

Curriculum vitae and scientific publications

Mirella Harsoula

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EDUCATION

1989: University Degree from the Physics Department of the National and Kapodistrian University of Athens.

1990 : Master Degree (**Diplome d'Etudes Approfondie**) from the University "Paul Sabatier" of Toulouse (France). The master thesis had title "**Radiation γ from the surface of planet Mars from the data of the artificial satellite PHOBOS**".

1999: Thesis Degree from the section of Astronomy, Astrophysics and Mechanics of the Physics Department of the National and Kapodistrian University of Athens. The thesis had title: "**Cosmological collapses and creation of counterrotating galaxies**".

Subject of Research:

Dynamical Astronomy -Non Linear Dynamics-Chaos

Conferences:

-September 1992: Participation in the 1st Panhellenic Astronomical Conference (Jenam) held in Eugenides Foundation.

-July 1993: Participation in 6th Predoctoral European Astrophysics School with oral presentation.

-July 1995: Participation in the 2nd Panhellenic Astronomical Conference (Jenam) with oral presentation.

-August 1995: Participation in the Conference “Gravitational dynamics” in Cambridge (England).

-August 1997: Participation in the NATO Conference “Nonlinear Dynamics” in Marathea of South Italy.

-July 1997 Participation in the 3rd Panhellenic Astronomical Conference held in Halkidiki (Greece) with oral presentation.

-September 1999: Participation of the 4th Astronomical Conference of the Hellenic Astronomical Society held in Samos.

-April 2001: Participation in the 2nd Hellenic Cosmological Conference of the Hellenic Astronomical Society held in the National Observatory of Athens in Penteli.

-September 2002: Participation in the International Conference “Galaxies and Chaos” held in Athens with oral presentation .

-September 2007: Member of the L.O.C. of the International Conference “Chaos in Astronomy” organised by the Academy of Athens and oral presentation.

- September 2009: Participation in the 9th conference of the Hellenic Astronomical Society with poster presentation with title: “Orbital structure and asymptotic orbits in barred-spiral galaxies” M. Harsoula and C. Kalapotharakos

-July 2010: Participation in the conference “Nonlinear Dynamics and Complexity: Theory, Methods and Applications in honor of Tassos Bountis on the occasion of his 60th birthday” Thessaloniki with oral presentation with title: “The role of asymptotic orbits in supporting the spiral structure of barred spiral galaxies»

-28 June-2 July 2015: Participation in the 12th Conference of the Hellenic Astronomical Society in Thessaloniki with oral presentation with title :”Convergent regions of the Moser Normal Forms and the Structure of Chaos”

-July 2016: Participation and member of the L.O.C. of the international conference : “Computational perturbative methods for Hamiltonian systems-Applications in physics and Astronomy”, held in Athens and co-organized by Rome University Tor Vergata and the Center for Astronomy and Applied Mathematics (RCAAM) of the Academy of Athens.

-May 2018: Oral talk in the National Centre For Scientific Research Demokritos as part of the COSA speeches (Complex Systems and Applications Network). Title of the talk: "Chaotic spirals in barred spiral galaxies".

-July 2018: Participation in the 25th Summer School-Conference "Dynamic Systems and Complexity", July 9-17, 2018, in the National Centre For Scientific Research "Demokritos" with an oral presentation and topic: "The role of chaos in barred spiral galaxies".

-July 2019: Participation in the 13th Hellenic Astronomical Society conference held in Volos with an oral presentation and topic: "A Milky Way model with two pattern speeds".

-July 2021: Participation in the 15th Hellenic Astronomical Society conference which took place online with an oral presentation and topic: "The building blocks of the spiral arms in galaxies".

-July 2021 Participation in an online conference of the European Astronomical Society, Annual Meeting June 28th -July 2nd, 2021 Poster presentation with title: "The building blocks of the spiral arms in galaxies".

-July 2022: Official guest at the 28th summer school – conference "Dynamical Systems and Complexity", which is organized by the National Centre For Scientific Research "Demokritos" <http://cosa.inn.demokritos.gr/>, online with oral presentation with title: "The building blocks of the spiral arms in galaxies".

-September 2022: Official guest in the conference "Nonlinear Dynamics and Complexity", September 26-29, 2022 held in Thessaloniki. Invited speaker of the mini-symposium "Dynamical systems methods in Natural Sciences". Oral presentation with title: "The building blocks of the spiral arms in galaxies".

-October 2022: One-day workshop "Spirals and bars in galaxies" held in the central building of the Academy of Athens. Oral talk with title "[The building blocks of the spiral arms in galaxies](#)" The video talk is found in the webpage: <https://www.youtube.com/watch?v=Ea4MQZI3GW4&t=9043s>

-July 2024: 1st and 2nd July. Participation in the 3rd Annual Workshop in Space Science & Complexity at Princeton Athens Center. Oral talk with title: "Chaos and Order in Galaxies: The building blocks of the spiral arms in galaxies".

Public Outreach-Popularization of Astronomy:

-**May 2009:** Oral talk for Popularizing Astronomy held in the building of the Academy of Athens on the occasion of the International Year of Astronomy (2009) and organized by the Center for Astronomy and Applied Mathematics, with title: "The dance of the galaxies".

-**November 2011:** Lecture at the Theocharakis Foundation of the Municipality of Athens entitled "The Dance of the Galaxies".

-**May 2014:** Oral talk for Popularizing Astronomy held at the spiritual center of the Municipality of Athens with the title: "The cosmic dance".

-**October 2015:** Oral talk for Popularizing Astronomy held in the building of the Academy of Athens on the occasion of the International Year of Light (2015) with title: «Light: the explorer of the Universe», (the talk was videotaped by the Theocharakis Foundation and is available on the website:
<http://www.blod.gr/lectures/Pages/viewlecture.aspx?LectureID=2327>)

- **September 2016:** Oral talk for Popularizing Astronomy in the one day conference organised by the non-profit association of sports and cultural events "Mad Waters" with co-organizer the Region of Central Greece, on Sunday, September 25 with the title "Tides" from Euripus to the Universe - Against the Current". The title of the talk was: "Tides in the Universe: the dance of the galaxies"

- **March 2017:** Oral talk with title: "Our planetary system" in the 1st nursery school of Papagos, with interactive play and construction of a plasticine planetary system

- **March 2017:** Oral talk for Popularizing Astronomy (common talk with the Astrophysicist Kalliopi Dasyra) with title: «Galaxies and Black Holes: Creation and Coevolution», the talk was videotaped by the Theocharakis Foundation and is available on the website:
<http://www.blod.gr/lectures/Pages/viewlecture.aspx?LectureID=3368>

- **April 2017:** Oral talk for Popularizing Astronomy at the reformatory school of Avlona prisons with the title: "The world of galaxies".

October 2017: Oral talk at the University of Athens at the physics Department at the section of Astronomy Astrophysics and Mechanics with title: «The cosmic Dance».

-**January 2018:** Oral talk for Popularizing Astronomy at the 6th grade of the 12th Stergiopoulou primary school of Chalandri with title: «Exploring our nearby Universe»

-**February 2018:** Oral talk for Popularizing Astronomy at the 6th grade of the 7th primary school of Agia Paraskevi with title: «Exploring our nearby Universe».

-**April 2018:** Design and presentation of the Eratosthenes experiment to measure the circumference of the Earth, together with my colleague Christos Efthymiopoulos at the 1st High School of Papagos.

- **March 2019:** Oral talk for Popularizing Astronomy at the 1st grade of the 1st vocational high school of Sivitanidios with title: «Exploring our nearby and the distinct Universe».

-**May 2019:** Oral talk for Popularizing Astronomy, in the context of the 100 years of the International Astronomical Union (IAU), entitled: "Tides in the Universe: The Cosmic Dance" Part of the speech was videotaped and presented in an ERT news bulletin.

<https://www.youtube.com/watch?v=iHevVvT-zAA>

- **November 2019:** Oral talk for Popularizing Astronomy in the 3rd grade of the 1st primary school of Papagos with title: «Exploring our nearby Universe».

- **November 2023:** 3 Oral talks for Popularizing Astronomy in the 6th grade of the 2nd primary school of Papagos with title: «Exploring our nearby and the distinct Universe».

- **November 2024:** Oral talk for Popularizing Astronomy at the 3rd grade of the 3rd high school of Vyronas with title: «Exploring our nearby and the distinct Universe».

-**February 2025** (3/2/2025): Oral talk for Popularizing Astronomy in Municipality of Voula, Vari and Vouliagmeni (in the town hall), as part of the 5th Day of Natural Sciences -Physics Festival, entitled "Exploration of the near and distant Universe".

-**March 2025** (6/3/25): Oral talk for Popularizing Astronomy at the 3rd General secondary school Physics enchants, co-organised by the Greek Physicists' Association, and entitled "Excursion to the near and distant Universe".

-Oral presentations of topics related to my current scientific research work, in the context of the weekly seminars of the Center for Astronomy and Applied Mathematics (RCAAM) of the Academy of Athens (2002-present)

Participation in funded research programs of the Academy of Athens:

- "Rotating Self-Consistent Galaxy Models", 2007
(Associates: G. Contopoulos, M. Harsoula and K. Kalapotharakos).

- "Resonances and Diffusion in the Arnold Web", 2007
(Associates: N. Voglis, M. Harsoula, K. Kalapotharakos and I. Stavropoulos).

- "Non-linear phenomena in galactic disks". Program of the Research Committee of the Academy of Athens (200/895). From January 2010 to 2020.
(Associates: P. Patsis, M. Harsoula, M. Katsanikas, E. Tsigaridi).

- "Non-linear phenomena in galactic disks" Program of the Research center for Astronomy and Applied Mathematics of the Academy of Athens (200/1022). From 1/6/2024 up to 31/12/2025 Associates: P. Patsis, G. Contopoulos, M. Harsoula, M. Katsanikas and A. Tzemos.

Participation in non-funded research programs of the Academy of Athens:

- "Analytical calculation of the unstable manifolds and the structure of Chaos"
(Associates: G. Contopoulos, M. Katsanikas, M. Harsoula and Ch. Efthymiopoulos).

Participation in international funded research programs:

- "Marie Curie Innovative Training Network Stardust-R: The asteroid and Space Debris Network v2.0" (2019-2023). International research program funded by the European Union under the Horizon-2020 action. Total project budget: **221.000€**. Participation for the RCAAM Efthymiopoulos Ch., University of Padova/ RCAAM and Harsoula M./ RCAAM

Results: • Supervision of an international PhD student (E. Legnaro), for 3 years (2020-2023), with main supervisor H. Efthymiopoulos and co-supervisor M. Harsoula.

The contribution of the Center for Astronomy and Applied Mathematics of the Academy of Athens to the specific program can be seen on the following website:

<http://www.stardust-network.eu/about/scientists/>

-Participation in programs under review:

-Participation in the project “Periodic Orbit dividing surfaces in Chemistry and Astronomy”, submitted in its context of the Basic Research Financing Action (Horizontal support of all Sciences) Sub-action 1 (Funding New Researchers) of the Hellenic Foundation for Research and Innovation (September 2022), as internal collaborator – research consultant (PI M. Katsanikas, Associate Researcher in RCAAM).

- Participation in the project “**Periodic Orbit dividing surfaces in Chemistry and Astronomy**”, submitted in its context of the ERC Consolidator Grant (March 2022) as internal collaborator (PI M. Katsanikas, Associate Researcher in RCAAM). The proposal was rejected, but received quite favorable comments.

Scientific Program Submission in the Hellenic Foundation for Research and Innovation :

-Program Submission of a proposal within the framework of the 3rd Call for Research Projects H.F.R.I. for the Strengthening of Faculty Members and Researchers (November 2023) as PI (Principal Investigator) on the subject:

“Transport and diffusion properties in 2D and 3D classical and quantum dynamical systems” with associates - research consultants: A. Tzemos Τζέμος Α., Associate Researcher in RCAAM and Ch. Efthymiopoulos Associate Professor, Mathematics Department Tullio Levi-Civita, University of Padova (Italy) .

Member of Hellenic and International Astronomical Unions:

-Member of the Greek Physicists

-Member of the Hellenic Astronomical Union

-Member of the International Astronomical Union (**IAU**) from July 2003

Job positions:

- From 1/12/1996 up to 28/2/1998 i worked with a project contract in the University of Athens in the Physics Department, Section of Astrophysics, Astronomy and Mechanics in a program with title: “Gravitational collapse and structure of the phase space” and scientific supervisor G. Contopoulos.

- From 20/3/2000 έως 20/6/2000 i worked with a project contract in the University of Athens in the Physics Department, Section of Astrophysics, Astronomy and Mechanics in a program with title: «N-body simulations» and scientific supervisor N. Voglis.
- From 1/2/1999 up to 31/1/2000 i worked with a project contract at the Research center for Astronomy and Applied Mathematics of the Academy of Athens (RCAAM) .
- From 4/9/2000 up to 11/11/2003 i worked at RCAAM with successive project contracts.
- From 11/11/2003 up to June of 2016 i worked at RCAAM as civil servant under private law following the conversion of my contract into an open-ended contract.
- From June of 2016 up to May 2024 i worked at RCAAM as Senior Researcher.
- From May of 2024 and up to now i work at RCAAM as Research Director .

Objects of research work:

-Dynamical Astronomy, dynamics of the Galaxy and study of chaos in non linear systems:

- Study of the angular-momentum development in elliptical galaxies created by cosmological collapses
- Orbital study of rotating barred galaxies using N-body simulations and study of the chaotic diffusion in 3/D barred-spiral galaxies.
- Study of chaos in non-linear systems. Stickiness phenomena. Applications to 3D galactic models
- Analytical calculations of unstable asymptotic curves of hyperbolic points and "Moser" curves in 2/dimensional mappings.
- Applications of the analytic Moser convergence regions in the case of the spiral structures of 3/D barred-spiral galaxies.
- Analytical model study of our Galaxy, with two different pattern speeds for the bar and spiral arms.
- Orbital study of spiral density waves in grand design galaxies.
- Orbital study in 3D models of barred spiral galaxies. Study of the sticky chaotic orbits that support rings and spiral arms.

-Celestial Mechanics:

- Study of orbits of artificial earth satellites in the MEO (middle earth objects) region. Study of the orbital diffusion in the phase space.
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-Reviewer in international scientific journals:

- The Astrophysical Journal
- The Mathematical Society
- Monthly Notices of the Royal Astronomical Society
- Astronomy and Astrophysics
- Celestial Mechanics and Dynamical Astronomy
- International Journal of Bifurcation and Chaos
- Physica D: Nonlinear Phenomena

-Referee in programs of the **Hellenic Foundation for Research and Innovation (H.F.R.I)** in the context of the 1st announcement of research projects for the support of Postdoctoral Researchers (2017).

Member of the Three-member Advisory Committee for supervising the preparation of doctoral theses:

a) of Ms Zouloumi Konstantina with title: "Spiral structure of galaxies and Chaos in models of N-body simulations of galactic disks" (2019-2024)

b) of Mr Edoardo Legnaro with title: "Orbital dynamics and diffusion at resonances in the near-Earth space environment". (2019-2023)

Practical exercise

Main supervisor of the Practical exercise of the student Chrysoula Kalogeropoulou of the Department of Physics of the University of Ioannina in the context of the "Tertiary Education Internship of the University of Ioannina", which is financed by the European Social Fund (ESF) and co-financed by National Resources through the Operational Program "Human Resource Development & Social Cohesion" (FP 2021-2027). The subject of the Practical was: "Spiral Density Waves in Galaxies", July-September 2024.

Diplomatic Thesis

Co-supervision of a diploma thesis (with main supervisor Mr. Kostas Anagnostopoulos, professor of the School of Applied Mathematics and Natural Sciences of the National Technical University of Athens) of Mr. Theodosios Kavalagios of the Mathematics department of the School of Applied Mathematics and Natural Sciences of the National Technical University of Athens on the topic "The role of the pattern speed velocity of spiral density waves in galaxies".

Participation in Greek position selection Committees:

-Alternate member of the electoral body for the permanence of the position of Mr. Pappa Georgios as assistant professor, at the ARISTOTLE UNIVERSITY OF THESSALONIKI with the subject "Theoretical Astrophysics-Fluid dynamics", 2021.

-Member of a review committee for a position of Principal Researcher (Researcher B') at the Research Center for Astronomy and Applied Mathematics (RCAAM) with subject "Computational Astrophysics", 2021.

-Member of the electoral body for an Assistant Professor position in the PHYSICS Department of the Aristotle University of Thessaloniki with the subject of Dynamics - Celestial Mechanics, 2021.

-Member of the judging committee for a position of Researcher C at the Research Center for Astronomy and Applied Mathematics (RCAAM) with the subject "Dynamic systems in Astronomy and in Quantum Mechanics", 2022

-Member of the Three-Member Nominating Committee for the filling of a faculty member position, with code APELLA APP 36830, at the rank of Assistant Professor of the Physics Department of the School of Applied Sciences of the International University of Greece with subject: "Dynamics – Celestial Engineering", Kavala, 2024

-Member of the electoral body for the Professor position in the Department of Astrophysics, Astronomy and Engineering of the Department of Physics of the Aristotle University of Thessaloniki, with subject "Dynamics", 2024.

Scientific Publications :

(1) "The semistatic equilibrium of stellar systems after Violent Relaxation", N. Voglis, N. Hiotelis and M. Harsoula in proceeding of the 1st Panhellenic Astronomical Conference, 1992.

(2) "Surviving Memory in Violently Relaxing Systems" N. Voglis, N. Hiotelis and M. Harsoula, Astrophysics and Space Science, 226, p. 213, 1995.

(3) "Can cosmological collapses create counterrotating galaxies?" M. Harsoula and N. Voglis proceedings of the 2nd Panhellenic Astronomical Conference (Jenam), 1995.

- (4) "Counterrotating objects formed by single cosmological collapses", N. Voglis and M. Harsoula, in proceedings of the conference: "Gravitational dynamics" in Cambridge of England, 1995.
- (5) "Possible cosmological origin of counterrotating galaxies", M. Harsoula and N. Voglis, proceedings of Nato Conference in "Nonlinear Dynamics" in Marathea, 1997.
- (6) "Density waves in the early evolution of galaxies: N. Voglis and M. Harsoula. Abstracts of Jenam July 2-7, 1997, Thessaloniki.
- (7) "Mixing of positive and negative angular momentum components in protogalaxies" N. Voglis and M. Harsoula. Abstracts of Jenam July 2-7, 1997, Thessaloniki.
- (8) "Counterrotating galaxies formed by cosmological collapses", M. Harsoula and N. Voglis, Astronomy and Astrophysics, 335, p. 431, 1998.
- (9) "Destruction of the islands of stability", G. Contopoulos, M. Harsoula, N. Voglis and R. Dvorak, J. Phys. A, 32, p.5213, 1999
- (10) "Cosmological Collapses and Counterrotating Galaxies", Harsoula M. and Voglis N., 1999, 4th Panellenic Meeting, Samos, September 16-18, 1999.
- (11) "Cosmological Initial Conditions and Velocity Curves of Elliptical Galaxies", Gaga Th., Harsoula M. and Voglis N., 1999, 4th Panellenic Meeting, Samos, September 16-18, 1999.
- (12) "Counterrotating galaxies formed by clumpy initial conditions", M. Harsoula and N. Voglis, in Proceedings of the 4th Astronomical Conference of the Hellenic Astronomical Society, 2000.
- (13) "Crossing of various cantori", G. Contopoulos, M. Harsoula and N. Voglis, Celestial Mechanics and Dynamical Astronomy, 78, p. 197, 2000.
- (14) "Counterrotating galaxies and memory of cosmological initial conditions", N. Voglis, M. Harsoula and Ch. Efthymiopoulos, Celestial Mechanics and Dynamical Astronomy, 78, p. 265, 2000.
- (15) "Destruction of the islands of stability", Contopoulos G., Harsoula M., Voglis N., "Order and Chaos in Dynamical Systems", volume 6, Bountis T. and Pnevmatikos S. (eds), Pnevmatikos editions, Athens 2000.

(16) "Forming counterrotating galaxies", N.Voglis and M. Harsoula, Modern Theoretical and Observational Cosmology, Proceedings of the 2nd Hellenic Cosmology Meeting, held in the National Observatory of Athens, Penteli, 19-20 April 2001. Edited by M. Plionis, and S. Cotsakis. Astrophysics and Space Science Library, Vol. 276, Kluwer Academic Publishers, Dordrecht, 2002., p.273

(17) "Destruction of Noble Tori", G. Contopoulos, M. Harsoula and N. Voglis, Proceedings of the International conference "stellar dynamics: from classic to modern" in Saint Petesberg, p.224,2001.

(18) "Direct vs merger mechanism forming counterrotating galaxies", N. Voglis and M. Harsoula "Galaxies and chaos" , Lecture Notes in Physics, 626, p.365 , Springer, 2002.

(19) "Recurrence in Chaos" , Contopoulos G. And Harsoula M., Proceedings of the Academy of Athens, volume 77, 2002 and in the book "Lectures of the Aacdemy of Athens", 2000 , "Stihiagra"

(20) "Chaos in the case of Two fixed Black Holes: G. Contopoulos and M. Harsoula, Journal of Mathematical Physics, 45, p.4932., 2004.

(21) "Recurrence of order in chaos" G. Contopoulos, R. Dvorak, M. Harsoula and F. Freistetter, International Journal of Bifurcation and Chaos, vol. 15, p. 2865, 2005.

(22) "Chaotic Motions in the Field of Two Fixed Black Holes", G. Contopoulos and M. Harsoula , Cel. Mech. Dyn. Astron., vol. 92, p.189, 2005, citations: PhysRevD D, 2005

(23) Chaotic Motions in the Field of Two Fixed Black Holes, 200,5cdep.conf..189C

(23) "Systems with Escapes" G. Contopulos and M. Harsoula, N. York Acad. Sci. Annals., vol. 1045, p.139, 2005

(24) "Stability and Instability in the anisotropic Kepler problem" G. Contopoulos and M. Harsoula J. of Physics A: Math. Gen., vol. 38, p. 8897, 2005.

(25) "Orbits in the Anisotropic Kepler problem" Contopoulos G. and Harsoula M. 2006, in «Order and Chaos», volume 9 , p. 109, «Non-linear Science and Complexity», Bountis T and Vlahos N. (eds) , Proceedings of the 18th Summer School, held in Volos at18-30 of July, 2005 .

- (26) "Orbital structure in barred Galaxies" N. Voglis, M. Harsoula and G. Contopoulos, MNRAS, 381. p.757, 2007
- (27) "Orbital structure in barred Galaxies and the Role of Chaos" M. Harsoula, G. Contopoulos and K. Kalapotharakos in "Chaos in Astronomy" , Astrophysics and Space Science Proceedings, eds. G. Contopoulos and P.A. Patsis, Conference 17-20 September 2007, p.53
- (28) "Order and Chaos in Quantum Mechanics", G. Contopoulos, C. Efthymiopoulos and M. Harsoula in Proceedings of the 19th Summer School of Bountis T. "Complexity and Non-Linear Dynamics» held in Thessaloniki 10-22 July, 2006 . "Nonlinear Phenomena in Complex Systems", 2008, vol.11 p.107, eds. Gaisyonok, Kuvshinov
- (29) "Stickiness in Chaos" G. Contopoulos and M. Harsoula, International Journal of Bifurcation and Chaos, 2008, vol. 18, No. 10, p. 2929.
- (30) "Orbital Structure in N-body models of barred-spiral galaxies" M. Harsoula and C. Kalapotharakos, MNRAS 394, 1605, 2009
- (31) "Stickiness Effects in Conservative Systems" G. Contopoulos and M. Harsoula, Review article, International Journal of Bifurcation and Chaos (2010), vol. 20, No 7, p. 2010
- (32) "Stickiness" πρακτικά 9ου συνεδρίου ΕΛΑΣΕΤ 2009 G. Contopoulos and M. Harsoula Astronomical Society of the Pacific, Conference Series (ASP), vol. 424 "Advances in Hellenic Astronomy during the IYA09", eds. K. Tsiganos, D. Hatzidimitriou and T. Matsakos, p.355, 2010.
- (33) "Orbital structure and asymptotic orbits in barred-spiral galaxies" Proceedings of 9th Conference of the Hellenic Astronomical Society, 2009, M. Harsoula and C. Kalapotharakos, Astronomical Society of the Pacific, Conference Series (ASP), vol. 424 "Advances in Hellenic Astronomy during the IYA09", eds. K. Tsiganos, D. Hatzidimitriou and T. Matsakos, p.377, 2010
- (34) "Stickiness effects in Chaos" G. Contopoulos and M. Harsoula in Celestial Mechanics and Dynamical Astronomy for the CELEMC 5, 5th International Meeting on Celestial Mechanics in Viterbo (Italy), September 2009, 107, p.77, 2010
- (35) "Asymptotic Orbits in Barred Spiral Galaxies" M. Harsoula, C. Kalapotharakos and G. Contopoulos , 2011
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Monthly Notices of the Royal Astronomical Society, Volume 411, Issue 2, pp. 1111-1126

(36) “Diffusion of Chaotic Orbits in Barred Spiral Galaxies”, M. Harsoula, C. Kalapotharakos and G. Contopoulos 2011, International Journal of Bifurcation and Chaos, vol. 21, issue 08, p. 2223

(37) “Chaotic spiral galaxies”, Contopoulos, G.; Harsoula, M., 2012
Celestial Mechanics and Dynamical Astronomy, Volume 113, Issue 1, 81

(38) “Periodic orbits and escapes in dynamical systems”, Contopoulos, George; Harsoula, Mirella; Lukes-Gerakopoulos, Georgios, 2012, Celestial Mechanics and Dynamical Astronomy, Volume 113, Issue 3, pp.255-278.

(39) “The Speed of Arnold Diffusion” C. Efthymiopoulos and M. Harsoula 2013
Physica D, 251, p.19

(40) “3D Chaotic diffusion in barred spiral galaxies”, Contopoulos G. and Harsoula M., 2013, Monthly Notices of the Royal Astronomical Society, Volume 436, Issue 2, p.1201.

(41) “The diffusion of chaotic orbits in 3D barred spiral galaxies”, Harsoula M., 2013, The 11th Hellenic Astronomical Conference, held 8-12 September, 2013 in Athens, Greece. Online at <http://www.helas.gr/conf/2013/>

(42) “Analytical study of Order and Chaos”,
public session 15/5/2014, Contopoulos G., Efthymiopoulos Ch., Harsoula M., Katsanikas M., published in “Lectures of the Academy of Athens” ,2022, editor Stoihiagra

(43) “Resonant normal form and asymptotic normal form behaviour in magnetic bottle Hamiltonians”, Efthymiopoulos, C.; Harsoula, M.; Contopoulos, G., 2015, Nonlinearity, Volume 28, Issue 4, p. 851.

(44) “Analytical description of the structure of Chaos” M. Harsoula, G. Contopoulos and C. Efthymiopoulos, 2015, Journal of Physics A: Mathematical and Theoretical, 48, Issue 13, article id. 135102

(45) “Convergence regions of the Moser normal forms and the structure of chaos ”, Harsoula M. and C. Efthymiopoulos, 2015, the 12th Hellenic Astronomical Conference, held from June 28 to July 2, 2015 in Thessaloniki, Greece. Online at <http://www.helas.gr/conf/2015/presentations.php>

(46) “Convergence regions of the Moser normal forms and the structure of chaos”, Contopoulos G. and Harsoula M. 2015, Journal of Physics A: Mathematical and Theoretical, 48, Issue 33, article id. 335101

(47) “Analytical study of chaos and applications” G. Contopoulos, M. Harsoula and C. Efthymiopoulos, 2016, The European Physical Journal Special Topics, 225, 1070 pp.

(48) “Analytical forms of chaotic spiral arms” M. Harsoula, C. Efthymiopoulos and G. Contopoulos, 2016, Monthly Notices of the Royal Astronomical Society, 459, p.3419-3431

(49) «Mathematical study of Chaos», Contopoulos G., Harsoula M. And Efthymiopoulos Ch., Proceedings of the Academy of Athens volume 9, public session of 9th of June, 2016.

(50) “The road of Chaos: analytical description of the structure of chaos in dynamical systems and in Dynamical Astronomy”, Newer developments in Astronomy, Center for Astronomy and Applied Mathematics of the Academy of Athens, curation G. Contopoulos and P. Patsis, 2016

(51) “Chaotic spiral arms in barred spiral galaxies”, Newer developments in Astronomy, Center for Astronomy and Applied Mathematics of the Academy of Athens, curation G. Contopoulos and P. Patsis, 2017

(52) “Building “CX” peanut-shaped disk galaxy profiles. The relative importance of the 3D families of periodic orbits bifurcating at the vertical 2:1 resonance”, P. Patsis and M. Harsoula, 2018, Astronomy and Astrophysics, 612A, 114.

(53) “A galactic model of our Galaxy with two pattern speeds”, Newer developments in Astronomy, Center for Astronomy and Applied Mathematics of the Academy of Athens, curation G. Contopoulos and P. Patsis 2018

(54) “Global and Local diffusion in the Standard Map”, M. Harsoula and G. Contopoulos, 2018, Phys. Rev. E, 97, p. 022215

(55) “Characteristic times in the standard map”, M. Harsoula, K. Karamanos, K., G. Contopoulos, Phys. Rev. E, 99, 032203, 2019

(56) “The building blocks of spiral arms in galaxies”, Harsoula M., Efthymiopoulos Ch. And Contopoulos G. ,Newer developments in Astronomy, Center for Astronomy and Applied Mathematics of the Academy of Athens, curation G. Contopoulos and P. Patsis , 2019

- (57) “Manifold spirals in barred galaxies with multiple pattern speeds”, C. Efthymiopoulos, M. Harsoula and G. Contopoulos, *Astronomy and Astrophysics*, 636, 44, 2020
- (58) “The building blocks of spiral arms in galaxies” in *Hipparchos* (newsletter of the Hellenic Astronomical Society), M. Harsoula, 3, 13, 2020.
- (59) “Spiral density waves in galactic models”, Harsoula M., Contopoulos G. and Zouloumi K. ,*Newer developments in Astronomy*, Center for Astronomy and Applied Mathematics of the Academy of Athens, curation G. Contopoulos and P. Patsis , 2020
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