Clara Vergès

Center for Astrophysics | Harvard & Smithsonian

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Research interests

- Improve systematics modeling for the new generation of CMB polarisation experiments;
- Inform the design process to set instrumental and calibration requirements given science goals;
- Develop new data analysis techniques, including component separation techniques, to account for increased complexity of future experiments.

Current position

Center for Astrophysics | Harvard & Smithsonian **Cambridge, USA**
Harvard Postdoctoral Fellow *2020 – present*
Calibration & Systematics for current and future CMB polarisation experiments
Member of the BICEP/*Keck* and CMB-Stage 4 collaborations

Activities

- Supervision of a NSF REU Internship (10 weeks)
- Integration and calibration of the BICEP Array receivers

Education

Université de Paris **Paris, France**
PhD in Cosmology at AstroParticle & Cosmology (APC) laboratory *2017–2020*
Searching for cosmological B-modes in the presence of astrophysical contaminants and instrumental effects.
PhD Advisors: Dr. Radek Stompor and Dr. Josquin Errard.

Activities

- Teaching assistant: Introduction to Physics and Computer Science Basics
- Supervision of a 2-month internship (bachelor student)
- Student representative at *Conseil de l'UFR de Physique* (Physics Department Counsel)

ISAE-Supaéro & Université Paul Sabatier **Toulouse, France**
Master of Science – Joint degree in Astrophysics and Aerospace engineering *2016–2017*

École polytechnique **Palaiseau, France**
Bachelor & Master of Science – Fundamental Physics and Astrophysics *2013–2016*

Experience

Research assistant

McGill University **Montréal, Canada**

Preliminary design and test of a new readout system for TES bolometers *April–August 2017*

Graduate exchange student supervised by Pr. Matt Dobbs

- Design, simulation and characterisation of a new readout system for CMB experiments;
- Assembly of a prototype, and testing at room temperature and in cryogenics conditions.

European Southern Observatory **Garching, Germany**

Study of galaxy clusters in the radio frequency domain using ALMA data *March–June 2016*

Graduate research assistant directed by Dr. Paola Andreani

- Data reduction, calibration and analysis.

Languages

French: Native

English: Fluent

German: Conversational

Russian: Basic

Numerical skills

Languages: Python, Matlab, HTML

Tools: Git, Latex, Mathematica

Volunteer experience

- Participation and organisation of various outreach events, from week-long astronomy summer camp for kids to general audience talks and school/high-school science days
- Volunteer in homeless support group
- Private teacher and mentor for young students from underprivileged backgrounds.

Oral contributions

Invited talks & Seminars

- *Beam calibration and systematics: from BICEP/Keck to future CMB experiments*, CMB group seminar, Kavli IPMU - Kashiwa, Japan, July 2022 (remote)
- *Updated Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season*, CfA Seminar, Center for Astrophysics - Cambridge, USA, April 2022
- *New Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season*, CMB France workshop #2, Institut d'Astrophysique de Paris - Paris, France, November 2021 (remote)
- *Impact of instrumental systematic effects on component separation and large scale B-modes measurements*, CMB systematics and calibration focus workshop, Kavli IPMU - Kashiwa, Japan, December 2020 (remote)
- *Probing Universe's first light: Looking for inflation with the new generation of CMB polarisation experiments*, ESO Lunch Talk Seminar - Garching, Germany, June 2020 (remote)

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, Italy, May 2022.
- *A framework for performance forecasting of the parametric component separation in the presence of systematic effects*, LiteBIRD France Day - June 2020 (remote)
- *A framework for performance forecasting of the parametric component separation in the presence of systematic effects*, B-modes from Space workshop - Garching, Germany, 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) - Paris, France, November 2018.

Posters

- *Control of beam systematics and temperature-to-polarisation leakage: From BICEP/Keck demonstrated performance to forecasts for CMB-S4*. Rencontres de Moriond- La Thuile, Italy, 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 - Paris, France, June 2019.

Publications

[1] The BICEP/Keck Collaboration. Improved Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season. *Physical Review Letters*, 127(15):151301, October 2021.

[2] The BICEP/Keck Collaboration. BICEP / Keck XV: The BICEP3 CMB Polarimeter and the First Three Year Data Set. *arXiv e-prints*, page arXiv:2110.00482, October 2021.

[3] The BICEP/Keck Collaboration. BICEP / Keck XIV: Improved constraints on axion-like polarization oscillations in the cosmic microwave background. *arXiv e-prints*, page arXiv:2108.03316, August 2021.

[4] Clara Vergès, Josquin Errard, and Radek Stompor. Framework for analysis of next generation, polarized cmb data sets in the presence of galactic foregrounds and systematic effects. *Phys. Rev. D*, 103:063507, Mar 2021.

[5] M. Rouble, M. Dobbs, A. Gilbert, J. Montgomery, G. Noble, and C. Vergès. Transformer-Coupled TES Frequency Domain Readout Prototype. *Journal of Low Temperature Physics*, February 2020.

[6] Maximilian H. Abitbol, David Alonso, Sara M. Simon, Jack Lashner, Kevin T. Crowley, Aamir M. Ali, Susanna Azzoni, Carlo Baccigalupi, Darcy Barron, Michael L. Brown, Erminia Calabrese, Julien Carron, Yuji Chinone, Jens Chluba, Gabriele Coppi, Kevin D. Crowley, Mark Devlin, Jo Dunkley, Josquin Errard, Valentina Fanfani, Nicholas Galitzki, Martina Gerbino, J. Colin Hill, Bradley R. Johnson, Baptiste Jost, Brian Keating, Nicoletta Krachmalnicoff, Akito Kusaka, Adrian T. Lee, Thibaut Louis, Mathew S. Madhavacheril, Heather McCarrick, Jeffrey McMahon, P. Daniel Meerburg, Federico Nati, Haruki Nishino, Lyman A. Page, Davide Poletti, Giuseppe Puglisi, Michael J. Randall, Aditya Rotti, Jacob Spisak, Aritoki Suzuki, Grant P. Teply, Clara Vergès, Edward J. Wollack, Zhilei Xu, and Mario Zannoni. The Simons Observatory:

Bandpass and polarization-angle calibration requirements for B-mode searches. *arXiv e-prints*, page arXiv:2011.02449, November 2020.

[7] The POLARBEAR Collaboration. A measurement of the degree-scale CMB b-mode angular power spectrum with polarbear. *The Astrophysical Journal*, 897(1):55, July 2020.

[8] The POLARBEAR Collaboration. A measurement of the CMB E-mode angular power spectrum at subdegree scales from 670 square degrees of POLARBEAR data. *arXiv e-prints*, page arXiv:2005.06168, May 2020.

[9] The POLARBEAR Collaboration. Internal Delensing of Cosmic Microwave Background Polarization B -Modes with the POLARBEAR Experiment. *Physical Review Letters*, 124(13):131301, April 2020.

[10] The POLARBEAR Collaboration. Cross-correlation of CMB Polarization Lensing with High-z Submillimeter Herschel-ATLAS Galaxies. *Astrophysical Journal*, 886(1):38, November 2019.

[11] T. Namikawa et al., The POLARBEAR Collaboration, and The SUBARU HSC SSP Collaboration. Evidence for the Cross-correlation between Cosmic Microwave Background Polarization Lensing from Polarbear and Cosmic Shear from Subaru Hyper Suprime-Cam. *Astrophysical Journal*, 882(1):62, September 2019.

[12] The Simons Observatory Collaboration. The Simons Observatory: Astro2020 Decadal Project Whitepaper. *arXiv e-prints*, page arXiv:1907.08284, July 2019.

[13] The Simons Observatory collaboration. The Simons Observatory: science goals and forecasts. *Journal of Cosmology and Astro-Particle Physics*, 2019:056, February 2019.

[14] K. T. Crowley, S. M. Simon, M. Silva-Feaver, N. Goeckner-Wald, A. Ali, J. Austermann, M. L. Brown, Y. Chinone, A. Cukierman, B. Dober, S. M. Duff, J. Dunkley, J. Errard, G. Fabbian, P. A. Gallardo, S.-P. P. Ho, J. Hubmayr, B. Keating, A. Kusaka, N. McCallum, J. McMahon, F. Nati, M. D. Niemack, G. Puglisi, M. Sathyanarayana Rao, C. L. Reichardt, M. Salatino, P. Siritanasak, S. Staggs, A. Suzuki, G. Teply, D. B. Thomas, J. N. Ullom, C. Vergès, M. R. Vissers, B. Westbrook, E. J. Wollack, Z. Xu, and N. Zhu. Studies of systematic uncertainties for Simons Observatory: detector array effects. In *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX*, volume 10708 of *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, page 107083Z, July 2018.

[15] R. Vio, C. Vergès, and P. Andreani. The correct estimate of the probability of false detection of the matched filter in weak-signal detection problems . II. Further results with application to a set of ALMA and ATCA data. *Astronomy & Astrophysics*, 604:A115, August 2017.