Joey S.G. **Mombarg**

Born: 09-12-1993, Arnhem, The Netherlands
joey.mombarg@kuleuven.be

Current

PhD Astronomy and Astrophysics

Leuven, Belgium
Mar 2018 - Present

Institute of Astronomy, KU Leuven.

- Thesis title: *"Asteroseismic 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

Nijmegen, The Netherlands
Aug 2015 - Feb 2018

Radboud University. Specialization in Particle and Astrophysics.

- 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

Nijmegen, The Netherlands
Sep 2012 - Jul 2015

Radboud University. Minor Astrophysics.

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

Conference Participations

Nederlandse Astronomen Conferentie 2018

Groningen, Netherlands
16-18 May 2018

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

MESA Summer School 2018

UCSB, California, USA
13-17 Aug 2018

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

PHOST 2018

Banyuls-sur-mer, France
2-7 Sep 2018

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

Lorentz workshop: 'Weighting stars from birth to death'

Leiden, The Netherlands
19-23 Nov 2018

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

Nederlandse Astronomen Conferentie 2019
Groningen, The Netherlands

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

27-29 May 2019

TASC5/KASC12
Cambridge, USA

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

22-26 July 2019

Tess Sci Con I
Cambridge, USA

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

29 July - 2 Aug 2019

Stars and their Variability: Observed from Space
Vienna, Austria

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

19-23 Aug 2019

European Astronomical Society (EAS) 2020
Online

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

29 Jun -3 Jul 2020

Seminars

Good vibrations seminar
Online

July 2021

Institut de Recherche en Astrophysique et Planétology
Toulouse, France

Journal club / seminar hybrid

May 2021

Institute of Astronomy
KU Leuven, Belgium

Dec 2019

Scientific Awards and Grants

2021 **IRAP PhD day Best poster award** — *Toulouse, France*
Title: *"Asteroseismic modelling of A- and F-type pulsators"*.
Authors: J.S.G Mombarg

2020 **Long-stay travel grant Research Foundation - Flanders (FWO)** — *Leuven, Belgium*
9-month travel grant (14850EUR) for research stay at Institut de Recherche en Astrophysique et Planétology (IRAP), Toulouse, France. (Shortened to 6.5 month due to COVID pandemic.)

2018 **Netherlands Astronomy Conference 2018 Best poster award** — *Groningen, The Netherlands*
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.

2018 **De Zeeuw-Van Dishoeck 2018 award** — *Haarlem, The Netherlands*
Award (3000EUR) for best astronomy Master thesis in The Netherlands awarded by the "Koninklijke Hollandse Maatschappij der Wetenschappen".

Publications

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: 5.565

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: 5.565

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; 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", 2020, *The Astronomy and Astrophysics Review*, Volume 29, 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., 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 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., 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: 5.565

Teaching

Teaching Assistent

Nijmegen, Netherlands

Radboud University

Sep 2015 - Jan 2016

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

Teaching Assistent

Leuven, Belgium

KU Leuven

Mar 2018 - ongoing

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

MSc thesis co-supervisor

Leuven, Belgium

KU Leuven

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

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
KU Leuven *March 2019*
- Departmental visit high school students.

Ladies@Science
Leuven, Belgium
KU Leuven *April 2019, April 2018*
- Exoplanet workshop for high school girls.

Kids University
Leuven, Belgium
KU Leuven *Oct 2018*
- Solar system workshop for primary school children.

Scientific reviewer
Monthly Notices of the Royal Astronomical Society *2020*

Member of the SOC for EAS2022
Special session on Machine Learning in astronomy *2021*

Observing Experience

Observer at the Mercator Telescope
La Palma, Spain
3x 10 nights on site, 1x 5 nights remote *Sep 2019, ongoing*
- Service mode.

Co-observer at the Hale telescope
Palomar, USA
3 nights *Jan 2017*
- As part of the MSc course “Telescope Observing”.

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.