Emanuele Maria Ventura

PhD candidate in Astrophysics
The University of Melbourne
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Research interest: Cosmic Dawn,; Population III stars; Epoch of Reionization (EoR); 21-cm signal; simulations of high-z galaxies formation and evolution.

Education:

Jan 2022 - present

PhD in Astrophysics, The University of Melbourne, Australia.
Thesis: First stars: where do they form? What is their impact to galaxy evolution?
Supervisors: Prof. J. Stuart B. Wyithe (UniMelb), Dr. Yuxiang Qin (UniMelb).

Sep 2019 – Sep 2021

M.Sc in Astrophysics and Cosmology, Università degli Studi di Padova, Italy.
Department of Physics and Astronomy "Galileo Galilei".
Curriculum A "Theory and Modeling".
Thesis: Modeling the 21cm global signal from first stars and black holes.
Supervisors: Prof. Michela Mapelli (UniPd), Prof. Raffaella Schneider (UniRoma "La Sapienza").
Final evaluation: 110/110 cum Laude.

Sep 2016 – Sep 2019

B.Sc in Astronomy, Università degli Studi di Padova, Italy.
Department of Physics and Astronomy "Galileo Galilei".
Thesis: Multiple populations in Magellanic Clouds globular clusters.
Supervisors: Prof. Antonino P. Milone (UniPd), Dr. Anna F. Marino (UniPd).

Grants & Awards:

Supercomputing time, Ozstar, NCI Australia & Swinburne University, 480k CPU hours.	Jul 2024
Laby Travel Scholarship, University of Melbourne, 2,000 AUD.	Jun 2024
Science Abroad Travel Scholarship, University of Melbourne, 2,000AUD.	Aug 2023
ASA Student Travel Assistance, Astronomical Society of Australia, 1,500AUD.	Apr 2023
ND Goldsworthy Scholarship, UniMelb, 20,000AUD.	Sep 2022
Melbourne International Research Scholarship, UniMelb, 31,200AUD p.a.	Jan 2022
Melbourne International Fee Remission Scholarship, UniMelb, 46,144AUD p.a.	Jan 2022
UniPd Scholarship "Mille e una Lode", Università degli Studi di Padova, 1000€.	Jan 2019

Selected Talks & Posters:

Invited

Can we explain bright z > 12 JWST galaxies with Pop. III star formation? Seminar at INAF (Padova). June 2024, Padova.

Can we explain bright z > 12 JWST galaxies with Pop. III star formation? Visit at the Cosmology group at SNS (Pisa). June 2024, Pisa.

Looking for a signature from Pop. III stars. Talk at the astrophysics group at University of Melbourne. April 2024.

Meraxes has now Pop. III! Remote talk at the extra-galactic team at University of Rome "La Sapienza". April 2024 (remote).

Can we see Pop III and mini-halos through EoR? Visit at the extra-galactic team at University of Geneva. June 2023, Geneva.

21-cm global signal from Cosmic Dawn. Visit at SNS (Pisa). June 2023, Pisa.

21-cm global signal from Cosmic Dawn. Visit at MPI for Astrophysics. July 2023, Garching.

Contributed & Posters

JWST bright galaxies at z > 12: a signature from Pop. III star formation? Conference "Cosmic Dawn at high-latitudes". June 2024, Stockholm.

Looking for a signature from Pop. III stars. Science Legacy Meeting of the Australian Research Council (ARC) Centre of Excellence for All-sky Astrophysics 3D (ASTRO3D), June 2024, Manly.

Global 21-cm signal with MERAXES. 6th Global 21-cm workshop, September 2023, Trieste (remote).

Can we see Pop III and mini-halos through EoR? Shedding new light on the first billion years of the Universe, July 2023, Marseille.

Can we see Pop III and mini-halos through EoR? ASA Annual Science Meeting, July 2023, Sydney.

(Poster) **Can we see Pop III and mini-halos during EoR? 21-cm signal from Cosmic Dawn.** Reionisation in the Summer, June 2023, Heidelberg.

A quick recipe for tasty Pop III stars. 2023 Science Meeting of the Australian Research Council (ARC) Centre of Excellence for All-sky Astrophysics 3D (ASTRO3D), May 2023, Fremantle.

Teaching & Outreach:

Lab Coordinator (May 2024 - Present)
1st year Physics Undergraduate Program – *From the Solar System to the Cosmos* – UniMelb:
Assisting with the preparation of course materials, maintaining and updating the LMS, and teaching small classes while facilitating a team of demonstrators and markers.

Lab Demonstrator (Mar 2022 - Present)
1st year Physics Undergraduate Program – *Standard* – UniMelb.
1st year Physics Undergraduate Program – *From the Solar System to the Cosmos* – UniMelb.
1st year Physics Undergraduate Program – *Introduction to Life Earth and Universe* – UniMelb.

Tutoring & Mentoring
Tutor for the 2nd year Bachelor course *Mathematical Analysis 3*. Mar – June 2019, UniPd.

Meet-an-expert (with primary school)
Teaching basic astronomy to 8-10 years old kids including preparation of hands-on activities. Feb – Sep 2022, Padova.

Experiences:

Journal referee for the Astrophysical Journal (ApJ), 2024-Present.

Coordinator & Chair
Member of LOC for EoR conference in Australia "Kaba Kada", September 2025.
Astro3D Science Legacy Meeting, reionisation session, Chair, June 2024.
Monthly Genesis Meeting (within Astro3D), Jan 2023 – Dec 2023.
Astro Group Meeting, Oct 2022 – Dec 2022, UniMelb.
SAZERAC online conference: *learning the high-redshift Universe,* Co-Chair, Feb 2022.

Schools & Workshops:

12-week graduate course on *HPC and Data in Astrophysics,* Remote participation, Sep-Nov 2024.

Cosmic Dawn at high-latitudes, week 4 on *Physical properties of high redshift galaxies and what happened before reionization started,* June-July 2024, Stockholm.

ASA ECR Python Workshop on *Optimization and Parallel Computing*, September 2023, Melbourne.

ASA Harley Wood School of Astronomy on *Dark Matter and Scientific Computing*, June 2022, Hobart.

ANITA 2022 School and Workshop on *Galactic Archaeology,* Feb 2022, Macquarie University, Sydney.

International Summer School on *ISM of Galaxies from the Epoch of Reionization to the Milky Way,* July 2021, Remote participation.

Digital and programming skills:

Developer of **MERAXES**: a semi-analytical model of galaxy formation.
Good knowledge of **Python**, including the main packages, widely used since the Bachelor.
Good knowledge of **C**, widely used during the PhD.
Good knowledge of **Latex,** widely used to write Bachelor and Master thesis and MNRAS papers.
Good knowledge of **HTML** used to make a personal website.
Proficient user of the following **software/libraries:** MPI, openMP, numpy, matplotlib, scipy, HDF5, fftw.
HPC experience with several supercomputers: Vera (Italy), Ozstar (Australia), GADI (Australia).
Basic knowledge of **21cmFAST**: a semi-numerical simulation of the high-redshift 21cm signal.
Basic knowledge of **Fortran** learnt during the Master thesis.
Basic knowledge of **Xspec** (X-ray spectral fitting package), learnt during a Master course.

Published Articles: *Citations*

4. Emanuele M. Ventura, Yuxiang Qin, Balu Sreedhar, and J. Stuart B. Wyithe.
Semi-analytic modelling of Pop. III star formation and metallicity evolution – II. Impact on large scales and 21cm power spectrum.
Submitted to MNRAS.

3. Emanuele M. Ventura, Yuxiang Qin, Balu Sreedhar, and J. Stuart B. Wyithe.
Semi-analytic modelling of Pop. III star formation and metallicity evolution – I. Impact on the UV luminosity functions at z = 9–16. ***18***
MNRAS (2024), 529, 628.

2. Emanuele M. Ventura, Alessandro Trinca, Raffaella Schneider, Luca Graziani, Rosa Valiante, and J. Stuart B. Wyithe.
The role of Pop III stars and early black holes in the 21-cm signal from Cosmic Dawn. ***17***
MNRAS (2023), 520, 3609-3625.

1. A. P. Milone, A. F. Marino, G. S. Da Costa, E. P. Lagioia, F. D'Antona, P. Goudfrooij, H. Jerjen, D. Massari, A. Renzini, D. Yong, H. Baumgardt, G. Cordoni, E. Dondoglio, C. Li, M. Tailo, R. Asa'd and E. M. Ventura
Multiple Populations in globular clusters and their parent galaxies. ***84***
MNRAS (2020), 491, 515-531.