



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

ANNUAL REPORT FOR 2005

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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 2005 calendar year. The staff of the Section consisted of 13 PhD research scientists, 5 graduate students and 4 technicians. Members of the Section were involved in teaching undergraduate and graduate courses in the University of Crete, while doing research in the fields of theoretical and observational Astrophysics, as well as in Atmospheric and Ionospheric Physics. Their work has been funded by national and international research grants, and in 2005 it resulted in 38 papers published in international refereed journals. 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 2006, based on contributions from all members of the Section. The final editing was done by V. Charmandaris.

2. STAFF

The staff associated with the Section of Astrophysics and Space Physics consists of 13 PhD research scientists, 5 graduate students, and 4 technicians.

The Physics faculty members of the Section during the whole period of the report were Vassilis Charmandaris (Assist. Prof.), Christos Haldoupis (Assoc. Prof.), Despina Hatzidimitriou (Assist. Prof.), Nikolaos D. Kylafis (Prof.), John Papamastorakis (Assoc. Prof.), Iossif Papadakis (Assist. Prof.), Ilias M. Vardavas (Assoc. Prof.), and Joseph Ventura (Prof.). Pablo Reig and Fotis Mavromatakis, who have tenure track positions at the Foundation for Research and Technology - Hellas (FORTH) and at the Technical Educational Institute (TEI) of Heraklion respectively, continued their affiliation with the Section. Researchers in non-tenure track positions holding a PhD degree were Zach Ioannou, Angelos Misiriotis and René J. Steiner. Support staff associated with Skinakas Observatory was Anastasios Kougentakis, Dr. Eythymios V. Paleologou, George Paterakis, and Anna Stiatiki. Graduate students during this period were Valsamo Antoniou (with D. Hatzidimitriou), Dimitrios Giannios (with N. Kylafis), Panagiotis Lavvas (with I. Vardavas), George Magdis (with I. Papadakis), and Agnes Mika (with C. Haldoupis). T. Mpitsakis worked on his senior diploma thesis (with V. Charmandaris) as well as A. Manousakis (with P. Reig).

During Spring 2005, two faculty members were on sabbatical / academic leave. C. Haldoupis was at the Univ. of Nagoya (Japan) and J. Ventura visited the NASA Marshall Space Flight Center (USA). I. Vardavas was also on sabbatical leave during the Fall of 2005. A number of changes in the personnel of Section took place during the period of the report. Vassilis Charmandaris started his appointment as an assistant professor in January 2005. Zach Ioannou joined the Section in February 2005, as a postdoctoral researcher (with I. Papadakis) and similarly with René J. Steiner (with C. Haldoupis). J. Ventura formally retired from the Department of Physics on August 31st 2005, after 22 years of service. J. Papamastorakis was promoted to Full Professor. D. Giannios obtained his PhD entitled "X-ray spectra and temporal variability of sources containing a black hole" under the supervision of N. Kylafis and moved to a postdoctoral position at the Max-Planck-Institut für Astrophysik, in Garching, Germany. G. Magdis obtained his Masters degree under the supervision of I. Papadakis and moved for his PhD studies in Observational Astrophysics at Oxford University (UK).

3. FACILITIES

3.1. SKINAKAS OBSERVATORY

The Skinakas Observatory operates as part of scientific research collaboration between the University of Crete, the Foundation for Research and Technology-Hellas (FORTH) and the Max-Planck-Institut für Extraterrestrische Physik of Germany. The site of the Observatory (Longitude: 24° 53' 57" East, Latitude: 35° 12' 43" North), chosen on scientific and functional grounds, is the Skinakas summit of Mount Ida (also known as Psiloritis), at an altitude of 1750 m and a distance of 60 km from Heraklion. The Observatory has two telescopes: a Modified Ritchey-Chrétien telescope with a 1.3 m aperture (focal ratio of f7.6), which became operational in 1995, and a 30 cm telescope (focal ratio f3.2). The building for the small telescope was constructed in 1986, and observations started in 1987. The optical system of the telescope was manufactured by Carl Zeiss (Germany). The mechanical parts were built by DFM Engineering (USA). More details on the Observatory, the quality of the site, the telescopes, and the available instrumentation can be obtained from: <http://skinakas.physics.uoc.gr>

The main projects during the 2005 April-to-November observing period were:

- ❑ Photometry and Spectroscopy of Planetary Nebulae
- ❑ Photometry and Spectroscopy of Supernova Remnants
- ❑ Photometry and Spectroscopy of Binaries with a compact star companion (WD, NS, BH)
- ❑ High Time Resolution optical observations of X-ray sources with the OPTIMA instrument. (Observers from Max-Planck-Institut für Extraterrestrische Physik, Germany and Lund Observatory, Sweden).
- ❑ Time resolved Photometry of BL- Lac's
- ❑ Photometry of High Redshift Quasars
- ❑ Spectroscopy of optical counterparts of X-ray sources in the local group galaxies M31 and M33
- ❑ Broad Filter Imaging of Nearby Galaxies

In November 2005 the improved version of the High Time Resolution OPTIMA Instrument ("OPTIMA BURST") of the Max-Planck Institut für Extraterrestrische Physik was successfully installed and tested at the 1.3 m telescope. The camera will commence regular operations on the telescope in 2006.

The facilities of Skinakas Observatory have also been used for various educational activities. The tradition of "open nights" continued in 2005 and the Observatory was open to the public for five nights through out the year, giving the opportunity to non-astronomers to be exposed to the wonders of the night sky using modern instruments. In June 2005 a group of students from the International University of Bremen, Germany, with two professors were hosted in Skinakas and the University of Crete in order to get practical experience in astronomical observations.

3.2. IONOSPHERIC PHYSICS LABORATORY

The Ionospheric Physics Laboratory (IPL), despite its limited funding and support, maintained operation of its main experimental facility, SESCAT (Sporadic E SCATter experiment), throughout 2005. SESCAT, which is the only ionospheric scatter radar that exists in Greece, operates at 50 MHz mostly as a Doppler radar but occasionally

also as radio interferometer. It is observing the magnetic aspect of radio backscatter from electrostatic plasma waves in the E region of the ionosphere during times of strong dense layers of metallic ions, which form at altitudes of ~ 100 km and are subject to plasma instabilities. In addition, IPL in collaboration with Stanford University, continued the un-interrupted operation of a narrow band very low frequency (VLF) receiver experiment throughout 2005, 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. The third experiment that IPL performed was based on a sensitive coil pulsation magnetometer for studies of natural electromagnetic noise at ultra-low frequencies (< 10 Hz) and the resonant response of the midlatitude ionosphere (in collaboration with the University of Oulu, Finland).

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 2005 these were:

- ❑ SPRING SEMESTER 2005:
 - "Atmospheric Physics"
 - "Observational Astrophysics"
 - "Observational Cosmology"
 - "Production and Propagation of Radiation in Astrophysics"
 - "Special Topics in Astrophysics"
- ❑ FALL SEMESTER 2005
 - "Astrophysics I"
 - "Astrophysics III"
 - "Stellar Evolution and Nucleosynthesis"

5. SCIENTIFIC RESEARCH

Here, we present a brief description of the major research projects in which members of the Section were involved in 2005. 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 9.

5.1. THEORETICAL ASTROPHYSICS

- ❑ Black holes as X-ray sources: Modeling of the spectral states of black-hole X-ray binaries in order to explain their energy spectrum (from radio to X-rays) and the intricate time variability of their intensity. Compton up-scattering of soft photons seems to be the mechanism for producing the hard X-ray spectrum. (Researchers involved: N. Kylafis, P. Reig)
- ❑ Spectral energy distribution of spiral galaxies: A model for spiral galaxies which parameterizes their stellar and dust distribution and self consistently predicts their appearance in all the wavelengths can be used to constrain several

physical parameters that are not directly observable. Such quantities are the Star Formation Rate, the dust opacity, the intrinsic Spectral Energy Distribution and the star formation history. (Researchers involved: N. Kylafis, A. Misiriotis)

- ❑ N-body simulation of Barred Galaxies: N-body simulations of spiral galaxies provide an insight on several dynamical mechanisms, which determine the morphology of barred Galaxies. The mass distribution of the halo, the resonant orbits, and the transfer of angular momentum from the disk to the halo, play a vital role on the long-term evolution of spiral galaxies, and they are examined in detail. (Researchers involved: A. Misiriotis)
- ❑ Transient X-ray emission of magnetars. The quiescent X-ray emission of soft gamma repeaters (SGR) and anomalous X-ray pulsars (AXP) is occasionally modified by transient events with a rich phenomenology. According to the magnetar model, the quiescent emission is powered by magnetic field decay, while transient events follow the buildup of magnetic stresses as a result of crust deformation and differential spin-down. We model the sudden release of energy and heat flow caused by crust fracture and magnetic field rearrangement in these ultra-magnetic neutron stars. Most of the energy release in the NS crust is efficiently conducted to the stellar interior feeding into the quiescent emission, while a very small fraction may reach the NS surface as transient emission. (Researchers involved: J. Ventura)

5.2. OBSERVATIONAL ASTROPHYSICS

5.2.1. OBSERVATIONAL GALACTIC ASTROPHYSICS

- ❑ Optical observations of supernova remnants: Deep narrow band observations of supernova remnants are routinely performed with the 0.3m and 1.3m telescopes at Skinakas Observatory. The images are complemented by deep long slit spectra at selected positions of the target objects to study in detail the energy distribution. Supernova remnants contribute to the recycling of heavy elements in the galaxy and impart great amounts of energy to the interstellar medium. The use of interference filters isolating major optical emission lines allow the study of the morphology of these faint objects and the factors that contribute to their shaping. Furthermore, imagery in low and medium ionization lines offers a unique opportunity to study the different zones of emission behind the shock front. The spectra provide useful information about the extinction that the optical emission suffers, the electron density at the given location and the speed of the shock traveling into the interstellar clouds. In addition, estimates of the initial explosion energy can be made if the distance to the remnant is known. (Researchers involved: F. Mavromatakis, J. Papamastorakis, J. Ventura)
- ❑ Optical studies of Cataclysmic Variables: Cataclysmic Variables (CVs) are interacting binary systems where a low mass main sequence star orbits around a white dwarf star (WD). Mass transfer takes place from the main sequence star to the white dwarf through Roche lobe overflow. CVs can be classified into magnetic and non-magnetic systems depending on the magnetic properties of the WD. In systems where the WD magnetic field is low, an accretion disk is present and the WD accretes material through a boundary layer between the surface of the WD star and the accretion disk. If the magnetic field of the WD is of intermediate strength then the inner part of the disk is truncated and

accretion takes place via “accretion curtains” that transport material from the inner parts of the accretion disk to the magnetic poles of the WD. Finally, if the magnetic field strength is high enough ($B > 10^8$ Gauss) it can prevent the formation of an accretion disk and material is trapped by the magnetic field lines and transported directly to the magnetic poles of the WD. The study of the physical processes occurring in these systems is crucial in our understanding of energy and angular momentum transport as well as magnetic viscosity in accretion flows. In 2005 the Skinakas Observatory took part in a worldwide multi-wavelength campaign involving observatories and satellites such as Chandra, GALEX, VLT and the VLA among others investigating the accretion properties of the magnetic CV system AE Aqr. (Researchers involved: Z. Ioannou)

- X-ray variability of high-mass X-ray binaries (HMXB): HMXB consist of a neutron star orbiting an early-type companion. According to the luminosity class of the primary they are further divided into supergiant X-ray binaries (SXRb) and Be/X-ray binaries (BeX). 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 neutron star. Furthermore, most HMXB are X-ray pulsars. The goal here is to investigate the periodic/quasiperiodic/aperiodic variability of HMXB. To achieve this goal different timing analysis techniques such as power spectra, Fourier-resolved spectra, phase-lag spectra are used. Data mainly come from RXTE and INTEGRAL. (Researchers involved: P. Reig)
- 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. The main objective of this project is to characterize the optical/IR variability time scales of Be/X-ray binaries. This objective is achieved by monitoring the evolution of the disc over many years. The main sources of data are the 1.3 m telescope of the Skinakas Observatory (optical) and the 1.5 m Carlos Sanchez Telescope in Tenerife (IR). (Researchers involved: P. Reig)
- Search for optical counterparts to HMXB: An optical identification is necessary to facilitate a complete study of these systems. Without a known counterpart, observations are limited to X-ray energies, and hence our understanding of the structure and dynamics of those systems that remain optically unidentified is incomplete. (Researchers involved: P. Reig)
- Interaction of the neutron star with the Be star's envelope: Be stars may have an isolated life or take part in binaries (the BeX systems). The difference is the presence, or not, of a neutron star. Here the objective 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. One of the main goals is to find observational evidence of such truncation. (Researchers involved: P. Reig)

- ❑ Study of Galactic globular clusters with the 1.3 m Skinakas Telescope: This is an ongoing project, using the 1.3 m Skinakas Telescope to acquire highly accurate BVRI photometry of poorly studied globular clusters in the Galaxy, with the purpose of deriving their ages, metallicities and RR-Lyrae content, and properties. (Researchers involved: D. Hatzidimitriou, I. Papadakis, J. Papamastorakis).

5.2.2. OBSERVATIONAL EXTRAGALACTIC ASTROPHYSICS

- ❑ Study of properties of carbon stars in the Magellanic Clouds: In collaboration with R. Cannon (AAO) and D. Morgan (ROE), optical spectra for 2300 carbon stars in the Magellanic Clouds were obtained, using the 2df spectroscopic facility at the Anglo-Australian Telescope. This dataset is the largest homogeneous sample of such stars ever studied, allowing detailed analysis and comparison against theoretical models of rare types of stars, such as cool R Coronae Borealis stars, Lithium-rich carbon stars, Merrill-Sanford band carbon stars etc. (Researchers involved: D. Hatzidimitriou)
- ❑ Study of HI structure in Local Group Galaxies: In collaboration with L. Staveley-Smith (CSIRO/Australia) and S. Stanimirovic (Berkeley/USA) a study of the origin and properties of the 509 expanding neutral hydrogen shells catalogued in the Small Magellanic Cloud (SMC) is ongoing. The standard model for the formation of giant HI shells (i.e. via supernova explosions and combined stellar winds from stellar associations) cannot account for the observed properties of the HI shells. Various other formation mechanisms, including Gamma-Ray bursts and turbulence are being considered. (Researchers involved: D. Hatzidimitriou).
- ❑ Study of X-ray sources in Local Group Galaxies: a) In collaboration with W. Pietsch (MPE/Germany), a study of the population of X-ray sources in the Local Group Galaxies, M33 and M31 is being performed. The X-ray data are taken with XMM-Newton. Spectroscopy of optical counterparts is obtained with the 1.3m Skinakas Telescope, and with the 4m William-Herschel Telescope. b) In collaboration with A. Zezas (CfA/USA), 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, is being conducted using optical imaging and spectroscopy with the 6m-Magellan Telescope, and the 4m-Anglo-Australian Telescope (2df). (Researchers involved: D. Hatzidimitriou, P. Reig).
- ❑ X-ray variability study of AGN: The study involves the use of data from recent satellites (mainly RXTE and XMM-Newton). One of the main aims is to correlate the variability amplitude that we observe with the central black hole mass. This is an important issue in order to understand what the major driver behind the observed variations is (the mass of the black hole as opposed to accretion rate for example). Furthermore, the observed spectral and flux variations are investigated, using new techniques such as the so-called Fourier resolved spectroscopy and the scaling index method, respectively. (Researchers involved: I. Papadakis, Z. Ioannou)
- ❑ Optical variability study of BL Lac objects: Using the Skinakas observatory, a number of "Low Frequency Peaked" BL Lacs is currently observed, in order to

characterize their flux and spectral variations, and compare them with the respective UV/X-ray variations observed in the "High Frequency peaked" BL Lacs. Furthermore, we are active members of the "World Earth Blazar Telescope", participating in a couple of worldwide, multifrequency observational campaigns every year. (Researchers involved: I. Papadakis, J. Papamastorakis)

- ❑ Study of the host galaxies of nearby Active and non-Active Galactic nuclei and comparison of their disk properties: This project has as a goal to identify possible differences in their disk structure, such as scale lengths, color profiles etc., taking into account, properly, the effects of dust obscuration, and associate them with intrinsic properties like age, stellar mass, etc. The final objective is to understand the growth of the Black Hole masses in them, and the reason for the presence of nuclear activity in some, but not all of them. (Researchers involved: I. Papadakis, A. Misiriotis)
- ❑ Mid-infrared properties of Ultraluminous Infrared Galaxies (ULIRGs): This project uses observations of the Infrared Spectrograph on the Spitzer Space Telescope in order to explore the mid-infrared properties of ULIRGs. The main goal is to improve the understanding of the dominant mechanism of the energy source (accretion onto an active nucleus or a super-massive starburst) in these galaxies by developing a robust diagnostic between a starburst and AGN in dust-enshrouded galactic nuclei. (Researchers involved: V. Charmandaris)
- ❑ Star formation and old stellar population in Hickson Compact Groups: Based on mid-infrared observations of a sample of Hickson Compact Groups obtained with the Infrared Space Observatory and near-infrared imaging data of the Palomar 5 m telescope, this project attempts to map in detail the star formation activity and old stellar population of these systems. (Researchers involved: V. Charmandaris)

5.3. ATMOSPHERIC & IONOSPHERIC PHYSICS

- ❑ ESRB Earth Observation Project: Initiated and coordinated a multi-national global climate change project under the EC Program for Preserving the Ecosystem 2001-2004. The Surface Radiation Budget (SRB) is the key to understanding global climate change processes. The goal of the project is to assess the new World Climate Research Program / Global Energy and Water Cycle Experiment (WCRP/GEWEX) 1-degree resolution global International Satellite Cloud Climatology Project (ISCCP) cloud climatology and SRB data (supplied to the project by NASA Langley). The coordinator will use tested deterministic radiation transfer models (applied to the North and South Hemispheres and published) for the shortwave (SW) and longwave (LW) fluxes using the GEWEX climatologies. Validation of the models will be through ground-based measurements at sites corresponding to BSRN (Baseline Surface Radiation Network) and other stations that measure SRB. (Researchers involved: I. Vardavas, D. Hatzidimitriou)
- ❑ Ionospheric and Upper Atmospheric Physics: The research topics under study relate to the plasma physics and electrodynamics of irregular ionospheric phenomena occurring at midlatitude, and problems associated with the interaction and coupling of the neutral mesosphere and lower thermosphere with the earth's ionosphere. During 2005 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 electrodynamic coupling between the unstable Es plasma and midlatitude ionospheric "spread F" and the generation of large electric fields in patchy sporadic E plasma layers, 3) the role of plasma density gradients on the generation of short scale electrostatic plasma waves in the ionospheric E region, 4) the effects on VLF (very low frequency) electromagnetic wave propagation and VLF response signatures associated with "transient luminous events", such as sprites and elves, which are atmospheric electricity (thunderstorm and lightning) phenomena in the upper atmosphere and lower ionosphere, 5) meteor trail plasma instabilities and unusually long-lasting meteor echoes observed with VHF (very high frequency) and HF radars, and 6) studies of ionospheric resonance phenomena observed in ultra low frequency (ULF) electromagnetic noise recordings with sensitive coil magnetometers. (Researchers involved: C. Haldoupis, R. J. Steiner).

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.

- ❑ IKYDA 2004 funded research project between Greece and Germany. Title: "Determination of the mean spectral energy distribution of nearby active galaxies" (P.I.: I. Papadakis, budget: 10,000 euros, duration: 2005-2006)
- ❑ GSRT funded research project within the "Scientific and Technological Cooperation between RTD organizations in Greece and USA" program of GSRT. Title: "Fourier Frequency Resolved X-ray spectroscopy of AGN, using Newton-XMM data". (P.I.: I. Papadakis, budget: 60,000 euros, duration: 2 years. Start: May 2004)
- ❑ Ministry of Transport and Communication funded research project entitled "Real Time Remote Observations at Skinakas Observatory for Lyceum Schoolchildren and Teachers". (P.I.: I. Papamastorakis, budget 60.000 Euros , duration 2004 - 2005)
- ❑ Herakleitos Doctoral Project Award. Three year funding for the doctoral thesis project of D. Giannios entitled: "X-ray spectra and temporal variability of sources containing a black hole" under the supervision of Prof. Kylafis (Budget: 33,669 euros, duration: 2003-2005)
- ❑ Pythagoras II Post-Doctoral Project Award. Two year funding for the research project of Dr. A. Misiriotis entitled: "Morphology and Dynamics of Spiral Galaxies" under the supervision of Prof. Kylafis. (Budget: 50,000 euros, duration: 2005-2006)
- ❑ European Union (EU) Research Training Network (RTN) project, entitled "Coupling of Atmospheric Layers", (P.I.: C. Haldoupis, duration: 2003-2007).
- ❑ Collaborative research program between GSRT (the Greek Secretariat of Research and Technology) and The British Council, UK, entitled " An investigation of planetary and gravity wave effects on ionospheric sporadic E layers with ground based radar systems". (P.I.: C. Haldoupis, duration: 2003-2005).
- ❑ Collaborative research program between GSRT and the Russian Academy of Sciences, entitled "Investigation of the Electrodynamics and Plasma Physics of Ionospheric Phenomena at Midlatitude". (P.I.: C. Haldoupis, duration: 2004-2006).

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 Ioannina, Dept. of Physics, Ioannina
- ❑ INTERNATIONAL
 - Anglo-Australian Observatory, Australia
 - Australia Telescope National Facility, CSIRO, Australia
 - California Institute of Technology, Spitzer Science Center, Pasadena, CA, USA
 - CEA/Saclay, Service d'Astrophysique, France
 - Cornell University, Astronomy Department, Ithaca, NY, USA
 - Danish Space Research Institute (DSRI), Denmark
 - East Tennessee State University, TN, USA
 - ETH, Zurich, Switzerland
 - Free University of Berlin, Germany
 - Harvard University, Center for Astrophysics, Cambridge, MA, USA
 - Imperial College, UK
 - Institut d'Astrophysique de Paris, France
 - Institute of Physics of the Earth, Russia
 - Iowa State University, Dept. of Physics & Astronomy, Ames, IA, USA
 - Ioffe Institute of Physics & Technology, St. Petersburg, Russia
 - Lawrence Livermore National Lab, CA, USA
 - Max-Planck-Institut für Extraterrestrische Physik, Garching, Germany
 - Max-Planck-Institut für Astrophysik, Garching, Germany
 - Max-Planck-Institut für Kernphysik, Heidelberg, Germany
 - NASA Goddard Space Flight Center, Greenbelt, MD, USA
 - NASA Langley Division of Atmospheric Sciences, Langley, VA, USA
 - NASA Marshall Space Flight Center, Huntsville, AL, USA
 - Nagoya University, Japan
 - National Space Science and Technology Center, Huntsville, AL, USA
 - Observatoire de Marseille, France
 - Observatoire de Paris, France
 - Royal Observatory Edinburgh, UK
 - San Diego State University, CA, USA
 - Stanford University, Palo Alto, CA, USA
 - Université de Rennes, France
 - University of Alicante, Spain
 - University of Arizona, Tucson, AZ, USA
 - University of Bath, UK
 - University of California Berkeley, Radio Astronomy Lab, Berkeley, CA, USA
 - University of Nagoya, Solar-Terrestrial Environment Laboratory, Japan
 - University of Oulu, Finland
 - University of Saskatchewan, Canada
 - University of Southampton, UK
 - University of Texas at Austin, TX, USA
 - University of Valencia, Spain

8. NATIONAL & INTERNATIONAL COMMITTEES

Prof. V. Charmandaris commenced his duties as the Editor of the European Astronomical Society Newsletter in January 2005, and continued for the seventh year as the Editor of the Newsletter of the Hellenic Astronomical Society. He is also the Editor of the Physics Panel of the Annals of the "Marie Curie" Fellowship Association, since 2002. In December 2005 he served in the Time Allocation Committee (TAC) of the Astro-F infrared space telescope.

Prof. D. Hatzidimitriou is Vice President of the Hellenic Astronomical Society for the 2004 - 2006 term. She is also a member elect of Commission 37 Organizing Committee of the IAU for the period 2003 - 2006.

Prof. N. Kylafis was appointed by the Secretary General of Research and Technology as an ordinary member of the Greek National Committee for Astronomy (GNCA) in November 2005. He was also appointed by the president of GNCA as a substitute to the representative of Greece to the Optical Infrared Coordination Network for Astronomy (OPTICON).

Prof. I. Papadakis served, in October 2005, in the Time Allocation Committee (TAC) of the XMM/Newton X-ray space telescope.

Prof. J. Papamastorakis was appointed by the Secretary General of Research and Technology as a substitute member of the Greek National Committee for Astronomy in November 2005.

Prof. J. Ventura was, until November 2005, the Vice President of the Greek National Committee for Astronomy. He was also, until the same date, on the Board of Directors of the international journal Astronomy and Astrophysics.

9. CONFERENCE & WORKSHOP ORGANIZATION

Prof. C. Haldoupis organized and hosted an International meeting on "Coupling of Atmospheric layers: Mid-term review and Science meeting" which took place in Elounda, Crete from June 20 to 24, 2005 (see <http://cal-crete.physics.uoc.gr/>).

Prof. D. Hatzidimitriou was the chair of the 2005 physics summer school organized for the 17th consecutive year by the Physics Department. The summer school provides introductory graduate level courses in various areas of modern physics to 4th year physics students from all Universities of Greece. The theme for 2005 was "Computational Physics" (see <http://summer.physics.uoc.gr/>)

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 Prize winner, surrounded by leading scientists in the same field, presents intensive lectures to students for a week. Typically two and occasionally three lecture series are organized every summer since 2001. The focus of the 2005 lectures was in molecular biology. (see <http://www.forth.gr/onassis>).

10. PUBLICATIONS

The following 38 publications of the members of the Section appeared in print in international refereed journals during the 2005 calendar year. This corresponds to 2.9 refereed publications per PhD researcher. For each publication, the names of the members of the Section are underlined.

1. Arévalo, P., Papadakis, I., Kuhlbrodt, B., Brinkmann, W., "X-ray to UV variability correlation in MCG-6-30-15", 2005, A&A, 430, 435
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