Curriculum Vitae

Diego Lorenzo-Oliveira

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I am an expert in high-precision spectroscopy of Sun-like and M dwarf stars. This technique enables the determination of robust stellar properties such as atmospheric parameters, ages, stellar activity, radial velocities, and rotation. Since 2016, I have been working on how stars like our Sun produce magnetic fields, and how these magnetic fields and stellar rotation evolve over the stars' lifetimes. The major goal of my research is to place our own Sun into context to better understand the origins and evolution of its magnetic fields. The interplay between stellar rotation, activity, and age drives the dynamo evolution and has applications in many areas of astrophysics. For instance, the magnetic variability of stars is currently the dominant obstacle to discovering Earth-like planets. I addressed the long-standing issue of the magnetic evolution of old stars that was first questioned 18 years ago (Pace Pasquini, 2004, AA, 426, 1021; Pace, 2013, AA 551, 8). I provided solid evidence that stellar activity and rotation can be used as reliable chronometers for solar analogs. I have published 21 peer-reviewed articles, including 12 as first author or major contributions (H-index = 12, Google Scholar) in high-profile journals. From the observational side, I had a crucial experience involving observations, project development, pipeline construction, and data analysis. My projects have been approved in several telescopes worldwide (notably 14 nights of HARPS time awarded as PI). I am a leading collaborator of the Solar-Twin Planet Search, undertaken at the High Accuracy Radial velocity Planet Searcher (HARPS) on ESO's 3.6m telescope at La Silla, Chile. I have given 11 invited talks worldwide (including NASA, ESO, AIP-Potsdam, and Exeter) and contributed talks at international conferences. Recently I have been invited to give a review talk about stellar chromospheric chronometers at the conference Fifty Years of the Skumanich Relations, celebrating the 50th anniversary of the most impactful paper in my area of research (Skumanich, 1972, ApJ, 171, 565).

Keywords: High-precision spectroscopy; Statistics; Search for solar twins; binary stars; open clusters; stellar ages; atmospheric parameters; radial velocities; FGKM magnetic activity.

Education

2012-2016 **Ph.D., Valongo Observatory, Federal University of Rio de Janeiro, Brazil (OV/UFRJ).**
Astronomy. Supervisor: Gustavo F. Porto de Mello, Ph.D.

2014-2015 **Ph.D., Interuniversity exchange doctorate at Institut d'Estudis Espacials de Catalunya, IEEC, Spain.**
Supervisor: Ignasi Ribas Canudas, Ph.D.

2009-2011 **M.Sc., Valongo Observatory, Federal University of Rio de Janeiro, Brazil (OV/UFRJ).**
Astronomy. Supervisor: Gustavo F. Porto de Mello, Ph.D.

2005-2009 **B.Sc., Valongo Observatory, Federal University of Rio de Janeiro, Brazil (OV/UFRJ).**
Astronomy. Focus: Astrophysics. Supervisor: Gustavo F. Porto de Mello, Ph.D.

Awards/Funded Research Projects

As Principal Investigator:

- 2017 - 2021: São Paulo Research Foundation (FAPESP) Postdoctoral Fellowship, University of São Paulo (441,083.76 BRL).
- 2017: Award; 1st place poster presentation at XLI Reunião da Sociedade Astronômica Brasileira. Title: *The Solar Twin Planet Search: The age-chromospheric activity relation*
- 2018 Award; 1st place poster presentation at XLII Reunião da Sociedade Astronômica Brasileira. Title: *In search of solar twin candidates in distant open clusters with Gemini/GMOS*

Computation Skills

- **Python + LaTeX + R**
- **Advanced statistical methods** such as: Multivariate Analysis, Time Series Analysis, (Markov-Chain) Monte Carlo, Bayesian Analysis, Gaussian Process Regression and other methods.

Presentations, highlights

03/09/2022 › **Fifty Years of The Skumanich Relations (High Altitude Observatory, Boulder, USA)**.
Invited Review talk.
(Celebrating Fifty years of the most impactful publication in my field of work.)
Title: *Building magneto-chronometers for solar-like stars: The state-of-the-art, limitations, and future research challenges.* ADS link

10/25/2021 › **JPL Astrophysics and Space Physics Colloquia (NASA Jet Propulsion Laboratory, USA)**.
Invited Speaker.
Title: *The past and future of the Sun: What solar twins can tell us about the solar magnetic and rotational evolution?*

02/17/2021 › **Astrophysics seminars, University of Exeter, Exeter, England**.
Invited Speaker. Online.
Title: *The past and the future of the Sun: What solar twins can tell us about the solar dynamo evolution?*.

11/17/2020 › **COFFIES NASA Drive Center**.
Invited Speaker. Online.
Title: *The evolution of magnetic cycles of Sun-like stars*.

09/24/2019 › **16th Potsdam Thinkshop (Leibniz Institute for Astrophysics Potsdam, AIP, Germany): The rotation periods of cool stars**.
Invited Speaker.
Title: *The past and future of the Sun: What solar twins can tell us about the solar magnetic and rotational evolution?*

07/03/2019 › **IAU Symposium 354; Solar and Stellar Magnetic Fields: Origins and Manifestations, Copiapó, Chile**
Title: *The past and the future of the Sun: What solar twins can tell us about the solar magnetic and rotational evolution?*

07/29/2019 › **Cambridge Workshops of Cool Stars, Stellar Systems and the Sun (Cool Stars 20), Boston, Cambridge-USA**
Plenary talk.
Title: *The Sun as a star: the evolution of stellar activity during the main sequence.*

09/06/2019 › **Precision Spectroscopy 2019: Rotation, Magnetic Activity and Lithium, São Paulo, Brazil**.
Invited Speaker.
Title: *The evolution of magnetic cycles of Sun-like stars*.

11/26/2019 › **Universidade Presbiteriana Mackenzie, São Paulo, Brazil**
Invited Speaker.
Title: *Past and future of the magnetic Sun: Solar twins as a testbed for solar dynamo models*

04/17/2019 › **IAG/USP Seminar, São Paulo, Brazil**.
Invited Speaker.
Title: *Past and future of the magnetic Sun: What solar twins can tell us about the solar magnetic cycle and rotational evolution?*

10/29/2019 › **Observatório do Valongo Seminar, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil**.
Invited Speaker.
Title: *Past and future of the magnetic Sun: Solar twins as a testbed for solar dynamo models*.

07/10/2019 › **XLII Reunião Anual da Sociedade Astronômica Brasileira, São Paulo-SP**
Awarded presentation.
In Search of solar twin candidates in distant open clusters with Gemini/GMOS
Past and future of the magnetic Sun: Solar twins as a testbed for solar dynamo models.

Presentations, highlights (continued)

08/13/2018 › **Observatório Nacional Seminar, Rio de Janeiro, Brazil**.
Invited speaker.
Title: *Past and future of the magnetic Sun: Solar twins as a testbed for solar dynamo models.*

10/25/2017 › **ESO Thirty Minute Talks, Santiago/Chile**.
Invited Speaker.
Title: *Stellar Chronometers: The age - chromospheric activity relation of solar twins.*

10/03/2019 › **Astronomia ao Meio-Dia - IAG/USP, São Paulo, Brazil**
Outreach presentation in portuguese.
Missão TESS: O telescópio espacial caçador de planetas.

11/27/2020 › **IAG/USP - Science Day**
Short online presentation in portuguese.
In search of ancient solar-proxies to unveil the activity and rotational fate of the Sun.

Local and Scientific Organizing Committee

2021 › **Precision Spectroscopy: From Galaxy evolution to exoplanets** (Workshop)
Scientific Organizing Committee.
Virtual meeting - Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP. São Paulo, SP, Brasil.

2019 › **Precision Spectroscopy: Rotation, Magnetic Activity and Lithium** (Workshop)
Scientific Organizing Committee.
Centro de Radioastronomia e Astrofísica Mackenzie. São Paulo, SP, Brasil.

2018 › **Precision Spectroscopy: From the first stars to exoplanets** (Workshop)
Scientific and Local Organizing Committee.
Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP. São Paulo, SP, Brasil.

2017 › **Precision Spectroscopy: Towards Earth 2.0** (Workshop)
Scientific and Local Organizing Committee.
Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP. São Paulo, SP, Brasil.

Observational Experience in Astronomy as Principal Investigator, highlights

PI
- 14 nights at HARPS spectrograph La Silla - Chile (ESO): 0100.D-0444, 0103.D-0445
- 2 + 2 nights at TWIN spectrograph (3.5m telescope) ; CAHA Observatory, Spain.
- 4 nights at GOODMAN spectrograph; 4.1m SOAR telescope - Chile.
- 15h in queue mode (2014A, 2014B, 2015A), and 10h in queue mode (Rollover 2013B-2014B) at GMOS-South/GMOS-North spectrograph.
- 60 + nights. 1.6m and 0.6m telescopes at Observatório Pico dos Dias (OPD), Laboratório Nacional de Astrofísica (LNA) (Coudé/Cassegrain spectragraph).

Co-I
- 3 nights at 3.6m Telescopio Nazionale Galileo, - La Palma - Spain. HARPS North spectrograph.
- XMM-Newton Space Telescope Proposal ID: 080005. Duration: 50ks

Teaching

- Radioastronomy, 15h. Undergraduate level (OV/UFRJ)
- Planetary Systems, 30h. Undergraduate level (OV/UFRJ)
- Astrobiology, 30h. Undergraduate level (OV/UFRJ)
- Topics on Advanced Spectroscopic Reduction and Analysis, 10h. Graduate level (IAG/USP)

Mentoring Experience

- I have had intense experience mentoring graduate students and post-doctoral fellows since 2017 (former master's student Geisa Teixeira da Ponte Univ. Mackenzie, former PhD student Jhon Joel Yana Galarza, and Dirceu Yuri Simplício Netto from Univ. São Paulo). The outcomes of the mentoring processes were very positive for them: 3 published papers in high-profile journals (Jhon: 31 citations, Yuri: 1 citation), 2 papers in preparation (Geisa), 1 first place award for best poster presentation in the 2018 Brazilian Astronomical Society Annual Meeting (Geisa), and several international work presentations, including a plenary talk on 1st TESS Science Conference (Geisa), fully funded by MIT. Now, Geisa and Jhon are starting (or about to start) their Ph.D. and post-doctoral research internship at Univ. São Paulo and Carnegie Institution for Science (United States), respectively.

Media, highlights

- Brazil out of ESO Consortium.
- Major Science Budget Cuts: Crowdfunding to help Brazilian students.

List of Publications by Diego Lorenzo-Oliveira

17 October 2021

- **ADS search:** orcid:0000-0002-1387-2954
- **ADS search:** Lorenzo-Oliveira, D (or Lorenzo de Oliveira, D.)
- **Number of peer-reviewed publications**: 20
- **Number of citations**: 2296
- **Time since first publication**: 6.8 years
- **h-index**: 12 (Google Scholar)
- **m-index**: 1.8

Highlighted Publications

1. **Lorenzo-Oliveira** et al. 2018, A&A, 619, 73: *The Solar Twin Planet Search. The age-chromospheric activity relation.*
2. **Lorenzo-Oliveira**, Porto de Mello, Schiavon 2016, A&A Letters, 594L, 3L: *The age-mass-metallicity-activity relation for solar-type stars: comparisons with asteroseismology and the NGC 188 open cluster.*
3. **Lorenzo-Oliveira** et al. 2020, MNRAS Letters, 495, 61: *The ancient main-sequence solar proxy HIP 102152 unveils the activity and rotational fate of our Sun.*
4. **Lorenzo-Oliveira** et al. 2019, MNRAS Letters, 485, 68: *Constraining the evolution of stellar rotation using solar twins.*
5. Yana Galarza, Meléndez, **Lorenzo-Oliveira** et al. 2019, MNRAS Letters, 490, 86: *The effect of stellar activity on the stellar parameters of the young solar twin HIP36515.*
6. **Lorenzo-Oliveira** et al. 2016, A&A, 595, 11L: *Fine structure of the age-chromospheric activity relation in solar-type stars. I. The Ca II infrared triplet: Absolute flux calibration.*

Other publications

7. Shadab (**incl. Lorenzo-Oliveira**) et al. 2015, ApJS, 219, 12: *The Eleventh and Twelfth Data Releases of the Sloan Digital Sky Survey: Final Data from SDSS-III.*

8. Ghezzi, Dutra-Ferreira, **Lorenzo-Oliveira** et al. 2014, AJ, 148, 105: *Accurate Atmospheric Parameters at Moderate Resolution Using Spectral Indices: Preliminary Application to the MARVELS Survey.*

9. Yana Galarza, López-Valdivia, **Lorenzo-Oliveira** et al. 2021 (MNRAS, in press): *Searching for new solar twins: The Inti survey for the Northern Sky.*

10. Yana Galarza (**incl. Lorenzo-Oliveira**) et al. 2021, ApJ, 922, 129: *Evidence of Rocky Planet Engulfment in the Wide Binary System HIP 71726/HIP 71737.*

11. Tucci-Maia, Meléndez, **Lorenzo-Oliveira** et al. 2019, A&A, 628, 126: *Revisiting the 16 Cygni planet host at unprecedented precision and exploring automated tools for precise abundances.*

12. Grieves (**incl. Lorenzo-Oliveira**) et al. 2017, MNRAS, 467, 4264: *Exploring the Brown Dwarf Desert: New Substellar Companions from the SDSS-III MARVELS Survey.*

13. Barragán (**incl. Lorenzo-Oliveira**) et al. 2018, MNRAS, 475, 1765: *K2-139 b: a low-mass warm Jupiter on a 29-d orbit transiting an active K0 V star*

14. Prieto-Arranz et al. 2018, A&A, 618, 116: *Mass determination of the 1:3:5 near-resonant planets transiting GJ 9827 (K2-135).*

15. Grieves, Ge, Thomas, Willis, Ma, **Lorenzo-Oliveira** et al. 2018, MNRAS, 481, 3244: *Chemo-kinematics of the Milky Way from the SDSS-III MARVELS survey.*

16. Giribaldi (**incl. Lorenzo-Oliveira**) et al. 2019, A&A, 624, 10: *Accurate effective temperature from Hα profiles.*

17. Giribaldi, Porto de Mello, **Lorenzo-Oliveira** et al. 2019, A&A, 629, 33: *Faint solar analogs for large telescopes.*

18. Galarza, Meléndez, Karakas, Asplund, **Lorenzo-Oliveira** 2021, MNRAS Letters, in press: *Explosive nucleosynthesis of a metal-deficient star as the source of a distinct odd-even effect in the solar twin HIP 11915.*

19. do Nascimento (**incl. Lorenzo-Oliveira**) et al. 2020, ApJ, 898, 173: *Rotation of Solar Analogs Crossmatching Kepler and Gaia DR2.*

20. Netto, **Lorenzo-Oliveira** et al. 2021, AJ, 162, 160: *Radial velocity precision of ESPRESSO through the analysis of the solar twin HIP 11915.*

21. Costa-Almeida, Porto de Mello, Giribaldi, **Lorenzo-Oliveira** et al. 2021, MNRAS, (in press): *M dwarf spectral indices at moderate resolution: accurate Teff and [Fe/H] for 178 southern stars.*

Papers *submitted* or *in preparation*

21. **Lorenzo-Oliveira** et al. (to be submitted): *Past and future of the magnetic Sun: Solar twins as a testbed for solar dynamo models.*

22. **Lorenzo-Oliveira** et al. (to be submitted) *Chromospheric chronometers of low-mass stars: Fundamental parameters, and Hα & Ca II IRT age-activity relations.*

23. Ponte, **Lorenzo-Oliveira** et al. (to be submitted): *TESS lightcurves as a new age indicator through solar twins.*