

# Dr Rogério Monteiro de Oliveira (Monteiro-Oliveira, R.)

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Member of the Brazilian Astronomical Society



## Current position

Position: Visiting professor

Place: State University of Santa Cruz

Start date: 20/Sep/2020



## Professional experience

Position: Assistant professor

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo

Period: 01/Mar/2020 - 20/Sep/2020

Position: Post-doctoral researcher

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo

Supervisor: Prof. Dra. Eduardo S. Cypriano

Period: 01/Jan/2018 - 31/Dec/2019

Position: Assistant professor

Place: Astronomy Department at the Physics Institute of the Federal University of Rio Grande do Sul

Period: 27/Mar/2017 - 31/Jan/2018

Position: Post-doctoral researcher

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo

Supervisor: Prof. Dra. Cláudia L. M. de Oliveira

Period: 01/Nov/2016 - 31/Oct/2017



## Education

Title: PhD in Astronomy

Advisor: Prof. Dr. Eduardo Serra Cypriano

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo

Thesis: "Uma contribuição ao estudo de aglomerados de galáxias em fusão (A contribution to the study of merging galaxy clusters)"

Founded by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)

Period: 10/Nov/2011 - 20/Oct/2016

Title: Master in Astronomy

Advisor: Prof. Dr. Eduardo Serra Cypriano.

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo.

Thesis: "Aglomerados de galáxias em fusão (Merging galaxy clusters)"

Founded by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).

Period: 06/Mar/2009 - 29/Sep/2011

Title: Bachelor in Physics

Place: Institute of Physics at the University of São Paulo

Period: 01/Feb/2002 - 25/Aug/2008



## Current research

Merging galaxy clusters: I am focused on the study of the dynamical state of merging galaxy clusters and their application as probes for dark matter properties. Additionally, these systems can provide details of the hierarchical scenario and the large scale structure assembling.

Weak gravitational lensing: This technique has been proved to be an excellent tool for cluster mass reconstruction, mostly dark matter. However, some intrinsic questions (e.g. weak lensing for nearby low signal targets) are still open and the technique needs to be continuously improved. Our recent works have been extending the application of this technique for extremely low-z clusters.

Superclusters: Currently, I am involved in mapping the dark matter structures in superclusters of galaxies. I am part of the team in charge of the dynamical characterization of the supercluster Saraswati, one of the most massive structures in the local Universe. The supercluster Hercules is another target I am currently working in.



## Relevant experience

- R language programming (intermediate level);
- IDL (beginning level);
- Imaging and spectroscopic data reduction, including those from Subaru Suprime-Cam, Gemini GMOS and Victor Blanco DECam;
- IRAF user;
- Linux/MAC OS user.
- Shell script programming (beginner level).
- Latex user (intermediate level)



## Teaching experience

Position: Professor

Place: State University of Santa Cruz

Courses prepared to teach: Structure of matter

Position: Professor

Place: Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo

Courses prepared to teach: Astrometry.

*Position:* Professor

*Place:* Astronomy Department at the Physics Institute of the Federal University of Rio Grande do Sul

*Courses prepared to teach:* Astronomy 101, Astrometry, Astrometry for engineers and Astronomical observing techniques.

*Position:* High school supervisor of the Science fair project "Excess noise: a social epidemic"

*Place:* Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo.

*Description:* In this project, we investigated the noise level at the metropolitan train service. Our results have shown that, on average, the passenger is exposed to a higher noise level than those recommended by the World Health Organization.

*Position:* Teaching assistant

*Place:* Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo.

*Course within the mentoring program:* Astronomy 101

*Period:* 01/Jul/2012 - 30/Nov/2012, 01/Mar/2013 - 30/Jun/2013, 01/Jul/2013 - 30/Nov/2013, 01/Jul/2014 - 30/Nov/2014

*Position:* Teaching assistant

*Place:* Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo.

*Course within the mentoring program:* Statistical methods in Astronomy and Astrophysics

*Period:* 01/Mar/2014 - 30/Jun/2014, 01/Mar/2015 - 30/Jun/2015

*Position:* Lecturer

*Place:* Braz Cubas University

*Courses prepared to teach:* Fundamental Physics (levels I, II, III & IV)

*Period:* 01/Jul/2011 - 31/Aug/2011

*Place:* Federal Institute of Mato Grosso do Sul

*Start date:* 01/Jul/2019 - 01/Jul/2020



## Conferences/presentations

1. JSPS-FAPESP Workshop on dark energy, dark matter, and galaxies. "Merging galaxy clusters and the search for self-interacting dark matter". 2019. São Paulo – Brazil.
2. SnowCluster - The Physics of Galaxy Clusters. "Unveiling the dark side of the Universe through the merging galaxy clusters". 2018. Salt Lake City - USA.
3. ICTP-SAIFR School on Dark Matter. 2016. São Paulo – SP – Brazil.
4. IAU General Assembly Meeting. "The merging cluster Abell 1758: an optical and dynamical view". 2015. Honolulu - USA.
5. 10th J-PAS Collaboration Meeting. "The merging cluster Abell 1758: adding new pieces into a complex puzzle". 2015. Paraty – RJ - Brazil.
6. Cosmology with Galaxy Clusters. "The merging cluster Abell 1758: adding new pieces into a complex puzzle". 2014. Madrid - Spain.
7. XXXVIII Annual Meeting of the Brazilian Astronomical Society. "The merging cluster Abell 1758". 2014. Búzios – RJ - Brazil.
8. 2nd annual Snowbird Workshop SnowCLUSTER: Physics of Galaxy Clusters. "Dynamical Analysis of the Merging Cluster Abell 1758". 2013. Salt Lake City - USA.
9. GMT Science Workshop. "The merging cluster 1758". 2013. São Paulo - SP – Brazil.
10. USP Conference: Cosmology, large scale structure and first objects. "The merging cluster Abell 1758". 2013. São Paulo - SP – Brazil.
11. Growing up at high redshift: from proto-clusters to galaxy clusters workshop. "A multi-technique analysis of the merging cluster Abell 1758". 2012. Madrid - Spain.
12. Observatório Abrahão de Moraes de Portas Abertas. "Distances in the Universe". 2012. Valinhos - SP (Outreach).
13. Science with LSST: A Brazilian/US joint workshop. "Merging galaxy clusters". 2012. Campos do Jordão – SP – Brazil.
14. XVI IAG/USP Advanced School on Astrophysics. "The merging cluster Abell 1758". 2012. Itatiba – SP - Brazil.
15. XXXVII Annual Meeting of the Brazilian Astronomical Society. "The merging cluster Abell 1758". 2012. Águas de Lindoia – SP - Brazil.
16. South American Gemini Data Workshop. "Merging galaxy clusters". 2011. São José dos Campos – SP - Brazil.
17. XXXVI Annual Meeting of the Brazilian Astronomical Society. "Merging galaxy clusters". 2011. Águas de Lindoia - SP – Brazil.



## Supervising and mentoring

*Student:* Sara Jéssica Soja

*Level:* High-School mentoring program

*Project:* Excess noise - a social epidemic

*Place:* Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo.

*Period:* 01/Jan/2013 - 31/Dez/2014

*Student:* Thierry Oliveira Candido

*Level:* Undergraduate supervision program

*Project:* Mapping the universe on a large scale: identifying the dynamic state of Saraswati's clusters

*Place:* Federal Institute of Mato Grosso do Sul

*Start date:* 01/Jul/2019

*Student:* Ronaldo Roca Flores

*Level:* Undergraduate supervision program

*Project:* Mapping the universe on a large scale: identifying the dynamic state of Saraswati's clusters

18. I Jayme Tiomno School of Cosmology. "Merging galaxy clusters". 2010. Rio de Janeiro - RJ - Brazil.
19. XXXV Annual Meeting of the Brazilian Astronomical Society. "Merging galaxy clusters". 2010. Passa Quatro - MG - Brazil.



## Awards

*Local:* Mostra Paulista de Ciências e Engenharia (MOP) - State fair of Science.

*Prize:* Winner advisor.

*Date:* December, 2013.

*Local:* Feira Brasileira de Ciências e Engenharia (FEBRACE) - National fair of Science

*Prize:* Winner advisor.

*Date:* March, 2014.



## Ongoing projects

Galaxy evolution within interacting galaxy clusters:

This is a collaboration project involving several Brazilian researchers. In 2017B we have earned 3 nights for observing some Planck clusters at Victor Blanco Telescope. Here, I am in charge of the mass and dynamical characterization of the interacting clusters. The collaboration has three already observed targets taken in four bands (g'r'i'z'). Currently, I'm working on the reconstruction of their mass distributions.

JPAS - Javalambre Physics of the Accelerating

Universe: This is an international collaboration project between lead by Brazil and Spain but also involving several researchers around the world. J-PAS consists of building and operating a telescope that will map about 8000 deg<sup>2</sup> for five years. It will take that imaging using 56 narrow photometric bands, allowing accurately photometric redshifts with  $\sigma_z \approx 0.003(1+z)$  for galaxies up to  $z = 1$  and  $i_{AB} < 22.5$ . Currently, the telescope is carrying a preparatory survey (Mini J-PAS) preceding the full survey scheduled to start in middle 2020. As a full member of the galaxy clusters and weak lensing working groups, I will have access to the data releases. J-PLUS is a complementary survey that has been carried using a set of 12 broad, intermediate and narrowband filters. J-PLUS will be a powerful 3D view of the nearby Universe that will observe and characterize tens of millions of galaxies and stars of the Milky Way halo, with a wide range of Astrophysical applications. S-PLUS is the same but carried in the Southern hemisphere. As a member, Dr Monteiro-Oliveira will have full access to the data.

Weak lensing and dynamical analysis of the merging cluster SPT-CLJ0411-4819: In 2017B we observed during 7.7h the merging galaxy cluster SPT-CLJ0411-4819 with the GMOS instrument mounted at Gemini South telescope (GS-2017B-Q48). The imaging and spectroscopic data taken will afford us to perform the full dynamical characterization of this system which shows a significant offset between the X-ray peak and the position of the BGC (Rossetti et al. 2016).

Cluster dynamics at the core of the Hercules

supercluster: We are analyzing an improved subset of the Yang catalogue (Yang et al. 2007) selected by de Carvalho 2017. Our catalogue comprises the galaxies belonging to the region of the Hercules supercluster and contains, among others, their spatial position, radial velocity, metallicity, g'-r' color, stellar mass and their age. Our intention is: (i). provide a dynamical description of the galaxy clusters A2147 and A2152 looking forward to answering whether they are individual or multiple systems and a possible interaction among them and (ii). verify how the galaxy properties eventually change across their large-scale position.

Looking into the Saraswati heart: weak lensing

analysis of Abell 2631: The supercluster Saraswati was recently reported by Bagchi et al. 2017 as a large scale structure found in the Stripe 82 region of the SDSS. Saraswati spans for at least 200 Mpc at  $z \sim 0.3$  having an estimated mass of  $2 \times 10^{16} M_{\odot}$ . At the core lie the galaxy cluster A2631. With available imaging and spectroscopic data, we will reconstruct the mass distribution as well as perform the dynamical analysis of the system. Future plans include expanding this analysis for the most massive clusters in the Saraswati region.



## Service to the scientific community

*Function:* Referee of the scientific committee

*Organization:* International Science and Technological Fair (MOSTRATEC)

*Period:* 2017

*Function:* Referee of the scientific committee

*Organization:* Brazilian National Fair of Science (FEBRACE, since 2015).

*Period:* Since 2015

*Function:* Reviewer of ApJ (The Astrophysical Journal)

*Period:* Since January, 2019



## Observing time awarded as PI

2017B: Gemini/S (GS-2017B-Q-48) – "Imaging and spectroscopy of the merging galaxy cluster candidate SPT-CL J0411" (7.7h).

2013A: Gemini/N (GN-2013A-Q-36) – "Spectroscopy follow up of the merging galaxy cluster A2034" (3.5h).



## Published papers

13. Monteiro-Oliveira, R.; Soja, A. C.; Ribeiro, A. L. B.; Bagchi, J.; Sankhyayan, S.; Candido, T. O.; Flores, R. R. *Probing Saraswati's heart: evaluating the dynamical state of the massive galaxy cluster A2631 through a comprehensive weak lensing and dynamical analysis*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 500, p. 1858-1869, 2021.
12. Moura, M. T.; Machado, R. E. G.; Monteiro-Oliveira, R. *Simulations of the merging galaxy cluster Abell 2034: what determines the level of dissociation*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 500, p. 1858-1869, 2021.
11. Kelkar, K; Dwarakanath K. S.; Poggianti B. M.; Moretti A.; Monteiro-Oliveira, R.; Machado, R. E. G.; Lima Neto, G. B.; Fritz, J.; Vulcani, B.; Gullieuszik, M.; Bettoni, D. *Passive spirals and shock influenced star formation in the merging cluster Abell 3376*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 496, p. 442-455, 2020.
10. Monteiro-Oliveira, R.; Doubrawa, L.; Machado, R. E. G.; Lima Neto, G. B.; Molina, M. C.; Cypriano, E. S. *Revising the merger scenario of the galaxy cluster Abell 1644: a new gas poor structure discovered by weak gravitational lensing*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 495, p. 2007-2021, 2020.
9. Doubrawa, L.; Machado, R. E. G.; Laganá, T. F.; Lima Neto, G. B.; Monteiro-Oliveira, R.; Cypriano, E. S. *Simulations of gas sloshing induced by a newly discovered gas poor substructure in galaxy cluster Abell 1644*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 495, p. 2022-2034, 2020.
8. Mendes de Oliveira, C. L. + 118 authors; Monteiro-Oliveira, R.; et al. *The Southern Photometric Local Universe Survey (S-PLUS): improved SEDs, morphologies, and redshifts with 12 optical filters*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 489, p. 241-267, 2019.
7. Molino, A.; Costa-Duarte, M.V.; Mendes de Oliveira, C.; Lima Neto, G. B.; Cypriano, E. S.; Sodr e Jr, L.; Coelho, P.; Chow-Mart inez, M.; Monteiro-Oliveira, R.; et al. *J-PLUS: On the identification of new*

*cluster members in the double galaxy cluster A2589 & A2593 using PDFs*. *Astronomy & Astrophysics*, v. 622, p. A178, 2019.

6. Mahadev, P.; Monteiro-Oliveira, R.; Bagchi, J.; Simionescu, A.; Limousin, M.; Raychaudhury, S. *A combined X-ray, optical and radio view of the merging galaxy cluster MACS J0417-1154*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 482, p. 5093-5105, 2019.
5. Monteiro-Oliveira, R.; Cypriano, E. S. ; Vitorelli, A. Z.; Ribeiro, A. L. B.; Sodr e, L.; Dupke, R.; Mendes de Oliveira, C. L. *New insights on the dissociative merging galaxy cluster Abell 2034*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 481, p. 1097-1114, 2018.
4. Soja, A. C.; Sodr e, L.; Monteiro-Oliveira, R.; Cypriano, E. S.; Lima Neto, G. B. *A Gemini view of the galaxy cluster RXC J1504-0248: insights on the nature of the central gaseous filaments*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 477, p. 3279-3292, 2018.
3. Monteiro-Oliveira, R.; Lima Neto, G. B.; Cypriano, E. S.; Machado, R. E. G. ; Capelato, H. V.; Lagan a, T. F.; Durret, F.; Bagchi, J. *Weak lensing and spectroscopic analysis of the nearby dissociative merging galaxy cluster Abell 3376*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 468, p. 4566-4578, 2017b.
2. Monteiro-Oliveira, R.; Cypriano, E. S. ; Machado, R. E. G. ; Lima Neto, G. B. ; Ribeiro, A. L. B. ; Sodr e, L.; Dupke, R. *The merger history of the complex cluster Abell 1758: a combined weak lensing and spectroscopic view*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 466, p. 2614-2632, 2017a.
1. Machado, R. E. G.; Monteiro-Oliveira, R.; Lima Neto, G. B.; Cypriano, E. S. *Simulating the shocks in the dissociative galaxy cluster Abell 1758N*. *Monthly Notices of the Royal Astronomical Society (Print)*, v. 451, p. 3309-3320, 2015.



## Papers submitted

1. Bonoli, S. + 163 authors; Monteiro-Oliveira, R.; et al. *The miniJPAS survey: a preview of the Universe in 56 colours*. Submitted to A&A.