

Joey S.G. Mombarg

Born: 09-12-1993, Arnhem, The Netherlands

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🏠 <https://jmombarg.github.io/PersonalWebsite/>



Current

Postdoctoral researcher

Institute of Astronomy, KU Leuven.

Leuven, Belgium

Mar 2022 - Present

- I am working on modelling gravity mode pulsations in A/F-type pulsators in the group of Prof. Dr. Conny Aerts.

Education

PhD Astronomy and Astrophysics

Institute of Astronomy, KU Leuven.

Leuven, Belgium

Mar 2018 - Feb 2022

- Thesis title: *"Astero seismic Modelling of Intermediate-mass Stars"*.
- Supervisors: Prof. Dr. C. Aerts and Dr. Timothy Van Reeth.
- Research stay at Université Toulouse III Paul Sabatier, Toulouse, France from April 12 2021 - Nov 1 2021 under the supervision of Prof. Dr. Michel Rieutord. Awarded FWO (Flanders Research Foundation) long-stay travel grant.
- Topic: My PhD focused on modelling gravity mode pulsations in A/F-type pulsators to derive masses, ages, and mixing efficiencies with the goal of improving our understanding of the mechanism(s) behind the transport of angular momentum and chemical elements. My PhD thesis can be found [here](#).

MSc Physics and Astronomy

Radboud University. Specialization in Particle and Astrophysics.

Nijmegen, The Netherlands

Aug 2015 - Feb 2018

- Graduated Bene Meritum.
- Thesis title: *"Detection and characterization of Jovian S-bursts"* (see awards). Supervisors: Dr. M. Klein-Wolt and C. Brinkerink.
- Attended a planetary science collaboration meeting organized by L'Observatoire de Paris - LESIA, Paris.
- Summer project (6 ECTS) with the asteroseismology group of KU Leuven.

BSc Physics and Astronomy

Radboud University. Minor Astrophysics.

Nijmegen, The Netherlands

Sep 2012 - Jul 2015

- Graduated Bene Meritum.
- Thesis title: *"Simulating the variable sky for BlackGEM"*. Supervisor: Dr. E Körding.

Conference and Workshop Participations

Workshop stellar physics group Institut de Recherche en Astrophysique et Planétologie

Oral contribution: *'Improving the theory of chemical mixing inside intermediate-mass stars with asteroseismology'*

Villalier, France

18-19 Oct 2021

European Astronomical Society (EAS) 2020

Poster contribution: *'Predicting stellar gravity-mode pulsations and evolution tracks with neural networks'*

Online

29 Jun -3 Jul 2020

Stars and their Variability: Observed from Space

Oral contribution: *'Improving stellar evolution models with atomic diffusion from asteroseismology of intermediate-mass stars'*

Vienna, Austria

19-23 Aug 2019

Tess Sci Con I

Poster contribution: *'High-precision mass and age estimates of F-type stars from asteroseismology'*

Cambridge, USA

29 July - 2 Aug 2019

TASC5/KASC12

Oral contribution: *'Improving stellar evolution models with atomic diffusion from asteroseismology of intermediate-mass stars'*

Cambridge, USA

22-26 July 2019

Nederlandse Astronomen Conferentie 2019

Oral contribution: *'Masses, Ages, and Core Properties of Intermediate-mass Stars from Asteroseismology and Spectroscopy'*

Groningen, The Netherlands

27-29 May 2019

Lorentz workshop: 'Weighting stars from birth to death'

Oral contribution: *'Probing the fundamental parameters and core properties of γ Dor stars'*

Leiden, The Netherlands

19-23 Nov 2018

PHOST 2018

Oral contribution: *'The effect of atomic diffusion on gravity modes of young stars with a convective core'*

Banyuls-sur-mer, France

2-7 Sep 2018

MESA Summer School 2018

5-day workshop on the stellar evolution code Modules for Experiments in Stellar Astrophysics (MESA).

UCSB, California, USA

13-17 Aug 2018

Nederlandse Astronomen Conferentie 2018

Poster contribution: *'Atomic diffusion in young stars with a convective core'*

Groningen, Netherlands

16-18 May 2018

Seminars

Good vibrations seminar

"Asteroseismic modelling of gravito-inertial modes in γ Doradus pulsators"

Link to video [here](#).

Online

July 2021

Institut de Recherche en Astrophysique et Planétologie

"Constraining stellar evolution theory with asteroseismology of γ Doradus stars using deep learning"

Journal club / seminar hybrid

Toulouse, France

May 2021

Institute of Astronomy

"Pulse fiction: Gravito-inertial asteroseismology of intermediate-mass stars"

KU Leuven, Belgium

Dec 2019

Scientific Awards and Grants

- 2021 **IRAP PhD day Best poster award**
Title: “Asteroseismic modelling of A- and F-type pulsators”.
Authors: J.S.G Mombarg
Toulouse, France
- 2020 **Long-stay travel grant Research Foundation - Flanders (FWO)**
9-month travel grant (14850EUR) for research stay at Institut de Recherche en Astrophysique et Planétologie (IRAP), Toulouse, France. (Shortened to 6.5 month due to COVID pandemic.)
Leuven, Belgium
- 2018 **Netherlands Astronomy Conference 2018 Best poster award**
Title: “Atomic diffusion and pulsations in young stars with a convective core”.
Authors: J.S.G Mombarg, M. Michielsen, M.G. Pedersen and C. Aerts.
Groningen, The Netherlands
- 2018 **De Zeeuw-Van Dishoeck 2018 award**
Award (3000EUR) for best astronomy Master thesis in The Netherlands awarded by the “Koninklijke Hollandse Maatschappij der Wetenschappen”.
Haarlem, The Netherlands

Publications

4 first-author, 7 co-author, 230 citations, h-index 7

[Link to ADS Library](#)

Mombarg, J. S. G.; Dotter, A.; Rieutord, M.; Michielsen, M.; Van Reeth, T.; Aerts, C, “Predictions for gravity-mode periods and surface abundances in intermediate-mass dwarfs from shear mixing and radiative levitation”, 2022, [The Astrophysical Journal](#), Volume 925, Issue 1, id.154, Impact factor: 5.874

Pavlovski, K.; Hummel, C. A.; Tkachenko, A.; Dervisoglu, A.; Kayhan, C.; Zavala, R. T.; Hutter, D. J.; Tycner, C.; Sahin, T.; Audenaert, J.; Baeyens, R.; Bodensteiner, J.; Bowman, D. M.; Gebruers, S.; Janssen, N. E.; **Mombarg, J. S. G.**, “Dynamical parallax, physical parameters and evolutionary status of the components of the bright eclipsing binary α Draconis”, 2022, [Astronomy & Astrophysics](#), Volume 658, id.A92, Impact factor: 5.802

Aerts C.; Augustson K.; Mathis S.; Pedersen M. G.; **Mombarg J. S. G.**; Vanlaer V.; Van Beeck J.; Van Reeth T, “Rossby numbers and stiffness values inferred from gravity-mode asteroseismology of rotating F- and B-type dwarfs”, 2021, [Astronomy & Astrophysics](#), Volume 656, id.A121, Impact factor: 5.802

Serenelli, Aldo; Weiss, Achim; Aerts, Conny; Angelou, George C.; Baroch, David; Bastian, Nate; Bergemann, Maria; Bestenlehner, Joachim M.; Czekala, Ian; Elias-Rosa, Nancy; Escorza, Ana; Van Eylen, Vincent; Feuillet, Diane K.; Gandolfi, Davide; Gieles, Mark; Girardi, Leo; Lodieu, Nicolas; Martig, Marie; Miller Bertolami, Marcelo M.; **Mombarg, Joey S. G.**; Morales, Juan Carlos; Moya, Andres; Nsamba, Benard; Pavlovski, Kresimir; Pedersen, May G.; Ribas, Ignasi; Schneider, Fabian R. N.; Silva Aguirre, Victor; Stassun, Keivan; Tolstoy, Eline; Tremblay, Pier-Emmanuel; Zwintz, Konstanze, “Weighing stars from birth to death: mass determination methods across the HRD”, 2021, [The Astronomy and Astrophysics Review](#), Volume 29, Impact factor: 25.357

Gebruers, Sarah; Straumit, Ilya; Tkachenko, Andrew; **Mombarg, Joey S. G.**; Pedersen, May G.; Van Reeth, Timothy; Li, Gang; Lampens, Patricia; Escorza, Ana; Bowman, Dominic M.; De Cat, Peter; Vermeylen, Lore; Bodensteiner, Julia; Rix, Hans-Walter; Aerts, Conny, “A homogeneous spectroscopic analysis of a Kepler legacy sample of dwarfs for gravity-mode asteroseismology”, 2021, [Astronomy & Astrophysics](#), Volume 650, id.A58, 23 pp, Impact factor: 5.802

Mombarg J. S. G., Van Reeth T., and Aerts C., “Constraining stellar evolution theory with asteroseismology of γ Doradus stars using deep learning”, 2021, [Astronomy & Astrophysics](#), Volume 650, id.A58, 23 pp, Impact factor: 5.802

Henneco, Jan; Van Reeth, Timothy; Prat, Vincent; Mathis, Stéphane; **Mombarg, Joey S. G.**; Aerts, Conny, “The effect of the centrifugal acceleration on period spacings of gravito-inertial modes in intermediate-mass stars”, 2021, [Astronomy & Astrophysics](#), Volume 648, id.A97, Impact factor: 5.802

Mombarg J. S. G., Dotter A., Van Reeth T., Tkachenko A., Gebruers S. and Aerts C., “Asteroseismic modeling of gravity modes in slowly rotating A/F stars with radiative levitation”, 2020, [The Astrophysical Journal](#), Volume 895, Issue 1, id.51, Impact factor: 5.874

Mombarg J. S. G., Van Reeth T., Pedersen M. G., Molenberghs G., Bowman D. M., Johnston C., Tkachenko A. and Aerts C., “Astero seismic masses, ages and core properties of gamma Doradus stars using gravity-inertial dipole modes and spectroscopy”, 2019, *Monthly Notices of the Royal Astronomical Society*, Volume 485, Issue 3, Pages 3248-3263, Impact factor: 5.287

Aerts C. Molenberghs G., Michielsen M., Pedersen M. G., Björklund R., Johnston C., **Mombarg J. S. G.**, Bowman D. M., Buysschaert B., Pápics P. I., Sekaran S., Sundqvist J. O., Tkachenko A., Truyaert K., Van Reeth T. and Vermeyen E., 2018, “Forward Astero seismic Modeling of Stars with a Convective Core from Gravity-mode Oscillations: Parameter Estimation and Stellar Model Selection”, *The Astrophysical Journal Supplement Series*, 237, id15, Impact factor: 8.136

Van Reeth T., **Mombarg J. S. G.**, Mathis S., Tkachenko A., Fuller J., Bowman D. M., Buysschaert B., Johnston C., García Hernández A., Goldstein, J. Townsend, R. H. D. and Aerts, C., 2018, “On the sensitivity of gravito-inertial modes to differential rotation in intermediate-mass main-sequence stars”, *Astronomy & Astrophysics*, 618:A24, Impact factor: 5.802

Teaching

Teaching Assistant

Radboud University

Nijmegen, Netherlands

Sep 2015 - Jan 2016

- TA of the BSc biology and physics courses ‘Mathematics for Biologists’, ‘Biophysics’ and ‘Mechanics’ (3h/week).

Teaching Assistant

KU Leuven

Leuven, Belgium

Mar 2018 - ongoing

- TA for the BSc introductory courses to astronomy, and mechanics.
- TA for MSc course ‘Astero seismology’.

MSc thesis co-supervisor

KU Leuven

Leuven, Belgium

Sep 2019 - July 2020

- Mentor of MSc student Jan Henneco (Supervisor: Dr. T. Van Reeth).
Thesis title: ‘The effect of the centrifugal deformation of stars on g-mode pulsations’

Scientific community work

STEM University

KU Leuven

Leuven, Belgium

Feb 2022

- Workshop on stars and (exo)planets for primary and high school children, ~15 participants, 1.5-hour workshop.

Member of the SOC for the EAS 2022 conference

Special session on Machine Learning in astronomy.

Valencia, Spain

2022

Lecture at high school

Berthoutsinstituut, Mechelen

Online

May 2021

- Online lectures for high school students on stellar evolution, black holes, exoplanets, and space travel.
~50 participants, 2 times 45-min lecture.

Scientific reviewer

Monthly Notices of the Royal Astronomical Society

2020

High School visit

KU Leuven

Leuven, Belgium

March 2019

- Departmental visit high school students, ~20 participants, 1-hour workshop.

Ladies@Science

KU Leuven

- Exoplanet workshop for high school girls, ~20 participants, 1-hour workshop.

Leuven, Belgium

April 2019, April 2018

Kids University

KU Leuven

- Solar system workshop for primary school children, ~30 participants, 1-hour workshop.

Leuven, Belgium

Oct 2018

Observing Experience

Observer at the Mercator Telescope

4 × 10 nights on site, 1 × 5 nights remote

- Service mode.

La Palma, Spain

Sep 2019, Apr 2022

Co-observer at the Hale telescope

3 nights

- As part of the MSc course “Telescope Observing”.

Palomar, USA

Jan 2017

Programming

Advanced **Python, \LaTeX , Fortran**

Basic **C++, Matlab**

SSE and pulsation codes **MESA, GYRE, ESTER, TOP**

Languages

Native **Dutch**

Fluent **English**

Proficient **French** level B1.

Basic **German, Russian** German: level A2. Russian: level A1.