

Observatorio Astronómico de Cantabria

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Abstract "The Astronomical Observatory of Cantabria" is a center of the "Consejería de Medio Ambiente del Gobierno de Cantabria" managed by the "Centro de Investigación del Medio Ambiente (CIMA)", an autonomous organism which depends on such "Consejería". The development of different activities of the Observatory is a joint collaboration between "The University of Cantabria" and the "Agrupación Astronómica Cántabra (AstroCantabria)". As part of "The University of Cantabria", the "Instituto de Física de Cantabria (IFCA, CSIC-UC)" is in charge of the direction, management and coordination of scientific, observational, educational and outreach activities of the Observatory. "Agrupación Astronómica Cántabra (AstroCantabria)" takes care of the outreach activities for the general public as well as the astronomical observations. In addition, it is responsible for the calibration and maintenance of the astronomical instrumentation of the Observatory. "The Astronomical Observatory of Cantabria" is located on the Southern edge of the "Comunidad Autónoma de Cantabria". It is situated on the high plateau of "La Lora" (Valderredible county), at an altitude of 1080 meters, with longitude $3^{\circ} 56' 36''$ W and latitude $42^{\circ} 46' 18''$ N. "Rocamundo" is the closest town. The Observatory aims to become a center of reference for scientific, observational, educational and public outreach activities in Cantabria. In the near future, an observational proposal system for outside users will be set in place.

1 Installations

The Observatory building has three floors and it runs on electricity from solar panels as well as from two aerogenerators. Open to the general public on the ground

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floor are the Guest Reception Area (located on the Main Hall of the building), the Lecture Hall and restrooms. The Guest Reception Area is a large waiting area for visitors where children activities will be carried out. The Lecture Hall has capacity for fifty people and in it there will be talks and courses. It will also be used to display observations made with the main telescope. During the tours there would be a series of audiovisual presentations on astronomical topics. The remaining areas of the ground floor are storage rooms and a laboratory.

The first floor has the housing area for visiting astronomers and it is closed to the public.

The Telescope Dome and Main Control Room are located on the second floor. The Dome has a 4 meter diameter and it will house the main reflector telescope of 40 centimeters in diameter. Visual observations, as well as those carried with instruments take place in it. The Dome has capacity for about twenty people. The telescope and instrumentation are controlled from the Main Control Room.

2 Instrumentation

The main telescope is a MEADE 16''f/10 LX200R (Fig. 1). It is Ritchey-Chrétien f/10 and the focus type is Cassegrain. The aperture is 40.64 cm (16'') with a focal length of 406.4cm and resolving power of 0.28 arc sec.

The available instrumentation for the main telescope is:

1. **CCD camera:** model ST-8XE with KAF1602E chip model. The chip dimensions are 1530×1020 pixels with $9 \mu\text{m}$ pixel size. It has a field of view of 11.82×7.88 arc min with 0.463 arc min/pixel. The gain is 2.63 and the readout noise is $15 e^-$ rms.

The CCD has a chip, coaxial with the main one, which allows us to do autotracking at the same time images are taken.

Coupled to the CCD are the following elements:

- **Filter Wheel:** model SBIG CFW-9. Currently, fitted to the Wheel are the following filters: U, B, V, R, and Johnson I. Also available are: OIII, $H\alpha$, $H\beta$, SII, IR807, IR742, RGB, #12, #21, #25, #38A, #47, #58 and Fringe Killer

Fig. 1 MEADE 16''f/10 LX200R placed at the Observatorio Astronómico de Cantabria and observatory staff explaining during last moon eclipse.



- Focusing element, model TCF-S3. And adaptive optics, model AO-8 TCF-S3

2. Spectrograph

The available model is SGS. The Spectrograph is fitted to the camera CCD ST-8XE. It is designed to work in the 3800 to 7500 Å range. It has 2 gratins:

- The first one has 150 lines per mm, giving a dispersion of 4.3 Å per pixel and a resolution of 8 Å
- The second one has higher resolution, 2.2 Å, and has a dispersion of 1.07 Å per pixel. It covers a spectral range of about 750 Å

The Spectrograph also has two slits: one with width of 25 μm (although only 18 μm effective width) and another one with width of 100 μm (only 72 μm effective width).

3. Photoelectric Photometer

The available model is SSP-5, R6358 Hamamatsu, type 9-atage side-on photo-multiplier tube. The spectral range covering is 185 - 830 nm. It has different apertures: 0.5, 0.75, 1.0 and 2.0 mm, as well as several gains: 1, 10 y 100. Integration times vary between 1, 5, and 10 seconds. In addition it has a light grid to make the process of centering the object in the aperture simpler. The Filter Wheel has 6 filters with the Johnson as available filters. The gain is $\sim 2 \times 10^5$ at -750V and the dark current ~ 2 pA at -750V and 25C. It work at 750V.

4. There are also available a great variety of **focal length reducers** and **eyepieces**.

3 Scientific Activities

Currently, the Astronomical Observatory of Cantabria is involved in several scientific projects. Some of them are herein described:

1. Following eclipsing binaries with the goal of obtaining their light-curves as well as some stellar physical parameters. Their have been students on the eclipsing binary RZ Cas.
2. Search of Novas in M31, in collaboration with Dr. Vadim Burwitz, who is part of the MPE (Max-Planck-Institut fr extraterrestrische Physik)(Fig. 2)..
3. Involvement in the International Program Minor Planet Center (MPC), tracking comets and asteroids
4. Involvement in the program INTERNATIONAL LUNAR OCCULTATION CENTER (ILOC)
5. During the whole year the Observatory carries out a detailed tracking of the Sun aiming to determine the Wolf number relative to the Solar Cycle (Fig. 2). This work has lead us to collaborate with the SIDC (Solar Influences Data Analysis Center) which is part of the Royal Observatory of Belgium, a center which collects these type of observations at a world level.

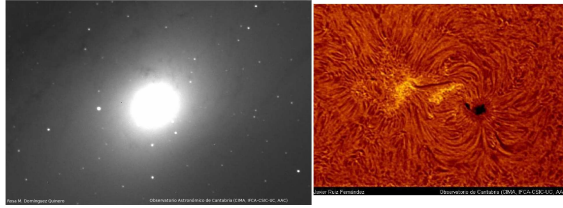


Fig. 2 M31 and Sunspot obtained at the Observatorio Astronómico de Cantabria

6. Tracking and study of quasars, binary and variable stars, and supernovas. Specifically Novas Vul 07, Cyg 08-1 and Cyg 08-2 have been studied.
7. Tracking of the cataclysmic variable type SW Sextantis DW Uma.

In addition, we intend to start shortly two other scientific projects :

- Search of extrasolar planet candidates.
- Tracking of Supernovas.

4 Public Outreach Activities

The Astronomical Observatory of Cantabria carries on outreach in two ways. Firstly, it is open during weekdays to education centers and organized groups (such as associations, cultural centers, and professional societies). Secondly, the Observatory opens its doors to the general public during the weekends. There are also special sessions organized during astronomical events.

Observations are carried out both daytime and nighttime. During the day looking at the Sun, and during the nights observing objects of interest depending on the time of year. Tours are organized in half hour shifts, which are divided in two parts. In the first, personnel from the Observatory gives an explanation on the objects that will be observed. In the second part, guided visual observations are made.

Different educational activities are available for educational centers, depending on the age of the students as well as the current weather conditions. These activities are of various types: explanatory, where a lecture about astronomical topics is given; hands-on, where the students participate in scientific experiments (always related to Astronomy) and finally there are playing activities, inside as well as outside of the building. Last year 2.000 people visited the Observatory, which was opened only during 2 months. This year it reopened its doors during Easter and since there have been 1250 people visiting in spite of the bad weather conditions of this spring (Fig. 1).

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