



Olga Balsalobre-Ruza

PhD candidate [defending in May 2026]

Center for Astrobiology (CAB)

Madrid, Spain

obalsalobre@cab.inta-csic.es

<https://github.com/olgabalsa/olgabral/>

Spanish [Native] & English [Advanced, C1]

I graduated in Physical Sciences with a major in Astrophysics from the Complutense University of Madrid. I pursued various internships to explore the areas that interested me the most, including high-energy astrophysics, observational astronomy, instrumentation with data from the Rover Curiosity, and exoplanet research. Currently, I am a **last-year** (fourth) **PhD student** at the Center for Astrobiology in Madrid, specializing in the **search** and characterization of **exoplanets** and co-orbital using various techniques, with a strong focus on the **radial velocity** (RV) and **direct imaging** (DI) methods. I am an enthusiastic Python programmer with a keen interest in expanding my skills, for instance in astro-statistics and machine learning. During my PhD, I published **4 first-author** and **7 co-authored papers**, developed **2 Python packages**, and presented my work at international conferences and institutions (**15 talks & 6 posters**). I enjoy both independent and collaborative work, seeing the latter as necessary in science. Outside of research, I enjoy music, nature, social events and practicing sports.

Education

Bachelor in Physics University Complutense of Madrid (UCM) • Honors in three subjects • Speciality in Astrophysics 2015 - 2020	BSc thesis Gamma Rays data analysis detected with Cherenkov telescopes	Master in Astrophysics UCM • Honors in two subjects • Honors in the MSc thesis 2020 - 2021	MSc thesis Development of a Python algorithm to improve the efficiency of the detection of exoplanets in Radial Velocity (RV) Surveys	PhD in Astrophysics UCM & Center for Astrobiology (CAB) supervised by Dr. Jorge Lillo-Box & Dr. Nuria Huélamo Multi-technique search for co-orbital exoplanets with RV, DI and transits. 2022 - [2026]
---	--	---	---	---

Publications in peer-reviewed journals

First-authored

- (1) **Balsalobre-Ruza** et al., in prep.
Dust clumps at close separations to PDS 70 with star-hopping: a third protoplanet or spiral arms?
- (2) **Balsalobre-Ruza** et al., *A&A*, 694, A15
KOBE-1: The first planetary system from the KOBE survey. Two planets likely in the sub-Neptune mass regime around a late K-dwarf
- (3) **Balsalobre-Ruza** et al., 2024, *A&A*, 689, A53
The TROY project: III. Exploring co-orbital around low-mass stars
- (4) **Balsalobre-Ruza** et al., 2023, *A&A*, 675, A172 [[ESO press release](#)]
Tentative co-orbital submillimeter emission within the Lagrangian region L5 of the protoplanet PDS 70 b
- (5) **Balsalobre-Ruza** et al., 2022, *A&A*, 669, A18
KOBESim: A Bayesian observing strategy algorithm for planet detection in radial velocity blind-search surveys

Co-authored

- (1) **Figueira** et al., 2025, *accepted in A&A, arXiv:2507.07514* [Author 9, scientific feedback on photometric centroid analysis]
A comprehensive study on radial velocity signals using ESPRESSO: Pushing precision to the 10 cm/s level
- (2) **Grouffal** et al., 2025, *submitted in A&A, arXiv:2507.01807* [Author 9, analysis and text on CARMENES RV, Sect. 2]
The star HIP 41378 potentially misaligned with its cohort of long-period planets
- (3) **Cesario** et al., 2024, *A&A*, 692, A172 [Author 27, manuscript revision]
Large Interferometer For Exoplanets (LIFE). XIV. Finding terrestrial protoplanets in the galactic neighborhood
- (4) **Lillo-Box** et al., 2024, *A&A*, 689, L8 [Author 8, manuscript revision]
K2-399 b is not a planet: The Saturn that wandered through the Neptune desert is actually a hierarchical eclipsing binary
- (5) **Lillo-Box** et al., 2024, *A&A*, 686, A232 [Author 4, scientific feedback on the centroid analysis Sect. 3.4]
The AstraLux-TESS high spatial resolution imaging survey. Search for stellar companions of 215 planet candidates from TESS
- (6) **Christiansen** et al., 2023, *ASCL* [Author 5, minor coding contribution]
VCAL-SPHERE: Hybrid pipeline for reduction of VLT/SPHERE data
- (7) **Lillo-Box** et al., 2022, *A&A*, 667, A102 [Author 8, sample selection and text Sect. 4.3]
The KOBE experiment: K-dwarfs Orbited By habitable Exoplanets. Project goals, target selection, and stellar characterization

Book Chapter

- **Lillo-Box & Balsalobre-Ruza** (to be published), Elsevier
Exoplanet Detection Methods. Chapter 8. Orbital Phase Modulations

Research experience

- Jun 2024 - Aug 2025 [2 months] **Predoctoral stay.** Training in N-body simulations and collaboration with Dr. Nathaly Bathala's group. UCSC (California, USA)
- Oct 2022 - Nov 2022 [1 month] **Predoctoral stay.** Training in the analysis of ALMA observations with Dr. Itziar de Gregorio. ESO (Santiago de Chile, Chile)
- **Mar 2022 - Currently** [3 years] **Predoctoral Researcher.** Search for co-orbital exoplanets in the **TROY project**. CAB (Madrid, Spain)
- Dec 2021 - Mar 2022 [4 months] **Research Assistant.** Exoplanets. On the rocks project. Autónoma University of Madrid (UAM) (Madrid, Spain)
- Jul 2021 - Sep 2021 [3 months] **Summer Internship.** Characterization of the atmospheric extinction of the Javalambre Observatory. CEFCA (Teruel, Spain)
- Feb 2021 - Jun 2021 [5 months] **Internship Trainee.** Support to the Mars data analysis with the Rover Curiosity. CAB (Madrid, Spain)
- Feb 2019 - Feb 2020 [1 year] **Internship Trainee.** Characterization of the LST-1 Cherenkov telescope camera. CIEMAT (Madrid, Spain)

Coding

- **Python:** 6-year experience as daily user. 54-hour online courses. [Codes available in GitHub](#):
 - [MOCA](#) - RV simulator of planetary signals. Focused on preparing observing proposals and injection recovery for sensitivity analysis [to be published]
 - [VCAL-SPHERE](#) - Collaborator in a SPHERE pipeline [published in ASCL](#)
 - [KOBEsim](#) - Bayesian algorithm to plan RV observations to boost the detection of exoplanets
- **Machine Learning & AI:** 240-hour course by Samsung Innovation in the Polytechnic University of Madrid (UPM). 18-hour course by IPARCOS applied to physics and astrophysics (UCM). Application of Random Forest algorithms in my BSc thesis with Python
- **Other:** experience with Matlab, R, Stan, IDL, SQL, Git, HTML. User of macOS, Linux and Windows

Observational experience

- Jun 2024. **6 nights with HARPS-N** in the TNG (La Palma Observatory) [Visitor Mode]
- Feb 2024. **1 night with ESPRESSO** in the VLT (ESO, Paranal Observatory) [Visitor Mode]
- Aug 2022. **6 nights with HARPS** in the 3.6 m telescope (ESO, La Silla Observatory) [Visitor Mode]

Accepted observing programs:

- **8 programs as IP** [including one DDT at ESO]: **40 CHEOPS orbits** (ESA); **8.6 h with SPHERE** in the VLT (ESO, Paranal Observatory); **4 h with GRAVITY** in the VLTI (ESO, Paranal Observatory); **74 h with CARMENES** in the 3.5 m telescope (CAHA Observatory)
- **10 program as co-IP:** **NIRPS & HARPS** in the 3.6 m telescope (ESO, La Silla Observatory) [IP: J. Lillo-Box]; **ESPRESSO** in the VLT (ESO, Paranal Observatory) [IP: J. Lillo-Box; and J. Faria]; Two **CHEOPS** proposals (ESA) [IP: J. Lillo-Box]; **CARMENES** in the 3.5 telescope (CAHA Observatory) [IP: C. Cifuentes; L. Lillo-Box; A. Castro-González; and a large-program (**KOBE**, IP: J. Lillo-Box); **CAFOS** in the 2.2 m telescope (CAHA observatory) [IP: A. Castro-González]; **CAFÉ** in the 2.2 m telescope (CAHA observatory) [IP: J. Lillo-Box]

Dissemination

Seminars

- (1) **Geneva Observatory** [Apr 2025] *The TROY project: do co-orbital exoplanets really exist?*
- (2) **Liege University** [Mar 2025] *The TROY project: do co-orbital exoplanets really exist?*
- (3) **ESA exoplanet team at Madrid** [Oct 2024] *The TROY project: do co-orbital exoplanets really exist?*
- (4) **ESO headquarters at Santiago de Chile** [Nov 2022] KOBEsim. Bayesian observing strategy algorithm for planet detection in RV surveys
- (5) **ESO headquarters at Santiago de Chile** [Aug 2022] PiGs. Planets in Giant stars

Conferences

- #### Talks
- (1) **Detection and Dynamics of Exoplanets** [Coimbra, Jul 2025] *Looking closer at PDS 70: Tracing Trojan dust?*
 - (2) **Madrid-Area Exoplanet Science Meeting at ESAC** [Madrid, Dec 2024] *The KOBE experiment. First results*
 - (3) **Bay Area Exoplanets Meeting** [Santa Cruz California, Jul 2024] *The TROY project: co-orbital exoplanets and how to find them*
 - (4) **Other Worlds Laboratory Summer Program 2024** [California, Jul 2024] *Developing Moca to compute mock RVs induced by exoplanets*
 - (5) **Keep uPhDated CAB** [Madrid, Dec 2023] *Genesis of Trojans in PDS 70 b potentially hunted with ALMA*
 - (6) **Toward Other Earths III** [Porto, Jul 2023] *Genesis of Trojans in PDS 70 b potentially hunted with ALMA*
 - (7) **PhD meetings UCM** [Madrid, Mar 2023] *Exotrojan planets. Missing pieces of planetary formation*
 - (8) **Keep uPhDated CAB** [Madrid, Dec 2022] *Exotrojan planets. Missing pieces of planetary formation*
 - (9) **Madrid-Area Exoplanet Science Meeting at ESAC** [Madrid, Oct 2022] *In the search for exotrojan planets*
 - (10) **Spanish Society of Astronomy XV at IAC** [Tenerife, Sep 2022] *The KOBE experiment - KOBEsim: improving RV detection through efficient scheduling*

Posters

- (1) **Extremely Precise Radial Velocities 6** [Porto, Jun 2025], *Exotrojans around low-mass stars: A search with a RV clock*
- (2) **Extremely Precise Radial Velocities 6** [Porto, Jun 2025], *KOBE-1: A new multi-planetary system around a late K dwarf*
- (3) **Complex Planetary Systems II** [Namur, Jul 2023] *Witnessing the genesis of exotrojans in PDS 70* [**Awarded**]
- (4) **ESLAB 2023 in ESTEC** [Noordwijk, Mar 2023] *Towards completing extrasolar systems with the TROY project*,
- (5) **Spanish Society of Astronomy XV at IAC** [Tenerife, Sep 2022] *The KOBE experiment - KOBEsim: improving RV detection through efficient scheduling*
- (6) **LATIS 22 in ETH** [Zurich, Sep 2022] *Co-orbital worlds as possible bullets of giant impacts*

Technical talks

- **PyCoffee at CAB** [Jan 2025] *Regular expressions for a more efficient work*
- **Journal club at CAB** [Madrid, Nov 2024] about DSHARP VII. The Planet-Disk Interactions Interpretation
- **PyCoffee at CAB** [Madrid, Mar 2024] *Start doing your own Python modules*

Outreach and media

- **Nacional Radio and international written interviews** on my research [see for example [Onda Regional](#), [Radio Extremadura](#), [ABC](#), [Science](#), [Space](#)]
- **Press-releases** on my research work [see for example [ESO](#), [CAB](#), [CAHA](#)]
- Collaborator in the outreach **YouTube** channel of my research group [[Remote Worlds Lab](#)]
- **Course on TV, Radio and News Conferences** for researchers [17 h, Feb 2025] by the Spanish National Radio and TV (RTVE) and CSIC
- **Writing and speaking courses:** Writing better proposals and Papers workshop (by Dr. Artie Hatzes). Speak in public and present work efficiently course (UCM)
- **First-authored article for the Revista Española de Física**[to be published, V40] Acercándonos al desierto donde residen los mundos...
- **Four outreach talks in schools** [Madrid, Apr 2025] *Hidden planets in the immense Universe*
- **Co-writer in a scientific blog and instagram content** [Jun 2020 - Jan 2022] *Le dijo un Quark al Cosmos* [not available anymore]