Curriculum Vitæ

Simon Guichandut

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I am a computational astrophysicist, interested in how we can explain observed features of Type I X-ray Bursts, the most common transient in the high-energy sky, using theoretical models and numerical simulations of neutron star surfaces. I employ widely used astrophysical software (`MESA`, `MAESTROeX`, `Athena++`), and utilize high-performance computing clusters for massively parallel calculations. I enjoy creating insightful data visualizations and presenting my results, both to physics peers and for outreach.

Education

Ph.D. — Physics

2020 - 2024, McGill University, Advisor: Prof. Andrew Cumming
Thesis: Convection and Outflows from Accreting Neutron Stars during Thermonuclear Flashes

M.Sc. — Physics

2018 - 2020, McGill University, Advisor: Prof. Andrew Cumming
Thesis: Regimes of photospheric radius expansion driven by high luminosities in Type I X-ray bursts

B.Eng. — Engineering Physics

2014 - 2020, École Polytechnique de Montréal
Internships in neuroscience & biomedical physics research. 3.85/4 GPA.

Scholarships & Awards

2024	McGill Physics graduate teaching award
2023	CRAQ International Internship Scholarship (at Stony Brook University, 10k CA$)
2021-2024	NSERC Doctoral Fellowship (63k CA$)
2018-2020	FRQNT Master's Fellowship (35k CA$)
2018	IVADO Data Science Research Scholarship (7k CA$)
2016	NSERC Undergraduate Research Internship Scholarship (3k CA$)

Presentations

Invited talks

Sep 2024	Seminar, Institut de Recherche en Astrophysique et Planétologie, Toulouse	France
Nov 2023	Astronomy seminar, Michigan State University	USA
May 2023	Geophysical/Astrophysical fluid dynamics seminar, CU Boulder	USA
Nov 2023	Stars & Compact Objects group meeting, Flatiron CCA, NYC	USA

Contributed talks

May 2024	CRAQ Annual Meeting, St-Alexis-des-Monts. *Best student talk prize.*	Canada
May 2023	Frontiers Meeting for Nuclear Astrophysics, East Lansing, MI	USA

May 2022	CRAQ Annual Meeting, Magog	Canada
Mar 2022	AAS High Energy Astrophysics Meeting, Pittsburgh, PA	USA
June 2019	Lorentz Center workshop on X-ray bursts, Leiden	Netherlands
May 2019	CRAQ Annual Meeting, St-Alexis-des-Monts	Canada

Outreach

June 2024	Speaker at annual public astronomy conference at Observatoire du Mont-Mégantic
March 2021	Speaker at Vanderbilt Dyer Observatory Virtual Star Party
2021	Lead Coordinator of AstroMcGill outreach group
2018-2020	Public lecture coordinator for AstroMcGill

Service

2021-2023	CRAQ (Centre de Recherche en Astrophysique du Québec) Student representative
2023	Referee, Astronomy & Astrophysics
2021-2022	Coaching undergraduate students for Canadian physics exam competition
2019-2022	Mentor for undergraduate and new graduate students, McGill Physics

Teaching

At McGill University: Graduent Student Instructor

- PHYS642: Radiative Processes in Astrophysics (W2022,W2024). 2 guest lectures.
- PHYS512: Computational Physics with Applications (F2023).
- PHYS521: Astrophysics (F2022). 1 guest lecture.
- PHYS251: Honours Classical Mechanics (F2019,F2020)
- PHYS142: Electromagnetism and Optics (W2019,W2020)
- PHYS131: Mechanics and Waves (F2018)

Skills

Programming (* = proficient)

Languages	*python, Matlab, Fortran 90, C++, *Excel, bash
Tools	NumPy, SciPy, scikit-learn
Visualization	*Matplotlib, yt
Version control	git, github
Markup	*LaTeX, Markdown, HTML
Development	*vim, vscode, jupyter
Operating systems	Unix, Linux

Interpersonal: Technical writing & presenting, Teaching, Leadership
Spoken languages: English, French (native)
Other: First aid, certified canoeing instructor

Publications

Peer-reviewed Journal Articles

- M. Zingale, K. Bhargava, R. Brady, Z. Chen, **S. Guichandut**, E.T. Johnson, M. Katz, A. Smith Clark (2025). *The Challenges of Modeling Astrophysical Reacting Flows*, J. Phys. Conf. Ser. 2997 012007
- F. Barra, D. Barret, C. Pinto, T. Di Salvo, N. Weinberg, **S. Guichandut** (2025). *Line detections in photospheric radius expansion bursts from 4U 1820-303*, A&A, 694, A266
- **S. Guichandut**, M. Zingale, A. Cumming (2024). *Hydrodynamical Simulations of Proton Ingestion Flashes in Type I X-Ray Bursts*, ApJ, 975, 250
- **S. Guichandut**, A. Cumming (2023). *The Imprint of Convection on Type I X-Ray Bursts: Pauses in Photospheric Radius Expansion Lightcurves*, ApJ, 954, 11
- **S. Guichandut**, A. Cumming, M. Falanga, Z. Li, M. Zamfir (2021). *Expanded Atmospheres and Winds in Type I X-Ray Bursts from Accreting Neutron Stars*, ApJ, 914, 49
- ⋆S. Casten, **S. Guichandut**, A. Cumming, E. Brown (2025). *Weak X-ray Bursts on Slowly Accreting Neutron Stars*, (in review)

In preparation

(* = I mentored this student)

- **S. Guichandut**, M. Zingale, A. Cumming. *Hydrodynamic Simulations of Proton-Ingestion Flashes in Type I X-ray Bursts. II. 3D compressible simulations.*
- **S. Guichandut**, *B. Herfray, A. Cumming. *Metal Ejection in Helium-Triggered Type I X-ray bursts.*
- *N. Baz-Pérez, D. Page, **S. Guichandut**, A. Cumming, M. Nava-Callejas. *Post-Supernova Accretion of Light Elements onto a New-Born Neutron Star and NS 1987A.*

References

Prof. Andrew Cumming
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Prof. Michael Zingale
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Department of Physics and Astronomy
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Prof. Edward Brown
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