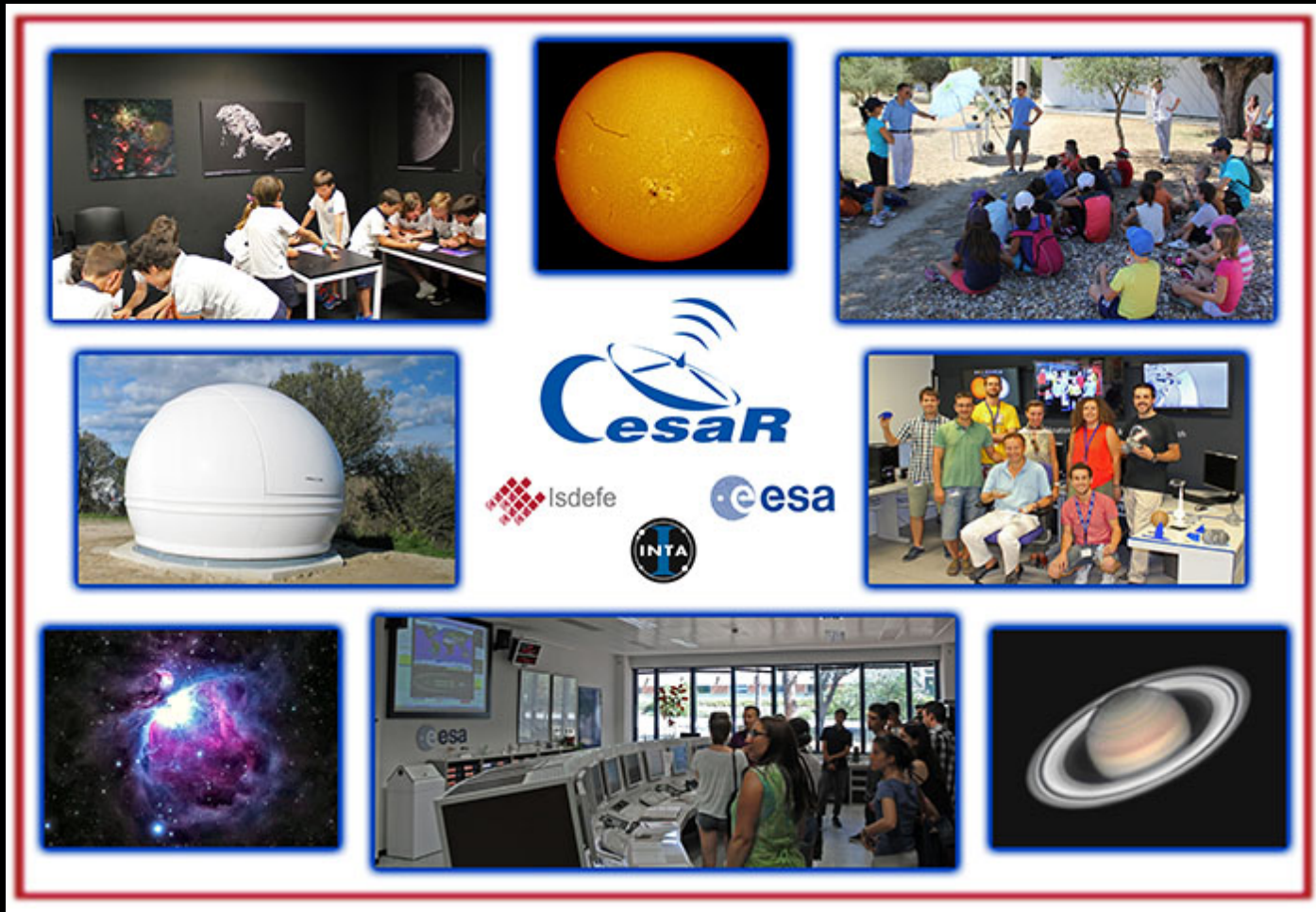


The CESAR education initiative

Cooperation through Education in Science and Astronomy Research



Miguel Pérez-Ayúcar, M Breitfellner, M. Castillo
On behalf of the CESAR Team, EPSC2018, 20 Sep 2018

EDUCATION PROJECT CESAR

“The EUROPEAN SPACE AGENCY as a didactic resource”

cesar.esa.int

- Started: June 2012
- ESA & ISDEFE & INTA
- @ESAC (European Space Astronomy Center)
- Age range: Primary - Secondary – University
- To promote science and technology among students





Education Project CESAR



RESOURCES IN THE CLASS

Using our
observatories

SPACE SCIENCE EXPERIENCE

School visits to
ESAC

SPECIAL EVENTS

Scientific
expeditions,
transits,
eclipses,
hangouts ..

TEACHERS COURSES

Teachers CTIF
C. Madrid

www.cesar.esa.int



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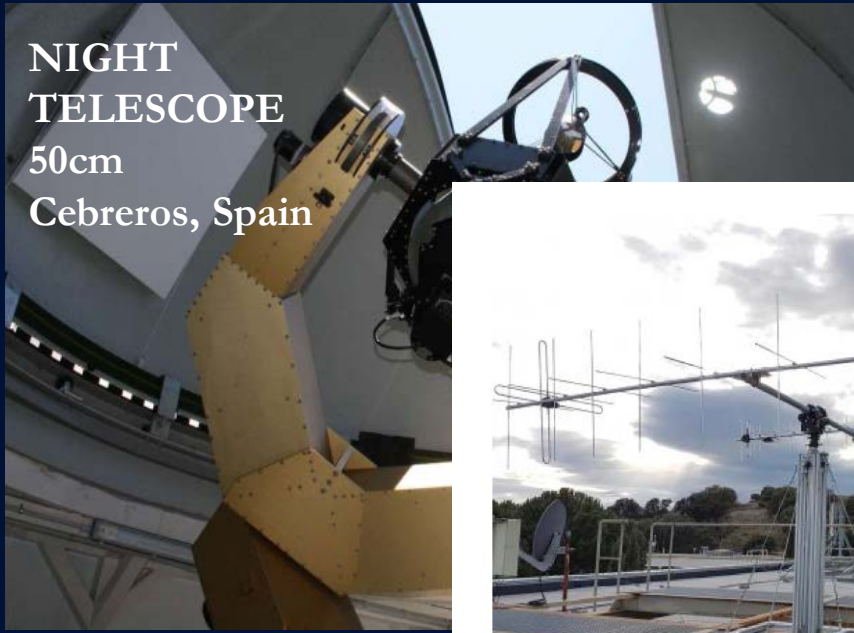
www.cesar.esa.int

CESAR - RESOURCES

NIGHT TELESCOPE

50cm

Cebreros, Spain



NIGHT TELESCOPE

30cm

Robledo de Chavela,
Spain



SOLAR TELESCOPE

H-alpha, visible,
ESAC, Madrid



CUBESAT
ground station
VHF, UHF
ESAC, Madrid



RADIO TELESCOPE

15m S-Band

ESAC, Madrid



CESAR Theatre, workshop and meeting rooms





A satellite map of Europe and North Africa, showing the Atlantic Ocean to the west and the Mediterranean Sea to the east. Two yellow arrows point to specific locations: one to the Netherlands and another to Madrid. The map is overlaid with a grid of latitude and longitude lines. The text 'Netherlands, ESTEC' is positioned above the first arrow, and 'Madrid, ESAC' is positioned above the second arrow.

Netherlands,
ESTEC

Madrid,
ESAC

Image Landsat / Copernicus
Image IBCAO
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2018 ORION-ME

Google Earth

CESAR @ ESAC (European Space Astronomy Center)



Control Room & Theatre

CUBESAT antenna

RADIO
telescope

SOLAR
observatory

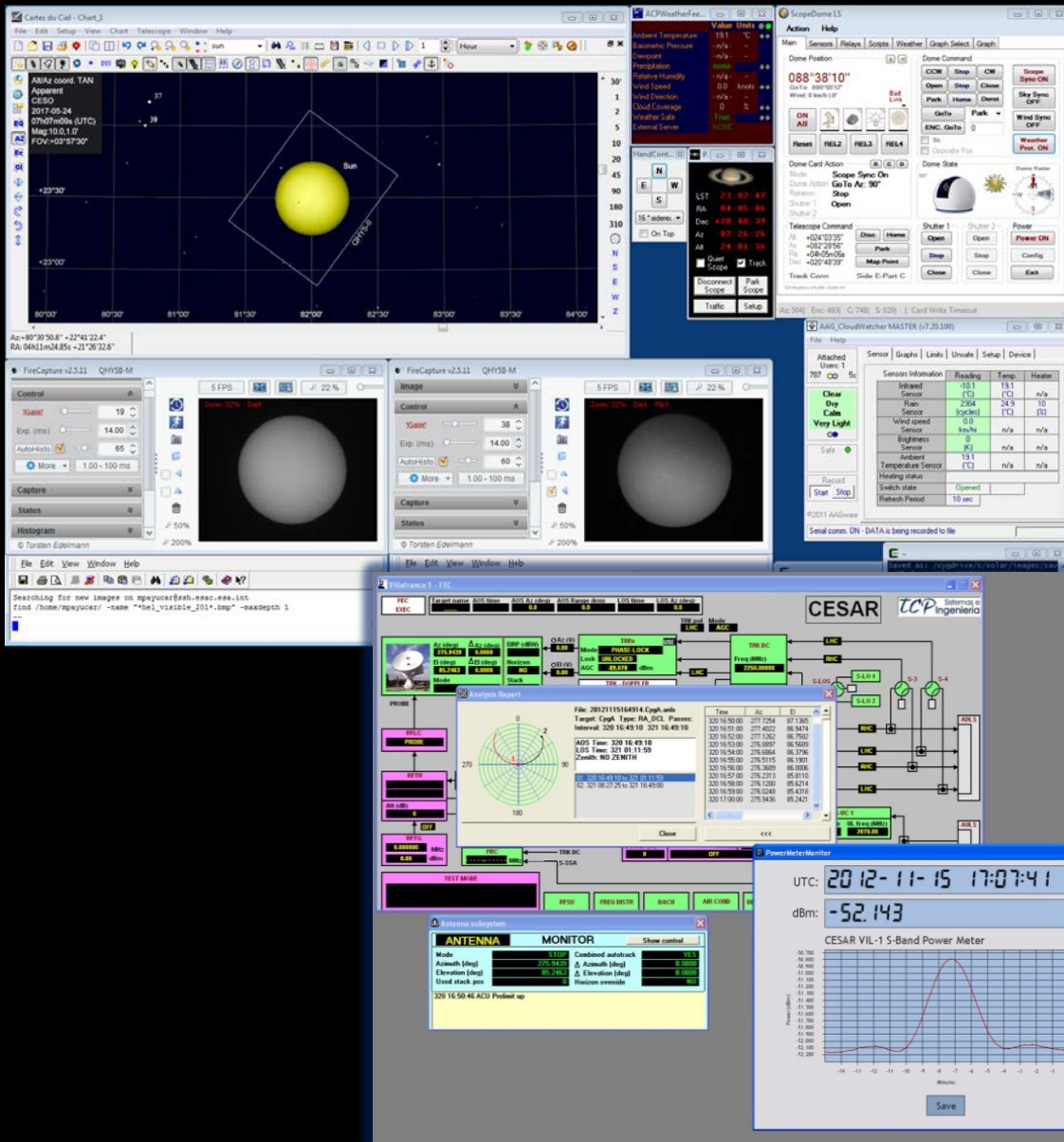
Google Earth

CESAR – Remote Control

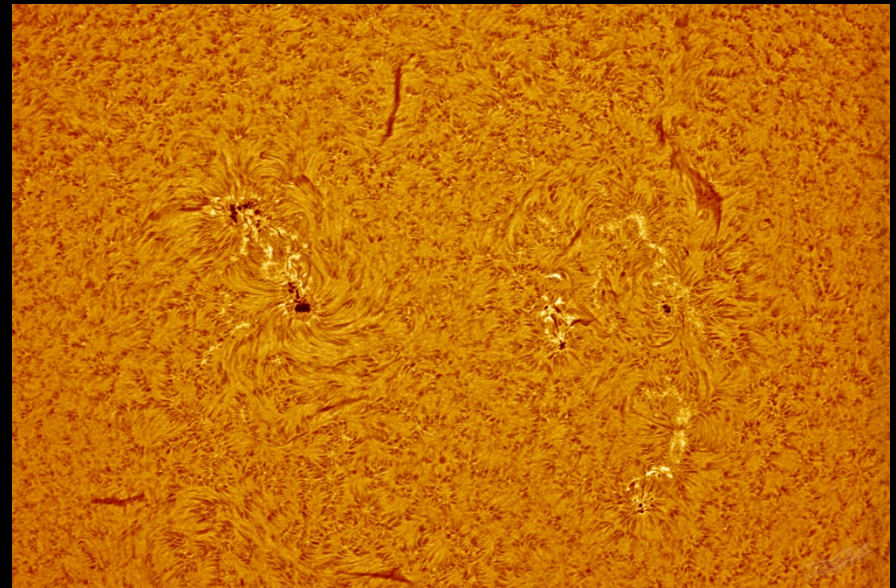


TELESCOPES CONTROL CENTER

CESAR – Remote Control

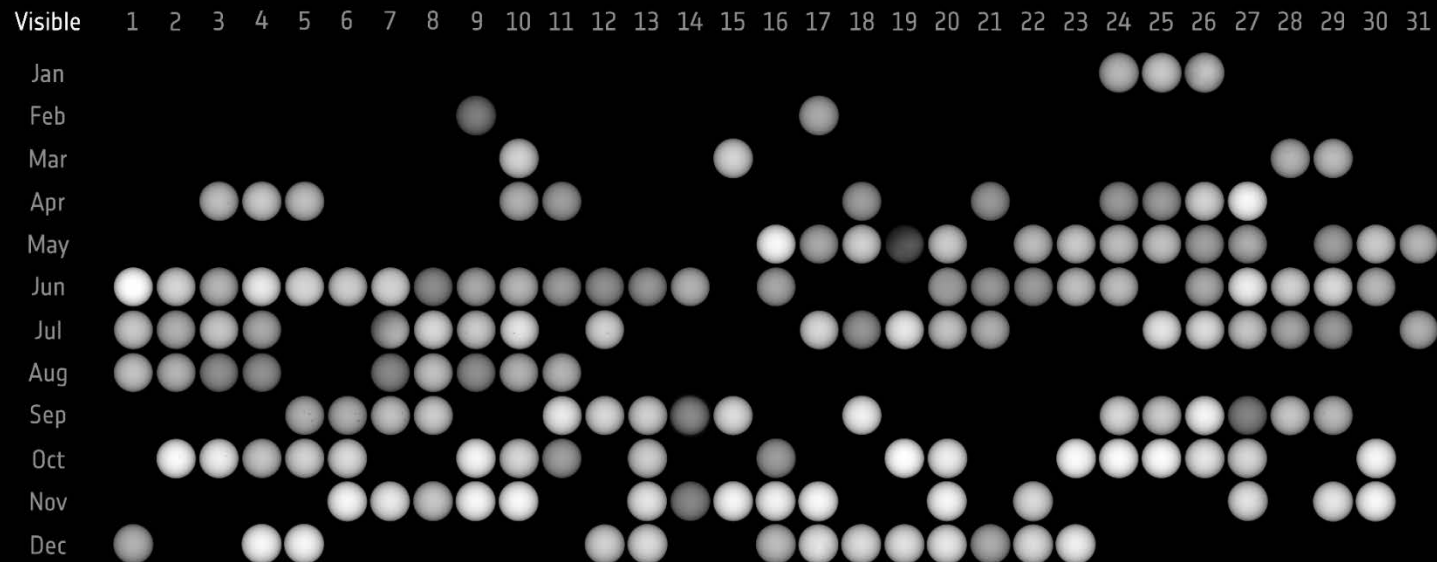
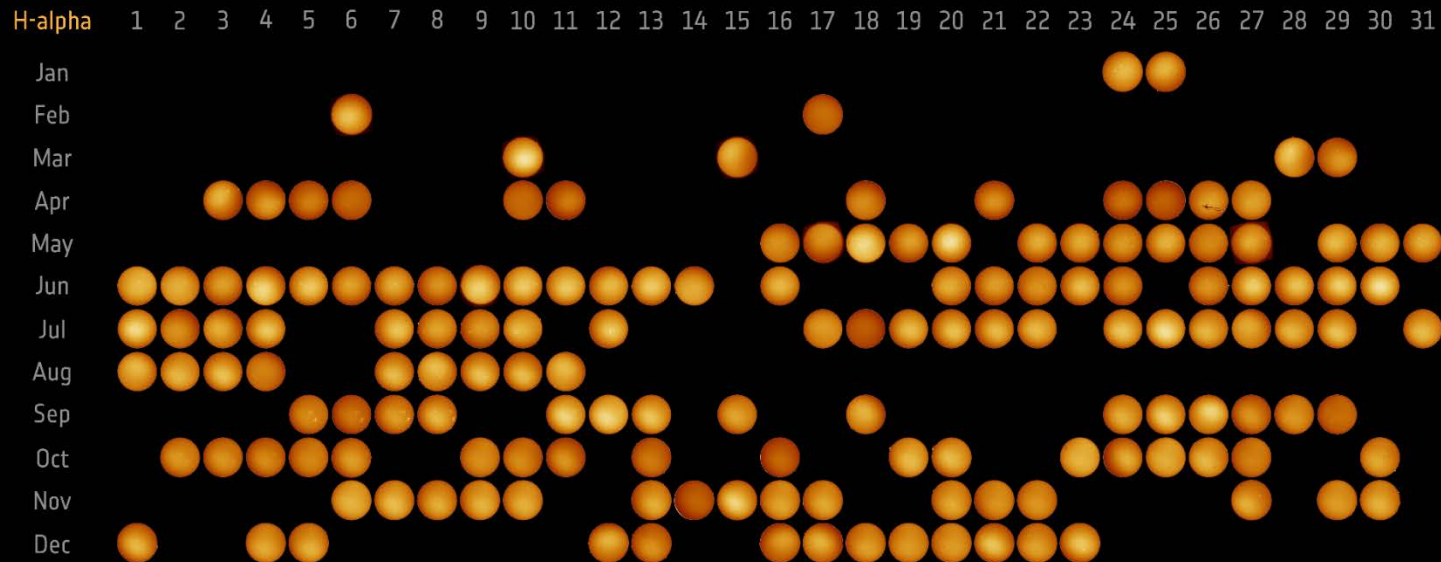


HELIOS (ESAC) – SOLAR OBSERVATORY



HELIOS (ESAC) – SOLAR OBSERVATORY

Sun in 2017





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Education Project CESAR



Home » Lectures

Lectures

Page: 1 2 3 4 ... 8 9 (8 Lectures each page) - [See all lectures news](#)



The colour of the Stars - German School
4th year of Primary School - 36 students [See more](#)



Travel through Solar System - CEIP El Pradillo de Ávila
70 studens - 2º Primary
From Ávila- Spain [See more](#)



Javier Ventura & Topographic Study with Augmented Reality - Lycée fra
26 Students - CM2A [See more](#)



Topographic Study with Augmented Reality - Jesús Maestro School
80 Students 2ºESO [See more](#)



Solar Mass Ejections - J.L.López Aranguren school
Solar Mass Ejections
3 ESO + 1 Bachillerato - 48 students [See more](#)



Hertzsprung-Russell diagram - IES Francisco Giner de los Rios school
4 ESO - 50 students [See more](#)



Topographic Study - IES Francisco Giner de los Rios school
110 students - 4th year of ESO [See more](#)



Mission to the Moon - CRA Elena Fortún school
Third & Fourth year of primary school - 54 students [See more](#)



Come and visit us and live an **unforgettable experience**.

Space Science Experience Topic	Recommended age of the students	Introduction to the Scientific Case	Scientific Case	Recommended videos
Mission to the Moon	7-9	English	English Map Material	<ul style="list-style-type: none"> • Introduction to ESA (6:46 min) • Departure into Space (4:02 min) • Paxi - The Solar System (5:18 min)
The colour of the stars	8-10	English	English	<ul style="list-style-type: none"> • Introduction to ESA (6:46 min) • Departure into Space (4:02 min) • Further than the Solar System (6:03 min)
Topographic study On Thursday is the Topographic Planetary Study with Augmented Reality	10-12	English	English	<ul style="list-style-type: none"> • Introduction to ESA (6:46 min) • Departure into Space (4:02 min) • The space missions that observe the Earth (5:11 min) • Paxi - The Solar System (5:18 min)
The rotation of the Sun	12-14	English	English Image1 Image2	<ul style="list-style-type: none"> • Introduction to ESA (6:46 min) • Departure into Space (7:19 min) • Science@ESA: Episode 8: The Sun, our local star (24:20 min, recommended at least the first 5 min) • Paxi - Day, night and the seasons
Solar mass ejections	14-16	English	English	<ul style="list-style-type: none"> • Introduction to ESA (6:46 min) • Departure into Space (7:19 min) • Science@ESA: Episode 8: The Sun, our local star (24:20 min, recommended at least the first 5 min)

SCIENCE CASES at ESAC and ONLINE

CHOOSE THE CORRECT SCIENCE CASE

The CESAR Science Cases deal with many different topics, all of them didactic and suitable for involving students in a science experience. A given Science Case is offered in different levels, so that teachers can pick the one more appropriate to their students' background of Mathematics and Physics. Note that not all Science Cases are available for all levels; pay attention at the level indicator and read the corresponding Teacher's Guide for further information.

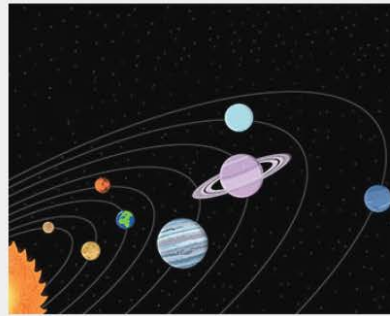
Basic



Fundamental knowledge of the Universe at one-click distance! Without formulae or complicated Math, simple as it is.

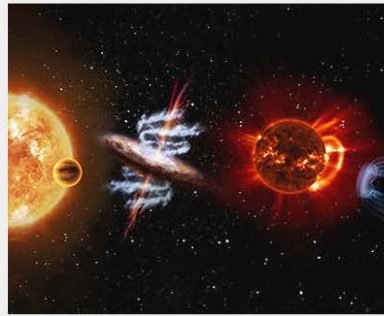
Credits: Nautilus

Intermediate



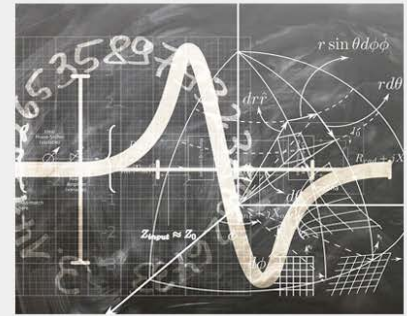
Basic Physics crafting the Cosmos! The next step to expand your knowledge of our Universe with some basic concept and formulae.

Advanced



Go one step forward! Put all your knowledge of Physics and Math to use. Skip no detail, and experience the Universe from end to end.

Super Hero

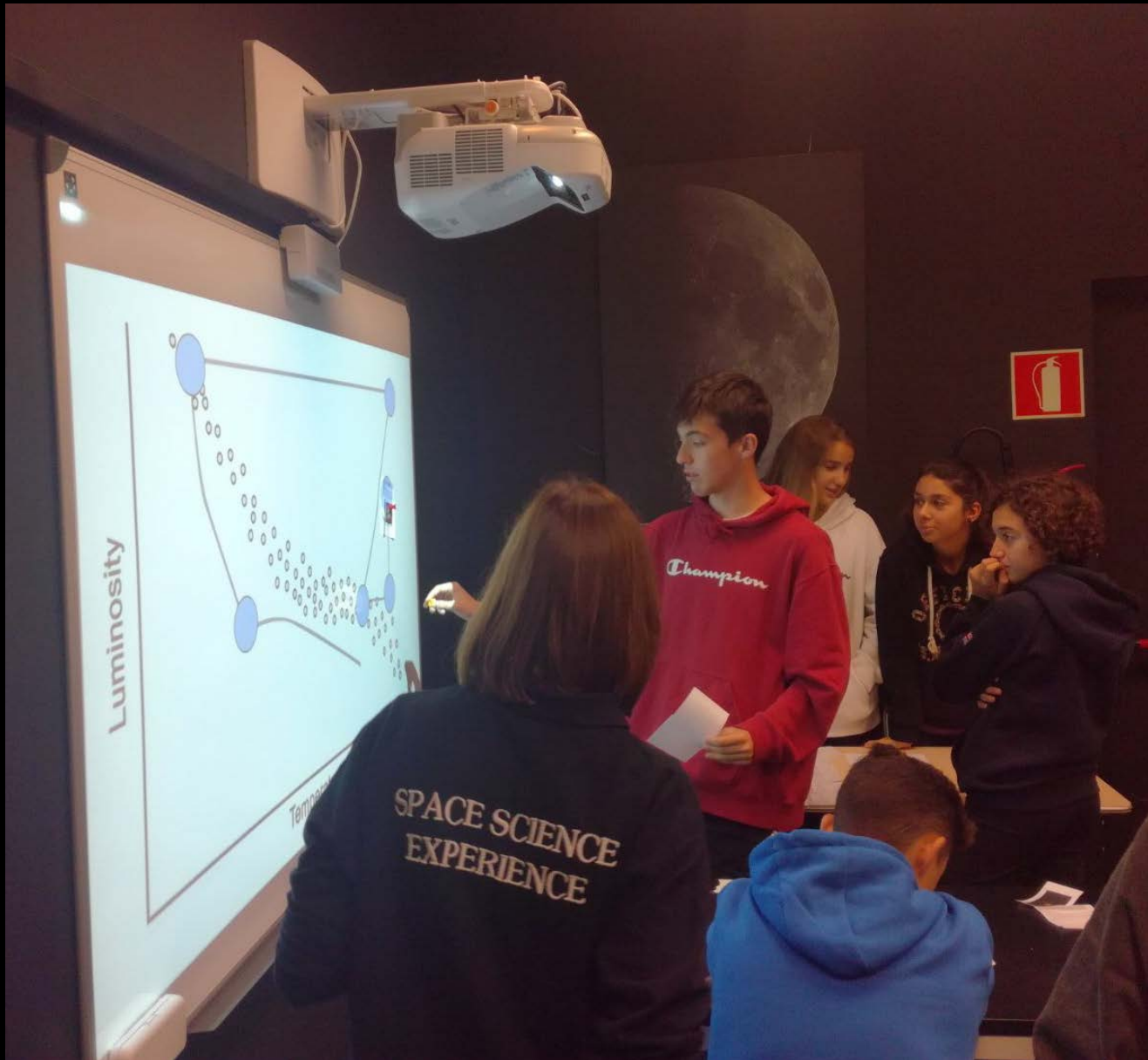


The real pro-level! Science as it is. Advanced Physics, high-level Math, and programming. Use every tool available to reveal the mysteries of the Universe.

SCIENCE CASES at ESAC



SCIENCE CASES at ESAC





Science Experience stats



GENERAL STATS (SINCE OCTOBER 2016)

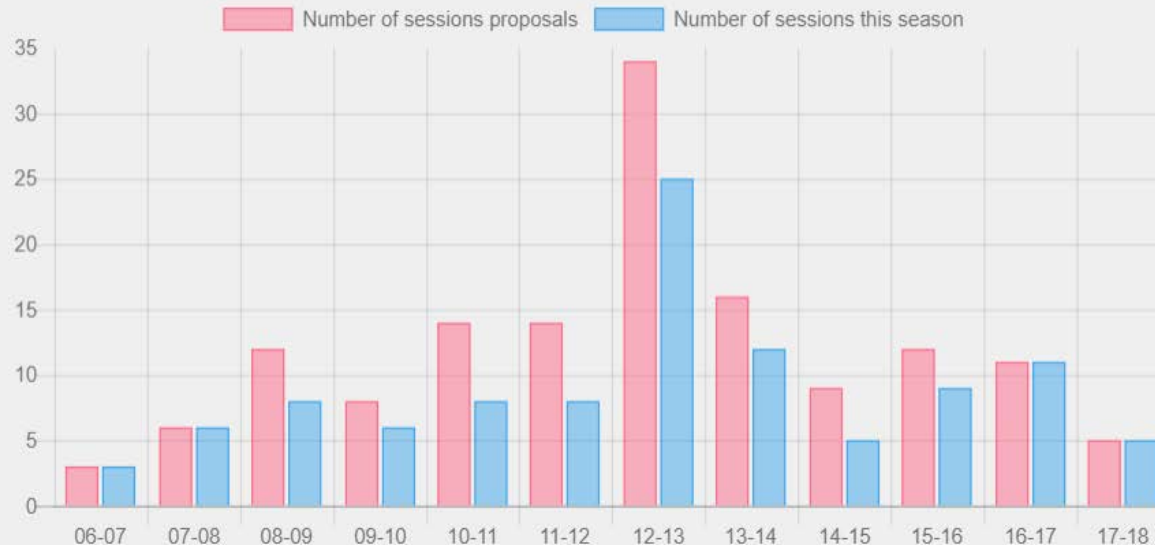
Total schools in database: **134**
 Total teachers in database: **202**
 Total students in SSE visits: **5498**
 Total sessions in SSE visits: **129**

SPACE SCIENCE EXPERIENCE 2018

Total students: **3001**
 Total schools: **47**
 Total teachers: **57** registered - **182** total in ESAC lectures
 Total sessions: **67**
 Students per session (average): **44.8**
 Teachers per session (average): **2.7**

AGES

Age	Total
06-07 years	3
07-08 years	6
08-09 years	12
09-10 years	8
09-12 years	1
10-11 years	14
11-12 years	14
12-13 years	34
13-14 years	16
14-15 years	9
15-16 years	12
16-17 years	11
17-18 years	5



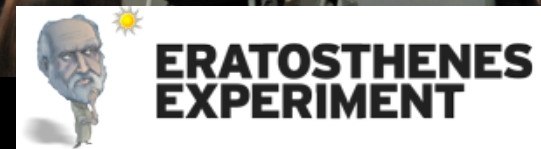
SCIENCE experience: university



SCIENCE experience: general ESAC visits



SCIENCE experience: special events at school



SCIENCE experience: student work experience



- Join ESA scientists and engineers during three days to get an insight into their daily work
- Just before their University year
- 3 days per year, 15-16 years old ~ 40 students



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Education Project CESAR



TEACHERS COURSES

Organized officially
in collaboration with
Comunidad Madrid

400+ teachers
2017-2018

4 days – 3h

Every ~3 months





Next Teacher Courses ...



24-27 Sep 2018

¿How to use a telescope in the school?

15-18 Oct 2018

Our inner Solar System: Mercury and BepiColombo, Venus and Venus-Express, Mars and Mars-Express y ExoMars

11-14 Feb 2019

**Our outer Solar System:
Jupiter and JUICE, Saturn and Cassini-Huygens,
Comets and Rosetta**

22-25 Apr 2019

Space Astronomy



Education Project CESAR



Explora el Universo con tu clase

Curso para profesores

13 -15 Junio 2018



Dr. Michel Breitfellner, Dra. Beatriz González, Angel del Pino

Imágenes cedidas por:
Abel de Burgos, CESAR, ESASky, NOAA, Professional Aero, SOHO.



CENTRO TERRITORIAL DE INNOVACIÓN Y FORMACIÓN
MADRID OESTE



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Scientific expeditions are organized to engage students with **rare exotic events**

- Super rare: Venus transits (not anymore in our lifetime)
- Mildly Rare: Mercury transits
- Normal Rare BUT AWE: solar and lunar eclipses

EXPEDITIONS EVENTS – main parts (1/2)

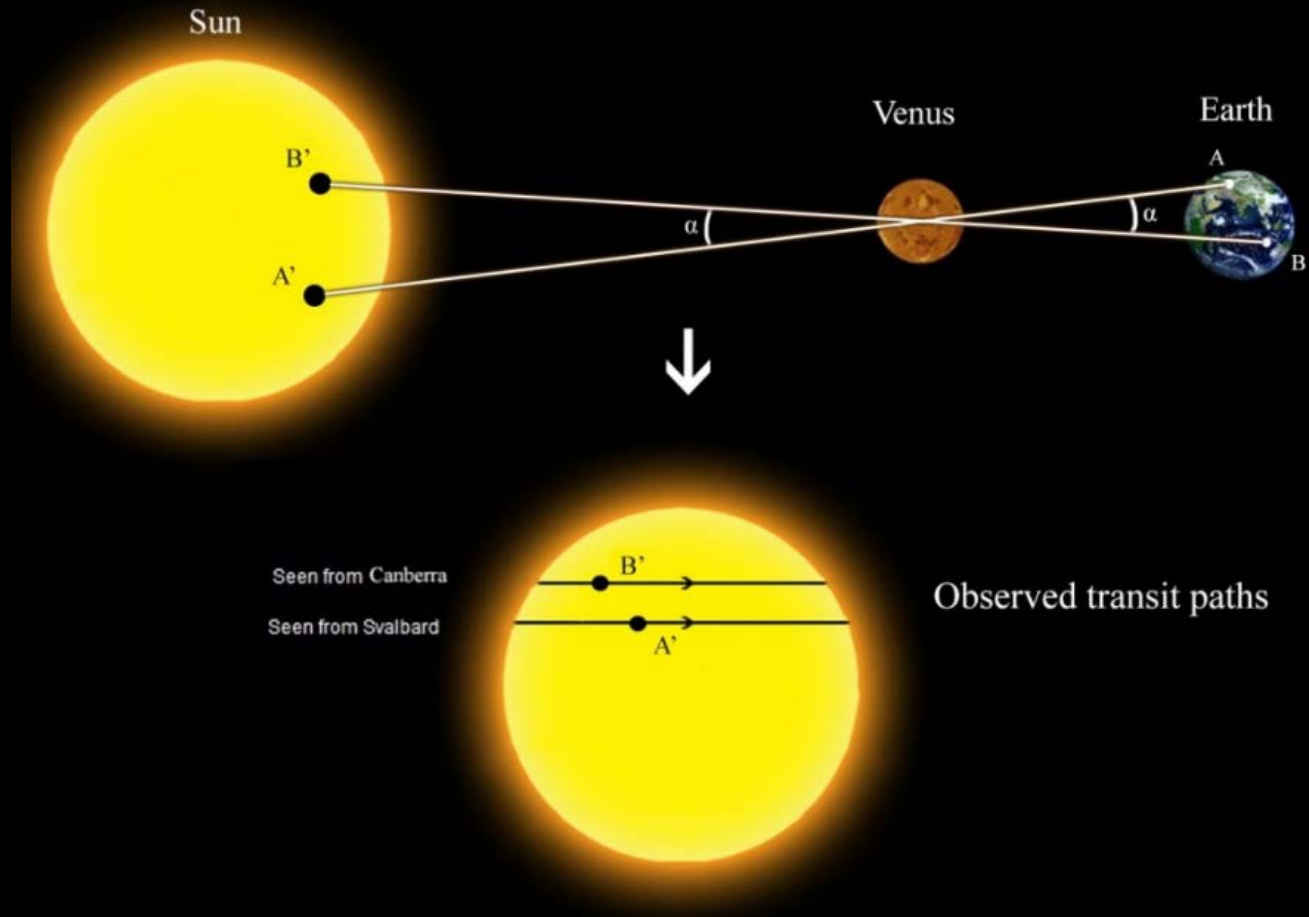
(1) Interactive LIVE transmission:

- Live images via ESAC servers in the web
- LIVE hangout with presentations from experts and LIVE connections to expeditions



EXPEDITIONS EVENTS – main parts (2/2)

(2) Creation of Offline Science Cases for students

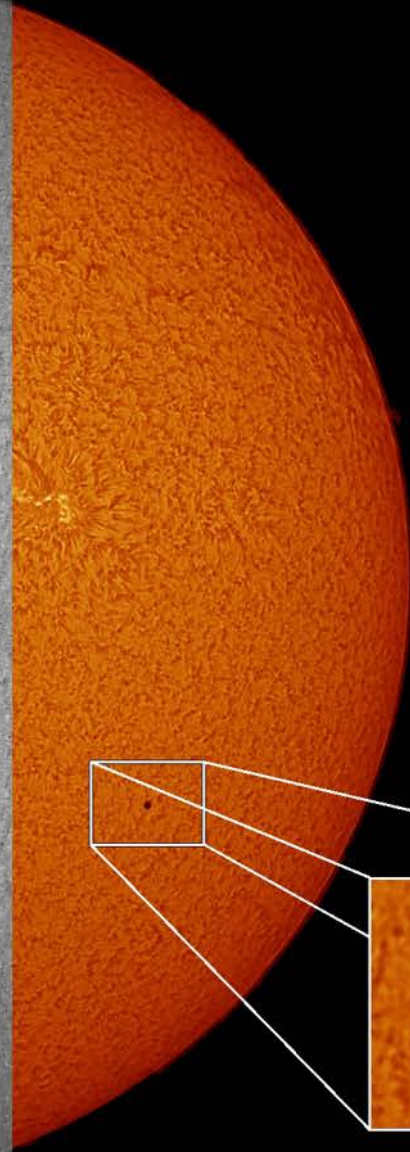




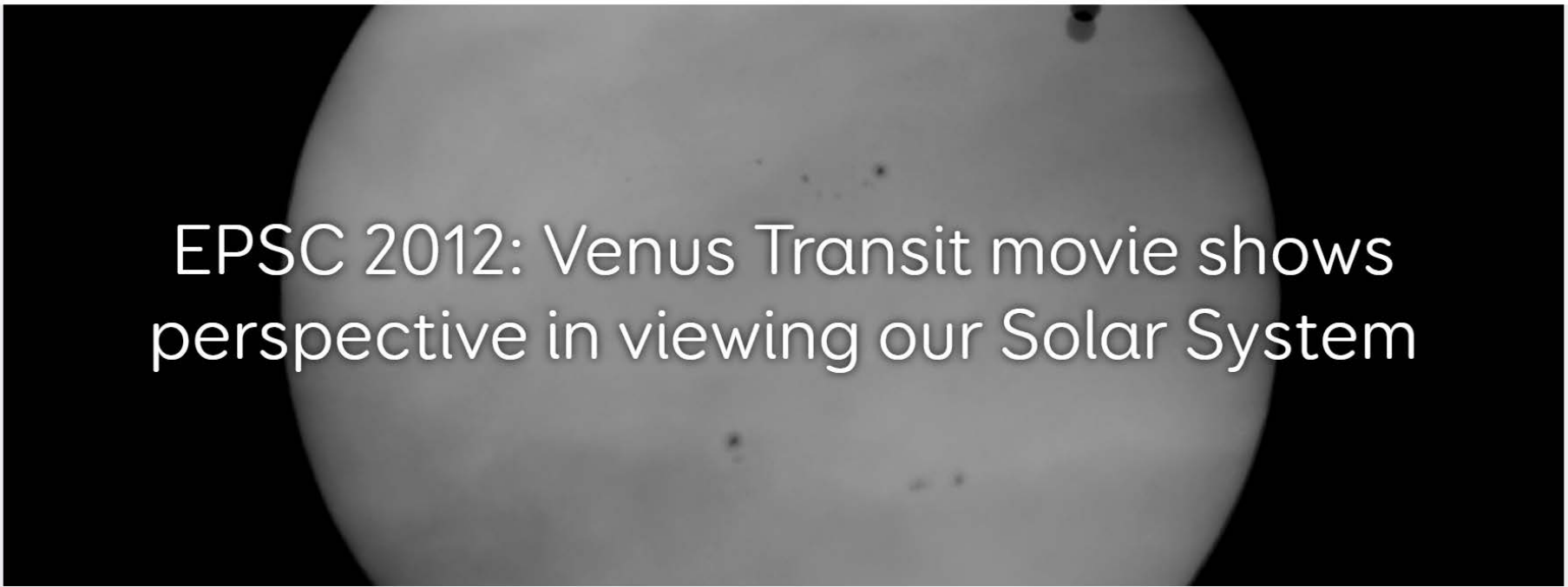
Aug 2017



June 2012



May 2016



EPSC 2012: Venus Transit movie shows perspective in viewing our Solar System



Blood Moon, 27 July 2018

THE CHROMOSPHERE

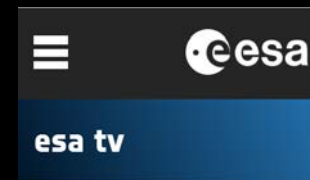
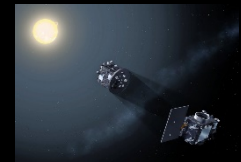


COLLABORATION

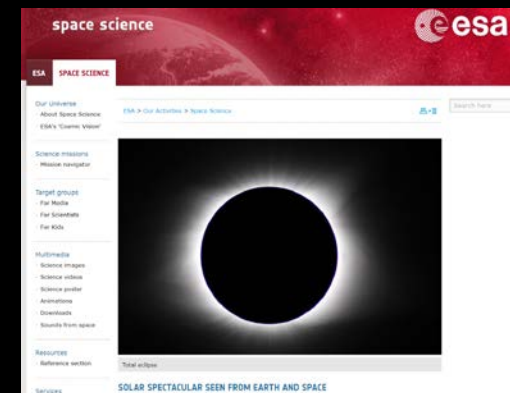
- Promote **ESA** science **satellite** projects
 - Venus Express, Solar Orbiter, Proba 2 – Proba 3, Bepi Colombo, Gaia ...



- **ESA communications**
 - ESAC Comms – Intranet, Press
 - ESA Science Comms – ESA main portal, ESA TV, Science Image of the Week



- Support from **local hosts**
 - ESO, Paranal
 - NASA Canberra Deep Space
 - Izana Observatory Teide, Canary Islands
 - Casper University



- **Education** with
 - ESA Education Office – ESTEC (science cases)



KEY POINTS

- CESAR-ESA Educational project offers **didactic material** based on own observatories and ESA Science resources, from primary to University grades.
- CESAR controls small **observatories** to directly use and obtain data
 - Optical telescopes x2
 - Solar telescopes x2
 - Radio telescope
 - Cubesat ground station
- **Education** activities are
 - School Science Experience
 - University
 - Teacher courses
 - ESAC general visits
- **Special Events** are organized to engage students with **rare astronomical events** : Venus and Mercury transits, solar and lunar eclipses