

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

Date of birth/place: 19/Jul/1982 - São Paulo/Brazil

ORCID: 0000-0001-6419-8827

Member of the Brazilian Astronomical Society



## Current position

Post-doctoral researcher

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

Supervisor: Prof. Dr. Eduardo S. Cypriano

Start date: 01/Jan/2018



## Professional experience

Position: Non-tenured 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: 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.

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

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.

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

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

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/Mar/2013 - 30/Jun/2013

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/2013 - 30/Nov/2013

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

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/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/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



## 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: Leonardo Costa Vieira

Level: Undergraduate supervision program

Project: Study of the dynamic evolution of galaxies in fusion merging clusters

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

Start date: 01/Jul/2018

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

Place: Federal Institute of Mato Grosso do Sul

Start date: 01/Jul/2019



## 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.
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 it 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.

Mass reconstruction and dynamical analysis of the nearby merging galaxy cluster A1644:

The galaxy cluster A1644 is a complex system with strong evidence to be undergoing a merger. This conclusion is supported by the detection of a cold front in the ICM (Johnson et al. 2010). Due to its low redshift ( $z = 0.047$ ), a mass reconstruction of the field is still lacking in the literature. From deep and multi-band ( $g'r'i'$ ) images observed by our collaborators in the DECam mounted at Blanco Telescope, we intend to describe in details the mass distribution. Radial velocities are already available in the literature and will contribute to providing a wealthy description of the current dynamical status of A1644.



### **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).