CV date	23/04/2024

Part A. PERSONAL INFORMATION

First Name	Giovanni Marcello		
Family Name	Mirouh		
Sex	Male	Date of Birth	14/03/1989
ID number			
URL Web	www.ugr.es/~gmm		
Email Address	gmirouh@iaa.es		
Open Researcher and Contributor ID (ORCID)	0000-0003-0238-8435		

A.1. Current position

Job Title	Postdoctoral researcher (*doctor fuera de convenio*)		
Starting date	22/04/2024		
Institution	Instituto de Astrofísica de Andalucía - CSIC		
Department/Centre	Stellar physics group		
Country	Spain	Phone Number	
Keywords	Stellar physics; stellar rotation; variable stars; evolution and stellar structure; stellar modelling		

A.2. Previous positions (Research Career breaks included)

Period	Job title / Name of Employer / Country
2021/12 – 2024/04	Postdoctoral research fellow / Universidad de Granada / Spain
2018/08 – 2021/08	Senior postdoctoral research fellow / University of Surrey / UK
2016/11 – 2018/08	Research fellow / International School of Advanced Studies (SISSA) / Italy
2017/09 – 2017/11	Visiting researcher / Max Planck Institut for Astrophysics (MPA) / Germany
2013/10 – 2016/10	PhD. student with teaching duties / Université Toulouse III / France
2009/10 – 2013/09	Intern student (“normalien”) / Ecole Normale Supérieure / France

A.3. Education

Degree / Master / PhD	University / Country	Year
Doctorate in Astronomy, Space Science and Planetology	Université Toulouse III / France	2016
Masters degree in Physics	École Normale Supérieure de Cachan / France	2014
Masters degree in Astronomy, Astrophysics and Space Engineering	Université Paris 6 & Ecole Normale Supérieure / France	2012
Licence (Bachelor of Science) in Physics	Université Paris 6 & Ecole Normale Supérieure / France	2010

Part B. CURRICULUM SUMMARY

My research delves into the evolutionary dynamics and the asteroseismology of intermediate-mass stars, which are often rotating rapidly and/or in binary systems. A good description of these stars is thwarted by rotation that impacts both the stellar structure and the oscillation modes it harbours, by making the star oblate and modifying the mode frequencies and geometries.
My career, spanning from my PhD in Toulouse (which received the Pierre Maury dissertation award) to postdocs in Trieste, Surrey, and now in Granada, focuses on developing strategies to leverage asteroseismic data for these rapid rotators. Notably, my contributions include the most comprehensive exploration of low-frequency modes in those stars, published in *Journal of Fluid Mechanics*. Since then, I develop innovative strategies for the forward modelling of centrifugally-flattened stars, by associating the ESTER 2D models with the TOP 2D oscillation code, and I am now a key member of the TOP development team. One of my main achievements is the creation of a groundbreaking machine learning algorithm for oscillation mode classification, that allows for an instant identification of computed modes with 96% accuracy.
These strategies were applied to the search of regularities in oscillation frequency spectra to confirm their link with stellar parameters, the interpretation of spectroscopic measurements in the flattened rotator, or the dating of stellar clusters (a work led by a UGR PhD student). During my stay at the University of Surrey, I extended my skill set by developing an evolution algorithm for binary stars that relies on bespoke detailed grids of models, which allowed me to show that tides in binary systems are inefficient on the main sequence (which contradicts earlier inferences). The underlying grids are accessible openly, and have triggered several collaborations and articles, for instance to constrain the mass distribution of the first stars of the Universe. Extensive SKA observations are now being analysed for a submission to *Nature* in 2024. Recently, I also have intensified collaborations with observation specialists by joining the SONG network and submitting with five successful proposals (two of which I am PI) for the spectroscopy and polarimetry of rapid rotators from the Pic du Midi and CFHT.
With my recent move to the Instituto de Astrofísica de Andalucía, I am now applying the strategies I developed to the modelling of M dwarfs and the quest for their oscillations, in preparation for the MOSAIC and ANDES spectrographs at ELT.

I have published 29 papers including 17 refereed articles for a total of 441 citations and a h-index of 10 (taken from ADS on 23/04/24). These works, led in small teams where I always had a significant role, established my reputation as a world expert of rotating, binary, main-sequence stars. As such, I am a referee for *A&A*. I participated in 24 national and international conferences with talks or posters, including invited talks in 6 workshops and 3 international conferences. I also visited three research institutes abroad (Munich, 2 months, Tokyo, 2 weeks, and Tabriz, 2 weeks) and have been invited to give more than 20 seminars worldwide. In 2021, I organised an international conference on the asteroseismology of binary stars: I obtained 3,300€ to bring together 32 experts of this oft-overlooked line of research.

Moreover, I have been involved in many research projects (see sec. C3), contributing ideas and managing autonomous lines of research. I belong to various collaboration networks related with asteroseismology missions and massive stars, such as the Kepler and TESS asteroseismology consortia, within which I published four articles in 2019. This led me to cultivate a dense network of collaborations in Spain (Granada, València), Europe (Cambridge, Toulouse, Paris, Vilnius, Tautenburg…) and Japan (Tokyo) that I aim to expand further. Striving for independence, I submitted the EREBOS project to the 2022 Marie Sklodowska-Curie Actions call and scored 90%: despite not being funded, I received the Seal of Excellence of the European Commission that acknowledges the high quality of the proposed research and my ability to deliver its science objectives.

Beyond research, I am very active in outreach activities: I have developed two projects from scratch, for both schools and young audiences and physics-savvy, more mature audiences. I secured funding for both projects and presented them in appropriate events (open days, school events, planetarium lectures) in France, Italy and the UK. At the university of Surrey, I got involved in institutional politics as a postdoctoral researcher representative and an equality, diversity and inclusion advisor, defining protocols to fight all discriminations and contributing to the university's successful application to a Race equality bronze award. Finally, I am also very interested and active in teaching and mentoring students: as such, I have taught for a total of 220 hours at the Bachelor, Master, and PhD. levels in four countries, I supervised 5 final-year projects (with two more under way), and since 2020 I co-supervise a PhD student on the later stages of stellar evolution.

Part C. RELEVANT ACCOMPLISHMENTS

C.1. Most important publications in national or international peer-reviewed journals, books and conferences

Below is a selection of my most significant publications. The complete list of 29 publications is available online. The first author is the corresponding author.

1 **Mirouh G. M.**, Hendriks D. D., Dykes S., Moe M., Izzard R. G. (1st/5 authors), **Detailed equilibrium and dynamical tides: impact on circularization and synchronization in open clusters,** 2023, *MNRAS*, 524, 3978. DOI: 10.1093/mnras/stad2048 (22 pages, 5 citations)

2 Pamos Ortega D., **Mirouh G. M.**, García Hernández A., Suárez J. C., Barceló Forteza S. (2nd/5), **Dating young open clusters using delta Scuti stars. Results for Trumpler 10 and Praesepe,** 2023, *A&A*, 675, A167, DOI: 10.1051/0004-6361/202346323 (19 pages, 1 citation)

3 Rieutord M., Petit P., Reese D. R., Böhm T., López Ariste A., **Mirouh G. M.**, Domiciano de Souza A. (6th/7) **Spectroscopic detection of Altair's non-radial pulsations,** 2023, *A&A*, 669, A99. DOI: 10.1051/0004-6361/202245017 (7 pages, 1 citation)

4 Gessey-Jones T., Sartorio N. S., Fialkov A., **Mirouh G. M.** […] Barkana R. (4th/9), **Impact of the primordial stellar initial mass function on the 21-cm signal,** 2022, *MNRAS*, 516, 841, DOI: 10.1093/mnras/stac2049 (20 pages, 22 citations)

5 **Mirouh G. M.** (1st/1), **Forward modelling and the quest for mode identification in rapidly rotating stars,** 2022, *Frontiers in Astronomy and Space Sci*., 9, 2296, DOI: 10.3389/fspas.2022.952296 (19 pages, 1 citation).

6 Reese D. R., **Mirouh G. M.**, Espinosa Lara F., Rieutord M., Putigny B. (2nd/5) **Oscillations of 2D ESTER models. I. The adiabatic case.** 2021, *A&A*, 645, A46. DOI: 10.1051/0004-6361/201935538 (20 pages, 16 citations)

7 Antoci V., Cunha M. S., Bowman D. M. […] Weiss W. W. (**Mirouh G. M.** 53rd/66) **The first view of δ Scuti and γ Doradus stars with the TESS mission** 2019, *MNRAS*, 490, 4040. DOI: 10.1093/mnras/stz2787 (20 pages, 83 citations)

8 **Mirouh G. M.**, Angelou G. C., Reese D. R., Costa G. (1st/4), **Mode classification in fast-rotating stars using a convolutional neural network: model-based regular patterns in δ Scuti stars,** 2019, *MNRASL*, 483, 28, DOI: 10.1093/mnrasl/sly212 (5 pages, 18 citations)

9 **Mirouh G. M.**, Baruteau C., Rieutord M., Ballot J. (1st/4), **Gravito-inertial waves in a differentially rotating spherical shell.** 2016, *Journal of Fluid Mechanics*, 800, 213, DOI: 10.1017/jfm.2016.382 (35 pages, 19 citations)

10 **Mirouh G. M.**, Garaud P., Stellmach S., Traxler A. L., Wood T. S. (1st/5), **A New Model for Mixing by Double-diffusive Convection (Semi-convection). I. The Conditions for Layer Formation,** 2012, *ApJ*, 750, 61, DOI: 10.1088/0004-637X/750/1/61 (18 pages, 72 citations)

C.2. Conferences and meetings

1 2023/11 – **Invited talk** at the 1st Granada PLATO workshop, "Modelling rotation with 1D and 2D models", IAA Granada.

2 2023/09 – **Invited talk** at the 11th Applied Inverse Problems conference, "Mode identification in rapidly-rotating stars: paving the way to inverse methods", Göttingen (Germany).

3 2022/09 –Talk at the Reunión científica de la Sociedad Española de Astronomía, "Detailed equilibrium and dynamical tides: impact on circularization and synchronization in open clusters", Universidad de la Laguna.

4 2021/01 – **Chair of SOC and LOC, review talk** ("Seismology of rotating stars") of the "Pulsations in Intermediate-mass, Massive and/or Multiple Stars" International conference, Guildford (UK) – 1 week, 32 participants from Europe and Japan.

5 Since 2020 – **Invited review talk** ("Two dimensional models and oscillations") and 3 participations at Iberian meetings in Asteroseismology.

6 2019/12 – **Organiser** of the binary_c workshop, Guildford (UK) – 1 week, 12 participants from the UK.

7 2018/02 to 2019/03 – Young scientist within the "Seismology of Fast Rotating Stars", ISSI Bern (Switzerland).

8 Since 2014 – 2 talks ("Gravitoinertial mode in fast-rotating stars", "Mode classification in fast-rotating stars using convolutional neural networks") and 2 posters at **international Corot, Kepler and TESS asteroseismology conferences**.

9 2014 – **LOC member and poster** contribution at the Corot/Kepler conference, Toulouse (France)

10 Since 2012 – **5 invited talks** and 10 participations to IRAP Stellar physics workshops, Toulouse (France)

C.3. Research projects and contracts

1 Since 2024 – Second-generation instrumentation (MOSAIC, ANDES) for the Extremely Large Telescope. PI: P. J. Amado (IAA).

2 2022 – **Seal of excellence of the European Commission**, recognizing a high-quality project proposal for the Marie Sklodowska-Curie Action application EREBOS (scored 90%). **PI: G. M. Mirouh.**

3 2021 to 2024 – Spanish contribution to the PLATO 2.0 space mission. AEI, 277,000€. PI : J. C. Suárez (UGR). My role: member as a research fellow.

4 2021 to 2023 – CHARROTS - Characterization of Rotating Stars. FEDER/Junta de Andalucía, 141,500€. PI: A. García Hernández (UGR). 01/03/2020-28/02/2023. My role: collaborator.

5 2018 – 2021 – First population models of the most massive stars. Science and Technology Facilities Council, 423,000€. PI: R. G. Izzard. (University of Surrey, UK). 08/2018-10/09/2021. My role: member as a senior research fellow, **lead researcher** on the grid computation and evolution algorithm part of the project.

6 2013 – 2016 – ESTER - Stellar evolution with rotation. French national research agency, 263,000€. PI: M. Rieutord. (Research institute for Astrophysics and Planetology, France). 01/10/2012-18/10/2016. My role: predoctoral researcher and teaching assistant.

7 2011 – Chemical mixing in the interior of stars. National Science Foundation, 247,000€. PI: P. Garaud. (University of California Santa Cruz). 2008-2011. My role: predoctoral researcher.

8 2023 – ArQus European **collaboration visit** to Vilnius University (Lithuania). Invited talk "Asteroseismology of rapidly-rotating stars". ArQus alliance, 1,400€. **PI: G.M. Mirouh**.

9 Since 2017 – I have contributed to **5 observing proposals (2 as PI)** dedicated to the spectroscopy, polarimetry and/or photometry of rapidly-rotating stars using the Pic du Midi observatory, TESS, or CFHT.

10 Since 2013 – I am an active member of **all major asteroseismology consortia** of Kepler, TESS, and PLATO. My role: collaborator, submitted an observing proposal and contributed to 4 TESS first-light papers.

C.4. Technology/Knowledge transfer

1 2021 – **Pulsations in Intermediate-mass, Massive and/or Multiple Stars international conference**. Royal Astronomical Society & Surrey Institute of Advanced Studies, 3,300€. **PI: G. M. Mirouh.** 18/01/2021-22/01/2021.

2 2017 to 2021 – **PI** of the "Sensory Universe" **outreach project, aimed at school and family audiences**. I received 220 € from the University of Surrey, presented in schools and Open Days in Italy and the UK.

3 Since 2019 – **PI** of "The music of stars" - **outreach project aimed at linking stellar oscillations and music**. I received 220 € from the University of Surrey, delivered invited lectures at the Winchester planetarium, the Guildford and Farnham astronomical societies (UK) and the Sirius conference (Constantine, Algeria).

4 2015 – Co-organised the **"Children's science conference" outreach event**, at the Cité de l'Espace (France). I supervised an elementary school class to prepare and present posters and talks in a dedicated conference.