

Zaira M. Berdiñas

My research is focused on detecting short period exoplanets orbiting M dwarfs. My expertise is the analysis of high-cadence high-precision radial velocity (RV) measurements. Besides being part of the "Pale Red Dot" team, that discovered an exoplanet orbiting around Proxima Centauri, I am also a researcher of the "Cool Tiny Beats" (CTB) collaboration. With CTB, we also observe M dwarfs at high-cadence with the aim of detecting stellar pulsations for the first time in this spectral type. Additionally, I have been actively involved in astronomical instrumentation in some way or other since the first steps of my career. I did my Master's thesis at the University of Oxford, where I tested if a commercial robotic arm was an adequate fiber positioner. Later, during my Ph.D at the Instituto de Astrofísica de Andalucía-CSIC, I identified some factors limiting the RV precision in some of the current most precise RV spectrographs, i.e. HARPS and HARPS-N. During my Ph.D, I also participated in the development of the Radial Velocity Corrector (RVC), an alternative to the scrambling methods for fiber-fed high-precision RV spectrographs. Recently, I have moved to Chile, where I have been granted with a ALMA-CONICYT postdoc at the Universidad de Chile to work with Dr. James Jenkins. Very recently I obtained a FONDECYT postdoc to continue my research at Universidad de Chile.

Personal Details

Date of birth January 10, 1986
Place of birth A Coruña (Oleiros), Spain
Nationality Spanish

Current Position

Jul 2018 **FONDECYT postdoctoral programme**, *University of Chile*, Santiago (Chile).

Grants and Fellowships

2017 – 2018 **ALMA-CONICYT postdoctoral programme**, *University of Chile*, Santiago (Chile).

Feb – Oct 2016 **Contract at the "Consejo Superior de Investigaciones Científicas" (CSIC)**, Granada (Spain), Contract in the area of Science and Physic technologies funded by MINECO/Spain.

2011 – 2015 **FPI fellowship**, Financial funding from MINECO/Spain for the completion of the PhD in IAA-CSIC (Spain).

"Ayuda del Programa Nacional de Formacion de Recursos Humanos de Investigación. Plan Nacional de Investigación Científica, Desarrollo e Innovación Tecnológica 2008-2011". Code: BES-2011-049647

May – Jul 2015 **Short Stays subprogram for FPIs**, Financial funding from MINECO/Spain for an international stay at the University of Hertfordshire (UK) during the PhD.

"Ayudas a la movilidad predoctoral para la realización de estancias breves en centro de I+D españoles y extranjeros 2015". Code: EEBB-I-15-09263.

- 17-28 – Nov 2014 **Santander Universities program in Astronomical Instrumentation in Chile**, Funding for the Summer School: "Reaching the Limits of the Sky: Astronomical Instrumentation in the 21st Century", Santiago de Chile, Chile.
Scientific directors of the Summer School: Prof. Andreas Quirrenbach (Universitat Heidelberg), Prof. Thomas Henning and Dr. Roland Gredel (Max-Planck Institute for Astronomy), Prof. Dr. Leopoldo Infante and Prof. Andrés Guesalaga (Pontificia Universidad Católica of Santiago de Chile)
- Aug – Oct 2014 **Short Stays subprogram for FPIs**, Financial funding from MINECO/Spain for an international stay at the Queen Mary University of London (UK) during the PhD.
"Ayudas a la movilidad predoctoral para la realización de estancias breves en centro de I+D españoles y extranjeros 2014". Code: EEBB-I-14-08428.
- Oct – Nov 2013 **Short Stays subprogram for FPIs**, Financial funding from MINECO/Spain for an international stay at the Queen Mary University of London (UK) during the PhD.
"Ayudas a la movilidad predoctoral para la realización de estancias breves en centro de I+D españoles y extranjeros 2013". Code: EEBB-I-13-07564.
- Feb – Jun 2011 **Mobility of master students in official university master's degrees**, Financial funding from MEC/Spain for the completion of the master thesis in University of Oxford (UK).
"Movilidad de alumnos en enseñanzas universitarias oficiales de máster para el curso académico 2010-2011". Code: MAS2010-00915.

Educational background

- 2011 – 2016 **Ph.D in Physics**, *University of Granada*, Instituto de Astrofísica de Andalucía-CSIC (Spain).
Ph.D thesis: "Radial velocity fiber-fed spectrographs towards the discovery of compact planets and pulsations on M stars". Defense date: November 25, 2016. Distinguished with: "Cum Laude" and "Doctor Internacional". Supervisors: Dr. P. J. Amado (IAA-CSIC) and Dr. G. Anglada Escudé (Queen Mary University of London). FPI fellowship granted by the Spanish Government. Link: <http://adsabs.harvard.edu/abs/2016PhDT.....191B>

International Stays

- 2016 – **Queen Mary University of London, School of Physics & Astronomy** (10 days), *London (UK)*.
Work with Dr. Guillem Anglada Escudé in the high-cadence data of the observing program "Cool Tiny Beats: Smalls Planets, Activity and Pulsations on M dwarfs".
- 2015 – **University of Hertfordshire, Science and Technology Research Institute** (60 days), *Hatfield (UK)*. *Spanish Government funding: "Estancias Breves del subprograma FPI"*.
Work with Dr. Guillem Anglada Escudé and Prof. Hugh Jones in the developing of a new high-resolution spectrograph concept and in the instrumental systematics effects detected with our CTB observing program.
- 2014 – **Queen Mary University of London, School of Physics & Astronomy** (72 days), *London (UK)*. *Spanish Government funding: "Estancias Breves del subprograma FPI"*.
Work with Dr. Guillem Anglada Escudé on the analysis of the data from CTB observing program.
- 2013 – **Queen Mary University of London, School of Physics & Astronomy** (60 days), *London (UK)*. *Spanish Government funding: "Estancias Breves del subprograma FPI"*.
Work with Dr. Guillem Anglada Escudé on GJ 725A HARPS-N high-cadence spectra observed with CTB. Fund from the Spanish Government.

2010 – 2012 **Master in Astrophysics - Specialized in Instrumentation**, *Universidad de La Laguna*, Canary Island (Spain).

Master thesis: "Testing Robotic Fibre Positioners for Use in Next Generation Astronomical Instruments". Distinguished with 10 (grading range: 0 - 10). Work developed at the instrumentation laboratories of the University of Oxford, (UK). Supervisors: Dr. Gavin Dalton (University of Oxford) and Dr. Ramón García López (Instituto de Astrofísica de Canarias, IAC).

International Stays

- 2011 – **University of Oxford, Department of Physics** (4 months), *Oxford (UK)*. *Spanish Government funding: "Mobility of students in official university Master's Degree 2010-2011"*.

Work with Dr. Gavin Dalton in a Python code to control the positioner of optical fibers of the WEAVE (William Herschel Telescope) and OPTIMOS-EVE (E-ELT) instruments.

2004 – 2010 **Physics Degree - Astrophysics specialization**, *University of La Laguna*, Canary Islands (Spain).

Publications

Refereed

- REINERS *et al.*, INCLUDING BERDIÑAS "The CARMENES search for exoplanets around M dwarfs. HD 147379 b: A nearby Neptune in the temperate zone of an early-M dwarf". *Accepted for publication in A&A*.
- REINERS *et al.*, INCLUDING BERDIÑAS "The CARMENES search for exoplanets around M dwarfs. High-resolution optical and near-infrared spectroscopy of 324 survey stars". *Accepted for publication in A&A*.
- ANGLADA *et al.*, INCLUDING BERDIÑAS (2017). "ALMA Discovery of Dust Belts around Proxima Centauri". *ApJL*, **850**, L6.
- TRIFONOV *et al.*, INCLUDING BERDIÑAS "The CARMENES search for exoplanets around M dwarfs. First visual-channel radial-velocity measurements and orbital parameter updates of seven M-dwarf planetary systems". *A&A*, **609**, A117.
- BERDIÑAS *et al.* (2017). "High-cadence spectroscopy of M-dwarfs - II. Searching for stellar pulsations with HARPS". *MNRAS*, **469**, 4268.
- ANGLADA-ESCUDE *et al.*, INCLUDING BERDIÑAS *ET AL.* (2016). "No evidence for activity correlations in the radial velocities of Kapteyn's star". *ApJ*, **830**, 74.
- ANGLADA-ESCUDE, P. J. AMADO, J. BARNES, Z. M. BERDIÑAS *ET AL.* (2016). "A terrestrial planet candidate in the habitable zone of Proxima Centauri". *Nature*, **536**, 437.
- BERDIÑAS *et al.* (2016). "High-cadence spectroscopy of M dwarfs - I. Analysis of systematic effects in HARPS-N line profile measurements on the bright binary GJ 725A+B". *MNRAS*, **459**, 3551.
- RODRÍGUEZ *et al.*, INCLUDING Z. M. BERDIÑAS. (2016). "Search for pulsations in M dwarfs in the Kepler short-cadence data base". *MNRAS*, **457**, 1851.
- ANGLADA-ESCUDE *et al.*, INCLUDING Z. M. BERDIÑAS *ET AL.* (2014). "Two planets around Kapteyn's star : a cold and a temperate super-Earth orbiting the nearest halo red-dwarf". *MNRAS*, **443**, L89.

Proceedings

- . BERDIÑAS, AMADO & ANGLADA-ESCUDE. (2015). "The Cool Tiny Beats Project - A High-cadence HARPS Survey Searching for Short-period Planets, Pulsations and Activity Signatures in M stars". *Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun*, **18**, 723.
- . 21 additional proceedings published as part of the CARMENES Consortium.

Teaching Experience

- Jan 2018 **Summer research program**, *Universidad de Chile*, Santiago (Chile), Supervisor of the undergraduate student Morin Antonia Órdenes Escobar.
Project: "Modeling the shape of cool stars"
- Jun – Dec 2017 **Master thesis supervisor**, *Valencian International University (VIU)*, Valencia (Spain), Supervisor of the master student Daniel Jesús Muñoz Guerra.
Project: "Spectrographs to find exoplanets: Analysis of the HARPS sub-night stability"

Professional Service

- Dec 2017 **Committee of master thesis**, *Valencia International University (VIU)*, Valencia (Spain), Member of two master thesis committees.
Students and projects: "Relación de las Abundancias N/O con la Tasa de Formación Estelar SFR en los Modelos de Evolución Química" by Leticia Corral Bustamante, and "Radiación en superficies planetarias e implicaciones para las plantas" by Carmen de la Cuesta Castillo.
- Feb 2013 **"CARMENES Final Design Review"**, *IAA*, Granada (Spain), Local Organizing Committee, LOC.

Observing Experience

- May 2018 4 nights at La Silla at ESO 3.6m telescope (La Serena, Chile). HARPS instrument.
- Mar 2013 - June 2017 31 nights at TNG 3.6 m telescope (Roque de los Muchachos, La Palma). HARPS-N instrument.
- Apr 2013 - May 2014 6 nights at CAHA 2.2 m telescope (Calar Alto, Almería). CAFE instrument.
- 2010 2 nights at INT 2.5 m telescope (Roque de los Muchachos, La Palma). Observer companion as part of the master practices.
- 2009 1 night at TNG 3.6 m telescope and MAGIC Cherenkov telescopes, (Roque de los Muchachos, La Palma). Observer companion as part of the university practices.
- 2008 - 2010 Several nights at IAC80 telescope, (El Teide Observatory, Tenerife). University practices.

Successful proposals as PI

- 2018 HARPS@La Silla (period 102): "Beating Red Dots-II" (4 nights).
- 2017 LCOGT@Cerro Tololo (period 18A): "Beating Red Dots" (40 hours).
- 2017 HARPS@La Silla (period 101): "Beating Red Dots" (8 nights).
- 2016 HARPS-N@TNG (period 16A): "Cool Tiny Beats V: Small planets, activity and pulsation in M dwarfs" (5 nights).

- 2015 HARPS@La Silla (period 95): "Disentangling the HARPS intra-night systematics" (1 night).
- 2014 HARPS-N@TNG (period 14B): Cool tiny beats IV: Small planets, activity and pulsation in M dwarfs (3 nights).

Astronomical Instrumentation Experience

- 2012 – 2016 Development of the RadiCa2D prototype.
 - Sep 2013 CARMENES NIR Echelle Cosmetics.
 - Sep 2013 Cleaning of the mirrors of the 1.5 and 0.9 m telescopes of Sierra Nevada Observatory.
 - Sep 2011 Testing the robotic fibre positioners of WEAVE (William Herschel Telescope) and OPTIMOS-EVE (E-ELT).

Outreach

- 12 Dic 2016 **Outreach session in a school**, *CEIP Cabanas*, Pontevedra (Spain).
Online interview about exoplanets with the students.
- 14 Ago 2017 **Invited talk at "museos científicos coruñeses"**, *Science museum of A Coruña*, programme: "*A nosa estrela*", A Coruña (Spain).
Talk: "Mundos de otras estrellas".
- Jun – Nov **"Red Dots" blog**.
 - 2017 Head editor of the science articles posted in this blog. Red Dots coordinated a pro-am initiative to search for planets around three nearby stars. <https://reddots.space/>.
- 28-30 Dec **Invited talk at CosmoOviedo-I**, *Palacio de Congresos Principe Felipe*, Oviedo (Spain).
 - 2016 Talk: "Proxima b and the search of life beyond the Solar System".
- Aug 2016 **Press, Radio and TV interviews about the discovery of Proxima b**.
Diffusion of our discovery of a temperate terrestrial orbiting Proxima Centauri in the Spanish media: El Confidencial, Granada Hoy, cadena COPE, esRadio, TVE news, Cuatro news, Cuarto Milenio.
- Jan – Apr **"Pale Red Dot" blog**.
 - 2016 The blog informed the public about the Proxima b discovery process. It also gathers posts from experts of the exoplanet field. I was member of the core editorial team and author of a post titled: "*between dusk and dawn with the northern twin of HARPS*". <https://palereddot.org>.
- Jan 2015 **Manuel Félix Herrera Gómez sessions**, *IAA*, Granada (Spain).
Talk: "The traveler photon: A walk along the planets".
- Mar 2015 **Science Outreach for Rural Schools**, *IES la Zafra*, Motril (Spain), Spectroscopy workshop for high school students.
- Sep 2012 **Science on the Street**, Granada (Spain), Organizer of the scientific experiments section.

Conferences

- Mar 2018 **Diversis Mundi: The Solar System in an Exoplanetary context**, *ESO*, Santiago de Chile (Chile).
Talk: "Unveiling the secrets of Proxima Centauri's environment"

- Jul 2015 **Extreme Precision Radial Velocities (EPRV)**, *Yale University*, New Haven, Connecticut (USA), Yale School of Management.
Talk: "High cadence of M-stars with HARPS". Poster: "High cadence observations with HARPS-N: noise caused by line profile variability"
- May 2015 **ExoSEP meeting**, *The Open University*, Milton Keynes (UK).
Talk: "Radial velocity fibre-fed spectrographs towards the discovery of compact planets and pulsations on M stars".
- Jan 2015 **II IAA-PhD workshop**, *IAA*, Granada (Spain).
Talk: "Radial velocity fibre-fed spectrographs towards the discovery of compact planets and pulsations on M stars".
- Nov 2014 **Reaching the Limits of the Sky: Astronomical Instrumentation in the 21st Century**, *Heidelberg Haus*, Santiago de Chile (Chile).
Summer School organised by the Heidelberg University for which I was awarded with funds from the Santander Universities program after a selection process.
- Sep 2014 **Planet Formation Theory and Dynamics in the PLATO Era**, *Queen Mary University of London*, London (UK).
- Jun 2014 **Cool Stars XVIII: "18th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun"**, *Lowell Observatory+Northern Arizona University+NSO+NExSci+USNO*, Flagstaff, Arizona (USA), High Country Conference Center in Flagstaff.
Poster: "Cool Tiny Beats Project".
- Feb 2014 **CARMENES 1st ñ-school. PhD and new Postdocs CARMENES scientific meeting**, *CARMENES-IAA+UCM+CAB*, Barcelona (Spain), Residència d'investigadors (CSIC).
Talk: "Reduction and Analysis of High-Resolution HARPS-North Spectra".
- Oct 2013 **CARMENES Scientific Meeting and 1st School**, *Georg-August-Iniversitat Gottingen*, Gottingen (Germany).
Talk: "Disentangling high-cadence M-dwarfs radial-velocity signals in search for pulsations and short-period planets".
- May 2013 **6th Iberian Meeting on Asteroseismology**, *VIU*, Aras de los Olmos, Valencia (Spain).
Talk: "Pulsations and Planets on M dwarfs through Radial Velocity Technique".
- Mar 2013 **I Workshop on Scientific Divulgation: beyond Papers**, *CEIA3*, Córdoba (Spain).
- Dec 2012 **I IAA-PhD workshop**, *IAA*, Granada (Spain).
Talk: "Planetary System on M stars. Improving the high-precision Radial Velocity technique".
- Jul 2012 **X Scientific Meeting of the Spanish Society of Astronomy**, *SEA*, Valencia (Spain).
- Jun 2012 **IAA CCD Conferences**, *IAA*, Granada (Spain).
Talk: "Testing Robotic Fibre Positioners for Use in Next Generation Astronomical Instruments".
- May 2012 **5th Iberian Meeting on Asteroseismology**, *IAC*, Canary Islands (Spain).
Talk: "Analysis of Planetary Transits. CoRoT multi-color photometry provided by the exo-channel".
- Mar 2010 **III Conference of Physics Students (COEFFIS)**, *University of La Laguna*, Canary Islands (Spain).

Invited Talks

- Jul 2018 **Weekly seminar**, *Universidad Valparaíso*, Valparaíso, Chile.
Talk: "Unveiling stellar pulsations in red dwarfs using high-resolution spectrographs".

- Jun 2018 **Weekly colloquium**, *Universidad Diego Portales*, Santiago, Chile.
Talk: "Beating Red Dots, a project to find stellar pulsations in M dwarfs using high-resolution spectrographs".
- Mar 2018 **Weekly seminar**, *European Southern Observatory (ESO)*, Santiago, Chile.
Talk: "Searching for rhythmic stars with the Beating Red Dots project".
- May 2015 **Weekly seminar**, *University of Hertfordshire*, Hatfield, UK.
Talk: "Radial velocity fibre-fed spectrographs towards the discovery of compact planets and pulsations on M stars".
- Oct 2014 **Exoplanet group meeting**, *Queen Mary University of London*, London, UK.
Talk: "The Cool Tiny Beats Survey: Observations from the North Hemisphere".

Complementary Education

- Oct - Dec 2015 **English Advance Course**, *CL Academy*, Granada (Spain), 100h.
- Oct 2015 **Course in Adobe Illustrator CS5**, *CSIC*, online, 40h.
- Oct 2015 **Course in Shell Programming**, *CSIC*, Granada (Spain), 20h.
- Nov 2014 **Optical System Design with Zemax**, *Greenlight Solutions S.L.*, Madrid (Spain), 32h.
- Jun 2014 **Labor and Handling of Liquid Nitrogen**, *Al Air Liquide España S.A.*, Granada (Spain), 5h.
- Feb - Jun 2011 **English Language Course**, *British Study Centre*, Oxford (UK), 180h.
- 2010 – 2011 **English Language Course**, *Fundación Canaria Empresa*, Canary Islands (Spain), 50h.
Certificate B1.4 by the Common European Framework of Reference for Languages (CEFR).
- 2005 – 2006 **4th edition of the program "Cultural extension in Astronomy"**, *University of Santiago de Compostela*, A Coruña (Spain), 12h.
- 2003 **Initiation course in Astronomy**, *Amateur astronomers association, IO*, A Coruña (Spain), 10h.

Languages

- Spanish **native**
Galician **native**
English **fluent**
French **beginner**

Computer skills

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|---------------|--------------------------------------|-----------|-------------------------------|
| OS | GNU/Linux, MacOS X, Windows. | Languages | Python, Shell, C/C++, IDL. |
| Office suites | Microsoft Office, OpenOffice, iWork. | Astronomy | IRAF, DS9, Period04, SigSpec, |

Optical Zemax.
Design

Others L^AT_EX.

Areas of interest

- Astronomical Instrumentation.
- Asteroseismology.
- Planetary Systems.
- Exoplanets
- Cool stars.
- Radial Velocity Technique.

Other relevant information

2013 – 2017 Member of the CARMENES Consortium.

2010 – Member of the Spanish Society of Astronomy (SEA).