

Stefano Castro Tognini

Curriculum Vitæ

Oak Ridge National Laboratory

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in stognini



Professional experience

2019

Postdoctoral Research Associate, Oak Ridge National Laboratory.

HPC Methods for Nuclear Applications

Nuclear Energy and Fuel Cycle Division

Education

2012

2018

Ph.D. in Physics, Federal University of Goias.

High Energy Physics, focused on cosmic ray data analysis on the NO ν A Experiment

Funding: CAPES, CNPq, ANL

INSPIRE
HEP

inspirehep.net/record/1692030

DOE OSTI

www.osti.gov/biblio/1468447

2010

2012

M.Sc. in Physics, Federal University of Goias.

High Energy Physics, focused on cosmic ray Monte Carlo simulation

Funding: CAPES, Fermilab

2005

2009

B.Sc. in Physics, Federal University of Goias.

Collaborations

2020

Celeritas Project, Oak Ridge National Laboratory.

A GPU Monte Carlo particle transport code for HEP experiments

celeritas-project

- Core member of the Celeritas team.

2020

URL Muon Detector Project, Oak Ridge National Laboratory.

A compact muon detector apparatus developed to test and validate new non-destructive techniques for geological disposal safety assessments (GDSA).

- Core team member involved with all stages of the project: Detector design, simulation, commissioning, deployment, and analysis.

2013

2019

NO ν A Experiment, Fermilab.

NuMI Off-axis ν_e Appearance Experiment

novaexperiment.fnal.gov

- Ph.D. Thesis [[Phys. Rev. D 99, 122004 \(2019\)](#)]

- The NO ν A Remote Operation Center at Federal University of Goias

- Commissioned, certified, and maintained the NO ν A ROC @ UFG between 2016 and 2018.

- Integration of CORSIKA in the NO ν A ART Framework

- Developed an integration layer software for between CORSIKA and Fermilab's art Framework.
 - Used by the MicroBooNE Collaboration to integrate CORSIKA with LArSoft.

- APD quality assessment task force

- NO ν A detector channels consist of wavelength-shifting fibers submersed in liquid scintillator and connected to Avalanche Photo Diodes (APDs). The work consisted in testing the quality of these APDs before being installed in the NO ν A Near Detector.

- Trained new people to keep the APD testings running at the end of the Near Detector commissioning period.

- On call emergency contact for Near Detector related issues (8 months)

2011

MINOS/MINOS+ Experiment, Fermilab.

Main Injector Neutrino Oscillation Search Experiment

(Data taking period ended on June 29, 2016. Data analyses are still ongoing.)

 www.numi.fnal.gov

- **MINOS/MINOS+ Remote Operation Centers**

- Developed software packages, wrote documentation, and provided technical support for commissioning, certifying, and maintaining all MINOS/MINOS+ ROCs.
- Helped writing a certification process for ROCs. Certification processes for all Fermilab neutrino experiments evolved from on it.
- Built and maintained the MINOS ROC @ UFG, which was the first certified ROC of any Fermilab neutrino experiment.
- Deployed and maintained the MINOS+ Control Room at FNAL's ROC-West until the end of the experiment.

- **Data analyses**

- Observation of seasonal variation of atmospheric multiple-muon events in the MINOS Near and Far Detectors [[Phys. Rev. D **91**, 112006 \(2015\)](#)]
- Measurement of the multiple-muon charge ratio in the MINOS Far Detector [[Phys. Rev. D **93**, 052017 \(2016\)](#)]

Scholarships & funding

2012

2016

CAPES.

Ph.D. scholarship.

2014

2015

Science Without Borders Fellowship (CAPES & CNPq) & Argonne National Laboratory.

One year period at ANL and Fermilab working on NO ν A and MINOS/MINOS+.

2010

2012

CAPES.

M.Sc. scholarship.

2011

Fermi National Accelerator Laboratory.

3 months period at Fermilab working on MINOS/MINOS+.

Skills

Spoken languages

Portuguese (native), English (fluent), Italian (fluent), French (conversational)

Programming & scripting languages

C/C++, Python, SQL, FORTRAN, UNIX Shell scripting, \LaTeX

Frameworks

ROOT, Fermilab ART Framework (NOvASoft and LArSoft)

Monte Carlo

Geant4, CORSIKA

Other

GIT, SVN, Redmine, PBS TORQUE

Teaching and mentoring

2012

2018

Advising assistant, Ph.D. student/candidate, Federal University of Goias.

Helped advising most younger students from my HEP research group on multiple projects.

2015

Co-advisor, Stratospheric temperature effects on cosmic ray muon flux, Senior Thesis, Matheus Norberto Jacome, State University of Goias.

2012
2013

Teaching assistant, *Ph.D. student*, Federal University of Goias.

- Physics I.
- Physics III.
- Introduction to Elementary Particle Physics.

2011
2012

Teaching assistant, *Master's student*, Federal University of Goias.

- Physics I.
- Laboratory of Physics II.
- Introduction to Elementary Particle Physics.

Leadership roles

2013
2014

Administrative Council of the Physics Ph.D. Program, *Institute of Physics*, Federal University of Goias.

- Elected representative of MSc. and Ph.D. students with the purpose to suggest, discuss, and vote on administrative resolutions, including the graduate program guidelines and funding approvals for graduate students, such as work-related field trips for Ph.D. students.

Talks and seminars

2022 From muons to supercomputers. *Fermilab Students and Postdocs Association Early Career Seminar.*

🌐 <https://fspa.fnal.gov/early-career-seminar-series/>

Celeritas: Bringing exascale computing to HEP detector simulation. *Colloquium.* Department of Physics and Astronomy, University of Mississippi.

🌐 <https://relativity.phy.olemiss.edu/Colloquia/#tognini>

2019 Particle Physics. *XI Physics School.* Institute of Physics, Federal University of Goias.

Presented as a part of a series of lectures at undergraduate level. [In Portuguese]

🌐 <https://if.ufg.br/e/23682-xi-escola-de-fisica-do-if-ufg>

2018 Observation of cosmic ray multiple-muon seasonal variations in the NO ν A Near Detector. *High Energy Physics Seminar.* Syracuse University.

🌐 <http://physics.syr.edu/event-items/2018/2018-04-11-stefano-tognini-hep-seminar.html>

2013 The loop of habit. *Perturbative Theories* – a series of seminars organized and presented by the graduate students of the Physics Institute at UFG. [In Portuguese]

🌐 <http://teoriasperturbativas.wikidot.com/blog:22>

2012 The problem with the speed of neutrinos. *Perturbative Theories* – a series of seminars organized and presented by the graduate students of the Physics Institute at UFG. [In Portuguese]

🌐 <http://teoriasperturbativas.wikidot.com/blog:4>

Scientific outreach

2020 Being a scientist outside the University. Invited speaker at PUC – Goias. [In Portuguese]

🌐 <https://www.pucgoias.edu.br/noticias/eventos/a-vida-de-cientista-fora-da-universidade/>

2018 How particle accelerators revolutionized our World. Invited speaker at Campus Party Brasilia, Brazil. [In Portuguese]

🌐 <https://campuse.ro/events/Campus-Party-Brasilia-2018-CPBSB2/talk/internet-tratamentos-de-cancer-producao-de-eletronicos-pneus-de-carro-como-aceleradores-de-particulas-revolucionaram-nosso-mundo-cpbsb2/>

2016 Interviewed by the TV show **Connect to UFG – Inovation and Technology.** *TV UFG*, aired on October 26, 2016. [In Portuguese]

📺 <https://www.youtube.com/watch?v=TeTco24vgY4>






- 2015 Volunteer scientist to interact with adults and children at the **Fermilab's Family Open House**. Briefly interviewed at: <https://www.dailyherald.com/article/20150208/news/150208893/>
- 2014 Invited scientist to answer questions from community decision leaders and VIPs at the **Future of Fermilab Address and Reception**.

Selected conference presentations





- 2014 S. C. Tognini and R. A. Gomes. **Simulation of cosmic ray shower using CORSIKA and CRY in the NO ν A Far Detector**. [Poster] XXXV National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.
- S. C. Tognini and R. A. Gomes. **Neutrino oscillation physics at the NO ν A experiment**. [Poster] XXXV National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.
- 2012 S. C. Tognini and R. A. Gomes. **Simulation of atmospheric temperature effects on cosmic ray muon flux**. [Poster] NuInt12: Eight International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Rio de Janeiro (RJ), Brazil.
- 2011 S. C. Tognini and R. A. Gomes. **Remote MINOS Shift Station at IF-UFG**. [Poster] I Physics Meeting, Foz do Iguacu (PA), Brazil.
- 2010 S. C. Tognini and R. A. Gomes. **Monte Carlo simulation of the cosmic ray muons at the MINOS Far Detector**. [Poster] XXXI National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.
- 2009 S. C. Tognini and R. A. Gomes. **Status and results in neutral hyperon physics at KTeV (Fermilab) and NA48/1 (CERN)**. [Poster] XXX National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.

Publications

Research profiles

-  orcid.org/0000-0001-9741-6608
-  inspirehep.net/authors/1074966
-  publons.com/researcher/1798369/stefano-castro-tognini/
-  scholar.google.com/citations?user=M4To0NcAAAAJ
-  www.researchgate.net/profile/Stefano-C-Tognini

Journal articles

- 2021 M. A. Acero, *et al.* (NO ν A Collab.) **Seasonal variation of multiple-muon cosmic ray air showers observed in the NO ν A detector on the surface**. *Phys. Rev. D* **104**, 012014.
 [10.1103/PhysRevD.104.012014](https://doi.org/10.1103/PhysRevD.104.012014)
- 2020 P. Adamson, *et al.* (MINOS+ Collab.) **Precision Constraints for Three-Flavor Neutrino Oscillations from the Full MINOS+ and MINOS Dataset**. *Phys. Rev. Lett.* **125**, 131802.
 [10.1103/PhysRevLett.125.131802](https://doi.org/10.1103/PhysRevLett.125.131802)
- P. Adamson, *et al.* (MINOS+ Collab.) **Improved Constraints on Sterile Neutrino Mixing from Disappearance Searches in the MINOS, MINOS+, Daya Bay, and Bugey-3 Experiments**. *Phys. Rev. Lett.* **125**, 071801.
 [10.1103/PhysRevLett.125.071801](https://doi.org/10.1103/PhysRevLett.125.071801)
- 2019 M. A. Acero, *et al.* (NO ν A Collab.) **Observation of seasonal variation of atmospheric multiple-muon events in the NO ν A Near Detector**. *Phys. Rev. D* **99**, 122004.
 [10.1103/PhysRevD.99.122004](https://doi.org/10.1103/PhysRevD.99.122004)

- P. Adamson, *et al.* (MINOS+ Collab.) **Search for Sterile Neutrinos in MINOS and MINOS+ Using a Two-Detector Fit.** Phys. Rev. Lett. **122**, 091803.
doi [10.1103/PhysRevLett.122.091803](https://doi.org/10.1103/PhysRevLett.122.091803)
- 2018 M. A. Acero, *et al.* (NO ν A Collab.) **New constraints on oscillation parameters from ν_e appearance and ν_μ disappearance in the NO ν A experiment.** Phys. Rev. D **98**, 032012.
doi [10.1103/PhysRevD.98.032012](https://doi.org/10.1103/PhysRevD.98.032012)
- 2017 P. Adamson, *et al.* (NO ν A Collab.) **Search for active-sterile neutrino mixing using neutral-current interactions in NO ν A.** Phys. Rev. D **96**, 072006.
doi [10.1103/PhysRevD.96.072006](https://doi.org/10.1103/PhysRevD.96.072006)
- P. Adamson, *et al.* (MINOS+ Collab.) **Search for flavor-changing nonstandard neutrino interactions using ν_e appearance in MINOS.** Phys. Rev. D **95**, 012005.
doi [10.1103/PhysRevD.95.012005](https://doi.org/10.1103/PhysRevD.95.012005)
- P. Adamson, *et al.* (NO ν A Collab.) **Measurement of the Neutrino Mixing Angle θ_{23} in NO ν A.** Phys. Rev. Lett. **118**, 151802.
doi [10.1103/PhysRevLett.118.151802](https://doi.org/10.1103/PhysRevLett.118.151802)
- P. Adamson, *et al.* (NO ν A Collab.) **Constraints on Oscillation Parameters from ν_e Appearance and ν_μ Disappearance in NO ν A.** Phys. Rev. Lett. **118**, 231801.
doi [10.1103/PhysRevLett.118.231801](https://doi.org/10.1103/PhysRevLett.118.231801)
- 2016 P. Adamson, *et al.* (MINOS Collab.) **The NuMI neutrino beam.** Nucl. Instr. Meth. A **806**, 279-306.
doi [10.1016/j.nima.2015.08.063](https://doi.org/10.1016/j.nima.2015.08.063)
- P. Adamson, *et al.* (NO ν A Collab.) **First measurement of muon-neutrino disappearance in NO ν A.** Phys. Rev. D **93**, 051104(R).
doi [10.1103/PhysRevD.93.051104](https://doi.org/10.1103/PhysRevD.93.051104)
- P. Adamson, *et al.* (MINOS Collab.) **Measurement of the multiple-muon charge ratio in the MINOS Far Detector.** Phys. Rev. D **93**, 052017.
doi [10.1103/PhysRevD.93.052017](https://doi.org/10.1103/PhysRevD.93.052017)
- P. Adamson, *et al.* (NO ν A Collab.) **First Measurement of Electron Neutrino Appearance in NO ν A.** Phys. Rev. Lett. **116**, 151806.
doi [10.1103/PhysRevLett.116.151806](https://doi.org/10.1103/PhysRevLett.116.151806)
- P. Adamson, *et al.* (Daya Bay Collab., MINOS Collab.) **Limits on Active to Sterile Neutrino Oscillations from Disappearance Searches in the MINOS, Daya Bay, and Bugey-3 Experiments.** Phys. Rev. Lett. **117**, 151801.
doi [10.1103/PhysRevLett.117.151801](https://doi.org/10.1103/PhysRevLett.117.151801)
- P. Adamson, *et al.* (MINOS Collab.) **Search for Sterile Neutrinos Mixing with Muon Neutrinos in MINOS.** Phys. Rev. Lett. **117**, 151803.
doi [10.1103/PhysRevLett.117.151803](https://doi.org/10.1103/PhysRevLett.117.151803)
- P. Adamson, *et al.* (MINOS Collab.) **Measurement of single π^0 production by coherent neutral-current ν Fe interactions in the MINOS Near Detector.** Phys. Rev. D **94**, 072006.
doi [10.1103/PhysRevD.94.072006](https://doi.org/10.1103/PhysRevD.94.072006)
- P. Adamson, *et al.* (MINOS Collab.) **Constraints on large extra dimensions from the MINOS experiment.** Phys. Rev. D **94**, 111101(R).
doi [10.1103/PhysRevD.94.111101](https://doi.org/10.1103/PhysRevD.94.111101)
- 2015 P. Adamson, *et al.* (MINOS Collab.) **Observation of seasonal variation of atmospheric multiple-muon events in the MINOS Near and Far Detectors.** Phys. Rev. D **91**, 112006.
doi [10.1103/PhysRevD.91.112006](https://doi.org/10.1103/PhysRevD.91.112006)

P. Adamson, *et al.* (MINOS Collab.) **Study of quasielastic scattering using charged-current ν_μ -iron interactions in the MINOS near detector.** Phys. Rev. D **91**, 012005.

 [10.1103/PhysRevD.91.012005](https://doi.org/10.1103/PhysRevD.91.012005)

P. Adamson, *et al.* (MINOS Collab.) **Precision measurement of the speed of propagation of neutrinos using the MINOS detectors.** Phys. Rev. D **92**, 052005.

 [10.1103/PhysRevD.92.052005](https://doi.org/10.1103/PhysRevD.92.052005)

2014 P. Adamson, *et al.* (MINOS Collab.) **Combined Analysis of ν_μ Disappearance and $\nu_\mu \rightarrow \nu_e$ Appearance in MINOS Using Accelerator and Atmospheric Neutrinos.** Phys. Rev. Lett. **112**, 191801.

 [10.1103/PhysRevLett.112.191801](https://doi.org/10.1103/PhysRevLett.112.191801)

P. Adamson, *et al.* (MINOS Collab.) **Observation of muon intensity variations by season with the MINOS near detector.** Phys. Rev. D **90**, 012010.

 [10.1103/PhysRevD.90.012010](https://doi.org/10.1103/PhysRevD.90.012010)

2013 P. Adamson, *et al.* (MINOS Collab.) **Measurement of Neutrino and Antineutrino Oscillations Using Beam and Atmospheric Data in MINOS.** Phys. Rev. Lett. **110**, 251801.

 [10.1103/PhysRevLett.110.251801](https://doi.org/10.1103/PhysRevLett.110.251801)

Proceedings

2022 S. C. Tognini, P. Canal, *et al.* **Celeritas: GPU-accelerated particle transport for detector simulation in High Energy Physics experiments.** Submitted to the Proceedings of the US Community Study on the Future of Particle Physics (Snowmass 2021). arXiv:2203.09467.

 [10.48550/arXiv.2203.09467](https://doi.org/10.48550/arXiv.2203.09467)


2021 S. R. Johnson, S. C. Tognini, *et al.* **Novel features and GPU performance analysis for EM particle transport in the Celeritas code.** 25th International Conference on Computing in High Energy and Nuclear Physics (CHEP 2021). EPJ Web of Conferences **251**, 03030.

 [10.1051/epjconf/202125103030](https://doi.org/10.1051/epjconf/202125103030)

2020 T. M. Evans, S. R. Johnson, *et al.* **Celeritas—a nascent GPU detector simulation code.** Letter of Interest for Snowmass 2021.

 www.snowmass21.org/docs/files/summaries/CompF/SNOWMASS21-CompF2_CompF1-053.pdf

2017 A. Habig, M. Goodman, P. Schreiner, S. C. Tognini, and R. A. Gomes. (On behalf of the NO ν A Collaboration) **Seasonal Variation of Multiple-Muon Events in MINOS and NOvA.** 35th International Cosmic Ray Conference (ICRC), Bexco, Busan, Korea.

 [10.22323/1.301.0200](https://doi.org/10.22323/1.301.0200)

2012 S. C. Tognini and R. A. Gomes. **Simulation of atmospheric temperature effects on cosmic ray muon flux.** NuInt12: Eight International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Rio de Janeiro (RJ), Brazil. AIP Conf. Proc. **1663**, 120015.

 [10.1063/1.4919521](https://doi.org/10.1063/1.4919521)

Technical reports

2021 J. Meszaros, S. C. Tognini, *et al.* **Underground Research Laboratory Muon Detector Project Progress Report.** Sponsor Report ORNL/SPR-2021/2077.