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BOOK OF ABSTRACTS

SODIS - The portal for reporting occultations of stars by minor planets

Sven Andersson (International Occultation Timing Association / European Section)

Abstract

Since 1 January 2023, occultations of observations of stars by minor planets are collected by IOTA-ES using the SODIS reporting portal. After an observation has been reported, it is assessed by the review team. After successful reviewing, the data will be forwarded for final storage in the Occult programme and several databases.

This presentation will give some hints and explanations on how to use SODIS.

Kilometer-precise (Ull) Umbriel physical properties from the multichord stellar occultation on 2020 September 21

Marcelo Assafin (Universidade Federal do Rio de Janeiro - Observatório do Valongo)

Co-authors: S. Santos-Filho, B. E. Morgado, A. R. Gomes-Júnior, B. Sicardy, G. Margoti, G. Benedetti-Rossi, F. Braga-Ribas, T. Laidler, J. I. B. Camargo, R. Vieira-Martins, T. Swift, D. Dunham, T. George, J. Bardecker, C. Anderson, R. Nolthenius, K. Bender, G. Viscome, D. Oesper, R. Dunford, K. Getrost, C. Kitting, K. Green, R. Bria, A. Olsen, A. Scheck, B. Billard, M. E. Wasiuta, R. Tatum, P. Maley, D. di Cicco, D. Gamble, P. Ceravolo, D. Ceravolo, W. Hanna, N. Smith, N. Carlson, S. Messner, J. Bean, J. Moore and R. Venable

Abstract

We report the results of the stellar occultation by (Ull) Umbriel on 2020 September 21. The shadow crossed the USA and Canada and 19 positive chords were obtained. Photometry was made with the PRAIA package. Using the SORA package, the chords were fitted with circular and elliptical limbs. Kilometer-precise size, albedo, density and milliarcsecond-precision position were derived. Atmosphere limits were estimated. The size was compared with the radius obtained from Voyager II measurements in 1986. Occultation and Voyager results indicate that the same strong topography variation in the surface of Umbriel is present on both hemispheres.

Fast Spectroscopy with a Slitless Spectrograph - Using a Blazed Grating with Low Resolution

Wolfgang Beisker (International Occultation Timing Association / European Section)

Abstract

Recording spectra with low resolution for occultation observations can be achieved for bright stars using a low resolution blazed grating (100 grooves per mm). During the occultation the asteroid covers part and/or all of the stellar disk. If the apparent diameter of the stellar disk is relatively large and the time for covering the star is in the range of a few milliseconds, spectra can be recorded with a rate of about 30 to 100 images per second. Spectral resolution can be achieved in each frame without the need of more than one camera. The big advantage compared to a multi-camera setup is, that the wavelengths to be used can be selected AFTER the observation. Experiments have been done with bright stars showing that the resolution is in the range of 5 nm or better. Because the spectrograph has no slit, the full half width of the stellar image from the telescope controls the resolution as well as the scintillation of the atmosphere.

Such a system is especially needed for objects like Betelgeuse (alpha ORI) for the occultation on the 12th of December 2023, where the exact spectral composition of subareas of the star is not known beforehand.

Occultations as a tool for creation and validation of asteroid models

Dominik Černý (Astronomical Institute of Charles University, Czech Republic)

Co-authors: Josef Ďurech

Abstract

Observations of asteroid occultations can be used to determine their dimensions, shapes and positions. Nowadays, precise photometric data allows us to determine asteroid position with sufficient accuracy. Therefore, we focus on asteroids models and sizes. At first, we use the data from occultation observations to validate models in The Database of Asteroid Models from Inversion Techniques (DAMIT). In this process we scale the model to fit the occultations data and consequently determine precise size of the asteroid, if possible. If the model does not fit the data sufficiently or does not exist, we use the All-Data Asteroid Modeling (ADAM) to create a new one using the occultation observations combined with the photometric data. This procedure allows us to update our database with newer and more accurate models.

Betelgeuse event - Astrocampaia organization to facilitate the observation of the occultation from Italy (VIRTUAL)

Claudio Costa (Astrocampaia Napoli, Italy)

Co-authors: Massimo Corbisiero, Andrea Di Dato, Ettore Marmo, Alfonso Noschese, Giuseppe Ruggiero

Abstract

Astrocampaia is organizing logistics and accommodation to allow participation in the observation of the occultation of Betelgeuse from the South of Italy. The association will choose a list of locations (hotels and farmhouses), in a strategic position in the shadow of the predicted path, and will arrange for logistics, food and other necessities. After the event Astrocampaia will organize a short meeting in the "Osservatorio Salvatore di Giacomo", in Agerola (NAPOLI), to discuss together the early results. Some interesting excursions and tours could be organized after the meeting.

The positive Observation of the Stellar Occultation by the Transneptunian Object 19521 Chaos at the Algiers Observatory (CRAAG), on March 29th, 2023

BABA AISSA Djounai (Center of Research in Astronomy, Astrophysics and Geophysics, Algiers, ALGERIA)

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Abstract

The observation of stellar occultation by trans-Neptunian objects is a powerful tool for characterizing these small bodies. This undoubtedly leads to the discovery of possible satellites, rings or eventual atmospheres as well as their composition. Furthermore, occultation method validates the models and theoretical predictions, and helps to deepen our knowledge of the solar system and its diversity [1]. In this work, we will present the positive result obtained during the observation of the stellar occultation by TNO 19521 Chaos on 29 March 2023 using the 81-centimetre telescope of the Algiers Observatory (CRAAG). We will also discuss the light curve of the star UCAC4 607-025282 occulted by Chaos. It should be noted that the prediction of the event has been refined by a team of the Institute of Astrophysics in Granada (Spain) [2], [3], [4], [5]. This is part of an astronomical observation campaign organized by the Spanish team and the Lucky Star team.

Invitation to the ESOP 43 in Stuttgart

Andreas Eberle (Sternwarte Stuttgart, Germany)

Abstract

For the 43th ESOP we would like to invite you to Stuttgart, Germany.
www.sternwarte.de/esop43

Some observation ideas for the occultation of Beteigeuse

Bernd Gährken (Bavarian Public Observatory, Germany)

Abstract

When Betelgeuse is occulted by the asteroid (319) Leona on December 12, 2023, it may be possible to determine the brightness distribution across the star disc more precisely than is possible with other technologies. Since the star and asteroid have an almost identical angle, the event will differ significantly from an ordinary occultation. The talk shows a few plans and ideas how to record the event.

Planned Observation of the occultation of Betelgeuse by (319) Leona

Konrad Guhl (IOTA/ES, Archenhold-Sternwarte, Berlin)

Abstract

The occultation of Betelgeuse (α Ori) by the minor planet (319) Leona on the morning of 12 December promises interesting results. The author plans an observation in two defined colour ranges with high time resolution. The aim is to measure the star and the planet. To realise a fast photometry in two colours, it is planned to equip the expedition telescope M2 with a beam splitter and two QHY174 cameras.

Baily's Bead Observations during the Total Solar Eclipse 2022 April 20

Konrad Guhl (IOTA/ES, Archenhold-Sternwarte, Berlin)

Abstract

Measuring the angular solar diameter and calculating the real diameter, taking into account the Earth-Sun distance, has been a fundamental challenge for astronomers for more than two thousand years. After micrometer, heliometer or transit measurements, astronomers found one of the best ground-based methods for finding the solar diameter: The observation of the disappearance and reappearance of the remaining sunlight in the valleys on the lunar limb during total or annular solar eclipses. Due to the fact that Francis Baily (1774-1844) was one of the first who described the tiny points of light on the lunar edge during a total eclipse, the technique was named Baily's Beads observation. Such observations have been a focus of activity of IOTA and IOTA/ES for many years. The aim was a measurement of the solar diameter and detection of possible variations.

In 2022, IOTA/ES organized an expedition to the northern of a total solar eclipse (TSE) on April 20, where bead observation is possible. The lecture present observation results

Submitting Light Curves to Dave Herald - The new Occult4 function, and open discussion +Q/A

Tim Haymes (British Astronomical Association, IOTA/ES)

Abstract

Occult 4.2023.7.9 includes a method that avoids any re-typing or data entry (Star, asteroid number). The xml export function from SODIS is used, and the Occult Add/Edit/Plot for Minor Planet Observations window to create the light curve report from a .csv file. This will be illustrated.

Observation highlights in GB/IE region for 2022/3

Tim Haymes (British Astronomical Association, IOTA/ES)

Abstract

Observers have made use of the occasional clear skies across the British Isles and Ireland in 2022/3. The talk will present occultation highlights from our group of 12 observers. About 300 reports have been submitted, with 40 occultation chords and one comet (29P). SODIS indicates we have contributed 17% of the total observations across Europe.

A Statistical Overview and Current State of the Occultation Portal

Yücel Kiliç (TÜBİTAK National Observatory, Turkey)

Co-authors: Felipe Braga-Ribas

Abstract

This study briefly overviews the Occultation Portal (OP), a purpose-built platform developed as part of the ERC Lucky Star Project. The OP was established in August 2020 and is hosted on the servers of TÜBİTAK National Observatory in Antalya, Türkiye. It has transformed the management of stellar occultation observing campaigns by streamlining data collection, archiving, and analysis processes, significantly enhancing the effectiveness and efficiency of the ERC Lucky Star Project and its partners. This abstract delves into statistical insights derived from the portal's usage and provides practical guidance on its functionality. Additionally, it examines the operational aspects of the Occultation Portal, offering valuable insights to stellar occultation observers and researchers, enabling them to maximize their utilization of the OP.

CORA - Collaborative Occultation Resources and Archive. Status quo and future plans

Mike Kretlow (IOTA-ES; Instituto de Astrofísica de Andalucía (IAA), Granada, Spain)

Abstract

The main purpose of CORA (Collaborative Occultation Resources and Archive) is to provide the community with native occultation predictions (either using JPL Horizon ephemerides or based on own refined orbit solutions) by small solar system bodies, and to archive and to present occultation observations from different sources to the community in a modern way. On-the-fly visualization and analysis capabilities as well as observation data export are further features of CORA. The system is highly automated and due to the browser-based user frontend also platform and device independent. Functionalities in development or currently planned are simple (semi-) automated occultation observation scheduling, enhanced analysis capabilities, and improved (automated) orbit calculations (mainly TNOs and Centaurs). In this talk, I will give a practical introduction to the current system and briefly address the future plans.

Exploring asteroid shape model uncertainties in occultation fitting

Anna Marciniak (Adam Mickiewicz University, Poland)

Co-authors: Josef Durech, Antoine Choukroun et al

Abstract

Asteroid shape models reconstructed from relative lightcurves are often insensitive to the vertical stretch along the spin axis. It is particularly true for asteroids with high spin axis inclination, always presenting its equatorial aspect to the Earth-bound observer.

However, stellar occultations can tell the difference. We created ten versions of selected asteroid shape models by changing inertia regularisation weight, that directly influences how much flattened or stretched the shape model is. These were next verified against sets of good, multichord occultation observations. This way the vertical dimension of each model was constrained, together with the equivalent-volume sphere size and its realistic uncertainties.

Stellar Occultations by Comet Nuclei: The Story of Centaur-comet 29P

Richard Miles (British Astronomical Association)

Co-authors: Mike Kretlow, Marc W. Buie

Abstract

No abstract.

Photometry and spectroscopy of Betelgeuse (α Ori) during its occultation by 319 Leona on 12/12/2023 (VIRTUAL)

Miguel Montargès (LESIA, Observatoire de Paris – PSL)

Co-authors: Josselin Desmars, Bruno Sicardy, Pierre Kervella

Abstract

On December 12, 2023, asteroid 319 Leona will occult Betelgeuse along a very thin band that will pass north of the Mediterranean. This occultation will be exceptional: Leona and Betelgeuse will have almost the same apparent size (~ 0.05 arcsec in the visible). The phenomenon will look more like an (annular) eclipse than a standard occultation.

During Leona's entry and exit from Betelgeuse apparent disk (which will last only a few seconds), it will be possible to obtain information on the distribution of convective cells on the surface of the star. I will present the scientific context of the project, and what observations (photometry and spectroscopy) amateur astronomer on the path will be able to perform.

Asteroid shape modeling driven by archival stellar occultation data

Julia Perła (Adam Mickiewicz University, Poland)

Co-authors: Anna Marciniak

Abstract

Stellar occultation database gathers many well covered results of occultation phenomena. This data is a wealthy mine of knowledge and is a great foundation for determining the physical properties of asteroids. One of the applications of the results from observations of stellar occultations by asteroids is their aid in shape reconstruction and size determinations. While conventional approaches to shape modeling focus on specific asteroid families or other special groups of targets, this presentation explores an alternative methodology: selecting those asteroids that have rich occultation data, and trying to reconstruct their shapes. This conference talk presents a new research project undertaken as a part of the author's master's thesis. This project aims to conduct a photometric observation campaign for selected asteroids and to reconstruct their shapes from lightcurves registered at various viewing geometries. Next step will be to scale those models using rich occultation data for precise diameter determinations. Alternatively, both sources of data can be used in a simultaneous optimisation process using ADAM method (All Data Asteroid Modelling).

A grazing asteroidal occultation by (325) Heidelberga on 2023 January 19

Alex Pratt (IOTA/ES, British Astronomical Association)

Abstract

The 76 km diameter asteroid (325) Heidelberga, mag 12.9, occulted a mag 13.9 star in Cancer for 1.7 s. Their combined merged magnitude was 12.6, giving a mag. drop during occultation of 0.3.

Analysis of the data using Tangra showed two dips in the light curve. This was evidence of a grazing occultation recorded from the edge of the shadow path.

A summary of the stellar occultation events by the large TNO 2002 MS4 (VIRTUAL)

Flavia L. Rommel (Federal University of Technology - Paraná (UTFPR), Brazil)

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Abstract

Stellar occultation is a ground-based technique successfully used to determine the physical properties of TNOs and Centaurs. Obtaining the physical parameters of such small body populations is essential to understand better the mechanisms involved in the Solar System formation and evolution. Our target, 2002 MS4, is one of the largest known TNOs and a dwarf planet candidate. However, since its discovery, it has been transiting in front of a field of view crowded with stars. Therefore, astrometric observations were constantly needed for orbit refinements and, consequently, to predict stellar occultation events by this object. We first recorded an occultation from South American observatories on July 9, 2019. This triple-chord detection allowed for orbit improvements and accurate prediction of new events. In total, our target was observed on ten stellar occultation events. Among them, nine are presented in our recently accepted paper; the most recent one is under analysis. This work presents i) details of the most successful campaign ever made for an occultation by a TNO, ii) the diameter and albedo derived from those data, iii) the impressive topography measured in the northeast limb of the object's profile, iv) a preliminary analysis of the last stellar occultation event observed from New Zealand on July 3, 2023, and v) how the occultation data sets looks like when combined.

VAMOR Validation of Asteroid Models by Occultation Results

Frank Schaffer (IOTA/ES, Archenhold Sternwarte, Berlin)

Co-authors: Konrad Guhl

Abstract

The combination of 3D models of asteroids obtained from inverted rotation light curves with the measured times of disappearance and reappearance from stellar occultations is realized with a new ongoing project called VAMOR (Validation of Asteroid Models by Occultation Results) by means of CAD – a Computer Aided Design program.

Graphical data (3D models and images of chords) from two different databases (DAMIT and Occult4) are read into a commercial CAD program and positioned and edited in relation to each other to scale. In the project the occultations data are centered and positioned to the center of asteroid model.

The work flow of data and processing in the CAD program are explained. The first results and the planned further work at VAMOR is presented.

Betelgeuse occultation in Spain

Carles Schnabel (IOTA/ES & Agrupació Astronòmica de Sabadell)

Abstract

Information will be presented on the organization of the observation in Spain and Portugal, as well as the preliminary results of the expedition to record the event that the same asteroid Leona causes on September 13.

Long-term data storage of observation data

Nikolai Wuensche (IOTA/ES)

Abstract

Today, everyone saves the original observation data (videos, fits folders, etc.) on their private computer. This means that the original data is neither secured for a long time nor is it accessible for re-examination at any time. As an example, consider the value of historical photo plate archives.

In this contribution to the discussion, possibilities of a central long-term archiving of these data are addressed, which do not overtax the budget of an organisation like IOTA/ES.

A short story of the Irish eclipses and occultations (VIRTUAL)

Marek Zawilski (Polish Association of Amateur Astronomers)

Abstract

No abstract.