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The CESAR Initiative.

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Abstract

The CESAR Initiative, which stands for 'Cooperation through Education in Science and Astronomy Research', is an educational project whose main objective is to engage school students with the wonders of Astronomy and, more generally, Science and Technology. The main areas covered by the project are presented here as well as our new projects.

1 Introduction

CESAR is a joint Educational and Scientific Initiative developed in 2012 by the European Space Agency (ESA), the Spanish National Institute for Aerospace Technology (INTA) and the company ISDEFE, aimed at students from European secondary schools as well as Universities. The agreement, signed in 2015 for five years, aim for bridging the gap between Research and the Education Community, by

- using Astronomy as a motivational element to learn about our planet, the Universe, science and technology;
- contributing to improve knowledge of Astronomy and science in general and understand scientific and technological concepts from the simplest to the most advanced ones;
- making Astronomy fun and interesting to stimulate the active participation and interaction of the students,
- disseminating to society the lastest astronomy developments.

2 The CESAR educational activities

The CESAR Initiative provides to students access to astronomical data, tools and expertise of the European Space Agency scientists, to help them in the analysis of their scientific results and understanding their impact in the current state-of-the-art scientific panorama. The CESAR Team offers teachers resources to prepare and support their students, as well as dedicated workshops, organised in collaboration between ESA and CTIF, to inspire them to use space as a context when teaching STEM subjects (Science, Technology, Engineering and Mathematics) at school.

2.1 The Space Science Experiences

Primary and secondary school teachers from ESA's Member States can register their class for a unique 2-hour session of real hands-on astronomy at ESAC. The students will be guided by ESA scientists through a group activity during which they will be assigned a 'mission' within a space science subjects that the teachers can choose at the time of registration (based on the students' age and curriculum). To accomplish their mission, the students will have to answer questions, use imagery taken by the CESAR telescopes and other ESA space missions, analyse the data, and communicate their results to their classmates (the Scientific Community). The teachers will be provided in advance with some explanations and resources to prepare their students to the experience itself, including a videoconference with a scientist (if technically feasible at the school). The main goal of these activities is to *learn-by-doing* and get used to work within teams. See some examples of these sessions are shown in Figure 1.

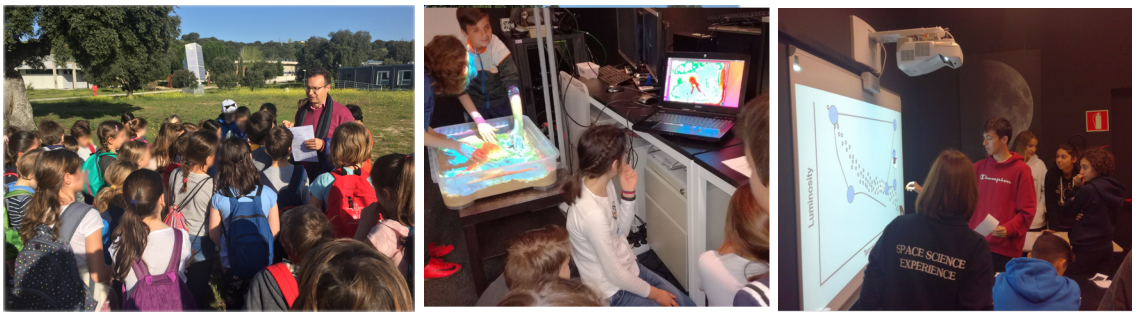

Figure 1: Pictures taken during Space Science Experiences organized by the CESAR Team.*(Credit: CESAR)*

2.2 Teacher Workshops

Every year, the CESAR Team makes a selection of special topics related to the state-of-the-art science, together with ESA scientists, and organise conferences and lectures to introduce Astronomy and Space Science to teacher. This should provide hints and inspiration to use space related subjects in their lessons, and make them interact with real space experts. Figure 2 shows the dynamics followed at them.

Figure 2: Pictures taken during some of the XII Teachers Workshops held by the CESAR Team. *(Credit: CESAR)*

3 The CESAR science cases

This is a series of classroom resources, containing teacher and student guides, real astronomical data and the astronomical tools, on astronomical topics ranging from the Sun to the Deep universe. These resources can be used by the teachers as a basis for their STEM lessons in the classroom. In Figure 4 it is indicated where in the CESAR website this material is available.

Figure 3: Location of the on-line science cases in the CESAR website. *Credit: CESAR*

4 CESAR observatories

The CESAR programme provides students with access to several ground-based observatories:

- Two solar telescopes (visible light), one mobile unit which is used to observe special astronomical events (see Section 5) and one permantly installed unit to observe the Sun every day, weather conditions permitting.]
- Two night telescopes (visible light)

These telescopes are all based at, or in the vicinity of, ESA's European Space Astronomy Centre (ESAC) near Madrid, Spain, where the control centre is located.

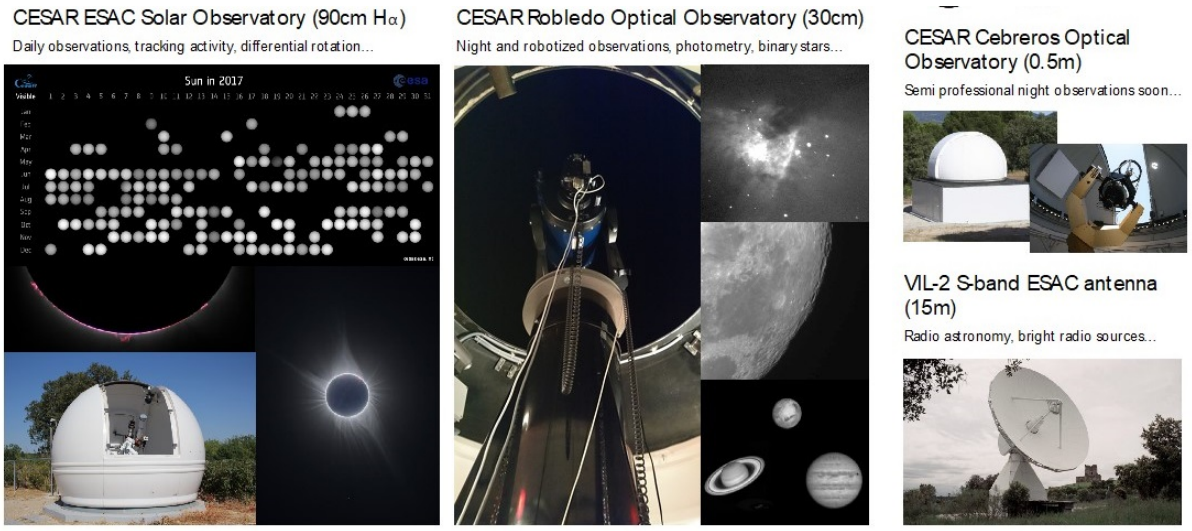

Figure 4: Summary of CESAR telescopes. *(Credit: Abel de Burgos).*

5 CESAR special events

The CESAR Team participates in Astronomical Events, such as the August 2017 Solar Eclipse, the 2016 Mercury transit and the 2012 Venus transit. Part of the team travels to locations from where the event is well visible while another part of the team is in charge of streaming the event to the internet providing also background lectures to the general public and answering questions.

Acknowledgments

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