



# Pierre Marchand

*Postdoc researcher in astrophysics*

## Experience

### Research

- Since Jan 2022 **Postdoc**, *Institut de Recherche en Astrophysique et Planétologie (IRAP)*, Toulouse, France.  
Chemistry in star formation, synthetic observations, radio-astronomy.
- Dec 2019 – Dec 2021 **Postdoc**, *American Museum of Natural History*, New-York, USA.  
Star formation simulations with non-ideal MHD, grain physics and chemistry.
- Oct 2017 – Oct 2019 **Postdoc**, *Osaka University*, Osaka, Japan, JSPS Fellowship.  
Star formation simulations with non-ideal MHD.
- Oct 2014 – Sep 2017 **PhD Thesis**, *CRAL*, Lyon, France.  
Study of physical processes involved in star formation.
  - Non-ideal Magnetohydrodynamics,
  - Numerical simulations,
  - Chemistry.
- Mar-Jul 2014 **Internship**, *CRAL*, Lyon, France.  
Study of the early phases of the protostellar collapse.
- Mar-Jul 2013 **Internship**, *CRAL*, Lyon, France.  
Study of the pulsations of gaseous planets.
- May-Jul 2012 **Internship**, *Tohoku University*, Sendai, Japan.  
Study of the light profiles of distant galaxies from observational data.

### Teaching

- Feb – Jul 2023 **Master 2 internship supervision**, *IRAP*, Toulouse, France.  
IRAM-30m telescope observations analysis.
- Feb – Jul 2023 **Master 2 internship co-supervision**, *IRAP*, Toulouse, France.  
Theoretical modeling of the chemical evolution in protostars.
- Jan – May 2023 **Master 1 research project supervision**, *Université Paul Sabatier*, Toulouse, France.  
Analytical models of star formation.
- May 2022 **Jury for research projects for the *Science de l'Univers et Technologies Spatiales* Master**, *Université Paul Sabatier*, Toulouse, France.
- Mar – Aug 2022 **Master 2 internship supervision**, *IRAP*, Toulouse, France.  
Synthetic observations of analytical models of star formation with RADMC3D.

08/10/1990 – French – 1 child (2016)

📞 +33 6 30 21 82 60 • ✉ [pierre.marchand.astr@gmail.com](mailto:pierre.marchand.astr@gmail.com)

📄 <http://pmarchandastr.github.io>

- Jan – May 2022 **Master 1 research project supervision**, *Université Paul Sabatier*, Toulouse, France.  
Study of grain growth in star formation.
- Jul. – Aug. 2020,2021 **Supervision of internships**, *American Museum of Natural History*, New-York, USA.  
6 weeks of research internships for future Earth Science Teachers. Astrophysics, computer simulations.
- 2015 – 2017 **Teaching assistant in mathematics**, *Université Claude Bernard Lyon 1*, Lyon, France.  
Tutorial classes and oral examinations in first and second year of University (192h).
- 2015 **Teaching assistant in sustainable development**, *Université Claude Bernard Lyon 1*, Lyon, France.  
Short lectures on energy sources for second year students (7x90min).
- 2013 – 2017 **Private tuitions**, *Methodia*, Lyon & Paris, France.  
Private tuitions for students in mathematics and physics from Middle School to 3rd year of University. Training classes in mathematics to prepare competitive examinations.
- Other**
- 2020 – 2021 **Admission committee for the Master of Art in Teaching of the American Museum of Natural History**, New-York, USA.  
Reviewing applications, conducting interviews, admission jury.
- 2018 – 2022 **Referee for 4 articles submitted to *Monthly Notices of the Royal Astronomical Society***, *Chemistry, star formation simulations, non-ideal MHD..*

## Publications and communications

### Published papers

- 2023 **Marchand, P.**, Lebreuilly, U., Mac Low, M.-M., Guillet, V., 2023, A&A, 670, 61: *Fast methods for tracking grain coagulation and ionization. III. Protostellar collapse simulations with non-ideal magnetohydrodynamics.*
- 2023 Lebreuilly, U., Valluci-Goy, V., Guillet, V., Lombart, M., **Marchand, P.**, 2022, MNRAS, 518, 3326: *Protostellar collapse simulations in spherical geometry with dust coagulation and fragmentation.*
- 2022 **Marchand, P.**, Guillet, V., Lebreuilly, U., Mac Low, M.-M., 2021, A&A, 666, 27: *Fast methods for tracking grain coagulation and ionization. II. Extension to thermal ionization*
- 2021 Lee, Y.-N., **Marchand, P.**, Liu, Y.-H., Hennebelle, P., 2021, ApJ, 922, 36: *Universal protoplanetary disk size under complete non-ideal magnetohydrodynamics: The interplay between ion-neutral friction, Hall effect, and the Ohmic dissipation.*
- 2021 **Marchand, P.**, Guillet, V., Lebreuilly, U., Mac Low, M.-M., 2021, A&A, 649, 50: *Fast methods for tracking grain coagulation and ionization. I. Analytic derivation*
- 2020 Guillet V., Hennebelle P., Pineau des forêts G., Marcowith A., Commerçon B., **Marchand P.** 2020, A&A, 643, 17 : *Dust coagulation feedback on magnetohydrodynamic resistivities in protostellar collapse.*

08/10/1990 – French – 1 child (2016)

📞 +33 6 30 21 82 60 • ✉ [pierre.marchand.astr@gmail.com](mailto:pierre.marchand.astr@gmail.com)

📄 <http://pmarchandastr.github.io>

2/4

- 2020 **Marchand P.**, Tomida K., Tanaka K.E.I., Commerçon B., Chabrier G. 2019, ApJ, 900, 180 : *Protostellar collapse: regulation of the angular momentum and onset of an ionic precursor.*
- 2019 **Marchand P.**, Tomida K., Commerçon B., Chabrier G. 2018, A&A, 631, A66 : *Impact of the Hall effect in star formation, improving the angular momentum conservation.*
- 2018 **Marchand P.**, Commerçon B., Chabrier G. 2018, A&A, 619, A37 : *Impact of the Hall effect in star formation and the issue of angular momentum conservation.*
- 2016 Hennebelle P., Commerçon B., Chabrier G. & **Marchand P.** 2016, ApJ, 830L, 8H : *Magnetically Self-regulated Formation of Early Protoplanetary Disks.*
- 2016 **Marchand P.**, Masson J., Chabrier G., Hennebelle P., Commerçon B., & Vaytet N. 2016, A&A, 592, A18 : *Chemical solver to compute molecule and grain abundances and non-ideal MHD resistivities in prestellar core-collapse calculations.*

### Conferences and seminars

- Since Sep 2015 12 oral presentations at national and international conferences (Europe, USA).
- Since Nov 2017 12 seminars in astrophysics departments (France, USA, Japan, Canada).
- Since Jun 2015 3 poster sessions at French and international conferences.

### Outreach

- Dec 2021 Scientific consultant for the French translation of the movie of the American Museum of Natural History "The Big Bang".
- Sep 2021 Public talk for the Mid-Hudson Astronomical Association: non-ideal MHD in star formation.
- Mar 2021 Chat moderator for a Youtube Live session of the American Museum of Natural History – answering chat questions about the universe.
- Jun 2020 Participation to an astronomy panel for high school students for the end of their rocket project, New-York, USA.
- Feb 2020 Scientific consultant for the French translation of the new planetarium show of the American Museum of Natural History "Worlds Beyond Earth".
- Jun 2019 Conference on star formation for high school students, Takamatsu, Japan.
- Dec 2018 Conference on the life cycle of stars for 2nd year scientific high school students, Kawanishi, Japan.
- Apr 2015, 2016, 2017 "Astro week", Accompanying high school students to visit the planetarium, computing center and Lyon observatory, France.
- 2015 – 2017 Presentation of the astrophysics department at ENS of Lyon and astronomy-related subjects for visiting middle and high school students (~10x90 minutes).
- May 2016 Presentation of astronomy subjects for 10 years old elementary school children (90 minutes).
- Mar 2012 "Nuit de l'équinoxe", Stand at a public gathering of the astronomy clubs of Lyon.

08/10/1990 – French – 1 child (2016)

☎ +33 6 30 21 82 60 • ✉ pierre.marchand.astr@gmail.com

📄 <http://pmarchandastr.github.io>

---

## Education

- Sep 2013 – **Master Degree in Astronomy and Astrophysics**, *Paris observatory*.
- Oct 2014 Theoretical astrophysics (fluid mechanics, radiative transfer, computational astrophysics).  
Ranking: 7th/33.
- Sep 2010 – **Engineering degree**, *École Centrale*, Lyon.
- Sep 2013 Specialised in Energy (electrical network, nuclear energy).
- Sep 2008 – **Classes préparatoires**, *Lycée Chaptal*, Paris.
- Jun 2010 Intensive courses of mathematics and physics to prepare competitive examinations. Accepted in *École Centrale de Lyon*.

---

## Associations / lab life

- 2022-2023 Member of the "Greenhouse gases reduction committee" at the Institut de Recherche en Astrophysics et Planétologie (IRAP), Toulouse, France
- 2022- Journal club co-organizer at the Institut de Recherche en Astrophysics et Planétologie (IRAP), Toulouse, France
- 2018-2019 Seminar co-organizer at the Osaka University Theoretical Astrophysics Group, Osaka, Japan
- 2015-2017 Welcoming middle-school students at the Centre de Recherche Astrophysique de Lyon (CRAL), Lyon, France
- 2011 President of the Astronomy club of *École Centrale de Lyon* in 2011
- 2011 Treasurer of the Theatrical improvisation club of the *École Centrale de Lyon* in 2011

---

## Computer skills

- Advanced Fortran 90,  $\LaTeX$
- Intermediate Office, Linux, Julia, Microsoft Windows, Parallel Computing
- Basic Python, HTML, CSS, C++, Matlab, Maple, Blender

### Public codes

- Chemistry code <https://bitbucket.org/pmarchan/chemistry> - Marchand et al (2016)
- Ishinisan <https://bitbucket.org/pmarchan/ishinisan> - Marchand et al (2021)

---

## Languages

- French **Native**
- English **Fluent**
- Japanese **Conversational**
- Spanish **Basic**

08/10/1990 – French – 1 child (2016)

☎ +33 6 30 21 82 60 • ✉ [pierre.marchand.astr@gmail.com](mailto:pierre.marchand.astr@gmail.com)

📄 <http://pmarchandastr.github.io>