

Calar Alto Observatory

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OPTICON Alliance/ORP Telescope Directors' Forum

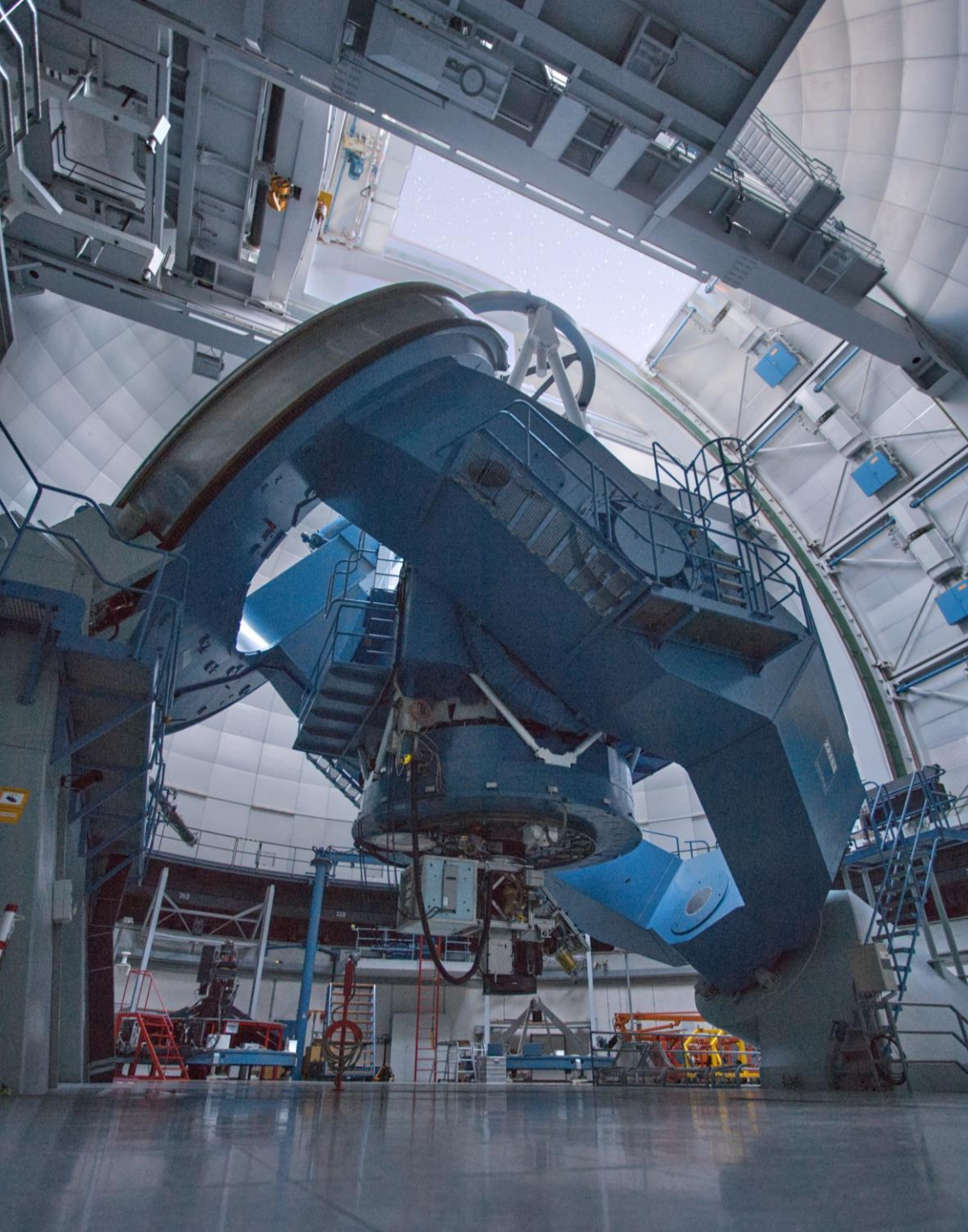
4th October 2024, Crete



Calar Alto Observatory

- **Location:** Sierra de Los Filabres (Andalucía)
- **Altitude:** 2168 m
- Agreement Germany / Spain signed in 1973 for the construction of the observatory
- **First telescope:** at 1975 the CAHA 1.23m
- **Average clear nights:** 210 night/year
- 4 telescope with larger than 1m diameter:
 - 3.5 m
 - 2.2 m
 - 1.23 m
 - Schmidt



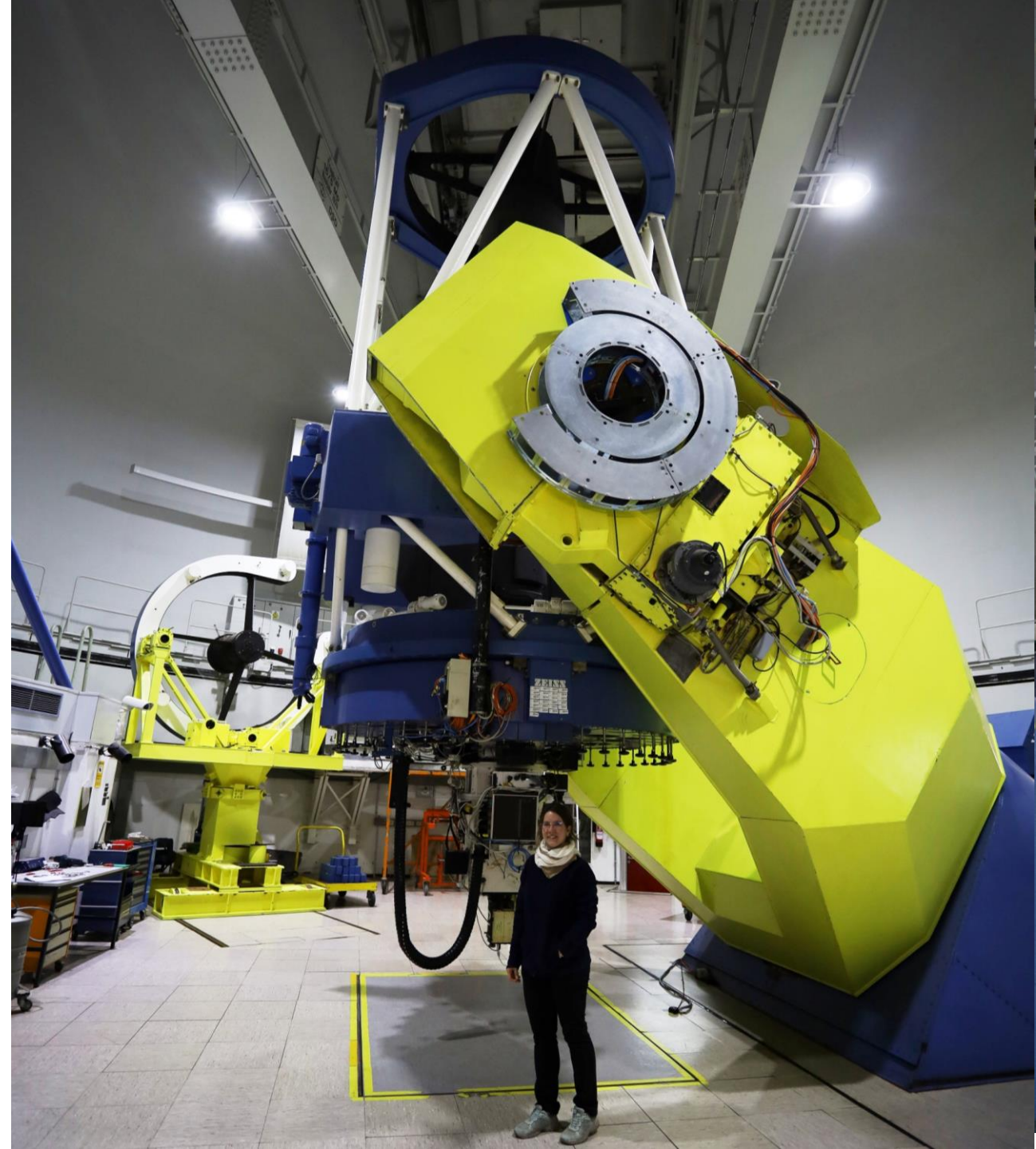


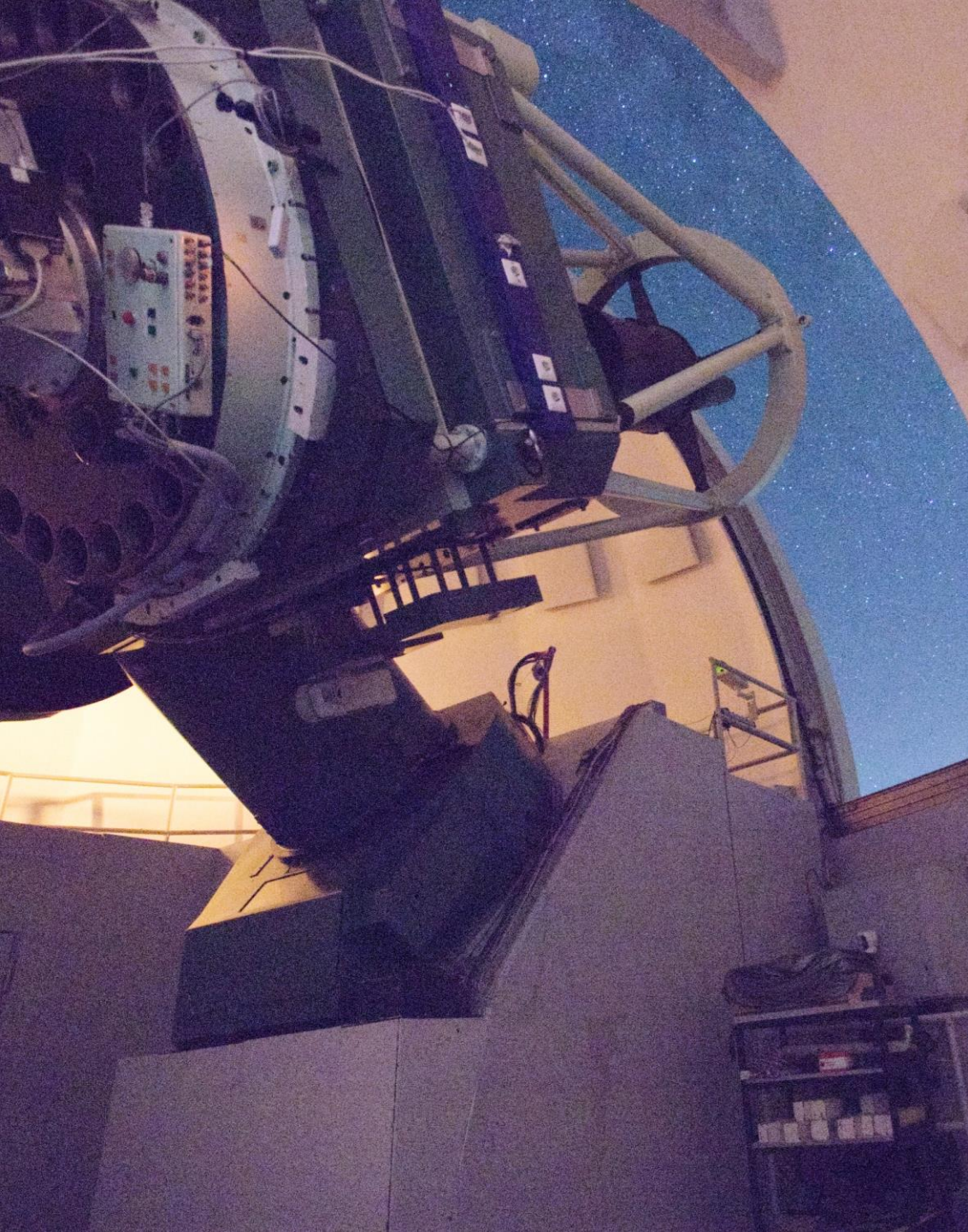
CAHA 3.5m Telescope Overview

- **Mainland Europe biggest telescope**
- **Telescope Type:** Ritchey-Chrétien reflector.
- **Primary Mirror Diameter:** 3.5 meters.
- **Focal Ratio:** f/10 at the Cassegrain focus. F1/45 in prime focus , prim focus with 4 lens f2.35
- **Field of View:** 29.47 arcmin , 2.38 min, 15.4 min
- **Mount Type:** Horseshoe Mount
- **First Light:** 1984.
- **Instruments offered:**
 - CARMENES
 - OMEGA-2000
 - PMAS

CAHA 2.2m Telescope Overview

- **Telescope Type:** Ritchey-Chrétien reflector.
- **Primary Mirror Diameter:** 2.2 meters.
- **Focal Ratio:** f/8 at the Cassegrain focus.
- **Field of View:** 33 arcmin.
- **Mount Type:** Yoke mount.
- **First light:** 1979
- Instruments offered:
 - CAFOS
 - CAFE
 - ASTRALUX





CAHA 1.23m Telescope Overview

- **Telescope Type:** Ritchey-Chrétien reflector.
- **Primary Mirror Diameter:** 1.23 meters.
- **Focal Ratio:** f/8 at the Cassegrain focus.
- **Field of View:** 1.5 degree
- **Mount Type:** Cross-Axis mount
- **First Light:** 1975.
- **Instruments:**
 - ASI461MM Pro
 - Eyepiece

CARMENES T3.5m

(Calar Alto high-Resolution search for M dwarfs with Exoearths with Near-infrared and optical Échelle Spectrographs)

- **Developed by:** A consortium of 11 institutions from Spain and Germany, including:
 - **Instituto de Astrofísica de Andalucía (IAA-CSIC)**, Spain.
 - **Max Planck Institute for Astronomy (MPIA)**, Germany.
- **Commissioned: 2016**
- **Observing Modes:**
 - **Radial Velocity Spectroscopy**
 - **Two channels:** optical and near-infrared.
 - **Resolving Power:** Optical $R \sim 94600$; NIR $R \sim 80400$.
 - **Wavelength Range:** Optical 520 nm - 960 nm; NIR 960 nm - 1710 nm.
 - **Science fiber FOV:** 1.5 arcsec
- **Detectors:**
 - **Optical:** e2v CCD231-84-1-D76 4k x 4k.
 - **NIR:** Teledyne Hawaii SGH2RG arrays 2kx2k.
- **Limiting Magnitude:**
 - **NIR:** ~ 10.5 in J band.
- **Science Cases:**
 - **Legacy+** (M-dwarfs), **KOBE** (K-dwarfs Orbited By habitable Exoplanets) **suvey**
 - Atmospheric studies of planetary systems
 - Search of new exoplanets
 - Extreme mass-ratio binary star systems



PMAS (Potsdam Multi-Aperture Spectrophotometer)

T3.5m



- **Developed by:** Leibniz Institute for Astrophysics Potsdam (AIP), Germany.
- **Commissioned:** 2001
- **Observing modes of the Integral Field Spectrograph (IFU):**
 - **Fiber Bundle (PPak):**
 - **Description:** IFU with **fiber bundle**, suited for extended objects.
 - **Fiber size:** 2.7"/fiber, 331 science fiber
 - **FOV:** 72"
 - **Spectral Range:** 255-1200nm
 - **Resolving Power:** 900 - 9000 (first order) or 5700 - 24000 (second order) .
 - **Lens Array:**
 - **Description:** IFU with **lens array**. Each lens focuses light onto an individual fiber, providing high spatial resolution.
 - **FOV:** 16"x16", 12"x12" or 8"x8"
 - **Spectral Range:** 255-1200nm
 - **Resolving Power:** 600 - 6000 (first order) or 3800 - 16000 (second order)
 - **Larr magnifications:** 0.5 - 0.75 - 1.0 (with FOVs 8"x8" - 12"x12" - 16"x16")
- **Detector:** E2V CCD231 4k x 4k
- **Limiting Magnitude:** 23 mag.
- **Science Cases:**
 - Metallicity studies of Cepheid and SN Ia host galaxies
 - Mapping the mass distribution of void galaxies
 - Studying star forming regions of galaxies
 - **CALIFA (past) , CAVITY (current) survey**

OMEGA2000 T3.5m

(Wide-field Near-infrared Camera)

- **Developed by:** Max Planck Institute for Astronomy (MPIA), Heidelberg, Germany.

- **Commissioned:** 2003

- **Observing Modes:**

- **Near-infrared Imaging:**

- Field of View (FOV): 15.4 x 15.4 arcmin.

- Wavelength Range: 0.85 μm - 2.5 μm (z to K bands).

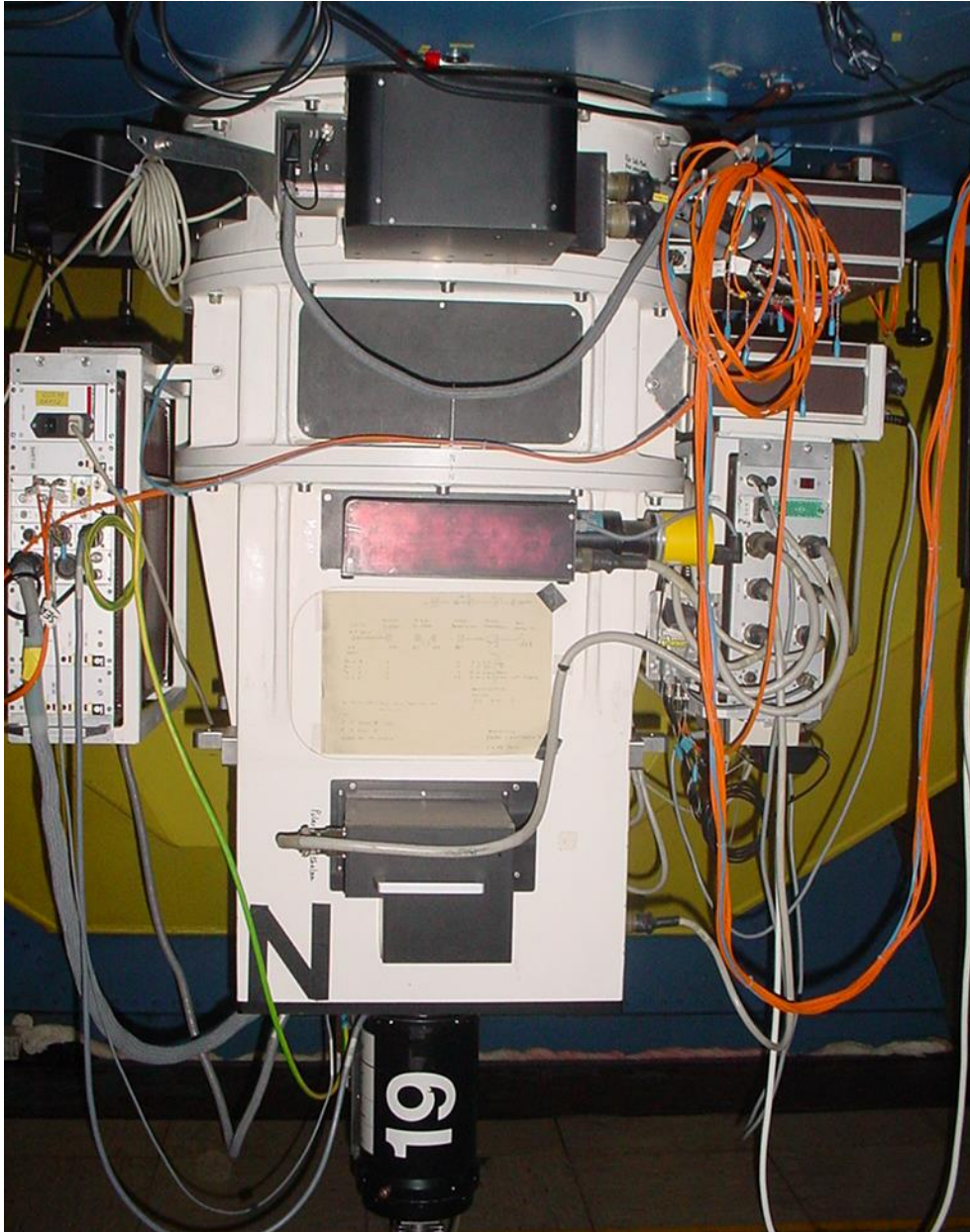
- **Detector:** 2k x 2k HgCdTe array.

- **Limiting Magnitude:** 22 J mag.

- **Science Cases:**

- Study galaxy cluster membership at high redshift
 - Monitoring supernova remnants, gravitational wave counterparts.





CAFOS

T2.2m

(Calar Alto Faint Object Spectrograph)

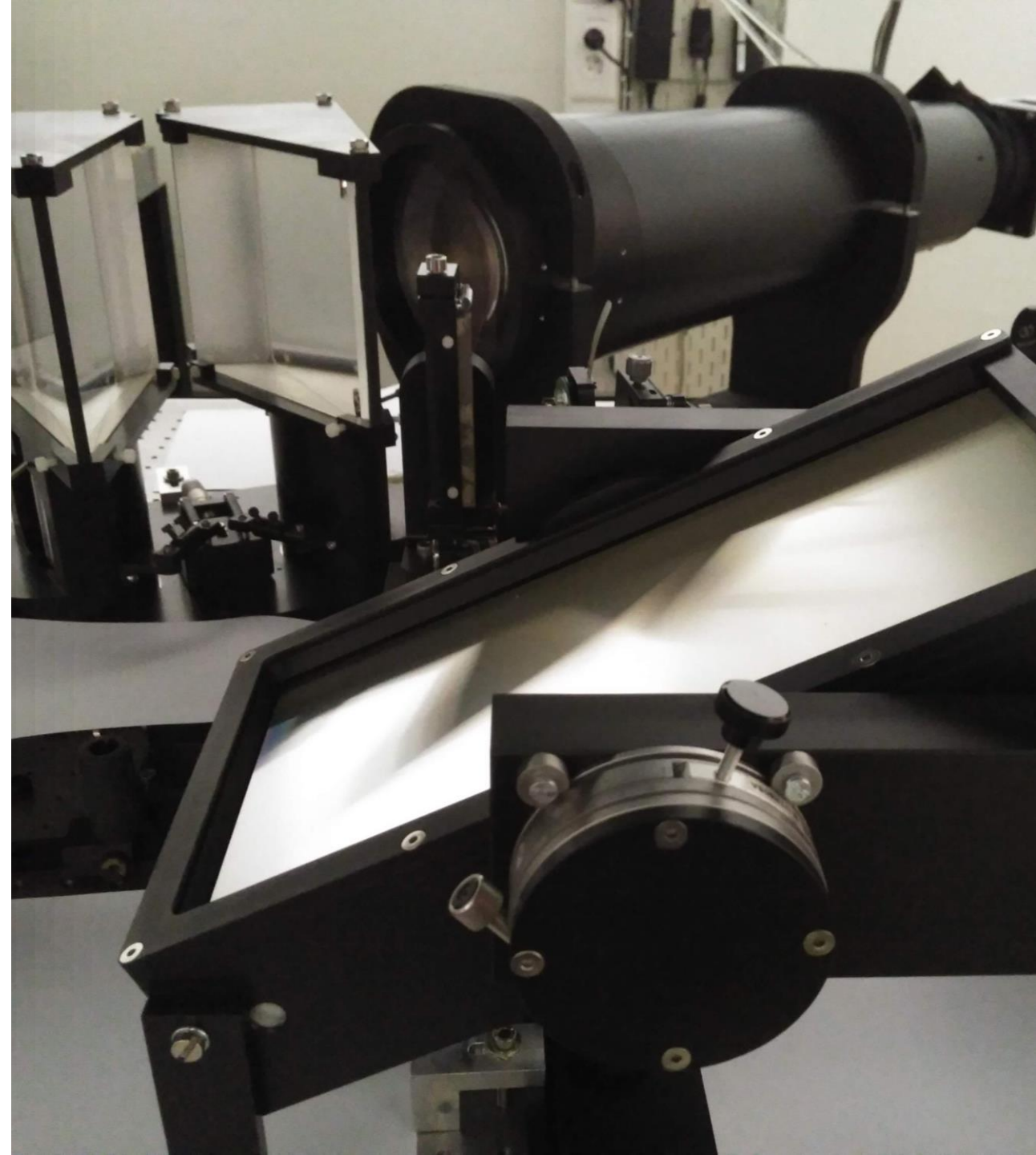
- **Developed by:** Max Planck Institute for Astronomy (MPIA), Heidelberg, Germany.
- **Commissioned:** 1996
- **Observing Modes:**
 - **Imaging:**
 - Available filter range: 480 nm - 1083 nm (both narrow and broad band filters).
 - FOV: 16 arcmin.
 - **Spectroscopy:**
 - **Slit:** Variable width, from 0.6" to 12".
 - **Grisms:** Three grism sets covering 320 nm - 1100 nm.
 - Resolutions: 400 Å/mm, 200 Å/mm, 100 Å/mm.
 - **Polarimetry (Imaging + Spectroscopy):**
 - Uses Wollaston prism and a rotatable $\lambda/2$ plate.
 - **Fabry-Pérot Etalon:**
 - Narrow band imaging in the 600 nm - 1000 nm region.
 - Resolution: $R = \lambda/\Delta\lambda = 500$.
- **Detector:** 2k x 2k SITe#1d CCD.
- **Limiting Magnitude:** imaging 23 mag.
- **Example of science cases:**
 - Quasar, Solar system object, supernova remnant, etc.. monitoring
 - **Reverberation Mapping survey**

CAFÉ

(Calar Alto Fiber-fed Echelle Spectrograph)

T2.2m

- **Developed by:** CAHA, Observatory of Munich University and the Astrophysics Department of the University of Goettingen
- **Commissioned:** 2011
- **Observing Modes:**
 - **High-resolution Spectroscopy:**
 - Resolving Power: $R \sim 62,000$.
 - Wavelength Range: 396 - 950 nm.
 - Science fiber FOV:
- **Detector:** iKon-L DZ936, 2kx2k CCD
- **Limiting Magnitude:** 14.5 mag
- **Science Cases:**
 - Monitoring stars with possible exoplanet systems.
 - Stellar activity and binary star studies.



ASI461MM Pro

T1.23m



- **Detector:** CMOS sensor 2048 x 2048 pixels.
- **Detector sensitivity:** 400 nm - 900 nm.
- **Available filters:** 358-910nm
- **Limiting Magnitude:** 21 in V band.
- **Science Cases:**
 - Time-series photometry for variable stars
 - Asteroid monitoring and minor planet detection.
 - Supernova searches and other transient phenomena.
 - Standard star monitoring

Ongoing projects

- **New instruments:**
 - 3.5m TARSIS
 - 2.2m PANIC
 - 1.23m new CMOS camera
 - Visitor instruments: PlanetCam for 2.2 and DSLR for 1.23
- **Telescope upgrades:**
 - 1.23m telescope control system
- **Science cases:**
 - Search for new long term projects possibly in collaboration with larger institutes.





Contributions in ORP projects

- **OPTICON's Trans National Access**
 - Period 2004-2025
- **Hosting NEON schools**
 - 2000
 - 2005
 - 2010
 - 2025

Impact of ORP in our operation

- Filling a gap in the budget for supporting new developments
- International visibility
- Participating in training





This data server provides access to the [CAHA](#) Archive. The German-Spanish Astronomical Center at Calar Alto is located in the Sierra de Los Filabres (Andalucía, Southern Spain) north of Almería. It is operated jointly by the [Max-Planck-Institut für Astronomie \(MPIA\)](#) in Heidelberg, Germany, and the [Instituto de Astrofísica de Andalucía \(CSIC\)](#) in Granada/Spain. Calar Alto provides three telescopes with apertures of 1.23m, 2.2m and 3.5m to the general community.

Resources

► Archive Search Form

► CAHA Asteroid Catalogue

► CALIFA:

- Catalogue access (web)
- Data access (web)

► ALHAMBRA:

- Project Web page
- Catalogue access (VO, ConeSearch)
- Image access (VO, SIAP)

► Help Desk

► System Overview

► News

► Private zone

Future with the ORP Alliance

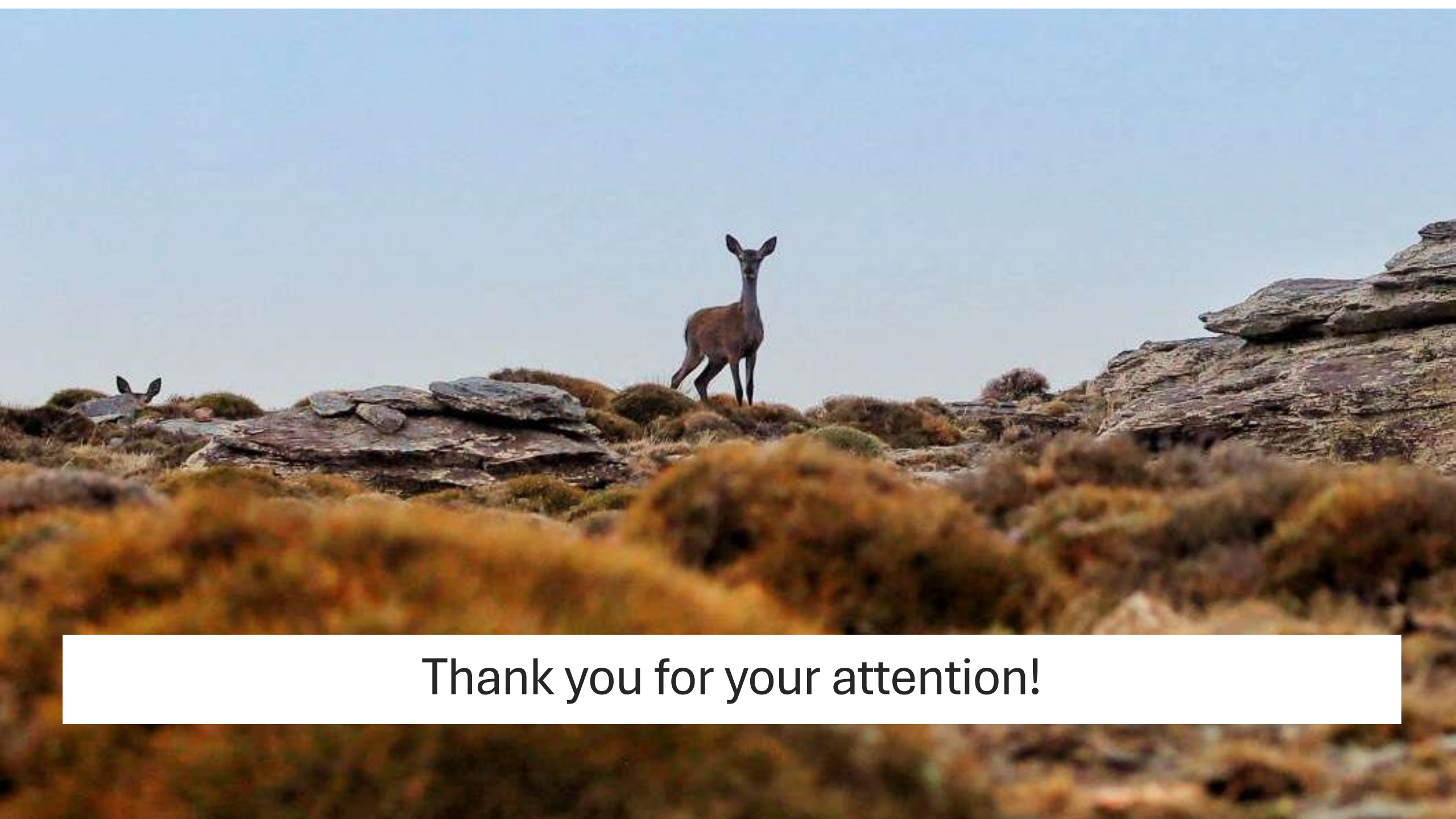
- Continuing contributing into TNA:
 - Limited free telescope time:
 - 1 night at the 2.2m telescope
 - 3 hours at the 3.5m telescope
 - Exchanging telescope time with work power of students
- Continuing contributing into education:
 - Providing support in organization of educational activities
- Supporting new developments:
 - Testing instruments on the 1.23 (paid telescope time)
 - Testing new equipment mounted on the land area of the observatory
 - Providing historical data from the 2.2 and 3.5 telescopes

If you use this service in your research, please include the following acknowledgement in any resulting publication

Conclusions

- Wide variety of instruments supporting various science case
- 70% telescope times for surveys
- We would be interested continuing the collaboration in the ORP program





Thank you for your attention!