

Pro-Am collaboration and outreach in French Occitanie

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Abstract. French Occitanie is the second most important region in France, situated in the south-west of the country. The two main towns are Toulouse, the European Capital of Aeronautics and Space Research, and Montpellier. Both towns host important universities whose origins go back to the Middle Ages. The region is also the site of the fabled Pic du Midi Observatory, and it now hosts two International Dark Sky Reserves. It has a long tradition of Pro-Am collaboration and communication with the public in astronomy and space research.

Keywords. communication

1. Introduction

Occitanie is a modern administrative French region, a cultural and historical land. Situated in the South-West of France, at the border of Spain, it also includes part of the Pyrénées mountains, with the wellknown “Observatoire du Pic du Midi de Bigorre”. With a superficie of about 73,000 square meters, it hosts 5,700,000 inhabitants in 2018, a number which increases rapidly. It is the second largest region in Metropolitan France.

The history of this land begins in the Roman times, with many vestiges of that period. In the 5th century, the city was the capital of the Visigothic Kingdom. The importance of this region grew up through the Middle Ages, with the Occitan culture and the poetic tradition of the “troubadours”. Later on, in the 12th and 13th centuries, when it was not yet attached to France, it was the land of the County of Toulouse. Terrible religious wars occurred in this region, between Catholics and Cathars, at that time.

The University of Toulouse was founded in 1229, just after these wars and soon after the University of Paris (founded in 1215). In 2018, the University of Toulouse, dispatched on several different sites, hosts more than 100,000 students.

The second largest town of French Occitanie is Montpellier. This town is wellknown for its medieval specialisation in medicine: the “Faculté de Médecine de Montpellier” was founded in 1220. At the present time, there are about 47,000 students in the University of Montpellier.

In the following, I focus on the Pro-Am collaboration and outreach in Toulouse, and at the Pic du Midi Observatory.

2. Toulouse, European Aeronautics and Space Capital, a melting pot for professional and amateur astronomers

Toulouse is the centre of the European Aeronautics and Space industry, with both the headquarters of Airbus (formerly EADS), and the Toulouse Space Centre, the largest space center in Europe, which is part of CNES (Centre National de la Recherche Spatiale). Many large and small space industries are located in Toulouse, in connection with the space center, for example Thales Alenia Space, ATR, Safran, Astrium satellites, Airbus

Defense and Space. The satellites SOHO and more recently GAIA were mounted in Toulouse.

Toulouse also hosts important research centers in Astronomy and more generally Earth and Space Sciences. The “Observatoire Midi-Pyrénées” is a federation of 7 different laboratories and institutes, including the “Institut de Recherche en Astrophysique and Planétologie” (IRAP). It manages the scientific part of the Pic du Midi Observatory.

Most of the Aeronautics and Space Enterprises in Toulouse host their own club of amateur astronomers. This means a huge pool of skilled scientists, who do astronomy for pleasure. Many Pro-Am collaborations are engaged in that respect. I will detail a few of them in the “Pic du Midi” section. Let me point out that the first CCD camera for amateurs was built in 1983, at the same epoch as the first professional ones, by Christian Buil, an amateur astronomer working at CNES, in the framework of the Alpha Centauri Astronomy Club of Carcassonne.

Amateur astronomers are fundamentally interested in sharing their passion with the public, as well as many professionnals. Festivals, conferences, meetings occur everywhere in Occitanie, either for a very large public, for children (stellar classes), or for initiated people. As I discuss below, the labellisation of International Dark Sky Reserves is also very appealing for the public.

Among the festivals, we may quote the “Festival d’Astronomie de Fleurance”, a small town not far from Toulouse, in the country side, which is followed by several thousand people every year, in August. The PhD students of IRAP participate in this festival by preparing astronomy lessons for kids, in parallel with the adult festival. People come with their families and enjoy some kind of astronomical vacation. The PhD students are enthusiastic for this interesting experience.

Last but not least, Toulouse hosts an important Space museum, the “Cite de l’Espace”, since 1997. It offers permanent and temporary expositions to the public, and also many conferences, movies and shows about astronomy and space. It hosted recently the congress of the International Planetarium Society, and also the international congress of Astronauts.

3. The Pic du Midi Observatory: a love history between Professional and Amateur Astronomers, and the Public

The Pic du Midi Observatory is a worldwide fabled monument. Built on a precipitous peak in front of the main Pyrénées mountains range, 2877m high, it is visible from a wide part of the country. Looking like a fortified castle, several levels high, surmounted by a large number of metal domes, it is able to overlook, by clear sky, one eighth of the French territory. Some people also compare it to a submarine, resting at the top of the mountain. Prime observing conditions, induced by its special situation, were the reason for building an astronomical observatory. The sky may be so clear, with so few turbulence, that it was chosen by NASA scientists to map the surface of the moon in preparation of the Apollo landing sites.

The origin of the astronomical observatory goes back to 1867, when an international supporting committee was founded. It was first constructed with private funds, by enthusiastic amateur astronomers, and it became a property of the French State in 1882.

The first solar coronagraph was conceived and built by Bernard Lyot at Pic du Midi in 1930. It was the beginning of very important solar observations during many decades. The Pic was also the site of cosmic ray detections and studies. The hyperon was discovered there in 1949.

The largest telescope in Pic du Midi is a 2m wide reflector, named as TBL (Telescope

Bernard Lyot) in honour of the founder of coronagraphs. The first image was obtained in 1980. After many years of observations, the TBL is now devoted to the observation and characterisation of the stellar magnetic fields. I uses a spectropolarimeter called “NARVAL”, built in Toulouse, the brother of “ESPADONS” which stands at the CFHT 4m telescope in Hawaii.

After a long history of professional and amateur observations, the Pic du Midi observatory is open to the public since the beginning of the millenium. The access is easy with a 15-minutes cable-car ride from the resort town of la Mongie. The visitors can chose a day-visit up to the highest museum in Europe, or stay in the evening for a starry sky observation, or even, upon reservation long in advance, for a complete night.

The traditional synergy between professional and amateur astronomers at Pic du Midi is going on, more than ever. Nowadays, professional astronomers are no more able to do routine observations by themselves. There is a kind of headlong pursuit with the need of more and more publications, using more and more sophisticated instruments, with bigger and bigger data bases... The evolution of knowledge goes faster and faster, in an exalting way, but it occurs to the detriment of works of routine and precision that may be important. Professional scientists do not have the liberty of doing all what they would like to do, because of all sorts of constraints. Amateur astronomers may overtake these works in connexion with professionnals, and they like doing it. I give below three examples of such Pro-Am collaboration:

- The CLIMSO Associated Observers (for Christian Latouche IMageur SOLaire) is a nation-wide organisation of amateur astronomers. Each of them spend two weeks every year observing the solar granulation and the solar prominences with a coronagraph. In this way, the Sun is followed all year round without interruption. The data are then gathered into a professional data basis.
- The Associated Observers of the TBL (OATBL in French) is a team of amateur astronomers who observe stellar magnetic fields for professional purposes with the NARVAL detector (detection and cartography)
- The European Community for Planetary Science “Europlanet” held a Pro-Am meeting in Pic du Midi in July 2018. The aim is to develop tools for amateur astronomers to detect and observe impacts of objects falling on giant planets, lunar flashes and many other cosmic events.

This list is not complete. There are also collaborations for terrestrial planets observations, asteroids, comets, etc... There is also a node of the FRIPON network aimed to detect falling meteorites, which is a public participative experiment...

This extremely rich Pro-Am collaboration has also repercussions towards a very large public. The amateur astronomers are very fond of communication and like to explain to the public the observations they are doing, and why they are spending so much time for that purpose. The public find very impressive to see such enthousiastic people working on astronomy during their vacation!

4. International Dark Sky Reserves and consequences

The fact that the Pic du Midi and its environment now has the label of IDSR (International Dark Sky Reserve) or RICE in French (Réserve Internationale de Ciel Etoilé), is also very attractive for the public. Officially initiated in 2009, during the international year of astronomy, the Pic du Midi International Dark Sky Reserve was labeled in 2013 by the International Dark-Sky Association. It is the sixth in the world, the first in Europe and the largest reserve in a inhabited zone. It covers 3,000 km², includes 251 towns and

villages, and is divided in two zones: a core zone, devoid of any permanent lighting, and a buffer zone, in which the politics act to reduce the light impact towards the sky.

The RICE is now co-managed by three structures. The first one is the Joint Association for the Tourist Valorization of the Pic du Midi. The second one, more connected with the problems of fauna and flora, is the Pyrenees National Park. The third one is the Departmental Energy, interested in reducing the energy expenses.

The RICE is very attractive for the public and is the pretext for astronomical tourism, with exhibitions and conferences, especially during the summer season. It also aims to public education on the impacts and consequences of light pollution as well as the establishment of responsible lighting in region. The program “Gardiens des Etoiles” (Guardians of the stars), concerns the mountain refuges guardians who do monitoring of the light pollution evolution, and give explanations to the hikers who stop there at night. A project of “Dark Frames” (trames sombres) also concern the nocturnal biodiversity by adapting the dark sky to the nocturnal motions of various species.

A design and consulting office “Dark Sky Lab” has been created to help people interested in decreasing light pollution in their own environnement, in France and other countries. It is active through conferences, measurements of pollution in situ, design of light transformation to decrease light pollution, creation of dark frames, etc.

Since Summer 2018, a second IDSR has been labelled in the Occitanie region: that of the a natural national park, “Parc des Cévennes”. This again is a tool for communication with the public and education.

5. Conclusions

French Occitanie is a privileged region for Pro-Am collaboration and its opening to a large public. It holds special astronomical sites, very attractive, like Pic du Midi. Toulouse, European Capital of Aeronautics and Space, has a rich potential in skilled amateur astronomers as well as structures for reaching a very large public. Pros and Ams have many collaboration programs for research observations, pedagogical actions, education of young and older people.

Some small and medium-sized companies have constructive collaborations with universities and research labs. They may work and do R&D research more quickly than the academic groups, because they have more liberty and less time-consuming obligations...

Such a synergy is needed for a better responsabilisation of men and women in the framework of a changing world.

6. Relevant websites

<https://en.wikipedia.org/wiki/Occitanie>
<https://cnes.fr/en>
<http://www.irap.omp.eu/en>
<http://picdumidi.com/en>
<http://picdumidi.com/en/discover-the-pic-du-midi/rice-en>
<https://darkskylab.com/>
<http://en.cite-espace.com/discover-the-cite-de-lespace/>
<https://www.festival-astronomie.com/>