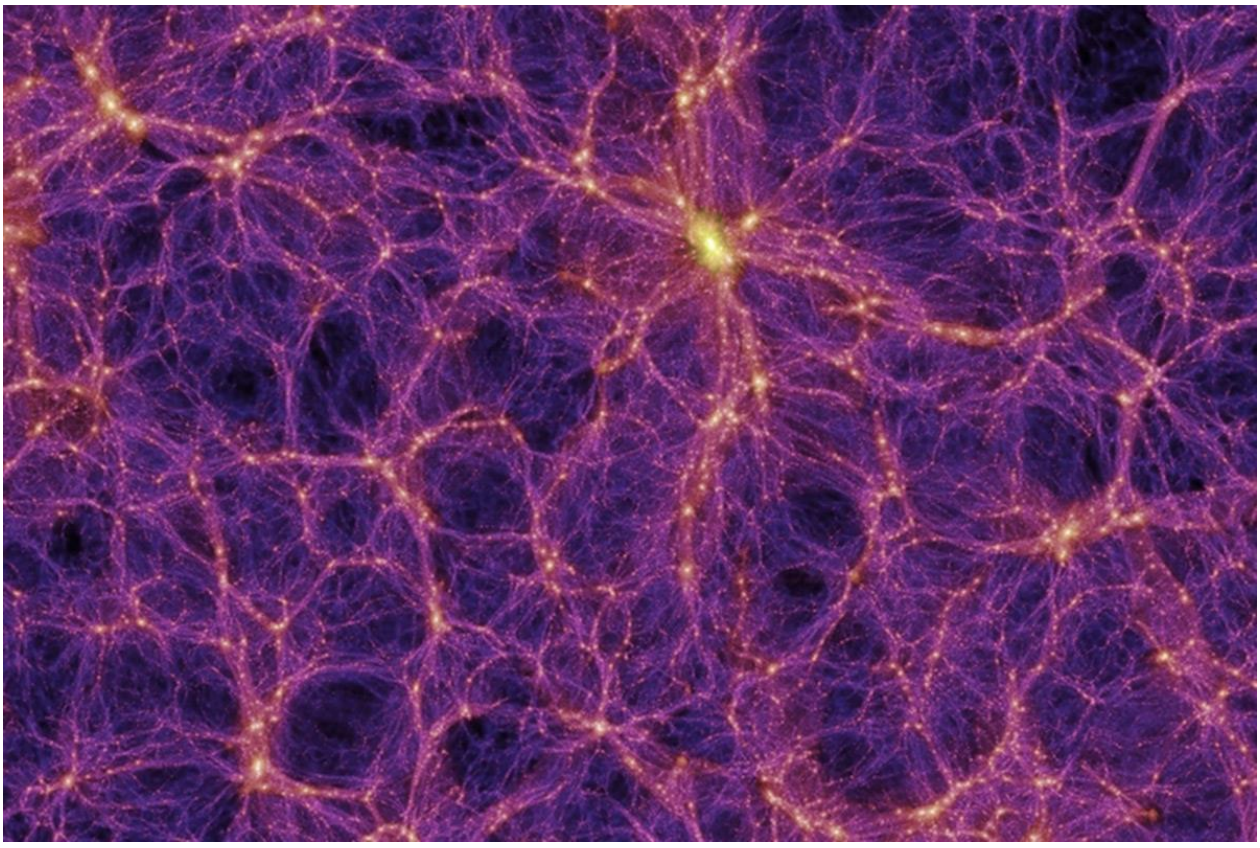
Research Center for Astronomy & Applied Mathematics
of the Academy of Athens

Curriculum Vitae

Dr. Spyros Basilakos
Director of Research



April 2018

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1. BRIEF SUMMARY

Current position: Director of Research at the Academy of Athens (Research Center for Astronomy and Applied Mathematics – RCAAM).

Scientific field: Astrophysics and Cosmology.

1.1. SCIENTIFIC ACTIVITY

- **Academic Appointments:**

  (a) PPARC fellow (research associate) at the Imperial College (UK: 1999-2002).

  (b) Research associate (2002-2005), Institute of Astronomy, Astrophysics & Space Applications and Remote Sensing (IAASARS), National Observatory of Athens (NOA), member of the X-ray & Cosmology group.

  (c) NOVA fellow (research associate) at the University of Groningen (The Netherlands: 2005-2006) .

  (d) For the period 2006-2014, I was a faculty member (Researcher C and Senior Researcher) RCAAM (Academy of Athens).

  (e) Director of Research at RCAAM (2014-Today).

  (d) Visiting Professor of Physical Cosmology at the University of Barcelona (2011-2012).

- **International Awards:**

  In 2013, 2014 and 2017 I participated in the international Gravity competition organized by the Gravity Research Foundation (GRF -USA) and my scientific works received honorable mentions by GRF. Specifically, these articles are: (i) ''From inflation to dark energy through a dynamical Λ: an attempt at alleviating fundamental cosmic puzzles'', (ii) ''A viable Starobinsky-like inflationary scenario in the light of Planck and BICEP2 results'' by Basilakos, Lima & Sola and (iii) ''Measuring the effects of loop quantum cosmology in the CMB data'' by Basilakos, Kamali & Mehrabi. These articles have been published by the Int. J. of Mod. Phys. D. (IJMPD)

- **Publications - Research monographs:**

  My research work has led to **183** scientific articles out of which **131** in refereed journals and **52** in conference proceedings. Out of the **131** refereed publications, I am the first or second author in **~70%** of these (**92** articles), while I am the single author in **9** publications (monographs). There are **62** first author publications. Notice, that there are **30** second author publications, while in more than the half the 1st authors are students of mine, publishing their

thesis work. Also, I published 2 review papers (JCAP & MPLA) and 12 Letters (MNRAS & ApJL). The latter numbers characterize my ability to perform independent scientific work.

My publications list is available at http://astro.academyofathens.gr/people/sbasil/

- **Citations:**

  Total number of citations (NASA ADS) ~3240

  Total number of citations (Google Scholar) ~ 3800

  Number of normalized citations ~ 1080

- **h-Index:**

  Following the databases

  https://scholar.google.gr/citations?user=mknfnlAAAAAJ

  http://adsabs.harvard.edu/abstract_service.html

  h-factor (NASA ADS) = 33.

  h-factor (Google Scholar) = 35

  Normalized h-factor = 17

- **Prizes:**

  (a) IKY fellowship (1997-1999).

  (b) Best PhD thesis (2000), by the Hellenic Astronomical Society.

  (b) PPARC fellowship (1999-2002).

  (c) NOVA fellowship (2005-2007).

- **Theorems and Lemmas:**

  Published **2 Lemmas and 4 Theorems**. These can be found in
  https://arxiv.org/pdf/1311.2173v1.pdf
  https://arxiv.org/pdf/1307.6694v1.pdf
  https://arxiv.org/pdf/1402.5935.pdf

- **Teaching:**

  (a) Postgraduate courses of Cosmology and General Relativity at the University of Athens, Department of Physics (MSc in ''Astronomy & Astrophysics'').

  (b) Undergraduate courses of Cosmology and General Relativity at the University of Athens, Department of Physics.

  (c) Undergraduate courses of Cosmology and General Relativity at the University of Athens, Department of Mathematics.

- **Supervision:**

  (a) Supervision of 10 PhD theses (out of which 3 are completed), of 5 MSc theses (all completed) and of many BSc theses.

  (b) Supervision of 1 Post-doc (in collaboration with Dr. I. Tereno), namely the post-doctoral fellowship of Dr. C. S. Carvalho in the field of Cosmology and dark energy (location Research Center for Astronomy Academy of Athens, duration: 2010-2014).

1.2. ORGANIZATIONAL ACTIVITY

- **Recent international Consortia/Projects:**

  (a) Leadership in the following international collaboration "The Physics of dark energy". This project involves Un. of Naples (S. Capozziello), Un. of Cambridge (J. Barrow), Un. of Barcelona (J. Sola) National Observatory of Athens (M. Plionis) and Un. of Sao Paulo (A. Lima).

  (b) ''Cosmology with HII galaxies''. This collaboration involves IfA-Hawai, ESO-Chile and INAOE, PI: R. Terlevich. I'm a member of the Scientific Committee of the collaboration, responsible for cosmology.

  (c) Research team at the Academy of Athens. I have organized a research group in RCAAM, involving 3 PhD students and 2 young scientists. Our team is working on the physical mechanism of the accelerated expansion of the Universe.

- **Funding of scientific projects:**

  Funds acquired mostly through competitive calls by European and National funding agencies. The total amount is **~492000 €.**

  Review panels – Referee:

- (a) Official referee of the European Science Foundation (ESF) in the field of “Dark Energy”.

  (b) Official referee of the French National Research Agency (ANR) in the field of Cosmology.

(c) Official referee of the National Research Agency in Chile (FONDECYTT) in the field of Cosmology.

(d) Regular referee of journals MNRAS, JCAP, EPJC, CQG, ApJ, PRD, Astronomy & Astrophysics, IJMPD.

- **Journal editor:**

  (a) Review editor in High energy & Astroparticle Physics

  https://loop.frontiersin.org/people/167067/overview

  (b) Editor of the special issue of IJMPD (published in 2015) on the topic ''Testing Inflationary scenarios with the Planck and BICEP2 data''.

  http://www.worldscientific.com/doi/abs/10.1142/S0218271815020010

  (c) Editor of the conference proceedings ''First Mediterranean Conference on Classical and Quantum Gravity (MCCQG 2009)'' published by Journal of Physics: Conference Series, Volume 222, 011001 (2010) DOI:10.1088/1742-6596/222/1/011001.

- **Organization of scientific conferences - seminars:**

  I have organized (member of LOC) of 15 scientific international conferences (see below for details). In total have participated in over 42 international and national conferences in most of which I have presented my work orally or as an invited speaker. I have also been invited to present seminars in various departments and institutes (cf. Durham Univ., Cambridge Univ., Imperial College, Sussex Univ., Nottingham Univ., Universidad Autonoma de Madrid - Spain, Universidad de Barcelona – Spain, University of Leiden - The Netherlands and INAOE in Mexico).

- **Administrative Positions:**

  (a) Appointed by the Hellenic Ministry of Education, member of the committee that proposed the National Council for Research and Technology for the period 2017-2021.

  (b) Elected member of the service council of the Academy of Athens (2016-2018)

  (c) Member of the Governing Board of the Hellenic Soc. of Gravitation & Cosmology (2016-today).

  (d) Vice-president of the Governing Board of the association of researchers at the Academy of Athens (2011-2014).

2. BASIC CURRICULUM VITAE INFORMATION

2.1. PERSONAL DATA

Born in Athens 6/10/1972 (spoken languages: Greek, English and basic Spanish)

Married to Nasia Darra and father of two children.

Work Address : Center for Astronomy & Applied Mathematics Academy of Athens
Soranou Efessiou 4, 11527
Athens, Greece
Tel: +30-210-6597248

e-mail: svasil@academyofathens.gr

Member of Professional societies:

- Founding member of the Hellenic Astronomical Society.
- Hellenic Relativity, Gravitation & Cosmology Society (founding member and elected member of the Governing Board 2016-2018).

2.2. INTRODUCTION

I am an astrophysicist and cosmologist with a career spanning scientific research, academic teaching and science communication. I have held several academic positions at various universities around Europe. Currently, I am a Director of Research (Professor-level) at the Academy of Athens (Research Center for Astronomy and Applied Mathematics - RCAAM). I am a member of the Hellenic Astronomical society, an elected Councilor of the Governing Board of the Hellenic Society for Relativity, Gravity and Cosmology and a member of the committee that proposed to the Greek Ministry of Education the National Council for Research and Technology for the period 2017-2021.

I completed my PhD studies in Cosmology at the University of Athens. During the period 1999-2002, I worked as a PPARC fellow at the Imperial College (UK). From 2002 to 2005, I worked within NOA's (National observatory of Athens) program searching for the clustering properties of the large scale structures. In 2005 I joined the astrophysics group at the University of Groningen (The Netherlands) as a NOVA fellow. For the period 2006-2014 I was a faculty member (Senior Researcher) at the Academy of Athens (RCAAM) and a Visiting Professor in Physical Cosmology at the University of Barcelona (2011-2012). Today, I am Director of Research at RCAAM. In 2013,

2014 and 2017 I participated in the international Gravity competition organized by the Gravity Research Foundation (GRF -USA) and my scientific works received honorable mentions by GRF. I published 183 scientific articles out of which 131 in refereed journals and 52 in conference proceedings. Moreover, I supervised 1 Post-doc, 10 PhD (main supervisor in 4), 5MSc and many BSc theses and I participated in several international collaborations and scientific programs. Currently, I'm participating in several international collaborations and scientific programs and I give lectures in Cosmology and General Relativity at the University of Athens (Departments of Mathematics & Physics) as well as I contribute to public engagement events in science.

2.3. HIGHER EDUCATION

- Mathematics degree, University of Thessaloniki Greece (1991-1995)
- M.Sc. in Astronomy, University of Athens (1995-1997)
- Ph.D. in Physical Cosmology, University of Athens (1997-2000). As a part of my Ph.D program I went at the University of Cambridge (1998: Institute of Astronomy) in which I worked on the Topology of Universe (with Dr. S. Maddox). For the duration of my entire Ph.D. studies, the State Fellowship Institution has awarded me a fellowship after a national competition. I was awarded, by the Hellenic Astronomical Society, the best PhD thesis of the year 2000.
- Fellowships:

  (a) For the duration of my entire Ph.D. studies, the State Fellowship Institution (IKY) has awarded me a fellowship after a national competition.

  (b) Particle Physics and Astronomy Research Council (PPARC, UK) fellow (1999-2002).

  (c) NOVA Theoretical Physics (The Netherlands) fellow (2005-2007).

2.4. APPOINTMENTS

1999-2002: Research Associate (PPARC fellow): Imperial College, London. Working on Astrophysics & Cosmology.

2002: Compulsory Military service in the Greek Army.

2002-2005: Research Associate: National Observatory of Athens (IAASARS). Working on Astrophysics & Cosmology.

2005-2006: Research Associate (Post-doc): Department of Mathematics & Physics University of Groningen, The Netherlands. Working on (a) Topology of the Universe, (b) nature of dark energy and (c) cosmic acceleration. This project funded by the Dutch State (NOVA fellowship).

2006-2010: Associate Researcher (faculty) at the Academy of Athens (RCAAM: Research Center for Astronomy & Applied Mathematics). Working on dark energy & Astrophysical Cosmology.

2010-2014: Senior Researcher (faculty) at the Academy of Athens (RCAAM). Working on Astrophysical Cosmology, Gravity and dark energy.

2011: Visiting Professor (sabbatical) at the University of Barcelona department of Physics. Working on dark energy Astrophysical Cosmology and alternative theories of gravity.

2014-todate: Director of Research at the Academy of Athens (RCAAM). Working on dark energy Astrophysical Cosmology and alternative theories of gravity.

3. TEACHING & SUPERVISION

- I have given tutorials at the Imperial College for two academic years (1999-2001) the undergraduate first year course in Mathematics/Astrophysics.
- Teaching the undergraduate third year course Cosmology & General Relativity at the Department of Physics, University of Athens (started in 2013).
- Teaching the postgraduate second year course Cosmology (MSc program ''Astronomy & Astrophysics'') at the Department of Physics, University of Athens (started 2013)
- Teaching the undergraduate third year course in Cosmology & General Relativity at the Department of Mathematics, University of Athens (started in 2013).
- Member of the supervising committee of 10 PhD theses. The details are the following:

  1. Andronikos Paliathanasis: ''Symmetries and physical implications'' (completed 2014, common supervision with prof. M. Tsamparlis). University of Athens.

  2. Constantinos – Parousis Orthodoxos: ''Using new algorithms to solve Physical problems'' (completed 2014). University of Peloponnese.

  3. Athina Pouri: 'Measuring the expansion rate of the universe using high energy extragalactic sources (main supervisor completed in 2016). University of Athens.

  4. John Papagianopoulos: ''Symmetries in alternative gravity cosmological models'' (main supervisor - started 2016), University of Athens.

  5. Fotis Anagnostopoulos: Studying cosmic acceleration in the context of dark energy models'' (main supervisor started 2017).

  6. Pavlina Tsiapi: ''Cosmological Implications of CMB in the light of Planck data'' (main supervisor she will start in April 2018).

  7. Alexandros Papageorgiou: ''Constraining the cosmological parameters'' (started - 2015, common supervision with prof. M. Plionis). University of Thessaloniki.

  8. Maria Chira: 'Studying large scale structure with cosmological simulations'' (started – 2017). University of Thessaloniki.

  9. Alkiviadis Triantafillopoulos: ''Studying the field equations in modified cosmological models'' (started-2018, common supervision with prof. P. Stavrinos). University of Athens.

  10. Victoras Gakis: 'Extended theories of gravity'', (started-2018, common supervision with prof. P. Stavrinos). National & Technical University of Athens.

- Member of the supervising committee of 5 MSc theses (all completed). The details are the following:

  1. Athina Pouri: ''Using GRBs to probe Cosmology'', University of Athens.

  2. Alexandros Papageorgiou: ''Bias evolution in ΛCDM model'', University of Athens.

  3. Dimitris Papadoulis: ''Dark energy in Relativistic Cosmology'', University of Athens.

  4. Fotis Anagnostopoulos: ''Dark energy and the accelerated expansion of the Universe'', University of Athens.

  5. Lefteris Patsourakis: ''Constraining the slow roll parameters in the light of Planck data'', University of Athens.

- Post-doc supervision:

  I supervised (in collaboration with Dr. I. Tereno) the post-doctoral fellowship of Dr. C. S. Carvalho in the field of Cosmology and dark energy (location Research Centre for Astronomy Academy of Athens, duration: 2010-2014).

4. FIELDS OF INTEREST

Nowadays, discovering the physics of dark energy, thought to be driving the phenomenon of the accelerated expansion of the universe, is considered as one of the most fundamental and challenging problems in the interface between Astronomy and Cosmology. My main interests concentrate on cosmic acceleration, nature of dark energy, unification between dark matter and dark energy, evolution of perturbations and structure formation in different cosmological models, large scale structures, early universe (including inflation), alternative theories of gravity. In my studies I utilized the majority of the observational data, **BATSE, WMAP, Einstein, ROSAT, XMM-Newton, Chandra, APM, Abell/ACO, SSRS2, 2dF, SDSS, SNIa/HST, HIPASS, IRAS, ELAIS/ISO, BAOs, Wiggle-Z, BOSS, DESY, Planck, BICEP2.**

In particular my research interests are summarized as follows:

- Cosmological and statistical tests of General Relativity. Classical and quantum Cosmology of scalar fields
- Constraints on the cosmological parameters using observational data.
- Nature of dark energy [Λ(t), scalar-vector fields, modified gravity etc] and the accelerating Universe.
- The physics of inflation and the evolution of matter perturbations.
- Statistical and geometrical measures for quantifying large-scale structure (galaxies, X-ray sources and clusters of galaxies).
- Use of numerical cosmological simulations for testing, describing and comparing scenarios of structure formation utilizing the Press-Schechter formalism.
- Use of alternative high-z tracers (HII-galaxies and X-ray selected AGN) to measure the expansion rate of the Universe.
- Models of the large-scale bias between mass-tracers and the underlying matter distribution.

4.1. Nature of the accelerated expansion of the Universe

Over the past two decades, studies of the available high quality observational data (supernovae type Ia, GRBs, QSOs, CMB, large scale structure clustering, etc.) have converged towards a cosmic expansion history that involves a spatially flat geometry and a recent accelerating expansion of the universe. The aim of this topic is to understand the underlying physical mechanism which is responsible for the accelerated expansion of the universe. From a theoretical point of view, an easy way to explain this expansion is to consider an additional energy component with negative

pressure, usually called dark energy (DE), that dominates the universe at late times. In spite of that, the absence of a fundamental physical theory, regarding the mechanism inducing the cosmic acceleration, has given rise to a plethora of alternative cosmological scenarios. Most of them are based either on the existence of new fields in nature (dark energy) or on modifications of Einstein's General Relativity (GR), in which the present accelerating stage appearing as a sort of geometric effect ("geometrical" dark energy).

The necessity to preserve Einstein's equations inspired cosmologists to conservatively invoke the simplest available hypothesis, namely, a cosmological constant Λ. Indeed, the so called spatially flat concordance ΛCDM model, which includes cold dark matter and a cosmological constant (Λ), fits accurately the current observational data and thus it is an excellent candidate model of the observed universe. Nevertheless, the identification of Λ with the quantum vacuum has brought another significant problem: *the estimated vacuum energy density should be 120 orders of magnitude larger than the measured Λ value*. This is the "old" cosmological constant problem. The "new" problem is related to the following question: *why is the vacuum density so similar to the matter density at the present time*?

Such problems have inspired many authors to propose alternative dark energy candidates such as running vacuum cosmologies, quintessence, k−essence, vector fields, phantom dark energy, tachyons and Chaplygin gas. Naturally, in order to establish the evolution of the dark energy equation of state, a realistic form of the Hubble parameter is required which should be constrained through a combination of independent observational data. In the original scalar field models which adhere to General Relativity (GR) and later in the quintessence context, one can ad-hoc introduce an adjusting or tracker scalar field ϕ (different from the usual SM Higgs field), rolling down the potential energy V(ϕ), which could resemble the dark energy. However, it was realized that the idea of a scalar field rolling down some suitable potential does not really solve the problem, since ϕ has to be some high-energy field of a Grand Unified Theory (GUT). Hence, this would lead to an unnaturally small value for its mass, which is beyond all conceivable standards in Particle Physics, namely the corresponding mass of ϕ is expected in the ballpark of ~ 10-33 eV. Note that the presence of such a tiny mass scale in scalar-field models of dark energy is generally expected also on the basis of structure formation arguments, namely from the fact that the dark energy perturbations seem to play an insignificant role in structure formation for scales well below the sound horizon. The main reason for this homogeneity of the dark energy is the flatness of the potential, which is necessary to produce a cosmic acceleration. Since the mass associated with the scalar field fluctuation is proportional to the second derivative of the potential itself, it follows that the scalar field mass will be very small and one expects that the magnitude of DE fluctuations induced by ϕ should be appreciable only at length scales of the order of the

horizon. Thus, equating the spatial scale of these fluctuations to the Compton wavelength of ϕ (hence to the inverse of its mass) it follows once more that ~ 10-33 eV.

Despite the above difficulties there are other possibilities to explain the present accelerating stage. Indeed, one may consider that the dynamical effects attributed to dark energy can be resembled by the effects of a non-standard gravity theory. In other words, the present accelerating stage of the universe can be driven only by cold dark matter, under a modification of the nature of gravity. Such a reduction of the so-called dark sector is naturally obtained in the modified gravity theories. The original extension of GR, via the modification of the Einstein-Hilbert action, provides a theoretical platform which assumes that the present accelerating epoch is due to the possibility of gravity becoming weak on cosmological scales. Therefore, dark energy is not related to new fields and it appears as a geometric effect.

The scope of my scientific work is to study the observational consequences of the overall dynamics for a wide class of cosmological models, in the light of the most recent observational data. Specifically, my aim to combine the observational data in order to whittle away the available parameter space for the contender dark matter/energy scenarios and hopefully to settle on a single viable cosmological model.

4.2. Inflationary Cosmology

In the last three years we have witnessed extraordinary developments on experimental tests of inflationary models, based on studies of photons in the Cosmic Microwave Background (CMB) radiation. In particular, the results of Planck collaboration and the associated non-observation of B-mode polarizations of primordial light fluctuations, have imposed very stringent restrictions on single scalar-field models of slow-roll inflation, allowing basically models with very low tensor-to-scalar fluctuation ratio ($r<<1$), with a scalar spectral index $n_s \sim 0.96$ and no appreciable running. In fact, the upper bound set by Planck Collaboration on this ratio, as a consequence of the non-observation of B-modes, is $r<0.11$, but their favored regions point towards $r \sim 0.001$. This is a feature that characterizes the so-called Starobinsky-type (or R-square inflation, with R denoting the scalar space-time curvature) inflationary models. The estimated energy scale of inflation, which in inflation-type models is related to the – approximately constant– scalar potential during inflation. The recent joint BICEP2-Planck analysis confirmed the early Planck result, namely the likelihood curve for r yields an upper limit $r<0.12$ at ~95% confidence level. Moreover, the present BICEP2-Planck data are consistent with a scalar spectral index 0.96 and no appreciable running, in agreement with the previous Planck data. In this sense the Starobinsky type scenarios can still be considered as a serious possibility to describe the inflationary universe.

Following this point of view, I have investigated a large family of Starobinsky like models as potential candidates for realistic implementation of inflation compatible with the data. Specifically, I have proposed a concrete-model realization of inflation triggered by vacuum decay in a fundamental physics context which, as it turns out, can also be extended for the remaining epochs of the cosmological evolution until the current dark energy era. Moreover, I have studied another possibility, namely the hyperbolic inflation which could resemble, under specific conditions, that of Starobinsky. Finally, I have found that if we consider a tachyon scalar field then the predictions of the warm tachyon inflationary model are in excellent agreement with the Planck data. Based on the latter approach, I have investigated the observational signatures of Loop Quantum Cosmology (LQC) in the CMB data, by obtaining the power spectrum of scalar and tensor perturbations in order to study the performance of LQC against the latest CMB data. I have shown that LQC provides a robust prediction for the main slow-roll parameters, like the scalar spectral index and the tensor-to-scalar fluctuation ratio, which are in excellent agreement within the values recently measured by the Planck collaboration. This result indicates that LQC can be seen as an alternative scenario with respect to that of standard inflation.

4.3. Using alternative tracers to determine the Hubble constant

The accurate determination of the Hubble constant is considered one of the most fundamental tasks in the interface between Astronomy, Astrophysics and observational Cosmology. The importance of measuring the expansion rate of the Universe to high precision stems from the fact that the Hubble constant, besides providing cosmic distances, is also a prerequisite for independent constraints on the mass-energy content of the Universe. Therefore, it becomes clear that Supernovae type Ia (SnIa) are the only tracers of the Hubble expansion utilized to-date, over a relatively wide redshift range. Due to the great importance of direct determinations of the Hubble constant for cosmological studies it is highly desirable to independently confirm the SnIa based H_0 value by using an alternative tracer. In order to achieve that we have developed an international observational consortium that involves several Institutes around the world (see below: program Cosmology with HII galaxies). Specifically, our observational campaign used VLT and Subaru high dispersion spectroscopic observations of a local sample of HII galaxies that contain high star formation rate, identified in the SDSS DR7 catalog in order to redefine and improve the L-σ distance indicator and hence to determine the Hubble constant. To this end we utilized as local calibration or 'anchor' of this correlation, Giant extragalactic HII regions (GEHR) in nearby galaxies which have accurate distance measurements determined via primary indicators. Using our best sample of nearby HII galaxies and GEHR in 9 galaxies we obtain H_0=

74.3 km/s/Mpc (with error ~3), in excellent agreement with, and independently confirming, the recent results provided by the Sne Ia team (Riess et al. 2011).

4.4. Testing Gravity on Extragalactic scales

The motivation behind the current theme is that since we are entering the “golden age” of observational cosmology, with a huge amount of data arising from various cosmological probes, which are available with relatively low costs, one should systematically use these data in order to understand how the gravitational interaction works. Gravitational constructions are now being developed in a strong relation and interaction with observations, which enlightens issues that until recently were considered as fundamental and purely theoretical.

The high-quality observations performed during the last two decades have enabled cosmologists to gain substantial confidence that modern cosmology is capable of quantitatively reproducing the details of the many observed cosmic phenomena, including the accelerated expansion of the universe at the present epoch. The field of Cosmology is therefore no longer a pure realm of philosophical speculation, but a rigorous branch of Astrophysics. In view of this fact, Einstein's General Relativity (GR) is not able to provide an explanation to the aforementioned experimental results unless some exotic and invisible matter is admitted to exist in the universe, the so called dark energy. In this scientific project I am investigating possible cosmological models, mainly involving modifications of GR and with the dark energy hypothesis, with the aim of providing new theoretical explanations for experimental evidences. Physical behaviors of these (new suggested) models along with their deeper physical meaning are also be studied.

At this stage, I study the cosmological features at the expansion and perturbations levels respectively. Specifically, my work focuses on the linear perturbations of non-standard gravity models in the matter dominated era. Following standard lines, I found that in the case of modified gravity models the evolution of matter perturbations, which are responsible for the formation of the Large Scale Structures (LSS), are affected by the effective Newton's parameter Geff. Therefore, any modification to the gravity theory is reflected in the Newton's parameter. In other words, for modified gravity models Geff depends on the scale factor of the universe, while for those dark energy models which adhere to GR Geff reduces to the usual Newton's constant as it should. As expected, the theory of gravity affects the cosmic expansion via the Hubble parameter, and the growth rate of clustering via the Newton's parameter Geff. In my scientific works the growth rate of matter fluctuations is computed for a large family of modified gravity models and is confronted to the latest growth rate data via a two-step process. Firstly, we implement a joint statistical analysis (using the MCMC algorithm) in order to place constraints on the free parameters of all models using solely background data (CMB-Planck, SNIa, BAOs, Hubble

parameter etc.). Secondly, using the observed growth rate of clustering from various galaxy surveys (BOSS, Wiggle-Z, DES etc.) we will test the performance of the current cosmological models at the perturbation level, aiming to distinguish the models.

Lastly, one of the main targets of this theme is to understand the fate of our Cosmos. Specifically, Our team attempts to provide an answer to the following fundamental question: Does the Universe end up with a Big-Rip singularity? This is an open issue in observational cosmology.

4.5. Clustering and biasing of extragalactic sources

The large-scale structures have grown gravitationally from tiny, nearly scale invariant adiabatic Gaussian fluctuations. Therefore, the statistical properties of the distribution of matter on large scales, based on different extragalactic objects, can provide important constrains on models of cosmic structure formation as well as on cosmology. Indeed, the application of the correlation function analysis on samples of high redshift extragalactic sources is a powerful tool for cosmological studies. One compares the observed correlation function with that predicted by a power-spectrum of initial perturbations and for different sets of cosmological parameters in order to put constraints on the main cosmological parameters, as well as to understand the formation of LSS. In particular, in my research I have extended the analysis of the clustering properties of the X-ray selected AGNs measured via the two-point correlation function in order to constrain the equation of state parameter as well as to test the environment in which AGNs survive. The two important facts that make the X-ray selected AGN an ideal target population for this type of analysis are: (a) they provide an unbiased census of the AGN phenomenon and (b) they can be easily detected at high redshifts (z~1), in which the decelerated expansion of the Universe is almost completed and thus their clustering properties can give important information on cosmic acceleration.

However, a serious problem that hampers the straight forward use of such an approach is our ignorance of how luminous matter trace the underlying mass distribution and how does their relation evolve with time. It is well known that the large scale clustering of different extragalactic mass tracers (galaxies, AGNs, clusters, etc) is biased with respect to the matter distribution, which is an essential ingredient for cold dark matter (CDM) models to reproduce the observed galaxy distribution. Usually, biasing is assumed to be statistical in nature by which galaxies and clusters are identified as high peaks of an underlying, initially Gaussian, random density field. It is worth noting that the evolution of the bias factor, has been found to be sensitive to the equation of state and to the nature of gravity. In my research I have extended the biasing formulation for various cosmological models and then combining various observational data (XMM-Newton,

SDSS, Dark Energy Survey etc) I studied the performance of various cosmological models against the data for a large family of bias models.

4.6. Cluster Cosmology

Galaxy clusters occupy an eminent position in the structure hierarchy, being the most massive virialized systems known and therefore they appear to be ideal tools for testing theories of structure formation and extracting cosmological information. The cluster distribution basically traces scales that have not yet undergone the non-linear phase of gravitationally clustering, thus simplifying its connection to the initial conditions of cosmic structure formation. The abundance of collapsed structures as a function of mass and redshift is a key statistical test for studies of matter distribution in the universe, and, more importantly, it can readily be accessed from observations. In my research the mass function of cluster-size halos and their redshift distribution were computed for a large family (more than 16 models) of distinct accelerating cosmological scenarios and confronted to the predictions of the conventional flat ΛCDM model. In particular, the comparison with ΛCDM is performed by a two-step process. First, we determined the free parameters of all models through a joint analysis involving the latest expansion data, Second, in order to attempt to distinguish the different dark energy models from the expectations of ΛCDM, we analyzed the predicted cluster-size halo redshift distribution on the basis of two future cluster surveys: (i) an X-ray survey based on the eROSITA satellite, and (ii) a Sunayev-Zeldovich survey based on the South Pole Telescope. As a result, we found that 80% of the dark energy models can be clearly distinguished from the concordance ΛCDM cosmology. My analysis suggests that such a technique appears to be very competitive to independent tests probing the late time evolution of the Universe and the associated dark energy effects.

Moreover, for the current family of cosmological models I studied the non-linear spherical collapse model, which has a long history in cosmology, because it is a simple but still a fundamental tool used to describe the growth of bound systems in the universe via gravitation instability. Within this framework, I found that the concentration parameter depends on the choice of the considered dark energy (homogeneous or clustered). In particular, if the distribution of the dark energy is clustered then we produce more concentrated structures with respect to the homogeneous dark energy. Finally, comparing the predicted concentration parameter with the observed concentration parameter, measured for some massive galaxy clusters, I found that the scenario which contains a pure homogeneous dark energy is unable to reproduce the cluster data. The situation becomes somewhat better in the case of an inhomogeneous (clustered) dark energy.

5. ORGANIZATIONAL ACTIVITY

5.1. Administrative Positions

(a) Appointed by the Hellenic Ministry of Education, member of the committee that proposed the National Council for Research and Technology for the period 2017-2021.

(b) Elected member of the service council of the Academy of Athens (2016-2018).

(c) Member of the Gov. Board of the Hellenic Soc. of Gravitation & Cosmology (2016-today).

(d) Vice-president of the Governing Board of the association of researchers at the Academy of Athens (2011-2014).

5.2. Recent organization of research groups

A key element of my research methodology is the organization and guidance of small (2-3 people) and medium (4-6 individuals) size research teams, made up of fellow researchers, postdoctoral researchers, graduate and undergraduate students, with the aim of tackling complex problems. Moreover, I participate at an organizational level in major international research collaborations that have as their aim to organize the necessary scientific personnel for the utilization of large volumes of data and for the development of complex numerical and analytical tools in order to attempt to tackle fundamental issues related to the nature of the Dark Energy equation of state and the Cosmological model that governs the observed Universe. Some recent collaborations are:

(a) Leadership in the following international collaboration "*The Physics of dark energy*". This project involves Un. of Naples (S. Capozziello), Un. of Cambridge (J. Barrow), Un. of Barcelona (J. Sola), National Observatory of Athens (M. Plionis) and Un. of Sao Paulo (A. Lima). Our team studies the dynamical properties of the Friedmann Roberson Walker metric in various cosmological models included those of extended theories of gravity (Finsler, Gauss-Bonnet, Brans-Dicke, scalar tensor theories, f(R), f(T) etc).

(b) ''*Cosmology with HII galaxies*''. This collaboration involves scientists IfA-Hawai, ESO-Chile and INAOE, PI: R. Terlevich. The main target of this observational campaign is to measure the distance modulus of high-z HII galaxies and then to use them as alternative cosmological tracers. I'm a member of the Scientific Committee of the collaboration (responsible for cosmology).

(c) "*Cosmology group*" at the Academy of Athens. I have organized a research group in RCAAM, involving 3 PhD students and 2 young scientists. Our team is working on the physical mechanism of the accelerated expansion of the Universe.

(http://astro.academyofathens.gr/people/sbasil/)

5.3. Organization and Participation in Observational Programs

In recent years I have participated as co-I (responsible for Cosmology) in numerous observational programs using some of the largest telescopes in the world (SUBARU and VLT) of HII galaxies which our team utilizes as probes of the expansion of the Universe in an attempt to calculate various cosmological parameters, such as the Hubble constant, the matter density parameter, but the main effort is to attempt to put stringent constraints on the Dark Energy equation of state.

The titles and PIs of recent observational programs in which I have participated are given below:

- *Precision cosmology with Hii galaxies* (periods 95a-2015, 97a-2016). VLTKMOS spectroscopy of HII galaxies, PI: R. Terlevich
- *The Hubble constant via Hii galaxies and giant Hii regions* (periods 2012B, 2013a, 2014B, 2015B, 2016A), Spectroscopy B&Ch of HII galaxies with the SPT 2.1m, PI: R. Chavez or David Fernandez (the PhD students of our team).
- *Using Hii galaxies* to probe the equation of state of dark energy (Periods 90a-91a- 2012) VLT-XSHOOTER observations of HII galaxies, PI: R. Terlevich

5.4. Organization of conferences/workshops

I have organized the following scientific in collaboration with other colleagues:

- One day cosmology meeting (National Observatory of Athens April 1998)
- “Large-Scale Structure in the X-ray Universe”, Santorini, Greece 1999
- Chandra meeting in Edinburgh (UK) 2001
- “Multiwavelength Cosmology”, Mykonos, Greece, 2003
- Member of the LOC of 3 Hellenic Astronomical Conferences (organized by Hellenic Astronomical Society)
- “X-ray Surveys”, Rhodes, Greece, 2007
- ''First Mediterranean Conference on Classical and Quantum Gravity (MCCQG 2009)''
- 1st Astrophysics Winter School, Kastoria, North Greece 2010
- Member of the LOC of 4 International Gravity Conferences, NEB “Recent Developments in Gravity” 2010, 2014, 2016, 2018, (organized by Hellenic Society for Gravity Relativity & Cosmology)
- “Half a Century of X-ray Astronomy”, Mykonos, Greece, 2012
- “Hot-Spots in the XMM Sky”, Mykonos, Greece 2016

6. PARTICIPATION IN INTERNATIONAL CONFERENCES -SEMINARS

In total have participated in over 42 international and national conferences in most of which I have presented my work orally or as an invited speaker. I have also been invited to present seminars in various departments and institutes (cf. Durham Univ., Cambridge Univ., Imperial College, Sussex Univ., Nottingham Univ., Universidad Autonoma de Madrid - Spain, Universidad de Barcelona – Spain, University of Leiden - The Netherlands and INAOE in Mexico).

7. FUNDING OF SCIENTIFIC PROJECTS

Funds acquired mostly through competitive calls by European and National funding agencies. The total amount is ~492000 €. In particular the scientific projects of which I am PI or Partner are:

- ~ 100000€ by Particle Physics and Astronomy Research Council (PPARC, UK) as a part of PPARC fellowships (1999-2002, PI).
- ~ 40000€ for bilateral collaborations with Spain (2000-2002), UK (2001-2003) and France (2002-2004). These projects funded by the Greek General Secretariat for Research & Technology (Partner).
- ~ 140000€ by Dutch state as a part of the NOVA fellowships (2005-2008) for theoretical astrophysics (PI).
- ~ 30000€ by Academy of Athens as a part of the program (2007-2010) ''Chaos in Cosmology and Statistical applications'' (co-PI).
- ~ 30000€ by Spanish Ministry of education (PI). In this context I spent 7 months in Spain (Un. of Barcelona: 01.06.2011-31.12.2011).
- ~ 100000€ by Portuguese Ministry of education as a part of the Portuguese fellowships (PI). In this framework Dr. C. S. Carvalho worked as a post-doc at the Academy of Athens for three years (2011-2014).
- ~ 12000€ by Academy of Athens as a part of the program (2017-today) ''Probing General Relativity on extragalactic scales'' (PI).
- ~ 30000€ by Hellenic Foundation for Research and Innovation as a part of the program (2017-today) ''Modified theories of gravity''. This program supports my PhD student G. Papagiannopoulos.

8. SCIENTIFIC ACHIEVEMENTS

8.1. International Awards

In 2013, 2014 and 2017 I participated in the international Gravity competition organized by the Gravity Research Foundation (GRF -USA). My scientific works received honorable mentions by GRF. And they published by Int. J. Mod. Phys. D (special issues). The corresponding articles are the following:

- 'From Inflation to Dark Energy Through a Dynamical Λ: An Attempt at Alleviating Fundamental Cosmic Puzzles', S. Basilakos, A. Lima & J. Sola (https://arxiv.org/abs/1307.6251)
- 'A viable Starobinsky-like inflationary scenario in the light of Planck and BICEP2 results', S. Basilakos, A. Lima & J. Sola (https://arxiv.org/abs/1406.2201)
- 'Measuring the effects of Loop Quantum Cosmology in the CMB data', S. Basilakos V. Kamali & A. Mehrabi (https://arxiv.org/abs/1705.05585)

8.2. Theorems – Lemmas

I have published 2 Lemmas and 4 Theorems. In particular,

- Lemma A: The Euler-Lagrange equations for two conformal Lagrangians transform covariantly under the conformal transformation relating the Lagrangians iff the Hamiltonian vanishes., Gen. Rel. Grav., Vol. 45, 2003 (2013).
- Theorem A: The field equations for a non minimally coupled scalar field ψ with Lagrangian and coupling function F(ψ) in the gravitational field gij are the same with the field equations of the minimally coupled scalar field Ψ for a conformal Lagrangian) in the conformal metric. The inverse is also true, that is, to a minimally coupled scalar field it can be associated a unique non minimally coupled scalar field in a conformal metric and with a different potential function, Gen. Rel. Grav., Vol. 45, 2003 (2013).
- Theorem B: we generalize theorem A to a Riemannian space of dimension N, Gen. Rel. Grav., Vol. 45, 2003 (2013).

All Theorems including those of C, D and Lemma B can be found in

https://arxiv.org/pdf/1311.2173v1.pdf
https://arxiv.org/pdf/1307.6694v1.pdf
https://arxiv.org/pdf/1402.5935.pdf

9. REFEREE – EDITOR

9.1. Review panel

I have served the following review panels:

(a) Official referee of the European Science Foundation (ESF) in the field of “Dark Energy”.

(b) Official referee of the French National Research Agency (ANR) in the field of Cosmology.

(c) Official referee of the National Research Agency in Chile (FONDECYTT) in the field of Cosmology.

(d) Regular referee of journals MNRAS, JCAP, EPJC, CQG, ApJ, PRD, Astronomy & Astrophysics, IJMPD.

9.2. Scientific Journal editor

Editor of the following scientific journals:

(a) Review editor in High energy & Astroparticle Physics (https://loop.frontiersin.org/people/167067/overview)

(b) Editor of the special issue of IJMPD (published in 2015) on the topic ''Testing Inflationary scenarios with the Planck and BICEP2 data''. (http://www.worldscientific.com/doi/abs/10.1142/S0218271815020010)

(c) Editor of the conference proceedings '' 'First Mediterranean Conference on Classical and Quantum Gravity (MCCQG 2009)'' published by Journal of Physics: Conference Series, Volume 222, 011001 (2010) DOI:10.1088/1742-6596/222/1/011001.

10. PUBLICATIONS – RESEARCH MONOGRAPHS

My research work has led to 183 scientific articles:

- 131 in refereed journals of high impact factor MNRAS, ApJ, A&A, PRD, JCAP, GRG, CQG, IJMPD, MPLA out of which,

  (1) ~48% are first author publications (62 articles), which proves my ability for independent research.

  (2) single author in 9 publications (monographs).

  (3) 30 are 2nd author publications, while in more than the half the 1st authors are students of mine, publishing their thesis work.

  (4) 2 review articles in JCAP and MPLA and 12 Letters in MNRAS and ApJL.

- 52 in conference proceedings. This publications list can be found in http://astro.academyofathens.gr/people/sbasil/.

- One volume of the conference proceedings '' 'First Mediterranean Conference on Classical and Quantum Gravity (MCCQG 2009)'' published by Journal of Physics: Conference Series, Volume 222, 011001 (2010) DOI:10.1088/1742-6596/222/1/011001.

- One special colume on the topic ''Testing Inflationary scenarios with the Planck and BICEP2 data'' published by IJMPD in 2015.

  http://www.worldscientific.com/doi/abs/10.1142/S0218271815020010

- 9 articles in the daily, periodical press and in serious blogs popularizing science.

My publications list is available in http://astro.academyofathens.gr/people/sbasil/.

Below, is included the list of the relevant refereed publications:

Monthly Notices of the Royal Astronomical Society

1) 'Large-Scale Coherent Dipole Anisotropy?', 1998, **299, 637** by Basilakos S. & Plionis M.

2) 'The X-ray Luminosity Function of Local Galaxies', 1999, **305, L31** by Georgantopoulos, I., Basilakos, S. & Plionis, M.

3) `The Galaxy and Cluster Biasing from Local Group Dynamics', 2000, **313, 8** by Plionis M., Basilakos, S., Rowan-Robinson M., Maddox, S., Oliver, S., Keeble, O., Saunders, W.

4) `The Apparent and Intrinsic Shape of the APM Galaxy Clusters', 2000, **316, 779** by Basilakos, S., Plionis, M., Maddox, S.

5) `Searching for Cluster Substructure using APM & ROSAT data', 2001, **320, 49,** by Kolokotronis, V., Basilakos, S., Plionis, M., Georgantopoulos, I.

6) `PSCz Superclusters: Detection, Shapes & Cosmological Implications', 2001, **323, 47,** by Basilakos, S., Plionis, M., Rowan-Robinson, M.

7) `Constraints on Cosmological and Biasing models using AGN Clustering', 2001, **326, 203,** by Basilakos, S.

8) 'Cosmological implications of the PSCz PDF and its moments', 2001, **327, L32,** by Plionis, M., Basilakos, S.,

9) 'The Size and Shape of Local Voids', 2002, **330, 329,** by Plionis, M., Basilakos, S.

10) 'The European Large Area ISO Survey VII: ROSAT observations of ELAIS sources', 2002, **331, 417,** by Basilakos, S., Georgantopoulos, I, Perez-Fournon, I., Efstathiou, A., Rowan-Robinson, M., Cabrera-Guerra, F., Gonzalez-Solares, E., Alexanter, D. M.Serjeant, S., Oliver, S.

11) `Supercluster properties as a cosmological probe', 2002, **331, 1020**, by Kolokotronis, V., Basilakos, S., and, Plionis, M.

12) `The cluster substructure alignment connection', 2002, **329, L47**, by Plionis M., Basilakos, S.

13) `Shape statistics of Sloan Digital Sky Survey superclusters', 2003, **344, 602**, by Basilakos, S.

14) `Modelling the two point correlation function of galaxy clusters in the Sloan Digital Sky Survey', 2004, 348**, 882,** by Basilakos S., Plionis M.

15) `The XMM-Newton/2dF survey II: The nature of X-ray faint optically bright X-ray sources', 2004, **349, 135,** by Georgakakis, A., Georgantopoulos, I., Vallbe M., Kolokotronis V., Basilakos S., Plionis, M., Stewart G. C., Shanks T., Boyle, B J.

16) `The European Large Area ISO Survey (ELAIS): The Final Band-merged Catalogue', 2004, by **351, 1290,** Rowan-Robinson M. et al.

17) `The XMM/2dF survey III: Comparison between optical and X-ray cluster detection methods', 2004, **351, 989,** by Basilakos, S., Plionis M., Georgakakis A., Georgantopoulos I., Gaga T., Kolokotronis V., Stewart G. C.

18) `The Shape of Poor Groups of Galaxies', 2004, **352, 1323,** by Plionis, M., Basilakos, S., Tovmassian H.M.

19) 'The Needles in the Haystack survey: searching for X-ray selected normal galaxies', 2004, **354, 123,** by Georgakakis, A., Georgantopoulos I., Basilakos S., Plionis M.

20) `The XMM-Newton/2dF Survey-VIII: Clustering and Bias of the Soft X-ray point sources', 2005, **356, 183,** by, Basilakos S., Plionis, M., Georgakakis A., Georgantopoulos I.

21) `Cosmological constrains from X-ray AGN clustering and SNIa data for', 2005, **360, L35,** by Basilakos S., Plionis M.

22) `The Serendipitous XMM-Newton Cluster Athens Survey: sample selection and the cluster logN-logS', 2006, **366, 163,** by Kolokotronis, V., Georgakakis A., Basilakos S., Kitsionas S., Plionis M., Georgantopoulos I., Gaga T.

23) `The XMM-Newton/2df survey-VIII: The extended X-ray sources', 2005, **365, 549,** by Gaga, T., Plionis, M., Basilakos, S., Georgantopoulos, I., Georgakakis A.

24) `The Shape Alignment relation in ΛCDM Cosmic Structures', 2006**, 365, 549,** by Basilakos S., Plionis M., Yepes G., Gottloeber S., Turchaninov, V.

25) `The PSCz dipole revisited', by 2006, **373, 1112,** Basilakos S., Plionis M.

26) `Virialization of cosmological structures in models with time varying equation of state', by 2007, **374, 269,** Basilakos S., Voglis N.

27) `Large scale structure in the HI Parkes All-Sky Survey: Filling the Voids with HI galaxies?' 2007, **378, 301,** by Basilakos S., Plionis M., Kovac K., Voglis N.

28) `Is the CMB shift parameter connected with the growth of cosmological perturbations?, by 2008, **387, 1126,** Basilakos S., Nesseris S., Perivolaropoulos L.

29) `The Aspen-Amsterdam void finder comparison project', 2008, **387, 933,** by Colberg J., Pearce F., Foster C., Platen E., Brunino R., Neyrinck M., Basilakos S.

30) `Testing Gamma Ray Bursts as Standard Candles', 2008, **391, 411,** by Basilakos S., Perivolaropoulos L.

31) `Cosmological Implications and structure formation from a time varying vacuum', 2009, **395, 234,** by S. Basilakos

32) `Precision Cosmology from X-ray AGN clustering', 2009, **400, L57,** by Basilakos S. & Plionis M.

33) 'A strategy to measure the dark energy equation of state', 2011, **416, 2981**, by Plionis M., Terlevich R., Basilakos S., Bresolin F., Terlevich E., Melnick J., Chavez R.

34) 'Determining the Hubble constant using giant extragalactic H II regions and H II galaxies', 2012, **425, 56**, by Chavez R., Terlevich E., Terlevich R., Plionis M., Bresolin F., Basilakos S., Melnick J.

35) 'The growth index of matter perturbations and modified gravity', 2012, **423, 3761,** by Basilakos S. & Pouri A.

36) 'A consistent comparison of bias models using observational data', 2012, **422, 206,** by Papageorgiou A., Plionis M., Basilakos S., Ragone-Figueroa C.

37) 'Expansion history with decaying vacuum: a complete cosmological scenario', 2013, **431, 923,** by Lima A., Basilakos S., Sola J.

38) 'Effective equation of state for running vacuum: `mirage' quintessence and phantom dark energy', 2014, **437, 3331,** by Basilakos S. & Sola J.

39) 'The L - sigma relation for massive bursts of star formation', 2014, **442, 3565,** by Chavez R., Terlevich R., Terlevich E., Bresolin F., Melnick J., Plionis M., Basilakos S.

40) 'On the road to precision cosmology with high-redshift H II galaxies', 2015, **451, 3001**, by Terlevich R., Terlevich E., Melnick J., Chavez R., Plionis M., Bresolin F., Basilakos, S.

41) 'The growth index of matter perturbations using the clustering of dark energy', 2015, **449, 2151** by Basilakos S.

42) 'How clustering dark energy affects matter perturbations', 2015, by Mehrabi A., Basilakos S. & Pace F., 2015, **452, 2030**

43) 'Constraining the dark energy equation of state with H II galaxies', 2016, **462, 2431**, by R. Chavez, M. Plionis, S. Basilakos, et al.,

44) 'Spherical collapse model and cluster number counts in power-law f(T) gravity', 2017, **466, 3488**, by M. Malekjani, S. Basilakos, N. Heidari

45) 'Agegraphic dark energy: growth index and cosmological implications', 2017, **464, 1192**, by M. Malekjani, S. Basilakos, A. Mehrabi, Z. Davari, M. Razaei

46) **'**An independent determination of the local Hubble constant', 2018, **474, 1250**, by Fernadez A. D. et al.

47) 'Comparison of the linear bias models in the light of the Dark Energy Survey', 2018, in press arXiv:1710.05648, by A. Papageorgiou, S. Basilakos, M. Plionis

48) 'Model selection and constraints from Holographic dark energy models', 2018, MN-18-0044-MJ, M., Malekjani, S. Basilakos, arXiv:1804.02989

Astrophysical Journal

49) 'Cosmological Evolution of Linear Bias', 2001, **551, 522**, by Basilakos, S., Plionis, M.

50) 'Evolution of Linera bias', 2001, **557, 494**, Basilakos, S., Plionis, M.

51) `Cluster formation rate in models with dark energy'**,** 2003**, 590, 636,** by Basilakos, S.

52) `Galaxy bias in quintessence cosmological models'**,** 2003, **593, L61** by Basilakos, S., Plionis, M.

53) `Galaxy alignments as a probe of the dynamical state of clusters', 2003, **594, 144,** by Plionis M., Benoist C., Maurogordato S., Ferrari C., Basilakos S.

54) `The clustering of the hard X-ray sources', 2004, **607, L79**, by Basilakos S., Georgakakis A., Plionis M., Georgantopoulos I.

55) `XMM-Newton observations of optically selected SDSS clusters', 2005, **622, L17,** by Plionis M., Basilakos S., Georgantopoulos I., Georgakakis A.

56) `Constraining the cold dark matter spectrum normalization in flat dark energy cosmologies', 2006, **650, L1,** by Basilakos S., Plionis M.

57) Morphological and Dynamical properties of low-redshift two degree field galaxy redshift survey groups', 2006, **650, 770,** by Plionis M., Basilakos S., Ragone-Figuero C.

58) `Luminosity Dependent X-ray active galactic nucleus clustering?', 2008, **674, L5,** by Plionis M., Rovilos M., Basilakos S., Georgantopoulos I., Bauer, F.

59) `The halo mass-bias redshift evolution in the ΛCDM cosmologies', 2008, **678, 627,** by Basilakos S., Plionis M., Ragone-Figueroa C.

60) 'Breaking the σ_8 -Ω_m degeneracy using the clustering of high-z X-ray AGN', 2010, **400, L57,** by Basilakos S., Plionis M.

61) 'Constraints to Dark Energy Using PADE Parameterizations', 2017, **843, 65**, by Rezaei M., Makekjani M., Basilakos S., Mehrabi A., Mota D. F.

Astronomy & Astrophysics

62) `The tension of cosmological magnetic fields as a contribution to dark energy', 2007, **471, 59,** by Contopoulos I., Basilakos S.

63) `Could Dark Matter interactions be an alternative to Dark Energy?', 2009, **507, 47**, by Basilakos S., Plionis M.

64) `Solving the main cosmological puzzles using a modified vacuum energy', 2009, **508, 572**, by Basilakos S.

65) 'Angular correlation functions of X-ray point-like sources in the full exposure XMM-LSS field', 2012, 537**, 131**, by Elyiv A., Clerc N., Plionis M., Surdej J., Pierre M., Basilakos S.

66) 'The environment of HII galaxies revisited', 2013, **554, 13,** by Koulouridis E., Plionis M., Chavez. R., Terlevich. E., Terlevich R., Bresolin F., Basilakos S.

67) 'Comparison of the spatial and the angular clustering of X-ray AGN', 2016, 2016, **590, 23,** by Koutoulidis L., Plionis, M., Georgantopoulos I, Georgakakis A., Akylas A., Basilakos S., Mutrichas G.

68) 'Direct measurement of lensing amplification in Abell S1063 using a strongly lensed high redshift HII galaxy', 2016, **592, L7**, by R. Terlevich, J. Melnick, E. Terlevich, R. Chavez, E. Telles, F. Bresolin, M. Plionis, S. Basilakos

69) 'Angular distribution of cosmological parameters as a probe of inhomogeneities: a kinematic parametrisation', 2016, **592, 152**, by S. C. Carvalho & S. Basilakos

70) 'The L-σ relation for HII galaxies in green', 2017, **599, 76,** by J. Melnick et al.

PRD, JCAP, IJMPD, Astrop. Phys., GRG, GQG, MPLA

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71) `Dynamics and chaos in the unified scalar field cosmology', PRD, 2008, **77, 043521,** by Lukes-Gerakopoulos, G., Basilakos S., Contopoulos G.

72) `Dynamics and constraints of the unified dark matter flat cosmologies', PRD, 2008, **78, 3509**, by Basilakos S., Lukes-Gerakopoulos

73) `Spherical collapse model and cluster formation beyond the Λ cosmology: Indications for a clustered dark energy?', PRD, 2009, **80, 3530,** by Basilakos S., Sanchez J., Perivolaropoulos L.

74) `Hubble expansion & structure formation in time varying vacuum models', PRD, 2009, **80, 083511**, by Basilakos S., Plionis M., J. Sola

75) 'Constraints on Cold Dark Matter Accelerating Cosmologies and Cluster Formation", 2010, PRD, **82, 3504**, by Basilakos S., Lima J. A. S.

76) 'The spherical collapse model in time varying vacuum cosmologies', 2010, PRD, **82, 083512**, by Basilakos S., Plionis M, Sola J.

77) 'Confronting dark energy models using galaxy cluster number counts', 2010, PRD, **82, 083517,** by Basilakos S., Plionis M., Lima J.A.S

78) 'Quantum gravity corrections and entropy at the Planck time', 2010, JCAP, **09, 027,** by Basilakos S., Das S., Vagenas E.

79) 'Dynamics and constrains of the massive gravitons dark matter flat cosmologies', 2011, PRD, **83, 103506**, by Basilakos S., Plionis M., Alves M. Lima J.A.S

80) 'Using the Noether symmetry approach to probe the nature of dark energy', 2011, PRD, **83, 103512**, by Basilakos S., Tsamparlis M., Paliathanasis A.

81) 'The generalized bias factor: a tool to test gravity', 2011, PRD, **83, 103525,** by Basilakos S., Plionis M., Pouri A.

82) 'Hubble expansion and structure formation in the running FLRW model of the cosmic evolution', 2011, JCAP, **08, 007,** by Grande J., Sola J., Basilakos S., Plionis M.

83) 'Newtonian perturbations on models with matter creation', 2011, PRD, **84, 063511**, by Jesus J. F., Oliveira F. A., Basilakos S., Lima J.A.S.

84) 'Hubble expansion and structure formation in the "running FLRW model', 2011, JCAP, **08, 007,** by Grande, J., Solà, J., Basilakos S., Plionis

85) 'Constraints and analytical solutions of f(R) theories of gravity using Noether', 2011, PRD, **83, 123514**, by Tsamparlis M., Paliathanasis A., Basilakos S.

86) 'New cosmic accelerating scenario without dark energy', 2012, PRD **86, 103534,** by Lima J.A.S., Basilakos S., Costa F.

87) 'Generalizing the running vacuum energy model and comparing with the entropic-force models', 2012, PRD, 86**, 043010,** by Basilakos S., Polarski D., Sola J.

88) 'Dynamics and constraints of the Dissipative Liouville Cosmology', 2012, Astrop. Physics, **36, 7**, by Basilakos S., Mavromatos N., Mitsu V., Plionis M.

89) 'The ΛCDM Growth Rate of Structure Revisited', 2012, IJMPD, **21, 1250064,** Basilakos S.

90) 'Testing general relativity using the evolution of linear bias', 2012, PRD, 85**, 123501,** by Basilakos S., Dent J. B., Dutta S., Perivolaropoulos L.

91) 'Confronting the relaxation mechanism for a large cosmological constant with observations', 2012, JCAP, 01**, 050,** by Basilakos S., Bauer F., Sola J.

92) 'Cosmological equivalence between the Finsler-Randers space-time and the DGP gravity model', 2013, PRD, **113, 255,** by Basilakos S. & Stavrinos P.

93) 'Observational constraints on viable f(R) parametrizations with geometrical and dynamical probes', 2013, PRD, **87, 3529,** by Basilakos S., Nesseris S., Perivolaropoulos L.

94) 'CMB lensing reconstruction from the WMAP 7-year data', 2013, PRD, **88, 2002,** by Carvalho C.S., Tereno I., Basilakos S.

95) 'From inflation to dark energy through a dynamical Lambda: an attempt at alleviating fundamental cosmic puzzles', 2013, IJMPD, 22, **13420,** by Basilakos S., Lima A., Sola J.

96) 'Resembling dark energy and modified gravity with Finsler-Randers cosmology ', 2013, PRD, **88, 123510,** by Basilakos S., Kouretsis, A. P., Saridakis, E. N., Stavrinos P.

97) 'Complete cosmic history with a dynamical Λ=Λ(H) term', 2013, PRD, 88**, 3531,** by Perico E.L.D., Lima J. A. S., Basilakos S., Sola J.

98) 'Conformally related metrics and Lagrangians and their physical interpretation in cosmology', 2013, Gen. Rel. Grav., **45, 2003,** by Tsamparlis M., Paliathanasis A., Basilakos S., Capozziello S.

99) 'Viable f(T) models are practically indistinguishable from LCDM', 2013, PRD, **88, 310,** by Nesseris S., Basilakos S., Saridakis E. N., Perivolaropoulos L.

100) 'Noether symmetries and analytical solutions in f(T)-cosmology: A complete study', 2013, PRD, **88, 3526,** by Basilakos S., Capozziello S., De Laurentis M., Paliathanasis A., Tsamparlis M.

101) 'Scalar-tensor gravity cosmology: Noether symmetries and analytical solutions', 2014, PRD **89, 3532,** by Paliathanasis A., Tsamparlis M., Basilakos S., Capozziello S.

102) 'New Schwarzschild-like solutions in f(T) gravity through Noether symmetries', 2014, PRD ***8*9, 104042,** by Paliathanasis A., Basilakos S., Saridakis E., Capozziello S., Atazadeh K., Darabi F., Tsamparlis M.

103) 'Entropic-force dark energy reconsidered', 2014 PRD 90, 3008 by Basilakos S. & Sola J.

104) 'Precision growth index using the clustering of cosmic structures', 2014 JCAP, 08, 042, by Pouri A., Basilakos S., Plionis M.

105) 'A viable Starobinsky-like inflationary scenario in the light of Planck and BICEP2', 2014 IJMPD, **23, 1442011,** by Basilakos S., Lima A., Sola J., Essay written for the Gravity Research Foundation 2014 - Awards Essays on Gravitation

106) 'Cosmic acceleration without dark energy: Background tests and thermodynamic analysis', 2014 JCAP **10, 042** by Lima, A., Graef L., Pavon D., Basilakos S.

107) 'Dynamical symmetries and observational constraints in scalar field cosmology', 2014, PRD **90, 3524** by Paliathanasis A., Tsamparlis M., Basilakos S.

108) 'Special Issue on Inflation', 2015, IJMPD **24, 1502001**, by Basilakos S. & Plionis M.

109) 'Dynamical vacuum energy in the expanding Universe confronted with observations: a dedicated study', 2015 JCAP **01, 004,** by Gomez-Valent A., Sola J. & Basilakos S.

110) 'Nonsingular decaying vacuum cosmology and entropy production', 2015, GRG **47, 40** by Lima A., Basilakos S., Sola J.

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118) 'Testing Einstein's gravity and dark energy with growth of matter perturbations: Indications for new physics?', 2016, PRD, **94, 123525**, by S. Basilakos & S. Nesseris

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126) 'Measuring the effects of loop quantum cosmology in the CMB data', IJMPD, 2017, **26, 1743023**, S. Basilakos, V. Kamali, A. Mehrabi

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129) 'Constraining the dark energy models with H(z) data: an approach independent of H0', 2018, PRD, **97, 063503**, by F. Anagnostopoulos, S. Basilakos

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Review Articles

'Cosmic expansion and structure formation in running vacuum cosmologies', 2015, *Mod. Phys. Lett. A*, **30, 1540031** by Basilakos S.

'Dynamical vacuum energy in the expanding Universe confronted with observations: a dedicated study', 2015 JCAP **01, 004,** by Gomez-Valent A., Sola J. & Basilakos S.

10.1. References - Index Hirsch

My total number of citations is ~3800 (h-factor=35, normalized number of citations=1080) according to the following databases:

https://scholar.google.gr/citations?user=mknfnlAAAAAJ

http://adsabs.harvard.edu/abstract_service.html

Parts of my work are referenced in several books of Cosmology: S. Weinberg, “Cosmology”, Oxford (2008), Peacock, “Cosmological Physics”, Cambridge, L. Amendola & S. Tsujikawa, ''Dark energy'' (2011), Cambridge.

According the ADS database my Hirsch index is h=34, while according to Google Scholar it is h=35. Because this indicator does not take into account the contribution of each author in the relevant publications, a normalized corresponding index can be defined where the citations per publication are divided by the number of co-authors of the publication.

This index is perhaps most indicative of an author's scientific contribution since it gives a normalized weight to work with many co-authors. In my case the normalized numbers are:

- Number of normalized citations = 1080
- Normalized h-factor=17

11. PUBLIC OUTREACH

I give every effort to contribute to public engagement events in science. Specifically, I have been invited to present public seminars in various places in Greece (schools etc). There are 9 articles in the daily or periodical press, 6 of which in serious blogs popularizing science.

12. REFERENCE LETTERS

My curriculum vitae is supported by the following esteemed colleagues (in alphabetic order):

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