Michael Chadolias

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Physics graduate specialising in astroparticle physics with hands-on experience in neutrino physics, large-scale workflow pipelines, and machine learning for high-energy physics. Credited as co-author on nine peer-reviewed KM3NeT publications for contributions to the collaboration. Looking to pursue a PhD in particle physics.

Research Interests

Astroparticle physics, Neutrino physics, Dark matter, Data science & AI, Statistical & Computational methods

Education

Friedrich-Alexander-Universität Erlangen-Nürnberg   Erlangen, Germany
M.Sc. in Physics (Specialisation: Astrophysics and astroparticle physics)   *Apr 2022 – February 2025*
Grade: 1.6/1.0   Equivalent grade: 90/100

    Research: Active participation in the ANTARES/KM3NeT collaboration

Aristotle University of Thessaloniki (AUTh)   Thessaloniki, Greece
B.Sc. in Physics; **Grade: 7.84/10.00**   *Oct 2018 – Mar 2022*

    Teaching Assistant: HM 131: Systems Reliability under Prof. Alkiviadis Hatzopoulos

    Among the top 10% of students during my graduation period

Research Experience

Erlangen Centre for Astroparticle Physics (ECAP)   Erlangen, Germany
Master Thesis Student   *Aug 2023 – Oct 2024, Full-time*

- Conducted the first feasibility study on tau neutrino appearance using the full duration of ANTARES, evaluating the reconstruction quality of the events and providing the first estimate of the detector's capabilities.
- Developed a scalable pipeline to convert over 500k ANTARES Monte Carlo event files to TTree-based ROOT files, reducing pre-processing time by 20%, storage requirements by 35%, and enabling parallelised cluster execution (NHR@FAU & CC@Lyon).
- Analysed 200+ different oscillation scenarios with the SWIM software, accounting for the possible cut selection criteria, model parameters, and systematic uncertainties.
- Compared the tau appearance potential from ANTARES against KM3NeT/ORCA predicted sensitivities.

Erlangen Centre for Astroparticle Physics (ECAP)   Erlangen, Germany
Graduate Research Assistant   *Nov 2022 – Apr 2023, Part-time*

- Co-developed and tested modules within a Snakemake-based MC production pipeline for ORCA events.
- Performed testing and diagnostics of pipeline jobs on NHR@FAU cluster, reducing execution errors and improving workflow reproducibility.
- Achieved 25% CPU workload reduction by improving the SLURM profile, identifying inefficient parallelisation patterns, and optimising Snakemake rule resources.

National Centre of Scientific Research Democritus (NCSR)   Athens, Greece
Undergraduate Research Assistant   *Nov 2021 – Jan 2022, Internship*

- Studied the reconstruction quality of simulated events focusing on the limited 6 string KM3NeT/ORCA detector configuration (ORCA6).
- Analysed ν_μ interaction topologies across key metrics such as energy, zenith angle, inelasticity, and distance from the detector, among others.
- Assisted in the optical module integration and component testing.

SpaceDot Team - AcubeSAT Project   Thessaloniki, Greece
Undergraduate Researcher & Sub-team Coordinator   *Mar 2019 – Dec 2021, Part-time*

- Led the trajectory subsystem and co-authored a proposal for ESA's "Fly your satellite" programme
- Modelled the space environment for the mission with the OMERE, and estimated the radiation levels during the entire duration of the mission with the FASTRAD software, with this work being credited as my bachelor's thesis.

Relevant Coursework

Specialisation Lectures: Particle Physics, Astroparticle Physics, Neutrino Physics & Astronomy

Minor coursework: Computational Physics and Numerical Methods, Methods of Data Analysis

Skills

Languages: Python, C/C++, Bash, SQL

Frameworks & Tools: ROOT, SWIM, TensorFlow, PyTorch, GraphNet, JAX

Computing Methods: High-Performance Computing (Slurm, UNIX), Workflow Management (Snakemake), Version Control (Git), CI/CD (Github Actions), Containerization (Docker, Apptainer)

Foreign Languages: Greek (Mother), English(C2), German(B2), Italian(A1)

Soft Skills: Team player, analytical thinker, problem-solving, adaptability

Conferences & Workshops

Analysis Reproducibility   Mar 2025
Participant   *Online*

12th HEP C++ Course and Hands-on Training - The Essentials   Mar 2025
Participant   *Online*

KM3NeT Bootcamp   Dec 2024
Participant   *Erlangen, DE*

DPG Spring Meeting   Mar 2024
Speaker: Feasibility study of tau appearance measurement with the ANTARES neutrino telescope (T 29.2) *Karlruhe, DE*

KM3NeT Oscillation WG Meeting   Dec 2023
Speaker: Feasibility study of tau appearance measurement with the ANTARES neutrino telescope *Erlangen, DE*

KM3NeT Bootcamp   Oct 2023
Participant   *Online*

GraphNeT III - Workshop   May 2023
Participant   *Sandvig, DN*

Volunteering

Long Night of Sciences, FAU   Erlangen, Germany
Volunteer - Neutrino Group ECAP   *October 2023*

- Presented neutrino detection concepts to 1100+ visitors at ECAP through posters and demos, as well as showcasing the group's contributions to neutrino physics & astronomy.

AUTh - CERN Masterclass   Thessaloniki, Greece
Volunteer   *Mar 2021*

- Guided 10 high school students through ATLAS event identification exercises during the AUTh–CERN Masterclass.

Physicists of Aristotle university of Thessaloniki (PATH)   Thessaloniki, Greece
Group coordinator   *Nov 2017 − Jun 2019*

- Organized the speaker list and conference logistics to highlight undergraduate research in physics for the second iteration of the $\Sigma\Pi E\Phi$ conference.
- Facilitated student visits to research labs through the 'Labs & Paths' event, helping fellow students engage with the research conducted in the department.

Hobbies

Chess (Ex-professional player, national arbiter), Basketball, Hiking, D&D fan, Book-club member

References

PD. Dr. Thomas Eberl (ECAP)   Prof. Dr. Claudio Copper (ECAP)   Dr. Aikaterini Tzamarioudaki (NCSR)

PUBLICATIONS

1. Aiello, S. *et al.* gSeaGen code by KM3NeT: An efficient tool to propagate muons simulated with CORSIKA. *Comput. Phys. Commun.* **314,** 109660. arXiv: 2410.24115 [hep-ex] (2025).

2. Aiello, S. *et al.* Measurement of neutrino oscillation parameters with the first six detection units of KM3NeT/ORCA. *JHEP* **10,** 206. arXiv: 2408.07015 [hep-ex] (2024).

3. Aiello, S. *et al.* Search for neutrino emission from GRB 221009A using the KM3NeT ARCA and ORCA detectors. *JCAP* **08,** 006. arXiv: 2404.05354 [astro-ph.HE] (2024).

4. Aiello, S. *et al.* Atmospheric muons measured with the KM3NeT detectors in comparison with updated numeric predictions. *Eur. Phys. J. C* **84,** 696. arXiv: 2403.11946 [astro-ph.HE] (2024).

5. Aiello, S. *et al.* Differential Sensitivity of the KM3NeT/ARCA detector to a diffuse neutrino flux and to point-like source emission: Exploring the case of the Starburst Galaxies. *Astropart. Phys.* **162,** 102990. arXiv: 2402.09088 [astro-ph.HE] (2024).

6. Aiello, S. *et al.* Astronomy potential of KM3NeT/ARCA. *Eur. Phys. J. C* **84,** 885. arXiv: 2402.08363 [astro-ph.HE] (2024).

7. Aiello, S. *et al.* Searches for neutrino counterparts of gravitational waves from the LIGO/Virgo third observing run with KM3NeT. *JCAP* **04,** 026. arXiv: 2311.03804 [astro-ph.HE] (2024).

8. Unbehaun, T. *et al.* Prospects for combined analyses of hadronic emission from γ-ray sources in the Milky Way with CTA and KM3NeT. *Eur. Phys. J. C* **84,** 112. arXiv: 2309.03007 [astro-ph.HE] (2024).

9. Aiello, S. *et al.* Embedded software of the KM3NeT central logic board. *Comput. Phys. Commun.* **296,** 109036. arXiv: 2308.01032 [astro-ph.IM] (2024).