



Prof. Loukas Vlahos

Education

- 1967–1972 **Diploma (with Honors)**, *Aristotle University*, Thessaloniki, Greece.
1974–1976 **M.Sc.**, *University of Maryland*, College Park, MD, USA.
1976–1979 **Ph.D**, *University of Maryland*, College Park, MD, USA.

Employment

- 1980–1982 **Research Associate**, *University of Maryland*, College Park, MD, USA.
1983–1985 **Senior Research Associate**, *University of Maryland*, College Park, MD, USA.
1983–1985 **Consultant**, *Applied Physics Laboratory, Johns Hopkins University*, Baltimore, MD, USA.
1986–1990 **Assistant Professor**, *Aristotle University*, Thessaloniki, Greece.
1990–2007 **Associate Professor**, *Aristotle University*, Thessaloniki, Greece.
2007–2016 **Professor**, *Aristotle University*, Thessaloniki, Greece.
2016– **Retired Professor**, *Aristotle University*, Thessaloniki, Greece.

Research Activities

Research Interests

High Energy Astrophysics, Turbulence in space and laboratory plasmas, Dynamics of Complex systems, Complexity in Solar Active Regions, Diffusion of energetic particles in turbulent plasmas with applications in space and laboratory plasmas.

Research Coordinator

- 1981–1986 **Team Leader**, *Research group **Solar Radiation and particle acceleration.***, The group was part of the Solar Terrestrial Theory Group (Profs. K. Papadopoulos and C.S. Wu were the P.I.'s., *University of Maryland*, USA).
1990–today **Team Leader**, *Research group **Non-linear processes in Astrophysical and Laboratory Plasmas***, The group is part of the Section of Astrophysics, Astronomy and Mechanics in the Department of Physics, *Aristotle University of Thessaloniki*, Greece, (See more in my web-page).

Collaborations

- 1980-2000 **A long list of collaborators during this period.**

2000-2016 **Collaborators**, Prof. P. Cargill (Imperial College, UK); Prof. K. Hizanidis (National technical University of Athens (NTUA), Greece), Prof. J. Kuijpers (University of Nijmegen, Holland); Prof. D. Papadopoulos (Aristotle University (AUTH), Greece); Prof. N. Stergioulas (AUTH, Greece); Prof. G. Voyatzis (AUTH, Greece); Prof. C. Tsagas (AUTH, Greece); Dr. N. Vilmer (Observatory d' Paris, France); Dr. K. Garlsgard (Niels Bohr Institute, Copenhagen, Denmark); Dr. K. Azner (ETH, Switzerland); Dr. R. Turkmani (Imperial College, UK); Dr. A. Anastasiadis (Observatory of Athens, Greece); Dr. H. Isliker (AUTH, Greece); Dr. M. Georgoulis (Academy of Athens, Greece); Dr. M. Onofri (University of Calabria, Italy); F. Lepreti (University of Calabria, Italy); Dr. J. Kominis (NTUA, Greece), Dr. S. Krucker (Berkley, USA).

Research Funding (1988–2020)

- 1991-1993 **Coherent Radiation and Particle Acceleration in magnetized plasmas**, Research Training Network, Funded by European Community.
- 1995-1997 **Plasma Physics of the Solar Active Regions: Theory and Observations**, Research Training Network, Funded by European Community.
- 1995-1997 **Inovative methods on teaching Astronomy in High Schools**, Funded by the Greek Ministry of Education .
- 1997-1998 **Dynamics of Complex systems**, Funded by the Greek Ministry of Education.
- 1996-1999 **Solar and Heliospheric Plasma Physics**, Research Training Network, Funded by European Community.
- 2002–2006 **Theory, Simulation and Observations in space turbulence**, Research Training Network, Funded by European Community.
- 2004–2006 **Non-linear interaction of Gravitational Waves with plasmas in Astrophysics**, Funded by the Greek Ministry of Education in the framework of the program PYTHAGORAS, .
- 2012–2015 **THALIS, HELLENIC NATIONAL NETWORK FOR SPACE WEATHER RESEARCH**, Funded by the Ministry of Education, Greece.
- 2001–2020 **Research on Control Fusion**, Funded by the Association Euratom-Hellenic Republic through the European Union program EURATOM.

Supervision of Ph.D Candidates

- 1987– 1994 **A. Anastasiadis**, Ph.D. thesis on **Particle acceleration by an ensemble of shocks**, Department of Physics, Aristotle University, Thessaloniki, Greece.
- 1994– 2000 **M. Georgoulis**, Ph.D. thesis on **Spatio-temporal evolution of complex active regions and energy release processes in solar Corona**, Department of Physics, Aristotle University, Thessaloniki, Greece.
- 2002– 2007 **C. Tsironis**, Ph.D. thesis on **Non-linear wave particle interaction and Electron Cyclotron Heating (ECRH) in fussion devices**, Department of Physics, Aristotle University, Thessaloniki, Greece.
- 2009– today **T. Pisokas**, Ph.D. thesis candidate, Department of Physics, Aristotle University, Thessaloniki, Greece.
- 2010– today **M. Mavridis**, Ph.D. thesis candidate, Department of Physics, Aristotle University, Thessaloniki, Greece.

Invited talks the last ten years

- 2008 **Solar and Stellar Active Regions: A cosmic laboratory for Complexity'**, *Chaos in Astronomy*, Athens, Greece.
- 2008 **Waves in Plasmas**, *7th School of Physics and Technology of Fusion*, Volos, Greece.
- 2008 **Magnetic Energy Release**, *IAU 257 Meeting on Universal Heliophysical Processes*, Ioannina, Greece.
- 2010 **Self Organized Criticality and applications in Laboratory and Astrophysical Plasmas**, *Nonlinear Dynamics and Complexity*, International meeting in honor of Prof. T. Boundis, Thessaloniki, Greece.
- 2010 **The solar flare: a strongly turbulent particle accelerator**, *IAU 274 Advances in plasma astrophysics*, Giardini-Naxos, Italy.
- 2011 **Particle acceleration during solar flares**, *ISSI workshop on Particle acceleration in cosmic plasmas*, Bern, Switzerland.
- 2011 **Complexity in Solar Active Regions**, *IAFA 2011 International Astrophysics Forum Alpbach*, Tyrol - Austria.
- 2014 **Current fragmentation and Heating/Particle Acceleration during Solar Flares**, *US-Japan Workshop on Magnetic Reconnection*, Tokyo, Japan.
- 2015 **Coronal heating from explosive events: A kinetic approach**, *First Joint Solar Probe Plus-Solar Orbiter Workshop-The Origins of the Heliosphere*, Florence - Italy.
- 2015 **Current fragmentation and particle acceleration in strongly turbulent plasmas**, *16th European Fusion Theory Conference*, Lisbon - Portugal.
- 2015 **A Fermi Model for Coronal Heating by MHD Waves and Nanoflares**, *Multi-Wavelength Studies of the Solar Atmosphere: Celebrating the Career of Costas Alissandrakis*, Ioannina - Greece.
- 2016 **Turbulent reconnection in the solar atmosphere**, *International Scientific Seminar on "Structures and Dynamics of the solar atmosphere: Recent advances and challenges"*, *Kavli Royal Society International Center*, Chiney Hall, London - UK.
- 2018 **Acceleration and Heating in Turbulent Reconnecting Plasmas**, *The Joint Meeting on Quantum Fields and Non Linear Phenomena*, April 18-22, Sinaia, Romania.
- 2018 **Anomalous Transport in Turbulent Plasmas**, *25th Summer School and Conference on Dynamical Systems and Complexity*, July 9-17, Athens, Greece.
- 2018 **Particle heating and acceleration inside the turbulent Solar Corona**, *45th Conference of Plasma Physics, European Physical Society*, July 2-6, Prague, Czech Republic.
- 2018 **Particle heating and acceleration by turbulent reconnection in the solar atmosphere**, *Workshop on "Particle acceleration and transport: From Sun to extra-galactic sources"*, University of Calabria, November 12-16, Rende, Italy.

Conferences and Summer Schools

- 2002-2018 **I have been team leader in four Workshops, Member of the Scientific Organizing Committee in fifteen national and international meetings, Chairman of the Organizing Committee in five international meetings.**

Teaching

1986-2016 I have been teaching several courses (Calculus, Plasma Physics, Introductory Astronomy, Astrophysics). The last thirty (30) years I have supervised forty five (45) diploma thesis and help them develop their carrier. Some of them are currently working in Universities, Research Institutes and Private Companies around the world. .

Other activities

1990-2016 Serve as member of several Committees in the Department of Physics of the Aristotle University of Thessaloniki, Greece.
1995-2002 Chairmen of the Committee of The Aristotle University responsible for the establishment of the Career Office of the University.
2012-2014 Vice- President of The Hellenic Astronomical Society.
2014-2016 President of The Hellenic Astronomical Society.
2014-2016 Director of the the Laboratory of Astronomy, Department of Physics, Aristotle University, Thessaloniki, Greece.

Publications

1980–2018 I have published more than 110 articles in international refereed journals and more than 30 review articles or chapters in books., *My work was cited by more than 4000 articles and the h index for my publications is 40, see the Google Scholar <https://scholar.google.com/citations?user=NyKmqyYAAAAJ> for details.*

Articles in Refereed Journals the last ten years

- [1] **A self-organized criticality model for ion temperature gradient mode driven turbulence in confined plasma**, *H. Isliker, Th. Pisokas, D. Strintzi, L. Vlahos*, Physics of Plasmas, 17, 082303-10, 2010.
- [2] **Simulating flaring events in complex active regions driven by observed magnetograms**, *M. Dimitropoulou, H. Isliker, L. Vlahos, M. K. Georgoulis*, Astronomy Astrophysics, 529, 2011.
- [3] **Design concepts for the Cherenkov Telescope Array CTA: an advanced facility for ground-based high-energy gamma-ray astronomy**, *M. Actis,...L. Vlahos,...*, Experimental Astronomy, 32, 193-316, 2011.
- [4] **Ion and impurity transport in turbulent, anisotropic magnetic fields**, *M. Negrea, I. Pertisor, H. Isliker, A. Vogianou, L. Vlahos, B. Weyssow*, Plasma Physics and Controlled Fusion, 53, 085022-085025, 2011.
- [5] **Electron-cyclotron wave propagation, absorption and current drive in the presence of neoclassical tearing modes**, *H. Isliker, I. Chatziantonaki, C. Tsironis, L. Vlahos*, Plasma Phys. Control. Fusion, 54, pp. 095005, 12pp., 2012.
- [6] **Introducing the CTA concept**, *L. Vlahos and 967 coauthors*, Astroparticle Physics, 43, 3-18, 2013.
- [7] **Dynamic data-driven integrated flare model based on self-organized criticality**, *M. Dimitropoulou, H. Isliker, L. Vlahos, M.K. Georgoulis*, Astronomy and Astrophysics, 553, 11 pp., 2013.

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- [8] **Self-consistent modeling of the dynamic evolution of magnetic island growth in the presence of stabilizing ECCD**, *I. Chatziantonaki, C. Tsironis, H. Isliker, L. Vlahos*, Plasma Physics and Controlled Fusion, 55, issue 11, 2013.
- [9] **Integrable perturbed magnetic fields in toroidal geometry: An exact analytical flux surface label for large aspect ratio**, *N. Kallinikos, H. Isliker, L. Vlahos, E. Meletlidou*, Physics of Plasmas, 21, issue 6, 2014.
- [10] **A study of self organized criticality in ion temperature gradient mode driven gyrokinetic turbulence**, *M. Mavridis, H. Isliker, L. Vlahos, T. Gorler, F. Jenko, D. Told*, Physics of Plasmas, 21, issue 10, 2014.
- [11] **Particle acceleration and heating by turbulent reconnection**, *L. Vlahos, T. Pisokas, H. Isliker, V. Tsiolis and A. Anastasiadis*, Astrophysical Journal Letters, 827, pp L3 , 2016.
- [12] **An observationally-driven kinetic approach to coronal heating**, *A. Toutountzi, L. Vlahos, H. Isliker, K. Moraitis, M. Georgoulis and G. Chintzoglou*, Astronomy and Astrophysics, Vol. 596, pp. 56, 2016.
- [13] **Limits of applicability of the quasilinear approximation to the electrostatic wave-particle interaction**, *G. Zacharekgas, H. Isliker and L. Vlahos*, Physics of Plasmas, Vol. 23, pp. 112119, 2016.
- [14] **Fractional Transport in Strongly Turbulent Plasmas**, *H. Isliker, L. Vlahos, D. Constantinescu*, Physical Rev. Letters, Vol. 119, pp. 35, 2017.
- [15] **Particle Acceleration and Fractional Transport in Turbulent Reconnection**, *H. Isliker, Th. Pisokas, L. Vlahos, A. Anastasiadis*, Astrophysical Journal, Vol. 849, pp. 045101, 2017.
- [16] **Synergy of Stochastic and Systematic Energization of Plasmas during Turbulent Reconnection**, *Th. Pisokas, L. Vlahos, H. Isliker*, Astrophysical Journal, Vol. 852, pp. 64, 2018.
- [17] **Diffusive Shock Acceleration and Turbulent Reconnection**, *C. Garrel, L. Vlahos, H. Isliker and Th. Pisokas*, Monthly Notices of the Royal Astronomical Society, 48, 2976, 2018.
- [18] **Particle Acceleration and Heating in Regions of Magnetic Flux Emergence**, *H. Isliker, V. Archontis and L. Vlahos*, The Astrophysical Journal, 882, 571, 2019.
- [19] **Particle acceleration and heating in a turbulent solar corona**, *L. Vlahos and H. Isliker*, Plasma Physics and Controlled Fusion , 61 ,014020, 2019.
- [20] **Stochastic turbulent acceleration in fractal environments**, *N. Sioulas, H. Isliker and L. Vlahos* , Astrophysical Journal Letters , 895 , 14, 2020.
- [21] **Superdiffusive stochastic Fermi acceleration in space and energy**, *N. Sioulas, H. Isliker L. Vlahos, A. Koumtzis and Th. Pisokas*, Monthly Notices of the Royal Astronomical Society, 491, 3860, 2020.

Review articles the last fifteen years

- [1] **Statistical Properties of the evolution of solar magnetic fields (invited review)**, *L. Vlahos*, in Magnetic Coupling of the Solar Atmosphere, G. Tsiropoula, U. Schuhle (eds) ESA SP-505. 2002

- [1] **Energy Release and particle acceleration in stressed and complex magnetic topologies, (invited review),** *L. Vlahos*, in *Energetic phenomena in the sun*, L. Klein (ed) *Lecture Notes in Physics*, Springer Verlag, 2005
- [3] **Particle Acceleration in a Three-Dimensional Model of Reconnecting Coronal Magnetic Fields,** *P. J. Cargill, L. Vlahos, R. Turkmani, H. Isliker*, *Space Science Reviews*, Volume 124, 249-259, 2006.
- [4] **Summary of Joint Discussion,** *L. Vlahos*, *Highlights of Astronomy*, Volume 14, p.104-106, 2007.
- [5] **Magnetic Complexity, Fragmentation, Particle Acceleration and Radio Emission from the Sun,** *L. Vlahos*, *The High Energy Solar Corona: Waves, Eruptions, Particles*, *Lecture Notes in Physics*, Springer Verlag, 725, 15. 2007
- [6] **Normal and anomalous diffusion: A tutorial,** *L. Vlahos, H. Isliker, Y. Kominis, K. Hizanidis*, in *Proceedings of the school/conference on "Order and Chaos"*, Volume 10, *Patras University Press*, 2008.
- [7] **Solar and stellar active regions: A cosmic laboratory for Complexity,** *L. Vlahos*, in *Chaos in Astronomy*, *Lecture Notes in Physics*, Springer. 2008
- [8] **Hard X-Ray emission from the solar corona,** *S. Krucker, ..., L. Vlahos*, *Annual Review of Astronomy and Astrophysics*, Volume 16, pp. 155-208. 2008
- [9] **The Solar Flare: A strongly turbulent accelerator,** *L. Vlahos, S. Krucker and P. Cargill*, in *Turbulence in Space plasmas*, *Lecture Notes in Physics*, Springer, p. 157. 2009
- [10] **Recent Advances in Understanding Particle Acceleration Processes in Solar Flares,** *V.V. Zharkova, ..., L. Vlahos, ...*, *Space Science Reviews*, Volume 159, 357-420, 2011.
- [11] **Current fragmentation and particle acceleration in solar flares,** *P. Cargill, L. Vlahos, G. Baumann, J. Drake and A. Nordlund*, *Space Science Reviews*, Volume 173, pp. 223-245. 2012
- [12] **Turbulence, Magnetic Reconnection in Turbulent Fluids and Energetic Particle Acceleration,** *A. Lazarian, L. Vlahos and 4 coauthors*, *Space Science Reviews*, vol. 173, 557-622, 2012.
- [13] **Complexity methods applied to turbulence in plasma astrophysics,** *L. Vlahos and H. Isliker*, *European Physical Journal*, vol. 225, pp 999, 2016.
- [14] **Introduction to the physics of solar eruptions and their space weather impact,** *V. Archontis and L. Vlahos*, *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 337,20190152, 2019.
- [15] **Particle Acceleration and Heating in a Turbulent Solar Corona,** *L. Vlahos and H. Isliker*, *Plasma Physics and Controlled Fusion*, vol. 61, pp. 014020, 2019.
- [15] **Sources of solar energetic particles ,** *L. Vlahos, A. Anastasiadis, A. Papaioannou, A Kouloumvakos, H. Isliker*, *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 337,20180095, 2019.

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Books published

- [1] **Galactic Dynamics and N-Body Simulations**, *G. Contopoulos, N. Spyrou and L. Vlahos (eds)*, Lecture Notes in Physics, Springer Verlag.
1993
- [2] **Plasma Physics**, *L. Vlahos*, Tziolas Publ.(in greek), 2000.
- [3] **Differential Calculus of Several Variables**, *L. Vlahos*, Tziolas Publ. 2nd Edition (in greek), 2005.
- [4] **Turbulence in space plasmas**, *L. Vlahos, P. Cargill (eds)*, Lecture Notes in Physics, Springer Verlag.
2009