

THE UNIVERSITY OF NARIÑO OBSERVATORY

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Abstract

The Astronomical Observatory of the University of Nariño was founded on March 2002 by Alberto Quijano Vodniza (Master's Degree in Physics of the University of Puerto Rico). The Astronomical Observatory's Director is a member of the AMERICAN ASTRONOMICAL SOCIETY – AAS since 2007. As a result of our research, we have published some books and we have participated on several international meetings. In the year 2008 our Observatory received the international code “H78” from the MINOR PLANET CENTER of USA, by providing this institution with high quality scientific data of asteroids as well as of comets. We presented in this work the last researches about asteroids and comets.

Keywords: AAS, MPC, University of Nariño, asteroids, comets.

1. Introduction

Astronomical Observatory of the University of Nariño was founded on March 2002 by Alberto Quijano Vodniza (Master's Degree in Physics of the University of Puerto Rico), and built thanks to the immense support given by Dr. Pedro Vicente Obando (Rector: 1995-2004). Nowadays our Observatory operates at the permanent location built under the conduction of Dr. Jairo Muñoz (Rector: 2004-2007) and at present it gets support from the academic authorities at the University of Nariño. It has a dome of approximately 4.5 meters of diameter and a capacious auditorium. At this point in time we own the following instrumentation: A newtonian reflecting telescope MEADE f/4 of 16 inches, a 14 inches MEADE robotic telescope LX200GPS, a CGE Pro 1400 CELESTRON telescope (14 inches), two 8 inches MEADE robotic telescopes LX200GPS, a newtonian reflecting telescope CELESTRON of 8 inches – Dobsonian type, and a CORONADO solar telescope. We have several digital cameras and also a digital spectrometer SBIG, a high resolution spectrometer SHELYAK and a JOVE receptor for analysing the radio signals emitted by Júpiter and the Sun. Electronic Engineering students from the University of Nariño have completed the robotization of the 16” MEADE f/4 telescope. The images obtained are processed through specialized software with the purpose of getting correct photometric and astrometric measurements. The observatory is destined for professors and students' scientific research. For the time being we have an internal club and we open our doors to all the educational institutions in the Department of Nariño. [1]

The Astronomical Observatory's Director is a member of the AMERICAN ASTRONOMICAL SOCIETY – AAS since 2007. As a result of our research, we have published several books: “Obtaining of the Luminous Curve of Comet

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Hale-Bopp and Measuring of the Rotation Period Through the CCD Camera”; “Digital Astronomy”; “Design of An Experimental Method for Measuring Stellar Temperatures Through the CCD Camera and Spectrometry”; “Obtaining of the Luminous Curve of the Comets C/2002T7 Linear, C/2001Q4 Neat, and Spectrometry of C/2001 Q4 Neat”.

We have participated on several international meetings as speakers.[2]

One of the most important goals of our Observatory is having actively participated in the project “DEEP IMPACT” of NASA. As a result of this scientific event, a book was published in Germany. The book includes the lectures and research papers of the Scientific Congress that gathered theoreticians and observers from many nations, intending to make a full utilization of the observational data set captured from the Earth. The research we presented at this important meeting in 2006 was published in October 2008 in GERMANY by the internationally recognized publishing company “SPRINGER-VERLAG” on the Congress’ namesake book “Deep Impact as a World Observatory Event: Synergies in Space, Time, and Wavelength”. Our work appears with the name “THE DEEP IMPACT EVENT AS SEEN FROM THE UNIVERSITY OF NARIÑO OBSERVATORY”.[3]

Our Astronomical Observatory has also distinguished for having photographed a lot of Asteroids, many of them supremely weak on brightness. In the year 2008 our Observatory received the international code “H78” from the MINOR PLANET CENTER of USA , by providing this institution with high quality scientific data of asteroids as well as of comets, and we are the only Colombian observatory to own such code: It’s an international accreditation earned by the Astronomical Observatory of the University of Nariño. [4], [5]

2. LAST WORKS

2.1. STUDY OF THE ASTEROID 1998 QE2

This big asteroid was at 5.8 millions of kilometers from the Earth on May 31 (2013) and it has a diameter of 2.7 km. The radar images obtained by JPL showed that the period of rotation around its axis is close to five hours. Hills. K (2013) reported that the period is of 5.281 +/- 0.002 hours. On June 4 the team of Goldstone-Arecibo found a period of 4.75 +/- 0.01 hours. We also contributed with the light and phase curves to estimate the period by means of the telescope (with red filter). The radar imagery (JPL and Arecibo) revealed that 1998 QE2 has a moon, and we captured a mutual event (eclipse).

From our Observatory, located in Pasto-Colombia, we captured several pictures, videos and astrometry data during several days. Our data was published by the Minor Planet Center (MPC) and also appears at the web page of NEODyS. The pictures of the asteroid were captured with the following equipment: CGE PRO 1400 CELESTRON (f/11 Schmidt-Cassegrain Telescope) and STL-1001 SBIG camera. We obtained the light curve of the body. Astrometry was carried out, and we calculated the orbital elements.[6]

After having processed adequately all the photographs (bias reduction, dark frames correction and correction of flat frames), we employed the software “The Sky6” and the “CcdSoft-Version 5” in order to identify the stars appearing on the images, so we could have the coordinates of any standard star. It is necessary to use many reference stars so we can have a higher precision on determining the asteroid’s coordinates. The asteroid is identified superposing the photos and designing a small video to appreciate clearly enough its movement with regard to the fixed stars.

We obtained the following orbital parameters: eccentricity = 0.5692181, semi-major axis = 2.41104631 A.U, orbital inclination = 12.82771 deg, longitude of the ascending node = 250.16876 deg, argument of perihelion = 345.61328 deg, mean motion = 0.26326658 deg/d, perihelion distance = 1.03863508 A.U, aphelion distance = 3.78345755 A.U. The asteroid has an orbital period of 3.74 years The parameters were calculated based on 191 observations (2013 May: 17-24) with mean residual = 0.162 arcseconds.

2.2. THE COMET ISON

The comet was discovered last year on September 24th by Vitali Nevski and Artyom Novichonok (Russia) and named “C/2012 S1”, and though it had promise of being very bright at the end of the current year and the beginning of

2014, but the close encounter with the Sun (November 28th) was devastating; the comet couldn't survive this event. To this day (December 31st 2013), it hasn't yet been possible to detect the debris left in orbit not even by employing the Hubble Space Telescope. In this work the comet's light curve and the orbital parameters are obtained, using high precision data. We have photographed and studied the comet from the University of Nariño's Observatory (Pasto-Colombia) since January 31st, 2013. The pictures of the comet were captured with the following equipment: CGE PRO 1400 CELESTRON (f/11 Schmidt-Cassegrain Telescope) and STL-1001 SBIG camera. [9], [10] We obtained the following orbital parameters: eccentricity = 1.000009, orbital inclination = 61.92926 deg, longitude of the ascending node = 295.72536 deg, argument of perihelion = 345.51426 deg, perihelion distance = 0.01249335 A.U. The parameters were calculated based on 22 observations (2013 Jan 31-May 17) with mean residual = 0.387 arcseconds.



Fig. 1. Comet Ison (B&W) and Comet Ison (LRGB)

2.3. STUDY OF THE COMET C/2013 A1 (SIDING SPRING)

The comet called C/2013 A1 (SIDING SPRING) was discovered on January 3, 2013 in Australia. In January 28/2014, NASA announced that is preparing for the close encounter that will happen between the comet C/2013 A1 and Mars on October 19-2014. The Mission called "MAVEN" will insert in Mars orbit on september 21—2014. The comet will pass just 138,000 kilometers far from the surface of Mars. The probability that the comet collides with Mars is small but the dust particles emitted by the comet can cause damage to spacecrafts and probes that are in orbit around that planet. NASA is making preparations to take all precautions. If the comet is quite active, there will be almost no time to take security measures with Mars orbiters. For that reason NASA is already ahead of the facts. According to scientists of the "JET PROPULSION LABORATORY-JPL", dust particles spewing from the comet may be traveling at 56 km / sec in relation to the orbiters, fifty times faster than the speed of a bullet. From our Observatory, located in Pasto-Colombia, we captured several pictures, videos and astrometry data during several days. The pictures of the asteroid were captured with the following equipment: CGE PRO 1400 CELESTRON (f/11 Schmidt-Cassegrain Telescope) and STL-1001 SBIG camera. We obtained the light curve of the body. Astrometry was carried out, and we calculated the orbital elements. [11]

We obtained the following orbital parameters (Jan 21 to April 02): eccentricity = 1.0003983, orbital inclination = 129.03078 deg, longitude of the ascending node = 300.99538 deg, argument of perihelion = 2.42310 deg, perihelion

distance = 1.40023196 A.U. The parameters were calculated based on 20 observations with mean residual = 0.334 arcseconds. And the following orbital parameters (Jan 21 to October 29): Eccentricity = 1.0005849, orbital inclination = 129.04413 deg, longitude of the ascending node = 300.97593 deg, argument of perihelion = 2.42011 deg, perihelion distance = 1.39876996 A.U. The parameters were calculated based on 32 observations with mean residual = 0.309 arcseconds. We also obtained the light curve of the body with our data (January to November/2014). The orbit has a perturbation of 7 minutes, 44 seconds.

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