

Allande Stars: scientific outreach in rural areas

Hermosa Muñoz, L.^{1,2}, González-Cuesta, L.², and González Fernández, J.R.^{3,2}

¹ Centro de Astrobiología (CAB) CSIC-INTA, Camino Bajo del Castillo s/n, 28692 Villanueva de la Cañada, Madrid, Spain

² Allande Stars, Pola de Allande, 33880 Allande, Asturias, Spain

³ Universidad Internacional de la Rioja (UNIR), Av. de la Paz 137, 26006 Logroño, La Rioja, Spain

Abstract

Allande Stars is an astronomical outreach project taking place in rural areas, mainly based on Asturias, in the northern part of Spain. Its main objective is to enhance the cultural and natural heritage of these regions and the preservation of the night sky. This project brings together the astronomy to other scientific and artistic fields to show, protect and conserve unique places in the countryside. This motivates local institutions to preserve these places by making them aware of the importance of the night sky quality as a natural resource. In this manuscript, we present the development of this project during the past five years, not only in the municipality of Allande, but also its expansion to other territories of Asturias, such as the municipality of Somiedo. This project has already contributed to creating new sustainable tourism resources, such as 'La Ruta del Oro a las Estrellas'. It also helped Allande achieve the Starlight accreditation, promoting the development of these regions through science.

1 Introduction

Astronomy is a very powerful discipline to engage people with science, due to its visual potential and inspiring nature. It is also deeply rooted in the history and culture of past and present societies, allowing a direct connection to the public's traditions and emotions difficult to achieve by other sciences [1, 2].

This paper presents the results of the efforts made by the project Allande Stars to contribute to an accessible and decentralised scientific outreach in the municipality of Allande (Asturias) using astronomy and its relation to local natural and cultural heritage as a framework.

Allande is one of the largest municipalities in Asturias, with an area of 342.24 km², located south west of the region. As many other rural areas in Spain, Allande suffers from the problem of depopulation. New generations leave the rural area in search of work opportunities, settle in cities, and often find it challenging to return to live in the villages. Allande has lost 80% of its population in the last 60 years, resulting in a critically low density of 9 inhabitants per km², placing the municipality at extreme risk of depopulation. This demographic decline, combined with the area's unique terrain and dispersed settlements, has led to low levels of light pollution, creating ideal conditions for stargazing events. Developing this potential can generate high-quality tourism resources, fostering positive economic and social impacts that help revitalize these territories.

The main objectives of the project are the following: (1) Revitalise the rural areas, particularly in Allande; (2) preserve and promote the local heritage, with a particular focus on the night sky; (3) grant access to science to people at all ages; and (4) generate (female) role models in science.

2 Activities carried out in rural areas

The project focuses on developing activities adapted to the characteristics of each territory. Through these activities, we teach scientific or artistic concepts that connect with and promote the local heritage of the villages we visit. In the five years since the project started, we have developed more than 30 activities in different municipalities of Asturias. For example, Allande is known for its gold mines, which were exploited by the Roman Empire. These mining processes modified the terrain, creating distinctive landscapes near certain villages, such as 'Fana La Freita'. We used this as the basis for an activity called 'El viaje cósmico del oro', which explains how gold forms in the Universe, mainly from supernova explosions, and how it eventually ends up on Earth's surface through the formation of the Solar System and subsequent geological processes. This activity was carried out as a guided walk along part of the primitive Way of St. James (which passes through Allande), where participants learned about the origin of gold while visiting an old, open gold mine.

These activities allow us to connect people to their territories and natural resources, showing them that science is present everywhere, even in small, rural areas. As another example, we developed an activity called 'Radones y mazmorras' at the 'Castillo de Cienfuegos' in Pola de Allande, a site declared of Cultural Interest in 1994. There, we talked about natural radioactivity through both particle physics and geology, and the presence of radon in the northwest part of Spain, particularly in Allande. These kinds of activities end up generating new attractive and sustainable tourism resources for rural areas (see Sect. 3).

2.1 Astronomical observations and night sky quality

A natural resource that is often overlooked is the night sky. There are institutions, such as the Starlight Foundation, that aim to protect its quality and darkness so that humans can see the light coming from the stars. In fact, night sky protection aims to be recognized as one of the



Figure 1: Guided astronomical observation of the night sky in Lago (Allande, Asturias) on 9 August 2024, during the 5th edition of Allande Stars. Credit: Glendor Díaz.

Sustainable Development Goals. While big cities offer greater access to resources such as high-level education, transport, or healthcare, rural areas have a significant advantage over cities: the absence of light pollution. In Allande, as well as other regions towards the southwest of Asturias, the low light pollution allows us to contemplate the night sky to a similar level as in professional astronomical sites (see Sect. 3.1). Since astronomy is the main scientific driver of the project (see Sect. 1), one of the key activities is astronomical observations using amateur telescopes (see Fig. 1). The first part of these activities consists of a guided tour of the visible constellations through mythological stories, which help participants orient themselves in the night sky, as was done for navigation in the past. Then we use the telescopes to point towards the brightest astronomical objects visible, such as planets, nebulae, stellar clusters, or galaxies. The great interest raised by this activity among participants and local authorities eventually resulted in Allande being awarded with the 'Starlight certificate' in 2021, as will be further explained in Sect. 3.

2.2 Activities in schools

One of the biggest issues of rural areas is that children do not have access to as much cultural and scientific activities as those that live in big cities. For that reason, part of the project is

devoted to carry out activities in schools, where we are able not only to talk about astronomy and other scientific disciplines, but also create female scientific role models.

As mentioned in Sect. 2.1, the night sky is an important natural resource that needs to be protected. For that reason, some activities focus on the problem of light pollution. With these, we aim to make school students aware of the problem and understand the importance of protecting the night sky, especially in their own area.

3 Impact of the project on the territory

After five years since Allande Stars started, we have seen that it has impacted the territory in multiple ways. Here we present the main projects currently developed or in development, with the support of the Allande Town Council.

3.1 Starlight certification

As mentioned in Sect. 2.1, our project aims to create a collective awareness of the problem of light pollution in order to protect the quality of the night sky in rural areas of Asturias. Therefore, in a joint effort with the Allande Town Council and the Starlight Foundation, in October 2021 the county of Allande became the first county in Asturias to achieve Starlight certification for its sky quality.

Since then, several joint actions have been planned to improve the illumination of the territory, reduce light pollution, and promote astronomy. Notably, since December 2022, we created the 'Encuentro de Turismo de Estrellas en Allande', an annual event that gathers together experts on tourism, astronomy, photography, and local businesses and associations. It combines presentations on astronomical tourism initiatives to dynamise Starlight territories, with various astronomy-related talks and workshops. It also includes the 'Ruta del Pincho Astronómico', where local establishments offer astronomy-themed pinchos.

As a consequence of the boost that is being achieved for Allande in various sectors, we are now collaborating with other areas in Asturias interested in obtaining Starlight certification.

3.2 New local infrastructures

Locally, new environmentally sustainable tourist attractions have been generated in Allande related to astronomy and the activities we have already developed within the project. In particular, the activity presented in Sect. 2 has been transformed into the 'Ruta del Oro a las Estrellas'. It is now a circular route (5.8 km) along the primitive Way of St. James, indicated with informative panels that explain the formation of the 'Fana A Freita' from a geological perspective, and how gold is produced in space from an astronomical perspective.

Moreover, the town council of Allande has obtained European funds to build a new astronomical station. It will have a room for exhibitions or talks, a courtyard where telescopes will be placed for observations, and an outdoor asylum in case of bad weather conditions.

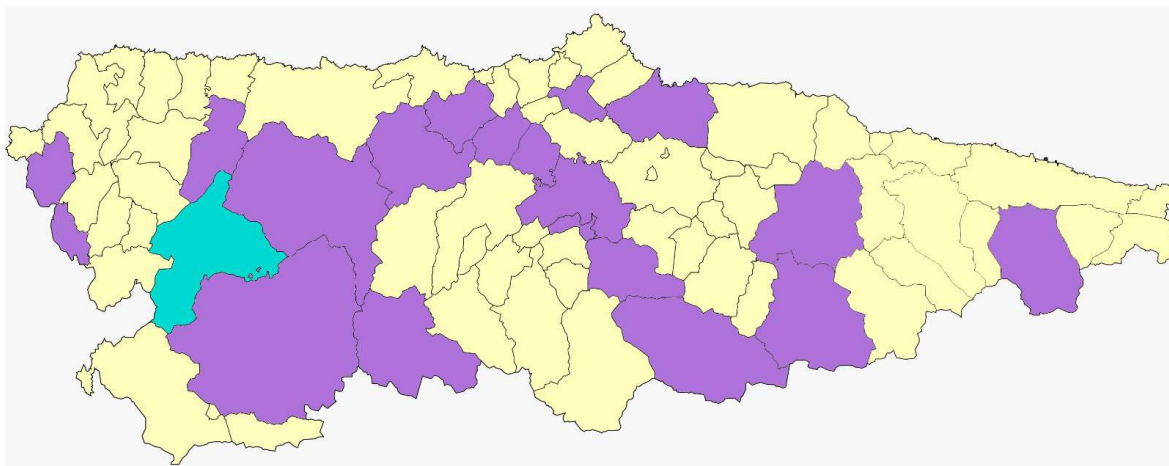


Figure 2: Map of Asturias divided by municipalities. In blue, we highlight the position of Allande, and in purple all the municipalities in which we have done activities from 2020 until July 2024.

4 Expansion on the project and future prospects

Since March 2024, Allande Stars has been established as a science communication company. We aim to expand our methodology to other rural areas similar to Allande, that could revitalise their regions while protecting their natural resources through astronomy. We have now developed new activities in more than 20 different municipalities of Asturias (see Fig. 2), such as Somiedo ('CosmoSomiedo') or Mieres ('AstronoMieres'), some of them through the collaboration of important institutions, such as the *Fundación Caja Rural de Asturias*.

We are currently working on a new project called 'Miradas al cielo' with Nomad Studio, that will be presented in 2025. This project aims to preserve and disseminate the ancestral knowledge about the sky preserved by the elderly people of the rural area of Allande. It is an interdisciplinary project between art, culture and science, which seeks to highlight the rich intangible cultural heritage linked to the observation of the sky.

We will continue working to showcase the cultural and natural heritage of rural areas, through creating synergies between astronomy, other sciences, and various disciplines. This approach brings attention to these hidden places that connect us to the land and its history, helping to build a sustainable future for these regions.

Acknowledgments

This project is possible mainly thanks to: Ayuntamiento de Allande, Fundación Oxígeno, Instituto de Astrofísica de Canarias, Fundación Starlight, Rotary Club, Fundación Caja Rural de Asturias, Caja Rural de Asturias, Ayuntamientos de: Somiedo, Mieres, Ribera de Arriba, Salas, y Santa Eulalia de Oscos, STDL Pravia, Carrera Automoción, and the European Space Agency. We want to thank the local astronomical associations Cielos Despejados and Omega for their collaboration in the activities.

A special thanks to all the local associations, collaborators, and speakers of the different activities during these years, for their implication and enthusiasm that have made the activities possible.

References

- [1] Benitez-Herrera, S. & GalileoMobile Team, 2017, Highlights on Spanish Astrophysics IX, 784
- [2] McBride, V., Venugopal, R., Hoosain, M., et al., 2018, Nature Astronomy, 2, 511.