UNIVERSITY OF CRETE
DEPARTMENT OF PHYSICS
SECTION OF ASTROPHYSICS & SPACE PHYSICS

ANNUAL REPORT FOR 2012

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Image Credit of Cover Page
Top: View of the Skinakas summit with the telescope domes and the housing quarters (see Sect. 3.1).
Middle: The receiving antennae of the SESCAT experiment near Chania (see Sect. 3.2).
Bottom: The 1.3m telescope of Skinakas Observatory inside its dome (see Sect. 3.1).

1. INTRODUCTION

The present document summarizes the activities of the members of the Section of Astrophysics and Space Physics at the Department of Physics of the University of Crete, during the 2012 calendar year. The staff of the Section consisted of 12 PhD research scientists, 9 graduate students and 4 technicians. Members of the Section were involved in teaching undergraduate and graduate courses at the University of Crete, while doing research in the fields of Theoretical and Observational Astrophysics, as well as in Atmospheric and Ionospheric Physics. Their research has been funded by national and international research grants, and in 2012 it resulted in 36 papers published in refereed journals, that is ~3.6 papers per PhD researcher. Significant efforts were also devoted in the operation and improvement of the infrastructure and hardware at Skinakas Observatory and the Ionospheric Physics Laboratory. This document was prepared in January 2013, based on contributions from all members of the Section. The final editing was done by V. Charmandaris.

2. PERSONNEL

2.1. PERSONNEL OF THE SECTION

The staff associated with the Section of Astrophysics and Space Physics consists of 12 PhD research scientists, 5 PhD students, 4 Masters students, and 4 technicians.

The 9 Physics faculty members of the Section during the period of the report were Vassilis Charmandaris (Assoc. Prof.), Christos Haldoupis (Prof.), Nikolaos D. Kylafis (Prof.), John Papamastorakis (Emeritus Prof.), Iossif E. Papadakis (Assoc. Prof.), Vasiliki Pavlidou (Assist. Prof.), Kostas Tassis (Assist. Prof.), Ilias M. Vardavas (Assoc. Prof.) and Andreas Zezas (Assist. Prof.). Pablo Reig (Principal Researcher at the Foundation for Research and Technology – Hellas) and Fotis Mavromatakis, (Assist. Prof. at the Technical Educational Institute of Heraklion) were also affiliated with the Section. Researchers in non-tenure track positions holding a PhD degree were Dr. Eleni Vardoulaki. Support staff associated with the Skinakas Observatory were Mr. Anastasios Kougentakis, Dr. Eythymios V. Paleologou, Mr. George Paterakis, and Ms. Anna Stiakaki.

PhD students during this period were Nikos Benas (with I. Vardavas), Theodore Bitsakis (with V. Charmandaris), Paolo Bonfini (with A. Zezas), Alexandros Maragkoudakis (with A. Zezas), and Grigoris Maravelias (with A. Zezas). Master's students were Fani Dosopoulou (with Th. Tomaras), Stergios Kyanidis (with A. Zezas). In September 2012 Tassos Epitropakis and Tzina Panopoulou commenced the 2012-2013 Master's program in Astrophysics. In November 2012 Alexandros Psychogios joined the PhD program (with V. Charmandaris).

2.2. PERSONNEL CHANGES

Dr. Vasiliki Pavlidou (MPIfR, Germany) and Dr. Kostas Tassis (MPIfR, Germany) joined the group in November 2012 as Assistant Professors of Theoretical Astrophysics, while Dr. Eleni Vardoulaki joined the group as a postdoctoral fellow in February 2012. Prof. Andreas Zezas obtained tenure in December 2012.

2.3. GRADUATING STUDENTS

Mr. Theodore Bitsakis succefully defended his PhD in Astrophysics in December 2012. His thesis, performed under the supervision of Prof. Charmandaris, was entitled "Galaxy evolution in Compact Groups: an Infrared Perspective". Dr. Bitsakis moved to the Herschel Science Center / Caltech, USA.

3. FACILITIES

3.1. SKINAKAS OBSERVATORY

The Skinakas Observatory operates as part of a scientific research collaboration between the University of Crete and the Foundation for Research and Technology-Hellas (FORTH[1]). Faculty and staff of the Section using the facilities of Skinakas, are also affiliated members of the Institute of Electronic Structure and Laser (IESL[2]) of FORTH. IESL provides additional hardware and logistics support towards the research of the members.

The Observatory currently possesses three telescopes. One is a Modified Ritchey-Chrétien telescope with a 1.3 m aperture (focal ratio of f/7.6), which was built by DFM Engineering and Zeiss and became operational in 1995. The second is a 0.6 m Cassegrain telescope (focal ratio of f/8) owned by the University of Tübingen (Germany) and co-operated with the Univ. of Crete, which can be remotely controlled in a robotic mode via the web. A third 30 cm telescope (focal ratio f/3.2) is also available and was used in a few projects during the 2011 observing season. A number of modern instruments are permanently available on the 1.3 m telescope. These include several optical CCD cameras with complete set of filters, a long slit optical spectrograph, a high resolution (R=38,000) echelle spectrograph, as well as a near-IR wide field camera.

There have been numerous modifications to the 1.3 m telescope and dome control systems, as well as in the autoguider of the 1.3 m telescope, in preparation of the mounting of the optical polarimeter, "RoboPol", on the 1.3 m telescope of Skinakas observatory. "RoboPol" is a joined project of Skinakas Observatory, the California Institute of Technology (USA), the Max-Planck Institute for Radio Astronomy (Germany), the Inter-University Center for Astronomy and Astrophysics (India), and the Nicolaus Copernicus University (Poland). It is currently under construction, and is expected to start observations on blazars in June, 2013.

The main projects during the 2011 April-to-November observing period were:

- Photometry and Spectroscopy of Binaries with a compact star companion.
- Fast monitoring of stars with planetary candidates
- High speed photo-polarimetry of optical GRB afterglows and X-ray binaries (HMXR, microquasars)
- Fast Photometry of cataclysmic variables
- BVRI photometry of blazars
- BVRI photometry of edge-on-galaxies observed by Herschel
- Optical spectroscopy of unidentified X-ray sources in M31

[1] For more information on FORTH visit: http://www.forth.gr
[2] For more information on IESL visit: http://www.iesl.forth.gr

The High Time Resolution OPTIMA Instrument ("OPTIMA BURST"[3]) of the Max-Planck Institut für Extraterrestrische Physik was in operation at the 1.3 m telescope between mid-July and mid-August 2012.

The tradition of "open nights" continued and the Observatory was open to the public. However construction reduced the number of organized visits to just two nights during the 2012 season.

More details on Skinakas Observatory, the quality of the site, the telescopes, and the available instrumentation can be found in its recenty updated web page at: http://skinakas.physics.uoc.gr

3.2. IONOSPHERIC PHYSICS LABORATORY

The Ionospheric Physics Laboratory (IPL), in collaboration with Stanford University, continued the un-interrupted operation of a narrow-band very low frequency (VLF) receiver experiment throughout 2012, and maintained its VLF database. This experiment is used for studying VLF signatures and propagation effects in the lower ionosphere during times of intense atmospheric electrical activity and the occurrence of transient luminous events (sprites and elves) in the upper atmosphere. Also, IPL operates, in collaboration with the Eötvos-Lenard Budapest University, a second automatic VLF receiver system on a routine basis side by side with the Stanford receiver in the rooftop of the Physics Building. In 2011, a new GPS (Global Positioning System) receiver station was set up in Crete (in collaboration with the Universite de Rennes, France) for continuous monitoring of the ionospheric variability by measuring total electron content (TEC) and S4 index changes.

4. COURSES

A number of elective undergraduate and graduate courses, directly related to the research areas covered by the Section, were offered as part of the teaching responsibilities of the faculty members. For the caldendar year 2012 these were:

- SPRING SEMESTER 2012
  - "Astrophysics II"
  - "Astrophysics III"
  - "Production and Transfer of Radiation"

- FALL SEMESTER 2012
  - "Astrophysics I"
  - "Atmospheric Environment"
  - "Evolution of Planetary Atmospheres"
  - "Observational Cosmology"
  - "Physics of Galaxies"

[3] For more information on "Optima" visit: http://www.mpe.mpg.de/OPTIMA

5. SCIENTIFIC RESEARCH

Here we present a brief description of the major research projects in which members of the Section were involved in 2012. These are grouped by research area and the scientists associated with each project are indicated in parentheses.

The scientific publications that resulted from this work, over the same period, are presented at the end of the report in section 12.

5.1. THEORETICAL ASTROPHYSICS

- Black-hole X-ray binaries: Over the past several years, a rich phenomenology has been accumulated regarding black-hole X-ray binaries. When the sources are in the, so-called, hard X-ray state, a compact jet is always present. In the, so-called, soft X-ray state, no jet is ever detected. In the hard-to-soft transition, the jet disappears eruptively, while in the soft-to-hard transition the jet reappears in a smooth way. All this phenomenology has been explained with a physical model and only one free parameter, the mass-accretion rate. (Researcher involved: N. Kylafis).

- Anomalous X-ray pulsars: Extremely interesting observations have been made recently on the hard X-ray spectra of Anomalous X-ray Pulsars (AXPs). The hard X-rays have luminosity comparable to that of the soft X-rays and they are pulsed, with the rotational period of the neutron stars involved. The pulsed fraction of the hard X-rays increases with the energy of the photons and it becomes ~100% at ~100 keV. In addition, the pulse shape changes with X-ray energy. A model to explain all of the above, plus the pulsed radio emission observed in some of them, has been worked out. A paper was published in 2010 and a second one was accepted for publication in ApJ. (Researchers involved: N. Kylafis, A. Zezas).

- Simulations of Galactic star-forming regions: non-equilibrium chemodynamical multi-fluid non-ideal MHD simulations of star-forming molecular cloud cores. Identification of observable quantities (such as molecular species ratios) that can distinguish between theories of star-formation. Calibration of frequently used molecular species (such as OH for Zeeman observations) for measurement of magnetic fields. (Researchers involved: K. Tassis)

- Sources of the gamma-ray background: Modeling of astrophysical populations that may be contributing to the diffuse gamma-ray sky, such as star-forming galaxies, blazars, and millisecond pulsars. Development of techniques to decompose different contributions to the gamma-ray background and to identify possible exotic signals, such as an annihilation signature from dark-matter subhalos in the Galaxy (Researchers involved: V. Pavlidou)

- Spectral formation in radiative shocks: X-ray pulsars are accreting magnetic neutron stars. Accretion of matter onto a magnetic neutron star results in a radiative shock in the accretion column. Spectral formation in such a radiative shock is a rather difficult problem to solve, because of the large optical depths involved. In low-luminosity X-ray pulsars, on the other hand, the problem becomes tractable. A Monte Carlo calculation was performed and the computed spectrum is quite similar to that observed from low-luminosity pulsars. The results may be applicable to Anomalous X-ray Pulsars accreting matter from a

fallback disk. (Researcher involved: N. Kylafis).

- Star formation in the simulated Universe: development of realistic star-formation algorithms for cosmological simulations in order to connect the dark matter halos with the observable universe. The developed algorithms follow the formation of molecular hydrogen and molecular clouds, where stars are known to form in the local universe. (Researchers involved: K. Tassis)

- Astrostatistics: Application of statistical methods in astrophysical problems. Recent projects include: assessing the significance of apparent correlations between average AGN fluxes at different wavelengths, derivation of star-formation histories from colour-magnitude diagrams, analysis of data taking into account calibration uncertainties, derivation of spectral parameters from X-ray hardness ratios (Researcher involved: A. Zezas as member of the California/Harvard/ASC Astrostatistics Collaboration, V. Pavlidou).

5.2. Observational Astrophysics

5.2.1. Observational Galactic Astrophysics

- X-ray variability of X-ray binaries (XRB): XRB consist of a compact star (neutron star or black hole) orbiting a regular star. When part of the material from the optical companion is accreted on the compact object the system brightens in X-rays. Hard X-ray observations provide a valuable probe of the emission region near the compact object. The goal here is to study their spectral and timing properties. The results from the spectral analysis of the RXTE data from the 2005/2006 outbursts of GX 339-4 were finally published in MNRAS, while we plan to submit soon, early next year, the results from the timing analysis of the outburst data of the GRO J1655 (Researchers involved: P. Reig, I. Papadakis, M. Sobolewska).

- Optical/IR monitoring of Be/X-ray binaries (BeX): BeX consist of a neutron star orbiting a O9e-B2e main-sequence star. The letter "e" stands for emission, as instead of the normal photospheric absorption lines the optical spectra of Be stars display emission lines. Strong infrared emission is another defining characteristic of Be stars. The origin of these two observational properties (emission lines and infrared excess) resides in a gaseous, equatorially concentrated circumstellar disc around the OB star. This disc constitutes the main source of variability in BeX and the fuel that powers the X-ray emission through accretion. The main objective of this project is to characterize the optical/IR variability time scales of Be/X-ray binaries in correlation with their X-ray activity. Another goal of this project is to investigate the effects of the compact object on the structure and evolution of the circumstellar envelope. One of the most interesting effects is the truncation of this envelope by the neutron star. In this project we wish to find observational evidence of such a truncation. During 2012 we carried out the first detailed analysis of the optical counterpart to the accreting X-ray pulsar MXB 0656-072 in the classification region (4000-5000 A) and an X-ray-colour, spectral, and timing analysis of both normal and giant X-ray outbursts of this source. (Researchers involved: P. Reig, A. Zezas).

- Study of long period X-ray pulsars: X-ray pulsars with pulse periods longer than a few hundred seconds are difficult to accommodate in current spin evolutionary models. The existence of this kind of systems could be explained invoking very large magnetic fields, larger than the quantum critical value of 4.4×10^{13} G, hence suggesting the presence of a magnetar. During 2012 we analyzed the first XMM-Newton observations of the peculiar high-mass X-ray binary 4U 2206+54 and investigate its spin evolution. We found that the observed spin-down rate agrees with the magnetar scenario. (Researchers involved: P. Reig)

- Study of the aperiodic variability of X-ray pulsars during giant outbursts. The main goal of this project is the definition and unified characterization of accretion-powered pulsar spectral states during giant outbursts. In the last twenty-five years, the discovery of different "states" in the X-ray emission of black-hole binaries (BHB) and neutron-star Low-Mass X-ray Binaries (LMXBs) constituted a large step forward in the understanding of the physics of accretion onto compact objects. While there are numerous studies on the timing and spectral variability of BHB and LMXBs, very little work has been done on High-Mass X-ray Binaries (HMXBs). We use both X-ray archived and new data of all the HMXBs displaying major outbursts to generate X-ray color-color and hardness-intensity diagrams to define possible spectral states. Subsequently, we obtain power density spectra and energy spectra to define the timing and spectral properties of those states. We search for correlation between the timing and spectral parameters. Such correlation will provide new insights (by constraining the models) into the accretion physics in HMXBs. (Researchers involved: P. Reig).

5.2.2. Observational Extragalactic Astrophysics

- Study of X-ray sources in the Small Magellanic Cloud: A study of the X-ray population in the Small Magellanic Cloud is underway, using Chandra observations of the central region of the Small Magellanic Cloud, dominated by a recent burst of star formation. Study of the optical counterparts and characterization of the star formation history in the specific areas of the Chandra sources has been conducted using optical imaging and spectroscopy with the 6m-Magellan Telescope, and the 4m-Anglo-Australian Telescope (2df). Moreover, XMM-Newton time has been awarded (end of 2008) to an international team (PI: Frank Haberl – MPE), of which D. Hatzidimitriou is a member, for the detailed study of the SMC X-ray binary population (Researchers involved: D. Hatzidimitriou, V. Antoniou, A. Zezas).

- X-ray source populations in nearby galaxies: Studies of the discrete X-ray source populations (in particular accreting sources) in nearby galaxies and their connection with their parent stellar populations (star-formation history, metallicity, etc) and star-cluster parameters. Studied objects cover the full spectrum of galaxies, ranging from dwarf-irregular star-forming galaxies to spiral and elliptical galaxies (Researchers involved: A. Zezas, P. Bonfini).

- Extragalactic supernova remnant populations: Multiwavelength studies of the supernova remnant populations in nearby galaxies using data from the Chandra X-ray observatory and narrow-band data from the Skinakas observatory. The goal of this project is to understand the populations of SNRs in different wavelengths in a variety of environments (Researchers involved: A. Zezas; this

is the PhD project of I. Leonidaki (NOA, University of Patras)).

- X-ray variability studies of AGN: The work on the X-ray variability studies of AGN has been continuing during last year. The work on the the study of the variability properties of the iron line in bright Seyferts, and the study of the "reverberation", negative time lags at high frequencies in a few AGN, using XMM-Newton data, was continued. The results should be ready for publication next year. A spin off of the collaborative project with colleagues in Italy, regarding the long-term variability properties of high-z AGN, was the submission of a paper on the statistical properties of the excess variance in the case of unevenly sampled light curves. The work on the collaborative project with the colleagues in India (regarding the RXTE ASM data analysis of a large sample of both radio quiet and radio loud AGN) continues. (Researchers involved: I. Papadakis).

- Multiwavelength studies of interacting galaxies: This is a comprehensive study of a large sample of interacting galaxies with the Spitzer Space Telescope and the Chandra X-ray Observatory. The goal of this study is to address the connection between galaxy interactions and induced star-formation and AGN activity (Researchers involved: A. Zezas).

- Mid- and Far-infrared properties of Luminous and Ultraluminous Infrared Galaxies (LIRGs/ULIRGs): This project was based on observations with the Spitzer Space Telescope in order to explore the mid-infrared properties of ULIRGs. The main goal is to improve our understanding of the dominant mechanism of the energy source (accretion onto an active nucleus or a super-massive starburst) in these galaxies and ascertain their role in galaxy evolution. There are various components of this project. One major component is the characterization of the mid- and far-infrared emission for a complete flux-limited sample of local LIRGs/ULIRGs, the Great Observatories All-Sky Survey (GOALS) galaxy sample, using the Spitzer and Herschel Space telescopes. In addition analysis of the role of LIRGs/ULIRGs at high redshift is being conducted based on date obtained with the Herschel Great Observatories Origins Deep Survey (H-GOODS). (Researchers involved: V. Charmandaris, T. Díaz-Santos).

- Star formation and stellar populations in Compact Galaxy Groups: This project is based on mid-infrared observations of a sample of Hickson Compact Groups obtained with the Infrared Space Observatory and the Spitzer Space Telescope. Additional near-infrared imaging data of the Palomar 5m telescope, and Skinakas 1.3m telescope are being used in order to map in detail the star formation activity and old stellar population of these systems. The analysis is being extended to a larger sample of ~1700 compact galaxy groups identified in the Sloan Digital Sky Survey, with ancillary data of GALEX and WISE (Researchers involved: T. Bitsakis, V. Charmandaris, T. Díaz-Santos).

5.3. Atmospheric & Ionospheric Physics

- Earth Observation and climate Project: Research work on Earth Observation and the Earth's Radiation Budget is an ongoing project. Modelling work of the radiation forcing of aerosols on a planetary scale includes the effects of aerosols on the solar ultraviolet, visible and near-infrared radiation reaching the Earth's surface. Model input data include satellite data from the NASA EOS satellites,

Aqua and Terra. Ground-based data include the AERONET (Aerosol Robotic Network) site operated in Crete and provided by NASA Goddard. Climate research includes the effects of the El Nino phenomenon on the surface radiation budget over the tropical Pacific ocean. Collaboration with NASA Langley and the Meteorological Institute of the University of Munich on the heat budgets of enclosed seas, such as the Mediterranean, Black and Red seas is ongoing.: (Researchers involved: I. Vardavas, N. Hatzianastassiou (Univ. of Ioannina), C. Matsoukas (Univ. of the Aegean), K. Pavlakis, A. Fotiadi, C. Papademas (Univ. of Ioannina)).

- Modelling the Evolution of Planetary Atmospheres Project: Research on modelling the evolution of planetary atmospheres has focussed on the development of a radiative/convective-photochemical-microphysical model for the global mean vertical atmospheric structure of the Precambrian Earth and of Titan. The Titan model has been validated against data from the recent Cassini/Huygens mission to Titan. A model for the formation of the haze layer that surrounds Titan has been developed. Work on the evolution of ultraviolet and XUV radiation of G-type solar like stars, which affects the atmospheric chemical composition of planets orbiting such stars, is ongoing with planned applications to exoplanets around G-type stars. (Researchers involved: I. Vardavas, P. Lavvas)

- Ionospheric and Upper Atmospheric Physics: The research topics under study relate to the plasma physics and electrodynamics of irregular ionosphericphenomena occurring at midlatitude, and problems associated with the interaction and coupling of the neutral mesosphere and lower thermosphere with the earth's ionosphere. During 2012 our research focused on the following topics : 1) the properties and mechanisms relating to the formation and destabilization of midlatitude sporadic E plasma layers (Es), and the role of wind shears and atmospheric tidal, gravity and planetary waves on sporadic E layer morphology and variability. 2) the effects on VLF (very low frequency) electromagnetic wave propagation and VLF response signatures associated with "transient luminous events", such as sprites, elves and gigantic jets, which are atmospheric electricity (thunderstorm and lightning) phenomena in the upper atmosphere and lower ionosphere; modelling the lifetimes of lightning-produced VLF peturbations, 3) meteor trail plasma instabilities and unusually long-lasting meteor echoes observed with VHF (very high frequency) and HF radars, 4) studies of ionospheric resonance phenomena observed in ultra low frequency (ULF) electromagnetic noise recordings with sensitive coil magnetometers, and 4) studies of the annual and seasonal variations of midlatitude sporadic E layers, and 5) Effects of X-ray solar flare events on the lower ionosphere using Arecibo radar incoherent scatter measurements. (Researchers involved: C. Haldoupis and international collaborators).

6. RESEARCH FUNDING

The following projects, funded by national and international agencies, enabled the research activities of the Section during the period of the report.

- EU funded International Research Staff Exchange Scheme Grant for the "The Physics of The Most Luminous Galaxies", (P.I.: V. Charmandaris, budget: €171,800, duration: 2012-2015)
- Marie Curie Career Integration Grant "JetPop", entitled "Unveiling the Physics of the Most Active of Galaxies: Using Blazars as Laboratories to Study Supermassive Black Holes and Relativistic Jets", (P.I.: V. Pavlidou, budget: €100,000, duration: 2012-2016)
- Marie Curie International Reintegration Grant "SFOnset", entitled "Onset of Star Formation: Connecting Theory and Observations Coupling Dynamics and Interstellar Chemistry in Molecular Cloud Cores", (P.I.: K. Tassis, budget: €100,000, duration: 2012-2016)
- ESPA Postdoctoral Fellowship Grant entitled "The Radio Continuum Properties of Luminous Infrared Galaxies", (P.I.: V. Charmandaris / E. Vardoulaki, budget: €150,000, duration: 2012-2015)
- GSRT-Funded "Excellence" (Aristeia) Grant "RoboPol", entitled "Unveilling the physics of supermassive black holes and relativistic jets with optical polarization of blazars", (P.I.: N. Kylafis/V. Pavlidou, budget: €330,000, duration: 2012-2015)

7. COLLABORATIONS WITH OTHER INSTITUTES

Members of the group are actively collaborating with scientists affiliated with the following universities and research institutes:

- GREECE
  - Foundation for Research and Technology – Hellas (FORTH), Heraklion
  - National Observatory of Athens, Athens
  - Technical Education Institute of Crete, Dept. of Electrical Engineering, Heraklion
  - University of the Aegean, Dept. of Environment, Mytilene
  - University of Ioannina, Dept. of Physics, Ioannina

- INTERNATIONAL
  - California Institute of Technology, Astronomy Department, Pasadena, CA, USA
  - California Institute of Technology, Spitzer Science Center, Pasadena, CA, USA
  - CEA/Saclay, Service d'Astrophysique, Paris, France
  - Cornell University, Astronomy Department, Ithaca, NY, USA
  - Eötvos-Lenard University, Budapest, Hungary
  - ETH, Zurich, Switzerland
  - Geophysical Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria
  - Harvard University, Center for Astrophysics, Cambridge, MA, USA
  - Hebrew University of Jerusalem, Jerusalem, Israel
  - Institut d'Astrophysique de Paris, France
  - Max-Planck-Institut für Extraterrestrische Physik, Garching, Germany
  - Max-Planck-Institut für Kernphysik, Heidelberg, Germany
  - Max-Planck-Institut für Radioastronomie, Bonn, Germany
  - NASA Goddard Space Flight Center, Greenbelt, MD, USA
  - NASA Langley Division of Atmospheric Sciences, Langley, VA, USA

- Nicolaus Copernicus Astronomical Center, Warsaw & Torun, Poland
- Northwestern University, Evanston, IL, USA
- Observatoire de Paris, Paris, France
- Oxford University, Oxford, UK
- Rome Observatory, Rome, Italy
- Shanghai Astronomical Observatory, Shanghai, China
- Stanford University, Palo Alto, CA, USA
- The Inter-University Centre for Astronomy and Astrophysics, Pune, India
- Université de Rennes, Rennes, France
- University of Alicante, Alicante, Spain
- University of Durham, Durham, UK
- University of Napoli Federico, Napoli, IL
- University of Saskatchewan, Canada
- University of Southampton, Southampton, UK
- University of Texas at Austin, Austin, TX, USA
- University of Valencia, Valencia, Spain

8. National & International Committees

During the period covered by this report, members of the Section were in a number of national and international committees. More specifically:

Prof. V. Charmandaris continued his duties as the Editor of the European Astronomical Society Newsletter (since 2005) as well as as substitute member of the Greek National Committee for Astronomy for the 2011-2013 term. He also served as a panel member of the 2012 Spitzer Space Telescope Time Allocation Committee.

Prof. N. Kylafis is serving as the President of the Hellenic Astronomical Society for the 2012-2014 term, as well as the President of Greek National Committee for Astronomy for the 2011-2013 term. He completed his duties a Dean of the School of Sciences of the Univ. of Crete for the 2008-2012 term.

Prof. I. Papadakis is serving as the Secretary of the Hellenic Astronomical Society for the 2012-2014 term. He also served as a chair in an AGN panel in NASA/ADAP 2012.

Prof. I. Vardavas is on the Editorial Board of the Environmental Modelling and Software Journal.

9. Conference & Workshop Organization

Prof. J. Papamastorakis was the chair of the organizing committee of the "Onassis Foundation Science Lecture Series", which take place at the premises of FORTH every summer. The lectures are principally sponsored by the Onassis Benefit Foundation and selected students from across Europe are financially assisted to attend. A Nobel laureate as well as other leading scientists in the same field, present intensive lectures to students for a week. Typically one to three lecture series are organized every summer since 2001. The 2012 lectures in Biology were addressing the topic of "A World of RNAs" (see http://www.forth.gr/onassis).

10. PUBLIC OUTREACH

All members of the Section are involved in a number of public outreach activities throughout the year. These consist of giving public lectures, mostly in the island of Crete, along with dedicated tours to the facilities of Skinakas Observatory, as well as TV and radio interviews. The group also supports the activities organized by the local amateur astronomy societies in Crete.

11. VISITORS

A total of 21 scientists visited our Department during the 2012 calendar year in order to collaborate with staff members of the Section and/or give seminars. These individuals were: Dr. V. Antoniou (CfA, Harvard Univ., USA), Dr. A. Bonanos (National Obs. of Athens, Greece), Dr. N. Brassington (Univ. of Hertfordshire, UK), Dr. I. Contopoulos (Academy of Athens, greece), Dr. M. Dovciak (Astronomical Institute of the Academy of Sciences, Czech Republic), Dr. T. Fragkos (CfA/Harvard, USA), Prof. R. Gianconni (John Hopkins Univ., USA), Prof. P. Kalas (Univ. of California, Berkeley, USA), Dr. O. King (Caltech, USA), Dr. E. Le Floc'h (CEA/Saclay, France), Ms I. Leonidaki (Univ. of Patras), Dr. A. Manousakis (Univ. of Geneva, Switzerland), Dr. A. Marcowitz (UC San Diego, USA), Dr. F. Nicastro (Obs. of Rome, Italy), Prof. M. Paolillo (Univ. of Napoli, Italy), Dr. T. Pechacek (Astronomical Institute of the Academy of Sciences, Czech Republic), Dr. A. N. Ramaprakash (Inter-University Center for Astronomy & Astrophysics, India) Prof. A. Readhead (Caltech, USA), Dr. J.-L. Starck (CEA/Saclay, France). Prof. J. Trumper (MPE-Garching, Germany), Mr. G. Varnardos (Swinburne University of Technology, Australia).

12. PUBLICATIONS

The following 36 publications of the members of the Section appeared in print in international refereed journals (according to ISI/WoS) during the 2012 calendar year. This corresponds to ~3.6 refereed publications per PhD researcher. For each publication, the names of the members of the Section are underlined.

1. Béthermin, M., Daddi, E., Magdis, Georgios, S., Mark T., Hezaveh, Y., Elbaz, D., Le Borgne, D., Mullaney, J., Pannella, M., Buat, V., Charmandaris, V., Lagache, G., Scott, D., "A Unified Empirical Model for Infrared Galaxy Counts Based on the Observed Physical Evolution of Distant Galaxies", 2012, ApJ Letters, 757, 23
2. Barnard, R., Galache, J. L., Garcia, M. R., Nooraee, N., Callanan, P. J., Zezas, A., Murray, S. S., " Period Distribution of X-Ray Binaries Observed in the Central Region of M31 with Chandra and the Hubble Space Telescope", 2012, ApJ, 756, 23
3. Bonfini, P., Zezas, A., Birkinshaw, M., Worrall, D. M., Fabbiano, G., O'Sullivan, E., Trinchieri, G., Wolter, A. "Studying the asymmetry of the globular cluster population of NGC 4261", 2012, MNRAS, 421, 2872
4. Brassington, N. J., Fabbiano, G., Zezas, A., Kundu, A., Kim, D.-W., Fragos, T., King, A. R., Pellegrini, S., Trinchieri, G., Zepf, S., Wright, N. J., "The Spectral and Temporal Properties of Transient Sources in Early-type Galaxies", 2012, ApJ, 755, 162
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