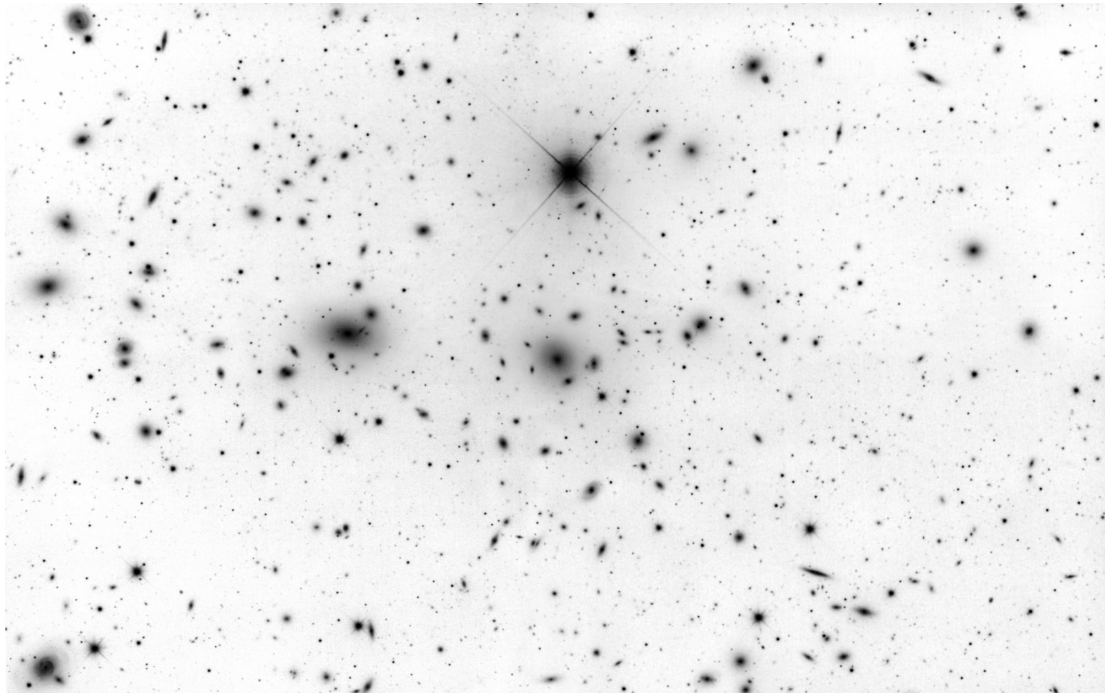




**Research Center for Astronomy
and Applied Mathematics**
of the Academy of Athens

ANNUAL REPORT

2017



Contact Address

Research Center for Astronomy and Applied Mathematics
of the Academy of Athens

Soranou Efesiou 4 Athens, GR-11527 GREECE

Tel.: (+30) 210 6597648

Fax: (+30) 210 6597602

E-mail: keaem@academyofathens.gr

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Staff Members in 2017

Supervisor Prof. George Contopoulos	(+30) 210-6597601	gcontop@academyofathens.gr
Acting Director Panos Patsis (Research Director)	(+30) 210-6597169	patsis@academyofathens.gr
Researchers Christos Efthymiopoulos (Research Director)	(+30) 210-6597513	cefthim@academyofathens.gr
Ioannis Contopoulos (Research Director)	(+30) 210-6597165	icontop@academyofathens.gr
Spyros Basilakos (Research Director)	(+30) 210-6597248	svasil@academyofathens.gr
Constantinos Gontikakis (Senior Researcher)	(+30) 210-6597246	cgontik@academyofathens.gr
Manolis Georgoulis (Senior Researcher)	(+30) 210-6597103	manolis.georgoulis@academyofathens.gr
Mirella Harsoula (Senior Researcher)	(+30) 210-6597157	mharsoul@academyofathens.gr
Scientific Associates Eleni Dara		edara@academyofathens.gr
Scientific Associates Vasileios Tritakis		vas@academyofathens.gr
Scientific Associates Theodosios Zachariadis		tzachar@academyofathens.gr
Information Systems Administrator & EPO Manolis Zoulias	(+30) 210-6597511	mzoulias@academyofathens.gr

Associate Members and Visitors

Post-doctoral Fellows

Konstantinos Florios	(+30) 210 6597145	cflorios@central.ntua.gr
Giannis Kontogiannis	(+30) 210 6597139	jkonto@noa.gr
Rocio Paez	(+30) 210 6597513	rociouisabelpaez@gmail.com
Athanasios Tzemos	(+30) 210 6597513	thanasistzemos@gmail.com
Sotirios Chatzopoulos	(+30) 210 6597169	mrsotiris2000@gmail.com
Konstantinos Tziotziou	(+30) 210 6597139	kostas.tziotziou@gmail.com
Evaggelos Chaliasos		
Eleni Christodoulidi	(+30) 210 6597513	

PhD Students

Elpida Koutsantoniou (Supervisor: I. Contopoulos) (+30) 210 6597143 leelamichaels@gmail.com

MSc Students

Konstantina Zouloumi (Supervisor: C. Efthymiopoulos) (+30) 210 6597513

Evangelia Samara (Supervisor: M. Georgoulis) evangelia.sam@gmail.com

Collaborators Georgia Aggelopoulou, Administrative support in the A-EFFort program (in collaboration with M. Georgoulis), Evaggelos Argoudelis, Financial and legal manager of the European program FLARECAST (in collaboration with M. Georgoulis), Panos Kyziropoulos (PhD student of the University of Thrace, collaboration with C. Efthymiopoulos), Mygdakos Constantinos, software manager in the framework of the A-EFFORT program of ESA (in collaboration with M. Georgoulis), Moraitis Constantinos, post-doc fellow at the Observatoire de Paris-Meudon (in collaboration with M. Georgoulis), L. Chaves-Velasques (PhD candidate, INAOE-Mexico, SEP-CONACYT program (in collaboration with P. Patsis).

About us

The Research Center for Astronomy and Applied Mathematics (RCAAM), is one of the Research Institutes of the Academy of Athens.

The main competences of RCAAM are Galactic Dynamics and Galactic Morphology, Nonlinear Dynamics and Chaos Theory, Solar Physics, Magnetohydrodynamics, Cosmology and Gravitation.

We are working towards comparing theoretical results with observational data from ground based as well as from space observatories (VLT, Solar Dynamics Observatory, etc.). The main scientific goals for the period 2016-17 include the study of the role of Chaos in supporting structures in Nbody simulations, the Dynamics of the Milky Way and other galaxies, the investigation of Chaos in quantum systems, the study of the magnetic connectivity in the active-regions of the solar atmosphere, the investigation of particle acceleration in the pulsar magnetosphere and the time profiles of the resulting high energy radiation, the formation and evolution of Structures in Cosmology as well as the nature of dark matter and dark energy.

A number of young researchers are coming to our Institute and successfully complete their PhD and Masters Theses. The researchers of our institute participate in fourteen (14) supervising committees of PhD and MSc theses. RCAAM members participated in the teaching of the courses "Galactic and Extragalactic Astronomy", "Dynamical Astronomy" and "Cosmology" at the Department of Physics of University of Athens.

RCAAM organizes since 1997 a seminar on a weekly basis, during the whole year, with speakers leading scientists from Greece and abroad. The talks are attended by many researchers, university professors and young scientists. RCAAM has organized in 2002 and 2007 international conferences on "Galaxies and Chaos" and on "Chaos in Astronomy" respectively. This series of conferences is planned to be continued during the next years. Another conference organized with great success by our Institute was the conference "Classical and Quantum Gravity", Crete 2009. Members of RCAAM participated also in the organization of several more conferences in Greece and abroad. Many other talks for the broad public are given every year by the researchers of RCAAM.

History

The Research Center for Astronomy and Applied Mathematics was established in 1959 initially as “Office for Research and Calculations”, to promote scientific research in Astronomy and Applied Mathematics and to perform calculations related to these topics. In 1966 has been renamed “Research Center for Astronomy and Applied Mathematics”. Since then scientific research has been conducted in the following fields, which are also the current working areas:

- Dynamical Astronomy, Nonlinear phenomena and applications of Chaos Theory in Astronomy
- Galactic Dynamics and Galactic Morphology
- Solar Physics and Relations between Solar and Terrestrial Phenomena
- Magnetohydrodynamics
- Cosmology and Gravitation

The first supervisor of the “Office for Research and Calculations”, and later of the “Research Center for Astronomy and Applied Mathematics”, was Academician Prof. I. Xanthakis, until his death on 10 July 1994. During the years 1994-1997 the Research Center was supervised by Academician Prof. N. Artemiadis. After 1997 the supervisor is Academician Prof. G. Contopoulos.

As directors have served in the past Dr. L. Mavridis (1960-1966), Dr. K. Makris (1971-1979), Dr. K. Poulakos (1981-2001), Dr. N. Voglis (2001-2007), Dr. V. Tritakis (2007), Dr. E. Dara (2008). Since 2009 acting director of the Center is Dr. P.A. Patsis. Researchers who have worked in the past in the Research Center were Dr. I. Lyritzis, Dr. V. Petropoulos and Dr. Th. Zachariadis.

Our Research

Nonlinear & Chaotic Dynamics

The research that is carried out in Nonlinear and Chaotic Dynamics has as goal the investigation in depth of chaotic phenomena and the application of Chaos theory in solving astronomical problems as well as problems in dynamics that are encountered in other science disciplines. The term "Chaos" means that the laws of Physics allow limited predictability, despite the fact that these laws are expressed by rigorous mathematical equations. Although the Theory of Chaos was first applied in astronomical dynamical systems, today it finds applications to various phenomena of interest for everyday life (for example: earth and space weather forecasting, earthquakes, development of complex digital networks etc.).

Galactic Dynamics & Galactic Morphology

Galactic Dynamics is the tool to understand the observed Morphology of disk and elliptical galaxies. Our research combines Orbital Theory, N-body Simulations and Hydrodynamics with Observations in large telescopes. The orbital analysis of bars and spirals in 2D and 3D models has revealed the dynamical phenomena that shape the forms of elliptical galactic systems, the spirals of normal and barred-spiral galaxies, as well as the edge-on profiles of galactic disks. In the last years research in this field in our Institute has underlined the role of chaotic orbits in reinforcing the spiral structure in barred-spiral systems and in the dynamics of disk galaxies in general.

Solar Physics

The members of RCAAM working in solar physics possess significant skills and experience in the study and analysis of (1) magnetic loops in the solar corona, (2) particle acceleration processes in reconnecting magnetic configurations, (3) small-scale phenomena in the solar atmosphere, including micro-flares and jets, (4) solar magnetography and related diagnostics, (5) solar eruptions and their connections with the Earth, including eruption prediction, and (6) fundamental properties and complexity of solar magnetism. RCAAM solar physicists perform both data analysis and modeling, routinely analysing data from multiple ground- and space-based instruments and actively collaborating with fellow solar and heliospheric physicists worldwide.

RCAAM solar physicists are active members of multiple international professional organizations and routinely attend and contribute to International Conferences, Workshops, Symposia, as well as to Public Outreach activities aiming to inform and educate the general public on aspects of heliophysics. They participate and organize multiple conferences and convene sessions within wider conferences. They interact and collaborate with colleagues in Greece, Europe in general, the United States, and Asia (China, Japan).

Astrophysical Magnetohydrodynamics

We are investigating the dynamics of electrically conducting magnetized fluids in various systems of astrophysical interest. Over the years, we have developed pioneering semi analytical solutions of the non-linear equations of Magnetohydrodynamics (MHD) in non-relativistic protostellar winds, relativistic galactic and extragalactic jets, magnetized protostellar collapse, the axisymmetric pulsar magnetosphere, and the magnetosphere of rotating black holes. More recently, we have been working on a particular regime of MHD, namely Force-Free Electrodynamics (FFE), and developed a numerical code that we implement in the study of the structure and high energy radiation of the three dimensional pulsar magnetosphere and the solar corona. We are investigating accretion disk magnetic winds as the origin of Warm Absorbers (WA) and Ultra Fast Outflows (UFO) in Active Galactic Nuclei (AGN). We are also actively investigating the role of a novel astrophysical mechanism, the Cosmic Battery, in the origin of astrophysical magnetic fields and in the dynamics of X-ray binaries and astrophysical jets.

Cosmology & Gravitation

In the field of Cosmology, research ranges from observational to fully theoretical aspects of Cosmological physics. In particular RCAAM is interested in: (a) statistical properties of the large scale structures as well as the geometry and topology of the distribution of matter in the Universe, (b) constraints on the cosmological parameters from cosmological data, (c) evolution of perturbations and structure formation in different cosmological models, (d) the nature of dark energy and the possible interaction between dark matter and dark energy, (e) alternative theories (except dark energy) for the accelerated expansion of the universe, and (f) classical and quantum cosmology of scalar fields.

In the field of Gravitation, research is pursued in the following thematic areas: (a) classical problems in General Relativity, (b) alternative theories of gravity, (c) black hole physics and in particular on the computation of Hawking radiation, black hole entropy and the possible solutions of the Black Hole Information Paradox, (d) quantum fields in curved spacetime, and (e) quantum gravity phenomenology.

Scientific Projects

The scientific staff of RCAAM participated during 2016 in the following programs:

1. **“Non-linear phenomena in galactic discs”**. Program of the Research Committee of Academy of Athens (200/815). (G. Contopoulos, P.A. Patsis, C. Efthymiopoulos, M. Harsoula, R. Paez).
Publications in journals with referees No: “4”, “5”, “8”.
Talks, presentations: PP-2, CE-3, CE-5. One paper submitted in journal with referees. There have been made observations with the telescope “Aristarchos” at Helmos in the optical wavelengths for 3 nights (P. Patsis, M. Xilouris, I. Alikakos, 21-22/7, 25-26/8, 29-30/9). The analysis of observations and a pertinent paper is in progress
2. **“Dissemination of research results”** Program funded from the general bequests for education of the Academy of Athens (200/870) (G. Contopoulos, A.C Tzemos). 39 seminars at the RCAAM and a special volume of RCAAM (see catalog in the paragraph “Seminars”).
3. **“Analytic Computation of Invariant Manifolds and the structure of Chaos”** (G. Contopoulos, C. Efthymiopoulos, M. Harsoula, R. Paez (not funded).
Talk: CE-7
4. **“Dimensionality in Physics and Astronomy”** (G. Contopoulos, E. Chaliasos)
Analytical study on the unification of Physics by means of Kaluza-Klein theory (5 dimensions) (not funded). Three papers submitted for publication in journals with referees.
5. **“Study of the stellar orbits and the gravitational potentials in galaxies with theoretical, numerical and observational methods”**. Program of Instituto Nacional de Astrofisica Optica y Electronica, Mexico, funded by the National Council for Research and Technology of Mexico (SEP-Conacyt). Coordinator: I. Puerari. Participation (P. Patsis). Duration: 2015-2018. The program includes the supervision of a PhD thesis (L.Chavez).
Publication in journal with referees: No “6”.
Talk: PP-5
6. **“The thick part of galactic bars”**. Program of Laboratoire d’ Astrophysique de Marseille, University Aix-Marseille (AMU), in collaboration with RCAAM (E. Athanassoula, P. Patsis), 2017-2018. The program funds the visits of researchers at LAM.
Talks: PP-3, PP-6
7. **“Simulation of the crossing effects of dark subhalos on the tidal streams around galaxies”**. AMU in collaboration with RCAAM (E. Athanassoula, C. Efthymiopoulos).

Publication in journal with referees: No "7". Moreover there have been used N-body codes, published in "9" and "12".

Talk: CE-7.

8. **"N-body simulations of galactic disks – The relation between observed spiral disk morphologies a/d the dynamical properties of DM halos"** (P. Patsis, A. Burkert. University of Munich, T. Naab, Max Planck Institute für Astronomie, P. Grosbol, European Southern Observatory, Munich). Program funded by the interdisciplinary program of excellence "Excellence Cluster" involving the Polytechnical School (TU) and the University (LMU) of Munich, the institutes Max-Planck for Astrophysics and extrasolar Physics in Munich and the European Southern Observatory (ESO). Computational time is provided in the Computational Center RZG, Garching, Germany, where numerical simulations with N-body models are conducted.
A paper in preparation
Talks: PP-1, PP-4
9. **"Marie Curie innovative Training Network "Stardust"**. Program funded by the European Committee. RCAAM participates as an Associate Partner represented by C. Efthymiopoulos (2014-2017)
Publications in journals with referees No: "10", "11" "3"
Two more papers submitted for review in journals with referees.
Talks: CE-1, CE-4
10. **"Study of the dynamical evolution of the entanglement and coherence in quantum systems"** (C. Efthymiopoulos, A. Tzemos) (not funded).
Publications in journals with referees No "1", "2"
Talks: CE-2, CE-6
11. **"Complex Dynamics of Hamiltonian Systems with many degrees of freedom"** Research funded by IKY in the framework of the program Education and Lifelong Learning-Supporting Postdoctoral Researchers. Post-Doc scholar Q E. Christodoulidi. Dr. Efthymiopoulos participates as scientific advisor.
Publication in journal with referees No "38".
12. **"MPNS COST Action MP1304, Exploring fundamental physics with compact stars"** 11/2013-11/2017 (directed by Pr. Luciano Rezzola). Participation: I. Contopoulos. Funded by the European Science Council. (Program that can be used for the funding of participation and organization of conferences.
13. **"Comparison of global non-potential magnetic field models of the solar corona"** international team with subject "Global Non-Potential Magnetic Models of the Solar Corona (coordinator: Pr. Anthony Yeates, Durham University, UK, participation: I. Contopoulos. Funded by the International Space Science Institute (ISSI), Bern, Switzerland. A paper in preparation.

14. **“Using starburst galaxies to trace the cosmic acceleration”** (S. Basilakos, M. Plionis, AUT, R. Terlevich, Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Mexico and University of Cambridge. It is about a collaboration of RCAAM with the National Observatory of Athens, Institute INAOE of Mexico and the University of Cambridge. It is financially supported by INAOE (duration 2011-2018).
Publications in journal with referees No: “30”
15. **“Testing General Relativity on Cosmological scales”** Research program for testing of the General Theory of Relativity in cosmological scales. Program funded by the Research Committee of the Academy of Athens. Dr. Basilakos is the scientific advisor of the program (2017-2019). Publications in journals with referees No: “25”, “27”
16. **“XMM-Newton Very Large Programme”** Program of European Space Agency (ESA) with collaboration between many Universities and Institutes. Dr. Basilakos is the scientific director of the section named “AGN Cosmology” (not funded). (Duration 2010-2020).
Publication in journal with referees No: “23”
17. **“The nature of dark energy”** Research Program for the study of the nature of dark energy. It is a collaboration between several Universities (S. Basilakos, M. Plionis, AUT, J. Sola (Un. of Barcelona), S. Capozziello (Un. Of Naples), A. Lima (Un. of Sao Paulo) and N. Mavromatos (King College, Un. of London). It is financially supported by the Universities of Barcelona, Naples and Sao Paulo (Duration 2011-2018).
Publications in referees with reviewers No: “22”, “24”, “26”, “28”, “19”, “31”.
18. **“Flare Likelihood and Region Eruption Forecasting (FLARECAST)”** . Program Horizon 2020 of the European Committee (1/2015-12/2017). Scientific Coordinator: M. Georgoulis. Participator: C. Gontikakis. Total budget: 2.415.000 € (Budget of RCAAM of the Academy of Athens: 375.000 €).
Publication in journal with referees No: “33”, “36”, “37”
Talks in Conferences MG-1, MG-4, MG-8, MG-9, MG-17, MG-19
19. **“Athens Effective Solar Flare Forecasting (A-EFFort)”** Sponsor: European Space Agency (ESA), 10/2014-12/2015. Total budget: 100.000 €. Scientific Director: M. Georgoulis. A paper in preparation.
20. **“Dissemination of results A-EFFort”** Program of the Research Committee of the Academy of Athens (200/857)(M. Georgoulis). Total budget: 4.400 Euros
21. **“Decoding the Pre-Eruptive Magnetic Configurations of Coronal Mass Ejections”**. Program funded by the International Space Science Institute (ISSI), Bern, Switzerland. Main Researchers: Spiros Patsourakos (UOI) and Aggelos Vourlidas (The John Hopkins University Applied Physics Laboratory [JHU/APL],

USA. RCAAM representative: M Georgoulis. Two meetings partially funded by ISSI
webpage: <http://www.issibern.ch/teams/magnetichelicity/>
Talks: MG-5
A paper in preparation

22. **“Development of the ASPIICS Coronagraph for the PROBA-3 Mission”** Program of the European Space Agency (ESA). Principal Investigator : Dr. Andei Zhukov, Royal Observatory of Belgium, Belgium, Principal Investigator from Greece: K. Tsiganos, (UOA). Participator from RCAAM: M. Georgoulis. 2009-undefined.
23. **“VarSITI/ISEST/MiniMax24”** Program of the Scientific Committee for Solar Terrestrial Physics (SCOSTEP). Principal Investigators: J. Zhang, G. Mason University, USA, M. Temmer, University of Graz, Austria and N. Gopalswamy, NASA Goddard Space Flight Center. Duration 1/2014-12/2018. Participator from RCAAM: M. Georgoulis (not funded).
webpage: <http://www.varsiti.org>
Publication in journal with references No: “32”
24. **“Understanding and forecasting of Solar Flares- Supplementary Action”** Sponsored by the Research Committee of the Academy of Athens. (January 2017- December 2018). Program number: 200/871. Total budget: 10.000 Euros. Participator from RCAAM: M. Georgoulis.
Participations in conferences: MG-2, MG-5, MG-6, MG-10, MG-13, MG-17, MG-19
25. **“ESA/SSA SWE Solar Weather Expert Service Center (ESC)”** Sponsored by the European Space Agency Space Situational Awareness Programme (ESA/SSA). Principal Investigator: Dr. Jesse Andries, Royal Observatory of Belgium. Participator from RCAAM: M.Georgoulis (12/2017-6/2019). Program number: not defined yet. Total budget (for the Academy of Athens): 57000 Euros
26. **“Advanced Particle Events Casting System (ASPECS)”** Sponsored by ESA. Principal Investigator: Dr. Anastasios Anastasiadis, NOA. Participator from RCAAM: M. Georgoulis. (2017-2019). Total budget for the Academy of Athens:= 150.000 Euros.
27. **“Odysseus II Contest”** Sponsored by the European Committee (Program Horizon 2020). Coordinator: E. Tavlaki (Signosis), Brussels, Belgium. M. Georgoulis, member of the international committee of referees. (2016-2017).
webpage:<https://www.odysseus-contest.eu>. Goal: To give awards for the best student papers in the field of astronomy and space science.
Participation in Conference: MG-11

28. **“Construction of experimental station for the measurement of Schuman waves and preliminary measurements”**. Scientific Director of research program, V. Tritakis. Program funded by Mariolopoulio Foundations and the University of Ioannina. Participator from RCAAM: I. Contopoulos. Experimental measurements also work for the construction of a permanent station are underway

Publications in 2017

During 2017 there were published or accepted for publication 61 papers, of which 39 were in journals with referees. Specifically the publications are:

Special Editions

RCAAM published a special volume (in Greek) with title “Advances in Astronomy 2017” (Eds., G. Contopoulos and P.A. Patsis), which includes a series of papers summarizing the recent research results of RCAAM.

Furthermore, Dr. Patsis was the editor for the 14th issue (Volume 2) of the journal of Hellenic Astronomical Society “Hipparchos”.

Publications in International Journals with Referees

1. Tzemos A.C., Contopoulos G. and Efthymiopoulos C., 2017, “Partial integrability of 3d Bohmian trajectories”, J. Phys. A., 50, 19
2. Tzemos A.C. and Contopoulos G., 2017, “Integrals of motion in 3-d Bohmian trajectories”, J. Phys. A., in press
3. Harsoula M. and Contopoulos G., 2017, “Global and Local diffusion in the Standard Map”, Phys. Rev. E, in press
4. Patsis P. A. and Tsigaridi L., 2017, “The flow in the spiral arms of slowly rotating bar-spiral models”, Astroph. Sp. Sc., 362, 129
5. Patsis P.A. and Harsoula M., 2017, “Building CX peanut-shaped disk galaxy profiles. The relative importance of the 3D families of periodic orbits bifurcating at the vertical 2:1 resonance”, Astron. Astroph., in press (<https://doi.org/10.1051/0004-6361/201731114>)
6. Chaves-Velasquez L., Patsis P. A., Puerari I., Skokos Ch. and Manos T., 2017, “Boxy Orbital Structures in Rotating Bar Models”, Astroph. J. 850, 145
7. Efthymiopoulos C., 2017, “Mind the Galactic Bar”, Nature Astron., 1, 9, pp. 571-572. (Σχόλιο)

8. Paez R. and Efthymiopoulos C., 2018, "Secondary resonances and the boundary of effective stability of Trojan motions". *Cel. Mech. Dyn. Astron.*, (in press), arXiv 1712.08460
9. Kyziropoulos P., Filelis-Papadopoulos C.K., Gravvanis G. and Efthymiopoulos C., 2017, "Toward the design of a novel hybrid parallel N-body method in scope of modern cloud architectures". *J. Supercomputing*, in press, doi 10.1007/s11227-017-2140-5
10. Celletti A., Efthymiopoulos C., Gachet F., Galeş C. and Pucacco G., 2017, "Dynamical models and the onset of chaos in space debris", *Int. J. Nonlin. Mechanics*, 90, pp. 147-163.
11. Gkolias I., Efthymiopoulos C., Pucacco G. and Celletti A., 2017, "Hamiltonian formulation of the spin-orbit model with time-varying non-conservative forces". *Comm. Nonlin. Sci. and Num. Sim.*, 51, pp. 23-38.
12. Kyziropoulos P., Filelis-Papadopoulos C.K., Gravvanis G., and Efthymiopoulos C., 2017, "A parallel Self Mesh-Adaptive N-body method based on approximate inverses". *J. Supercomputing*, in press
13. Gachet F., Celletti A., Pucacco G. and Efthymiopoulos C., 2017, "Geostationary secular dynamics revisited: application to high area-to-mass ratio objects", *Cel. Mech. Dyn. Astron.*, 128, 149-181
14. Contopoulos I., Nathanail A. and Strantzalis A., 2017, "The signature of the Blandford-Znajek mechanism in GRB light curves", *Galaxies*, 5, 21
15. Contopoulos I. Kazanas D. and Fukumura K., 2017, "Magnetically Advected Winds", *Mon. Not. R. Astron. Soc.*, 472, L20
16. Contopoulos I., 2017, "Electric currents along astrophysical jets", *Galaxies*, 5, 71
17. Contopoulos I., 2017, "The immediate environment of an astrophysical black hole", *Mon. Not. R. Astron. Soc.*, 473L, 146
18. Contopoulos I., Nathanail A., Sadowski A. Kazanas and D. Narayan R., 2018, "Numerical simulations of the Cosmic Battery in accretion flows around astrophysical black holes", *Mon. Not. R. Astron. Soc.*, 473, 721
19. Fukumura K., Kazanas D., Shrader C., Behar E., Tombesi F. and Contopoulos I., 2017, "Magnetic origin of black hole winds across the mass scale", *Nature Astron.*, 1, 0062
20. Christodoulou D. M. Laylock S. G. T. Kazanas D. Cappallo R. and Contopoulos, I., 2017, "The Great Pretenders Among the ULX Class", *Res. Astron. Astroph.*, 17, 063

21. Fukumura K., Kazanas D., Shrader C., Behar E. Tombesi F. and Contopoulos I., 2017, "Magnetized Disk-Winds in NGC 3783", *Astroph. J.*, in press
22. Basilakos S., Kamali V. and Mehrabi A., 2017, "Measuring the effects of loop quantum cosmology in the CMB data", *Int. J. Mod. Phys. D.*, 26, 1743023
23. Basilakos S. and Nesseris S., 2017, "Conjoined constraints on modified gravity from the expansion history and cosmic", *Phys. Rev. D.*, 96, 063517
24. Papagiannopoulos G., Barrow J.D., Basilakos S., Giacomini A. and Paliathanasis A., 2017, "Dynamical symmetries in Brans-Dicke cosmology", *Phys. Rev. D.*, 95, 024021 (2017)
25. Malekjani M., Basilakos S., Mehrabi A., Davari Z. and Rezaei M., 2017, "Agegraphic dark energy: growth index and cosmological implications", *Mon. Not. R. Astron. Soc.*, 464, 1192
26. Malekjani M., Basilakos S. and Heidari N., 2017, "Spherical collapse model and cluster number counts in power-law $f(T)$ gravity", *Mon. Not. R. Astron. Soc.*, 466, 3488
27. Rezaei M., Malekjani M., Basilakos S., Mehrabi A. and Mota D. F., 2017, "Constraints to Dark Energy Using PADE Parameterizations", *Astroph. J.*, 843, 65
28. Kamali V., Basilakos S., Mehrabi A. et al., 2017, "Tachyon warm inflation with the effects of Loop Quantum Cosmology in the light of Planck 2015", *Int. J. Mod. Phys. D.*, in press (arXiv:1703.01409)
29. Papagiannopoulos G., Basilakos S., Paliathanasis A., Savvidou S. and Stavrinos P. C., 2017, "Finsler-Randers cosmology: dynamical analysis and growth of matter perturbations", *Class. Quan. Grav.*, 34, 225008
30. Melnick J., Telles E., Bordalo V, Chavez R. Fernandez-Arenas D., Terlevich R., Terlevich E., Bresolin F., Plionis M. and Basilakos S., 2017, "The $L-\sigma$ relation for HII galaxies in green", *Astron. Astroph.*, 599, 76
31. Fernandez-Arenas D., Terlevich R., Terlevich E., Melnick J., Chavez R., Bresolin F., Telles E., Plionis M. and Basilakos S., 2017, "An independent determination of the local Hubble constant", *Mon. Not. R. Astron. Soc.*, in press (arXiv:1710.05951)
32. Patsourakos S. and Georgoulis M. K., 2017, "A Helicity-Based Method to Infer the CME Magnetic Field Magnitude in Sun and Geospace: Generalization and Extension to Sun-Like and M-Dwarf Stars and Implications for Exoplanet Habitability", *Solar Phys.*, 292, 89

33. Kontogiannis I., Georgoulis M. K., Park S.-H. and Guerra J. A., 2017, "Non-Neutralized Electric Currents in Solar Active Regions and Flare Productivity", *Solar Phys.*, 292, article id. 159
34. Guo Y., Pariat E., Valori G., Anfinogentov S., Chen F., Georgoulis M. K., Liu Y., Moraitis K., Thalmann J. K. and Yang S., 2017, "Magnetic Helicity Estimations in Models and Observations of the Solar Magnetic Field. III. Twist Number Method", *Astrophys. J.*, 840, article id.40
35. Anastasiadis A., Papaioannou A., Sandberg I., Georgoulis M. K., Kouloumvakos A., Tziotziou K. and Jiggins P., 2017, "Forecasting Flares and Solar Energetic Particle Events: the FORSPEF Tool", *Solar Phys.*, 292, article id. 134
36. Guerra J. A., Park S.-H., Kontogiannis I., Gallagher P. T., Georgoulis M. K. and Bloomfield D. S., 2017, "Active Region Photospheric Magnetic Properties Derived from Line-of-Sight and Radial Fields", *Solar Phys.*, in press
37. Florios K., Kontogiannis I., Park S.-H., Guerra J. A., Benvenuto F. and Georgoulis M. K., 2017, "Forecasting Solar Flares Using Magnetogram-Based Predictors and Machine Learning", *Solar Phys.*, in press
38. Christodoulidi H., 2017, "Extensive packet excitations in FPU and Toda lattices", *Europhys. Lett.* 119/40005.
39. Bisbas T. G., van Dishoeck E.F., Papadopoulos P. et al., 2017, "Cosmic-ray Induced Destruction of CO in Star-forming Galaxies", *Astroph. J.*, 839, 2

Publications in conference proceedings and other publications with referees:

1. Efthymiopoulos C., Contopoulos G. and Tzemos A.C., 2017, "Chaos in de Broglie - Bohm quantum mechanics and the dynamics of quantum relaxation", *Ann. Fond. Louis Broglie*, 42, 133-159
2. Behar E., Fukumura K., Kazanas D., Shrader C. R., Tombesi F. and Contopoulos I. 2017, "MHD Wind Models in X-Ray Binaries and AGN", *Amer. Astron. Soc. Society*, HEAD meeting No 16, id.108.15
3. Korsos M. B., Poedts S., Gyenge N., Georgoulis M. K., Yu S., Bios S., Yan Y., Ruderman M. S. and Erdelyi R., 2017 "On the Evolution of Pre-Flare Patterns of a Three-Dimensional Model of AR 11429", *Proc. IAU Symp.* 335, in press
4. Georgoulis M. K., 2018, "Ambivalent Role of Field-Aligned Electric Currents in the Solar Atmosphere, Invited AGU Refereed Monograph in *Electric Currents in Geospace and Beyond*" (Eds., A. Keiling, O. Marghitu and M. Wheatlnd), J. Wiley and Sons, in press (κεφάλαιο βιβλίου)

5. Massone A. M., Piana M., et al (Georgoulis M. K.), 2018, "Machine Learning for Flare Forecasting, in Machine Learning Techniques for Space Weather" (Eds. E. Camporeale, S. Wing and J. Johnson), Elsevier, in press (κεφάλαιο βιβλίου)

Publications in conference proceedings and other publications without referees:

1. Patsis P. A., 2017, "Outer spiral structure in disk galaxies", in the Proceedings of the International Astronomical Union, IAU Symposium, "Formation and Evolution of Galaxy Outskirts", A. Gil de Paz, J. H. Knapen and J.C. Lee (eds), 321, 123
2. Chaves-Velasquez L., Puerari I. and Patsis P. A., 2017, "Stellar Orbital Structures in Slowly Rotating Bar Models", Rev. Mex. Astron. Astrof. (Serie de Conferencias) 49, 86, XV Latin American Regional IAU Meeting Cartagena 2016 (Eds. M.A. Higuera Garzón, S. Vargas Domínguez)
3. Patsis P.A., Xilouris M. and Alikakos J., 2017, "Boxy bulges and the 3D morphology of galactic bars", Hipparchos 14, vol.2., 21
4. Contopoulos I., 2017, "An astronomer is reading the six days of creation", Proceedings of the interdisciplinary conference "Begin and evolution of Cosmos and the mankind with reference in the six days of creation by Basil the Great. Interdisciplinary approximation", Department of Theology of the University of Athens (October 17-18)
5. Georgoulis M. K. and Patsourakos S., 2017, "Can Stellar Eruptions Influence Exoplanet Habitability?", Hipparchos, vol. 2., issue 14, p.30 (June)

Publications in Greek

1. G. Contopoulos: The existence of life in the Universe, Academy of Athens, 6-4-2017.
2. G. Contopoulos: Life in the Universe, Magazine "Aktines" (in Greek), 2017.
Moreover the contents of the special edition "Advances in Astronomy 2017" are:
3. G. Contopoulos, C. Efthymiopoulos, A.C. Tzemos: Chaos in Quantum Mechanics.
4. P. Patsis: Models of slowly rotating barred-spiral galaxies
5. C. Efthymiopoulos: Simulating the environment of galactic discs
6. I. Contopoulos: Magnetic winds around astrophysical black holes.
7. S. Basilakos: The rate of expansion of the Universe

8. C. Gontikakis: Radiation scattering in the ultraviolet spectral emission lines, from the transition zone of chromosphere-corona
9. M. Georgoulis and S. Patsourakos: The birth and propagation of solar bursts in the heliosphere: what we learn for star bursts and their effect on exoplanets?
10. M. Harsoula: Chaotic spirals in barred spiral galaxies
11. V. Tritakis: Atmospheric electricity, Schumann resonances and pertinent measurements in Greece.
12. I. Kontogiannis: Forecast indexes of solar flares: parameterizing the explosivity of active regions.

Distinctions

In recognition of the scientific work of Mr. Efthimiopoulos, the asteroid 2002 PV34 was called "Efthymiopoulos", (decision of the Minor Planet Center meeting of 12/01/-2017 of the International Astronomical Union).

Mr. Basilakos received an honorary distinction for work 22 in the international gravity contest held annually in the US by the Gravity Research Foundation (USA), May 2017.

Participation in Conferences and Talks

P. Patsis

- PP-1. Participation in the 13th conference of the Hellenic Astronomical Society, Heraklion, July 2-6. Talk: "Gaseous flows and starforming dynamical mechanisms in the spiral arms of barred spirals", July 4.
- PP-2. Participation in the 24th summer school-conference: "Dynamical systems and complexity", Volos July 12-21. Invited talk: "Nonlinear phenomena in galactic disks", July 15.
- PP-3. Invited talk at the Laboratoire d'Astrophysique de Marseille (LAM), "Stellar and gaseous flows in barred-spiral models: The implications for star formation along the spiral arms", May 16.
- PP-4. Invited talk at the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Tonanzitla, Mexico, "Dynamical Mechanisms supporting spirals in disk galaxies", October 5.
- PP-5. Invited talk at the National Autonomous University of Mexico (UNAM), Mexico City, Mexico, "Boxy Structures in Bars", October 11.

PP-6. Invited talk at the NCSR Democritus (Group of complex systems and applications), "Orbital stability in 3D Hamiltonian systems and the peanut-shaped structure of the galactic bars", December 6.

C. Efthymiopoulos

- CE-1. "Analytical study of the secular dynamics of the geosynchronous space debris." in
in
CELMECVII, Viterbo, Italy, (September 2017). Invited talk.
- CE-2. "3D Vortices, Bohmian Chaos and Quantum Relaxation." in 2nd FQXI Workshop on Quantum Rogue Waves as Emerging Quantum Events, Ecole de Marseille (July 2017). Invited talk.
- CE-3. "Analytical Framework for Exo-Trojan Dynamics." in 9th Humboldt Colloquium on Celestial Mechanics, Bad Hofgastein, Austria (March 2017). Invited talk.
- CE-4. "Theory and Applications of Spin-Orbit secondary resonances." Observatoire de la Cote d'Azur, Nice (July 2017).
- CE-5. "Accurate measurement of Arnold diffusion using computer-algebraic optimal normal forms." in Workshop on Computational Dynamics, Foundations of Computational Mathematics FOCM 2017, Barcelona (July 2017).
- CE-6. "Asymptotic properties of quantum normal forms and effects on quantum dynamics". Evaluation seminar of the Mechamol Consortium, Amsterdam (May 2017).
- CE-7. "The invariant manifold modelling of spiral structure." Laboratoire d'Astrophysique de Marseilles (June 2017).

I. Contopoulos

- IC-1. "Current sheets in ideal force-free magnetospheres", Astronomy Division, University of Thessaloniki, April 3.
- IC-2. "Magnetic Winds around Astrophysical Black Holes", Astronomy Division, University of Thessaloniki, October 2.
- IC-3. "Magnetic Winds around Astrophysical Black Holes", Department of Physics, University of Athens, October 11.
- IC-4. "Dissipation in Astrophysical Current Sheets", Department of Applied Mathematics, Leeds University, UK, 9 Μαρτίου.
- IC-5. "Current sheets in ideal force-free magnetospheres", Lebedev Institute of Physics of the Russian Academy of Sciences (FIAN), Moscow, April 26.

IC-6. "Practical applications of magnetohydrodynamics", Moscow Engineering Physics Institute (MEPhI), Moscow, April 27.

IC-7. "Electric currents along astrophysical jets in Polarized Emission from Astrophysical Jets", Ierapetra, Crete, May 12-16.

C. Gontikakis

CG-1. Participation in the conference: FLARECAST science workshop, Observatoire de Paris, June 26-29.

CG-2. Participation in the 13th conference of the Hellenic Astronomical Society, Herakleion, July 2-6.

CG-3. Participation as invited speaker in the conference of Statistical Physics (Corfu), July 10-14. Talk: "Influence of particle acceleration on the heating of the solar coronal plasma and a data-driven model on nanoflares in solar active region loops."

CG-4. Seminar at the Institut d'Astrophysique Spatiale Orsay France with title: Phénomènes de diffusion dans les raies C IV 1548A, 1550A, (SUMER) et Si IV 1393A, 1402A, (IRIS) (April 18).

CG-5. Seminar at the Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA) Observatoire de Paris with title: Phénomènes de diffusion dans les raies C IV 1548A, 1550A, (SUMER) et Si IV 1393A, 1402A, (IRIS) (April 27).

CG-6. Talk at the FLARECAST science workshop, Observatoire de Paris with title: Differential Emission Measure temporal evolution as precursor to solar flares (June 28).

CG-7. Talk at the international conference of Statistical Physics with title: Influence of particle acceleration on coronal heating, and a nanoflare active region model.

CG-8. Poster in the 13th conference of the Hellenic Astronomical Society with title: Possible solar flare precursors by Differential Emission Measure studies in active regions: the FLARECAST approach.

CG-9. The transition zone of chromosphere-corona by far ultraviolet spectroscopy. Department of Physics, class on solar physics for Physics senior students (December 18).

M. Georgoulis

- MG-1. FLARECAST First Stakeholders Workshop, Exeter, Μεγάλη Βρετανία. (January 12-13).
- MG-2. L5 Workshop, London, UK. Short presentation /intervention with title "Advocating for Identical Magnetographs at L5 and L1" (March 6-9).
- MG-3. International CCMC – LWS Workshop: Assessing Space Weather Applications and Understanding, Cape Canaveral, Florida, ΗΠΑ. Co-organiser of the session for the forecasting of solar flares. Furthermore two talks with title: Solar Flare Prediction Team: Contribution to the Discussion Inferring the CME / ICME Magnetic Field from Magnetograms and Coronagrams: the Helicity-CME Model (with S. Patsourakos, University of Ioannina) (April, 3-7).
- MG-4. FLARECAST 2nd Year Review Meeting, Brussels, Belgium (April 11).
- MG-5. ISSI Workshop on Decoding the Pre-Eruptive Magnetic Configuration of Coronal Mass Ejections, Bern, Switzerland. Invited talk with title "ISSI Pre-Eruptive Stage Part II". (May 8-11).
- MG-6. First China Europe Solar Physics Meeting (CESPM-1), Kunming, Province of Yunnan, China. Representative of the European society as President of ESPD/EPS. Member of the scientific committee. Furthermore, a talk with title "A Non-Trivial View of Photospheric Electric Currents in Solar Active Regions". (May 15-19).
- MG-7. Greek Participation in Solar Orbiter Mission, meeting that took place at NOA, Thiseio. Member of the scientific organising committee. Furthermore, a talk with title "Active Regions Observations in the Solar Orbiter Era" (June 5).
- MG-8. 4th FLARECAST Full Consortium Meeting, Observatoire de Paris – Meudon. Co-ordinator of the meeting with several presentations and interventions (June 26-27).
- MG-9. FLARECAST Science Workshop, Observatoire de Paris – Meudon. Two talks with title: FLARECAST Overview Toward a Future Integrated Forecasting System: Linking Solar Flares to CME and SEP Forecasts. (June 28-29).
- MG-10. 13th Hellenic Astronomical Conference, Heraklion, Crete. Member of the scientific organising committee as secretary of Hel.A.S. Furthermore a talk with title "Linking Solar Eruptions with Fundamental Physical Parameters at the Solar Atmospheric Base". (July 2-6).
- MG-11. Final competition Odysseus II, Toulouse, France. Member of the international committee of reviewers. (July 5-7).

- MG-12. PROGRESS Summer School, Majorca, Spain. Invited talk with title "FLARECAST: The Fully Automated Solar Flare Forecasting System". (July 26-28).
- MG-13. 15th European Solar Physics Meeting (ESPM-15), Budapest, Hungary. Head of the scientific organising committee as president of the ESPD/EPS. In addition a poster presentation with title "CME Magnetic Field and Impact in Terrestrial and Exoplanet Magnetospheres". (September 4-8).
- MG-14. SEPRAD Expert Workshop, Seibersdorf Labs, Vienna, Austria. Invited talk with title "Progress and Challenges Toward A Future Integrated Space Weather Forecasting System". (September 18-19).
- MG-15. PSTEP Flare Prediction Workshop, University Nagoya, Japan, closed meeting. Two invited talks: ESA/SSA SWE A-EFFort Service FLARECAST Status Update (October 31 - November 3).
- MG-16. Third Helicity Thinkshop, Tokyo University, Japan. Member of the scientific organising committee. Moreover an invited talk with title "Magnetic Helicity in the Solar Atmosphere: Much Gained, Still a Lot to Learn". (November 19-23).
- MG-17. 14th European Space Weather Week (ESWW14), Ostend, Belgium. Co-organiser of a session. Moreover a talk and two electronic posters: Talk with title "Inferring ICME Magnetic Fields at 1 AU and Elsewhere: the H-CME Method" Electronic poster with title "Finalizing the FLARECAST Project)" Electronic poster with title "Validation-Based Decision Making" (November 27- December 1).
- MG-18. FLARECAST Second Users Workshop, Ostend, Belgium. Coordinator of the conversation with several presentations and interventions. (November 29).
- MG-19. 2017 Fall AGU Meeting, New Orleans, USA. A talk and a poster: Talk with title "The Next Level in Automated Solar Flare Forecasting: the EU FLARECAST Project" Poster with title "A New Spin to Exoplanet Habitability Criteria".
- MG-20. Royal Observatory of Belgium, Belgium. Scientific seminar with title "Magnetic Field Magnitude of Coronal Mass Ejections in Solar and Stellar Habitable Zones: Recent Results", April 10 2017.
- MG-21. IAADET of NOA. Scientific seminar with title "Magnetic Field Magnitude of Coronal Mass Ejections in Solar and Stellar Habitable Zones: Habitability Constraints", June 1.

Organisation of Conferences and Meetings

1. PP-1. Dr. Patsis was member of the scientific organising committee (SOC) of the 13th international conference of the Hellenic Astronomical Society, Her-

- aklion, July 2-6 and coordinator of the session “Extragalactic Astronomy and Astrophysics”.
2. SB-1. Dr. Basilakos was coordinator of the session “Cosmology and Relativistic Astrophysics” in the Hel.A.S. conference, 02-06/07/2017, Heraklion.
 3. MG-1. Dr. Georgoulis was member of the scientific organising committee, First China Europe Solar Physics Meeting (CESPM-1), Kunming, Yunnan Province, China, May 15 – 19.
He was also:
 4. MG-2. Member of the scientific organising committee, 13th Hellenic Astronomical Conference, Heraklion, Crete July 2-6.
 5. MG-3. President of the scientific organising committee, 15th European Solar Physics Meeting (ESPM-15), Budapest, Hungary, September 4 – 8.
 6. MG-4. Co-organiser of the session Progress in Space Sciences Fostered by the European Commission, 2017 EGU General Assembly, Vienna, Austria, April 23 – 28.
 7. MG-5. Co-organiser of the session, Best Practice In Transitioning Existing Space Science Tools To Operational SW Prediction Systems, 14th European Space Weather Week (ESWW14), Ostend, Belgium, November 27 Νοεμβρίου – December 1.
 8. MG-6. Organiser, FLARECAST First Stakeholders Workshop, Exeter, UK, January 12 – 13.
 9. MG-7. Coordinator, co-head of work group, International CCMC – LWS Workshop: Assessing Space Weather Applications and Understanding, Cape Canaveral, Florida, USA, April 3 – 7.
 10. MG-8. Organiser, FLARECAST 2nd Year Review Meeting, Brussels, Belgium, April 11.
 11. MG-9. Co-organiser, Greek Participation in Solar Orbiter Mission, meeting at NOA, Thiseion, June 5.
 12. Mg-10. Organiser, 4th FLARECAST Full Consortium Meeting, Observatoire de Paris – Meudon, June 26 – 27.
 13. MG-11. Co-organiser, FLARECAST Science Workshop, Observatoire de Paris – Meudon, June 28 – 29.
 14. MG-12. Co-organiser, Third Helicity Thinkshop, Tokyo University, Japan, November 19 – 23.

Seminars

RCAAM, aiming at the continuous effort to inform both researchers and postgraduate students in modern research, organizes weekly seminars, funded mainly by the Academy of Athens, by decision of its Council, while some researchers of foreign institutions were funded by their institutions to come and speak in the seminars. In 2017 39 seminars took place at RCAAM, most of them about Astronomy, Astrophysics and Mechanics.

The invited speakers were, beside the researchers and students of RCAAM, Academicians, professors and distinguished scientists from various universities and research centers in Greece and abroad. Here is the complete list of the seminars.

Table of Invited Talks 2017

Panos Patsis RCAAM of the Academy of Athens	Shocks, star formation and spiral arms in galaxies	11/1/2017
Despoina Chatzidimitriou University of Athens	The Hubble Catalog of Variables	17/1/2017
Christos Efthymiopoulos RCAAM of the Academy of Athens	Emergent non-linearities from quantum mechanics	24/1/2017
Rocio Isabel Paez RCAAM of the Academy of Athens	Resonant dynamics in the Trojan problem	31/1/2017
Zaharias Roupas University Eötvös Loránd	Gravitational Phase Transitions	7/2/2017
Athina Kousthenis LESIA - Observatory of Athens	Space Exploration of Habitable Worlds in the Outer Solar System	16/2/2017

Constantinos Gourgouliatos University of Leeds	Magnetic Field Evolution in Neutron Star Crusts	21/2/2017
Vasileios Rothos University of Thessaloniki	Localized Structures in Nonlinear Magnetic Metamaterial Lattices	28/2/2017
Emmanouil Floratos UOA & NCSR Democritos	Eigenstate Thermalization Hypothesis and Fast Scrambling Bound on Black Hole Horizons: A Quantum Cat Map Toy Model	7/3/2017
Christos Efthymiopoulos RCAAM of the Academy of Athens	Dynamics of tidal interactions	14/3/2017
Dimosthenis Kazanas NASA/GSFC, University Maryland	The Universal Magnetic Structure of Black Hole Accretion Disk Winds	21/3/2017
Ioannis Contopoulos RCAAM of the Academy of Athens	Practical Applications of Magnetohydrodynamics	28/3/2017
Anastasios Anastasiadis Athens Observatory	Foretelling Flares and Solar Energetic Particle Events the FORSPEF tool	4/4/2017
Manolis Georgoulis RCAAM of the Academy of Athens	Magnetic Field Magnitude of Coronal Mass Ejections in the Solar and Stellar Habitable Zones: A Habitability Constraint	25/4/2017
Panagiotis Stavrinos UOA	Finsler Geometry, Lorentz Violation and Cosmology	2/5/2017
Emmanouil Saridakis Ntua and Baylor University	Modified Gravity Theories and their Cosmological Consequences	9/5/2017
Constantinos Karamanos TEI of Athens	Introduction to Symbolic Dynamics at the Feigenbaum point	16/5/2017

Constantinos Gontikakis RCAAM of the Academy of Athens	Diagnostic of the Chromosphere - corona transition region in Extreme Ultraviolet spectrum. Analysis of the mechanism of radiative scattering using spectral lines recorded with SUMER and IRIS spectrographs	23/5/2017
Rudolf Dvorak University of Vienna	The Race to find the Second Earth	30/5/2017
Aggelos Vourlidis University Johns Hopkins	Another STEREO Accomplishment: The First Multi-Viewpoint Coronal Mass Ejection Catalog	7/6/2017
Alexei Pevtsov US National Observatory, University Oulu	Search for a Signature of Twist-Removal in Magnetic field of Sunspots in Relation with Major Flares	13/6/2017
Athanasios Tzemos RCAAM of the Academy of Athens	Partial Integrability in 3d Bohmian Trajectories	20/6/2017
Constantinos Karamanos TEI of Athens	Measuring the Uncomputable: Entropy Analysis of Automatic Sequences Revisited	27/6/2017
Charis Skokos University Cape Town	Heterogeneity and Chaos: Granular Chains and DNA models	5/9/2017
Maria Petropoulou Purdue University	Plasmoids in relativistic magnetic reconnection: the blobs of blazar emission models?	12/9/2017
Astero Provata NCSR Democritos	Chimeral states in oscillator networks with non local couplings	19/9/2017
Ioannis Contopoulos RCAAM of the Academy of Athens	Magnetic Winds around Astrophysical Black Holes	26/9/2017

Rocio I. Paez RCAAM of the Academy of Athens	A fully predictive model for the adiabatic evolution of the actions in Arnold diffusion	3/10/2017
Christos Efthymiopoulos RCAAM of the Academy of Athens	Tidal Streams around Galaxies	10/10/2017
Maria Chira University of Thessaloniki	Environmental Dependence of the Abundance function of Light-Cone simulation Dark Matter Halos	17/10/2017
Alceste Bonanos Athens Observatory	First results from the lunar monitoring project NELIOTA	24/10/2017
Ioannis Almirantis NCSR Democritosersity	Origin of life: abiogenesis – prebiotic evolution – complexity	31/10/2017
F. George Anagnostopoulos University of Thrace	Space Observations and Earthquake Related Electromagnetic Phenomena	7/11/2017
Evangelos Paouris University of Athens	Forecasting Space Weather conditions from Interplanetary Coronal Mass Ejections	14/11/2017
Andreas Efstathiou European University of Cyprus	Models for the panchromatic emission of galaxies in the near and far Universe	21/11/2017
Vasileios Constandoudis NCSR Democritos	Seeking the mathematical footprint of meaning in written texts: multifractal analysis and long-range correlations	28/11/2017
Demetrios Nanopoulos Academy of Athens	Starobinsky-like inflation, supercosmology and neutrino masses in no-scale flipped SU(5)	5/12/2017
Constantinos Karamanos TEI of Athens	On the Poincare recurrence theorem in higher dimensions	12/12/2017
Athanasios Tzemos RCAAM of the Academy of Athens	A Review of Chaos in BQM	19/12/2017

Teaching

Researchers of RCAAM taught postgraduate courses in university departments, seminars for students and researchers, and schools organized by scientific associations.

- **Dr. Patsis** taught, under assignment, the postgraduate lesson “Galactic and Extragalactic Astronomy” of the Astronomy, Astrophysics and Mechanics Division of UoA, (in collaboration with assistant professor Dr. S. Kazantzidis).
- **Dr. Efthymiopoulos** taught, under assignment, the postgraduate lesson “Dynamical Astronomy” (spring semester) in the postgraduate program Astronomy-Astrophysics of the Physics Department of UoA. Moreover he made three lectures as a member of the teaching group of the postgraduate lesson “Non-linear Dynamical Systems”, during the spring semester and three lectures as a member of the teaching group of the postgraduate lesson “Special topics of Complexity” in the framework of the postgraduate lesson “Mathematical Modelling” which is coorganised by National Polytechnical University and the network COSA of NCSR Demokritos.
- **Dr. Basilakos** taught the lesson of Cosmology (winter and spring semester of 2017) in the Mathematics and Physics Departments of UOA. During the winter semester of 2017 he taught Cosmology to postgraduate students of the Physics Department of UOA.
- **Dr. Georgoulis** taught in 2 scientific seminars
 1. School of Aviation Medicine of the 251 GHA. Seminar with title “The solar Atmosphere”, January 24.
 2. School of Aviation Medicine of the 251 GHA. Seminar with title “Space Weather and its Impact”, January 24.

Phds and Masters

RCAAM researchers participate in other PhD supervision committees inside and outside of RCAAM. Specifically, during 2017 RCAAM members supervised the PhD of:

- E. Koutsantoniou, “Cosmic battery in accretion discs around astrophysical black holes” (supervisor: Dr. I. Contopoulos)

and the Masters of:

- K. Zouloumi, “Invariant manifolds and spiral structure of galaxies” (supervisor: Dr. C. Efthymiopoulos)

- F. Anagnostopoulos, "Study of the accelerating rhythm of expansion of the Universe" (supervisor: Dr. S. Basilakos)

All of the aforementioned persons are postgraduate students of Physics Department of the UOA.

Furthermore: Dr. Patsis is the co-supervisor of Leonardo Chavez Velasquez's PhD in the Instituto Nacional de Astrofisica, Optica y Electronica (INAOE), Puebla, Mexico, with title "Numerical and Analytical Studies of Orbits in Models of Spiral Galaxies" in the framework of the program No "4". For this purpose, Mr. Chavez-Velasquez visited RCAAM for two months.

Dr. Patsis participates in the supervising committee of the PhD of Magdalini Aggelakopoulou with title "Numerical and theoretical study of 3d Hamiltonian systems in Economics" (Department of Economics, University of Thessaly).

Dr. Patsis was a member of the examining board of the PhD thesis of A. Gana, "Complex population dynamics and economic repercussions", University of Thessaly, Department of Economical Studies (April 6).

Dr. Efthymiopoulos participates in the supervising committee of Mr. P. Kyziropoulos's PhD thesis with subject "Simulations of N-body systems with pre-resonance techniques" (Department Of Electrical Engineering, University of Thrace)

Dr. Efthymiopoulos was also the supervisor of the Master's thesis of K. Zouloumi, University of Athens, with title "Invariant manifolds and spiral structure of galaxies".

Finally, Dr. Efthymiopoulos was member of the PhD examining committees of the PhD theses of F. Gachet with title "Analytical modelling of the long term dynamics of Earth satellites" and I. Gkolias with title "Modelling of resonances in small body orbital and rotational dynamics, both at the "Dipartimento di Matematica, Universita degli Studi di Roma Tor Vergata". He collaborated with both of the above researchers during their visits to RCAAM, in the framework of the funded program Marie Curie ITN Stardust.

Dr. I. Contopoulos is one of the three members of Mr. N. Trifonidis's PhD supervision board, Department of Physics, University of Thessaloniki. Subject: Computational study of nonlinear phenomena of Magnetohydrodynamic with applications in Astrophysics".

Dr. Basilakos supervises the PhD of I. Papagiannopoulos (UoA) with title "Study of symmetries in cosmologic models of alternative gravitation" and the PhD of F. Anagnostopoulos with title "Study of the accelerating expansion of the Universe in the framework of the dark energy models".

Dr. Basilakos is one of the three members of the PhD supervision board of

1. Mr. A. Papageorgiou's at the University of Thessaloniki with subject "Cosmological parameters and dark energy".
2. Mr. A. Triantafyllopoulos at the University of Athens with subject "Finsler Geometries and their cosmological expansions".
3. Mr. G. Gakis at NTUA with subject "Generalized gravity theories at the tangent bundle".

Dr. Georgoulis supervises the Masters of Mrs. Evangelia Samara (student at UoA) entitled "Magnetic Field of Coronal Mass Ejections (CMEs) and its effect on Planetary Magnetospheres: Methods and Effect on Exoplanets". Mr. Georgoulis also participated in two PhD examining committees:

1. As a member of the seven-member Committee of the Ph.D. of Mr. Konstantinos Boutatzis entitled "Thin Texture of Metric Radio Ex- Type IV Observations of the Multichannel Radio Spectrum Analyzer ARTEMIS-IV "(Supervisor: Prof. Panagiota Preka - Papadima, University of Athens). The thesis was successfully presented on October 20.
2. As a member of the seven-member examination board, of the PhD of Mr. Athanasios Kouloumpakos entitled "Study of the Wave of Wave on Solar Cord and the Mesoplanetary Space "(Supervisor: Prof. Alexander Nintos, University of Ioannina). The PhD was successfully presented on December 5.

Missions – Visits to other Research Institutions

1. Panos Patsis

He visited the Laboratoire d'Astrophysique de Marseille "(LAM) (May 8-22), invited by Professor Dr. E.A- thanassoula, in order to collaborate with her and her group on Galactic Dynamics, where he made a talk (PP-3).

He visited the Instituto Nacional de Astrofísica, Óptica y Electrónica "(INAO) (October 1-15) invited by Professor Dr. I. Puerari in order to collaborate with him and his group on Galactic Dynamics, where he made a talk(PP-4).

He was visited the University of National Autonomous University of Mexico "(UNAM), Mexico City, Mexico, (October 16-17) invited by Professor Dr. B. Pichardo and made a talk (PP-5).

He visited the Laboratoire d'Astrophysique de Marseille "(LAM) (November 9-23), invited by Professor Dr. E.Athanassoula in order to collaborate with her and her group on Galactic Dynamics.

2. Christos Efthymiopoulos

He was invited to attend as a visiting professor in the framework of a funded program, the Laboratoire d'Astrophysique of the University of Aix- Marseille from 08/06 to 12/07/2017, where he participated in research as visiting professor and make invited seminars both at LAM and Observatoire from the Cote d'Azur, Nice, France.

3. Spiros Basilakos

He visited the Department of Physics at the University of Barcelona- from 11/09 to 14/09/2017, where he made an invited talk.

4. **Constantinos Gontikakis**

He was visiting professor in Paris from 3 April to 5 May at the Institut d'Astrophysique spatiale.

Incoming Visitors

- Dr. P. Papadopoulos, associate professor in the University of Thessaloniki was hosted at RCAAM for collaboration with Dr. Patsis and Dr. Basilakos.
- Dr. K. Gourgouliatos (Leeds University, UK) (February 13 - March 3) was hosted at RCAAM in the framework of MPNS COST Action MP1304 " Exploring fundamental physics with compact stars" (funded by the European Science Council) for collaboration with I. Contopoulos, on the evolution of neutron star magnetic fields.
- Prof. Demosthenes Kazanas (NASA/Goddard Space Flight Center, USA), (March 20-22) was hosted at RCAAM for collaboration with I. Contopoulos on the magnetic winds from black hole accretion disks.

Participation in Committees

The members of RCAAM are active members in many national and international scientific committees for the promotion of researchers and university professors in Greece and abroad. They serve also as referees in the main research astronomical journals.

Promotion of Astronomy and Public Outreach

The researchers of RCAAM were invited to give lectures in educational institutions and events for the public. They also wrote articles for the public while their interventions helped to disseminate the research results of the Centre.

- P.Patsis: Interview at the Athens news agency regarding the importance of the discovery of seven exoplanets by NASA around the Trappist-1 star (February 24).
Talk for the work of Demetrios Aiginitis during an event dedicated to the memory of Ioannis Varvakis, organised by Varvakeios School at the convention hall of the Bank of Greece (March 17).
- C. Efthymiopoulos: Star observation event at the 6th Elementary School of Katw kastritsi, Patras (June 1).

- I. Contopoulos: "Space travel", 12th Elementary School of Glyfada, March 6, camps of the Cathedral of Nafpaktos, July 16, Cathedral of Spetses, August 21.
 "Taking photos of a black hole", student meeting "Students meet Physics", organised by the Hellenic Physical Society, Tei of Athens, December 17.
 "An astronomer is reading the six days of creation", "Begin and evolution of Cosmos and mankind with reference to the six days of creation by Basil the Great. An interdisciplinary approximation", Department of Theology of the University of Athens (October 17-18).
- M. Georgoulis: "Solar activity and its effect on our life", Public University of Elefsina (February 1) and Lyceum of the penitentiary center of Avlona (February 13).
 "International efforts for the forecasting of solar activity: from theory to practice", 5th festival of Astronomy in Chios island, Campos (August 10).
 "Robotical space missions: our eyes in the Universe", Homeric educational center of Chios municipality, Chios (September 15).
 "Third year of FLARECAST: the solar flare forecasting system of the future", Academy of Athens, January 2017.
 webpage: <http://www.academyofathens.gr/el/node/1655>
 "FLARECAST: Preparing mankind for the next large solar storm". webpage of radio1d.gr, January 23.
 webpage: <http://www.radio1d.gr/epikairoτητα/149185-flarecast-proetoimazontas-tin-anthropoita-gia-tin-epomeni-megali-iliaki-kategida>
 Furthermore, 3 appearances in television (in ALPHA and Action24 channels), 2 references in electronic press, 2 outreach articles and 2 interviews.
- M. Harsoula: March: Outreach talk at Technopolis (with the astrophysicist Kalliopi Dasira) with title: "Galaxies and black holes: creation and co-evolution". The talk was recorded by the Theocharakis Foundation and can be found at the webpage:
<http://www.blod.gr/lectures/Pages/viewlecture.aspx?LectureID=3368>
 Talk at 1st kindergarten of Papagou with interactive game and construction of planetary system with title: "Our solar system" (March).
 Talk at the penitentiary center of Avlona with tile: "The cosmos of galaxies" (April)
- V. Tritakis: "The contribution of colors in Science", Etaireia Filwn tou Laou.
 "The begin, the evolution and the future of life on Earth", educational center of Sparta.
 "Contemporary technology in our life", Rotarian Club of Glyfada.

- J. Kontogiannis: "Sun a small giant in our neighbourhood, 7 invited presentations to schools at the Aikaterini Lascarides Foundation.
 "Living with the Sun, an unpredictable giant", talk in the Astronomy club of the Hellenic-German School (February 10)
 "Solar flares: The great challenge", talk at the Athens Science Festival (March 31)
 "Sun, the giant of our neighbourhood", talk at the children festival of Agios Nicolaos, Crete, (June 18).
 Participation in exhibitions of physical and chemical experiments, at the children festival of Agios Nicolaos, Crete, (June 17).
 "Sun, an unpredictable giant", Science night, Amaliapoilis Magnisias (August 8).
 Presentation of the FLARECAST program at the Researcher nigh (September 29).
 "Sun, an unpredictable giant", Korydallos educational center (November 22).
 Participation in exhibitions of physical and chemical experiments, at the children library of the municipality of Chalandri, (December 27).
 Furthermore 13 outreach papers at the inserted volume PRISMA of the newspaper "Avgi".
- A.C. Tzemos: "Faith confession of the founders of Quantum Mechanics", Christian Scientific Union (November 11).