

Joey S.G. Mombarg

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Current

PhD Astronomy and Astrophysics

Institute of Astronomy, KU Leuven.

Leuven, Belgium
Mar 2018 - Present

- Thesis title: “Forward 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: I am using 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.

Education

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 Participations

Nederlandse Astronomen Conferentie 2018

Poster contribution: ‘Atomic diffusion in young stars with a convective core’

Groningen, Netherlands
16-18 May 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

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

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

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

TASC5/KASC12

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

Cambridge, USA

22-26 July 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

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

European Astronomical Society (EAS) 2020

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

Online

29 Jun -3 Jul 2020

Scientific Awards

Netherlands Astronomy Conference 2018 Best poster award

2018 Title: "Atomic diffusion and pulsations in young stars with a convective core".
Authors: J.S.G Mombarg, M. Michelsen, M.G. Pedersen and C. Aerts.

Groningen, The Netherlands

De Zeeuw-Van Dishoeck 2018 award

2018 Award (3000EUR) for best astronomy Master thesis in The Netherlands
awarded by the "Koninklijke Hollandse Maatschappij der Wetenschappen".

Haarlem, The Netherlands

Publications

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*, in press, Impact factor: 5.565

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: 5.565

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; Lodie, 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", 2020, *The Astronomy and Astrophysics Review*, in press, Impact factor: 11.611

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: 5.580

Mombarg J. S. G., Van Reeth T., Pedersen M. G., Molenberghs G., Bowman D. M., Johnston C., Tkachenko A. and Aerts C., "Asteroseismic 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: 5.194

Aerts C. Molenberghs G., Michelsen M., Pedersen M. G., Björklund R., Johnston C., **Mombarg J. S. G.**, Bowman D. M., Buyschaert B., Pápics P. I., Sekaran S., Sundqvist J. O., Tkachenko A., Truyaert K., Van Reeth

T. and Vermeyen E., 2018, "Forward Asteroseismic 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: 8.561

Van Reeth T., **Mombarg J. S. G.**, Mathis S., Tkachenko A., Fuller J., Bowman D. M., Buyschaert 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: 5.565

Teaching

Teaching Assistant

Radboud University

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

Nijmegen, Netherlands

Sep 2015 - Jan 2016

Teaching Assistant

KU Leuven

- TA for the BSc introductory courses to astronomy, and mechanics.
- TA for MSc course 'Asteroseismology'.

Leuven, Belgium

Mar 2018 - ongoing

MSc thesis co-supervisor

KU Leuven

- 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*'

Leuven, Belgium

Sep 2019 - July 2020

Outreach

Lecture at high school

Online

Berthoutsinstituut, Mechelen

May 2021

- Online lectures for high school students on stellar evolution, black holes, exoplanets, and space travel.

High School visit

Leuven, Belgium

March 2019

KU Leuven

- Departmental visit high school students.

Ladies@Science

Leuven, Belgium

April 2019, April 2018

KU Leuven

- Exoplanet workshop for high school girls.

Kids University

Leuven, Belgium

Oct 2018

KU Leuven

- Solar system workshop for primary school children.

Observing Experience

Observer at the Mercator Telescope

La Palma, Spain

Sep 2019, ongoing

3x 10 nights on site, 1x 5 nights remote

- Service mode.

Co-observer at the Hale telescope

Palomar, USA

Jan 2017

3 nights

- As part of the MSc course "Telescope Observing".

Programming

Advanced **Python, L^AT_EX, Fortran**

Basic **C++, Matlab**

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

Languages

Native **Dutch**

Fluent **English**

Proficient **French** level B1.

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