



Hugo Plombat

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Home: Pasadena (United States)

WORK EXPERIENCE

Visiting post-doctoral researcher

Jet Propulsion Laboratory & Caltech [15/10/2024 – Current]

City: Pasadena | **Country:** United States

Collaborating with:

- Researchers in charge of Lunar Laser Ranging at Jet Propulsion Laboratory
- Ocean Circulation And Air Sea Interaction group at Jet Propulsion Laboratory
- Oceans & Cryosphere, Theory & Observations group at Caltech

Postdoctoral researcher

University of Michigan [15/11/2024 – Current]

City: Ann Arbor | **Country:** United States

Impact of changes in sea level and ocean stratification on tides and lunar orbital parameters

Doctoral researcher

Université de Montpellier [01/10/2021 – 30/09/2024]

City: Montpellier | **Country:** France

Subject: Investigating the 21cm hydrogen line as a cosmological probe of the Dark Ages and Cosmic Dawn

Supervisor: Denis Puy

2nd year master's internship

Astrophysics and Planetology Research Institute (IRAP) [01/03/2021 – 30/06/2021]

City: Toulouse | **Country:** France

Subject: Mapping the distribution of baryons in galaxies with from mixed photometry (HST) and spectroscopy (MUSE) observations to estimate the dark matter content at high redshift

Supervisors: Thierry Contini, Benoît Epinat & Wilfried Mercier

Research project

University of Montpellier [09/2020 – 12/2020]

City: Observatoire de Haute-Provence | **Country:** France

Subject: Colour-magnitude diagram construction of a globular star cluster in the Milky Way, from observation to modelisation.

Supervisors: Julien Morin & Bertrand Plez

1st year master's internship

LUPM, University of Montpellier [05/2020 – 06/2020]

City: Montpellier | **Country:** France

Subject: Calibration of photometric redshifts in preparation for Cosmological Analyses with the Legacy Survey of Space and Time (LSST).

Supervisor: Eric Nuss

PUBLICATIONS

[2024]
[**Probing Dark Relativistic Species and Their Interactions with Dark Matter through CMB and 21cm surveys**](#)

Volume, Issue and Pages: JCAP01(2025)071

H. Plombat, T. Simon, J. Flitter, V. Poulin

[2024]
[**21cm signal from Dark Ages collapsing halos with detailed molecular cooling treatment**](#)

H. Plombat, D. Puy

EDUCATION AND TRAINING

Ph.D degree in Cosmology

Laboratoire Univers et Particules de Montpellier (LUPM), University of Montpellier [01/10/2021 – 30/09/2024]

City: Montpellier | **Country:** France | **Field(s) of study:** Estimation of constraints on cosmological models by the 21 cm line of primordial hydrogen.

Supervisor: Denis Puy

Physics Master's Degree: "Cosmos, Fields and Particles"

University of Montpellier [2019 – 2021]

City: Montpellier | **Country:** France | **Final grade:** 16.1/20, Rank : 2/10

Bachelor's degree in Physics

University of Montpellier [2016 – 2019]

City: Montpellier | **Country:** France

CONFERENCES AND SEMINARS

[13/04/2025 – 16/04/2025] ENS Paris, France

GDR CoPhy Episode 3 - Invited Talk

Title: Probing Dark Relativistic Species and Their Interactions with Dark Matter through CMB and 21cm surveys

[10/2023] Saint-Jean-de-Monts, France

Journées de rencontre des jeunes chercheurs - Talk & Proceeding

Title: 21cm emission in primordial clouds with full chemical computation

[05/2023] Nazareth, Israël

Neutral Hydrogen as a Cosmological Probe Across Cosmic Time - Talk

Title: 21cm emission in primordial clouds with full chemical computation

[07/2021] Montpellier

Laboratoire Univers et Particules de Montpellier (LUPM)- Talk

Title: What can we learn about cosmology from the 21cm hydrogen line ?

[04/2023] Cargèse, France

"Future cosmology" school, Cargèse, France - Poster

Title: Primordial 21cm line global signal in the Dark Ages

[10/2022] Berkeley, USA

5th Global 21-cm Workshop - Poster

Title: Primordial 21cm line global signal in the Dark Ages

TEACHING EXPERIENCES

[2022 – 2023]

Physics lectures (50 hours)

Physics Department, Univ. of Montpellier

Lectures:

- Mathematical tools for physics (L1 "polytech")
- Thermodynamics (L1 Physics-Chemistry)

[05/2022 – 06/2022]

Internship co-supervisor of a Master 1 student (8 weeks)

Student: Mathieu Selves

Subject: Constraining the Λ CDM cosmological parameters with Sunyaev–Zeldovich effect.

[2021 – 2022]

Computer Science lectures (64 hours)

Computer science department, Univ. of Montpellier

Lectures:

- Bash & Linux environment (L1 "polytech")
- C language (L1 "polytech")

THEMATIC SCHOOLS

[04/2023]

Future cosmology (1 week)

IESC, Cargèse, France

Link: <https://www.cpt.univ-mrs.fr/~cosmo/EC2023/index.php?page=schedule>

[08/2022]

EUCLID school (2 weeks)

Observatoire océanologique, Banyuls-sur-Mer, France

[03/2022]

Theoretical Aspects of Astroparticle Physics, Cosmology and Gravitation (2 weeks)

Galileo Galilei Institute for Theoretical Physics, Florence, Italy

Link: <https://www.ggi.infn.it/showevent.pl?id=421>

Formation : Introduction to Deep Learning (FIDLE)

40 hours online formation

- Understand the basics of deep learning through theoretical and practical examples
- Learn Tensorflow/Keras technologies

Link: <https://fidle.cnrs.fr>

Bayesian statistics with R

16 hours - University of Montpellier

- Introduction to Bayesian inference
- Likelihoods, priors, model selection
- Markov chains Monte Carlo (MCMC)

COLLABORATIONS

[2021 – Current]

Primordial Hydrogen Observation with Nanosatellite Explorers (PHONE)

Spatial mission in collaboration with Montpellier University Spatial Center (CSUM).

21cm observation from the Dark Ages using a swarm of nanosatellites.

[2022 – Current]

LUPM sustainable development group

I contributed to the creation in 2022 of a working group on sustainable development in the Laboratoire Univers et Particules de Montpellier (LUPM). We are part of the Groupement de Recherche "Labos" 1.5

Our current projects are :

- Seminar organisation and climate fresh animation for the laboratory.
- Computation of the laboratory carbon footprint every year.
- Proposition of a strategy to reduce the lab emissions and stick to the Paris agreements.

Links: <https://www.lupm.in2p3.fr/en/laboratory/2150-2/sustainable-development/> | <https://labos1point5.org/>

SCIENCE OUTREACH

[11/2023]

Organisation of the 2023 non-permanent workshop

LUPM, Montpellier

[05/2023 – 06/2023]

Organisation of a workshop on astronomy and cosmology in a kindergarten

Montferrier-sur-Lez kindergarten, Montferrier-sur-Lez

[07/2022]

Organisation of the 2022 non-permanent workshop

LUPM, Montpellier

SKILLS

IRAF / TOPCAT / LaTeX

Programming :

Python / C / Fortran / Bash / Linux / R language / GameMaker language

Codes :

CLASS / 21cmFAST

LANGUAGE SKILLS

Mother tongue(s): French

Other language(s):

English

LISTENING C2 READING C2 WRITING C2

SPOKEN PRODUCTION C2 SPOKEN INTERACTION C2

Spanish

LISTENING B1 READING B1 WRITING A2

SPOKEN PRODUCTION B1 SPOKEN INTERACTION B1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DRIVING LICENCE

Driving Licence: B

PROFESSIONAL ASSOCIATIONS

[2021 – Current]

Société Française de Physique

French physicists community exchanging about the place of physics in society, and collectively working to animate the community and contribute to providing access to scientific culture for as many people as possible.

[2023 – Current]

Astronomers for planet Earth

International movement working to adress the Climate Crisis from an astronomical perspective

Link: <https://astronomersforplanet.earth/>

HOBBIES AND INTERESTS

Piano, Judo, Cycling, Illustration drawing, computer music