

# Florian Kéruzoré

Cosmological Physics & Advanced Computing  
High Energy Physics Division  
Argonne National Laboratory  
Lemont, IL, USA

Téléphone: (+1) 224-277-7384  
Email: [fkeruzore@anl.gov](mailto:fkeruzore@anl.gov)  
ORCID: [0000-0002-9605-5588](https://orcid.org/0000-0002-9605-5588)  
Github: [fkeruzore](https://github.com/fkeruzore)

## — Post-Doctorate —

**Lieu** Argonne National Laboratory, Lemont, IL, USA

**Dates** October 2021 – present

**Activities**

- Thermodynamic properties of simulated clusters
- Baryon pasting: emulation of thermodynamic properties of simulated clusters
- Millimeter-wave sky maps from cosmological simulations
- Multi-wavelength studies of galaxy cluster samples
- Supervision of an internship: Simulated catalogs of radio galaxies at mm wavelengths (*post-bachelor* internship, 6 months)

## — PhD in cosmology —

**Title** High resolution SZ observations for cluster cosmology with NIKA2

**Place** Laboratoire de Physique Subatomique et de Cosmologie  
Université Grenoble Alpes, Grenoble, France

**Dates** October 2018 – September 2021

**Supervision** Pr. Frédéric Mayet

**Activities**

- Observations at the IRAM 30-m telescope
- Analysis of NIKA2 raw data
- Analysis of the thermodynamic properties of the intracluster medium
- Mass-observable scaling relations

## — Scientific responsibilities —

### 2022 – present: PI of a joint SPT-eROSITA project

- Intitulé: *Linking SZ and X-ray observables from eROSITA-selected galaxy clusters*
- Study of statistical relations between galaxy cluster observables in X-ray and mm-wave
- Goals: understanding differences between SZ and X-ray samples and observables, study of the cluster mass calibration at both wavelengths

### 2019 – 2021: Responsible of the NIKA2 collaboration SZ pipeline

- Development and standardization of the analysis chain of NIKA2 cluster observations
- Products: NIKA2 raw data reduction software for SZ observations, intracluster medium thermodynamic properties measurement software

### 2019 – 2021: Responsible of the NIKA2 collaboration SZ database

## — International collaborations —

2022 – present: Member of the Dark Energy Science Collaboration (DESC)  
2022 – present: Member of the CMB-S4 collaboration  
2022 – present: Member of the South Pole Telescope (SPT) collaboration  
2021 – present: Member of the *Galaxy Clusters* working group of the SPT collaboration  
2019 – present: Member of the CHEX-MATE collaboration  
2019 – present: Member of the NIKA2 collaboration *Core Team*  
2018 – present: Member of the NIKA2 collaboration

## — Skills —

**Galaxy clusters** Cosmology, Sunyaev-Zeldovich effect, X-ray emission  
*N*-body simulated clusters, Scaling relations

**Data analysis** Bayesian inference, Monte Carlo Markov Chains,  
Regression, Convolutional neural networks,

**Programming** Python (scipy, astropy, emcee, pymc3), IDL, R,  $\LaTeX$ , bash,  
Version control (git, svn), Documentation (Sphinx),  
Parallelization (multithreading, MPI)

## — Education —

2018 – 2021 PhD in cosmology, Université Grenoble Alpes, France  
2016 – 2018 Master's degree in Physics, Université de Montpellier, France  
*Graduated with honors – Rank: 1<sup>st</sup>*  
2014 – 2016 Bachelor's degree in Physics, Université de Bordeaux, France  
2012 – 2014 Two-year degree in applied physics, Université de Bordeaux, France

## — Summer schools —

**ESCAPE Summer School** – 2021 – Organizer: LAPP Annecy  
*Data analysis for astronomy, astroparticles & particle physics*

**Statistical Challenges in Modern Astronomy** – 2021 – Organizer: PennState University

**IN2P3 School of Statistics** – 2021 – Organizer: IN2P3

**Pedagogy in higher education** – 2019 – Organizer: Université Grenoble Alpes

## — Teaching —

2018-2021: 96h of teaching at Université Grenoble Alpes, tutorials (TD) and labs (TP).

Subject	Year	Type	Hours
Electromagnetism	1st year	TD, TP	56 h
Applied thermodynamics	3rd year	TD	30 h
Nuclear Physics	5th year	TP	12 h

## — Conferences & Seminars —

### International Conferences

- Observing the mm Universe with NIKA2, Roma, Italy, 2021  
Talk: A new software to measure pressure profiles from SZ observations  
Talk: The  $Y_{500} - M_{500}$  scaling relation from the NIKA2 SZ Large Program
- CosmoGold IAP, Paris, France, 2019  
Talk + poster: High resolution SZ observations for cluster cosmology with NIKA2
- Observing the mm Universe with NIKA2, Grenoble, France, 2019  
Talk: A test case for faint galaxy clusters within the NIKA2 SZ Large Program

### National Conferences

- Colloque National Action Dark Energy, Paris, France, 2020  
Talk: High resolution SZ observations for cluster cosmology with NIKA2

### Seminars

- University of Michigan, Ann Arbor, USA, 2022  
The NIKA2 SZ Large Program: High angular resolution SZ observations for cluster cosmology
- Laboratoire de Physique Subatomique et de Cosmologie, Grenoble, France, 2020  
High-resolution SZ observations for cluster cosmology with NIKA2
- Institut d’Astrophysique et de Planétologie de Grenoble, Grenoble, France, 2020  
High-resolution SZ observations for cluster cosmology with NIKA2

## — Public codes —

### panco2: pressure profile measurements from SZ maps of galaxy clusters

- Public diffusion date: November 2022
- GitHub: [fkeruzore/panco2](https://github.com/fkeruzore/panco2); Documentation: [panco2.readthedocs.io](https://panco2.readthedocs.io)
- Forward modeling MCMC analysis enabling taking into account usual systematics
- Tested on simulated *Planck*, SPT, NIKA2 maps; may be used for any millimeter-wave cluster observations

## — Publications —

10 publications in peer-reviewed journals, 28 conference proceedings.(22-12-15).

### Peer-reviewed articles

- F. Kéruzoré *et al.* “panco2: a Python library to measure intracluster medium pressure profiles from Sunyaev-Zeldovich observations,” *Submitted* (2022). arXiv: [2212.01439](https://arxiv.org/abs/2212.01439)
- F. Kéruzoré *et al.* “Exploiting NIKA2/XMM-Newton imaging synergy for intermediate-mass high- $z$  galaxy clusters within the NIKA2 SZ large program. Observations of ACT-CL J0215.4+0030 at  $z \sim 0.9$ ,” *A&A* 644 (2020). arXiv: [2009.02563](https://arxiv.org/abs/2009.02563)

- J.-F. Lestrade *et al.* “Candidate cosmic filament in the GJ526 field, mapped with the NIKA2 camera,” A&A 667 (2022). arXiv: [2209.12904](#)
- M. Muñoz-Echeverría *et al.* “Multi-probe analysis of the galaxy cluster CL J1226.9+3332: Hydrostatic mass and hydrostatic-to-lensing bias,” *Submitted* (2022). arXiv: [2209.07460](#)
- CHEX-MATE Collaboration *et al.* “The Cluster HERitage project with XMM-Newton: Mass Assembly and Thermodynamics at the Endpoint of structure formation. I. Programme overview,” A&A 650 (2021). arXiv: [2010.11972](#)
- A. J. Rigby *et al.* “GASTON: Galactic Star Formation with NIKA2 - evidence for the mass growth of star-forming clumps,” MNRAS 502.3 (2021). arXiv: [2101.08811](#)
- G. Gianfagna *et al.* “Exploring the hydrostatic mass bias in MUSIC clusters: application to the NIKA2 mock sample,” MNRAS 502.4 (2021). arXiv: [2010.03634](#)
- M. Ricci *et al.* “The XXL Survey. XLIV. Sunyaev-Zel’dovich mapping of a low-mass cluster at  $z \sim 1$ : a multi-wavelength approach,” A&A 642 (2020). arXiv: [2004.07866](#)
- L. Perotto *et al.* “Calibration and performance of the NIKA2 camera at the IRAM 30-m Telescope,” A&A 637 (2020). arXiv: [1910.02038](#)
- F. Ruppin *et al.* “Unveiling the Merger Dynamics of the Most Massive MaDCoWS Cluster at  $z = 1.2$  from a Multiwavelength Mapping of Its Intracluster Medium Properties,” ApJ 893.1 (2020). arXiv: [1911.00560](#)

## Conference proceedings

- F. Kérusoré *et al.* “Forecasting the  $Y_{500} - M_{500}$  scaling relation from the NIKA2 SZ Large Program,” vol. 257. European Physical Journal Web of Conferences. 2022. arXiv: [2111.01660](#)
  - F. Kérusoré *et al.* “PANCO2: A new software to measure pressure profiles from resolved thermal SZ observations,” vol. 257. European Physical Journal Web of Conferences. 2022. arXiv: [2111.06493](#)
  - F. Kérusoré *et al.* “A low-mass galaxy cluster as a test-case study for the NIKA2 SZ Large Program,” vol. 228. European Physical Journal Web of Conferences. 2020. arXiv: [1911.03005](#)
- + **25** conference proceedings as co-author (22-12-15).

## Doctorate thesis

F. Kérusoré. “Cosmologie à partir des observations Sunyaev-Zeldovich d’amas de galaxies avec NIKA2.” PhD thesis. 2021, [Manuscript \(in french\)](#)