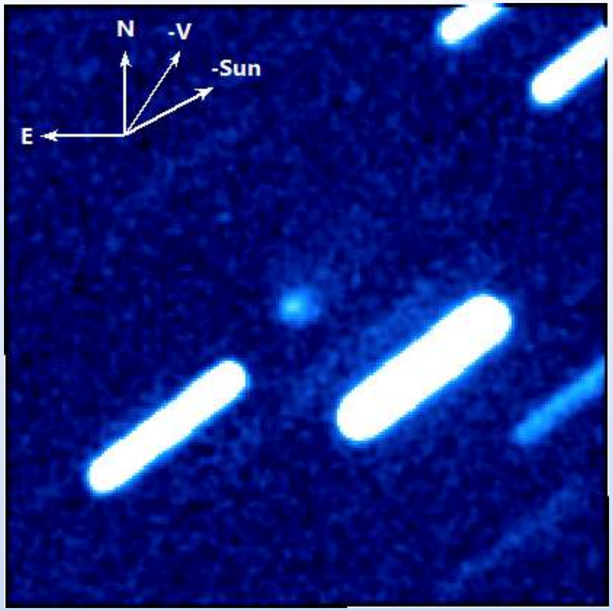
P. Pravec[a,*], P. Fatka[a,b], D. Vokrouhlický[b], P. Scheirich[a], J. Ďurech[b], D.J. Scheeres[c], P. Kušnirák[a], K. Hornoch[a], A. Galád[d], D.P. Pray[e], Yu. N. Krugly[f], O. Burkhonov[g], Sh. A. Ehgamberdiev[g], J. Pollock[h], N. Moskovitz[i], A. Thirouin[i], J.L. Ortiz[j], N. Morales[j], M. Husárik[k], R. Ya. Inasaridze[l,m], J. Oey[n], D. Polishook[o], J. Hanuš[b], H. Kučáková[a,b], J. Vraštil[b], J. Világi[d], Š. Gajdoš[d], L. Kornoš[d], P. Vereš[d,p], N.M. Gaftonyuk[q], T. Hromakina[f], A.V. Sergeyev[f], I.G. Slyusarev[f], V.R. Ayvazian[l,m], W.R. Cooney[r], J. Gross[r], D. Terrell[r,s], F. Colas[t], F. Vachier[t], S. Slivan[u], B. Skiff[i], F. Marchis[v,w], K.E. Ergashev[g], D.-H. Kim[x,y], A. Aznar[z], M. Serra-Ricart[aa,ab], R. Behrend[ac], R. Roy[ad], F. Manzini[ae], I.E. Molotov[af]

Research on comets

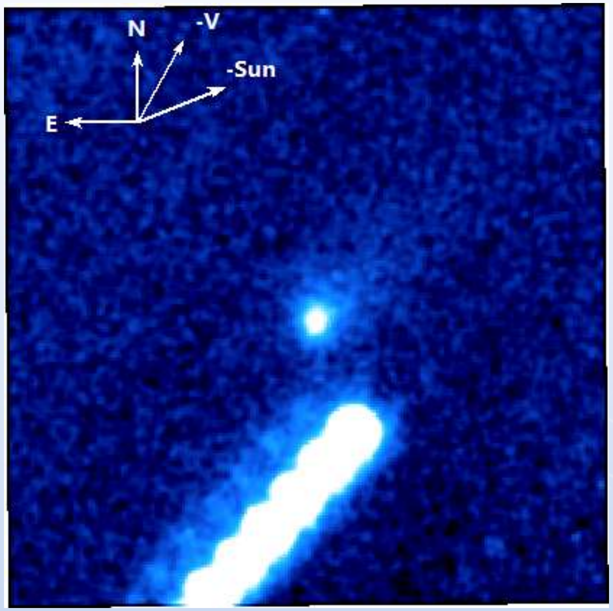
Photometry, polarimetry, *Afρ*, colors, sizes

PI Oleksandra V. Ivanova

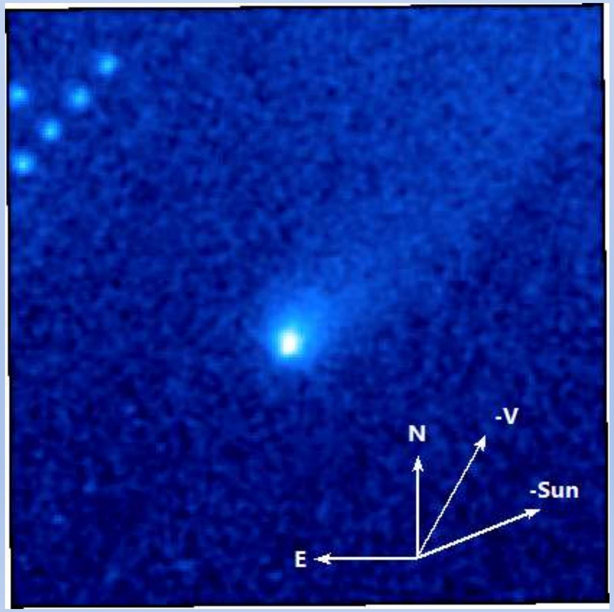
INTERSTELLAR COMET 2I/BORISOV



0.61-m, R filter, 2019 09 13



1.3-m, R filter, 2019 10 18



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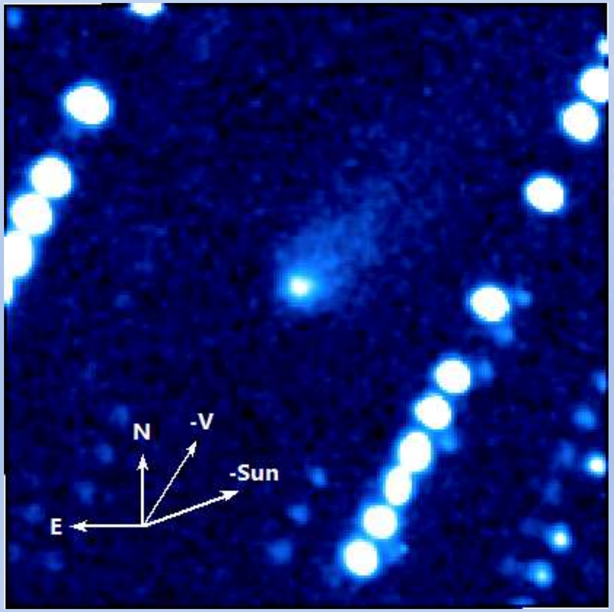

0.61-m, R filter, 2019 12 09

RNAAS RESEARCH NOTES OF THE AAS

Velocity of Dust Ejected from Interstellar Comet 2I/Borisov

Anton Kochergin[1,2], Evgenij Zubko[3], Marek Husárik[4], Oleksandra V. Ivanova[4,5,6], Gorden Videen[3,7], Ekaterina Chornaya[1,2], Sungsoo S. Kim[3], Maxim Zheltobryukhov[2], and Igor Luk'yanyk[6]

Published 2019 October 11 •

Research Notes of the AAS, Volume 3, Number 10

Figures ▾ References ▾

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Export citation and abstract BibTeX RIS

The discovery of interstellar comet 2I/Borisov (C/2019 Q4) provides an opportunity to study a planetesimal formed beyond our solar system. de León et al. (2019) measured the spectrum of 2I/Borisov in the visible and near-IR, which appears to be dominated by continuum, suggesting it is the result of elastic scattering by dust particles. The spectrum is often characterized by either its color index CI or color slope S' (e.g., A'Hearn et al. 1984). de León et al. (2019) found $S' \approx (10 \pm 1)\%$ per 0.1 μm over the wavelength range $\lambda = 0.55$–0.9 μm. Zubko et al. (2019) analyzed this color slope and demonstrated that the 2I/Borisov coma cannot be dominated by particles having water–ice, Mg-rich silicate, and/or amorphous-carbon composition. Instead, it could be populated by particles made of either Mg–Fe silicates or organic refractory residue as processed in the diffuse interstellar medium.

COLOR, SIZE AND MASS OF DUST OF 2I/BORISOV

- Colors
  - **V-R about 0.50 mag, B-V about 0.80 mag**
  - Similar to Damocloids, active Centaurs, Halley-type comets or active long-period comets
- Rough nucleus size estimate **$D < 7$ km**
  - Other, more probable size estimates from 0.5 km to 3.3 km or 6 km or 16 km (bigger telescopes, data from HST). Depends on albedo, activity of surface
- Mass of dust dependent on measured aperture
  - Scattering cross-section $C_e \sim 38$ km^2 (5000 km) – 111 km^2 (11500 km)
  - **$M \sim 0.5 – 1.4 \times 10^7$ kg**
  - *Dave Jewitt and Jane Luu estimate from the size of its coma the comet is producing 2 kg/s of dust and is losing 60 kg/s of water.*

A&A 626, A26 (2019)
https://doi.org/10.1051/0004-6361/201935077

Astronomy & Astrophysics

Photometry, spectroscopy, and polarimetry of distant comet C/2014 A4 (SONEAR)

Oleksandra Ivanova[1,2,3], Igor Luk'yanyk[3], Ludmilla Kolokolova[4], Himadri Sekhar Das[5], Marek Husárik[1], Vera Rosenbush[2,3], Viktor Afanasiev[6], Ján Svoreň[1], Nikolai Kiselev[2,7], and Vadim Krushinsky[8]

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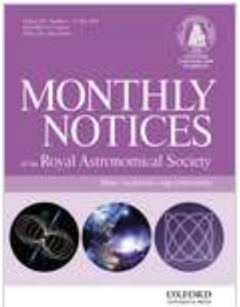
[7] Crimean Astrophysical Observatory, Nauchnij, Crimea
[8] Ural Federal University, 620083 Ekaterinburg, Russia

Received 17 January 2019 / Accepted 4 April 2019



Volume 485, Issue 3
May 2019

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Rapid variations of dust colour in comet 41P/Tuttle–Giacobini–Kresák

Igor Luk'yanyk, Evgenij Zubko, Marek Husárik, Oleksandra Ivanova, Ján Svoreň, Anton Kochergin, Alexandr Baransky, Gorden Videen

Monthly Notices of the Royal Astronomical Society, Volume 485, Issue 3, May 2019, Pages 4013–4023, https://doi.org/10.1093/mnras/stz669

Published: 08 March 2019   **Article history ▼**

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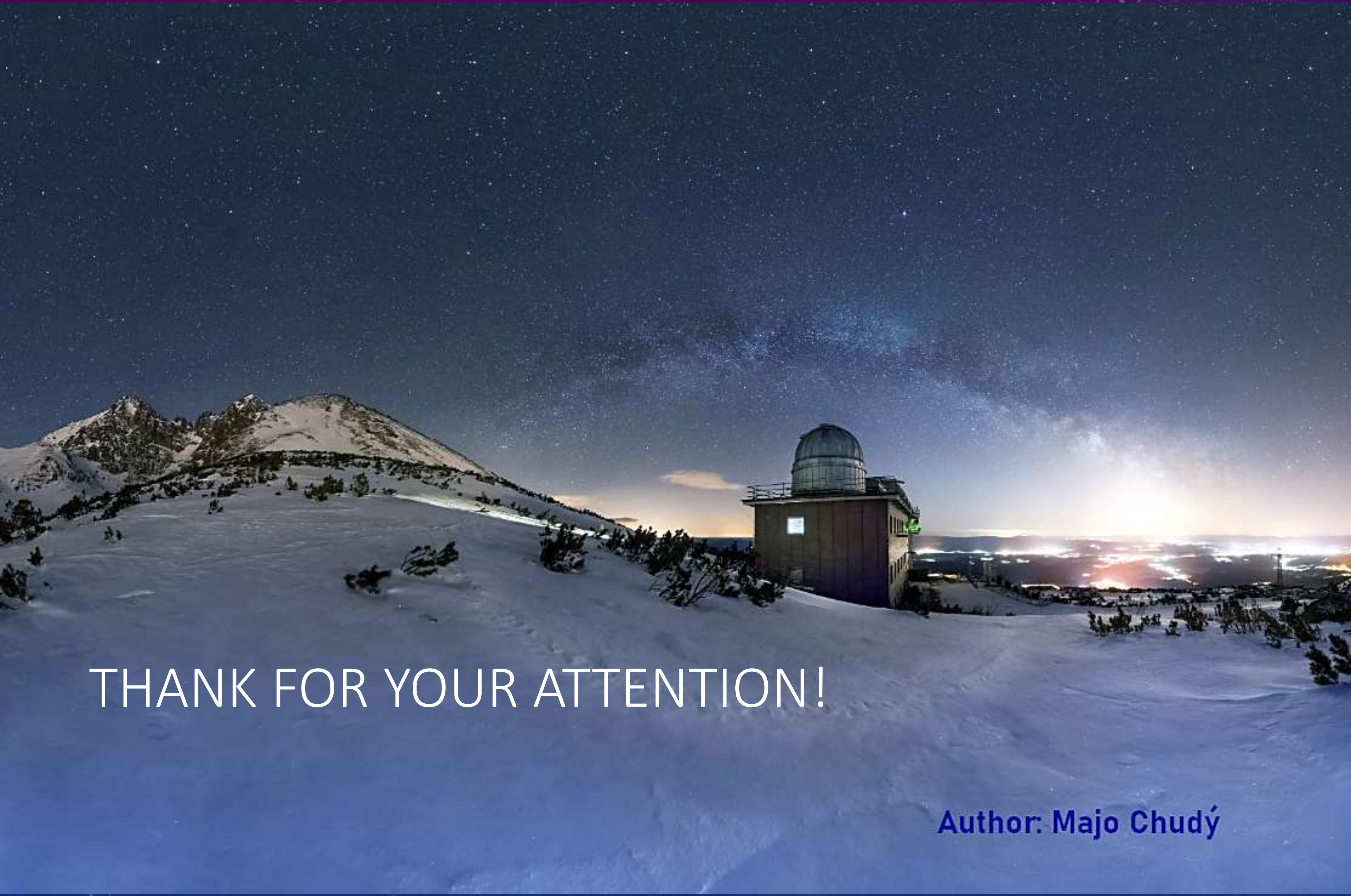
FUTURE?

- Many many comets
- Focus on active bodies in Solar System (Gault, main-belt comets, active Trojans and NEAs)
- Long-term photometry of Oort cloud comets
- Planned articles on comets Wirtanen, 21P, 2014 B1 Schwartz, 2019 Y4 Atlas,...



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