

Julia C. Santos

Leiden Observatory, Leiden University – PO Box 9513, 2300 RA Leiden, The Netherlands

✉ santos@strw.leidenuniv.nl | 🏠 juliacsantos.com

Education

Ph.D. in Astronomy

LEIDEN UNIVERSITY

- Thesis: Unraveling the origin of interstellar ices
- Supervisors: Prof. Harold Linnartz, Prof. Ewine van Dishoeck, Dr. Ko-Ju Chuang

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

* 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. SO₂ 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 C₂H₂, HS, and atomic H. 2024a, *ACS Earth Space Chem*, 8, 1646.
- J. C. Santos***, H. Linnartz, K.-J. Chuang. Interaction of H₂S 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 CH₃OH 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 CH₃OH in interstellar ices: CH₃O + H₂CO → CH₃OH + HCO. 2022c, *ApJL*, 931, L33.
- J. C. Santos***, †, F. Fantuzzi†, 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 C₁₀H₈ 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 CH₃CCH 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†, **J. C. Santos**†, 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 (NH₄SH): 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 C₂H₂ 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

SCHOLARSHIPS

- 2019 - 2021 **Graduate research scholarship:** Academic Excellence Program, Coordenação de Aperfeiçoamento de Pessoa de Nível Superior, BR
- 2017 - 2019 **Undergraduate research scholarship:** Conselho Nacional de Desenvolvimento Científico, 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

INVITED (6) AND CONTRIBUTED (10) TALKS

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| 2024 | Seminar at the Astronomy department: Universidade Federal do Rio de Janeiro, Rio de Janeiro, BR | <i>Invited</i> |
| 2024 | Chemistry and Physics at Low Temperatures: Niseko, JP | <i>Contributed</i> |
| 2024 | QuantumGrain Workshop: Barcelona, ES | <i>Contributed</i> |
| 2024 | Seminar at the Astronomy department: Columbia University, New York, US | <i>Invited</i> |
| 2024 | Seminar at the Center for Astrophysics: Harvard University, Cambridge, US | <i>Invited</i> |
| 2024 | Seminar at the Astrochemistry Reading Club: Harvard University, Cambridge, US | <i>Invited</i> |
| 2024 | Seminar at the Chemistry department: Massachusetts Institute of Technology, Cambridge, US | <i>Invited</i> |
| 2024 | Netherlands ALMA + JWST Joint Science Day: Groningen, NL | <i>Contributed</i> |
| 2023 | Origins Center Conference: Groningen, NL | <i>Contributed</i> |
| 2023 | Workshop on Interstellar Catalysis: Fuglsøcentret, DK | <i>Invited</i> |
| 2022 | NOVA Network II Meeting: Leiden, NL | <i>Contributed</i> |
| 2019 | Astrochemistry LLAMA Meeting: São Paulo, BR | <i>Contributed</i> |
| 2019 | 10a Semana de Integração Acadêmica: Rio de Janeiro, BR | <i>Contributed</i> |
| 2018 | 9a Semana de Integração Acadêmica: Rio de Janeiro, BR | <i>Contributed</i> |
| 2018 | XXII Encontro Latino Americano de Iniciação Científica: São José dos Campos, BR | <i>Contributed</i> |

POSTER PRESENTATIONS (11)

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

Additional Research Activities

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

- 2024 - Pres. **Kelly Ma:** M.Sc. student, Leiden University. Thesis: Directly testing hot core gas vs ice chemistry: ALMA vs JWST
- 2023 - 2024 **Iara Tiago:** M.Sc. student, Leiden University. Thesis: Non-thermal desorption of interstellar ices induced by H₂ formation: an experimental investigation

Teaching Experience

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

Professional Service

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

Selected DEI & Outreach

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 in person.

- 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