Thomas Flöss Postdoctoral researcher in cosmology ✓ tsfloss@gmail.com **G** tsfloss in tsfloss thomasfloss.com 0000-0002-8245-780X



I am a postdoc at the University of Vienna. I work primarily on using late-time cosmological probes, such as the CMB, galaxy surveys, and intensity mapping (e.g. 21-cm) to study the primordial universe, particularly cosmic inflation through primordial non-Gaussianity. In my research, I make use of analytical, numerical and state-of-the-art machine learning (ML) methods. Additionally, I like to think about formal aspects of cosmology such as consistency conditions and the cosmological bootstrap. I have also studied the amplitude double copy, its application to cosmology, and a possible connection with massive gravity. I received my PhD from the University of Groningen in 2024.

Professional Experience





Awards & Grants

Fundamentals of the Universe PhD Scholarship, University of Groningen Sept 2020 Research proposal: Sensing in the Dark: exploring the early universe through the Dark Ages.

Research Visits

Sept – Nov 2023 Center for Computational Astrophysics (Flatiron Institute), New York, USA Guest researcher with Franscisco Villaescusa-Navarro and William Coulton

Teaching & Mentoring

2023	Co-supervisor MSc. student Jelte Bottema, University of Groningen
2021	Co-supervisor MSc. student Jorik Melsen, University of Groningen
2022	Teaching Assistant, General Relativity (MSc. course), University of Groningen
2020	Co-supervisor MSc. students Tim de Wild and Tom Westerdijk, University of Groningen
2017	Teaching Assistant, Calculus II (BSc. course), Utrecht University

Organization

2020 - 2023	Cosmology Journal Club, University of Groningen
2020 - 2021	Seminar Series on Cosmological Correlators and Bootstrap, University of Groningen
2015	Physics Symposium "Physical Creativity", Utrecht University

Skills

Languages	English (Fluent), Dutch (Native), German (Proficient)
Coding	Python, JAX, TensorFlow, julia, PyTorch, C/C++, LATEX, Mathematica (incl. xAct), GitHub

Public Codes (see GitHub)

- PolyBin3D: a GPU accelerated unwindowed power spectrum and bispectrum estimator in Python (together with Oliver Philcox)
- BFast: a GPU accelerated FFT bispectrum estimator in JAX (Python)
- PyNG: Fisher forecast primordial non-Gaussianity including non-Gaussian covariance
- 21cmDA: Fisher forecast primordial non-Gaussianity from the Dark Ages' 21-cm signal

Talks & Posters

July 2024	Cosmology in the Adriatic, Split, Croatia (contributed talk)
	New Strategies for Cosmology from Galaxy Surveys, Sexten, Italy (contributed talk)
Oct 2023	Dunkley group meeting, Princeton University
	CMBAS/CCA group meeting, Flatiron Institute
May 2023	Weniger group meeting, GRAPPA, University of Amsterdam
Mar 2023	Netherlands Theoretical Cosmology (THC) meeting
Dec 2022	Hill group meeting, Columbia University
Sep 2022	PNG2022, International Conference, ITF Madrid (contributed talk)
May 2022	Kapteyn Institute Lunch Talk, University of Groningen
Apr 2022	Fundamentals of the Universe Symposium, University of Groningen (invited talk)
	State of the Universe Seminar, TIFR, India (invited talk, online)
Feb 2022	Friday Journal Club, KICP, UChicago (invited talk, online)
Sept 2021	Fundamentals of the Universe Symposium, University of Groningen (poster)

Research Publications

- T. Flöss, W. R. Coulton, A. J. Duivenvoorden, F. Villaescusa-Navarro, and B. D. Wandelt, "Denoising diffusion delensing: reconstructing the non-Gaussian CMB lensing potential with diffusion models," *Mon. Not. Roy. Astron. Soc.*, vol. 533, no. 1, pp. 423–432, 2024. *O* DOI: 10.1093/mnras/stae1818. arXiv: 2405.05598 [astro-ph.CO].
- [2] O. H. E. Philcox and **T. Flöss**, "PolyBin3D: A Suite of Optimal and Efficient Power Spectrum and Bispectrum Estimators for Large-Scale Structure," Apr. 2024. arXiv: 2404.07249 [astro-ph.CO].
- [3] **T. Flöss**, D. Roest, and T. Westerdijk, "Non-linear Electrodynamics from Massive Gravity," Aug. 2023, Submitted to JHEP. arXiv: 2308.04349 [hep-th].
- [4] G. Orlando, **T. Flöss**, P. D. Meerburg, and J. Silk, "Local non-Gaussianities from cross-correlations between the CMB and 21-cm," Jul. 2023, Submitted to PRD. arXiv: 2307.15046 [astro-ph.CO].
- [5] **T. Flöss** and P. D. Meerburg, "Improving constraints on primordial non-Gaussianity using neural network based reconstruction," May 2023, Accepted in JCAP. arXiv: 2305.07018 [astro-ph.CO].
- [6] T. Flöss, M. Biagetti, and P. D. Meerburg, "Primordial non-Gaussianity and non-Gaussian covariance," *Phys. Rev. D*, vol. 107, no. 2, p. 023 528, 2023. *O* DOI: 10.1103/PhysRevD.107.023528. arXiv: 2206.10458 [astro-ph.CO].
- T. Flöss, T. de Wild, P. D. Meerburg, and L. V. E. Koopmans, "The Dark Ages' 21-cm trispectrum," *JCAP*, vol. o6, no. o6, p. 020, 2022. *O* DOI: 10.1088/1475-7516/2022/06/020. arXiv: 2201.08843
 [astro-ph.CO].

References

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Dr. Daan Meerburg

Assistant Professor