



UNIVERSITY OF CRETE
DEPARTMENT OF PHYSICS
SECTION OF ASTROPHYSICS & SPACE PHYSICS
ANNUAL REPORT FOR 2004

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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 2004 calendar year. The staff of the Section consisted of 11 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 2004, it resulted in 37 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 April 2005, based on contributions from all members of the Section. The final editing was done by V. Charmandaris.

2. STAFF

The staff of the Section of Astrophysics and Space Physics consists of 11 PhD research scientists, 5 graduate students, and 4 technicians.

The faculty members of the Section during the whole period of the report were Christos Haldoupis (Assoc. Prof.), Despina Hatzidimitriou (Assist. Prof.), Nikolaos D. Kylafis (Prof.), John Papamastorakis (Assoc. Prof.), Iossif E. Papadakis (Assist. Prof.) Joseph Ventura (Prof.) and Ilias M. Vardavas (Assoc. Prof). Researchers of the Section in non-tenure track positions holding a PhD degree were Angeliki Fotiadi, Angelos Misiriotis, and Fotis Mavromatakis. Support staff associated with Skinakas Observatory was Anastasios Kougentakis, Dr. Eythymios Palaiologou, George Paterakis, and Anna Stiataki. Graduate students during this period were Vallia Antoniou (with D. Hatzidimitriou), Dimitris Giannios (with N. Kylafis), Panagiotis Lavvas (with I. Vardavas), George Magdis (with I. Papadakis) and Agnes Mika (with C. Haldoupis).

Pablo Reig (Univ. of Valencia, Spain) joined the Section in March 2004, as a tenure track researcher at the Foundation for Research and Technology – Hellas (FORTH). Vassilis Charmandaris (Cornell Univ., USA) was elected as an assistant professor of observational astrophysics in 2004 and he will join the Physics Department in 2005. Fotis Mavromatakis was elected to an assistant professor position at the Technological Educational Institute (TEI) of Crete, where he will move in 2005.

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, chosen on scientific and functional grounds, is the Skinakas summit of Mount Ida (Psiloritis), at an altitude of 1760m and a distance of 60km from Heraklion. The Observatory has two telescopes: a Modified Ritchey Cretien telescope with a 1.3m aperture (focal ratio of f7.6), which became operational in 1995, and a 30cm telescope (focal ratio f3.2). The building for the small telescope

was constructed in 1986, and observations started in 1987. The optical system was manufactured by Karl Zeiss, and the mechanical parts by DFM Engineering, Germany. More details on the Observatory, the quality of the site, the telescopes and the available instrumentations are can be obtained from: <http://www.skinakas.org.gr>

The main observing projects during the 2004 April to November observing period were:

1. Photometry and Spectroscopy of Planetary Nebulae
2. Photometry and Spectroscopy of Supernova Remnants
3. Photometry and Spectroscopy of Binaries with a compact star companion (WD,NS,BH)
4. 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).
5. Time resolved Photometry of BL- Lac's
6. Photometry of High Redshift Quasars
7. Spectroscopy of optical counterparts of X-ray sources in the local group galaxies M31 and M33
8. Search for close binaries in the open star cluster NGC 7243, using CCD photometry (Observers from INAF- Catania Astrophysical Observatory, Italy)
9. Broad Filter Imaging of Nearby Galaxies
10. Cometary observations: photometry of comets T7 and Q4 using special filters. (Observer from ESO)

At the end of observing period of this report, the 1.3m primary mirror was sent to Germany for re-aluminization. The process was completed and the mirror has been successfully reinstalled at the telescope for the 2005 observing period.

The facilities of Skinakas Observatory have also been used for various educational activities. The tradition of "open nights" continued in 2004 and the Observatory was open to the public for five nights through out the year, giving the opportunity to non-astronomers to be exposed in the wonders of the night sky using modern instruments. In June 2004 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 2004. 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 magnetic aspect sensitive radio backscatter from electrostatic plasma waves in the E region of the ionosphere during times of strong dense layers of metallic ions, which form near 100 km and are subject to plasma instabilities. In addition, IPL continued the un-interrupted operation of a narrow band VLF receiver experiment (in collaboration with Stanford University) throughout 2004, and maintained its VLF database. In addition, IPL helped maintain in operation a pulsation magnetometer, which is installed in Crete by the University of Oulu, Finland.

4. TEACHING

The following courses were offered to the students of the University of Crete by the faculty of the Section during the 2004 calendar year.

- **SPRING SEMESTER 2004**
 - "Atmospheric Physics", (C. Haldoupis)
 - "Physics Lab I - Mechanics", (C. Haldoupis and A. Misiriotis)
 - "Classical Mechanics", (D. Hatzidimitriou)
 - "Stellar Evolution and Nucleosynthesis", (D. Hatzidimitriou)
 - "Special Topics in Astrophysics", (N. Kylafis)
 - "Physics Lab III - Optics", (A. Misiriotis)
 - "Physics of Galaxies" (I. Papadakis)
 - "High Energy Astrophysics", (I. Papadakis)
 - "Observational Astrophysics", (J. Papamastorakis)
 - "Production and Propagation of Radiation", (I. Vardavas)
 - "Introduction to Nuclear Physics", (J. Ventura)

- **FALL SEMESTER 2004**
 - "General Physics I (in the Dept. of Chemistry)", (C. Haldoupis)
 - "Physics Lab III - Optics", (D. Hatzidimitriou)
 - "Astrophysics III", (N. Kylafis)
 - "General Physics I (in the Dept. of Materials Science)", (A. Misiriotis)
 - "Astrophysics I", (J. Papamastorakis)
 - "General Physics I", (I. Papadakis)
 - "Atmospheric Environment", (I. Vardavas)
 - "General Physics I (in the Dept. of Biology)", (J. Ventura)

5. SCIENTIFIC RESEARCH

In this section, we present a brief description of the major research projects in which members of the Section were involved in 2004. 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 the energy spectrum of these sources (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)

- 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 give us 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 vital role on the long-term evolution of spiral galaxies. (Researchers involved: A. Misiriotis in collaboration with a team at Observatoire de Marseille, France)

5.2. OBSERVATIONAL ASTROPHYSICS

5.2.1. GALACTIC OBSERVATIONAL 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)
- 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 further divide into supergiant X-ray binaries (SXRb) and Be/X-ray binaries (BeX). A BeX contains a neutron star orbiting a O9e-B2e star. The origin of the emission lines and infrared excess observed in these objects is a disc around the OB star, which acts as a reservoir of material for the compact object. Progress toward understanding in detail the physics of these systems depends on a multi-wavelength program of observations. Our main sources of data are the 1.3m telescope of the Skinakas Observatory (optical), the 1.5m Carlos Sanchez Telescope in Tenerife (IR) and from various space missions (RXTE, INTEGRAL, etc). The main goals of this project are: a) Characterize the optical/IR variability time scales via optical/IR photometric and spectroscopic observations. b) Characterize the X-ray variability time scales investigating the QPO behavior and searching for correlations between the optical/IR and the X/gamma-ray behavior. c) Study the spectral properties in the range 20-100 keV. d) Search for optical counterparts of the systems. e) Examine the effects of the neutron star on the structure and evolution of the Be star's circumstellar envelope. (Researchers involved: P. Reig)
- Study of Galactic globular clusters with the 1.3m Skinakas Telescope: This is an ongoing project, using the 1.3m 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, J. Papadakis, I. Papamastorakis).

5.2.2. EXTRAGALACTIC OBSERVATIONAL ASTROPHYSICS

- Study of properties of carbon stars in the Magellanic Clouds: In collaboration with R. Cannon (AAO) and D. Morgan (ROE), we have obtained optical spectra for 2300 carbon stars in the Magellanic Clouds, 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) we have been studying the origin and properties of the 509 expanding neutral hydrogen shells catalogued in the Small Magellanic Cloud (SMC). 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), we have been studying the population of X-ray sources in the Local Group Galaxies, M33 and M31. 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), we have been studying the X-ray population in the Small Magellanic Cloud, 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).

- 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 opposed to accretion rate for example). Furthermore, we are trying to investigate the observed spectral and flux variations using new techniques such as the so-called Fourier resolved spectroscopy and the scaling index method, respectively. (Researchers involved: I. Papadakis)

- Optical variability study of BL Lac objects: Using the Skinakas observatory, we are currently observing a number of "Low Frequency Peaked" BL Lacs 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 couple of world-wide, 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: We try 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 goal 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)

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)
- MEDIS Water Resources Project: Participating in a multi-national Mediterranean Islands Water Resources project under the EC Program for Preserving the Ecosystem. (Researchers involved: I. Vardavas)
- Ionospheric and Upper Atmospheric Physics: The main topics of the research work relate to the plasma physics and electrodynamics of irregular ionospheric phenomena, which are known to occur at midlatitudes, and problems relating to the interaction and coupling of the neutral mesosphere and lower thermosphere with the ionosphere. More specifically, we studied the properties and mechanisms relating to the formation and destabilization of midlatitude sporadic E plasma layers (E_s), and the role of wind shears and atmospheric tidal, gravity and planetary waves on sporadic E layer morphology and variability. In addition, we studied the electrodynamic coupling between the unstable E_s plasma and midlatitude ionospheric spread F, both experimentally and theoretically. Furthermore, we pursued research work on VLF (very low frequency) electro-magnetic wave propagation and on VLF ionospheric signatures associated with "transient luminous events", such as sprites and elves, which are atmospheric electricity (thunderstorm and lightning) related phenomena in the upper atmosphere and lower ionosphere. In addition, we have initiated work on meteor trail plasma instabilities and on unusually long-lasting meteor echoes observed with VHF (very high frequency) and HF radars. Finally, we have also participated in studies of ionospheric resonance phenomena observed in ultra low frequency (ULF) electromagnetic noise recordings with sensitive coil magnetometers. (Researchers involved: C. Haldoupis).

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.

- ❑ GSRT funded research project within the "Scientific and Technological Cooperation between RTD organizations in Greece and USA" program of GSRT. Title: "Active and Non-active spiral galaxies: Observations and Modeling" (P.I.: I. Papadakis, budget: 12,000 euros, duration: 2 years. Start: April 2003)
- ❑ 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)
- ❑ 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)
- ❑ "ESRB" Earth Observation project. See description in section 5.3. (P.I.: I. Vardavas, budget: 700,000 euros, duration: 2001-2004)
- ❑ MEDIS Water Resources Project. See description in section 5.3 (P.I.: I. Vardavas, budget: 610,000 euros, duration: 2002-2006)
- ❑ TITAN, a Planetary Scale Laboratory. A network funded by the International Space Science Institute (Bern, Switzerland). Funding for one year (2004-2005) pre Cassini Mission workshops (P.I.: I. Vardavas).
- ❑ EUROPLANET: A network funded by the European Union for five years with a total budget for the network of 2 million euros. The network involves European institutes whose research is on planets. Funds cover travel costs to meetings (P.I.: I. Vardavas).
- ❑ PLATON.: France-Greece collaborative research award with Paris Observatory to work on Titan's atmosphere. (P.I.: I. Vardavas, budget: 12,000 euros).
- ❑ Herakleitos Doctoral Project Award. Three year funding for the doctoral thesis project of P. Lavvas entitled: "Spatial and Temporal Variations in the Properties of the Atmosphere and Surface of Titan: Simulations and Interpretation through Space and Ground Observations", under the supervision of Prof. Vardavas. (Budget: 33,240 euros, duration: 2002-2005)
- ❑ Pythagoras Post-Doctoral Project Award. Three year funding for the research project of Dr. A. Fotiadi entitled: "The Impact of Aerosol Radiative Forcing on the Energy and Water Budget of the Eastern Mediterranean" under the supervision of Prof. Vardavas. (Budget: 80,000 euros, duration: 2004-2006)
- ❑ EOARD (USAF European Office for Aerospace Research and Development) special contract award, entitled "Radio wave studies of irregular ionospheric phenomena at midlatitude", (P.I.: C. Haldoupis, duration: 2003-2004)
- ❑ 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).

- OPTICON observing grant at the 4.2m William Herschel Telescope to V. Antoniou, for the project entitled "Optical identification of X-ray sources in the nearby galaxy M33", under the supervision of Prof. Hatzidimitriou.

7. COLLABORATIONS WITH OTHER INSTITUTES

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

- GREECE
 - Foundation for Research and Technology – Hellas (FORTH), Heraklion
 - National Observatory of Athens, Institute of Astronomy & Astrophysics, 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
 - Cornell University, Ithaca, NY, USA
 - Danish Space Research Institute (DSRI), Denmark
 - 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 Space and Atmospheric Studies of Saskatchewan, Canada
 - Max-Planck-Institut für Extraterrestrische Physik, Garching, Germany
 - Max-Planck-Institut für Kernphysik, Heidelberg, Germany
 - Muenster University, Germany
 - NASA Goddard Space Flight Center, Greenbelt, MD, USA
 - NASA Langley Division of Atmospheric Sciences, VA, USA
 - NASA Marshall Space Flight Center, Huntsville, AL, USA
 - National Space Science and Technology Center, Huntsville, AL, USA
 - Observatoire de Marseille, France
 - Observatoire de Paris, France
 - Royal Observatory Edinburgh, UK
 - Stanford University, USA
 - Université de Rennes, France
 - University of Alicante, Spain
 - University of Arizona, Tucson, AZ, USA
 - University of Barth, UK
 - University of California Berkeley, Radio Astronomy Lab, Berkeley, CA, USA
 - University of Corsica, France
 - University of Cyprus, Cyprus
 - University of Nagoya, Solar-Terrestrial Environment Laboratory, Japan
 - University of Oulu, Finland
 - University of Sicily, Italy
 - University of Southampton, UK
 - University of Valencia, Spain

8. NATIONAL & INTERNATIONAL COMMITTEES

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

Prof. N. Kylafis was member of the Scientific Committee for the 2004 Bodossakis Award.

Prof. J. Ventura is Vice President of the Greek National Committee for Astronomy and a member of the Board of Directors of the international journal Astronomy and Astrophysics.

9. PUBLICATIONS

The following 37 publications of the members of the Section appeared in international refereed journals in 2004. This corresponds to 3,3 refereed publications per PhD researcher. In each publication, the names of the members of the Section are underlined.

1. Alton, P.B., Xilouris E.M., Misiriotis A., Dasyra K.M., Dumke M., "The emissivity of dust grains in spiral galaxies", 2004, A&A, 417, 39
2. Böisinger, T., Hussey, G., Haldoupis, C., Schlegel, K., "Auroral E-region electron density height profile modification by electric field driven vertical plasma transport: some evidence in EISCAT CP-1 data statistics", 2004, Ann. Geophys. 22, 901
3. Blay, P., Reig, P., Martínez Núñez, S., Camero, A., Connell, P., Reglero, V., "INTEGRAL observations of the peculiar BeX System SAX J2103.5+4545", 2004, A&A, 427, 293
4. Boumis, P., Meaburn, J., López, J.A., Mavromatakis, E., Redman, M.P., Harman, D.J., Goudis, C.D., "The kinematics of the bi-lobal supernova remnant G 65.3+5.7. II", 2004, A&A, 424, 583
5. Brinkmann, W., Papadakis, I.E., Ferrero, E., "XMM-Newton observations of the two X-ray weak quasars PG 1411+442 and Mrk 304", 2004, 414, 107
6. Georgantopoulos, I., Papadakis, I., Zezas, A., Ward, M.J., "X-Ray Luminous Galaxies. II. Chandra and XMM-Newton Observations of the ``Composite'' Galaxy IRAS 20051-1117", 2004, ApJ, 614, 634
7. Giannios, D., Kylafis, N.D., Psaltis, D., "Spectra and time variability of Galactic black-hole X-ray sources in the low/hard state", 2004, A&A, 425, 163
8. Haldoupis, C., Neubert, T., Inan, U.S., Mika, A., Allin, T.H., Marshall, R.A., "Subionospheric early VLF signal perturbations observed in one-to-one association with sprites", 2004, Jour. Geophys. Res., 109, 10303
9. Haldoupis, C., Pancheva, D., Mitchell, N.J., "A study of tidal and planetary wave periodicities present in midlatitude sporadic E layers", 2004, Jour. Geophys. Res. 109, 0230
10. Hatzianastassiou, N., Katsoulis, V., Vardavas I.M., "Global Distribution of Direct Ultraviolet and Visible Aerosol Forcing", 2004, TELLUS, 56B, 51-71
11. Hatzianastassiou, N., Katsoulis, V., Vardavas, I., "Sensitivity Analysis of Aerosol Direct Radiative Forcing in the Ultraviolet-Visible Wavelengths and Consequences for the Heat Budget", 2004, TELLUS B, 56B, 368-381
12. Hatzianastassiou, N., Pavlakis, K., Hatzidimitriou, D., Matsoukas, C., Drakakis, E., Vardavas I., "Ten-years Climatology of Global Net Radiation Budget", 2004, International Journal of Climatology, 24 (14): 1785-1802

13. Hatzianastassiou, N., Fotiadi, A., Matsoukas, C., Pavlakis, K.G., Drakakis, E., Hatzidimitriou, D., Vardavas, I., "Long-term global distribution of Earth's shortwave radiation budget at the top of atmosphere", 2004, Atmos. Chem. Phys., 4, 1217
14. Hatzidimitriou, D., Antoniou, V., Papadakis, I., Kaltsa, M., Papadaki, C., Papamastorakis, I., Croke, B.F.W., "BVRI photometry of the galactic globular cluster NGC 6779", 2004, MNRAS, 348, 1157
15. Hatzidimitriou, D., Vardavas, I., Pavlakis, K.G., Hatzianastassiou, N., Matsoukas, C., Drakakis, E., "On the decadal increase in the tropical mean outgoing longwave radiation for the period 1984-2000", 2004, Atmos. Chem. Phys., 4, 1419
16. Hussey, G., Haldoupis, C., Bourdillon, A., Delloue, J., Wiensz, J., "Mid-latitude E-region bulk motions inferred from digital ionosonde and HF radar measurements", 2004, Ann. Geophys., 22, 3789
17. Karaiskou, A., Vallance, C., Papadakis, V., Vardavas, I., Rakitzis, P. "Absolute absorption cross-section measurements of CO₂ in the ultraviolet from 200 to 206nm at 295K and 373K", 2004, Chemical Physics Letters, 400, 30-34
18. Mavromatakis, F., Aschenbach, B., Boumis, P., Papamastorakis, J., "Multi-wavelength study of the {G 82.2+5.3} supernova remnant", 2004, A&A, 415, 1051
19. Mavromatakis, F., Papamastorakis, J., Ventura, J., Boumis, P., "Optical supernova remnant observations from Skinakas Observatory", AdSpR, 33, 480
20. Mavromatakis, F., Xilouris, E., Boumis, P., "The supernova remnant G 6.4-0.1 and its environment", 2004, A&A, 426, 567
21. McHardy, I.M., Papadakis, I.E., Uttley, P., Page, M.J., Mason, K.O., "Combined long and short time-scale X-ray variability of NGC 4051 with RXTE and XMM-Newton", 2004, MNRAS, 348, 783
22. Meaburn, J., Boumis, P., Redman, M.P., López, J.A., Mavromatakis, F., "Candidates for giant lobes projecting from the LBV stars P Cygni and R 143", 2004, A&A, 422, 603
23. Misiriotis, A., Papadakis, I.E., Kylafis, N.D., Papamastorakis, J., "Dust masses and star formation in bright IRAS galaxies. Application of a physical model for the interpretation of FIR observations", 2004, A&A, 417, 39
24. Morgan, D.H., Hatzidimitriou, D., Cannon, R.D., "Merrill-Sanford bands in Large Magellanic Cloud carbon stars", 2004, MNRAS, 355, 1196
25. Nandra, K., Georgantopoulos, I., Brotherton, M., Papadakis, I.E., "X-ray and optical counterparts of hard X-ray selected sources from the SHEEP survey: first results", 2004, MNRAS, 347, 41
26. Nikolajuk, M., Papadakis, I.E., Czerny, B., "Black hole mass estimation from X-ray variability measurements in active galactic nuclei", 2004, MNRAS, 350, 26
27. Papadakis, I.E., "The scaling of the X-ray variability with black hole mass in active galactic nuclei", 2004, MNRAS, 348, 207
28. Papadakis, I. E., Samaritakis, V., Boumis, P., Papamastorakis, J., "Multi-band optical micro-variability observations of the BL Lac object S4 0954+658", 2004, A&A, 426, 437
29. Pavlakis, K. G., Hatzidimitriou, D., Matsoukas, C., Drakakis, E., Hatzianastassiou, N., Vardavas, I., "Ten-year global distribution of downwelling longwave radiation", 2004, Atmos. Chem. Phys., 4, 127
30. Pietsch, W., Misanovic, Z., Haberl, F., Hatzidimitriou, D., Ehle, M., Trinchieri, G., "XMM-Newton survey of the Local Group galaxy M 33", 2004, A&A, 426, 11
31. Popescu, C.C., Tuffs, R.J., Kylafis, N.D., Madore, B. F., "Far Infrared mapping of NGC 891", 2004, A&A, 414, 45
32. Reig, P., Negueruela, I., Fabregat, J., Chato, R., Blay, P., Mavromatakis, F.,

- "Discovery of the optical counterpart to the X-ray pulsar SAX J2103.5+4545", 2004, A&A, 421, 673
33. Reig, P., van Straaten, S., van der Klis, M., "Timing Properties and Spectral States in Aquila X-1", 2004, ApJ, 602, 918
 34. Tuffs, R.J., Popescu, C.C., Völk, H. J., Kylafis, N.D., Dopita, M.A., "Modelling the spectral energy distribution of galaxies. III. Attenuation of stellar light in spiral galaxies", 2004, A&A, 419, 821
 35. Villata, M., Raiteri, C.M., Aller, H.D., Aller, M.F., Terasranta, H., Koivula, P., Wiren, S., Kurtanidze, O.M., Nikolashvili, M.G., Ibrahimov, M.A., Papadakis, I.E., Tosti, G., Hroch, F., Takalo, L.O., Sillanpaa, A., Hagen-Thorn, V. A., Larionov, V.M., Schwartz, R.D., Basler, J., Brown, L.F., Balonek, T.J., "The WEBT campaigns on BL Lacertae. Time and cross-correlation analysis of optical and radio light curves 1968-2003", 2004, A&A, 424, 497
 36. Villata, M., Raiteri, C.M., Kurtanidze, O.M., Nikolashvili, M.G., Ibrahimov, M.A., Papadakis, I. E., Tosti, G., Hroch, F., Takalo, L.O., Sillanpaa, A., Hagen-Thorn, V.A., Larionov, V.M., Schwartz, R.D., Basler, J., Brown, L.F., Balonek, T.J., Benitez, E., Ramirez, A., Sadun, A.C., Boltwood, P., Carini, M.T., Barnaby, D., Coloma, J.M., Ros, J.A., Dai, B. Z., Xie, G.Z., Mattox, J.R., Rodriguez, D., Asfandiyarov, I.M., Atkerson, A., Beem, J.L., Bloom, S.D., Chanturiya, S.M., Ciprini, S., Crapanzano, S., de Diego, J.A., Efimova, N.V., Gardiol, D., Guerra, J.C., Kahharov, B.B., Kapanadze, B.Z., Karttunen, H., Kato, T., Kimeridze, G.N., Kudryavtseva, N.A., Lainela, M., Lanteri, L., Larionova, E.G., Maesano, M., Marchili, N., Massone, G., Monroe, T., Montagni, F., Nesci, R., Nilsson, K., Noble, J.C., Nucciarelli, G., Ostorero, L., Papamastorakis, J., Pasanen, M., Peters, C.S., Pursimo, T., Reig, P., Ryle, W., Sclavi, S., Sigua, L. A., Uemura, M., Wills, W., "The WEBT BL Lacertae Campaign 2001 and its extension. Optical light curves and colour analysis 1994-2002", 2004, A&A, 421, 103
 37. Xilouris, E.M. Georgakakis, A., Misiriotis, A., Charmandaris, V. "Cold and warm dust along a merging galaxy sequence", 2004, MNRAS, 355, 57

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