

# Joaquín Sureda

PHD STUDENT · ASTROPHYSICS

115 Keenan House, Old Dryburn Way, Durham, UK

✉ joaquin.m.sureda@durham.ac.uk | 🌐 ADS Profile | 📞 0000-0003-2348-8267 | 📧 jmsureda

## Education

### Institute for Computational Cosmology - Durham University

PHD IN ASTROPHYSICS

- **Advisors:** Dr. Azadeh Fattahi and Dr. Sownak Bose

*Durham, UK*

*Oct. 2022 - Current*

### Instituto de Astrofísica - Pontificia Universidad Católica de Chile

M.S. IN ASTROPHYSICS

- **Thesis:** Primordial black holes as dark matter candidates
- **Advisors:** Prof. Nelson Padilla and Prof. Ignacio Araya
- **Examiners:** Prof. Gonzalo Palma and Prof. Claudio Dib

*Santiago, Chile*

*Mar. 2019 - Dic. 2021*

### Pontificia Universidad Católica de Chile

B.S. IN ASTRONOMY

- **Final Project:** Gravitational waves background in an expanding Universe
- **Advisors:** Prof. Jorge Alfaro
- **Examiners:** Prof. Benjamin Koch and Prof. Nelson Padilla

*Santiago, Chile*

*Mar. 2012 - Dic. 2018*

## Research Experience

### Institute for Computational Cosmology - Durham University

PHD RESEARCH

- Studied extremely high-resolution simulations of dwarf galaxies to understand their formation and about dark matter.

**Supervisors:**

- Dr. Azadeh Fattahi, Institute for Computational Cosmology, Durham University, UK.
- Dr. Sownak Bose, Institute for Computational Cosmology, Durham University, UK.

*Durham, UK*

*Oct. 2022 - Current*

### Donostia International Physics Center

RESEARCH ASSISTANT

- Prepared a high resolution cosmological dark matter only simulation to study the first structures in the Universe.

**Supervisor:**

- Prof. Silvia Bonoli, Donostia International Physics Center, Spain.

*Donostia - San Sebastián, Spain*

*Dec. 2021 - Sep. 2022*

### Pontificia Universidad Católica de Chile

MSC RESEARCH

- Research in Primordial black holes as dark matter.

**Supervisors:**

- Prof. Nelson Padilla, Instituto de Astrofísica, Pontificia Universidad Católica de Chile.
- Prof. Ignacio Araya, Instituto de Ciencias Exactas y Naturales, Universidad Arturo Prat.

*Santiago, Chile*

*Dec. 2018 - Dec. 2021*

## Extracurricular Activity

### Institute for Computational Cosmology

STUDENT REP

- Attend the monthly staff meetings of the institute
- Provide communication between the students and the staff

*Durham, UK*

*Jun. 2023 - Current*

### Astro-PhD coding club

ORGANISER

- Organised bi-weekly meeting for the members of the club.
- Maintained and updated the GitHub repository for the club.

*Durham, UK*

*Feb. 2023 - Current*

### Global Citizenship Programme - Ustinov College

GCP SCHOLAR OF CAFÉ SCIENTIFIQUE

- Organised different activities for the college related to science.
- Oversaw some joint activities with other members of the GCP.

*Durham, UK*

*Oct. 2022 - Sep. 2023*

## Teaching Experience

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### Computing Workshop Demonstrator

DISCOVERY SKILLS IN PHYSICS

Assistant for the computing workshop, part of the Discovery Skills in Physics 1 at Durham University.

[Durham, UK](#)

[Oct. 2023 - July. 2024](#)

### Teaching Assistant

EXTRAGALACTIC ASTROPHYSICS - PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Teaching assistant in the extragalactic astrophysics course at Pontificia Universidad Católica de Chile.

[Santiago, Chile](#)

[Feb. 2021 - Jul. 2021](#)

### Teaching Assistant

ASTRONOMY - PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Teaching assistant in the astronomy course at Pontificia Universidad Católica de Chile.

[Santiago, Chile](#)

[Jul. 2020 - Dec. 2022](#)

### Teaching Assistant

ASTRONOMY - PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Teaching assistant in the astronomy course at Pontificia Universidad Católica de Chile.

[Santiago, Chile](#)

[Jun. 2019 - Dec. 2019](#)

### Teaching Assistant

CALCULUS I - PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Teaching assistant in the Calculus I laboratory at Pontificia Universidad Católica de Chile.

[Santiago, Chile](#)

[Mar. 2019 - Jun. 2019](#)

## Conferences and Seminars

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### National Astronomy Meeting 2023

PARTICIPANT

- Talk presented in the Simulations session  
"LYRA: Probing the high-resolution regime of cosmological zoom-in simulations".
- Talk presented in the Galactic Archeology session  
"LYRA: Old stellar populations with high-resolution simulations of dwarf galaxies"

[Cardiff, UK](#)

[03 Jul. 2023 - 07 Jul. 2023](#)

### DIPC Seminar

PARTICIPANT

- Seminar presented at Donostia International Physics Center  
"Primordial black holes as dark matter candidates"

[Donostia - San Sebastián, Spain](#)

[11 Feb 2022](#)

### Cosmology from Home

PARTICIPANT

- Short-talk presented at the conference.

[Virtual](#)

[04 Jul. 2021 - 15 Jul. 2021](#)

### Friends Of Friends Virtual Meeting 2021

PARTICIPANT

- Recorded talk presented at the meeting.

[Virtual](#)

[24 Apr. 2021 - 28 Apr. 2021](#)

### Cosmología y Gravitación en el Cono Sur

ATTENDEE

- Attendee at a seminar related to Cosmology and Gravitation.

[Valparaiso, Chile](#)

[05 Oct. 2019 - 09 Oct. 2019](#)

### Latin American Symposium of High Energy Physics

PARTICIPANT

- Poster presented at the symposium entitled  
"An alternative explanation to accelerating Universe without Lambda in concordance with the last  $H_0$  measured value".

[Lima, Peru](#)

[23 Nov. 2018 - 27 Nov. 2018](#)

### XXI Simposio Chileno de Física

PARTICIPANT

- Poster presented at the symposium entitled  
"An alternative explanation to accelerating Universe without Lambda in concordance with the last  $H_0$  measured value".

[Antofagasta, Chile](#)

[13 Nov. 2018 - 15 Nov. 2018](#)

### La parte y el todo: Tópicos avanzados en Física de Altas Energías y Gravitación

ATTENDEE

- Attendee at the symposium related to High energy physics and gravitation

[Villarrica, Chile](#)

[02 Jan. 2018 - 04 Jan. 2018](#)

## Outreach

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### Celebrate Science

VOLUNTEER

- Volunteer at a science festival aimed at school kids.

[Durham, UK](#)

[Oct. 2022](#)

- Instructor at a scholar activity related to astronomy.

**Día del Patrimonio**

- Outreach activity at Manuel Foster Observatory, PUC.

## Publications

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**Extended primordial black hole mass functions with a spike**

JUAN MAGANA, MARCO SAN MARTIN, JOAQUIN SUREDA, MARCELO E. RUBIO, IGNACIO J. ARAYA, NELSON D. PADILLA

2023

<https://doi.org/10.1093/mnras/stad261>**Dark matter from primordial black holes would hold charge**

IGNACIO J. ARAYA, NELSON D. PADILLA, MARCELO E. RUBIO, JOAQUIN SUREDA, JUAN MAGANA

2023

<https://doi.org/10.1088/1475-7516/2023/02/030>**Pytearcat: PYthon TEnsor AlgeBRa calCulATor A python package for general relativity and tensor calculus**

MARCO SAN MARTIN, JOAQUIN SUREDA

2022

<https://doi.org/10.1016/j.ascom.2022.100572>**Press-Schechter primordial black hole mass functions and their observational constraints**

JOAQUIN SUREDA, JUAN MAGANA, IGNACIO J. ARAYA, NELSON D. PADILLA

2021

<https://doi.org/10.1093/mnras/stab2450>**Magnetic field generation from primordial black hole distributions**

IGNACIO J. ARAYA, MARCELO E. RUBIO, MARCO SAN MARTIN, FEDERICO A. STASYSZYN, NELSON D. PADILLA, JUAN MAGANA,

2020

JOAQUIN SUREDA

<https://doi.org/10.1093/mnras/stab729>**Power spectrum of density fluctuations, halo abundances and clustering with primordial black holes**

NELSON PADILLA, JUAN MAGANA, JOAQUIN SUREDA, IGNACIO ARAYA

2020

<https://doi.org/10.1093/mnras/stab1115>**An Accelerating Universe without Lambda: Delta Gravity Using Monte Carlo**

JORGE ALFARO, MARCO SAN MARTIN, JOAQUIN SUREDA

2019

<https://doi.org/10.3390/universe5020051>