Clara Vergès

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Research interests

I am a cosmologist working at the interface between instrumentation and data analysis. I work on the search for the primordial B-modes signal in CMB polarisation, a smoking gun for cosmic inflation. My focus is on calibration and systematics in the context of analysis of multi-frequency, multi-component data sets. I have 5+ years of experience working on CMB experiments, from receiver characterisation to low- and high-level data analysis and simulations of instrumental systematic effects.

Education & Academic appointments

Current position

Center for Astrophysics | Harvard & Smithsonian **2020 – present**
Harvard Postdoctoral Fellow

Education

Université Paris Cité **2017 – 2020**
PhD in Cosmology
Dissertation: *Searching for cosmological B-modes in the presence of astrophysical contaminants and instrumental effects*, with Radek Stompor and Josquin Errard at AstroParticle and Cosmology laboratory

ISAE-Supaéro & Université Paul Sabatier **2016 – 2017**
Master of Science – Double degree in Astrophysics and Aerospace engineering
Master thesis: *Novel readout electronics for CMB experiments*, with Matt Dobbs at McGill University

École polytechnique **2013 – 2016**
Bachelor & Master of Science – Fundamental Physics and Astrophysics
Senior thesis: *Looking for SZ effect in ALMA data*, with Paola Andreani at European Southern Observatory

Professional service

Collaboration membership

CMB-Stage 4 **2021 – present**
Small Aperture Telescopes (SATs) and Systematics working groups

BICEP/Keck **2020 – present**
Calibration lead

POLARBEAR/Simons Array, Simons Observatory **2017 – 2020**
Low-ell BB and Systematics working groups

Leadership & Representation

Harvard CMB group meeting **2021 – present**
Organisation of weekly meetings with local and invited speakers

La Sphinx **2017 – present**
École polytechnique alumni group with a focus on social and environmental issues

Université Paris Cité – Physics Department Board **2018 – 2020**
Student elected representative

APC Laboratory – Cosmology Journal Club **2018 – 2020**
Organisation of bi-weekly meetings

Mentoring, Teaching & Outreach

Mentoring

- Brodi Elwood, PhD candidate (Harvard University), 2022 – present
- Will Golay, NSF REU intern (University of Iowa), 2022 – present
- James Cornelison, PhD candidate (Harvard University), 2020 – present
- Maroua Benhatchi, junior thesis student (Université Paris Cité), 2019

Teaching

- Qualification for holding entry-level professor positions in France issued by the French Ministry of Higher Education and Research (*Qualification aux fonctions de Maître de Conférence*), based on teaching record and teaching statement, issued 2021
- Physics for pre-med students, Université Paris Cité, 2019
- Computer Science 101, Université Paris Cité, 2019
- Private tutor for high-school students from underprivileged background, 2015 – 2020

Outreach

- CMB-Stage 4 Saturday Space Science Series, 2022
- Skype a Scientist, 2022
- An Evening in Science, Loomis Chaffee School, 2022
- Physics content editor for *Fête le Savoir!* (science outreach for all ages), 2017 – present
- Camp counsellor for *Universciel* (astronomy outreach for children), 2018 – 2020
- Board member of *SpaceUp France*, 2016 – 2018
- Building a portable cloud chamber for science fairs, École polytechnique, 2014 – 2015

Talks

Invited talks & Seminars

- *Cosmology Talks Mini-workshop on parity violation* – Guest expert, online, November 2022
- *Beam calibration and systematics: from BICEP/Keck to future CMB experiments* – Kavli IPMU, July 2022
- *Updated Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season* – Center for Astrophysics, April 2022
- *New Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Ob-*

servations through the 2018 Observing Season – CMB France Workshop, Institut d'Astrophysique de Paris, November 2021
- *Impact of instrumental systematic effects on component separation and large scale B-modes measurements* – CMB Calibration and systematics focus workshop, Kavli IPMU, December 2020
- *A framework for performance forecasting of the parametric component separation in the presence of systematic effects* – LiteBIRD France Day, June 2020
- *Probing Universe's first light: Looking for inflation with the new generation of CMB polarisation experiments* – ESO, June 2020

Contributed talks

- *Beam calibration campaign requirements to control temperature-to-polarisation leakage for CMB-Stage 4* – From Planck to the future of the CMB, INFN Ferrara, May 2022
- *A framework for performance forecasting of the parametric component separation in the presence of systematic effects* – B-modes from Space workshop, MPA, December 2019
- *Instrumental systematic effects for the new generation of CMB polarisation experiments* – Young French Physicists annual meeting, organised by the French Physics Society (SFP), Collège de France, November 2018

Posters

- *New Algorithms for Characterizing the Beams of Next-Generation CMB Experiments* (with Will Golay) – AAS Winter Meeting, January 2023 (submitted)
- *Control of beam systematics and temperature-to-polarisation leakage: From BICEP/Keck demonstrated performance to forecasts for CMB-S4* – Rencontres de Moriond, January 2022
- *Latest results, current data-analysis and upcoming upgrades of the POLARBEAR experiment* – CosmoGold IAP 2019 : The golden age of cosmology from Planck to Euclid, June 2019

Selected publications

[1] J. Cornelison, C. Vergès, and the BICEP/Keck collaboration. "Improved polarization calibration of the BICEP3 CMB polarimeter at the South Pole". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Vol. 12190. SPIE, 2022, p. 121901X. DOI: 10.1117/12.2620212. URL: https://doi.org/10.1117/12.2620212.

[2] The BICEP/Keck Collaboration. "Improved Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season". In: *Phys. Rev. Letters* 127.15, 151301 (Oct. 2021), p. 151301. DOI: 10.1103/PhysRevLett.127.151301. arXiv: 2110.00483 [astro-ph.CO].

[3] C. Vergès, J. Errard, and R. Stompor. "Framework for analysis of next generation, polarized CMB data sets in the presence of Galactic foregrounds and systematic effects". In: *Phys. Rev. D* 103 (6 Mar. 2021), p. 063507. DOI: 10.1103/PhysRevD.103.063507. URL: https://link.aps.org/doi/10.1103/PhysRevD.103.063507.

[4] M. H. Abitbol ... C. Vergès et al. "The Simons Observatory: gain, bandpass and polarization-angle calibration requirements for B-mode searches". In: *Journal of Cosmology and Astroparticle Physics* 2021.05 (May 2021), p. 032. DOI: 10.1088/1475-7516/2021/05/032. URL: https://doi.org/10.1088/1475-7516/2021/05/032.

[5] M. Rouble, ..., and C. Vergès. "Transformer-Coupled TES Frequency Domain Readout Prototype". In: *Journal of Low Temperature Physics* 199.3-4 (Feb. 2020), pp. 780–788. DOI: 10.1007/s10909-020-02376-8.

Complete list appended

References

John M. Kovac
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Kirit S. Karkare
Staff Scientist, SLAC National Accelerator Laboratory (as of Dec 1st, 2022)
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Additional references available upon request