

Curriculum Vitae

Vladimir S. Airapetian, PhD in Astrophysics

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Scientific interests: astrobiology, exoplanetary atmospheres and space weather, physics of eruptive processes from the young solar-like and other active stars, superflares and super CMEs, escape processes from exoplanetary atmospheres, prebiotic chemistry, mid-IR space interferometers.

Science management of large interdisciplinary observing campaigns including HST, TESS, NICER, Nu-STAR, ground-based facilities (SEIMEI, AAT)

Science management of large interdisciplinary international astrobiology NExSS team

170+ professional papers on astrophysics, heliophysics, astrobiology, exoplanetary science, , (co)author of the 3 books, over 50 presentations at international meetings, 3 papers in Nature journals, 1 paper in PNAS, astronomy college education, one popular article.

EDUCATION

- 1990 **Ph.D.** in Astronomy, Atomic Energy Center, Moscow & Byurakan Astrophysical Observatory, Armenia (*Summa Cum Laude*)
- 1983 **MSci in Physics**, Summa Cum Laude, Yerevan State University, Armenia (*Summa Cum Laude*)

RESEARCH SKILLS

- Research experience in data driven MHD modeling of stellar coronae and winds and CMEs
- Research experience in atmospheric dynamics and chemistry of exoplanets
- Research experience in HD & kinetic models of atmospheric escape

SCIENCE MANAGEMENT SKILLS

- **PI**, Multi-observatory, multi-wavelength campaign to observe DS TucA (TESS, HST, NICER, Nu-STAR, ground-based: MWA, ATCA, AAT and Kent 0,7m)
- **PI**, Multi-observatory campaign, TESS, NICER, SEIMEI to observe EK Dra
- **PI**, NASA NExSS team “Mission to Young Earth 2.0”
- **Member** of NExSS Steering Committee
- **Member** of Prebiotic Chemistry and Early Earth Environment (PCE3) Steering Committee
- **PI**, multi-observatory campaign on the proxy of an infant Sun, DS TucA (radio-optical spectroscopy/Australia, X-ray/NICER, TESS)
- **Co-I**, XRP project “*Observationally Constrained Modeling of the Origin and Impacts of Exoplanetary Space Weather*” (2022-2024)
- **Co-PI**, HST-XMM Newton Cycle 23, “*Evolving Magnetic Lives of Young Suns*” (2020-2023)
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- **PI**, Heliophysics Innovation Fund, Global Impact of the 774/5 Solar Event on Earth's Atmosphere, Climate and Infrastructure (2023-2024).
- **PI**, The observing campaign of a young Sun's analog: space telescopes - TESS, NICER, HST; ground-based facilities - radio MWA, ATCA, optical Anglo-Australian 3.9m telescope
- **PI**, Exobiology US-Japan team on prebiotic chemistry of early Earth (NASA HQ funded)
- **PI**, NICER Cycle 2 Guest Investigator Program, “*Evolving Magnetic Lives of Young Suns*”
- **PI**, TESS Cycle 1 Guest Investigator Program, “*Evolving Magnetic Lives of Young Suns*”
- **Science coordinator** of multi-mission observing proposal team “Magnetic Lives of Young Suns”
- **PI**, Earth Origins Network ((EON) Seed Grant, ELSI/Tokyo Tech, Japan
- **Leadership member** of Sellers Exoplanetary Environments Collaboration (SEEC) at GSFC
- **Co-PI, International Space Science Institute (ISSI)**, “The Early Evolution of the Atmospheres of Earth, Mars and Venus”, Bern, Switzerland (2016-2019)
- **Co-I**, The Impact of Planetary Magnetization on Atmospheric Erosion (Belgium/USA, 2021-2023)
- **Editorial Board Member of Nature Scientific Reports**

SERVICE TO SCIENCE COMMUNITY

- **Lead author** and contributed author of 3 Decadal Survey White Papers for National Academy of Sciences call on Helio2050
- **Lead author** and contributed author of 3 Decadal Survey White Paper for National Academy of Sciences call on Astro2020
- **Lead author** of Decadal Survey White Paper for National Academy of Sciences call on Astrobiology, 2018
- **Chair**, AGU oral/poster session “**Planetary Atmospheres and Evolution**”, 2018-2022
- **Chair**, NASA NASA/NExSS sponsored Symposium “**Environments of Terrestrial Planets Under the Young Sun: Seeds of Biomolecules**”, Apr 9-13, 2018, Greenbelt, MD
- **Co-Chair, The Star-Planet Interaction Session**, Triennial Earth-Sun Heliophysics Summit, May 20-24, 2018, Leesburg, VA
- **Chair** of the NExSS workshop, “**Impact of Exoplanetary Space Weather on Climate and Habitability**” Nov.29-Dec 2, 2016, New Orleans, LA, 2016
- **Co-Chair**, Star-Planet Interaction Session, **NSF/SHINE** meeting, Canada, July 24-28, 2017
- **Co-Chair, Session** on Atmospheric Escape, **AbSciCon** 2017 - 2019
- Extensive experience in participating in NASA peer-review process as a chair and a panel member of Heliophysics, Astrophysics and Planetary science sub-committees
- Trusted **reviewer** for *Nature Geoscience*, *Nature Astronomy*, *ApJ*, *ApJ Letters*, *Life*, *MNRAS*

NASA HQ PRESS RELEASES and OUTREACH

1. Interview for NHK documentary TV show “Search for Life in the Universe”, Tokyo, Japan, 2016
2. Interview for the NASA podcast “Gravity Assist: Our Sun, Our Life”, NASA HQ

3. Solar Storms May Have Been Key to Life on Earth, Feb. 23, 2016 at <https://www.nasa.gov/feature/goddard/2016/nasa-solar-storms-may-have-been-key-to-life-on-earth> (*Nature Geoscience* 2016)
4. NASA Finds Planets of Red Dwarf Stars May Face Oxygen Loss in Habitable Zones, Feb. 8 2017 at <https://www.nasa.gov/feature/goddard/2017/nasa-finds-planets-of-red-dwarf-stars-may-face-oxygen-loss-in-habitable-zones> (**ApJ Let** 2017)
5. Atmospheric Beacons Guide NASA Scientists in Search for Life at <https://www.nasa.gov/feature/goddard/2017/atmospheric-beacons-guide-nasa-scientists-in-search-for-life> (*Nature Scientific Reports* 2017)
6. NASA Scientists Find Sun’s History Buried in Moon’s Crust at <https://www.nasa.gov/goddard/2019/feature/nasa-scientists-find-sun-s-history-buried-in-moon-s-crust>
7. Kyoto University press release on impact of superflares on exoplanets at <https://www.kyoto-u.ac.jp/ja/research-news/2019-07-16>
8. Joint NASA-JAXA press release - A New Look at Sunspots is Helping NASA Scientists Understand Major Flares and Life Around Other Stars at <https://www.nasa.gov/feature/goddard/2020/a-new-look-at-sunspots-is-helping-nasa-scientists-understand-major-flares-and-life-around> and <http://hinode.nao.ac.jp/news/results/pressrelease-lightcurves-20201008/index.html>
9. Public Lecture at Kyoto University (campus wide) “Are We Alone In the Universe?” on May 28, 2022, Kyoto University, Japan
10. Special Seminar “Living with the Current and Young Sun” at Solar Physics and Astronomy, Department of Kyoto University, May 30, 2022
11. Invited talk at the Science Innovation Forum at Kyoto University “What the Moon Can Tell Us About the Young Sun? May 31, Kyoto, Japan, 2022
12. Invited talk “Eruptions from Young Solar-Like Stars and Impact on Habitable Environments of Rocky Exoplanets” at ISAS-JAXA, Tokyo, Japan, June 1, 2022
13. Public Lecture at Yerevan State University “Searching for Signatures of Life”, September 2022
14. Public Lecture at Tor Vergata University of Rome “Searching for Signatures of Habitability in our Galaxy”, July, 2022
15. Public and Invited Lectures at Kyoto University, Tokyo Institute of Technology and JAXA, 2016 - 2023

AUTHORED BOOKS

Airapetian, V. S. “Rocking Stories of the Universe, College Level Astronomy Textbook, Great River Technologies/Kendal House (2014).

Airapetian, in *Extreme Events in Geospace*, **Chapter 25**, “CMEs in Time”, Elsevier (2017)

Airapetian, V. S. and Cuntz, M. 2015, Chapter 5, in *Giants of Eclipse: The ζ Aurigae Stars and Other Binary Systems*, *Astrophys. and Space Sci. Lib.*, 408. ISBN 978-3-319-09197-6.

Airapetian, V.S. *Physics of the Young Sun*, CRC, in progress (to be released in 2023).

Green, J. and Airapetian (eds) *Astrosphere Environments and Exoplanet Habitability*,

Ebook, IOP Ebook (to be released in 2023)

RESEARCH EXPERIENCE

- 07/2017 – 12/2022 **Research Professor in Residence**, American University, Washington, DC
10/2013 – present **Senior Astrophysicist**, NASA/GSFC/ Code 670, Greenbelt, MD
01/2022 – present **Distinguished Visiting Professor**, Kyoto University, Kyoto, Japan
- Multi-observatory, multi-wavelength campaign to observe DS TucA
 - Multi-observatory, multi-wavelength campaign to observe EK Dra
 - Prebiotic chemistry of the early Earth & Mars (theoretical models and lab experiments)
 - Models of the Faint Young Sun paradox (3D GCM + Aeroplanets)
 - Atmospheric chemistry driven by extreme SEP events
 - Dynamo models of terrestrial exoplanets
 - HD models of ionospheric outflows from exoplanetary atmospheres
 - Atmospheric erosion of TRAPPIST-1 and Proxima-b exoplanets
 - 3D MHD simulations of stellar extreme CMEs
 - 3D MHD simulations of solar and active stellar coronae and winds
 - Design for Exo Life Beacon Space Telescope (ELBST)
 - Design for Photon Sieve Space Telescope
 - Multidimensional MHD simulations of solar/stellar chromospheres
 - Public outreach in astrobiology (public lectures, TV presence, newspapers)
- 08/2011 – 10/2013 **Principal Analyst**, Sigma Space, Inc.
- Orbit determination techniques, support Aqua and Terra missions
 - Design for Photon Sieve Space Telescope
 - Hydrodynamic Modeling of Auroral Processes in Exoplanets
- 03/2007 – 08/2011 **Research Associate Professor**, GMU, VA
- 2.5D MHD Simulations of Stellar Winds (PI, Code 667)
 - Design for Photon Sieve Space Telescope
 - Hydrodynamic Modeling of Auroral Processes in Exoplanets
- 09/2003 – 03/2007 **Project Analyst in Ground Systems/Image Navigation and Registration**, Swales Aerospace, Inc, Beltsville, MD at NASA/GSFC and Suitland, NOAA/NESDIS/OSO & OSD
- 05/1995 – 08/2003 **Senior Analyst/Scientist**, Computer Sciences Corporation
- 04/1994 – 05/1995 **Research Astronomer**, Los Alamos National Lab & NSO, NM

- 04/1993 – 03/1994 **Research Scientist**, Crimea Astrophysical Observatory
- 12/1982 – 03/1993 **Research Scientist**, Byurakan Astrophysical Observatory, Armenia

TEACHING EXPERIENCE

- 2023 **Distinguished Visiting Professor**, Kyoto University, Japan
 - Developed and taught an astrobiology course
- 2000-2016 **Adjunct Professor**, Capella University, MN
 - Developed an online astronomy course PHY1000
 - Taught online astronomy PHY1000
- 2008-2015 **Adjunct Professor**, SPAC, George Mason University, VA
 - ASTR 111, 112, 113 courses
 - Developed an online astronomy courses
 - Taught online astronomy PHY1000, STAT 251 courses
- 1999-2008 **Adjunct Professor**, Embry-Riddle Aeronautical University – Worldwide
 - Developed physics PHY102, PHY 142 online courses
 - Taught MATH 142, 211 online courses
 - Taught PHY 102 & PHY 142 online courses
- 1998-2001 **Adjunct Professor**, Howard County Community College, Columbia, MD
 - Taught Calculus MATH 301
 - Taught Trigonometry MATH 133

AWARDS

- 2023 **PI**, HST/TESS/NICER proposal “Activity of an infant Sun, DS TucA”
- 2022 **PI**, NASA/FLaRe grant, “Formation of Nitrates on Early Mars”
- 2021 **PI**, NASA/SEEC grant, “Coupling Aeroplanets with ATMOS: Chemical Signatures of Rocky Exoplanets”
- 2020 **PI**, NICER Cycle 2 GO, “Evolving Magnetic Lives of Young Suns”
- 2019 **PI**, HST-XMM Newton Cycle 27 GO, “Evolving Magnetic Lives of Young Suns”
- 2018 **PI**, TESS Cycle 1 GO, “Evolving Magnetic Lives of Young Suns”
- 2018 **Co-I**, TESS Cycle 1 GO, “Supeflare Rates in GKM Stars With TESS”
- 2017 **PI**, Earth Origins Network Seed Grant, ELSI/TokyoTech, Japan
- 2017 **PI**, NASA HQ Exobiology award
- 2017 **Contract** for a Monograph “Physics of the Young Sun”, CRC, UK
- 2016 **Co-PI**, **International Space Science Institute (ISSI)**, Bern, Switzerland
- 2016 **PI**, NASA/NExSS team “Mission to Young Earth 2.0”
- 2016 NASA/GSFC Code 670 Peer Recognition Award (2016)
- 2012 **Co-I**, NASA/GSFC Task Grant: “Extended Magnetospheres”
- 2012 HOBI award for scientific achievement
- 2009 **Co-I**, NASA Grant “MHS Simulations of Stellar Winds”, Code 670
- 2008 **Co-I**, Solar Coronal Heating, NASA/GSFC, Code 671 to GMU, VA

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| 2008 | PI , the contract from Nortel Corp. from NOAA, Solutions for GOES ground system development |
| 2007 | PI , the contract from NASA/GSFC, Code 667 to CUA |
| 2003 | PI , the contract from the USNO “Stellar Seismology” |
| 2003 | PI , the contract from GSFC/NASA, Code 681 “Energy Dissipation and Winds from Evolved Luminous Stars” |
| 2002 | PI , the contract from GSFC/NASA, Code 681 “Nature of Jets and Accretion from Herbig Ae/Be stars” |
| 1999 | CSC’s Honorarium Award – the best paper in science category |
| 2000 | CSC’s Honorarium Award – the best paper in science category |
| 1997 | Technical Excellence Award at CSC |
| 1994 | US Air Force Research Grant for Los Alamos National Laboratory/NSO |

PROFESSIONAL MEMBERSHIPS

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|--------------|---|
| 2018-current | Full member of Japanese Geophysical Society |
| 2019-current | Full member of Asia-Oceania Geophysical Society |
| 2012-current | Full member of International Astronomical Union (IAU) |
| 2008-current | Full member of American Geophysical Union (AGU) |
| 1994-current | Full member of American Astronomical Society & Solar Physics Division |
| 1994-current | Full member of Armenian Astronomical Society |

Recent Significant Helio, Astrophysics and Astrobiology Related Publications

1. Namekata, K., Airapetian, V. S., Petit, P. et al. (2023) Multi-wavelength Campaign Observations of a Young Solar-type Star, EK Draconis I. Discovery of Prominence Eruptions Associated with Superflares, accepted by ApJ, eprint arXiv:2311.07380.
2. Reep, J. and **Airapetian, V. S.** (2023) Understanding the Duration of Solar and Stellar Flares at Various Wavelengths, ApJ, 958, 9.
3. Nielsen, K., **Airapetian, V. S.** et al. (2023) The Advanced Spectral Library: The Evolution of Chromospheric Wind Characteristics from non-Coronal to Hybrid Giant Stars, ApJ., 953, 16.
4. Dethero, M. G., Hare, J., **Airapetian, V. S.** et al. (2023) Energetic Superflare from a Young Solar Analog, DS Tucanae A, Observed with NICER, Res. Notes AAS, 7, 203
5. Kobayashi, K...**Airapetian, V. S.** et al. (2023) Formation of Amino Acids and Carboxylic Acids in Weakly Reducing Planetary Atmospheres by Solar Energetic Particles from the Young Sun, Life, 13, 1103. <https://doi.org/10.3390/life13051103>
6. Boro Saikia, S., Lueftinger, T., **Airapetian, V. S.** et al. (2023) Non-thermal motions and atmospheric heating of cool stars, accepted to ApJ, 950, 124.
7. Garcia-Sage, K., Farrish, A. O., **Airapetian, V. S.** et al. (2023) Star-exoplanet interactions, Frontiers in Astronomy and Space Sciences, vol. 10, id. 1064076
8. Namekata, K., Toriumi, S., **Airapetian, V. S.** et al. (2023) Reconstructing the XUV Spectra of Active Sun-like Stars Using Solar Scaling Relations with Magnetic Flux, ApJ, 945, 147.
9. Hamaguchi, K., Reep, J., **Airapetian, V. S.** et al. (2023) Delayed Development of Cool Plasmas in X-ray Flares from kappa1 Ceti, ApJ, 945, 147.

10. Sandora, M., **Airapetian, V. S.**, Barnes, L., Lewis, G. F., Perez-Rodriguez, I. (2023) “Multiverse Predictions for Habitability: Origin of Life Scenarios”, *Universe*, 9(1), 42, DOI: [10.3390/universe9010042](https://doi.org/10.3390/universe9010042).
11. Sandora, M., **Airapetian, V. S.**, Barnes, L., Lewis, G. F., Perez-Rodriguez, I. ((2023) “Multiverse Predictions for Habitability: Stellar and Atmospheric Habitability”, *Universe*, 9, 4, DOI: [10.3390/universe9010004](https://doi.org/10.3390/universe9010004)
12. Sandora, M., **Airapetian, V. S.**, Barnes, L. , Lewis, G. F., Perez-Rodriguez, I. (2022) “Multiverse Predictions for Habitability: Element Abundances”, *Universe*, 8, 651, DOI: [10.3390/universe8120651](https://doi.org/10.3390/universe8120651)
13. Sandora, M., **Airapetian, V. S.**, Barnes, L., Lewis, G. F., Perez-Rodriguez, I. ((2023) “Multiverse Predictions for Habitability: Stellar and Atmospheric Habitability”, *Universe*, 9, 4, DOI: [10.3390/universe9010004](https://doi.org/10.3390/universe9010004)
14. Wisniewski, J. P., Berdyugin, A. V., Berdyugina, S. V...**Airapetian, V. S.** et al. (2022) UV spectropolarimetry with Polstar: protoplanetary disks, *Ast, Sp. Sci*, 367, 1222.
15. Green, J. L.; Dong, C., Hesse, M., Young, C. A., **Airapetian, V. S.** (2022), Space Weather Observations, Modeling, and Alerts in Support of Human Exploration of Mars, *Frontiers in Astronomy and Space Science*, 9:1023305. doi: 10.3389/fspas.2022.1023305.
16. Toriumi, S., **Airapetian, V. S.** et al. (2022), Universal Scaling Laws for Solar and Stellar Atmospheric Heating: Catalog of Power-law Index between Solar Activity Proxies and Various Spectral Irradiances, *ApJ Suppl. Ser.* 262, 46.
17. Getman, K. V., Feigelson, E. D... **Airapetian, V. S.** (2022) Evolution of X-ray Activity in <25 Myr Old Pre-Main Sequence Stars, *ApJ*, 935, 43.
18. Hu, J., **Airapetian, V. S.**, Li, G., Zank, G., Jin, M. (2022) Extreme Energetic Particle Events by Superflare Associated CMEs from Solar-like Stars, *Science Advances*, 8(12), eabi9743
19. Toriumi, S., **Airapetian, V. S.** (2022), Universal Scaling Laws for Solar/Stellar Atmospheric Heating, *ApJ*, 927, 179.
20. Bamford, R. A., Kellett, B. J., Green, J. L., C. Dong, **Airapetian, V. S.**, Bingham, R. (2022) How to Create an Artificial Magnetosphere for Mars, *Acta Astronautica*, 190, 323.
21. **Airapetian, V. S.**, Jin, M. et al. (2021) One Year in the Life of Young Suns, *ApJ*, 916, 96.
22. Herbst, K., Papaioannou, A., **Airapetian, V. S.** and D. Atri, D. (2021) From Starspots to Stellar Coronal Mass Ejections—Revisiting Empirical Stellar Relations, *ApJ*, 907, 89.
23. Toriumi, S., **Airapetian, V. S.**, Hudson, H.S., Schrijver, C.J, Cheung, M.C.M., DeRosa, M. L. (2020) Sun-as-a-Star Spectral Irradiance Observations of Transiting Active Regions, *ApJ*, 902, 36.
24. Boro Saikia, S., Jin, M., Johnstone, C., Lueftinger, T., Kislyakova, K., Guedel, M., **Airapetian, V. S.**, et al. (2020) The Solar Wind From a Stellar Perspective, *Astron. Astrophys.*, accepted.
25. Gronoff, G., Maggiolo, R., Cessateur, G., Moore, W. B., **Airapetian, V. S.** et al. (2020) The Effect of Cosmic Rays on Cometary Nuclei. I. Does Deposition, *ApJ*, 890, 89-97.
26. Gilbert, E. A...**Airapetian, V. S.** et al. (2020) The First Habitable Zone Earth-sized Planet from TESS.: Validation of the TOI System, *ApJ*, eprint arXiv:2001.00952.
27. Yamashiki, Y. A., Maehara, H., **Airapetian, V. S.** et al. (2019) Impact of Stellar Flares on Planetary Habitability, *ApJ*, 881, 114-137.
28. **Airapetian, V. S.** & 44 co-authors (2019) Impact of Exoplanetary Space Weather on Climate and Habitability, Review paper, *Int. Journal of Astrobiolog*7, 1-57.
29. Kay, C., **Airapetian, V. S.**, Lüftinger, T., Kochukhov, O. (2019) Frequency of Coronal Mass Ejections Impacts with Early Terrestrial Planets, *ApJ Let*, 886, L37-L43.
30. Fu, S., Jiang, Y., **Airapetian, V. S.** et al. (2019) Effect of Star Rotation Rate on Characteristics of Energetic Particle Events, *ApJ Let*, L36-L42.

31. Saxena, P. P., Killen, R. M., **Airapetian, V. S.**, Petro, N. E. and Mandell, A. (2019) Was the Sun a slow rotator? - Sodium and Potassium constraints from the Lunar regolith. *ApJ Let*, 876, L16-L26.
32. Lynch, **Airapetian, V. S.**, DeVore, C. R. et al. (2019) Modeling of a Carrington-scale Stellar Superflare and Coronal Mass Ejections from k1 Ceti, *ApJ*, 880, 97-109.
33. **Airapetian, V. S.** (2018) Terrestrial planets under the young Sun, *Nature Astronomy*, 2, 448-449.
34. Dong, C. F., Jin, M., Lingam, M., **Airapetian, V. S.**, Ma, Y. J., van der Holst, B. (2018). Atmospheric escape from the TRAPPIST-1 planets and implications for habitability. *PNAS*, 115, 260-265.
35. **Airapetian, V. S.**, Jackman, C. H., Mlynczak, M., Danchi, W., Hunt, L. (2017) Atmospheric Beacons of Life from Exoplanets Around G and K Stars, *Nature Scientific Reports*, 7, 14141-14150
36. **Airapetian, V. S.**, Gloer, A., Khazanov, G. V. et al. (2017). How hospitable are space weather affected habitable zones? The role of ion escape. *Ap J Let*, 836, L3-L9.
37. **Airapetian, V. S.**, Gloer, A., Gronoff G., E. Hébrard, E., Danchi, W. (2016). Prebiotic chemistry and atmospheric warming of early Earth by an active young Sun. *Nature Geoscience*, 9, Issue 6, 452-255.

MISCELLANEOUS

US citizen, fluent in English, Russian and Armenian
References are available upon request