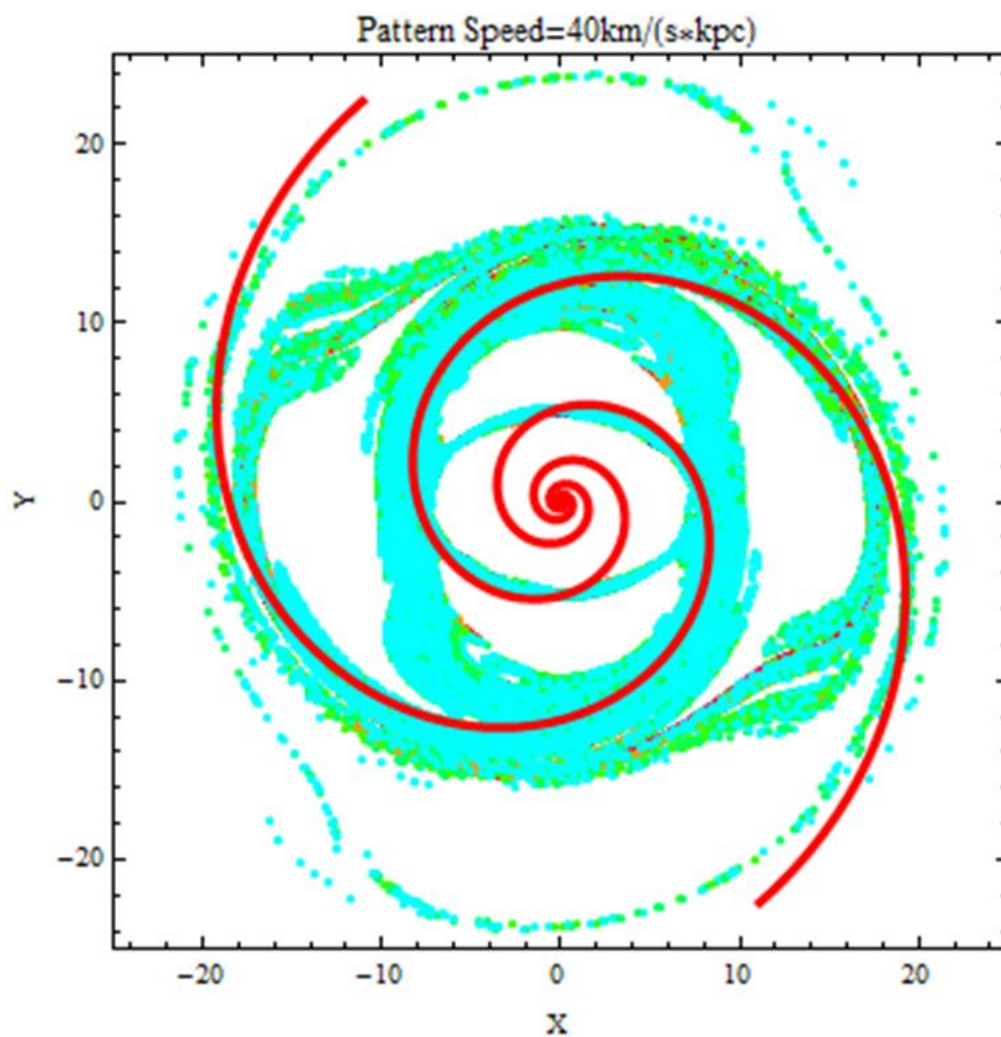




**Research Center for Astronomy
and Applied Mathematics**
of the Academy of Athens

ANNUAL REPORT 2018



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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 2018-19 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 (200/895). (G. Contopoulos, P.A. Patsis, C. Efthymiopoulos, M. Harsoula, R. Paez).
Publications in journals with referees No: “1”, “4”, “6”, “7”, “8”.
Talks, presentations: PP-1, CE-4.
2. **“Dissemination of research results”** Program funded from the general bequests for education of the Academy of Athens (200/901) (G. Contopoulos, A.C Tzemos). 37 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).
Publications in journals with referees No: “9”
Talks: CE-2, CE-3, CE-5
4. **“Quantum Dynamical Systems - Chaos and Entanglement Measures”** (G. Contopoulos, R. Paez.
Publications in journals with referees No: “2”
5. **“Study of the dynamical evolution of the entanglement and coherence in quantum systems”** (G. Contopoulos, C. Efthymiopoulos, A. Tzemos) (not funded).
Publications in journals with referees No “3”
Talks: AT-1, AT-2
6. **“Dimensionality in Physics and Astronomy”** (G. Contopoulos, E. Chaliasos). Non relativistic explanation of the magnetic anomaly of spin in seven dimensions (not funded). One paper submitted for publication in journals with referees.
7. **“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-2
8. **“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.

One paper submitted for publication in journals with referees.

9. **“Numerical investigation of the impact of Complex Instability to the phase space structure of Dynamical Systems with emphasis to barred galaxy models”** (H. Skokos, University of Cape Town, S. Africa, P. Patsis, A. Bäcker, Technische Universität Dresden, Germany). 2018-2019. Program funded by the University of Cape Town, supporting the visits of H. Skokos at RCAAM. H. Skokos visited RCAAM in July 2018
One paper in preparation.
10. **“Simulation of the crossing effects of dark subhalos on the tidal streams around galaxies”**. AMU in collaboration with RCAAM (E. Athanassoula, C. Efthymiopoulos).
One paper in preparation.
11. **“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.
One paper in preparation
12. **“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: “48”.
Talks: CE-1
13. **“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: “16”
14. **“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: "20-26", "28-29"

15. **"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).
16. **"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).
17. **"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: "34-37"
18. **"Athens Effective Solar Flare Forecasting (A-EFFort)"** Sponsor: European Space Agency (ESA), 10/2014-12/2015. Total budget: 100.000 €. Scientific Director: M. Georgoulis.
19. **"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.
20. **"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>
21. **"Solar Orbiter Modeling and Data Analysis Working Group (MADAWG)** Sponsor: ESA Principal Investigator: Dr. Alexis Rouillard, Insitute of Research in Astrophysics and Planetology (IRAP), Toulouse, France, Participation from RCAAM: M. Georgoulis. 2017 – undefined
Webpage: <https://sites.google.com/site/solarorbiterdawg/home>
One paper in preparation.

22. **“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.
Publications in journals with referees No: “33” Participations in conferences: MG-1, MG-3
23. **“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
24. **“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.
25. **“Construction of experimental station for the measurement of Schumman 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 journals with referees No: “15”

Publications in 2018

Special Editions

RCAAM published a special volume (in Greek) with title “Advances in Astronomy 2018” (Eds., G. Contopoulos and P.A. Patsis), which includes a series of papers summarizing the recent research results of RCAAM.

Dr. Patsis was the editor for the 1st issue of the journal of Hellenic Astronomical Society “Hipparchos”.

Furthermore Dr. Georgoulis was editor of the special volumes:

α) Space Weather Research Across the Full Data Lifecycle (Eds. R. M. McGranaghan, A. Anastasiadis, E. Camporeale and M. K. Georgoulis), J. Space Weather Space Climate, 2018, in press and

β) Advances in Solar Physics, from the Solar Interior to the Heliosphere (Eds. M. K. Georgoulis and E. Kontar), Adv. Space Res., 2018, in press

Publications in International Journals with Referees

(Published or accepted for publication in 2018)

1. Harsoula M. and Contopoulos G., 2018, "Global and Local diffusion in the Standard Map", 2018, Phys. Rev. E, 97, 022215
2. Tzemos A.C. and Contopoulos G., 2018, "Integrals of motion in 3-d Bohmian Trajectories", J.Phys. A, 51, 075101
3. Tzemos A.C., Efthymiopoulos C. and Contopoulos G., 2018, "Origin of chaos in 3-d quantum vortices: A General Bohmian theory", Phys. Rev. E, 97, 042201.
4. Patsis P.A. and Harsoula M., 2018, "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., 612, 114
5. Chaves-Velasquez L., Patsis P.A., Puerari I., Moreno E. and Pichardo B., 2018, "Dynamics of thick, open spirals in Perlas potentials", Astroph. J., in press
6. Font J., Beckman J.E., James P.A. and Patsis P.A., 2018, "Spiral structure in barred galaxies. Observational constraints to spiral arm formation mechanisms", Mon. Not. R. Astron. Soc., in press
7. Efthymiopoulos C., Kyziropoulos P., Paez R.I., Zouloumi K. and Gravvanis G., 2018, "Manifold spirals, disc-halo interactions and the secular evolution in N-body models of barred galaxies", Mon. Not. R. Astron. Soc. (in press).
8. Paez R. and Efthymiopoulos C., 2018, "Secondary resonances and the boundary of effective stability of Trojan motions", Cel. Mech. Dyn. Astron., 130, 20, 1
9. Kyziropoulos P., Filelis-Papadopoulos C.K., Gravvanis G. and Efthymiopoulos C., 2018, "Toward the design of a novel hybrid parallel N-body method in scope of modern cloud architectures", J. Supercomputing, 74, 569
10. Contopoulos I., 2018, "Current closure in the pulsar magnetosphere", Mon. Not. R. Astron. Soc., in press
11. Contopoulos I., 2018, "The immediate environment of an astrophysical black hole", Mon. Not. R. Astron. Soc., 473, L146
12. Contopoulos I., Nathanail A., Sadowski A., Kazanas D. and Narayan R., 2018, "Numerical simulations of the Cosmic Battery in accretion flows around astrophysical black holes", Mon. Not. R. Astron. Soc., 473, 721
13. Papadopoulos D. B. and Contopoulos I., 2018, "The magnetic Rayleigh-Taylor instability around astrophysical black holes", Mon. Not. R. Astron. Soc., in press (tmp.3020P)
14. Christodoulou D. M., Laycock S. G. T., Kazanas D. and Contopoulos I., 2018, "Flaring activity from quiescent states in neutron-star X-ray binaries", Res. Astron. Astrophys., 18, 142

15. Christofilakis V., Tatsis G., Votis C., Contopoulos I., Repapis C. and Tritakis V., 2018, "Significant ELF perturbations in the Schumann Resonance band before and during a shallow mid-magnitude seismic activity in the Greek area (Kalpaki)", *J. Atmospheric Sol.-Terr. Phys.*, in press
16. Yeates E. R., Amari T., Contopoulos I. και 17 συν-συγγραφείς, 2018, "Global non-potential magnetic models of the solar corona during the March 2015 eclipse", *Space Sci. Rev.*, 214, 99
17. Fukumura K., Kazanas D., Shrader C., Behar E., Tombesi F. and Contopoulos I., 2018, "Variable Nature of Magnetically Driven Ultra-Fast Outflows", *Astroph. J.* 864, L27
18. Bogovalov S. V., Contopoulos I., Prosekin A., Tronin I. and Aharonian F. A., 2018, "Magnetic absorption of VHE photons in the magnetosphere of the Crab pulsar", *Mon. Not. R. Astron. Soc.*, 476, 4213
19. Fukumura K., Kazanas D., Shrader C., Behar E., Tombesi F. and Contopoulos I., 2018, "Magnetized Disk-Winds in NGC 3783", *Astroph. J.*, 853, 40
20. Basilakos S., Paliathanasis A., Barrow J.D. et al., 2018, "Cosmological singularities and analytical solutions in varying vacuum cosmologies", *Eur. Phys. J. C.*, 78, 684
21. Basilakos S., Nesseris S., Anagnostopoulos F.K. et al., 2018, "Updated constraints on $f(T)$ models using direct and indirect measurements of the Hubble parameter", *JCAP*, 08, 008
22. Anagnostopoulos F. and Basilakos S., 2018, "Constraining the dark energy models with $H(z)$ data: An approach independent of H_0 ", *Phys. Rev. D.*, 97, 3503
23. Kamali V., Basilakos S., Mehrabi A., Motaharfar M. and Massaelli E., 2018, "Tachyon warm inflation with the effects of loop quantum cosmology in the light of Planck 2015", *Int. J. Pod. Phys. D.*, 27 1850056
24. Karpathopoulos L., Basilakos S., Leon G., Paliathanasis A. and Tsamparlis M., 2018, "Cartan symmetries and global dynamical systems analysis in a higher-order modified teleparallel theory", *Gen. R. Grav.*, 50, 79
25. Luna C. A. , Basilakos S. and Nesseris S., 2018, "Cosmological constraints on γ -gravity models", *Phys. Rev. D.*, 98, 023516
26. Mehrabi A. and Basilakos S., 2018, "Dark energy reconstruction based on the Padé approximation; an expansion around the Λ CDM", *Eur. Phys. J. C.*, 78, 889
27. Fernandez A., Terlevich E., Terlevich R. et al. (Basilakos S.), 2018, "An independent determination of the local Hubble constant", *Mon. Not. R. Astron. Soc.*, 474, 1250

28. Papageorgiou A., Basilakos S. and Plionis M., 2018, "Comparison of the linear bias models in the light of the Dark Energy Survey", *Mon. Not. R. Astron. Soc.*, 476, 2621
29. Papagiannopoulos G., Basilakos S., Barrow J.D. and Paliathanasis A., 2018, "New integrable models and analytical solutions in $f(R)$ cosmology with an ideal gas", *Phys. Rev. D.*, 97, 024026
30. Akhlaghi I. A., Malekjani M., Basilakos S. and Haghi H., 2018, "Model selection and constraints from holographic dark energy scenarios", *Mon. Not. R. Astron. Soc.*, 477, 3659
31. Gontikakis C. and Vial J.-C., 2018, " Effects of resonant scattering of the Si IV doublet near 140 nm in a solar active region", *Astron. Astroph.*, 619, 64
32. Kontogiannis I., Gontikakis C., Tsiropoula G. and Tziotziou K., 2018, "Probing the Quiet Solar Atmosphere from the Photosphere to the Corona", *Sol. Phys.*, 293, 56
33. Georgoulis M. K., Papaioannou A., Sanberg I., Daglis I. A., Anastasiadis A., Rodriguez-Gasen R., Aran A., Sanahuja B. and Nieminen P., 2018, "Analysis and Interpretation of Inner-Heliospheric SEP Events with the ESA Standard Radiation Environment Monitor (SREM) Onboard the Integral and Rosetta Mission", *J. Space Wea. Space Clim.*, 8, A40
34. Park. S.-H., Guerra J. A., Gallagher P. T., Georgoulis M. K. and Bloomfield D. S., 2018, "Photospheric Shear Flows in Solar Active Regions and their Relation to Flare Occurrence", *Solar Phys.*, 293, 114
35. Kontogiannis I., Georgoulis M. K., Park S.-H. and Guerra J. A., 2018, "Testing and Improving a Set of Morphological Predictors of Flaring Activity", *Solar Phys.*, 293, 96
36. Florios K., Kontogiannis I., Park S.-H., Guerra J.-A., Benvenuto F., Bloomfield D. S., and Georgoulis M. K., 2018, "Forecasting Solar Flares Using Magnetogram-Based Predictors and Machine Learning", *Solar Phys.*, 293, 28
37. Guerra J. A., Park S.-H., Gallagher P. T., Kontogiannis I., Georgoulis M. K. and Bloomfield D. S., 2018, "Active Region Photospheric Magnetic Properties Derived from Line-of-Sight and Radial Fields", *Solar Phys.*, 293, 9
38. Tritakis V., Repapis C. and Karamanos A., 2018, "Confirmation of an Early Estimation for an increase in the seismic activity towards the end of the twentieth century.", *J. Seismol.*, 22:921
39. Votis C., Tatsis G., Christofilakis V., Kostarakis P., Repapis C. and Tritakis V., 2018, "A new portable ELF Schumann resonance receiver: design and detailed

analysis of the antenna and the analog front-end.”, EURASIP J. Wirel. Commun. Netw., 155,
<https://doi.org/10.1186/s13638-018-1157-7>

40. Christodoulidi H., Bountis A. and Drossos L., 2018, “The effect of long-range interactions on the dynamics and statistics of 1D Hamiltonian lattices with on-site potential”, Eur. Phys. J. Sp. Topics, 227, 563
41. Papadopoulos P.P., Bisbas T.G. and Zhang Z-Y., 2018, “New places and phases of CO-poor/C I-rich molecular gas in the Universe”, Mon. Not. R. Astron. Soc., 478, 1716

Publications in conference proceedings and other publications with referees:

1. Fukumura K., Contopoulos I., Shrader C., Behar E., Kazanas D. and Tombesi F., 2018, “Variable Nature of Magnetically-Driven Ultra-Fast Outflows (UFOs) from AGN Accretion Disks”, 42nd COSPAR Scientific Assembly 14-22 July 2018, Pasadena, California, USA, E1, 4-45-18
2. Kazanas D., Fukumura K., Behar E., Shrader C., Tombesi F. and Contopoulos I., 2018, “MHD Winds as X-ray Absorbers in AGN Across the Black Hole Mass Scales”, Proceedings of the Meeting of the American Astronomical Society, 231, 404.04
3. Contopoulos I., 2018, “An astronomer reads the six days of creation”, Proceedings of the Interdisciplinary Conference “The begin and the evolution of Cosmos and Man with reference to the six days of creation of Basil the Great. An interdisciplinary approach”, Theological School of the University of Athens, Athens, October 17-18 2017.
Public electronic publication, ISBN: 978-960-99068-9-0, p. 115-121
4. Contopoulos I., 2018, “A Cosmic Battery in accretion flows around astrophysical black holes”, Proceedings of Science (PoS), Proceedings of the International Conference with title: “Black Holes as Cosmic Batteries: UHECRs and Multimessenger Astronomy”, Foz do Iguacu, Brasil, September 12-15, (arxiv: 1901.3228), in press
5. Georgoulis M. K., 2018, “The 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. Wheatland), AGU Geophysical Monograph Series 235, 371
6. Korsos M. B., Poedts S., Gyenge N., Georgoulis M. K., Yu S., Bios S., Yan Y., Ruderman M. S. and Erdelyi R., 2018, “On the Evolution of Pre-Flare Patterns of a Three-Dimensional Model of AR 11429”, Proc. IAU Symp. 335, 294

7. Massone A. M., Piana M. et al., 2018, "Machine Learning for Flare Forecasting, in Machine Learning Techniques for Space Weather" (Eds. E. Camporeale, S. Wing and J. Johnson), Elsevier, p. 355
8. Florios C. and Tritakis V., 2018, "Quasi- Preseismic Electromagnetic Perturbations Before two Earthquakes in North Greece", Proceedings of the the conference with title "International Conference in Meteorology, Climatology and Atmospheric Physics." COMECAP, Alexandroupolis, October 15-17, page 193, in press,
http://comecap2018.gr/wp-content/uploads/2018/12/COMECAP_PRAKTIKA_final.pdf .

Publications in conference proceedings and other publications without referees:

1. Contopoulos G., 2018, "Highlights of chaos research", Proc. Conference on Dynamical Systems and Complexity, Athens 2018, arXiv:1807.09492

Publications in Greek

The contents of the special edition "Advances in Astronomy 2018" are:

1. G. Contopoulos and R. Paez: Order in Chaos
2. P. Patsis: Dynamics of 3-d galactic spirals
3. C. Efthymiopoulos : Tides in our solar system
4. I. Contopoulos: Physical processes around a black hole
5. S. Vasilakos and M. Pleionis: Cosmology: The science of the birth and the evolution of Universe
6. C. Gontikakis: Solar Physics: Study of the upper solar atmosphere
7. M. Georgoulis: Space weather forecasting in era of artificial intelligence: FLARECAST program and its main results
8. M. Harsoula, C. Efthymiopoulos and G. Contopoulos: Galactic model of our Galaxy with two pattern speeds
9. V. Tritakis and K. Florios: Empirical-statistical method for the prediction of earthquakes of short space-time window in the Greek territory based on electromagnetic perturbations of low frequency (ELF)
10. C. Karamanos: Characteristic recurrence times (according to Poincaré) for 1-d and 2-d maps

Distinctions

Dr. S. Basilakos was elected Director of the Institute of Astronomy, (IDAET), National Observatory of Athens (2018- 2022).

Dr. M. Georgoulis was honored with the medal of the Member of the Historical 1st Gymnasium of Chios, August 22 2018. He was also selected among the top 10 judges for 2018 of the scientific journal "Advances in journal Review space".

Participation in Conferences and Talks

G. Contopoulos

GC-1. Highlights in Chaos Research, invited talk at the 25th Summer School-Conference: "Dynamical Systems and Complexity", NCSR Demokritos, July 9-17.

P. Patsis

PP-1. Participation in the 25th Summer School-Conference: "Dynamical Systems and Complexity", NCSR Demokritos, July 9-17. Invited talk: "Galactic disks as complex dynamical systems"

PP-2. Three invited seminars at the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Tonanzitla, Mexico, 27, 29 and 31/8).

C. Efthymiopoulos

CE-1. Metastability dynamics and FPU timescales: the perspective of perturbation theory Invited talk in "FPU-2018", Workshop, Università degli Studi di Padova, April 2018

CE-2. Methods and Applications in Manifold Dynamics: from molecules to Space and galaxies Invited talk in "Perspectives in Hamiltonian Dynamics" an ERC Funded Conference, Università degli Studi di Padova, Venezia, June 2018

CE-3. Applications of Invariant Manifolds in Dynamical Systems Invited talk in 25th summer school - conference on "Dynamical Systems and Complexity", NCSR Demokritos, July 9-17.

CE-4. Computational Hamiltonian Perturbation Theory and its Applications Invited seminar, Dept. of Mathematica, Università degli Studi di Padova

CE-5. Applications of Invariant Manifolds in Dynamical Astronomy Invited Seminar, Astro- nautical Institute, Czech Academy of Sciences, Prague, November 2018

I. Contopoulos

- IC-1. 17th Panhellenic Conference of the Hellenic Physical Society, Thessaloniki, March 15-18. Invited talk with title "The origin of the magnetic field in space: a cosmic battery".
- IC-2. Workshop on Relativistic Astrophysics, Purdue University, West Lafayette, IN, May 6- 9. Invited talk with title: "A Cosmic Battery in accretion flows around astrophysical black holes".
- IC-3. International Conference with title: "Black Holes as Cosmic Batteries: UHECRs and Multi-messenger Astronomy", Foz do Iguacu, Brasil, September 12-15. Invited talk with title: "A Cosmic Battery in accretion flows around astrophysical black holes" (<https://www.youtube.com/watch?v=mB3Cu07185c>).
- IC-4. Department of chemical engineering NTUA, March 13. Invited talk with title: "Numerical simulations of industrial processes". IK-5. NASA/Goddard Space Flight Center, Greenbelt, MD, ΗΠΑ, May 3. Invited talk with title: "The black hole magnetosphere".
- IC-5. Department of Astronomy, University of Chicago, May 9. Invited talk with title: "A Cosmic Battery in accretion flows around astrophysical black holes"
- IC-6. Institute of Physics MEPhI of Moscow, September 6. Invited talk with title: "Numerical simulations in industry"
- IC-7. University of Grenoble, October 16. Invited talk with title: "A Cosmic Battery around astrophysical black holes".

C. Gontikakis

- CG-1. Participation in the 9th conference IRIS, Gottingen, June 25-29. Talk with title: "Resonant scattering in Transition Region Si IV lines"
- CG-2. Participation at the meeting Solar Orbiter MADAWG (Modeling And Data Analysis Working Group), September 26-29 2018, Athens
- CG-3. Invited talk at the Physics Department of the UOC with title: "Study of the solar corona and transition region through Extreme Ultraviolet Spectroscopy", October 25.

M. Georgoulis

- MG-1. Solar Orbiter MADAWG Workshop 11, Toulouse, France. Invited participation and talk with title "Remote Sensing Magnetograph Observations with Solar Orbiter: Issues and Caveats", January 22 – 24

- MG-2. High Performance Computing (HPC) @ Sheffield, Workshop, University of Sheffield, UK. Opening talk (keynote) with title "From Physical Understanding to Forecasting of Solar Flares and Coronal Mass Ejections", March 27.
- MG-3. European Solar Telescope (EST) Science Meeting, Giardini Naxos, Italy. Invited talk with title "Pre-Eruption Conditions in Solar Active Regions: O2R and a Meaningful EST Role", May 14 – 18
- MG-4. Conference Horizon 2020, Academy of Athens. Invited talk with title "Strengthening experience in writing research proposals", June 28
- MG-5. 42nd COSPAR General Assembly, Pasadena, USA, July 14 – 22. Two talks: •Invited talk with title "Forecast Verification in the Framework of the EU FLARECAST Project". • Non invited talk with title "Eruptive Flare Initiation and the CME Magnetic Field".
- MG-6. 2018 EMF & Health Workshop, IIBEAA of the Academy of Athens. Invited talk with title "Solar Radiation", September 14 – 15
- MG-7. Solar Orbiter MADAWG Workshop 12, Athens. Talk with title "Tools and Results of the FLARECAST Project Useful to Solar Orbiter Operations", September 26 – 28
- MG-8. EarthCube RCN: Toward Integration of Heliophysics, Data, Models and Analysis Tools, New Jersey Institute of Technology (NJIT). Invited talk with title "European Efforts for Heliophysics Data Integration and Assimilation", November 14 – 16
- MG-9. 2018 Fall Meeting of the American Geophysical Union (AGU), Washington, DC, December 10 – 14. Two presentations: • Talk with title "Future Steps and an Architecture for Predicting the Solar End of Space Weather". • Poster with title "A Chain of Evolutionary Processes Forming the Core Structure(s) of Solar Eruptions".

M. Harsoula

- MH-1. Participation in the 25th summer school "Dynamical Systems and Complexity", NCSR Demokritos. Talk with title: "The role of chaos in barred spiral galaxies".

V. Tritakis

- VT-1. Participation in the conference COMECAP, Alexandroupolis, October 15-17, 2018.
- VT-2. Participation in the conference COST- Electronet, Cyprus-Limassol, September 25-29, 2018.

A. Tzemos

- AT-1. Participation in the 17th Panhellenic Conference of the HPS, Thessaloniki, March 2018. Talk with title: "Order and Chaos in Bohmian Mechanics".
- AT-2. Participation in the 25th summer school "Dynamical Systems and Complexity", NCSR Demokritos. Talk with title: "Chaos in Bohmian Mechanics".

K. Zouloumi

- KZ-1. Participation in the 25th summer school "Dynamical Systems and Complexity", NCSR Demokritos. Talk with title: "Invariant manifolds and chaos in the Milky Way".

Organisation of Conferences and Meetings

1. PP-1. Dr. Patsis was member of the scientific organizing committee of the 25th Summer School- Conference: "Dynamical systems and complexity", NCSR Demokritos, July 9-17.
2. SB-1. Ο κ. Βασιλάκος ήταν συντονιστής του διεθνούς συνεδρίου "NEB18: New developments in Gravity", 20-22/09/2018, Ρόδος.
3. MG-1. Dr. Georgoulis was coorganizer of the meeting "Progress in Space Sciences Fostered by the European Commission", 2018 EGU General Assembly, Vienna, Austria, April 8 – 13. In addition, in the conference of the 15 th European Space Weather Week (ESWW15), Leuven, Belgium, November 9 – 15 he participated in the organizing the following meetings and acts:
 - "Unveiling Current Challenges in Space Weather Forecasting".
 - "The FLARECAST Scientific and Technological Facility: What Now?".
 - "Flare Forecasting: Where are We, and Where Should We Be Going"?

Finally he organized two workshops with international participators:

- Member of the scientific organizing committee, EMF & Health Workshop 2018, IIBEAA of the Academy of Athens, September 14 – 15.
- Organizer, Solar Obiter MADAWG Workshop 12, Athens, September 26 – 28.

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 2018 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 2018

Stamatis Nicolis University of Tours	Deterministic chaos and information processing in quantum gravitational systems	9/1/2018
Vasileios Drakopoulos University of Thessaly	Complex Dynamics of several iterative methods	16/1/2018
Christos Efthymiopoulos RCAAM of the Academy of Athens	Manifold-driven spirals, disc-Halo interaction and the secular evolution in barred-spiral galaxies	23/1/2018
George Lukes-Gerakopoulos Astronomical Institute CAS	Celestial dynamics around a supermassive black hole	31/1/2018
Ioannis Papagiannopoulos University of Athens	Dynamical Analysis in Cosmological models of alternative Gravity	6/2/2018
Ioannis Kontogiannis RCAAM of the Academy of Athens	Solar active region properties and CME characteristics	13/2/2018
Rocio Paez RCAAM of the Academy of Athens	Space mission designs for stable Lagrangian points	20/2/2018
Mirella Harsoula RCAAM of the Academy of Athens	The manifold theory and its application in barred spiral galaxies	27/2/2018
Ioannis Daglis University of Athens	Storms, substorms, particles and waves: at the heart of geospace weather	6/3/2018
Ioannis Kominis NTUA	Non-linearity and Asymmetry in non-Hermitian Photonics	13/3/2018
Nikolaos Prantzis Institut d'Astrophysique de Paris	A short history of Nuclear astrophysics Part I : The energy of the Sun	21/3/2018
Fotios Anagnostopoulos University of Athens	Test of cosmological models with direct measurements of the Hubble expansion	27/3/2018

Evangelia Samara RCAAM of the Academy of Athens	CME magnetic fields and their effect on planetary magnetospheres - generalization to other stars and exoplanets	17/4/2018
Christos Efthymiopoulos RCAAM of the Academy of Athens	Dynamics of Earth satellites and space debris	24/4/2018
Panos Patsis RCAAM of the Academy of Athens	Are there alternative bar building blocks to the families of the x1 tree?	7/5/2018
Charalambos Sinnis University of Athens	Stability analysis of relativistic magnetized astrophysical jets	15/5/2018
Ioannis Contopoulos RCAAM of the Academy of Athens	Magnetically driven jets from astrophysical black holes	22/5/2018
Ioannis Contopoulos RCAAM of the Academy of Athens	Magnetically driven jets from astrophysical black holes (Part II)	29/5/2018
Panos Kyziropoulos University of Thrace	A study of computational methods for parallel simulation of the gravitational N-Body problem	5/6/2018
Christos Efthymiopoulos RCAAM of the Academy of Athens	Dynamical features of resonances for Earth satellite orbits	12/6/2018
Constantinos Gourgouliatos University of Durham	Reconfinement and Loss of Stability of Active Galactic Nuclei Jets	19/6/2018
Hongqi Zhang Chinese Academy of Sciences	The role of the solar magnetic fields and helicity	25/6/2018
Joan Font Instituto de Astrofísica de Canarias	Annular kinematic segmentation of galaxy disks	26/6/2018

Pierfrancesco Di Cintio IFAC-CNR Institute of Applied Physics	N-body chaos and the continuum limit in numerical simulations, revisited	3/7/2018
George Leivadiotis Southwest Research Institute Texas, USA	Kappa Distributions: Theory and Applications in Plasmas	17/7/2018
Ioannis Gkolias Milan Polytechnical School	Towards a sustainable exploitation of the geosynchronous orbital region	24/7/2018
Christos Efthymiopoulos RCAAM of the Academy of Athens	Quantum decoherence and its role in quantum foundations	10/10/2018
Athanasios Tzemos RCAAM of the Academy of Athens	The effect of entanglement on the Bohmian trajectories of a two-qubit system	16/10/2018
Jerome Daquins University of της Πάντοβα	Some dynamical aspects of the medium earth orbits	23/10/2018
Preben Grosbøl ESO	Spiral potential of the Milky Way	30/10/2018
Constantinos Gontikakis RCAAM of the Academy of Athens	Importance of the radiative diffusion in the spectral line Si IV 1393Å, 1402Å for the study of the transition region	6/11/2018
Constantinos Tziotziou NOA	A long-duration quiet-Sun small-scale vortex	13/11/2018
Manolis Xylouris NOA	DustPedia - A Definitive Study of Dust in the Local Universe	20/11/2018

Constantinos Karamanos TEI of Athens	Poincaré Recurrence Time Theorem as a unifying element towards the understanding of coding/noncoding prediction algorithms for DNA Strands	27/11/2018
Vasileios Tritakis RCAAM of the Academy of Athens	An Experimental/Empirical/Local Law of Estimating Oncoming Seismic Activity within a bounded time-space window based on ELF electromagnetic Perturbations	4/12/2018
Costas Florios RCAAM of the Academy of Athens	Possibility of Earthquake Forecasting Within a Narrow Time-Space Window	11/12/2018
Ioannis Contopoulos RCAAM of the Academy of Athens	High-energy radiation from a "ring of fire" in pulsars	18/12/2018
Constantinos Karamanos TEI of Athens	Poincaré Recurrence Time Theorem as a unifying element towards the understanding of coding/noncoding prediction algorithms for DNA Strands	27/11/2018
Vasileios Tritakis RCAAM of the Academy of Athens	An Experimental/Empirical/Local Law of Estimating Oncoming Seismic Activity within a bounded time-space window based on ELF electromagnetic Perturbations	4/12/2018
Costas Florios RCAAM of the Academy of Athens	Possibility of Earthquake Forecasting Within a Narrow Time-Space Window	11/12/2018
Ioannis Contopoulos RCAAM of the Academy of Athens	High-energy radiation from a "ring of fire" in pulsars	18/12/2018

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” 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 “Special Topics in Dynamical Systems”, in the framework of the postgraduate lesson “Mathematical Modelling” which is coorganised by National Polytechnical University and the COSA network of NCSR Demokritos.
- **Dr. Basilakos** taught the lesson of Cosmology (winter and spring semester of 2018) in the Mathematics and Physics Departments of UOA. During the winter semester of 2018 he taught Cosmology to postgraduate students of the Physics Department of UOA.
- **Dr. Georgoulis** taught in the seminar with title “Solar Physics Research at GSU” at the Department of Physics & Astronomy, Georgia State University, USA, November 28

Phds and Masters

RCAAM researchers participate in other PhD supervision committees inside and outside of RCAAM. Specifically, during 2018 RCAAM members supervised the PhD of:

- Dr. Patsis is co-supervisor of the PhD thesis of Leonardo Chavez Velasquez at 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 programm “7”). Mr. Chaves-Velasquez made a 2 month visit in RCAAM, while Dr. Patsis visited Mexico and INAOE Institute (25/8-8/9). Dr. Patsis is co-supervisor of the PhD thesis of Magdalini Aggelakopoulou with title “Numerical and theoretical study of 3-d Hamiltonian systems in Finance” (Department of Financial Studies, University of Thessaly. Moreover Dr. Patsis was member of the examining committee of the PhD thesis of Panagiotis Kyziropoulos with title “Study of computational methods for parallel simulation of the gravitational N-body problem”, at the Department of Electrical Engineering and Computer Engineering of the Polytechnical School of the University of Thrace (25/4).
- Dr. Efthymiopoulos supervises the PhD thesis of Constantina Zouloumi at the University of Athens with title “Manifold theory of the spires and multiple pattern speeds in simulations of N-body discs”. Moreover Dr. Efthymiopoulos was member of the advisory board of the PhD thesis of Panos Kyziropoulos at the Department of Electrical Engineering and Computer Engineering of the Polytechnical School of the University of Thrace (successfully presented in April 2018).

- Dr. Contopoulos supervised the PhD thesis of E. Coutsantoniou with title “Study of radiation of the accretion discs around black holes”. He is also member of the advisory committee of the PhD thesis of N. Trifonidis (AUTH) with title “Computational study of nonlinear phenomena of MHD with applications in Astrophysics” and of the PhD thesis of X. Sinnis (UOA) with title “Study of the stability of relativistic magnetised astrophysical jets”. He is also external reviewer of the PhD thesis of Loic Chantry at the Meudon Observatory and University 7 of Paris with title “Relativistic Jets: modeling using meridional self-similar methods for MHD flows around Kerr hole” and of Abdulina Kamila, at the Moscow Institute of Physics MEPhI with title “Numerical modeling of solidification process of an aluminum alloy with magnetic stirring at the solidification front”. Finally Dr. Contopoulos is member in the examining committee of the MSc thesis of Petros Stefanou (UOA) with title: “Production of gamma rays in the outer magnetosphere of pulsars”.
- Dr. Vasilakos supervises the PhD thesis of Ioannis Papagiannopoulos at the University of Athens with title “Study of symmetries in cosmological models of alternative gravity”. Moreover he supervises the Phd thesis of Fotios Anagnostopoulos (UOA) with title “Study of the accelerating expansion rate of the Universe” and the PhD thesis of Pavlina Tsiapi (NTUA) with title “Study of the dark energy via cosmological microwave radiation from Planck”
Finally, Dr. Vasilakos is member in the advisory board of the Phd thesis of A. Papageorgiou (AUTH) with title “Cosmological parameters and dark energy”, A. Triantafyllopoulos (UOA) with title “Finsler geometries and cosmological extensions” and G. Gakis (NTUA) with title “Generalized theories of gravity in the tangent bundle”.
- Dr. Georgoulis is membero the advisory board of the Phd thesi of Loukas Xaplanteris at the Department of Physics in UOA with title με θέμα “Coupling between primary and secondary cosmic radiation coming from galaxies and the sun”. Dr. Georgoulis was the supervisor of the MSc thesis of Evangellia Samara, Department of Physics of UOA, with title “Magnetig field of CMEs and its effect on planetary magnetospheres: Methods and applications in exoplanets”. (successfully presented in June 2018).
- Dr. Harsoula is member of advisory board of the PhD thesis of Constantina Zouloumi with title “Manifold theory of the spires and multiple pattern speeds in simulations of N-body discs”.

Missions – Visits to other Research Institutions

1. Panos Patsis

Invited visitor in the “Instituto Nacional de Astrofísica, Óptica y Electrónica”

(INAOE) (October 1-15) by the Professor I. Puerari for collaboration with his group in the field of Galactic Dynamics, where he made 3 seminars (PP-2)

2. **Christos Efthymiopoulos**

Invited visitor in the framework of a funded program in the Astrophysics Laboratory of the University Aix- Marseille(1/9-30/9).

He also visited the Astronomical Institute of the Czechisch Academy of Sciences (16/11- 26/11).

3. **Ioannis Contopoulos**

He visited the Department of Chemical Engineering of NTUA in the framework of the postgraduate program in Computational Mechanics. Talk IC-4

He visited the NASA/Goddard Space Flight Center, Greenbelt, MD, USA. Talk IC-5

He visited the Department of Astronomy of the University of Chicago, May 9. Talk IC-6

He visited the Institute of Physics MEPhI of Moscow, September 6. Talk IC-7

He visited the Institute of Planetology and Astrophysics of the University of Grenoble, October 16. Talk IC-8

4. **Spiros Basilakos**

He visited the Department of Physics of the University of Barcelona (09/11-11/11) where he made an invited talk.

5. **M. Γεωργούλης**

He visited, after invitation, the following institutes and he made the following seminars: School of Aviation Medicine of the 251 General Hospital of HAF, January 25-26 2018. Two seminars with title: "The Solar Atmosphere" and "Space Weather and its Impact".

Department of Physics & Astronomy, Georgia State University, USA. Seminar with title "Predicting Solar Flares and the Magnetic Field of Coronal Mass Ejections: Methods, Techniques and Implications for the Solar – Stellar Connection", March 18.

Department of Mathematics, University of Sheffield, Μεγάλη Βρετανία. Seminar with title "From Physical Understanding to Forecasting of Solar Flares and Coronal Mass Ejections", March 27.

Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany. Two seminars: "Physics and Prediction of Solar Flare Triggering", May 15 and "Non-Potential Field Calculation (NPFC) Azimuth Disambiguation Method", May 16.

Data Mining Lab, Department of Computer Science, Georgia State University, USA. Seminar with title "Predicting Solar Flares and the Magnetic Field of Coronal Mass Ejections: Methods, Techniques and Implications for the Solar – Stellar Connection", October 30 Department of Physics & Astronomy, Georgia State

University, ΗΠΑ. Seminar for the 3d year students with title “Solar Physics Research at GSU”, November 28.

He also visited, after invitation, the Department of Physics and Astronomy of the State University of Georgia, Atlanta USA as visiting professor of the department (he is in sabbatical leave from September 2018 in this Department.

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.

- G. Contopoulos: “Science and Faith”, Talk at the Christian Scientific Union, 1-12-2018
- P. Patsis: “Spirals, bars boxes and peanuts”. Talk at the Department of Physics of the University of Athens - Gerostathopouleio Observatory (April 20).
“Spirals, bars, boxes and peanuts - The morphology of the Galaxy and other spiral galaxies”. Article in “Prisma”- Avgi newspaper, May 5

"How star trajectories build the galaxies". School-Conference "Physics charms" for students of the Hellenic Physical Society, University of West Attica (December 16)

- C. Efthymiopoulos: X. Ευθυμιόπουλος; Conduct of the "Eratosthenes's experiment", in collaboration with the school of Anavryta and the first Gymnasium of Papagou, March 2018

"The hypothesis of the 9th planet". School-Conference "Physics charms" for students of the Hellenic Physical Society, University of West Attica, December 16)

"What is in the sky?", Gymnasium-Lyceum of Elateia, April 18.

- I. Contopoulos: "Photographing a black hole in space", 12th elementary school of Glyfada, February 1

"Photographing a black hole", Gymnasium-Lyceum of Holy Metropolis of Peiraus, March 7

"Photographing a black hole in space", Student meeting "Physics Charms", Hellenic Physical Society, Thessaloniki, March 17-18

"Photographing a black hole", Summer School of the Hellenic Physical Society in Aigina, June 24

"The end of Science", 2nd Gymnasium of Kallipolis, December 21

"The end of Physics?" Student meeting "Physics charms", Hellenic Physical Society, University of West Attica, Athens, December 14-16

- C. Gontikakis: "Comets", Lyceum of the youth penitentiary center of Avlona, February 15

- M. Georgoulis: "Solar Flares and space weather: the puzzle and the adventure of prediction", 6th Astronomical Festival of Chios, August 18

"Physics: Simple laws – Timeless ideas", Physics Museum of the first Gymnasium of Chios, August 22

•Three interviews:

- "The dark side of the Sun", zougla.gr, May 19.

Webpage: <https://www.zougla.gr/epistimi/sinentefksis/article/i-skotini-plevratou-iliou>

- Filmed interview for solar storms, for the website zougla.gr, May 20 2018. Available in Youtube:

<https://www.youtube.com/watch?v=NenGt3yE4Zc>

- "Contemporary Icarus survive in the breath of sun..", webpage of Huffington Post Greece, 2 December 2018.

Link: <https://www.huffingtonpost.gr/entry/ki-omos-oi-seychronoi-ikaroi-epiviono-en-mesa-sten-anasa-toe-elioe-gr-5c03c982e4b04fb21168ef01>.

- Creation of the webpage of the book "Space weather", which he is invited to write for the series named "Small Introductions" of the Papadopoulos editorial press from the president I. Papadopoulos and the director of the series journalist Babis Papadimitriou. This book is going to be published in January 2019. Webpage:
<https://www.epbooks.gr/product/101737/diastimikos>
- Participation in the formation of the program of scientific events Συμμετείχε στη διαμόρφωση του προγράμματος επιστημονικών εκδηλώσεων "Ομηρείου Έργα", as a member of the scientific advisory board of Omireion Center of Chios.
- Participated as an honorable member of the Chios Astronomical Club, in the meeting of the direction board of the club with the mayor of Chios in order to find a permanent place for the club, proper for day and night astronomical observations.
- M. Harsoula: Talk in the final class of the 12th elementary school of Chalandri with title "Exploring the near Universe", January
Talk in the final class of the 7th elementary school of Agia Paraskevi with title "Exploring the near Universe, February 2018
Talk in the second class of the 1st Gymnasium of Papagou with title "Exploring the near Universe, May 2018
Talk in the school of the youth penitentiary center of Avlona with title " A tour in the near and far Universe", May 2018
Participation in "Heratosthenes's Experiment" in the 1st Gymnasium of Papagou, March 2018
- V. Tritakis: "Color in Science" in the club "Εταιρεία Φίλων του Λαού". " Stars and their history." Rotarian club of Glyfada.
- I. Contogiannis: " Sun, the day star", Lyceum of the youth penitentiary center of Avlona, March 2018.