Clara Vergès

Center for Astrophysics | Harvard & Smithsonian

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Research interests

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

Current position

Center for Astrophysics | Harvard & Smithsonian **Cambridge, USA**
Postdoctoral researcher *2020 – present*
CMB polarisation measurements with BICEP/Keck and preparation of future surveys with CMB-S4
CMB research group directed by Pr. John Kovac

Education

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

Activities

- Teaching assistant: Introduction to Physics
- Supervision of a 2-month internship (bachelor student)
- Organisation of the Cosmology group Journal Club
- Participation and organisation of several outreach events for children and adults.
- Student representative at *Conseil de l'UFR de Physique* (Physics Department Counsel)

Université Paul Sabatier **Toulouse**
Master of Science – Astrophysics, Space Sciences and Planetary Sciences *2016–2017*

ISAE-Supaéro **Toulouse**
Master of Engineering – Aerospace engineering *2016–2017*

École polytechnique **Palaiseau**
Master of Science – Major in Fundamental Physics and Astrophysics *2013–2016*

Experience

Research assistant

McGill University **Montréal**

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-bei-München**

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.

Student project

Institut de Recherche en Astrophysique et Planétologie **Toulouse**

Phase-0 study of a nano-satellite for exoplanets detection *September 2016–March 2017*

Part-time group project, coordinated by Dr. Jean-François Donati

- End-to-end simulation of the instrument;
- Hardware requirements to meet science goals.

Languages

French: Native speaker

English: Fluent

German: Good knowledge

Russian: Basic

Numerical skills

Languages: Python (standard and cosmology-specific packages, parallelisation with `mpi4py`), Matlab, Mathematica

Tools: Git, Latex

Volunteer experience

- Private teacher and mentor for young students with difficulties and from underprivileged backgrounds.
- Volunteer at *Universciel*: outreach organisation dedicated to astronomy and astrophysics for children. Participation in several talks in schools and co-organisation of an astronomy summer camp.
- Secretary at *Fête le savoir*: general scientific outreach association, organizing two yearly events with talks and activities for children and adults.

Publications

[1] Clara Vergès, Josquin Errard, and Radek Stompor. Framework for analysis of next generation, polarised CMB data sets in the presence of galactic foregrounds and systematic effects. *arXiv e-prints*, page arXiv:2009.07814, September 2020.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

[6] 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.

[7] 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.

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

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

[10] 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.

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

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

Oral contributions

Invited talks & Seminars

- *Impact of instrumental systematic effects on component separation and large scale B-modes measurements*, CMB systematics and calibration focus workshop, Kavli IPMU, Kashiwa, Japon, December 2020
- *Probing Universe's first light: Looking for inflation with the new generation of CMB polarisation experiments*, ESO Lunch Talk Seminar - Garching, June 2020

Contributed talks

- *A framework for performance forecasting of the parametric component separation in the presence of systematic effects*, B-modes from Space workshop - Münich, 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, November 2018.

Posters

- *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, June 2019.