# Savvas Raptis

*Space & Plasma Physics | Data Science | Machine Learning*

## PERSONAL DETAILS


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## RESEARCH

Jun 2023 – Now
**Researcher**
*Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, USA*

Jan 2023 – Apr 2023
**Visiting Researcher**
*European Space Agency (ESA) - ESTEC, Leiden, Netherlands*

Nov 2022 – May 2023
**Postdoctoral Researcher**
*KTH Royal Institute of Technology, Stockholm, Sweden*

Oct 2018 – Nov 2022
**PhD. Researcher**
*KTH Royal Institute of Technology, Stockholm, Sweden*

## EDUCATION

2022
**PhD. Electrical Engineering (Focus: Space Plasma Physics)**
*KTH Royal Institute of Technology, Stockholm, Sweden*
Thesis: "High-speed jets and related phenomena at Earth's bow shock and magnetosheath"
Download (English):

2018
**MSc. Astronomy and Astrophysics**
*KU Leuven, Leuven, Belgium*
Thesis: "Processing Solar Images to Forecast Coronal Mass Ejections using Artificial Intelligence"
Download (English):

2016
**BSc. Physics**
*National and Kapodistrian University of Athens, Athens, Greece*
Thesis: "Solar Energetic Particles: A study of their properties through measurements from ESA's SREM instrument."
Download (Greek):

## TEACHING

**Full Description & Examples:**

2019 – 2023 **Teaching Assistant (TA) & Lecturer**

*KTH, Royal Institute of Technology*

2022: Guest Lecturer | Collisionless Shocks | PhD course
2022 – 2023: Guest Lecturer | Space Physics I | Master course (EF2240)
2021 - 2022: Guest Lecturer & TA | Space Physics I | Master course (EF2240)
2020 - 2022: TA | Electrical Circuit Analysis | Bachelor course (EI1110)
2020 - 2021: TA | Space Physics I | Master course (EF2240)
2019 - 2022: TA | LaTeXworkshop | Bachelor course
2019: TA | Electrodynamics | Bachelor course (EI2405)

Developed topical specialized lectures (workshops):

- Applied Machine Learning in Heliophysics | 2 hours of theory + 2 hours of hands-on applications, including a set of assignments
- Multi-Spacecraft Techniques and Collisionless Shocks | 2 hours of theory + 2 hours of hands-on applications, including a set of assignments

2013 – 2015 **Teacher - Mechanic & Waves (High School)**

*City of Athens, Social Tuition Center of City of Athens*

Assisting High school students with their studies in school and preparation for the Panhellenic National examinations to proceed to higher education.

## LEADERSHIP, SUPERVISION & MANAGEMENT

2025 – 2029 **GEM Focus Group Leader**

- Main organizer and leader of NSF Geospace Environment Modeling (GEM) focus group
- The topic is Multiscale Dayside Transients (MDT) and their Effect on Earth's Magnetosphere and our team is planning to organize for 4 years, a series of meetings, sessions, and activities to integrate dayside phenomena into our magnetospheric modelling efforts. More information can be found online on the Wiki page

2023 – Now **Paneling, SOC, LOC, Convening & Charing**

- Panelist on Topical Discussion Meeting (TDM) on "Scientific Outlooks for the Analysis of Space Weather Data in the Age of AI" at European Space Weather Week 25 on October 30 2025.
- Lead organizer of the "Workshop in Machine learning, Data Science, and Data Assimilation in Geospace *LMAG25*" in JHU/APL, US October 13-17, 2025
- Panelist and evaluator as a subject matter expert (SME) of the 2025 BLAST challenge at JHU/APL on the topic of *Space Weather Resilience* "
- Member of the Scientific Organizing Committee (SOC) for the "*10th MMS anniversary - 11th MMS community workshop*" in Paris, France May 12-14, 2025
- Primary convener, and chair of the session "*Collisionless Shocks in Heliospheric and Astrophysical Plasmas and their Effects on Planetary Magnetospheres*" at American Geophysical Union (AGU) general assembly 2024, and 2025
- Co-convener, of the session "*Collisionless shocks and associated transient phenomena at Earth and beyond*" at European Geophysical Union (EGU) general assembly 2024
- Co-convener, of the session "*Dayside mesoscale transients and their impact on the magnetosphere and ionosphere*" at American Geophysical Union (AGU) general assembly 2023
- Primary convener, and chair of the session "*Dayside transient phenomena and their effects on planetary magnetospheres*" at European Geophysical Union (EGU) general assembly 2023

2023 – Now **Mentoring & Supervision**

- Co-supervisor of Graduate student Anusree Padinjarethadathil Devanandan from University of New Hampshire
- Mentor for the First-time Presenters Feedback Program of American Geophysical Union (AGU) general assembly 2025
- Mentor for the GEM workshop meeting program for 2025
- Mentor of the summer internship program CIRCUIT of Johns Hopkins University
- Mentor for the European Geophysical Union (EGU) general assembly 2023

2022 – Now **Early Career Leadership Advisory Committee**
*American Geophysical Union (AGU)*

- 2024 - Now: Chair of the Early Career Leadership Advisory Committee (EC-LAC) of the Physics and Aeronomy (SPA) section
- 2022 - 2024: Member of the Early Career Leadership Advisory Committee (EC-LAC) of the Physics and Aeronomy (SPA) section

## SCIENTIFIC REVIEWING, EDITING & COMMUNITY SERVICE

2021 – Now **Mission, Instrumentation, Science, & Working Group Teams**

- IMAP Mission (NASA) - Member of the Science Team (2025 – Now)
- Center for Geospace Storms (CGS) - Working Group Lead of the Magnetosphere Data Analysis group (2025 – Now)
- Plasma Observatory (ESA) - Contributor of the Science Multi-point Working Group for the potential mission of PO (2025 – Now)
- SMILE Mission (ESA/CAS) - Member of Science Working Team & The Modeling Working Group (2023 – Now)
- MMS Mission (NASA) - Member of Science Working Team & the Energetic Particle Detector (EPD) instrument team (2023 – Now)
- MMS Mission (NASA) - Member of the Electric Double Probe (EDP) instrument team (2023)

2022 – Now **Grant Proposal Reviewer**

- NASA Heliophysics Heliophysics Supporting Research (HSR) program
- NASA Heliophysics Guest Investigator Open (HGIO) program
- NASA Heliophysics Living with a Star Science (LWS) program

2024 – Now **Journal Editorial Board**

- Discover Space - *Nature Springer*
- Frontiers in Astronomy and Space Sciences - *Frontiers*

2021 – Now **Journal Reviewer**

- Science Advances - *AAAS*
- Physical Review Letters (PRL)- *APS Journals*
- AGU Advances - *AGU/Willey*
- Geophysical Research Letters (GRL) - *AGU/Willey*
- Journal of Geophysical Research (JGR): Machine Learning and Computation - *AGU/Willey*
- Journal of Geophysical Research (JGR): Space Physics - *AGU/Willey*
- Earth and Space Science - *AGU/Willey*
- Radio Science - *AGU/Willey*
- Annales Geophysicae - *EGU/Copernicus Publications*
- The Astrophysical Journal (ApJ) - *Institute of Physics (IOP)*
- Astronomy and Astrophysics - *EDP Sciences*
- Frontiers in Astronomy and Space Sciences - *Frontiers*
- Journal of Plasma Physics - *Cambridge Press*
- Astrophysics and Space Science - *Springer*
- Advances in Space Research - *Elsevier*

- Remote Sensing - *MDPI*
- Universe - *MDPI*
- Journal of Experimental & Theoretical Artificial Intelligence - *Taylor & Francis*

More information: Web of Science Profile

2024 – Now **Conference Presentation Judge**

- Geospace Environment Modeling (GEM) workshop, held 22-27 June 2025 in Des Moines, Iowa, US - Student Poster Judge
- European Geophysical Union (EGU) meeting, held 27 April - 2 May 2025 in Vienna, Austria - Outstanding Student and PhD candidate Presentation (OSPP) Judge
- American Geophysical Union (AGU) meeting, held 9-13 December 2024 in Washington, DC, US - Outstanding Student Presentation Awards (OSPA) Judge
- The Triennial Earth-Sun Summit (TESS), held 7-12 April 2024 in Dallas, TX, US - Student Poster Judge
- Geospace Environment Modeling (GEM) workshop, held 23-28 July 2024 in Fort Collins, CO, US - Student Poster Judge
- 2025 GEM / CEDAR joint workshop, held 23-28 July 2025 in Des Moines, Iowa, US - Student Poster Judge

2021 – Now **MMS Scientist In The Loop (SITL)**

SITL service work for the NASA MMS team for orbits: 1181 - 1183, 1204 - 1206, 1248 - 1250, 1284 - 1285, 1314 - 1315, 1364 - 1365, 1404 - 1407, 1600 - 1601

## PUBLICATIONS

= Abstract | = PDF | = PowerPoint | = Video

2026 [47] **Raptis, S.**, Turner, L. D., Caprioli, D., Szalay, R. J., Clark, G., & Haggerty. C. C. (2025). Relativistic Electron Acceleration at Jupiter's Bow Shock and Beyond. *(Under Review).*

[46] Devanandan, A. P., Keesee, A., **Raptis, S.**, Ohtani, S., Merkin, V., & Gkioulidou, M. (2026). Statistical characteristics of stormtime bursty bulk flows. Geophysical Research Letters, 53, e2025GL119632. https://doi.org/10.1029/2025GL119632 |

[45] Zhou, Y., Wang, B., **Raptis, S**., Wang, S., Guo, J., Shue, J.-H., et al. (2026). Reconstructing the geometry of a hot flow anomaly with bounding jets in magnetosheath. Geophysical Research Letters, 53, e2025GL119404. https://doi.org/10.1029/2025GL119404. |

2025 [44] Angeles, A. J. G., Spence, H. E., Smith, C. W., Vasquez, B. J., Cohen, I. J., Genestreti, K. J., Skoug, R., **Raptis, S.,** et al. (2025). The correlation function for magnetic field fluctuations at ion dissipation scales in the solar wind. Journal of Geophysical Research: Space Physics, 130, e2025JA034569 |

[43] Ohtani, S., **Raptis, S.**, Devanandan, P. A., Motoba, T., Zou, Y., Gjerloev, W. J., & Merkin, G. V. (2025). Stormtime Magnetospheric Processes Associated with the Dawnside Current Wedge. Journal of Geophysical Research: Space Physics, 130, e2025JA034418. https://doi.org/10.1029/2025JA034418 |

[42] Roberts, O. W., Vörös, Z., Settino, A., Koller, F., **Raptis, S.**, Temmer, M., et al. (2025). Energy conversion and exchange in a magnetosheath jet. Journal of Geophysical Research: Space Physics, 130, e2025JA034414. https://doi.org/10.1029/2025JA034414 |

[41] Mo, W., **Raptis, S.**, Toy-Edens, V., Yeakel, K., & Turner, D. L. (2025). A comparison of

modeled and observed dayside bow shock locations in 8 Years of MMS data. Journal of Geophysical Research: Space Physics, 130, e2025JA033966. https://doi.org/10.1029/2025JA033966. |

[40] Toy-Edens, V., **Raptis, S.**, Turner, D. L., Mo, W., & Young, S. A. Q. (2025). Automated bow shock identification and multi-spacecraft timing using magnetospheric multiscale (MMS) observations. Journal of Geophysical Research: Space Physics, 130, e2025JA034252. https://doi.org/10.1029/2025JA034252 |

[39] Shumko, M., Artemyev, A., **Raptis, S.**, Zou, Y., Turner, D. L., Ukhorskiy, A. Y., et al. (2025). On the spatial relationship between the aurora and relativistic electron precipitation during a storm-time substorm. Geophysical Research Letters, 52, e2025GL116477. https://doi.org/10.1029/2025GL116477 |

[38] Liu, T. Z., Angelopoulos, V., Dorfman, S., Hartinger, M. D., Zhang, K., **Raptis, S.**, & Ma, D. (2025). Statistical relationship between foreshock ULF wave power and ground-based Pc3-4 wave power. Journal of Geophysical Research: Space Physics, 130, e2025JA033760. https://doi.org/10.1029/2025JA033760 |

[37] Lindberg, M., Shi, X., Hietala, H., Vuorinen, L., **Raptis, S.**, Koller, F., & Lalti, A. (2025). Fermi acceleration of electrons at Earth's bow shock due to current sheet interaction. Journal of Geophysical Research: Space Physics, 130, e2025JA034314. https://doi.org/10.1029/2025JA034314 |

[36] Zhang, C., Dong, C., Liu, T. Z., Mazelle, C., **Raptis, S.,** Zhou, H., et al. (2025). Role of ULF waves in reforming the Martian bow shock. AGU Advances, 6, e2025AV001654. https://doi.org/10.1029/2025AV001654 |

[35] Toy-Edens, V., Mo, W., Allen, R.C., Vines, S.K., & **Raptis, S.** (2025) Automated classification of MESSENGER plasma observations via unsupervised transfer learning. Front. Astron. Space Sci. 12:1608091. doi: 10.3389/fspas.2025.1608091 |

[34] Ekelund, J., **Raptis, S.**, Toy-Edens, V., Mo, W., Turner, D. L., Cohen, I. J., & Markidis, S. (2025). Adaptive PCA-Based Outlier Detection for Multi-feature Time Series in Space Missions. In: Lees, M.H., et al. Computational Science – ICCS 2025. ICCS 2025. Lecture Notes in Computer Science, vol 15903. Springer, Cham. https://doi.org/10.1007/978-3-031-97626-1_18 |

[33] Zou, Y., Walsh, B. M., Chen, Y., Zhou, H., & **Raptis, S.** (2025). Control of solar wind on magnetic field fluctuations in the subsolar magnetosheath. Journal of Geophysical Research: Space Physics, 130, e2025JA033856. https://doi.org/10. 1029/2025JA033856 |

[32] Turc, L., Archer, M. O., Zhou, H., Pfau-Kempf, Y., Suni, J., Kajdič, P., Blanco-Cano, X., Dahani, S., Battarbee, M., **Raptis, S.**, Liu, T. Z., Zhang, H., Escoubet, P. C., LaMoury, A. T., Tao, S., Lipsanen, V., Hao, Yufei., & Palmroth, M. (2025). Interplay between a foreshock bubble and a hot flow anomaly forming along the same rotational discontinuity. Geophysical Research Letters, 52, e2025GL116473. https://doi.org/10.1029/2025GL116473 |

[31] Ohtani, S., Zou, Y., Merkin, V. G., Wiltberger, M., Pham, K. H., **Raptis, S.**, Friel,

M., & Gjerloev, J. W., (2025). Ground magnetic response to an extraordinary IMF By flip during the May 2024 storm: Travel time from the magnetosheath to dayside high latitudes. Journal of Geophysical Research: Space Physics, 130, e2024JA033691. https://doi.org/10.1029/2024JA033691 |

[30] Madanian, H., Pfau-Kemp, Y., Rachel, R., Liu, T. Z., Karlsson, T., **Raptis, S.**, Turner, D. L. & Beedle, J. (2025). Sunward Flows in the Magnetosheath Associated with Magnetic Pressure Gradient and Magnetosheath. Front. Astron. Space Sci. - Space Physics, doi: 10.3389/fspas.2025.1574577 |

[29] Krämer, E., Hamrin, M., Gunell, H., Baddeley, L., Partamies, N., **Raptis, S.**, Herlingshaw, K., & Schillings, A. (2025). Magnetosheath Jet-Triggered ULF Waves: Energy Deposition in the Ionosphere. Journal of Geophysical Research: Space Physics 130, e2025JA033792. https://doi.org/10.1029/ 2025JA033792 |

[28] **Raptis, S**., Lindberg, M., Liu, T.Z., Turner, D.L., Lalti, A., Zhou, Y., Kajdič, P., Kouloumvakos, A., Sibeck, D.G., Vuorinen, L., Michael, A., Shumko, M., Osmane, A., Krämer, E., Turc, L., Karlsson, T., Katsavrias, C., Wilson III, L.B., Madanian, H., Blanco-Cano, X., Cohen, I.J., & Escoubet C.P. (2025). Multimission Observations of Relativistic Electrons and High-speed Jets Linked to Shock-generated Transients. The Astrophysical Journal Letters 981(1) L10, https://dx.doi.org/10.3847/2041-8213/adb154 |

**- NASA MMS highlight 1-page summary**:

[27] **Raptis, S.**, Ahmad, L., Lindberg, M., Turner, D. L., Caprioli, D., & Burch, L. J. (2025). Revealing an unexpectedly low electron injection threshold via reinforced shock acceleration. Nature Communications 16(1), 488 https://doi.org/10.1038/s41467-024-55641-9 |

**- NASA MMS highlight 1-page summary**:
**- ARTEMIS Science Nugget Highlight**:
**- Press Coverage**: Northumbria University , phys.org , sciencedaily.com
**- Behind The Paper**: Nature Portfolio

2024 [26] Krämer, E., Koller, F., Suni, J., LaMoury T. A., Pöppelwerth, A., Glebe, G., Mohammed-Amin, T., **Raptis, S.**, Vuorinen, L., Weiss, S., Xirogiannopoulou, N., Archer, M., Bianco-Cano, X., Gunell. H., Hietala, H., Karlsson, T., Plaschke, F., Preisser, L., Roberts, O., Wedlund, S. C., Temmer, M., & Vörös , Z. (2025). Jets Downstream of Collisionless Shocks: Recent Discoveries and Challenges. Space Science Reviews, 221(1), 1-59 |

[25] Osmane, A. & **Raptis, S.** (2024). On the Formation of Super-Alfvénic Flows Downstream of Collisionless Shocks. The Astrophysical Journal, 976(1), 104. |

[24] **Raptis, S.**, Merkin, V., Ohtani, S., Gkioulidou, M., & Regoli, L. H. (2024). Plasma sheet magnetic flux transport during geomagnetic storms. Geophysical Research Letters, 51, e2024GL110839. https://doi.org/10.1029/2024GL110839 |

**- NASA MMS highlight 1-page summary**:

[23] Kajdic P., Blanco-Cano X., Turc L., Archer M., **Raptis S.**, Liu T. Z., Pfau-Kempf

Y., LaMoury A., Hao Yufei., Escoubet C-P., Omidi N., Sibeck D. G., Wang B., Zhang H., & Lin Y. (2024). Transient Upstream Mesoscale Structures: Drivers of Solar-Quiet Space Weather. Front. Astron. Space Sci. - Space Physics, 10.3389/fspas.2024.1436916 |

[22] Toy-Edens, V., Mo, W., **Raptis, S.**, & Turner, D. L. (2024). Classifying 8 years of MMS dayside plasma regions via unsupervised machine learning. Journal of Geophysical Research: Space Physics, 129, e2024JA032431. https://doi.org/10.1029/2024JA032431 |

[21] Regoli, L. H., Gkioulidou, M., Ohtani, S., **Raptis, S.**, Mouikis, C. G., Kistler, L. M., et al. (2024). Temporal evolution of O+ population in the near-Earth plasma sheet during geomagnetic storms as observed by the magnetospheric multiscale mission. Journal of Geophysical Research: Space Physics, 129, e2023JA032203. https://doi.org/10.1029/2023JA032203 |

[20] Koller, F., **Raptis, S.**, Temmer, M., & Karlsson, T. (2024). The Effect of Fast Solar Wind on Ion Distribution Downstream of Earth's Bow Shock. The Astrophysical Journal Letters, 964(1), L5. https://doi.org/10.3847/2041-8213/ad2ddf |

[19] Lindberg, M., Vaivads, A., Amano, T., **Raptis, S.**, & Joshi, S. (2024). Electron Acceleration at Earth's Bow Shock Due to Stochastic Shock Drift Acceleration. Geophysical Research Letters, 51, e2023GL106612. https://doi.org/10.1029/2023GL106612 |

[18] Zhou, Y., **Raptis, S.**, Wang, S., Shen, C., Ren, N., & Ma, L. (2024). Magnetosheath jets at Jupiter and across the solar system. Nature Communications, 15, 4, https://doi.org/10.1038/s41467-023-43942-4 |

**- Press Coverage**: phys.org, Astronomy Magazine

2023 [17] Collinson, G., Hietala, H., Plaschke, F., Karlsson, T., Wilson, B. L., Archer, M., Battarbee, M., Bianco-Cano, X., Bertucci, C., Long, D., Opher, M., Sergis, N., Gasque, C., Liu, T., **Raptis, S.**, Burne, S., Frahm, R., Zhang, T., & Futaana, Y. (2023). Shocklets and Short Large Amplitude Magnetic Structures (SLAMS) in the high Mach foreshock of Venus. Geophysical Research Letters, 50, e2023GL104610, https://doi.org/10.1029/2023GL104610 |

[16] Trollvik, H., Karlsson, T., & **Raptis, S.** (2023). Velocity of magnetic holes in the solar wind from Cluster multipoint measurements. Ann. Geophys., 41, 327–337, https://doi.org/10.5194/angeo-41-327-2023 |

[15] Lindberg, M., Vaivads, A., **Raptis, S.**, & Karlsson, T. (2023). MMS observation of two-step electron acceleration at Earth's bow shock.Geophysical Research Letters, 50, e2023GL104714. https://doi.org/10.1029/2023GL104714 |

2022 [14] Karlsson, T., Trollvik, H., **Raptis, S.**, Nilsson, H., & Madanian, H. (2022). Solar wind magnetic holes can cross the bow shock and enter the magnetosheath. Ann. Geophys., 40, 687–699, doi:10.5194/angeo-40-687-2022 |

[13] Pollock, C., Chen, L-J., Schwartz, S., Wang, S., Avanov, L. A., Burch, J. L., Gershman, D. J., Giles, B. L., **Raptis, S.**, & Russell, C. T. (2022). Dynamics of Earth's bow shock under near-radial interplanetary magnetic field conditions. Physics of Plasmas

29, 112902 (2022) https://doi.org/10.1063/5.0089937 |

[12] **Raptis, S.**, Karlsson, T., Vaivads, A., Lindberg, M., Johlander, A., & Trollvik, H. (2022). On magnetosheath jet kinetic structure and plasma properties. Geophysical Research Letters, 49, e2022GL100678. https://doi.org/10.1029/2022GL100678 |

**- NASA MMS highlight 1-page summary**:

[11] Lindberg, M., Vaivads, A., **Raptis, S.**, Lindqvist, P.-A., Giles, B. L., & Gershman, D. J. (2022). Electron kinetic entropy across quasi-perpendicular shocks. Entropy 24, 745. https://doi.org/10.3390/e24060745 |

[10] **Raptis, S.**, Karlsson, T., Vaivads, A., Pollock, C., Plaschke, F., Johlander, A., Trollvik, H., & Lindqvist, P.-A. (2022). Downstream high-speed plasma jet generation as a direct consequence of shock reformation. Nature Communications. 13, 598 https://doi.org/10.1038/s41467-022-28110-4 |

**- Springer 2022 Highlight:** Breakthrough Research Highlights: Astronomy:
**- Editor Highlighted:** Focus - Astronomy and planetary science:
**- Press Coverage**: KTH, phys.org, spacedaily.com
**- Behind The Paper**: Nature Portfolio

2021 [9] Aminalragia-Giamini, S., **Raptis, S.**, Anastasiadis, A. A., Tsigkanos, A., Sandberg, I., Papaioannou, A., Papadimitrioy, C., Jiggens, P., Aran, A., & Daglis, I.A. (2021). Solar Energetic Particle Event occurrence prediction using Solar Flare Soft X-ray measurements with Machine Learning. Journal of Space Weather and Space Climate (JSWSC), 11, 59 https://doi.org/10.1051/swsc/2021043 |

[8] Karlsson, T., **Raptis, S.**, Trollvik, H., & Nilsson, H. (2021). Classifying the magnetosheath behind the quasi-parallel and quasi-perpendicular bow shock by local measurements. Journal of Geophysical Research: Space Physics, 126, e2021JA029269. doi: 10.1029/2021JA029269 |

[7] Katsavrias, C., **Raptis, S**., Daglis, I. A., Karlsson, T., Georgiou, M., & Balasis, G. (2021). On the generation of Pi2 pulsations due to plasma flow patterns around magnetosheath jets. Geophysical Research Letters, 48, e2021GL093611. doi:10.1029/2021GL093611 |

[6] Kajdič, P., **Raptis, S.**, Blanco-Cano, X., & Karlsson, T. (2021). Causes of jets in the quasi-perpendicular magnetosheath. Geophysical Research Letters, 48, e2021GL093173. doi:10.1029/2021GL093173 |

[5] Palmroth, M., **Raptis, S.**, Suni, J., Karlsson, T., Turc, L., et al., (2020). Magnetosheath jet evolution as a function of lifetime: global hybrid-Vlasov simulations compared to MMS observations. Ann. Geophys , doi: 10.5194/angeo-2020-49 |

2020 [4] Battarbee, M., Blanco-Cano, X., Turc, L., Kajdič, P., Johlander, A., Tarvus, V., Fuselier, S., Trattner, K., Alho, M., Brito, T., Ganse, U., Pfau-Kempf, Y., Akhavan-Tafti, M., Karlsson, T., **Raptis, S.**, Dubart, M., Grandin, M., Suni, J., and Palmroth, M. (2020), Helium in the Earth's foreshock: a global Vlasiator survey. Ann. Geophys., 38, 1081–1099, doi: 10.5194/angeo-38-1081-2020 |

[3] **Raptis, S.**, Karlsson, T., Plaschke, F., Kullen, A., & Lindqvist, P.-A. (2020). Classifying magnetosheath jets using MMS: Statistical properties. Journal of Geophysical Research: Space Physics, 125, e2019JA027754. doi:10.1029/2019JA027754 |

[2] **Raptis, S.**, Aminalragia-Giamini, S., Karlsson, T., & Lindberg, M. (2020). Classification of Magnetosheath Jets using Neural Networks and High Resolution OMNI (HRO) data. *Machine Learning in Heliophysics* Front. Astron. Space Sci. - Space Physics, doi: 10.3389/fspas.2020.00024 |

[1] Yordanova, E., Vörös, Z., **Raptis, S.**, & Karlsson T. (2020). Current Sheet Statistics in the Magnetosheath. Front. Astron. Space Sci. - Space Physics, doi: 10.3389/fspas.2020.00002 |

## SEMINARS

GEM Focus Group: Multiscale Dayside Transients (MDT) and their Effect on Earth's Magnetosphere GEM25, Des-Moines, Iowa, US, Jun 26, 2025

Magnetotail convection during storms: Global Statistical Patterns and Mesoscale Bursty Flows. IWF seminar series, Graz, Austria, May 6, 2025

Transient Phenomena at Collisionless Shocks and Their Effect on Particle Acceleration, ESA Heliophysics Seminar, ESAC, Madrid, Apr 07, 2025

Collisionless Shocks and Shock Generated Transients: Recent Advancements and Implications, LASP Magnetosphere Seminars - The Friends of the Magnetosphere (FOM), 10 Sep 2024.

Reinforced Shock Acceleration of Relativistic Electrons, SolO WG IR/RS meeting, Online, 20 June 2024.

High-speed jets and related phenomena at Earth's bow shock, 40th SMILE MWG meeting, Online, 12 September 2023.

High-speed jets and related phenomena in Earth's bow shock and magnetosheath, Johns Hopkins University Applied Physics Laboratory (JHU/APL), Online, 19 August 2022.

Downstream high-speed plasma jet generation as a direct consequence of shock reformation, *IRF Uppsala Seminars* Uppsala University, Uppsala, Sweden, 16 March 2022.

Magnetosheath Jets: Simulations, Data Analysis & Machine Learning, *SpaceCoffee Meetings* National and Kapodistrian University of Athens, Athens, Greece, 29 January 2020.

Classifying Magnetosheath Jets Using MMS: Quasi parallel & Quasi perpendicular Jets, *Third International Vlasiator Science Hackathon* University of Helsinki, Helsinki, Finland, 21 August 2019.

Forecasting CMEs using Image Processing & Neural Networks, *SpaceCoffee Meetings*

National and Kapodistrian University of Athens, Athens, Greece, 19 December 2018.

## SCIENTIFIC PRESENTATIONS

2025

"Magnetosheath Jets and Foreshock Transients Contribution to Particle Energization at Collisionless Shocks" *Cluster-Plasma Observatory Workshop* Paris, France, Oct 20, 2025. (**Invited** *talk*) |

"Particle Acceleration and Transient Processes Upstream of Planetary Bow Shocks" *IAGA 2025* Lisbon, Portugal, Sep 01, 2025. (**Invited** *talk*) |

"Shock Generated Transients and their Effects on Earth's Magnetospheric Environment" *LWS Meeting* NASA Goddard, US, Sep 12, 2025. (**Invited** *talk*) |

"Understanding stormtime geospace as a complex, coupled system: Recent progress from the Center for Geospace Storms" *EGU 2025* Vienna, Austria, May 01, 2025. (**Invited** *talk*) |

"Advancements on AI for Heliophysics and Space Weather" *AI for Space Applications, ASAP project meeting* Stockholm, Sweden, January 28, 2025. (**Invited** *talk*) |

2024

"Advances in Understanding Stormtime Magnetotail Dynamics " *AGU 2024 Fall meeting* Washington DC. US December 8 - 13 2024 (**Invited** *talk*) |

"Shock Kinetic Processes and Particle Energization" *First Plasma Observatory Community Workshop* Agenzia Spaziale Italiana (ASI), Rome, Italy, November 12 - 14, 2024. (*talk*) |

"Stormtime Observations of Plasma Sheet Convection" *COSPAR 24* Busan, South Korea, July 14 - 19, 2024. (*talk*) |

"Relativistic Electrons Energized by Reinforced Shock Acceleration" *COSPAR 24* Busan, South Korea, July 14 - 19, 2024. (*talk*) |

"Plasma Sheet Magnetic Flux Transport During Geomagnetic Storms" *GEM 24* Fort Collins, CO, US, June 23 - 28, 2024. (*talk*) |

"Modeling Earth's Plasma Sheet Using Machine Learning" *GEM 24* Fort Collins, CO, US, June 23 - 28, 2024. (*talk*) |

"Reinforced Shock Acceleration of Relativistic Electrons" *GEM 24* Fort Collins, CO, US, June 23 - 28, 2024. (*talk*) |

"Evaluating the magnetic flux transport in the plasma sheet during geomagnetic storms using MMS and Geotail" *EGU2024* Vienna, Austria, April 14 - 19, 2024. (*talk*) |

"Heliophysics Education and Research using Cloud Computing" *EGU2024* Vienna, Austria, April 14 - 19, 2024. (*talk*) |

"Magnetic flux transport in the plasma sheet during geomagnetic storms using MMS" *TESS2024* Dallas, TX, US, April 07 - 12, 2024. (*talk*) |

2023

"Transient phenomena in foreshock, shock, and magnetosheath – Expectations from large separation campaign" *MMS SWT 23* Washington DC, US October 22 - 26, 2023. (*talk*) |

"Discovering patterns, imbalanced classification & boundary surfaces in Heliophysics with artificial neural networks" *DASH23* Johns Hopkins University Applied Physics Laboratory (JHU/APL), MD, US October 9 - 11, 2023. (*talk*) |

"Characterizing Earth's Magnetosheath and High-Speed Downstream Jets using Machine Learning" *LMAG23* Johns Hopkins University Applied Physics Laboratory (JHU/APL), MD, US August 21 - 24, 2023. (*talk*) |

"High-speed downstream jets: relevance to bow shock dynamics & evolution" *IAGA23* Messe Berlin – City Cube, Berlin, Germany, July 11 - 20, 2023. (**invited** *talk*) |

"Multi-mission observations of a high speed jet associated to a solar wind discontinuity" *EGU2023* Vienna, Austria, April 23 - 28, 2023. (*poster*) |

"High-speed jets at Earth's magnetosheath & more" *CGS weekly meetings* Laurel, US, January 18, 2023. (*talk*) |

2022

"Investigation of magnetosheath jet kinetic structure and plasma moment derivation" *AGU 2022 Fall meeting (AGU2022)* Chicago, US, December 11 - 15, 2022. (*poster*) |

"On the discrepancies of magnetosheath jet identification and statistical properties due to different temporal resolution and plasma moment derivation" *44th COSPAR Scientific Assembly (COSPAR2022)* Athens, Greece, July 16 - 24, 2022. (*talk*) |

"Magnetosheath Jets using MMS" *Swedish Space Plasma Meeting 2019* Umeå, Sweden, June 8 - 9, 2022. (*talk*) |

"High-speed plasma jets generated by the cyclic behavior of the Earth's bow shock" *Solar Orbiter School 2022* Sete, France, May 30 - June 3, 2022. (*poster*) |

"Shock Reformation Generating High-speed Magnetosheath Jets" *EGU2022* Vienna, Austria, May 23 - 27, 2022. (*talk*) |

"High-speed Downstream Plasma Jet Generated due to Shock Reformation" *8th MMS Community Workshop* Daytona Beach, FL, US, May 9-13, 2022. (*talk*) |

2021

"Super-magnetosonic Downstream Jet Formation as a Direct Consequence of Shock Reformation" *AGU 2020 Fall meeting (AGU2020)* New Orleans, US, December 13 - 17, 2021. (*poster*) |

"Characterization of the Earth's Magnetosheath and its Fast Plasma Flows Using Up-

stream Measurements and Machine Learning" *Asia Oceania Geosciences Society (AOGS) 18th Anual Meeting* Online, August 1-8, 2021. (*virtual talk*) |

"Magnetosheath Jets Close to the Bow Shock: Generation Mechanisms Using MMS" *The 15th Hellenic Astronomical Conference* Patras, Greece, July 5 - 8 , 2021. (talk) |

"Fast Plasma Flows Downstream of the Bow Shock Using MMS: Correlations and Generation Mechanisms" *EGU2021* Vienna, Austria, April 19 - 30, 2021. (*Virtual* PICO) |

"Differentiating Between Convective and Nested Structures With a Single Spacecraft" *Swedish Space Plasma Meeting 2021* Kiruna, Sweden, February 1 - 2, 2021. (talk) |

"Magnetosheath jets using MMS: classification and generation mechanisms" *43rd COSPAR Scientific Assembly (COSPAR2021)* Sydney, Australia, January 28 - February 04, 2021. (talk) |

"Magnetosheath Jets Close to the Bow Shock | Generation Scenarios using MMS" *mini-GEM - Collisionless Shock Group* Online January 19, 2021. (**invited***virtual* talk) |

2020

"Investigation of Different Types of Magnetosheath Jets and their Origin using MMS" *AGU 2020 Fall meeting (AGU2020)* San Francisco, US, December 01-12, 2020. (*Virtual* talk) |

"Jets Downstream of Quasi-parallel and Quasi-perpendicular Bow Shock" *MMS FALL SWT 2020* Online October 08, 2020. (*Virtual* talk) |

2019

"Classification of Magnetosheath Jets using Neural Networks, Solar Wind Observations and High-resolution IMF Measurements" *Sixteenth European Space Weather Week (ESWW16)* Liege, Belgium, November 18-22, 2019. (poster) |

"Creation & Classification of Magnetosheath Jet Database using Magnetospheric Multiscale (MMS) mission" *Sixteenth European Space Weather Week (ESWW16)* Liege, Belgium, November 18-22, 2019. (poster) |

"Classification of Magnetosheath Jets using Neural Networks and High Resolution OMNI (HRO) data" *Machine Learning in Heliophysics* Amsterdam, Netherlands, September 16-20, 2019. (talk) |

"Deep Learning Applications in Space & Solar Physics" *Solar Physics Summer School at Raman Science Center* Leh, India, June 10-16, 2019. (poster) |

"Investigation of Quasi-parallel & Quasi-perpendicular Magnetosheath Jets Using Magnetospheric Multiscale (MMS)" *EGU General Assembly 2019* Vienna, Austria, April 7-12, 2019. (talk) |

"Difference between Quasi-parallel & Quasi-perpendicular Magnetosheath Jets Using MMS" *SRS (Svenska Rymdforskares Samarbetsgrupp) 2019* Gothenburg, Sweden, March 14-15, 2019. (poster) |

"Quasi-parallel & Quasi-perpendicular Magnetosheath Jets Using MMS" *Swedish Space Plasma Meeting 2019* Uppsala, Sweden, February 7-8, 2019. (talk) |

2018

"Processing Solar Images to forecast Coronal Mass Ejections using Artificial Intelligence" *Fifteenth European Space Weather Week (ESWW15)* Leuven, Belgium, November 5-9, 2018. (poster) |

## DISTINCTIONS, AWARDS & MERITS

2023 **Springer Nature 2022 Astronomy Highlight**
*Springer Nature, Berlin, Germany*
Our work "Downstream high-speed plasma jet generation as a direct consequence of shock reformation" has been featured as one of the nine articles of 2022's highlighted research in Astronomy.

2022 – 2024 **ISSI International Team 555**
*International Space Science Institute, Bern, Switzerland*
Early-career researcher of ISSI team "Impact of Upstream Mesoscale Transients on the Near-Earth Environment".

2023 **Outstanding contribution - ESA Cluster mission**
*European Space Agency (ESA) - ESTEC, Leiden, Netherlands*
Recognition of outstanding contribution to the Cluster mission

2019 – 2022 **ISSI International Team 465**
*International Space Science Institute, Bern, Switzerland*
Early-career researcher of ISSI team "Foreshocks Across the Heliosphere: System Specific or Universal Physical Processes?".

2016 – 2018 **Student Representative – Committee of Msc. Astronomy and Astrophysics**
*KU Leuven, Leuven, Belgium*
Student representative in the facility committee of the Master of Astronomy and Astrophysics - Permanente Onderwijscommissie (POC).

## SKILLS

| | |
|---|---|
| *Languages* | Greek (Native), English (Excellent), French (Good) |
| *Programming* | Python, MATLAB, R, C++, IDL, SQL |
| *Software* | LaTeX, git, Inkcape, ParaView, VisIt |
| *ML tools* | Tensorflow, Keras, Scikit-learn, Pytorch, SciANN |
| *Hobbies* | Classical guitar, fitness, video games |

## GRANTS, FUNDINGS & SCHOLARSHIPS

- NASA - ROSES2024: DEMO-ML: DisEntangling Magnetosheath Observations for a ML-ready dataset (**Co-I**). Funding Acquisition: $90,000
- MMS Early CAREER grant 2025: Kinetic Processes and Particle Energization of Downstream High speed Jets using Magnetospheric Multiscale mission (**PI**). Funding Acquisition: $125,000
- GEM - NSF 2022: Explorative Global-To Kinetic-Scale Modeling of Collisionless Shocks Using Physics-Informed Data Mining and Machine Learning (**Contributor/Collaborator**)

- Miscellaneous grants from various institutions and organizations (**PI**). Approximate Funding Acquisition: $15,000

## SUMMER SCHOOLS & WORKSHOPS

2022 **Solar Orbiter School**
*CCSD, Sète, France*
Course - Summer School | 30 May – 03 June 2022.
Presentation topic: *High-speed plasma jets generated by the cyclic behavior of the Earth's bow shock*

2021 **Polar Magnetospheric Substorms**
*UNIS, Svalbarad, Norway*
Course - Winter School | 26 November – 07 December 2021.
Presentation topic: *Magnetosheath Jets Formation & Basic Properties using MMS*

**14s Iberian Space Science Summer School**
*University of Coimbra, Coimbra, Portugal*
Summer school | 26 – 30 July 2021.

2020 **Solar-Stellar Connection STFC Summer School**
*University of Warwick, Warwick, UK*
Summer school | 14 – 18 September 2020.
Presentation topic: *Magnetosheath Jets*

**STFC Introductory Solar System Plasmas Summer School**
*University of Birmingham, Birmingham, UK*
Summer school | 24 – 27 August 2020.

**NASA Heliophysics Summer School**
*UCAR, Boulder, CO, USA*
Summer school | 6 - 17 July 2020.
Presentation topic: *Magnetosheath Jets using Magnetospheric Multiscale (MMS) Mission*

2019 **Solar Physics Summer School**
*Raman Science Center, Indian Institute of Astrophysics, Leh, India*
Summer school | 10 - 16 June 2019.
Presentation topic: *Deep Learning Applications in Space & Solar Physics*

2018 **CESRA Summer School**
*Royal Observatory of Belgium, Brussels, Belgium*
Summer school | 10 - 14 September 2018.
Presentation topic: *Forecasting Coronal Mass Ejections using Artificial Intelligence*

2017 **Intensive Week on Numerical Modeling in Astrophysics**
*University of Cologne, Cologne, Germany*
Summer school | 11 - 16 September 2017.

2016 **BCGS Summer School in Physics and Astronomy**
*BCGS, Bad Honnef, Germany*
Summer school | 22 - 26 August 2016.
Presentation topic: *Is there a quantum computer? The D-Wave controversy*

2015 **Petnica Summer Institute: Astrophysics and Astroparticles**
*Petnica Science Center, Valjevo, Serbia*

Summer school | 24 July - 2 August 2015.
Presentation topic: *Limb Darkening*

## REFERENCES

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