Calar Alto 2.0

João Alves & David Galadí

JENAM 2009 University of Hertfordshire, 20th Apr 2009

Outline

- Who are we and what do we do?
- Where do we want to be in 5 yrs?

Outline

Observatorio de Calar Alto – Calar Alto Sternwarte

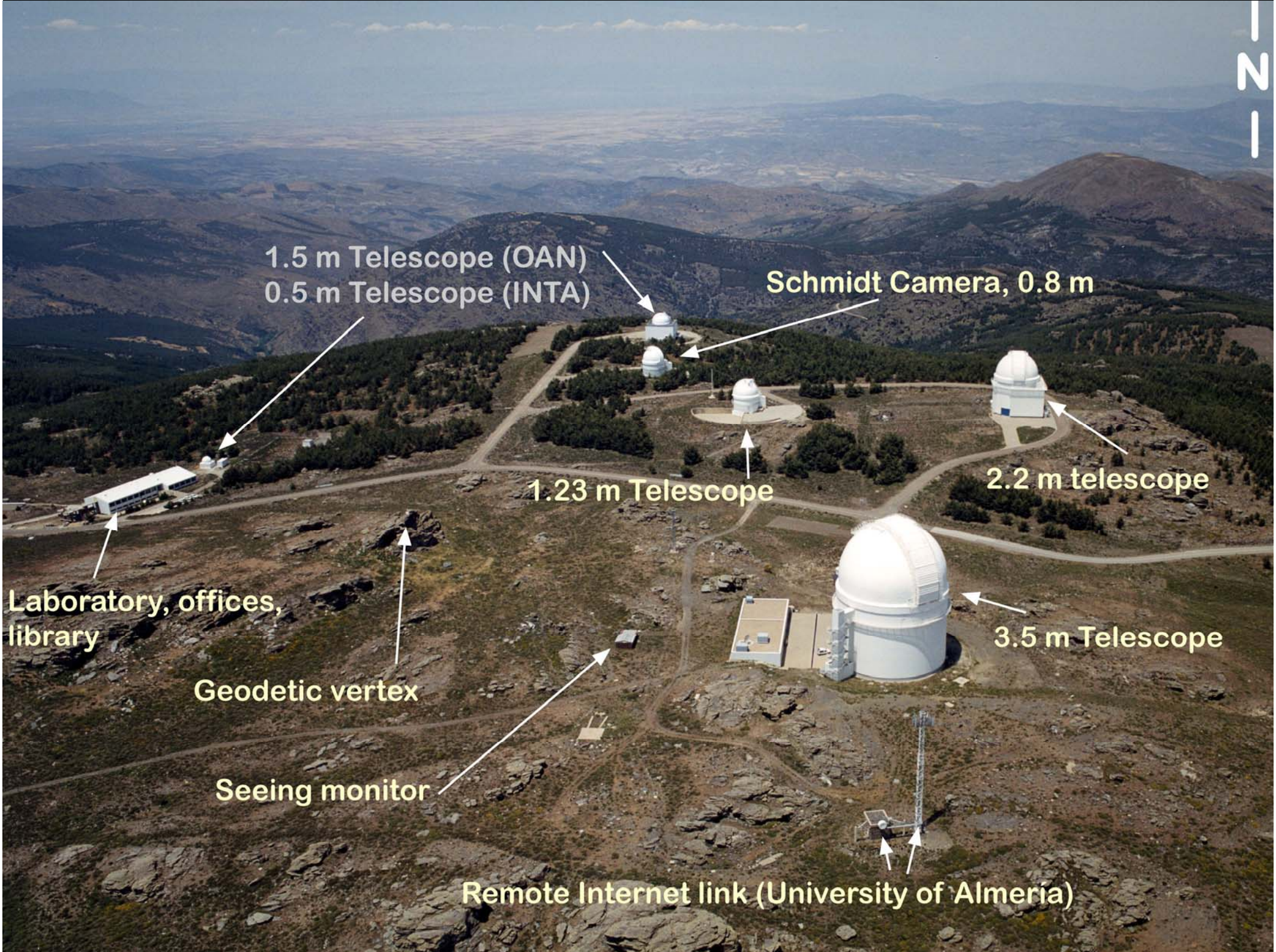
Centro Astronómico Hispano Alemán (CAHA)

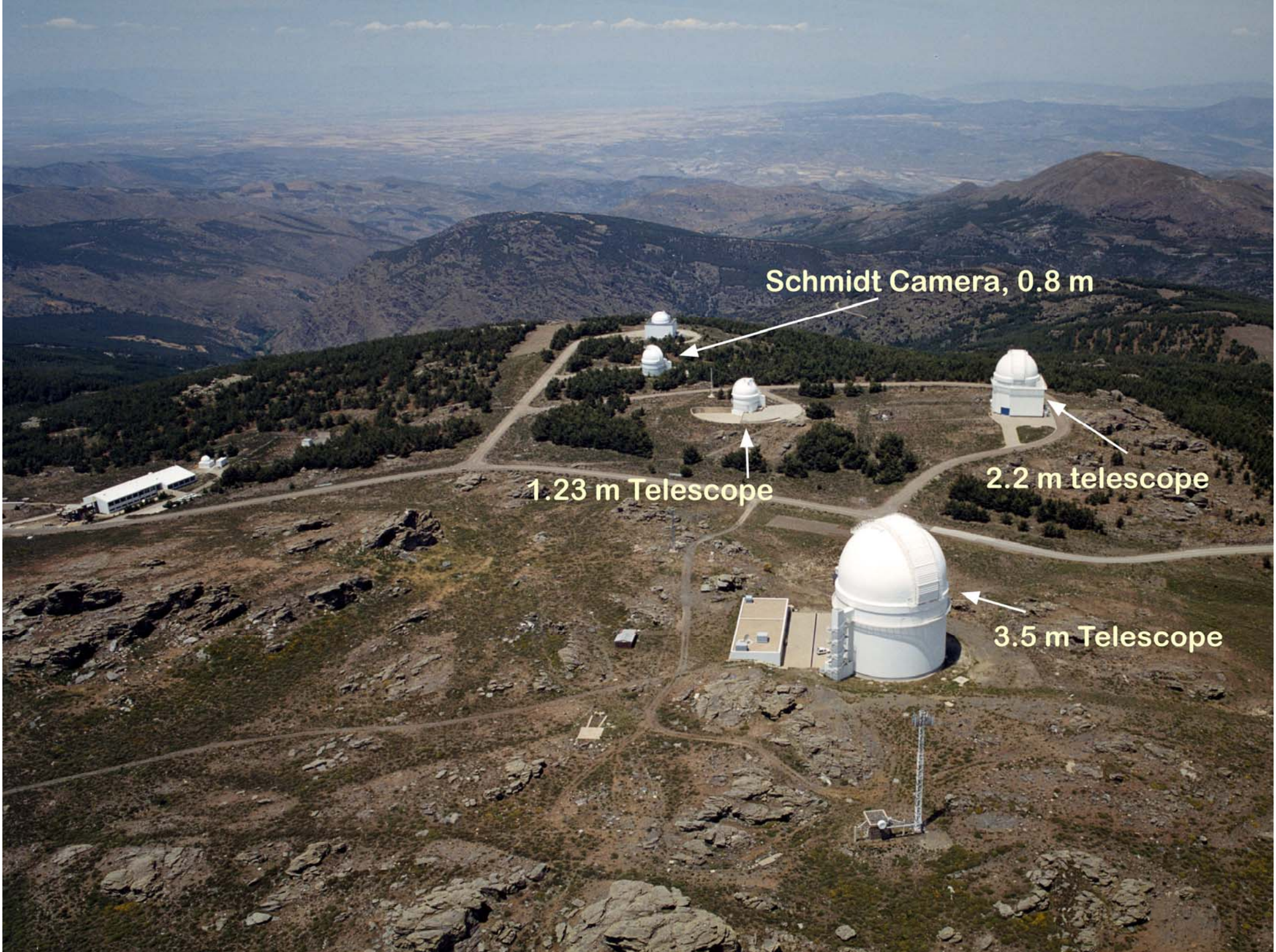
Max-Planck-Gesellschaft (MPG)

Max-Planck Institut für Astronomie, MPIA, Heidelberg

Consejo Superior de Investigaciones Científicas (CSIC)

Instituto de Astrofísica de Andalucía, IAA, Granada


N
1.5 m Telescope (OAN)
0.5 m Telescope (INTA)
Schmidt Camera, 0.8 m
1.23 m Telescope
2.2 m telescope
Laboratory, offices, library
Geodetic vertex
3.5 m Telescope
Seeing monitor
Remote Internet link (University of Almeria)


Schmidt Camera, 0.8 m
1.23 m Telescope
2.2 m telescope
3.5 m Telescope

CAHA's current mission

Provide top observational astronomy tools to its community:
State-of-the-art instruments, telescopes and services

CAHA has the sky quality, work force, experience and infrastructure necessary to accoplish successfully its current mission

CAHA's current strategy

1. **Full and exhaustive characterization of the quality of the site**

2. **Drive science operations to perform a very high fraction of service mode observations** (currently 60%-70%)

3. **Calar Alto's niche for the next decade**

4. **Education and Public Outreach**

Calar Alto NIR Sky

Sánchez et al. 2007-8

Sky quality: optical and infra-red

Extinction monitoring (one band, soon: multi-band)
Seeing monitor
Dark sky data (*U*, *B*, *V*, *R*, *I*, *J*, *H*, *K*s, *K*)
Sky spectra
Meteo data

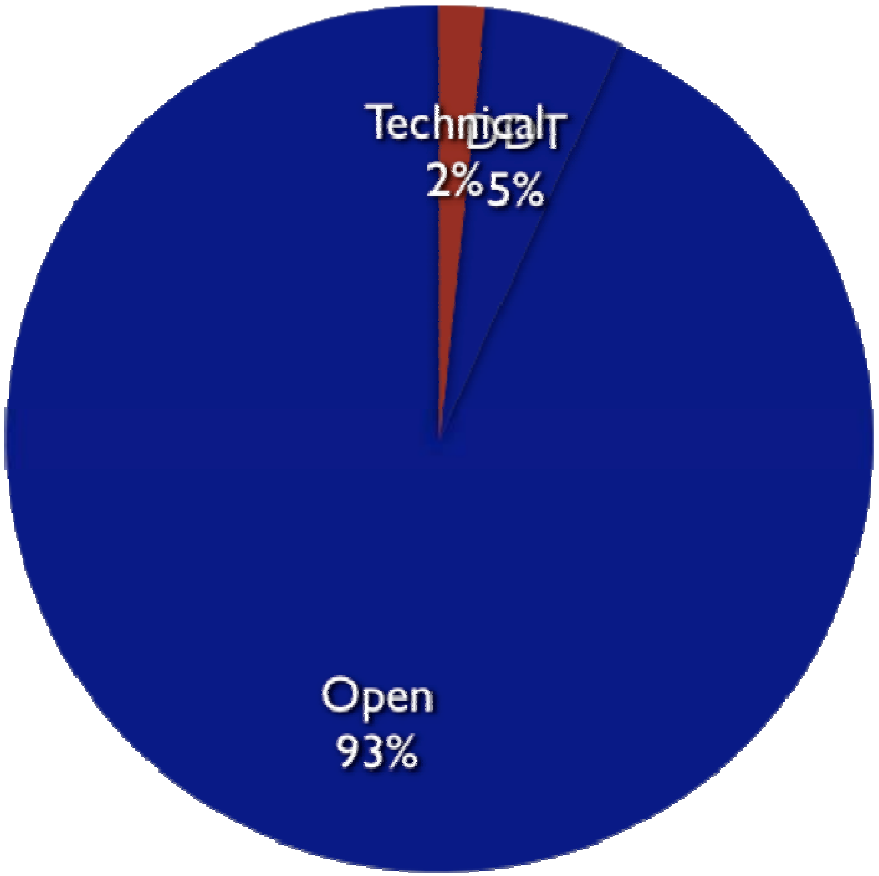
All data (raw and analised) available to the community!

Sánchez et al. (2007) *PASP* **119**, 1186-1200
Sánchez et al. (2008) *PASP* **120**, 1244-1254

Calar Alto Sky on par with sites hosting 10m-class telescopes

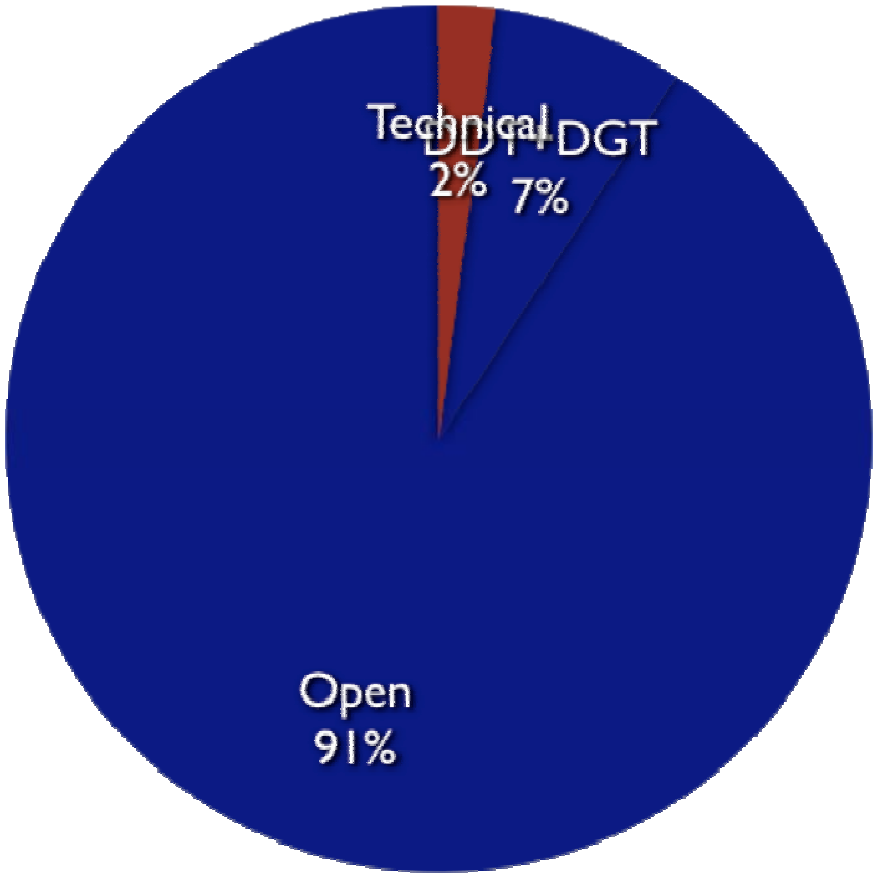
Science time in 2007

2.2m



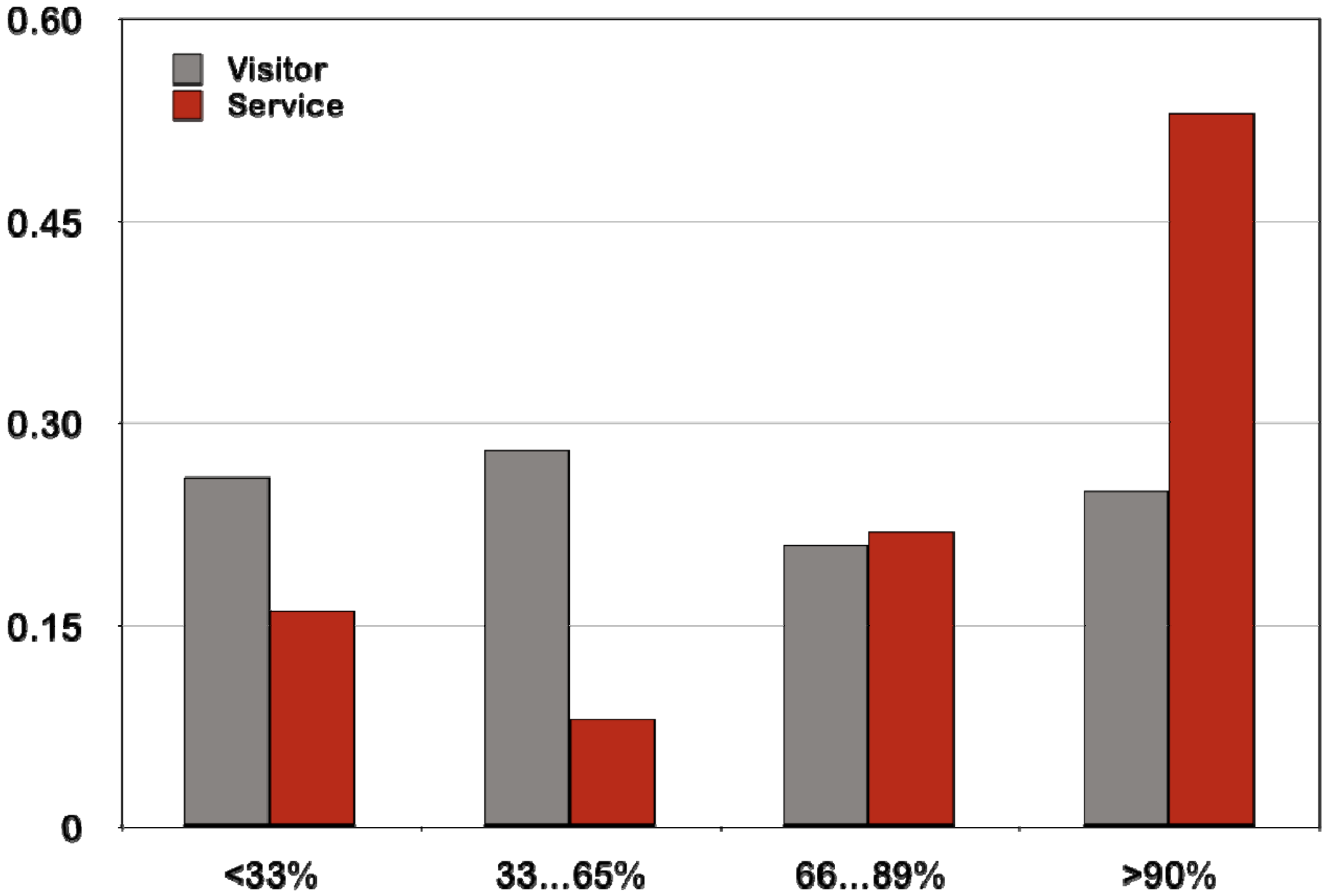
Science: 98%

3.5m

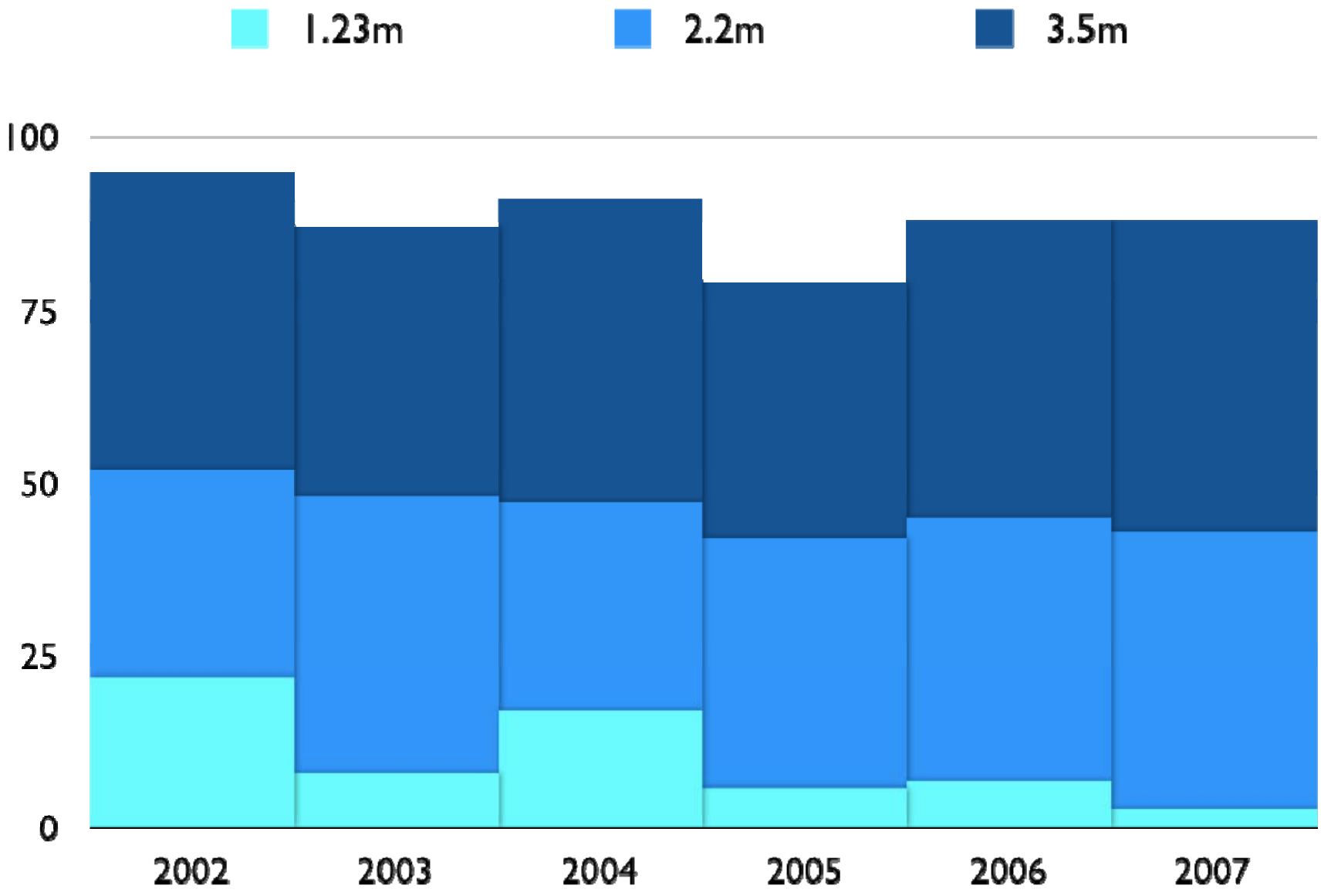


Science: 98%

Completion fraction 2007



Refereed papers



Publications

Calar Alto Astronomical Observatory

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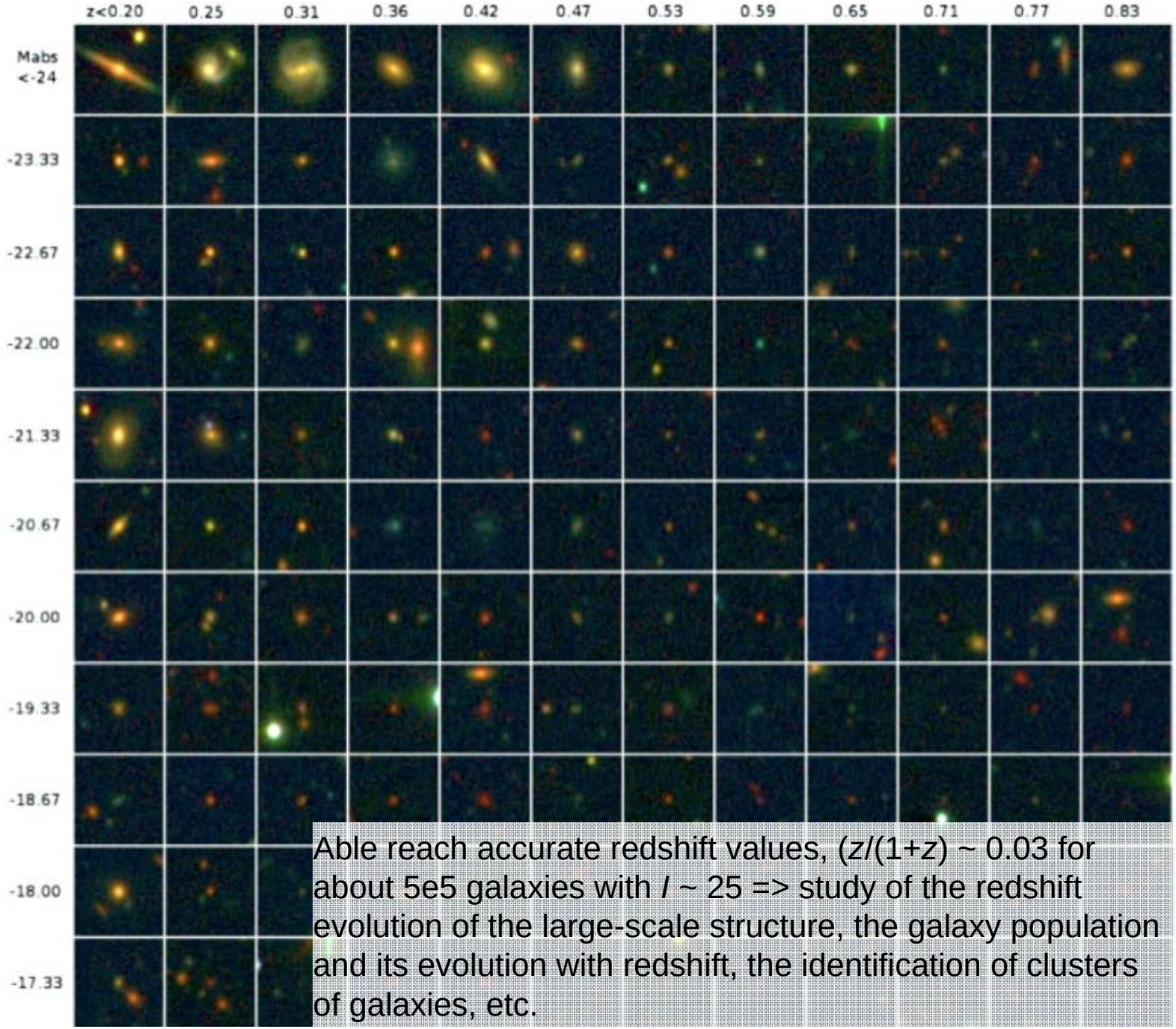
Author	Article	Year
D. Thomas	A counter-rotating core in the dwarf elliptical galaxy VCC 510	2006
S. Schuh	HS 0702+6043: a star showing both short-period p-mode and long-period g-mode oscillations	2006
J.A.Caballero	S Ori J053825.4-024241: a classical T Tauri-like object at the substellar boundary	2006
J. Fliri	The Wendelstein Calar Alto Pixellensing Project (WeCAPP): the M 31 variable star catalogue	2006
A. Richichi	The Calar Alto lunar occultation program: update and new results	2006
L. M. Lara	Pre-impact monitoring of Comet 9P/Tempel 1, the Deep Impact target	2006
A. Reiners.	Rotation- and temperature-dependence of stellar latitudinal differential rotation	2006
G. Gavazzi	Hα surface photometry of galaxies in nearby clusters	2006
P. Blay	Multiwavelength monitoring of BD $mathsf{+53degr}$2790, the optical counterpart to 4U 2206+5	2006
T. Bertram	Molecular gas in the galaxy cluster Abell 262	2006
J. Gorosabel	The short-duration GRB 050724 host galaxy in the context of the long-duration GRB hosts	2006
S. Corral	Simultaneous X-ray and optical spectroscopy of the Seyfert galaxy Mrk 993	2005
B. Voss	Discovery of seven ZZ Ceti stars using a new photometric selection method	2006
C. Broeg	Rotational periods of T Tauri stars in Taurus-Auriga, south of Taurus-Auriga, and in MBM12	2006
A. Melandri	Multi-wavelength analysis of the field of the dark burst GRB 031220	2006
	Testing the inverse-Compton catastrophe scenario in the intra-day variable blazar S5	

Selected publications

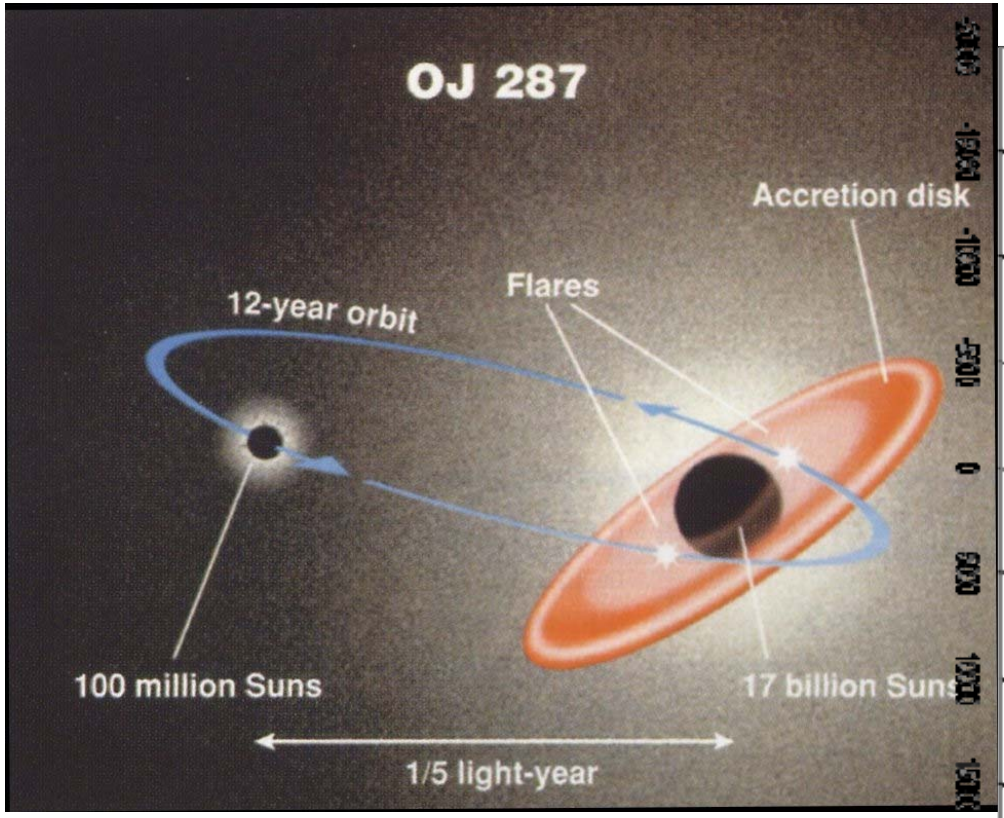
ALHAMBRA
Moles et al. 2008

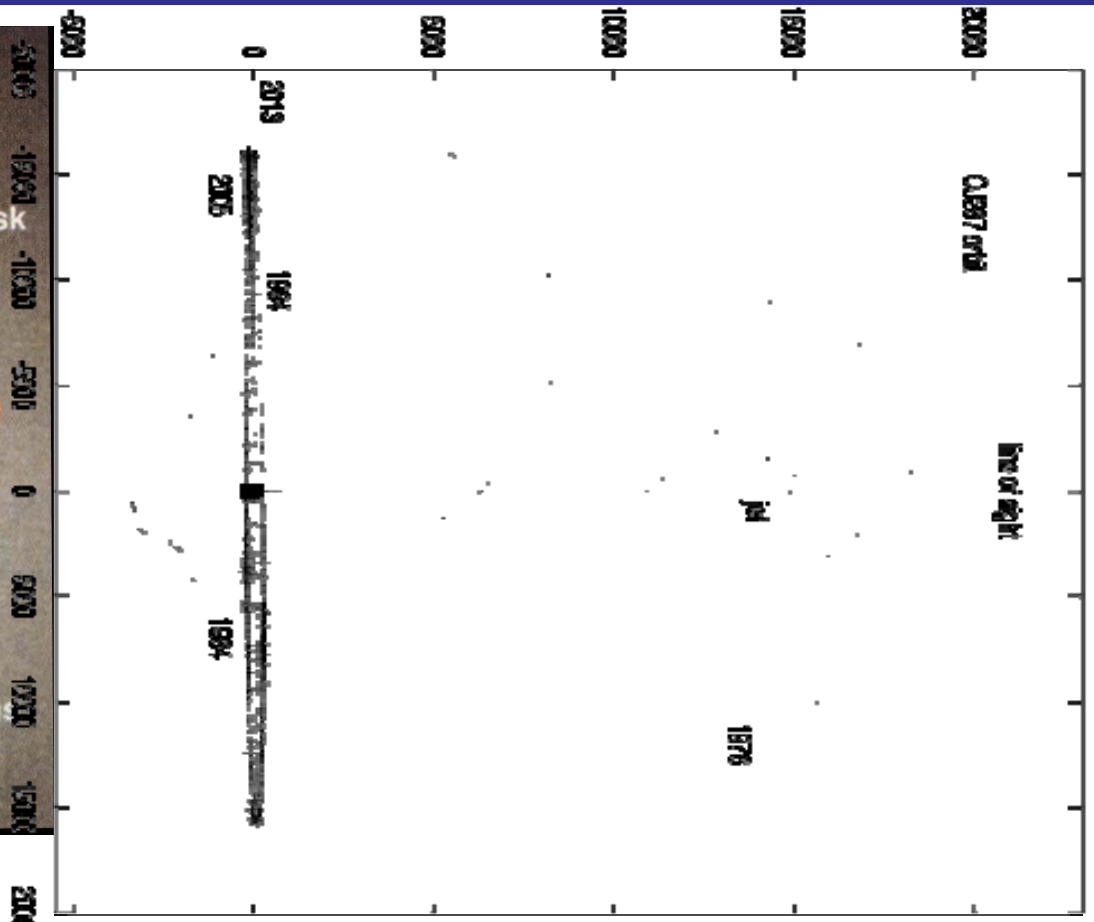


Able reach accurate redshift values, ($z/(1+z) \sim 0.03$ for about 5e5 galaxies with $I \sim 25$ => study of the redshift evolution of the large-scale structure, the galaxy population and its evolution with redshift, the identification of clusters of galaxies, etc.

Selected papers

Valtonen et al. 2008, Nature

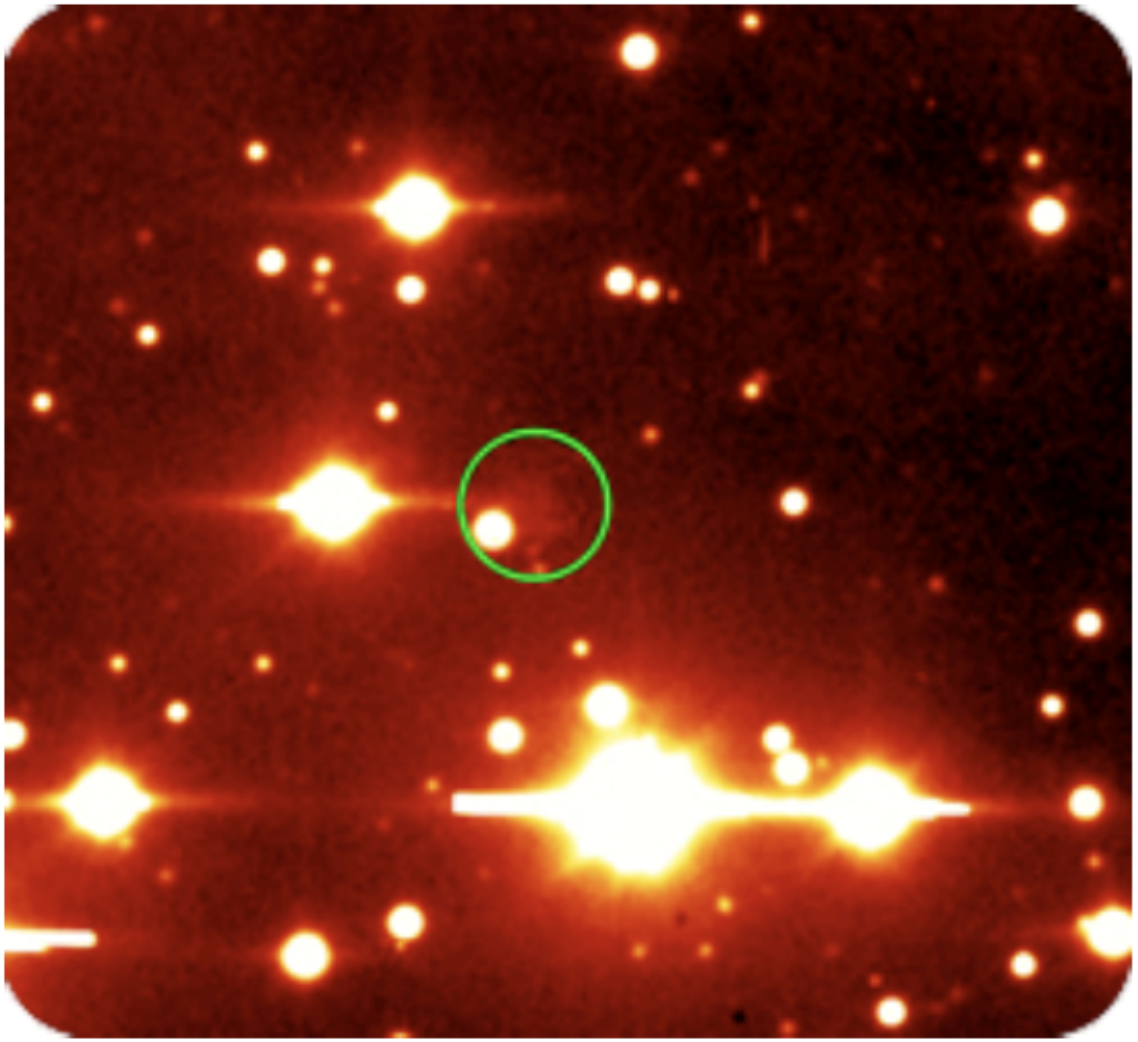




General relativity test in strong field: **The observations confirm the binary nature of the system and also provide evidence for the loss of orbital energy in agreement with the emission of gravitational waves from the system. In the absence of gravitational wave emission the outburst would have happened twenty days late**

Selected publications

Krause et al. 2008
Science

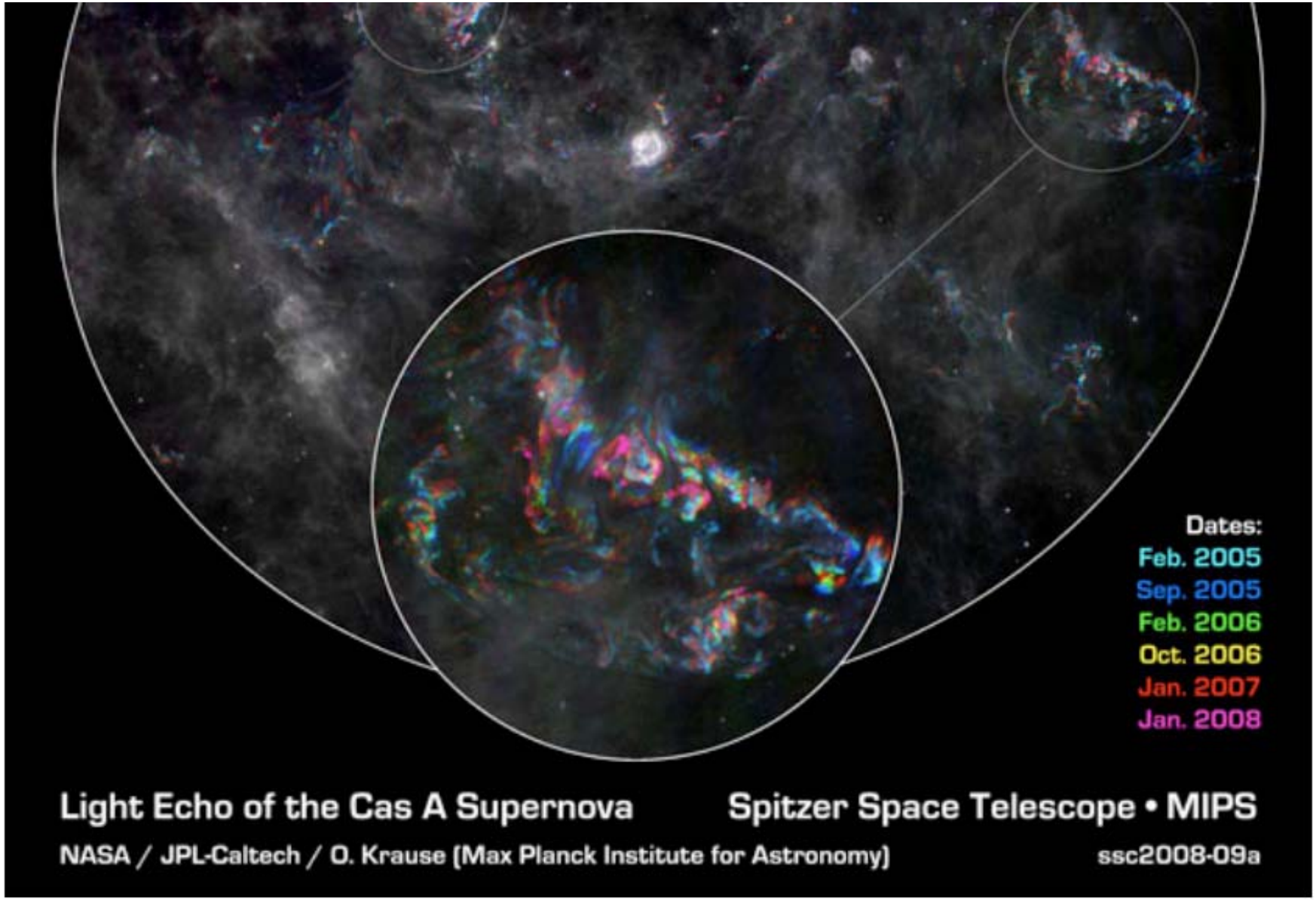


Light echo of Cass A three centuries after explosion.

Cass A was a type IIb SN. Their finding conclude a long-standing debate on the Cassiopeia A progenitor and provides new insight into supernova physics by linking the properties of the explosion to the wealth of knowledge about its remnant.

Selected publications

Krause et al. 2008
Science



Selected publications

Krause et al. 2008
Nature

A Blast from the Past: Astronomers Resurrect 16th Century Supernova – Calar Alto Astronomical Observatory

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AÑO INTERNACIONAL DE LA ASTRONOMÍA 2009

A Blast from the Past: Astronomers Resurrect 16th Century Supernova

Astronomers have used light echoes as a time machine to unearth secrets of one of the most influential events in the history of astronomy –a stellar explosion witnessed on Earth more than 400 years ago. By using a Galactic cloud as interstellar "mirror" an international team led by Oliver Krause of the **Max Planck Institute for Astronomy** in Germany has now re-analysed the same light seen on Earth in the 16th century and have, for the first time, determined the exact type of the explosion that happened. **Calar Alto Observatory** has contributed to this discovery and these results were published in the scientific journal ***Nature***, 4th December 2008 issue.

A brilliant new star appeared on the sky in early November 1572. The new star outshined all other stars in brightness and was even visible during daylight. It was widely observed by astronomers all the world and it helped to change our

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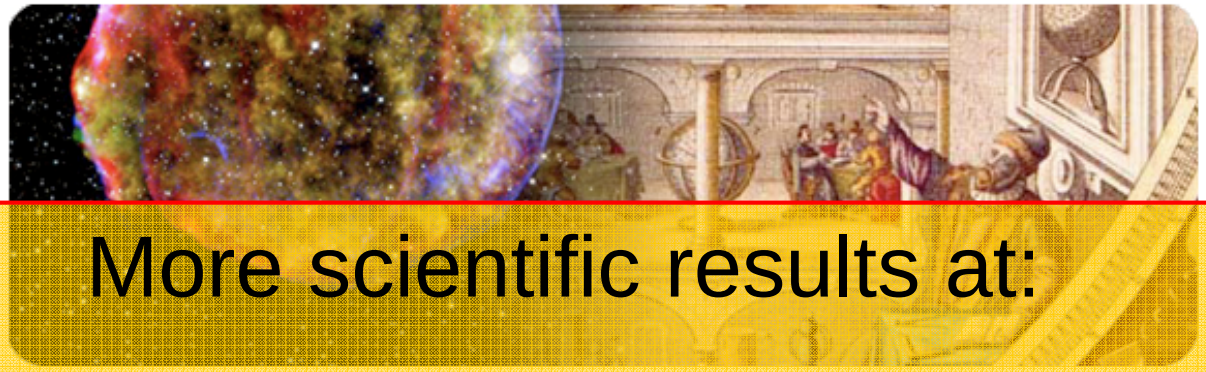

More scientific results at:

http://www.caha.es/ → Releases

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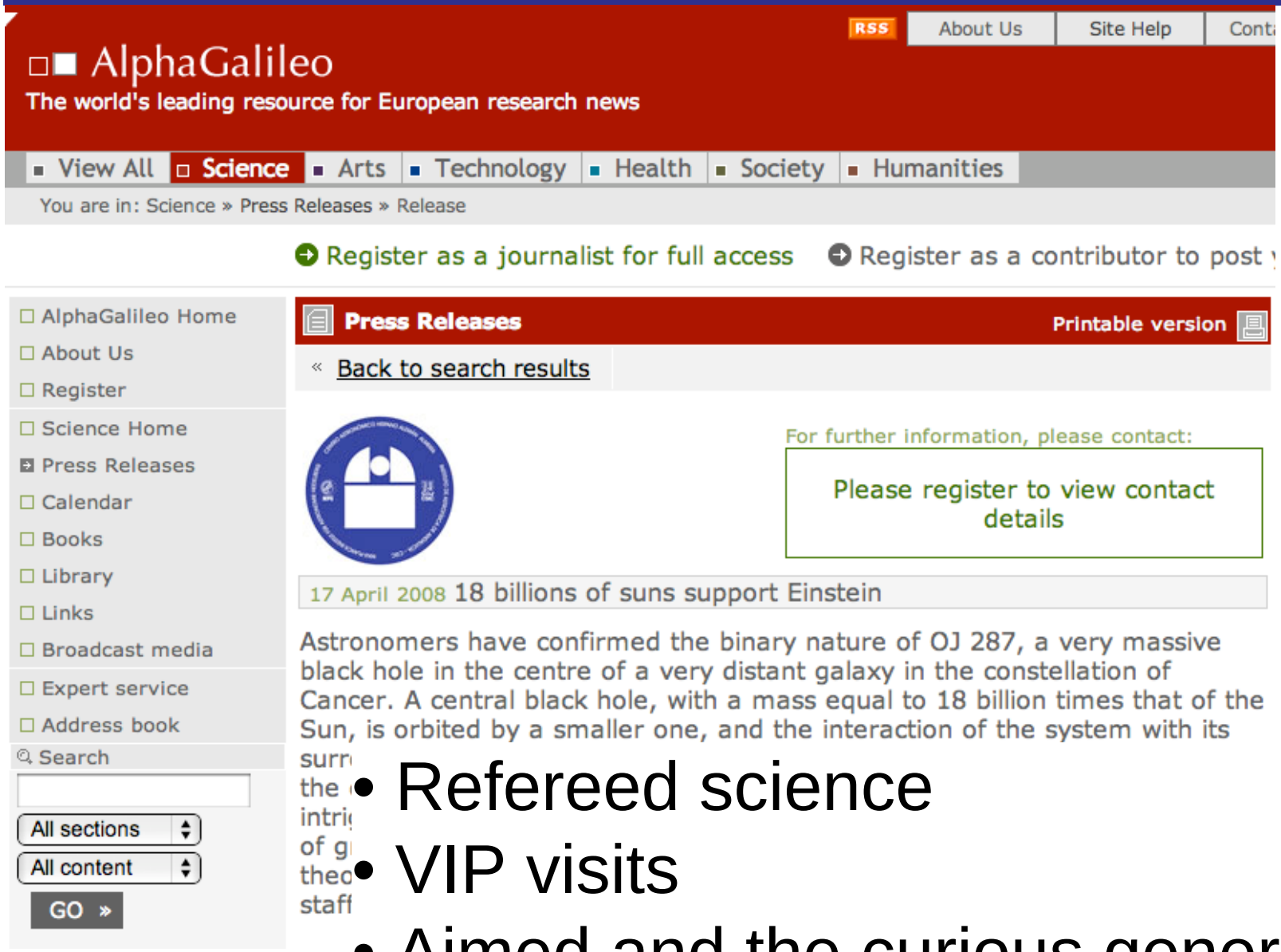
A brilliant new star appeared on the sky in early November 1572. The new star outshined all other stars in brightness and was even visible during daylight. It was widely observed by astronomers all the world and it helped to change our understanding of the Universe forever. Precise

EL UNIVERSO PARA QUE LO DESCUBRAS
AÑO INTERNACIONAL DE LA ASTRONOMÍA 2009

Calar Alto Academy

- 110 graduate students, 6 Spanish Universities
- “Zero” financial cost to observatory
- Some help needed from CAHA astronomers

Public Outreach



- Refereed science
- VIP visits
- Aimed and the curious general public

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Calar Alto Observatory-CA

The German-Spanish Astronomical Cen
Southern Spain) north of Almeria. It is o
Heidelberg, Germany, and the Instituto
provides three telescopes with aperture
telescope, also located on the mountai

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The Dark Horse (Photo Release)

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The red
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darkness of the Horsehead is caused
(smaller than 40 millionths of an inch).

This image is a RGB composition pro
simultaneously with an exposure of 300
camera BUSCA at Calar Alto 2.2m tele
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12x12 arcminutes (approx. one third of th

Full resolution image (1.2 MB)
© Calar Alto Observatory, July 2006

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Epitafio de un astrónomo afic

Suscríbete:

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2.2 m y 3.5 m, es gestionado
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Observatory - AstraLux: Hubble's sharp resolution from Calar Alto
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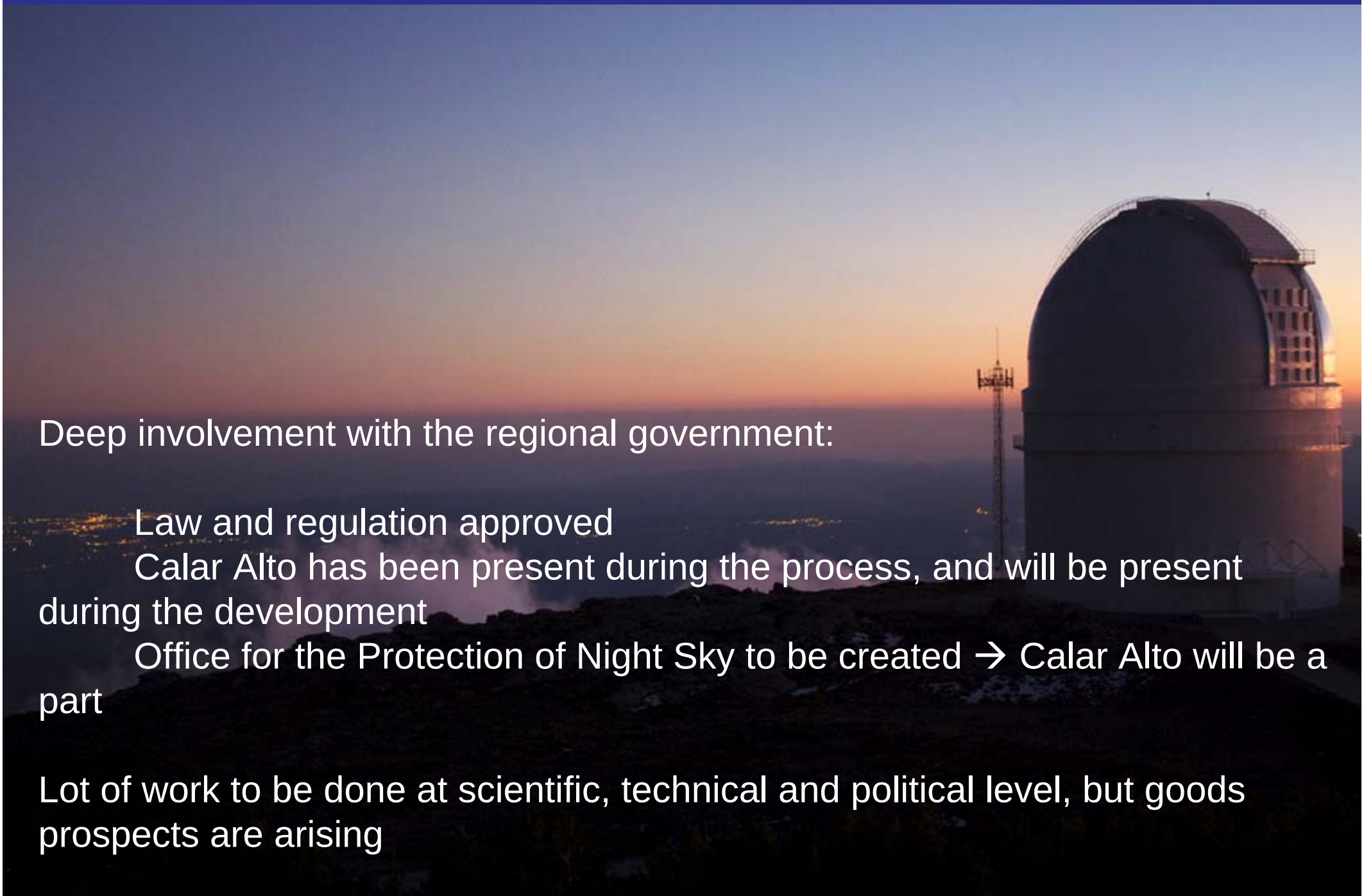
ble's sharp resolution from Calar Alto

5"

AstraLux, a new, simple instrument developed at the Max Planck Institute for Astronomy in Heidelberg, has demonstrated at Calar Alto its ability to register extremely sharp astronomical images, comparable in resolution to views obtained with the Hubble Space Telescope. The new camera circumvents the unwanted optical blurring effects of the Earth's atmosphere. Using a high-speed camera, AstraLux records the brief instants in time in which the image of an astronomical object is least affected by the turbulence of
s in a much sharper image with dramatically reduced blurring. Astronomers call this 'Imaging' Lucky, because only those fortunate moments with the best atmospheric
xted for the final image.

chnique picks the sharpest images from a set acquired during several minutes, at a
of shots per second. Typically, only 1% of the total data enter the final selection.
ng astronomers observe fine details 5 to 7 times sharper than is usually possible
Thus the ground based 2.2 meter telescope at Calar Alto matches almost the
d by the 2.4 meter Hubble Space Telescope, at a tiny fraction of the operating
capable of distinguishing details as tiny as the size of a 1-Euro coin seen from a
lometers. the instrument is bringing the telescope to the very limit of its optical
t 0.1 arcseconds at a wavelength of 900 nm, reaching the diffraction limit of the
red to Hubble. AstraLux at Calar Alto 2.2 m telescope covers a narrower field of
used to study relatively bright objects. Astronomical targets accessible with

Light Pollution



Deep involvement with the regional government:

Law and regulation approved

Calar Alto has been present during the process, and will be present during the development

Office for the Protection of Night Sky to be created → Calar Alto will be a part

Lot of work to be done at scientific, technical and political level, but goods prospects are arising

Where do we want to be in 5 years?

Calar Alto Instrumentation Workshop

IAA-Granada, June 11-13, 2008

SOC: J. Alves, M. Casali, M. Colless, R. García-López, T. Henning, J. Masegosa, S. Pedraz, F. Prada, D. Reimers, H-W. Rix, M. Roth, S. Sánchez, U. Thiele, S. Warren

LOC: J. Alves, J. Masegosa, S. Pedraz, S. Sánchez, U. Thiele

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Workshop de la Red de Infraestructuras de Astronomía (RIA)

3.5m INS design studies

1.CARMENES:

A high-resolution échelle NIR and optical spectrograph

A. Quirrenbach (LSW)
P. Amado (IAA)

- Planets around cold stars
- Astroseismology
- Astrophysics of cold stars
- …

3.5m INS design studies

2. XMS: Extremely Multiplexed Spectrograph

T. Shanks (University Durham)

- Dark matter cosmology
- 4000 slits for low-res spectroscopy of galaxies (R approx 400)
- 250 000 galaxy redshifts surveyed in 10 nights

2.2 m new developement

PANIC: Panoramic Infrared Camera

J. Fried (MPIA)
M. Fernández (IAA)

1 deg field of view
Optimised for surveys

CAHA and OPTICON

CAHA shares OPTICON philosophy and objectives

Calar Alto has participated in OPTICON and will participate in the future

2008: 20 OPTICON nights at the 2.2 m telescope
10 OPTICON nights at the 3.5 m telescope

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