

# Julia C. Santos

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## Education

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### Ph.D. in Astronomy

LEIDEN UNIVERSITY

- Thesis: Unraveling the origins of interstellar ices
- Supervisors: Prof. Ewine van Dishoeck, Prof. Harold Linnartz<sup>‡</sup>  
<sup>‡</sup>Deceased, 31/12/2023

Leiden, the Netherlands

July 2021 - Expected: June 2025

### M.Sc. in Astronomy

SÃO PAULO UNIVERSITY

- Thesis: Methyl acetylene in G331. 512-0.103: Looking at massive star formation through the lens of chemistry
- Supervisors: Prof. Jacques Lépine, Dr. Edgar Mendoza

São Paulo, Brazil

August 2019 - February 2021

### B.Sc. in Chemistry

FEDERAL UNIVERSITY OF RIO DE JANEIRO

- Thesis: Rotational spectrum simulations of astrochemically-relevant asymmetric tops
- Supervisors: Prof. Alexandre Rocha, Prof. Ricardo Oliveira

Rio de Janeiro, Brazil

August 2017 - July 2019

## Publications

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\* corresponding author, † shared first authorship.

### FIRST-AUTHOR PAPERS (10)

- J. C. Santos\***, H. Linnartz, K.-J. Chuang. Formation of carbonyl sulfide (OCS) via SH radicals in interstellar CO-rich ice under dense cloud conditions. 2024c, *A&A*, 690, A24.
- J. C. Santos\***, M. L. van Gelder, P. Nazari, A. Ahmadi, E. F. van Dishoeck. SO<sub>2</sub> and OCS toward high-mass protostars: A comparative study between ice and gas. 2024b, *A&A*, 689, A248.
- J. C. Santos\***, J. Enrique-Romero, T. Lamberts, H. Linnartz, K.-J. Chuang. Formation of S-bearing complex organic molecules in molecular clouds via ice reactions with C<sub>2</sub>H<sub>2</sub>, HS, and atomic H. 2024a, *ACS Earth Space Chem*, 8, 1646.
- J. C. Santos\***, H. Linnartz, K.-J. Chuang. Interaction of H<sub>2</sub>S with H atoms on grain surfaces under molecular cloud conditions. 2023b, *A&A*, 678, A112.
- J. C. Santos\***, K.-J. Chuang, J. G. M. Schrauwen, A. Traspas Muiña, J. Zhang, H. M. Cuppen, B. Redlich, H. Linnartz, S. Ioppolo. Resonant infrared irradiation of CO and CH<sub>3</sub>OH interstellar ices. 2023a, *A&A*, 672, A112.
- J. C. Santos\***, K.-J. Chuang, T. Lamberts, G. Fedoseev, S. Ioppolo, H. Linnartz. Experimental confirmation of a new formation route to CH<sub>3</sub>OH in interstellar ices: CH<sub>3</sub>O + H<sub>2</sub>CO → CH<sub>3</sub>OH + HCO. 2022c, *ApJL*, 931, L33.
- J. C. Santos\***<sup>†</sup>, F. Fantuzzi<sup>†</sup>, H. M. Qutián-Lara, Y. Martins-Franco, K. Menéndez-Delmestre, H. M. Boechat-Roberty, R. R. Oliveira. Structure and stability of multiply charged naphthalene and its C<sub>10</sub>H<sub>8</sub> isomers: bonding, spectroscopy, and astrophysical implications. 2022b, *MNRAS*, 512, 4669.
- J. C. Santos\***, L. Bronfman, E. Mendoza, J. R. D. Lépine, N. U. Duronea, M. Merello, R. A. Finger. A spectral survey of CH<sub>3</sub>CCH in the Hot Molecular Core G331.512-0.103. 2022a, *ApJ*, 925, 3.
- J. C. Santos**, A. B. Rocha\*, R. R. Oliveira. Rotational spectrum simulations of asymmetric tops in an astrochemical context. 2020, *J. Mol. Model.*, 26, 278.
- H. B. A. Cerqueira<sup>†</sup>, **J. C. Santos**<sup>†</sup>, F. Fantuzzi, F. de A. Ribeiro, M. L. M. Rocco, R. R. Oliveira\*, A. B. Rocha. Structure, stability, and spectroscopic properties of small acetonitrile cation clusters. 2020, *J. Phys. Chem. A*, 124, 6845.

## CONTRIBUTED PAPERS (4)

- K. Slavicinska\*, A. C. A. Boogert, Ł. Tychoniec, E. F. van Dishoeck, M. L. van Gelder, M. G. Navarro, **J. C. Santos**, P. D. Klaassen, P. J. Kavanagh, and K.-J. Chuang. Ammonium hydrosulfide (NH<sub>4</sub>SH): a potential significant sulfur sink in interstellar ices. 2024, A&A, in press.
- J. Zhang\*,†, A. Traspas Muiña\*,†, D. V. Mifsud, Z. Kaňuchová, K. Cielinska, P. Herczku, K. K. Rahul, S. T. S. Kovács, R. Rácz, **J. C. Santos**, A. T. Hopkinson, L. Craciunescu, N. C. Jones, S. V. Hoffmann, S. Biri, I. Vajda, I. Rajta, A. Dawes, B. Sivaraman, Z. Juhász, B. Sulik, H. Linnartz, L. Hornekær, F. Fantuzzi, N. J. Mason, S. Ioppolo. A systematic FTIR and VUV spectroscopic investigation of ion, electron, and thermally processed ethanolamine ice. 2024, MNRAS, 533, 826.
- K.-J. Chuang\*, C. Jäger, **J. C. Santos**, Th. Henning. Formation of N-bearing complex organic molecules in molecular clouds: Ketenimine, acetonitrile, acetaldimine, and vinylamine via the UV photolysis of C<sub>2</sub>H<sub>2</sub> ice. 2024, A&A, 687, A7.
- T. Lamberts\*, G. Fedoseev, M. van Hemert, D. Qasim, K.-J. Chuang, **J. C. Santos**, H. Linnartz. Methane formation in cold regions from carbon atoms and molecular hydrogen. 2022, ApJ, 928, 48.

## Awards, Scholarships, and Grants

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### SCHOLARSHIPS

- 2019 - 2021 **Graduate research scholarship**: Academic Excellence Program, CAPES, BR  
2017 - 2019 **Undergraduate research scholarship**: CNPq, BR

### AWARDS & GRANTS

- 2024 **LUF CWB grant**: for a research stay of five weeks at the Center for Astrophysics, Harvard University, US
- 2023 **IAU travel grant**: to attend the 2023 Kavli-IAU Astrochemistry Symposium, US
- 2023 **LKBF travel grant**: to attend the 2023 Kavli-IAU Astrochemistry Symposium, US
- 2019 **First-ranked candidate**: for the M.Sc. program in Astronomy at São Paulo University, BR
- 2019 **EuroPAH travel grant**: to attend the EuroPAH Summer School, FR
- 2019 **Best research of session**: 10a Semana de Integração Acadêmica, BR
- 2019 **Presentation award**: XX Brazilian Symposium of Theoretical Chemistry, BR
- 2018 **Presentation award**: 9a Semana de Integração Acadêmica, BR
- 2018 **Top 5 undergraduate research projects in the field of natural sciences**: XXII Encontro Latino Americano de Iniciação Científica, BR
- 2017 **Presentation award**: 8a Semana de Integração Acadêmica, BR

## Presentations

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### INVITED (6) AND CONTRIBUTED (10) TALKS

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|------|---|--------------------|
| 2024 | <b>Seminar at the Astronomy department</b> : Universidade Federal do Rio de Janeiro, Rio de Janeiro, BR | <i>Invited</i>     |
| 2024 | <b>Chemistry and Physics at Low Temperatures</b> : Niseko, JP   | <i>Contributed</i> |
| 2024 | <b>QuantumGrain Workshop</b> : Barcelona, ES  | <i>Contributed</i> |
| 2024 | <b>Seminar at the Astronomy department</b> : Columbia University, New York, US                          | <i>Invited</i>     |
| 2024 | <b>Seminar at the Center for Astrophysics</b> : Harvard University, Cambridge, US                       | <i>Invited</i>     |
| 2024 | <b>Seminar at the Astrochemistry Reading Club</b> : Harvard University, Cambridge, US                   | <i>Invited</i>     |
| 2024 | <b>Seminar at the Chemistry department</b> : Massachusetts Institute of Technology, Cambridge, US       | <i>Invited</i>     |
| 2024 | <b>Netherlands ALMA + JWST Joint Science Day</b> : Groningen, NL  | <i>Contributed</i> |
| 2023 | <b>Origins Center Conference</b> : Groningen, NL  | <i>Contributed</i> |
| 2023 | <b>Workshop on Interstellar Catalysis</b> : Fuglsøcentret, DK   | <i>Invited</i>     |
| 2022 | <b>NOVA Network II Meeting</b> : Leiden, NL   | <i>Contributed</i> |
| 2019 | <b>Astrochemistry LLAMA Meeting</b> : São Paulo, BR   | <i>Contributed</i> |

2019	<b>10a Semana de Integração Acadêmica:</b> Rio de Janeiro, BR	<i>Contributed</i>
2018	<b>9a Semana de Integração Acadêmica:</b> Rio de Janeiro, BR	<i>Contributed</i>
2018	<b>XXII Encontro Latino Americano de Iniciação Científica:</b> São José dos Campos, BR	<i>Contributed</i>
2017	<b>8a Semana de Integração Acadêmica:</b> Rio de Janeiro, BR	<i>Contributed</i>

## POSTER PRESENTATIONS (11)

2023	<b>Kavli-IAU Astrochemistry Symposium:</b> Traverse City, US
2022	<b>School on Laboratory Astrophysics:</b> Les Houches, FR
2022	<b>Niels Bohr Legacy Symposium in Astrochemistry:</b> Copenhagen, DK
2021	<b>European Conference on Laboratory Astrophysics:</b> Ana Capri, IT
2021	<b>Annual Meeting of the European Astronomical Society:</b> Online
2020	<b>Physique et Chimie du Milieu Interstellaire:</b> Online
2019	<b>XX Brazilian Symposium of Theoretical Chemistry:</b> João Pessoa, BR
2019	<b>EuroPAH Summer School:</b> Toulouse, FR
2019	<b>IV Winter School of the Valongo Observatory:</b> Rio de Janeiro, BR
2018	<b>41st Annual Reunion of the Brazilian Chemical Society:</b> Foz do Iguaçu, BR
2017	<b>XLI Annual Reunion of the Brazilian Astronomical Society:</b> São Paulo, BR

## Additional Research Activities

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### EXTENDED RESEARCH STAYS

- Öberg Astrochemistry Group, Center for Astrophysics, Harvard University (US)—5 weeks (2024)
- Center for Interstellar Catalysis, Aarhus University (DK)—total of 8 weeks (2022, 2023)

### EXPERIENCE WITH LARGE FACILITIES

- Synchrotron accelerators: LNLS (BR), ASTRID (DK)
- Free-electron lasers: FELIX (NL)

## Mentorship Experience

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2024 - Pres.	<b>Kelly Ma:</b> M.Sc. student, Leiden University. Thesis: Directly testing hot core gas vs ice chemistry: ALMA vs JWST
2023 - 2024	<b>Iara Tiago:</b> M.Sc. student, Leiden University. Thesis: Non-thermal desorption of interstellar ices induced by H <sub>2</sub> formation: an experimental investigation

## Teaching Experience

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2021 - 2024	<b>Teaching assistant, Bachelor Research Project:</b> Bachelors degrees in Physics and Astronomy, Leiden University, NL	<i>504 hours/y</i>
2023	<b>Invited guest lecturer (1 lesson), Astrochemistry course:</b> Bachelors degree in Astronomy, Federal University of Rio de Janeiro, BR	<i>2 hours</i>
2021	<b>Invited lecturer (full course), Astrochemistry course:</b> 24th Chemistry Week of the Chemistry Institute, Federal University of Rio de Janeiro, BR	<i>10 hours</i>

## Professional Service

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2023 - Pres.	<b>Journal reviewer:</b> Astronomy and Astrophysics, The Astrophysical Journal, ACS Earth and Space Chemistry
2021 - 2024	<b>Organizer:</b> Weekly meetings of the Laboratory for Astrophysics group, Leiden University
2021 - 2023	<b>Organizer:</b> Biweekly journal club of Leiden Observatory on interstellar ices

## Selected DEI & Outreach

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I engage in DEI and outreach activities both in person and through social media platforms: @santos\_j\_ on X (formerly Twitter) and @chem\_julia on Instagram. I communicate science online with a focus on astrochemistry for a primarily portuguese-speaking community of over 7k followers. Below is a selection of my outreach and DEI activities.

- 2024 **Public talk on Astrochemistry:** Elas fazem ciência (She (plural) does science)–Online DEI and outreach initiative targeted at high-school students in Brazil with an emphasis on women-led research in STEM
- 2023 **Interview on Experimental Astrochemistry:** Brazilian podcast “Café Debug”
- 2023 **Interview on Experimental Astrochemistry:** Brazilian YouTube channel “Astrotubers”, live broadcast
- 2022 **Talk on Astrochemistry:** for elementary-school students at Maple Bear School, Ribirão Preto, Brazil
- 2017 **Science communicator:** Public Museum ”Ciência e Vida”—Duque de Caxias, Brazil. Delievered regular educational sessions at the planetarium and the natural sciences collection for an audience of all ages and backgrounds

## Additional Information

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### LANGUAGES

- Portuguese—First language
- English—Fluent
- French—Advanced
- Japanese—Conversational
- Spanish—Conversational
- Dutch—Intermediate

### TREASURER OF THE DAIDOKAN KARATE ASSOCIATION

Since December 2023, I have served as the elected (volunteer) treasurer of Daidokan Karate Leiden, a non-profit organization with a 35-year history. The association is dedicated to teaching karate, self-defense, and modern Arnis to women of all backgrounds and physical abilities.