

---

# FRANCESCA CAPEL

KTH Royal Institute of Technology  
Department of Particle & Astroparticle Physics  
AlbaNova University Center  
Stockholm SE-106 91  
Sweden

Email: [capel@kth.se](mailto:capel@kth.se)  
Website: <https://francescacapel.com>  
Phone: +46 (0) 732 133 992

## EDUCATION

01/09/2015 - present

### Doctor of Philosophy (PhD)

KTH Royal Institute of Technology

- Supervised by Prof. Christer Fuglesang, Prof. Mark Pearce and Prof. Daniel J. Mortlock.
- Thesis title: *Identifying the origin of ultra-high-energy cosmic rays: novel instrumentation and analysis aspects.*
- Planned graduation in June 2020

01/09/2012 - 31/08/2013

### Master thesis (Erasmus Program)

École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

- Supervised by Prof. Ivo Furno and Prof. Benoit Labit
- Thesis title: *Characterization of scrape-off layer plasma using Langmuir probes in the TCV tokamak.*
- Awarded the *European Master Certificate in Fusion Science and Engineering* by the FuseNet Association.

01/09/2010 - 01/08/2014

### Msci. (Hons.) Degree in Physics

Imperial College London, United Kingdom

- Graduated with First Class Honours.
- Specialized in Astrophysics, Plasma Physics, Space Physics and Cosmology.

## RESEARCH POSITIONS

01/09/2014 - 31/08/2015

### Young Graduate Trainee

ESTEC, European Space Agency (ESA), The Netherlands

- Testing and calibration of a novel, highly miniaturized radiation monitor for space applications.

01/07/2009 - 31/08/2009

### Nuffield Science Bursary holder

Cardiff University, United Kingdom

- Based in the Electrical engineering department.
- Design and testing of a near-field microwave microscope.
- Received Gold CREST award.

---

## PUBLICATIONS

I have a total of **8** publications in refereed academic journals, including papers with the full JEM-EUSO Collaboration author list. In this section I list only publications that I have lead and/or made substantial contributions to. I also list relevant conference proceedings to highlight my contributions as part of the JEM-EUSO Collaboration.

Link to full publication list on Google Scholar: <https://scholar.google.com/citations?user=jKM43oUAAAAJ>.

### Selected publications

1. **Capel, F.** & Mortlock, D. J., 2019, Impact of using the ultra-high-energy cosmic ray arrival energies to constrain source associations. *Monthly Notices of the Royal Astronomical Society*, 484, 2324, 10.1093/mnras/stz081.
2. **Capel, F.** et al., 2018, Mini-EUSO: A high resolution detector for the study of terrestrial and cosmic UV emission from the International Space Station. *Advances in Space Research*, 62, 2954, 10.1016/j.asr.2017.08.030.
3. Belov, A., Bertaina, M. **Capel, F.\*** et al., 2018, The integration and testing of the Mini-EUSO multi-level trigger system. *Advances in Space research*, 62, 2966, 10.1016/j.asr.2017.10.044.  
\* **Capel, F.** is corresponding author, but author list is alphabetically ordered.

### Under review

4. **Capel, F.** et al., Mini-EUSO (Extreme Universe Space Observatory) data acquisition and control software. Under review with the *Journal of Astronomical Telescopes and Instrumentation*. Submitted in July 2019, arXiv:1907.04938 .

### Selected conference proceedings

5. **Capel, F.** et al., 2017, Mini-EUSO flight software and operations on ISS. *Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017)*, PoS, 454.
6. **Capel, F.** et al., 2017, The Mini-EUSO multi-level trigger algorithm and its performance. *Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017)*, PoS, 453.

## AWARDS

- |            |   |
|------------|---|
| 15/01/2019 | Shortlisted as one of four finalists for the American Statistical Association's <i>Best Astrostatistics Student Paper Award</i> . |
| 31/08/2018 | TeVPA award for <i>Excellent Young Scientists</i> , 500 EUR.  |
| 01/12/2014 | FuseNet Association <i>European Master Certificate in Fusion Science and Engineering</i> .  |
| 30/09/2009 | Gold CREST award ( <a href="https://www.crestawards.org/crest-gold">https://www.crestawards.org/crest-gold</a> ).                 |

## GRANTS

Grants awarded for conferences, short research visits and equipment.

- |            |   |
|------------|---|
| 26/06/2019 | <b>9 800 SEK</b> from Jubileumsanslaget for travel to the JSM conference, main applicant .  |
| 08/05/2019 | <b>15 000 SEK</b> from G  l  stiftelsen for travel to the EPS-HEP conference, main applicant.   |
| 28/06/2018 | <b>18 900 SEK</b> from Signeuls Stiftelsen for travel to the TeVPA conference, main applicant.  |
| 23/11/2017 | <b>50 000 SEK</b> from Alexandra och Bertil Gyllings Stiftelsen for research visits and equipment related to the Mini-EUSO project, co-applicant with Christer Fuglesang. |
| 22/02/2017 | <b>2 700 SEK</b> from the Swedish National Space Board for travel to the SRS meeting, main applicant.   |

---

## SCIENTIFIC SERVICES

- Referee for the *Monthly Notices of the Royal Astronomical Society* journal.
- Advocate for reproducible, open-source research and programming, active on GitHub ([www.github.com/cescalara](http://www.github.com/cescalara)).
- Organizer of the 18<sup>th</sup> JEM-EUSO Collaboration Meeting, Stockholm 7<sup>th</sup>-11<sup>th</sup> December 2015.

## INVITED TALKS

- 30/07/2019 **American Statistical Association - Joint Statistical Meetings, Denver**  
Impact of using the ultra-high-energy cosmic ray arrival energies to constrain source associations.
- 13/07/2019 **European Physical Society - High Energy Physics, Ghent**  
Multi-messenger astroparticle physics through hierarchical modelling.
- 16/11/2018 **Bayes Forum, Max Planck Institute for Astrophysics, Munich**  
A hierarchical model for the energies and arrival directions of ultra-high-energy cosmic rays.
- 28/02/2018 **Research Seminar, University of Turin**  
Scientific goals of the Mini-EUSO mission.
- 09/06/2017 **Science Coffee, ESTEC, European Space Agency, Noordwijk**  
The Mini-EUSO instrument.

## OTHER TALKS

- 04/04/2019 **IMAGINE Consortium workshop, Nijmegen**  
Connecting UHECR theory to data via hierarchical modelling.
- 15/11/2018 **CRC 1258 working group, Max Planck Institute for Extraterrestrial Physics, Munich**  
Impact of using the ultra-high-energy cosmic ray arrival energies to constrain source associations.
- 25/10/2018 **Extreme objects working group, Oskar Klein Center, Stockholm**  
A hierarchical model for the sources of ultra-high-energy cosmic rays.
- 31/08/2018 **TeV Particle Astrophysics, Berlin**  
Connecting UHECR theory to data with Bayesian hierarchical models.
- 01/12/2015 **Partikeldagarna, Uppsala**  
Towards a space-based cosmic ray observatory.

## SCHOOLS & COURSES

60 ECTS of graduate-level courses at KTH and Stockholm University in *Advanced Astrophysics*, *Frequentist Statistical Methods*, *Bayesian Statistics for Astronomers and Physicists*, *Quantum Field Theory* and *General Relativity*.

Other courses

- Proposal writing workshop, Technische Universität München, 11-14/08/2019.
- CERN School of Computing, Universidad Politécnica de Madrid, 27/08/2017 - 09/09/2017.
- Robust Chip Inc. TCAD sensor simulation workshop, ESA/ESTEC, 15-16/04/2015.
- Geant4-DNA radiation simulation workshop, ESA/ESTEC, 07/11/2014.
- Space Systems Engineering course organized by Southampton University, ESA/ESTEC, 14-16/10/2014.

---

## TEACHING & SUPERVISION

Teaching assistant for the *Radiation, Protection, Dosimetry and Detectors* and *Modern Physics* courses at KTH Royal Institute of Technology during the autumn semester of 2015 and 2016.

Erasmus student theses from the University of Turin

- D. D'Ago, *Simulations of UHECR induced air showers in ESAF*, 31/08/2017.
- S. Durando, *Data analysis for the EUSO-SPB mission*, 31/08/2017.
- A. Liberatore, *Optimization of the L2 trigger algorithm for Mini-EUSO*, 31/08/2016.

Bachelor student theses as part of the MIST student CubeSat project

- C. Eriksson & V. Minoz, *Development of a Helmholtz coil for the MIST satellite*, 27/05/2019.
- M. Al-Janabi & L. Fischer, *A subsystem simulator for the MIST satellite*, 27/05/2019.

Bachelor student theses at the KTH Department of Physics

- F. Hülphers, *Identification of UHE cosmic rays using neural networks*, 31/05/2018.
- P. Bühlmann & J. Sigvant, *Simulation study of meteors for Mini-EUSO*, 31/05/2017.

## OUTREACH

- 20/08/2019 Press release on the KTH website (in Swedish) for the launch of the Mini-EUSO experiment on-board the Soyuz MS-14 rocket to the International Space Station.  
link: <https://www.kth.se/forskning/artiklar/svensk-mjukvara-skickas-till-rymden-1.919615>.
- 30/11/2018 *Gravitational waves*, popular science seminar for undergraduate students at KTH as part of the *Modern Physics* course.
- 12/09/2018 *Exploring the universe with ultra-high-energy cosmic rays*, KTH Library public seminar series, filmed and published online.  
link: <https://www.youtube.com/watch?v=HK0hus6qBXQ>, **675 views**.
- 02/02/2018 Interview with *Rymdstyreslen* (Swedish National Space Agency) space blog (in Swedish), filmed and published online.  
link: <https://www.youtube.com/watch?v=-vEmMWaM5cU>, **471 views**.
- 24/10/2017 *Gravitational waves*, invited popular science talk at the KTH PhD Conference, Helsinki.
- 05/10/2014 Volunteer at the European Space Agency's open day at ESTEC. Gave short talks and answered questions from the public.

## SKILLS

Programming (<https://github.com/cescalara>)

- Advanced: C/C++, python, Stan
- Competent: VHDL and high-level synthesis, ROOT, Geant4.
- Familiar: R, MATLAB, Fortran.

Software

- Engineering: Xilinx Vivado Design Suite, AutoCAD, Accuro TCAD.
- Tensorflow, LaTeX.

Languages

- Mother tongue: English.
- Fluent: Swedish, French.
- Basic knowledge: German, Dutch.