

## ***Centre d'Observacio de l'Univers: first year of activities***

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### **Abstract**

The *Centre d'Observacio de l'Univers* is one of the parts of the *Parc Astronomic Montsec* (PAM). PAM is an initiative of the Catalan government, through the *Consorci del Montsec* (Montsec Consortium), to take advantage of the capabilities and potential of the Montsec region to develop scientific research, training, and outreach activities, particularly in the field of astronomy. The choice of the Montsec mountains to install the PAM was motivated by the magnificent conditions for observing the sky at night; the sky above Montsec is the best (natural sky free of light pollution) in Catalonia for astronomical observations. The PAM has two main parts: the *Observatori Astronomic del Montsec* (OAdM) and the *Centre d'Observacio de l'Univers* (COU). The OAdM is a professional observatory with an 80 cm catadioptric telescope (Joan Oro Telescope). The COU is a large multipurpose center which is intended to become an educational benchmark for teaching and communicate astronomy and other sciences in Catalonia. Since the opening more than 50 000 visitors went to this center to enjoy science with Montsec dark skies and an special natural environment.

### **1 *Consorci del Montsec***

The *Consorci del Montsec* is a public institution created by the Catalan government to implement a regional development project in this area of Catalonia which, by taking advantage of its capabilities and potential, helps to redirect and improve its socioeconomic situation. The major aim of the Consorci is to comprehensively develop the tourist, social and economic sectors of Montsec. Among other organisations, this initiative has involved 16 municipalities, two county councils, the Lleida regional council and several departments of the Catalan government.

The main activities of this consortium are related to the natural environment, being the astronomy outreach activities the most important part. In addition to the *Parc Astronomic*

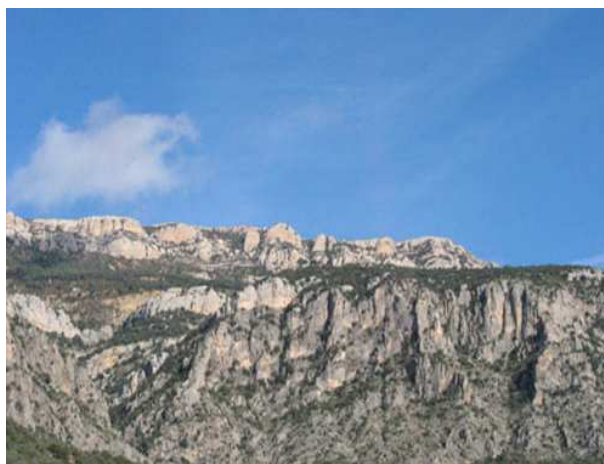


Figure 1: View of Montsec mountain range.

*Montsec* (PAM) project, this consortium has developed bird-watching routes, trekking routes, and gastronomical initiatives.

## 2 *Parc Astronomic Montsec*

The *Parc Astronomic Montsec* (PAM) is an astronomical equipment of *Consorti del Montsec*. The major objective of PAM is to offer updated infrastructures focused to research and communicate astronomy (main topic) and natural environment (geology, fauna and flora). These infrastructures and materials allow to accomplish educational objectives in several levels (from primary education to university students) and outreach activities to the general public. Finally, PAM is increasing scientific touristic activities that allow to maintain regular affluence of public to this area.

PAM is located in Montsec mountain range (see Fig. 1) in the north-east of Iberian Peninsula, around 180 km from Barcelona. Montsec is a calcareous mountain range more than 40 kilometers long, covering an area of 18 696 hectares divided between Aragon and Catalonia. PAM has two main parts: the observatory and the *Centre d'Observaci de l'Univers*. The observatory is placed on the top of the mountain and the *Centre d'Observaci de l'Univers* is placed in the Ager Valley in Montsec area.

This project was installed at Montsec region because this is the best place in Catalonia for astronomy due to the special meteorological condition, the sky free of light pollution and the exceptional natural environment.

The site-tests showed that Montsec mountains have one of the lowest humidity levels of Catalonia and moderate rain indexes. Some imaging tests show that Montsec has high atmospheric stability due to a particular wind regime. So, a high number of nights with clear skies (more than 60%) are available in Montsec area. In addition, this is the darkest sky



Figure 2: View of the *Observatori Astronomic del Montsec* during winter.

of the whole Catalonia. Ground-based studies show that Montsec skies are 80 times darker than the Barcelona sky and Montsec skies are considered free of light pollution (natural sky) and are specially protected by light pollution Catalanian law.

### **3 *Observatori Astronomic del Montsec: a brief summary***

The *Observatori Astronomic del Montsec* (OAdM) is located on the top of the mountain (see Fig. 2), at 1 570 meters above sea level. It is placed in a small town called Sant Esteve de la Sarga (Pallars Jussa). This is the research part of the PAM project and basically this observatory is devoted to general astronomy research and Ph.D. practical lectures. The OAdM contains an 80 cm telescope, called Joan Oro Telescope honoring this catalan scientist.

The Joan Oro Telescope will be a fully robotic telescope. Actually, the Catalanian Space Studies Institute has just finished the installation of the robotic systems. This observatory will control many environment variables to prevent any kind of problems in the telescope during robotical observations (humidity levels, rain, clouds, storms).

### **4 *Centre d'Observacio de l'Univers (COU)***

This *Centre d'Observacio de l'Univers* (COU) is the educational and outreach part of *Parc Astronomic Montsec*. It is placed in Ager (La Noguera) at 800 meters above sea level and 15 km far from the OAdM. COU uses the natural environment to explain to the visitors geology, fauna and flora. The clear skies without light pollution allow the visitors to do a lot of astronomical activities. This is a center opened to a large kind of people: primary



Figure 3: General view of *Centre d'Observació de l'Univers*.

and secondary students, university students and general public. The center was inaugurated the 16th of January of 2009 and started all the activities during the firsts months of the International Year of Astronomy.

#### 4.1 The telescopes park

The COU is divided in three main areas: central building, the telescopes park, and the eye of Montsec.

#### 4.2 Central building

The central building contains the reception and offices of the center, the standard classrooms, the computer classrooms and the permanent exhibition of this center. This central building houses a permanent exhibition covering the main areas of interest of the COU: astronomy, obviously, but also the geology, fauna and flora of the Montsec region are given pride of place. The exhibition reproduces and analyses the different habitats in the Montsec region and gives an overview of its geological history, including all the huge transformations the Earth has gone through since it was formed. The astronomical section gives an overview of the main topics in astronomy, from the Big Bang, the formation of galaxies and the evolution of stars and black holes through to the detection of other planets and our neighbors in the solar system (see Fig. 3).

The telescopes park is the outdoor section of the *Centre d'Observació de l'Univers*. This area is devoted to observing the sky during day and night. It consists of two buildings with



Figure 4: View of the two domes of the telescopes park.

astronomical domes (see Fig. 4) and an area for setting up the COU's portable telescopes. The equipment of the park consists of:

- A Schmidt-Cassegrain 16" telescope in the big dome.
- A Takahashi 15 cm refractor telescope in the small dome.
- A coelostat that projects the image of the Sun to a small classroom (25 persons of capacity).
- More than 20 portable telescopes.

### 4.3 The Eye of Montsec

The Eye of Montsec is an exceptional multimedia facility consisting of a multimedia digital planetarium which recreates the current sky as well as those of any other period and also shows films in the full dome screen format, allowing visitors to appreciate other aspects than purely astronomical ones, projected onto a 12 meter diameter dome.

With capacity for 68 people, the Eye of Montsec is equipped with highly advanced audiovisual equipment comprising seven audiovisual projectors (Barco) and a sound system controlled by computer systems. The planetarium system is DigitalSky 2 of Sky-Skan co.

Thanks to its retractable dome (see Fig. 5) and front wall, the Montsec Eye gives viewers an uninterrupted view of the sky above Montsec which is almost totally free of light pollution. This direct observation can be accompanied by the images obtained by a 30 centimeter diameter telescope installed in the same room, which displays the images on small TFT screens in the seating area.



Figure 5: View of the Eye of Montsec with its retractable dome partially opened.

## 5 Our visitors and activities

We are having visitors from:

- Primary and Secondary school students: these students will go to COU through *Camp d'Aprenentatge del Montsec* (Montsec Education Camp) of Education Department of Catalonia. This Camp attends around 3000 students per year. These visitors are doing activities in the center during one, two or three days. The main activities are planetarium shows, observations, workshops or excursions.
- Astronomy University students: the astronomy students of University of Barcelona are doing their practical lectures in our center. Around 250 students per year are using our telescopes.
- General public: during weekends and holidays we will do visits, observations or planetarium sessions to general public. These visits started in April 2009 and during the first year (2009) we had more than 25 000 visitors. During 2010 we expect near 30 000 visitors, so we will increase the number of visitors this year (2010). Every summer we are doing, in collaboration with University of Lleida, some courses of General Astronomy and Astronomical Images. During 2010 we started new activities like music in the planetarium, public observations in special interest places or scientific talks opened to public.