

**INSTITUTE OF NUCLEAR TECHNOLOGY –
RADIATION PROTECTION**

ANNUAL REPORT 2008

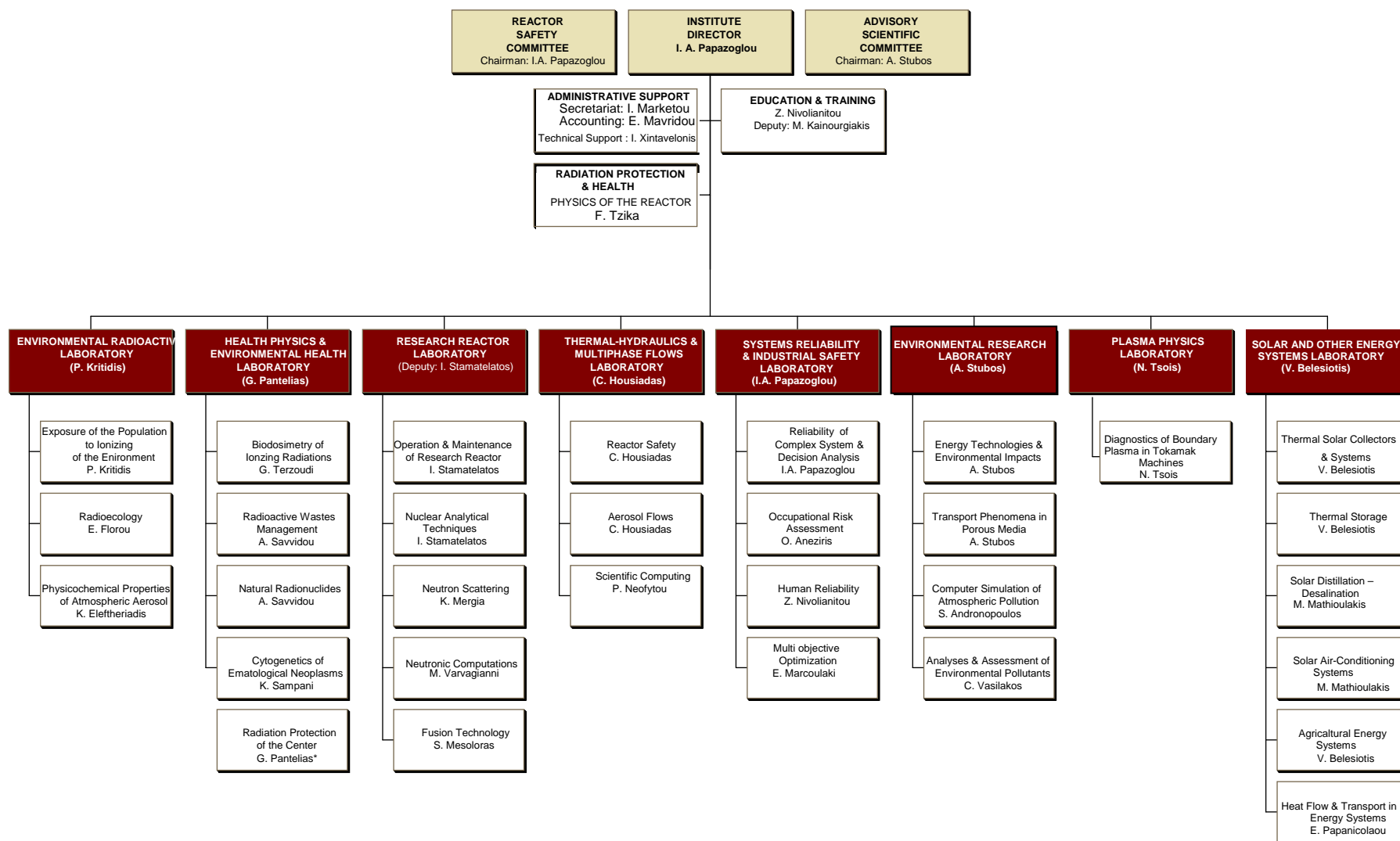
ANNUAL REPORT 2008

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ORGANISATIONAL CHART 2008



Laboratory: Research, Development and Services

* reports to the Director of the Centre

1. PREFACE

Transferring know how from Nuclear Technology to other areas of great importance to the Greek society, such as energy, environmental and health technologies, development of methods and decision tools for safe and secure industrial and infrastructure systems, as well as, advanced materials, cultural heritage and medical applications has been a success story for the Institute of Nuclear Technology – Radiation Protection over the last decades. This is demonstrated by the ability of its researchers to attract significant funding for their activities from European and National Competitive Research programs and International organizations by the large number of scientific publications in prestigious international journals and their number of citations. Furthermore, the Institute and its staff have provided the Greek Society with a number of Technological advanced services. Although the Nuclear Research Reactor formed the basis of the Institute when it was founded in 1985, today it has expanded beyond nuclear technology into six additional laboratories.

R&D activities based on the Nuclear Research Reactor continued to form the nucleus of the Nuclear Research Reactor Laboratory. Development of experimental facilities aiming at transforming part of the Laboratory to a Centre of Excellence in Neutron Science continued. An ambitious refurbishment /upgrade programme of the reactor systems has moved from the planning to the implementation phase. A call for tenders for consulting services for the replacement of the Primary Cooling System has been published in the spring of 2008 and bids were tendered on June 6, 2008. Evaluation of the bids has started and by the end of the year was well advanced into the final procedural steps. Modernization of our reactor will allow its safe and continuous operation and exploitation for the development and characterization of the advanced materials for aerospace, fusion and fission applications and the production of medical isotopes. The reactor constitutes a large national infrastructure, which will contribute to the development of the necessary nuclear safety culture and technological scientific know how for the eventual introduction in our country of the emerging new nuclear energy technology, if and when this is decided.

R&D on assessment of the impact of ionizing radiation on several types of ecosystems, atmospheric aerosol and heavy metal pollution of environment and routine monitoring of environmental radioactivity in Greece has been carried out by the Environmental Radioactivity Laboratory (ERL).

R&D in air quality and dispersion of pollutants, decision support systems, nanomaterials and their use in energy and environmental issues, hydrogen safety and storage (the Laboratory staff is coordinating the European Integrated Project on Hydrogen Storage in Solids) continued in the Environmental Research Laboratory (EREL).

Development of methodology for the quantification of the workers' occupational risk, the optimization of risk reducing measures, the application of this methodology in specific cases and the development of appropriate decision support systems continued in the Systems Reliability and Industrial Safety Laboratory (SRISL). Furthermore, SRISL worked on the development of methodologies for the quantification of Human Reliability.

R&D in the area of solar thermal energy utilization and energy savings, with emphasis on the development of new products, methods and analytical tools continued in the Laboratory of Thermal Energy Systems.

State of the art methodologies in biological dosimetry and cancer cytogenetics for the evaluation of radiation sensitivity, cancer proneness, myelodysplastic and leukemic diseases have been developed by the Health Physics & Environmental Health Laboratory and for these activities it has been nominated as the reference laboratory in Greece.

The Laboratory of Thermal–Hydraulics and Multiphase Flows (THEMLAB), the newest Laboratory of INT-RP exploits the longstanding experience of INT-RP in its field and shapes them according to the needs and challenges of currently emerging R&D applications requiring similar scientific know-how, like aerosol medicine, nanotoxicology, industrial hygiene, environmental health, and particle-biofluid mechanics.

2008 has been a transition year for the Institute with a new director taking over at about the middle of this year. Looking in the future, the Institute of Nuclear Technology & Radiation Protection will keep expanding the scope of its research activities in the energy, environment safety and health sectors in accordance with its new multiannual Business Plan, which forms an integral part the NCSR DEMOKRITOS Business Plan.

Dr. I. A. Papazoglou
Director of INT-RP
Member of the Board of Directors of NCSR Demokritos

2. ACTIVITY REPORT / PERSPECTIVE

2.1. ACTIVITY REPORT

The activities of the Institute of Nuclear Technology – Radiation Protection (INT-RP) cover the following fields:

I. Nuclear Technology & Radiation Protection (NT&RP)

The INT-RP is the only centre in the country encompassing integrated know how on Nuclear Technology and Radiation Protection and operates and exploits unique infrastructure for the benefit of the Greek research community and society. It has established co-operative links with similar Institutions in Europe and internationally and its facilities attract researchers from the neighbouring countries and Europe. Among the activities of the INT-RP, described in detail in other parts of this report, the following are worth mentioning. The INT-RP

- owns, operates and exploits the only Experimental Nuclear Reactor in Greece (5MW). Through the reactor operation, expertise in the field of nuclear reactor technology is maintained and it is transferred to the new generation of engineers and scientists. Around the reactor a number of large scale facilities for research and technology have been developed. Among the application areas of this infrastructure are materials science and nano-technology, health, environment and cultural heritage. Access to these facilities is open to all the Greek, neighbouring countries and European researchers. These large scale facilities, utilizing the reactor produced neutrons, are unique in the Balkan and East Mediterranean region and render the Greek Research Reactor as a Large Scale Facility in the European Research Area. INT-RP also represents Greece in European and International fora on Nuclear Research Reactors, Neutron Scattering, Nuclear Analytical Techniques, Reactor Safety (Severe Accidents) and on fission and fusion and supports in a large number of relevant activities the Greek Atomic Energy Commission and the Greek State.
- is the only Institution in Greece which carries out research and development in the Fusion Technology for the European Fusion Program and the study of advanced materials for fusion and fission applications. It is also the co-ordinator of the Greek Fusion Program.
- is an integrated radiation protection sector in Greece, a fact that is of significance, considering the existence of a wide range of ionising radiation applications in industry and medicine in the country. The importance of the NT&RP expertise became obvious following the Chernobyl accident, whereby the contribution of the INT-RP for tackling the after-effects of the accident proved decisive. The INT-RP supports – both technically and scientifically - a large number of the activities of the Greek Atomic Energy Commission (GAEC). It is also worth mentioning that the national radiological emergency plan XENOKRATES as well as the greater part of Greek radiation protection safety regulations were developed by the personnel of the INT-RP. The majority of the scientific committee members of the XENOKRATES plan come from the personnel of INT-RP.
- is the sole centre in Greece with expertise and equipment for handling radioactive waste, whereby it constitutes the only unit in the country capable of providing and implementing solutions to the waste handling problem.
- encompasses the only integrated Laboratory of Environmental Radioactivity in Greece, with an extensive network of sampling/measuring/monitoring stations covering the entire country.

- the Laboratory of Health Physics and Environmental Health constitutes the sole Greek Laboratory with expertise in the field of overexposure to ionising radiation using biodosimetry methodologies. It is the reference laboratory for Greek Atomic Energy Commission (GAEC) and it constitutes one of the Laboratories selected by the International Atomic Energy Agency (IAEA) for prototyping the methodology of biological dosimetry.

II. Environmental Technology

A significant number of activities have already been developed in this area, involving a large (larger than the critical mass) number of researchers and specialised operators of the INT-RP. More specifically, the INT-RP is the sole research institute in the country with an integrated R&D approach to environmental matters combining the fields of diagnosis, prognosis, impact and pollution technology.

- The ensemble of activities of the Environmental Radioactivity Laboratory concerns environmental technology in terms of both pure research and environmental quality evaluation studies. Besides, research on radioecology has ranked the laboratory to the expertise domain. Furthermore, research on aerosols has become a subject of increased interest for the laboratory.
- The same is true of the largest part of activities of the Laboratory of Environmental Research, with its personnel specialising in the simulation of (conventional and radioactive) pollutant dispersion and air pollutant measurements.
- The Laboratory of Thermal-hydraulics and Multiphase Flows is active in investigating possible health implications from environmental exposures or occupational exposures (in emerging technologies like nanotechnology).
- The Laboratory of System Reliability and Industrial Safety is mainly concerned with R&D in matters of risk analysis, including environmental pollution from large-scale industrial accidents. A number of case studies related to environmental pollution scenarios from chemical industries in Greece have been realised in the framework of the “Seveso directive” of the European Union.
- The Laboratory of the Experimental Nuclear Reactor has the potential of detecting/identifying environmental contaminants (with a resolution capability of ppm) employing environmental sample neutron activation.
- It becomes clear, thus, that the INT-RP constitutes - by far - the most experienced and reliable consultant of the Greek public and private Greek sector in matters of environmental protection. This is demonstrated by:
 - Its contribution in guiding the environmental crises during the Chernobyl accident and the war at Yugoslavia (fear of depleted uranium).
 - The increase in incoming funds – during the last five years - from the provision of services to the public and private sector in matters of environmental protection

III. Energy Technology

- It is apparent that the areas related to (both fission and fusion) reactor technology fall into the more general area of energy technology.
- The Solar & other Energy Systems Laboratory (SESL) receives considerable external funding and pursues applied research and technology development in the fields of Solar Thermal Energy Utilization & Energy Savings Systems. It is accredited according to the EN ISO/IEC 17025 standard and is equipped with excellent experimental facilities. Along with experimental techniques, it uses as basic analytical tools the metrology of energy quantities and numerical simulation of flow and heat/mass transfer phenomena.

- The laboratory of Environmental Research has developed significant research activity in the areas of hydrogen technologies (the emphasis being on issues of safety and storage), energy efficient separations (the emphasis being on nonporous media characterization and applications) and enhanced hydrocarbon recovery from underground reservoirs (the emphasis being on the simulation of fluid flow and dispersion processes).

IV. Health Technology

- Biological tissue disinfection/sterilisation (bones, skin, tendons) is performed in the Experimental Nuclear Reactor; these tissues are, subsequently, used in transplant operations.
- The Health Physics & Environmental Hygiene Laboratory gives proper and continuous recognition to problems related to all potential radiation induced health hazards. Specifically, the Laboratory provides operational health physics services related to the Radiation Protection Program in NCSR “Demokritos” and the evaluation of radiation overexposures and radiation accidents in general, by means of biological dosimetry methods. Its research activities involve the use of radiation cytogenetic, molecular genetics and radioisotope methodologies to study questions of basic and applied research in radiation protection, radiobiology and radioactive waste management. In addition, the Laboratory based on its expertise in radiation protection, radiation biology and cancer cytogenetic, offers specialized services for the calibration of radiation survey meters, for the development of individualized protocols for radiotherapy treatment, as well as for the diagnosis of preleukemic and leukemic diseases. Advanced cytogenetic and molecular genetic technologies are also used to evaluate the pathogenetic correlations between genetic changes and leukemogenesis.
- Nuclear analysis techniques are under development for the in vivo and in vitro study of the composition of the human body.
- Mathematical modelling techniques are under development for the “in silico” study of the interaction between particles and biofluids.

V. Health and Safety

- The System Reliability and Industrial Safety Laboratory (SRISL) is active in the area of management of technological risks. SRISL has developed methodologies and associated tools for supporting decisions on the management of risks from technological accidents and extreme natural phenomena. It contains a unique capability in Greece to perform integrated risk studies that assess the consequences of major accidents on public health, the worker’s health and the environment while at the same time it assesses the relative likelihood of these accidents and consequences. The Laboratory performs research and development in the areas of dynamic system reliability, quantification of uncertainties, human reliability and optimisation under uncertainty and multiple objectives. It also performs risk and safety studies for a variety of industrial installations. During the last four years SRISL has extended its activities in the area of occupational risk in collaboration with the ministry of Labour and Affairs of the Netherlands. The SRISL is a Technical Advisor to the Greek ministries of: a) Development; b) Environmental and Physical Planning and Public Works; and c) Employment and Social Affairs on the evaluation and technical assessment of the risk studies of the Greek Industrial Installations subject to the “Seveso Directive” of the European Union.

2.2. Scientific Achievements in 2008

The strategic objectives of the Institute have been, and will continue to be, to perform excellent research, to develop products and to provide services for the benefit of the Greek society.

Scientific Achievements

- Since the Nuclear Research Reactor is a unique Large Scale Facility for Greece and of great national importance steps have been taken in order to upgrade and modernize its facilities with the aim to attain a life extension of the facility for another 15-20 years. In 2008 a major civil engineering project was completed. The project included building structure reinforcement, thermal insulation works, total replacement of the floor surface area, maintenance and painting of all internal and external areas of the reactor building and part replacement of the electrical infrastructure.
- In 2008 an IAEA expert mission was conducted aiming to finalize the technical requirements related to the greek research reactor modification program. On the basis of the IAEA recommendations a project for engineering consulting services for the replacement of the primary cooling system (PCS) of the research reactor was prepared. An international open tender procedure was initiated in 2008. Contract with an International Nuclear Company will be signed and the project will be initiated in 2009. The PCS replacement project is expected to be completed in 2011.
- Participation in the EU project FEMaS-CA “Fusion Materials Related Science” and co-ordination of the workpackage “Neutron based methods” continued.
- Extension of the neutron scattering facilities through the development of complementary X-ray techniques continued. Already a SAXS apparatus, X-ray reflectivity and diffraction facilities have been installed and are operational. Fusion materials have been studied at high temperatures for the European Fusion programme.
- Through our participation in the project “Integrated Environmental Centre” new experimental facilities and computational infrastructure have been developed, e.g. the advanced computer cluster THALES (Thermofluid & Aero-biocolloidal Large Scale Engineering Simulations).
- In the area of Solar Thermal Energy Utilization and Energy Savings, the Energy Autonomus Building “Prometheas Pyroforos” was completed and used in the further spreading of pioneering technologies for energy savings in buildings (one-day seminars in Greece and abroad, presentation in the European Parliament). A prototype, energy autonomous solar desalination unit was completed and has come into operation in the area of Geroskipou, Cyprus. This unit is based on the Humidification-Dehumidification technology and it is the first time that this is being evaluated in real operating conditions. A new, fully autonomous solar domestic hot water system of low visual impact was developed for a private company, which intends to proceed in manufacturing it and making it available on the market. The development of a new, prototype facility for the energetic characterization and performance evaluation of indirectly-heated hot water tanks, according to the EN 12897:2006 standard was also completed and it has come into operation. In addition, a new solar-assisted drying facility utilizing an air-heater with evacuated tubes was developed.
- In the area of Energy and Environment, the Environmental Research Laboratory (EREL) coordinates the European FP6 Integrated Project on Hydrogen Storage in Solids and has achieved the development of novel and promising hydrogen storage materials with significantly enhanced gravimetric storage capacity at room temperature (collaboration with overseas partners, US patent granted). Moreover, advanced tools for hydrogen safety calculations have been developed and are applied

for consequence estimation purposes in various indoor (garages, etc) and outdoor cases.

- A European Grant (RegPot programme) has been awarded to EREL for the enhancement of its R&D potential and infrastructure in the fields of atmospheric quality and hydrogen technologies. This is expected to upgrade substantially the capabilities and prospects of the Laboratory in its areas of expertise.
- EREL has obtained accreditation (EN-17025) for PM10, PAH and BTX measurements in atmospheric samples. The Laboratory provides advanced services concerning air pollution matters to the industry and public organizations.
- Participation of ERL (Environmental Radioactivity Laboratory) in the national monitoring program of environmental radioactivity (Euratom Treaty Article 35), using a country-level monitoring network.
- In the frame of radioecology program, ERL represents Greece in two IAEA' TC interregional projects on the modern approaches and tools for the assessment of radiation impact on marine, terrestrial and freshwater ecosystems.
- ERL has sustained the operation of the Demokritos supersite for Aerosol Properties Research and technology applications in Atmospheric Pollution and Climate change. First Data for 2008 have been published in the EBAS Global Database (<http://ebas.nilu.no/Default.aspx>) operated by the European Supersites Atmospheric Aerosol Research programme (EUSAAR)
- ERL has been accredited under the terms of EL0T EN ISO/IEC-17025 for sampling and measurement of PM10, in atmospheric air.
- ERL has provided the Greek National counterparts in the following IAEA Regional programmes: 1) RER/2/005 for Characterizing Seasonal Variations in Elemental Particulate Matter in the field of Radioanalytical techniques 2)
- The HPEHL is the Reference Laboratory of the International Atomic Energy Agency (IAEA) and the Greek Atomic Energy Commission for biological dosimetry studies and the evaluation of absorbed doses after radiation accidents. It is the National Reference Laboratory for the cytogenetic evaluation of myelodysplastic syndromes. The provision of services were highly improved and optimised in the framework of the operational Programme "Competitiveness, Development of Public Research Agencies – AKMON".
- HPEHL is in the process of being accredited according to the EN ISO/IEC 15189:2007 for karyotyping and molecular cytogenetics, the ISO 19238:2004 and ISO 21243:2008 for radiation protection – biological dosimetry.
- The SRISL has developed a methodology for developing optimum strategies for responding to Emergencies owing to major industrial accidents. In 2007 SRISL has completed the quantification of models for 63 specific hazards faced by workers in various occupations. These models form the building blocks for the development of an integrated occupational risk model used in the assessment of occupational risk in companies of various sizes and activity fields.

2.3. Prespective and Mid Term Objectives

- A Strategic Planning for upgrading, full operation and exploitation of the Nuclear Research Reactor forseeing the start of operation in 2011 is implemented.
- Full renovation and upgrading of the Nuclear Research Reactor operation facilities are planned. Study of the replacement and the actual replacement of the PCS will continue.
- Training of young engineers in the field of Nuclear Technology and Radiation Protection.

- The suggestion of the international scientific jury of the “Centre of Excellence Programme” (which is in agreement with the policy of the INT-RP) of giving priority to the neutron diffractometer and the development of new neutron scattering facilities will be fully implemented. For this the installation of a TOF reflectometer, SANS and USANS facilities are being implemented.
- The development for the European Fusion programme of a new experimental facility for resistivity measurements after irradiation.
- Emphasis will be given in the application of nuclear analytical techniques in industrial, environmental and medical studies.
- The development of a methodology for the evaluation of environmental quality, as related to conventional and radioactive pollution and their synergistic action, is in progress at the ERL, based on the analysis of cytogenetic aberrations in natural aquatic populations. Development of methodology for source identification and apportionment of atmospheric pollutants, by means of elemental and radioactive aerosol tracers.
- SRISL will continue to work on methodologies and applications for the optimisation of occupational risk in collaboration with the ministry of Labour and Social Affairs of the Netherlands. It will also continue R & D in risk assessment and management methodology and application on new and emerging risks (e.g. nanotechnology) and assessment of the integrity of vital infrastructures. It will also develop models for integrating human factors in safety analysis of complex technological systems and continue work on Soft Computing.
- The THEMLAB will develop quite versatile, common physical methods and tools for the numerical simulation of dispersed, particle-laden multiphase flows, with the help of computational fluid dynamics (CFD). The scientific problems are concerned with applications in the areas of energy and environment and pertaining to human health implication issues. It will also operate a CFD platform (on THALES), which, besides inhouse developed tools, will be also equipped with state-of-the-art commercial software. A particular aim is to be connected to the grid (by means of the grid site GR-05-Demokritos).
- In the field of interest of SESL, emphasis will be given in the development of technologies for the optimal utilization of solar thermal energy (4th generation solar collectors and systems) extending also to higher temperatures which allow electric power generation, along with related applications (thermal distillation-desalination, solar-assisted drying and air-conditioning), thermal storage systems encompassing technologies for high temperatures as well, methodologies and tools for assessment of energy performance and metrology of energy quantities.
- Continuous emphasis is also placed on energy technologies and their interaction with the environment. The necessary infrastructure for climatic change studies (downscaling from global to regional level) is currently established at EREL and the Laboratory aims at providing integrated R&D services on issues related to hydrogen storage technology and safety of the relevant mobile and stationary applications.

Finally it should be noted that the importance – for the country, the protection of the environment and the health of the population - of maintaining a critical mass of researchers working in the area of NT&RP is self evident. Consequently, special emphasis has been given, and will continue to be given, in this direction.

2.4. Facts and Figures

Emphasis has been placed on: (a) publishing the results of the research in international peer reviewed journals; (b) winning R&D projects; and (c) providing high-technology services.

Research and development performance is reflected in the number and quality of publications and externally financed programs (mainly from the European Commission).

- The number of publications in international peer-reviewed scientific journals and in peer-reviewed international conferences continued at the same high levels of the recent years (see Figure 1), while the quality of the 2008 publications is among the highest in the engineering fields (see Table 1). A detailed list of the publications is given at the end of this report.
- INT-RP is financially healthy External Funding mainly from competitive research contracts remained at the same level as in 2007 (see Figure 2). This funding is expected to increase as the new EC-FP-7 program will start in 2009. Funding from the Greek government exhibited a decrease in 2007 owing to the lump-sum funding of the Reactor refurbishment of 2.M€ in 2007. INT-RP is thus in a position to self-finance significant building a scientific equipment infrastructures. Furthermore a significant part of INT-RP funding is directed in the employment of “fixed-term” scientific, technical and administrative personnel, necessary for the successful completion of the research projects.
- In addition to the amount shown in Table 2 under “Matching Funds” which has been given directly to the projects of the laboratories an additional amount of 242.000€ has been directed centrally to INT-RP. This amount has been spent in support of various needs of the institute and the laboratories as shown in Table 4.
- Staff-power in INT-RP over the last ten years is given in tabular form in Table 3 and schematically in Figure 3. Employment has remained at the same level of 2007 slightly elevated (10%) in the last two years of the decade. It is noteworthy that about 25% are “fixed-term” temporal employees.

Table 1. Publications and Impact Factors in 2008			
<i>LABORATORY</i>	<i>PUBLICATIONS</i>		<i>IMPACT FACTOR</i>
	Papers (in refereed Scientific Journals)	Papers (in Conference Proceedings)	
<i>Nuclear Research Reactor</i>	12	18	12.347
<i>Environmental Radioactivity</i>	12	16	7.5
<i>Health Physics & Environmental Health Research</i>	8	12	34.451
<i>System Reliability & Industrial Safety</i>	22	31	35.863
<i>Solar & Other Energy Systems</i>	8	9	5.505
<i>Thermal-Hydraulic & Multiphase Flow</i>	5	-	2.599
<i>Total</i>	74	99	

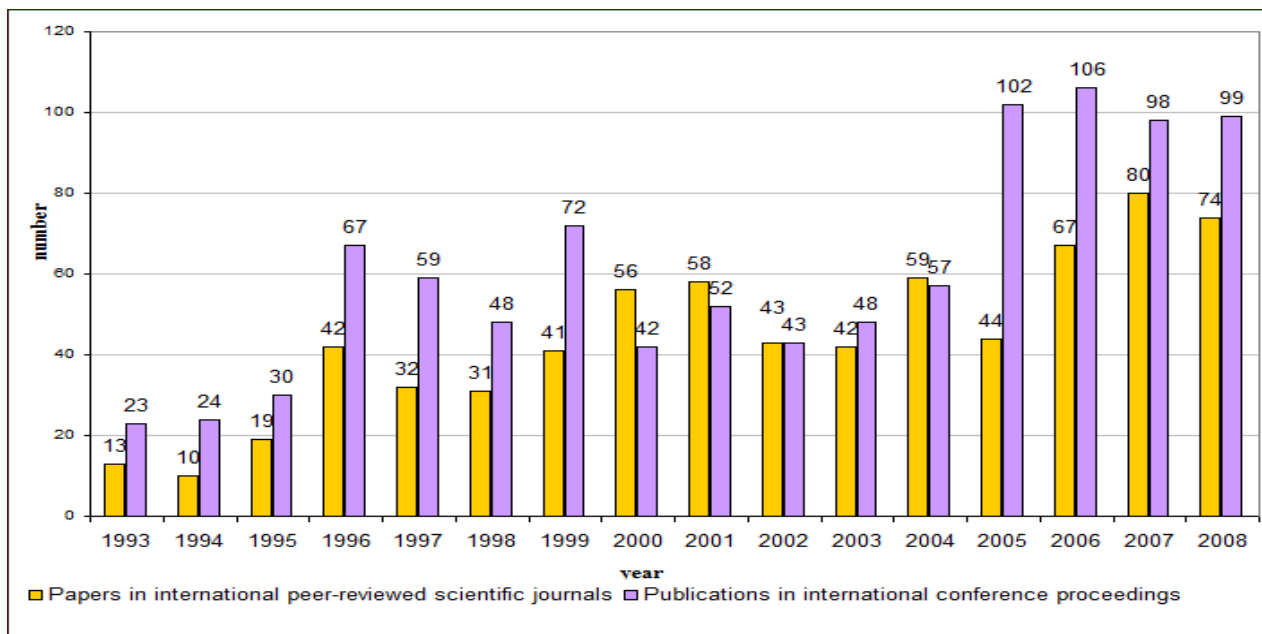


FIGURE 1. Temporal variation of INT-RP publications

Table 2. INT-RP funding for 2008 (Per Laboratory and total) from various third-party sources

<i>LABORATORIES</i>	<i>FUNDING (IN EURO)</i>				
	International Competitive Programs	National Competitive Programs	Provision of Services	Matching Funds	Total
<i>Nuclear Research Reactor</i>	249.575,00	102.250,00	–	129.889,00	481.714,00
<i>Enviromental Radioactivity</i>	52.500,00	50.000,00	57.123,00	–	159.623,00
<i>Health Physics & Enviromental Hygiene</i>	187.200,00	–	–	–	187.200,00
<i>Enviromental Research</i>	351.043,00	71.036,00	68.464,00	71.529,00	562.072,00
<i>System Reliability & Industrial Safety</i>	196.323,00	–	–	13.695,00	210.018,00
<i>Solar & other Energy Systems</i>	216.410,00	82.975,00	61.352,00	9.356,00	370.093,00
<i>Thermal-Hydraulicus & Multiphase Flow</i>	97.402,00	40.000,00	–	6.480,00	143.882,00
Total	1.350.453,00	346.261,00	186.939,00	230.949,00	2.114.602,00

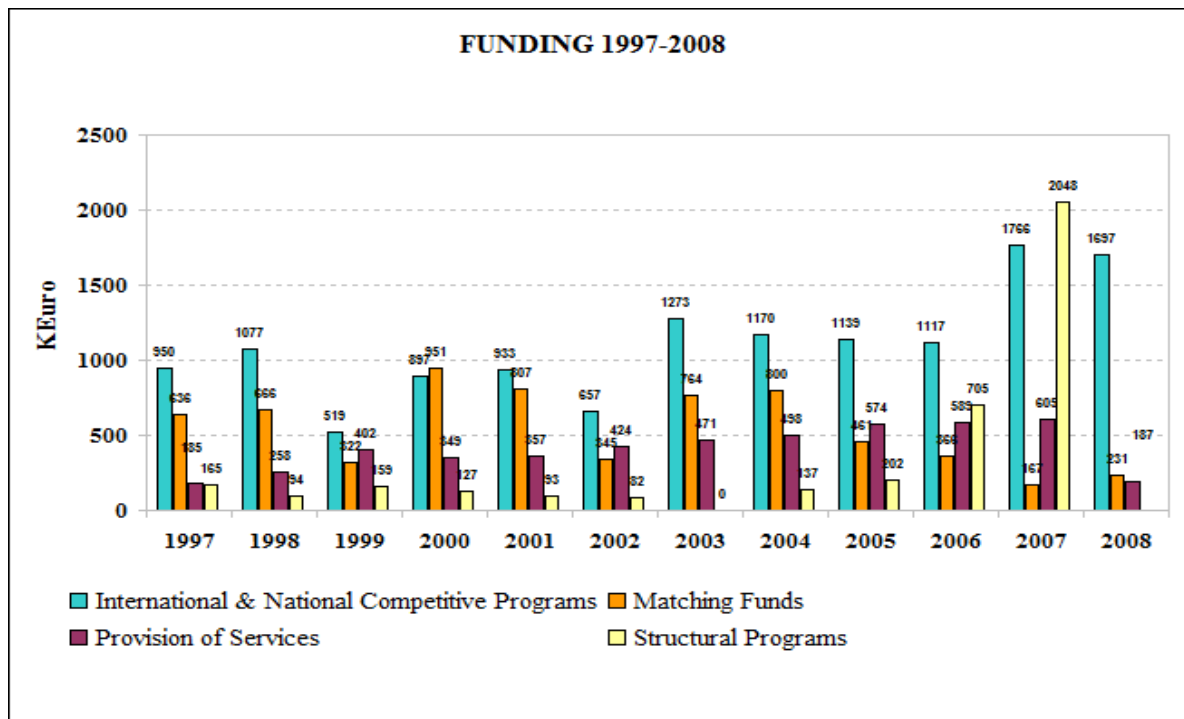


FIGURE 2: Temporal variation in INT-RP external funding

Table 3. PERSONNEL OVER THE LAST TEN YEARS											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Researchers and Functional Scientific Personnel	27	27	25	24	24	26	22	22	24	31	32
Post - Doctoral Researchers	6	6	5	3	4	2	2	2	4	7	3
Technicians	27	26	23	23	25	25	27	28	30	32	27
Temporal under Fixed-Term contracts	21	29	33	38	31	30	38	38	22	23	32
Administrative	2	4	6	4	2	2	2	2	3	2	2
Other Scientists	4	5	6	5	15	15	11	11	14	15	14
Ph-D Students	21	19	11	8	11	11	8	9	14	14	13
TOTAL	108	116	109	105	112	111	110	112	111	124	123

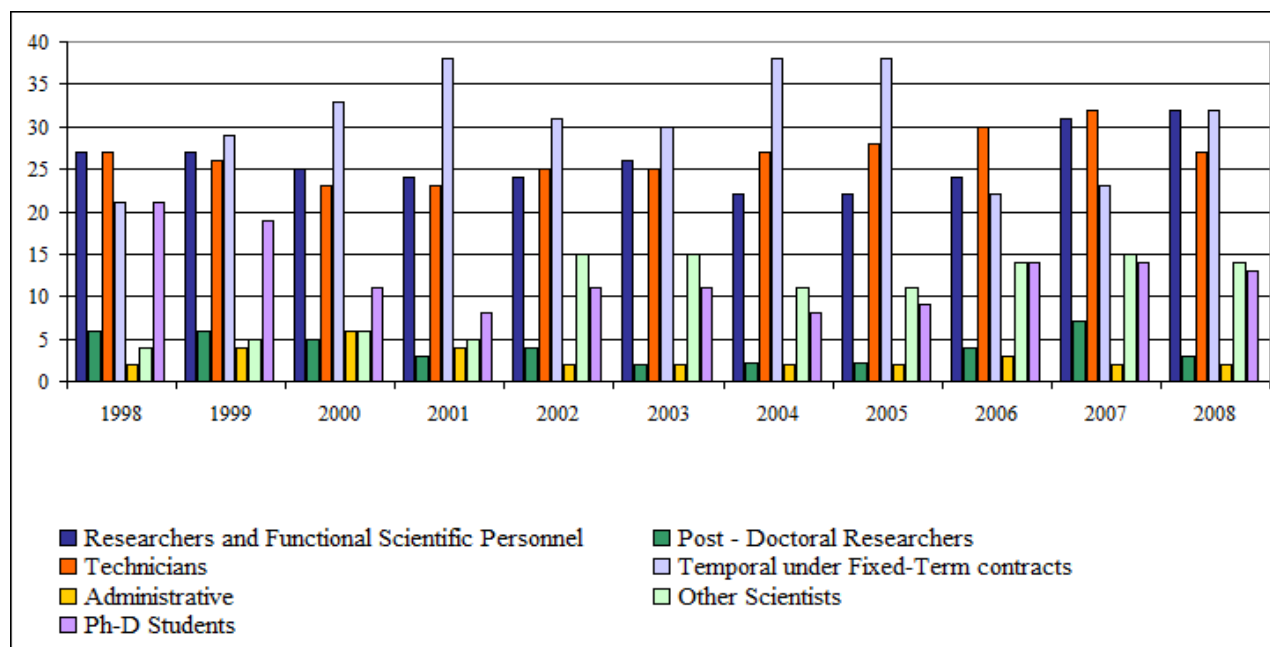


FIGURE 3 : Temporal variation in INT-RP personnel

Table 4. INSTITUTE ACCOUNT – EXPENDITURE 2008							
	EMPLOYMENT ON CONTRACT/OTHER	TRAVEL	CONSUMABLES	EQUIPMENT	GENERAL EXPENSES	OTHER COSTS	TOTAL
INT-RP (General)*	8.883€	9.828 €	21.622 €	13.539 €	26.829 €	4.130 €	84.833 €
System Reliability & Industrial Safety Laboratory			303 €	1.552 €			1.856 €
Thermal Hydraulics & Multiphase Flow Laboratory				1.590 €			1.590€
Environmental Research Laboratory			148 €	750 €			898 €
Health Physics Environmental Health Laboratory							36.250 €
Nuclear Research Reactor Laboratory	16.210 €	800 €	19.155 €	79.982 €	5.840 €		151.637 €
Environmental Radioactivity Laboratory			789 €				789 €
Solar & other Energy Systems Laboratory			200€				200 €
TOTAL	25.093 €	10.628 €	42.219 €	97.414 €	32.670 €	4.131€	241.803 €

*INT-RP: Institute of Nuclear Technology & Radiation Protection

3. Laboratories

NUCLEAR RESEARCH REACTOR LABORATORY

Head: Dr. I.A. Papazoglou (Acting)

Deputy Head: I.E. Stamatelatos

Personnel:

Researchers	7
Other Scientists:	5
Co-operating Researchers:	3
PG Scholarships:	2
Technicians:	13

General Description

Scope of the laboratory is the operation and exploitation of the Greek Research Reactor (GRR-1). Through reactor operation expertise in nuclear technology and radiation protection is developed. Successful exploitation of the reactor facility is achieved through the development and utilization of experimental research facilities aiming to apply neutron techniques in research and technology and carry out interdisciplinary research in the areas of material science, nanotechnology, condensed matter physics, applied nuclear physics and radioisotope production, health, environment and cultural heritage studies. Available experimental techniques include neutron diffraction, neutron reflectivity, irradiation rigs, neutron activation analysis including capabilities for large volume samples. In addition to the reactor based techniques, complementary techniques are available including prompt-gamma neutron activation using isotopic neutron sources, small angle X-ray scattering, X-ray reflectivity and X-ray diffraction. The reactor facilities are unique in the Balkan and East Mediterranean region and render the Greek Research Reactor as a Large Scale facility. The laboratory participates in GSRT, EU, IAEA research programs and moreover, provides services on environmental, health and material sciences issues. Collaborative agreements and links with European and International research centers have been established. Members of the laboratory participate in International fora and provide support to the Government, public bodies and the industry.

Research activities

The R&D activities during 2008 can be summarized as following:

- Development and Applications of Neutron Scattering techniques
 - Development of neutron scattering apparatus at GRR-1
 - Neutron detection systems and mechanical components (positioning systems)
 - Sample environment – high and low temperatures
 - Neutron scattering inelastic techniques for proton dynamics at high energy transfers
- Materials and Nanotechnology

Radiation damage for the European Fusion Program

- Radiation induced resistivity changes in model FeCr alloys
- Neutron radiation structural effects on composite materials (SiC_f/SiC)

Studies of advanced bulk materials for fusion applications

- Porosity in doped graphites using neutron scattering techniques
- Residual stress determination in Plasma Facing Materials using neutron diffraction
- Structural, physical and magnetic properties of ITER structural steels
- Phase transformations in alloys
- Magnetism in alloys

Thin films / Surfaces

- Magnetic thin films & multilayers

- High-k dielectrics on Si & Ge
- Ceramic metallization for joining
- Oxidization phenomena

Nuclear Technology & Radiation Protection

- Neutronic analysis and criticality safety calculations
- Thermohydraulics calculations
- Gamma ray detector modelling
- Characterization of radioactive waste using non-destructive techniques
- Development of nuclear techniques for analysis of large volume environmental, industrial and cultural heritage samples
- Development of a prompt gamma neutron activation technique for non-destructive analysis of concrete

Achievements

A three year reactor refurbishment and renovation program was initiated during 2007. The program includes replacement of the reactor primary cooling system, control instrumentation as well as a major refurbishment of the building and facilities. The program is expected to be concluded in 2009 and the reactor to be fully operational in 2010. The main achievements during 2008 were the following:

1. The refurbishment of the reactor building is completed
2. International Open Tender Procedure for “Provision of scientific-engineering advice on the replacement of the Research Nuclear Reactor primary cooling system”
3. Preparatory work for the decommissioning of the old primary cooling system
4. The article, "Induced magnetism at interfaces in ultra-thin epitaxial V/Gd bilayers," published in Physical Review B 74, 075417 (2006), has been selected for the August 28, 2007 issue of Virtual Journal of Nanoscale Science & Technology. The Virtual Journal, which is published by the American Institute of Physics and the American Physical Society in cooperation with numerous other societies and publishers, is an edited compilation of links to featured articles from participating publishers, covering a focused area of frontier research.

Education

MSc thesis

1. V. Maragos “Verification of U-235 mass content in MTR type fuel assemblies by a non-destructive method”, School of Physics and Astronomy, Birmingham University, UK (supervisors I.E. Stamatelatos, P. Norman)

Diploma thesis

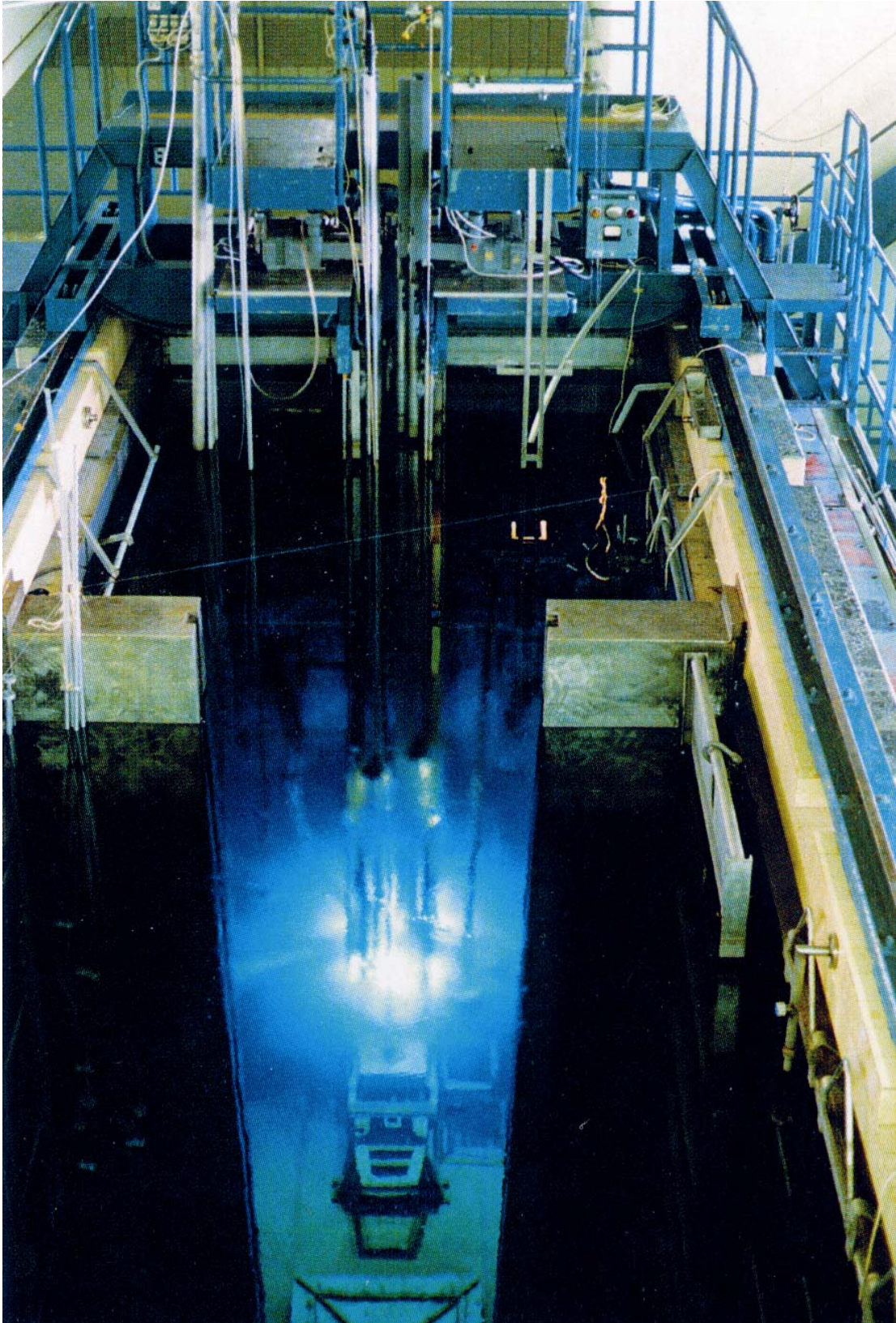
1. S. Kordolaimi, «Neutron radiography». Diploma Thesis, National Technical University of Athens, Department of Applied Mathematics and Physics (in collaboration with Prof. E. Gazis), 2008
2. E. Roussou, “Study of the γ -heating process on materials irradiated in research reactors” Diploma Thesis, National Technical University of Athens, School of Applied Mathematical and Physical Sciences.(2008)

Undergraduate students training

1. M. Kastriotou, “Residual Stresses in W/CuCrZr brazed tiles using neutron diffraction”, Department of Applied Mathematics and Physics, 1/8/2008 -30/9/2008

In addition, members of the laboratory participated in the teaching activities of the following national and international Post Graduate courses:

1. IAEA Post Graduate Educational Course on Radiation Protection and Safe Use of Radiation Sources, Organized by GAEC
2. Inter – University Postgraduate Course in Medical - Radiation Physics (IPCMRP)
3. 8th School and Workshop on Fusion Physics and Technology, Volos, Greece, 6 - 10 April 2009



Research Reactor

ENVIRONMENTAL RADIOACTIVITY LABORATORY (ERL)

Head: Dr. P. Kritidis

Personnel

Researchers and Functional Scientific Personnel	4
Technicians:	3
PhD Fellows (scholarships):	2
PHD Candidates	1
Post-graduate (MSc) Candidates:	1

General description

The scientific subject of ERL is the environmental radioactivity (soil radioactivity, indoor radon, marine radioactivity, aerosol radioactivity) and radioecology, oriented either to man and eco-centric approach. This relates to both natural and artificial radioactivity. ERL operates also a network of 40 sampling and measuring stations across the country, which is a key part of the National routine network. ERL is also engaged with radiological certification of imported and exported foods and materials.

ERL is also involved in the last-decade research for the development of a similar, like man system, for radiological protection of wildlife. Such system is required to address emerging legislation, in some countries, from the conservation perspective.

The Laboratory has obtained National accreditation under the terms of the EL0T EN ISO/IEC 17025:2005 Standard for specific atmospheric aerosol measurements in order to satisfy the European standard EN12341 (Accreditation Cert. No 447). Through structural programs and together with other laboratories, ERL carries out a substantial investment in novel state of the art instrumentation for the characterization of the atmospheric aerosol physicochemical properties, which is part of a Large Scale Environmental Research Infrastructure within NCSR “Demokritos”. This has resulted in the development of a State of the Art Urban Background Aerosol Monitoring station within the grounds of NCSR “Demokritos”, for real time measurements of physical and other properties of atmospheric aerosol and was put into continuous operation during 2008. Operation is supported by equivalent calibration and analytical lab infrastructure.

Research activities

- Coordinated research projects in collaboration with other scientific teams from research centers and universities, local authorities and international organizations. Principal topics:
 - Radioecology and radio-eco-toxicity.
 - Environmental modeling for radiation safety
 - Physicochemical properties of atmospheric aerosol and radioactive tracers with respect to climate change, impact on air quality and health effects.
 - Aerosol Nano-particle characterization techniques for new materials
 - Source apportionment and receptor modeling.
 - Risk assessment in indoor, urban and natural environments.
- Applied and oriented research projects related to the radiological and conventional impact of human activities on the environment.
- Control of radioactivity in various environmental media and food radioactivity control, in accordance with the frame program REM of DG XI / EU and the national obligations related to it. The routine monitoring network includes 40 stations for sampling of air, radioactive

deposition, surface and drinking water, soil and food. The routine monitoring is performed according to assignment of the Greek Atomic Energy Commission.

- Technical studies and measurements on demand of third parts.

ERL is a part of the REM network of DG XI / EU (Environmental Radioactivity of the European Community). The services provided are of approximately 75 000 Euro per year and include:

- Analysis of radionuclides in food and other samples and issuing of related certificates to Greek and foreign enterprises and persons.
- Radiological studies in regions of enhanced natural radioactivity, after the request of private enterprises or governmental organizations.
- Analysis of heavy metals in environmental and other samples.

The scientific staff of ERL provides expert services in national and/or international committees (EU, IAEA, Greek ministries), including reviews in scientific journals. They are also engaged in educational activities (supervising of PhD fellowships, diploma works, participation in university post-graduate studies and seminars, EU and IAEA seminars). ERL is the co-ordinator of inter-institutional thematic research activities for harmonizing existing approaches towards environmental protection, as well as, procedures, models and tools for the purpose.

ERL is also co-ordinating Regional Development Programmes entitled "Development of an operational mapping system of the atmospheric particulate matter concentration and the estimated population exposure in Attica", within the structural funds programme "Consortiums for Research and Technological Development in High Priority Areas" with has a CEC contribution of 75%.

ERL was awarded a grant by ARCFAC – (European Centre for Arctic Environmental Research in Ny-Ålesund) for access to the Arctic Research Infrastructure Zeppelin station, through the Research Infrastructures Action of the FP6 programme. Project title: Investigation of Arctic Aerosol Properties with emphasis on the formation and mixing state of cloud condensation nuclei.

Other major activities are focused on the study of microphysical properties and their effect on good practices and techniques for PM monitoring standards such as the EN12341 PM10 standard, as well as the retrieval of information on emission sources, source apportionment and receptor modelling in view of the needs of local and regional and national authorities to abide with Directives 96/62/EC, 1999/30/EC, 2000/69/EC, 2002/3/EC and Decision 97/101/EC.

Research work on source apportionment of pollution by means of aerosol particle elemental tracers has been successfully conducted by applying novel factor analysis tools on atmospheric aerosol composition data (A. Karanasiou, PhD thesis) and is currently extended to include additional aerosol properties.

Achievements

- Regional Coordination of the RER/7/003 programme activities and Data management at the international level (ended in 2008)
- Regional Coordination (and co-generator) of the RER/7/005 programme for harmonization of real-time data and simulation/adaptation to models (2008-2013)
- Development of an innovated methodology for the radiological impact assessment of non-human natural populations
- Development of state-of-the-art protocol for global bioindicator monitoring in the marine environment based on the EU Green Paper.
- Development of an observational system based on satellite environmental records and use of models for the radiological monitoring process and forecast the potential impact of accidental events.
- Coordination of the Regional Programme for "Development of an operational mapping system of the atmospheric particulate matter concentration and the estimated population exposure in Attica".

- Development of methodology for an in house atmospheric aerosol PM₁₀ sampler
- Completed 10 years of aerosol black carbon monitoring in the Arctic
- Highly specialised portable unit for field measurements of pollutants from industrial stacks
- Participation in the “Sample collection” Group of the Emergency Plan of the Greek Atomic Energy Commission
- Participation in the I.A.E.A Technical Co-operation Project RER8009 for “Air Pollution Monitoring in the Mediterranean region”

Education

Doctoral dissertations in progress

1. N. Evageliou, Chemist MSc, “Study on the distribution and speciation of radionuclides and trace elements in the marine environment (University of Athens).
2. M. Gini, Physicist, “Development and application of experimental methods for characterization of atmospheric aerosol physical parameters (University of Athens)

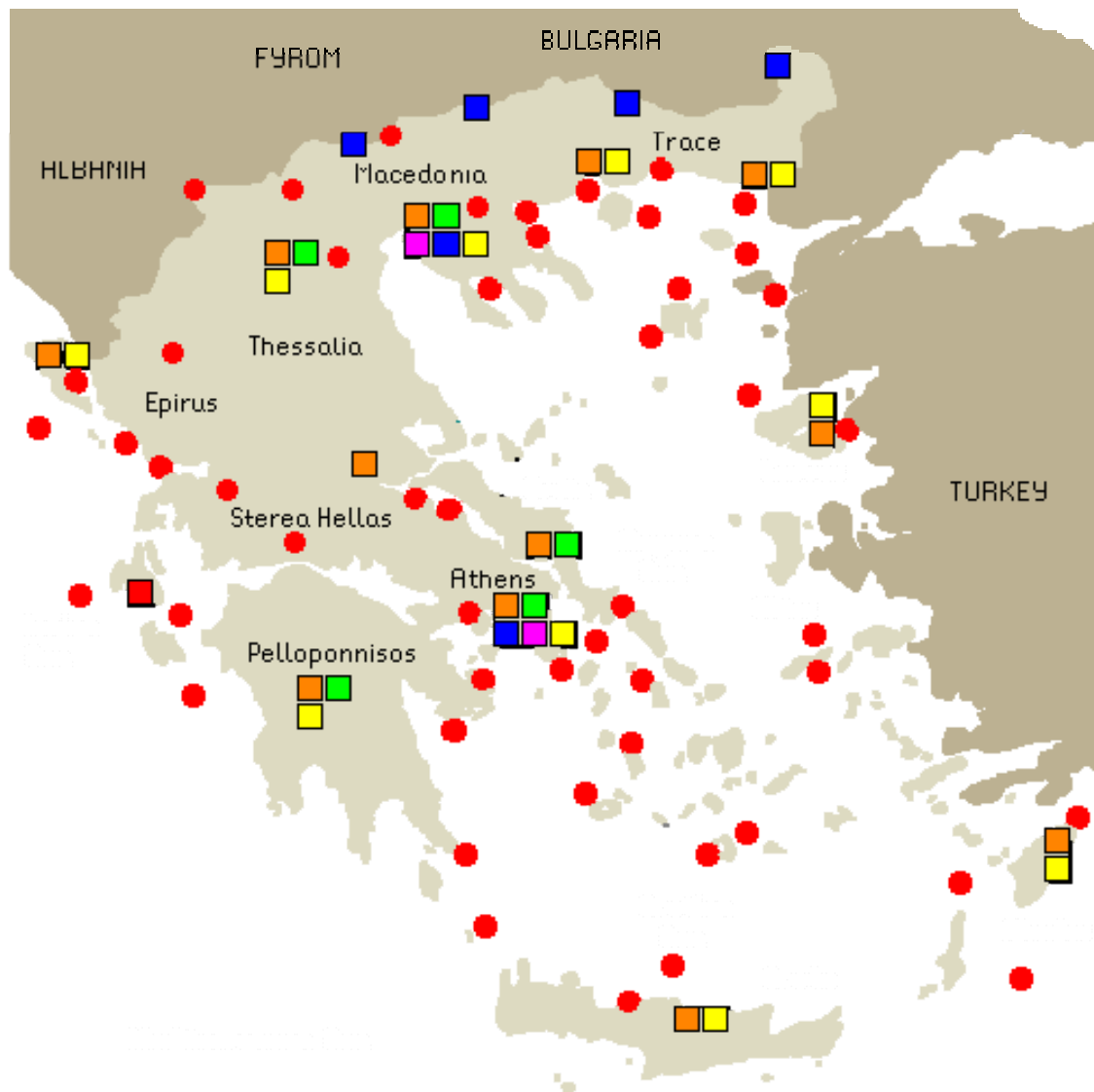
MSc Thesis

1. K. Barbounis, “Performance efficiency of radioactive charge neutralizers for aerosol particles”, University of Aegean, Dept. of Environmental Studies.

Intercalibration Exercises

1. EUSAAR Aerosol particle counting and size distribution measurements 2008

The sampling network:



The **red circles** represent areas where marine radioactivity studies have been performed **occasionally**.

- [Total beta activity in air](#)
- [Radioactive deposition](#)
- [Total beta activity of surface and drinking water](#)
- [Gamma-ray intensity](#)
- [Specific radionuclides in milk and mixed diet](#)

**HEALTH PHYSICS & ENVIRONMENTAL HEALTH LABORATORY
(HPEHL)
Head: G. Pantelias**

Personnel

Researchers and Functional Scientific Personnel	3
Other Scientists:	1
Co-operating Researchers:	-
Scholarships:	2
Technicians:	8

Overview

Since the early days of its foundation in 1960 the Health Physics & Environmental Hygiene Laboratory of the Institute of Nuclear Technology & Radiation Protection, gives proper and continuous recognition to problems related to all potential radiation induced health hazards. Specifically, the Laboratory provides operational health physics services related to the Radiation Protection Program in NCSR “Demokritos” and the evaluation of radiation overexposures and radiation accidents in general, by means of biological dosimetry methods. Its research activities involve the use of radiation and cancer cytogenetics, molecular genetics and radioisotope methodologies to study questions of basic and applied research in radiation protection, radiobiology, cancer genetics and radioactive waste management. In addition, the Laboratory, based on its expertise in radiation protection, radiation biology and cancer cytogenetics, offers specialized services for the calibration of radiation survey meters, for the development of individualized protocols for radiotherapy treatment, and for the diagnostic and follow-up cytogenetic evaluation of patients with hematological neoplasms.

Achievements

The Health Physics & Environmental Hygiene Laboratory has been the reference laboratory of the Greek Atomic Energy Commission and the International Atomic Energy Agency (IAEA) for biological dosimetry studies and the evaluation of absorbed doses in cases of radiation accident, as well as for standardization of state of the art methodologies applied for biodosimetry purposes. The Laboratory belongs to the “European LeukemiaNet”(ELN), (Network of Excellence for Leukemia, supported from the FP6 Program of the European Community) and it is the National Reference Laboratory for the cytogenetic characterization of myelodysplastic syndromes (nominated by the Hellenic Society of Hematology).

Specifically, the research activities of the Laboratory contributed essentially to the:

- Elucidation of the mechanisms underlying the biological effects of ionizing radiation at the molecular, chromosomal and cellular level.
- Development of cytogenetic methodologies in combination with molecular DNA-probes for biomonitoring purposes and the development of reliable and sensitive biological dosimeters for the estimation of absorbed radiation doses and cancer risk.
- Development of cytogenetic methodologies for the identification of persons with increased radiosensitivity and genetic predisposition to cancer, and the individualization of radiation therapy treatments.
- Study of the role of stable reciprocal translocations and chromosomal rearrangements in the mechanism of radiation induced carcinogenesis.

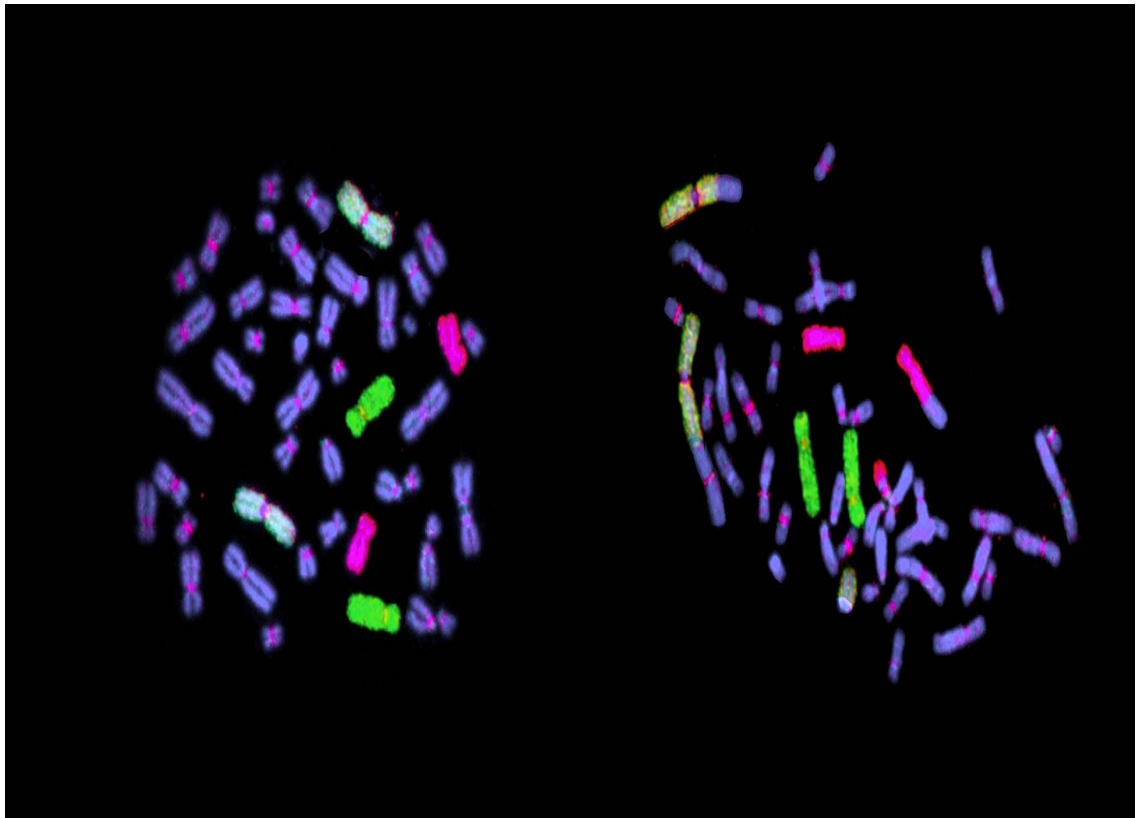
- Development of cytogenetic methods for the evaluation of mutagenic and carcinogenic potential of genotoxic chemicals.
- Molecular cytogenetic analysis of hematological neoplasms: characterization of genomic rearrangements, amplification of specific genes, exploration of genetic recombinations for the identification of critical mechanisms involved in leukemogenesis.
- Interindividual differences in susceptibility to leukemia and neurological diseases: polymorphisms of genes involved in the detoxification of xenobiotic compounds after genotoxic exposures.

Specialized scientific services offered to major hospitals and private clinics for the improvement of diagnostic and prognostic evaluation of leukemic diseases. During the year 2008 bone marrow biopsies obtained from 2850 patients were analyzed and characterized using cytogenetic methodologies.

Education

Doctoral dissertations

Hatzi Vasiliki (November 2008) "Study of genotoxic effects of selected chemicals found in occupational environment in peripheral blood lymphocyte cultures in vitro". National and Capodistrian University of Athens-Department of Forensic Medicine and Toxicology, Medical School.



Cytogenetics of hematological neoplasms

ENVIRONMENTAL RESEARCH LABORATORY (EREL)

Head: Dr. A. Stubos

Personnel:

Researchers and Functional Scientific Personnel	6
Other Scientists:	6
Co-operating Researchers:	0
Scholarships:	2
Technicians:	1
Administrative	1

General Description

The Environmental Research Laboratory (EREL) is part of the Institute of Nuclear Technology-Radiation Protection of the National Centre for Scientific Research “Demokritos” (NCSR-D). EREL with its over 20-years experience and its highly specialised scientific staff is one of the leading environmental research laboratories in the country with strong scientific links to many Research and Academic Organizations worldwide. The general aim of EREL is the production of scientific know-how and innovative tools for research and provision of services in the fields of environment and energy. The Laboratory is equipped with modern facilities for the measurement of air pollution and powerful computing equipment and provides high-level services in a wide range of issues related to environment and energy (air quality and environmental impact assessment, nanoporous materials characterization, gas storage). The Laboratory has been awarded ISO 9001 for software development in atmospheric applications while accreditation according to EN 17025 for specific gas pollutant measurements is underway (particulate matter, volatile organics, etc). EREL carries out several research projects with substantial external funding (mainly from EC), in several of which acts currently as coordinator of European consortia of universities, research institutions and industries. In the framework of these activities, EREL has developed a broad range of cooperation with Public and Private Organisations both within and outside Greece, while actively participating in international scientific networks (e.g. ERCOFTAC, MESAEP)

Research activities

In line with current international trends, EREL places emphasis in R&D activities relevant to hydrogen technology (safety and storage), simulation of atmospheric pollutant dispersion in realistic conditions, diagnostic and prognostic meteorological modelling, contribution of anthropogenic and biogenic pollutants to global warming and urban pollution, simulation of underground hydrocarbon and water reservoirs and characterization of nanoporous materials for environmental (gas separations, storage of CO₂ and H₂) and bio-medical applications (controlled release systems, transdermal drug delivery).

In parallel, EREL continues to produce and publish original methods and results in the wider area of computational fluid mechanics, with applications in pollutant dispersion, influence of meteorology and pollutant sources distribution in urban pollution, tropospheric ozone concentrations due to anthropogenic and biogenic pollutants in the Mediterranean area, turbulence simulation, transport phenomena in porous media, and flow and mass transport in multiphase systems.

The high R&D performance of EREL is deduced from: (i) its wide experience in carrying out (not only as participating research organisation but also as coordinator) large scale research projects, (ii) the large number of scientific publications in international journals and conferences, (iii) the successfully accomplished contracts of service provision to Public and Private Bodies, (iv) the organisation of international conferences, (v) the participation in International networks and (vi) acting as national representative in various international organisations.

Achievements

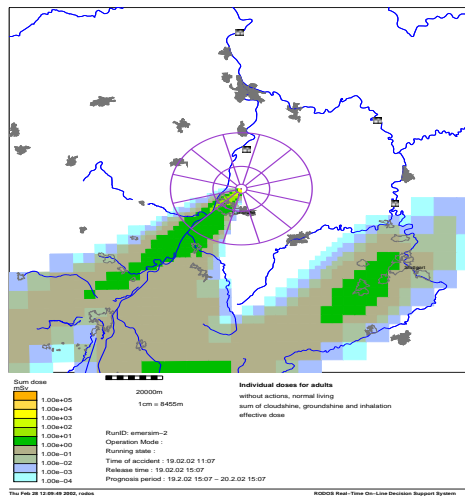
In addition to the above, important achievements of the Laboratory include the following:

- Coordination of the NESSHY FP6 Integrated Project on Hydrogen Storage in Solids
- Development of methodology and software for hydrogen safety simulations
- Development of state-of-the-art software for diagnostic and prognostic meteorological simulations, atmospheric dispersion of pollutants (toxic, radioactive, flammable, photochemical, heavier or lighter than air) in complex terrains
- Development of software for the simulation of sorption, flow and diffusion in porous materials
- Development of computational and experimental methods for the characterization of porous materials
- Fully equipped laboratory for organic pollutant measurements with high sensitivity analytical chemistry devices (GC/FID/FPD, GC/MS with Thermal Desorption Unit, HPLC)
- Highly specialised portable unit for field measurements of atmospheric pollutants
- Development and use of RODOS (Real-time On-line DecisiOn Support for nuclear emergencies in Europe) system
- Participation in the “Nuclear Technology” Group of the Emergency Plan of the Greek Atomic Energy Commission
- National representation in COST Senior Official Committee and in Advisory Committee for Radioactive Waste Management (ACPM) of the EU.

Education

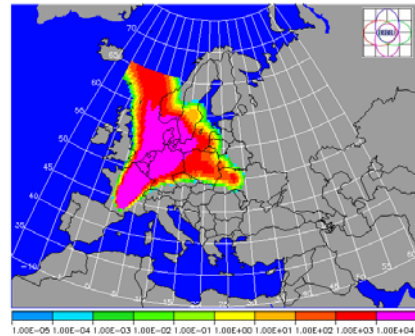
Diploma Theses

1. A. Chronis (2008), "Detection of indoor PM sources in houses using the Positive Matrix Factorization method", Marine Sciences Dept., University of Aegean.
2. M. Bekiari (2008), «Sampling and analysis of PAHs», Marine Sciences Dept., University of Aegean.
3. T. Tsohandaris (2008) «PM₁₀, PM_{2.5}, PM₁ measurements in semi-urban and industrial areas: their variations and correlation with meteorological parameters and conventional pollutants (O₃, SO₂)», Chem. Eng. Dept., NTU Athens.
4. M. Kasiou (2008), «Study of PM_{2.5} behavior in semi-urban areas of Attica», Physics Dept., Univ. of Athens.
5. N. Glezou (2008), «Sampling and analysis of Volatile Organic Compounds», Chem. Eng. Dept., NTU Athens.

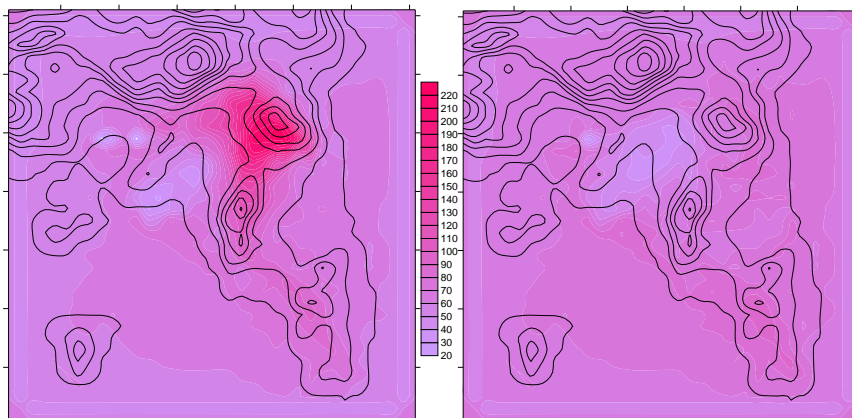


Exercise 02 - Grid plot for time-integrated concentration in Bq/m³
 Date and time: 2001-10-01 00:00 UTC (+600m after release start)
 Data range: [1.23E+04, 5.34E+06]

Release info:
 Location: 02:20 E 43:13 N
 Start: 2001-09-28 12:00 UTC
 Duration: 6 hours



Projection: Lambert2Mutual
 Created by user Jorfalls en 2002-02-28 12:01:37 UTC



**Prediction of
 maximum ozone
 concentrations in
 Athens area for the
 years 1990 (left) and
 2004 (right)**

SYSTEM RELIABILITY AND INDUSTRIAL SAFETY LABORATORY (SRISL)

Head: Ioannis A. Papazoglou

Personnel

Researchers and Functional Scientific Personnel: 6

Dr. Ioannis A. Papazoglou (Director of Research)

Dr. Zoe Nivolianitou (Researcher)

Dr I. Kollas (Researcher)

Dr O. Aneziri (Researcher)

Dr E. Marcoulaki (Researcher)

Ms. Vana Synodynou (ELE C)

Other Scientists: 1

Myrto Konstandinidou (Chemical Engineer)

Objectives

Development of methodology and associate software tools in the areas of:

- Reliability of large systems with complex stochastic behavior
- Quantitative Risk Assessment of complex technological systems
- Health and Environmental Consequence Assessment of alternative Electrical Power generating systems
- Virtual reality in use of human factor assessment and plant safety enhancement

Recently research and development has been focused in the:

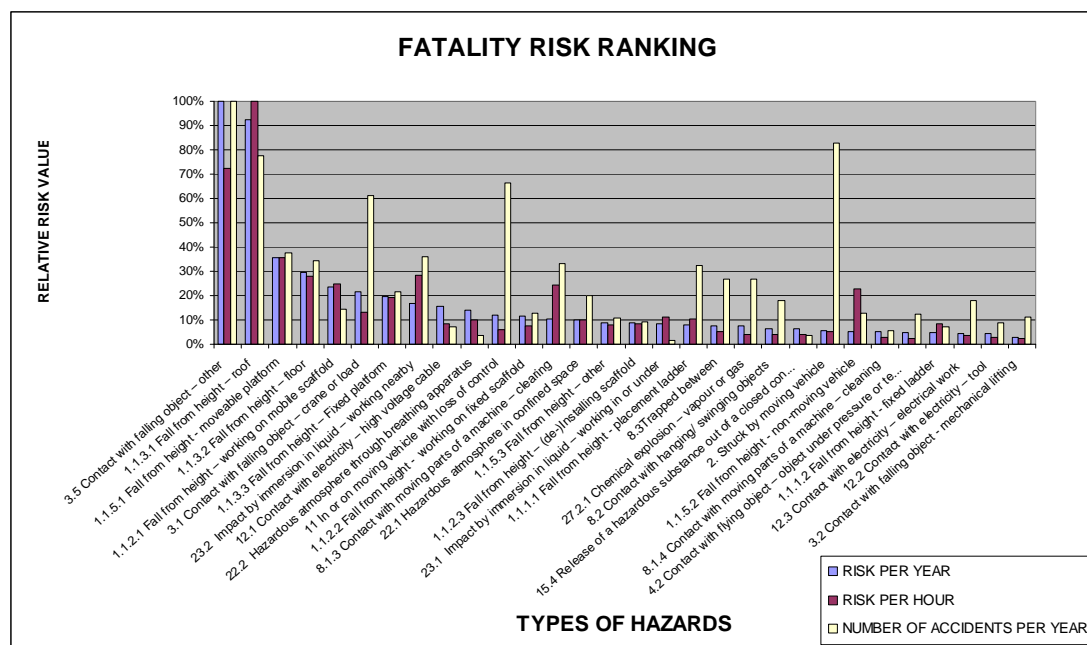
- Development of quantified risk models for occupational risks from accidents and tools for multicriteria optimization of occupational risk management strategies
- Quantification of uncertainties about the models simulating technological systems, physical phenomena and processes.
- Optimization Algorithm development in discrete decision spaces with multiple criteria
- Decision Support System development for risk management as well as emergency response policy selection in major hazard accidents in nuclear and chemical installations.
- System-state diagnostics using soft computing (artificial neural networks, genetic algorithms, fuzzy expert systems) and novel signal processing techniques (e.g. wavelets).
- Safety enhancement in the process industry through the use of virtual reality tools.
- Development of a simulator to assess the success ratio in operations where multiple teams undertake the mitigation of the consequences of a natural disaster.

Achievements

The laboratory for System Reliability and Industrial Safety (SRISL) was founded in 1988, with initial objective the development of an integrated capability for the quantitative risk assessment of large nuclear and non-nuclear systems. During the last fifteen years the laboratory has contributed to the state-of-the art of system reliability, quantified risk assessment, the development of Decision support systems with multiple criteria and under uncertainty and system diagnostics. Furthermore, the laboratory has developed an integrated methodology and the associated computer tools for the safety analysis and the quantification of uncertainty in installations handling hazardous material.

These achievements were accomplished through the active participation in the framework programmes of the European Commission in the area of Major Industrial Hazards and Risk

Assessment (1 project in Framework Programme II, 1 project in Framework Programme III, 3 projects in the Framework Programme IV, 2 projects in Framework Programme V). In these projects SRISL has collaborated with leading European organizations paving the way to the introduction of new risk based approaches to the regulatory framework for installations handling hazardous materials and subject to the SEVESO directive. Such organizations are: the Health and Safety Executive of the UK, The Ministry of Environment and the ministry of Labor of the Netherlands (VROM, SZW), and the Joint Research Center at Ispra of the EC.



Based on the developed methodology and the associated tools the SRISL in collaboration with the above and other European research organizations focused its research efforts in problems addressing the support of decisions concerning the management of risk, the land use planning around dangerous sites, and the evaluation of the role of the organizational and management system of a company on the safety of the installations. These two elements constitute the fundamental changes incorporated in the second updated version of the SEVESO directive (SEVESO II).

The SRISL is one of the main consultants of the Greek ministries of Environment and Development in issues concerning the regulation of Greek chemical installations subject to the SEVESO directive and it has reviewed and reassessed the safety cases of half the Greek industry with respect to the external risk, and almost the totality of the Greek industry with respect to the frequency assessment of the major accidents.

In the area of reliability analysis SRISL's work has resulted in a number of methodological developments in the assessment of the reliability of dynamic systems, the mathematical foundation of the Event Tree approach and other results published in international scientific journals.

Education

PHD Thesis Completed

A.M. Konstantinidou "Industrial Accidents", PhD Thesis, National Technical University of Athens, School of Chemical Engineering, Athens 2008

PHD Thesis in Progress

E. Georgiadou, "Decision support systems for major industrial accidents", PhD Thesis, National Technical University of Athens, School of Chemical Engineering

SOLAR & OTHER ENERGY SYSTEMS LABORATORY (SESL)

Head: V. Belessiotis

Personnel

Researchers and Functional Scientific Personnel	3
Other Scientists:	1
Co-operating Researchers:	1
Scholarships:	4
Technicians:	5

General Description

The Laboratory started its activities in 1980 and has ever since been pursuing applied research and technology development in the fields of Solar Thermal Energy Utilization & Energy Savings Systems and Thermal Distillation-Desalination. It is equipped with excellent measurement facilities and along with experimental investigations it uses as basic analytical tools the Metrology of Energy Quantities and Numerical Simulation, Computational Fluid Dynamics in particular.

The aforementioned activities, financed to a great extent by third means have had as a result a wide field of technical accomplishments. The Laboratory is organized and has been accredited according to the EN ISO/IEC 17025 standard, having developed a Quality Assurance System for performing tests based on ISO and EN standards

Areas of Applied Research

The laboratory conducts mainly applied research and experimental development, arising from the needs of the productive sector, the ties with which have been built through the services offered by the laboratory in a wide field of applications and over a number of years. However, in this effort the laboratory personnel is often faced with the need to answer questions that concern fundamental physical phenomena and expand the current knowledge, especially in the fields of fluid flow, heat/mass transfer and thermodynamics. Therefore, problems are often dealt with at the basic research level, by using suitable analytical methods (modelling and simulation) along with experimental methods.

The specific research areas of SESL are :

- **Solar collectors and systems**

- Design improvements of solar thermal collectors aiming at higher efficiencies, investigation of new materials for better performance, longer life cycles and better quality.
- New technologies such as those based on heat pipes and Dewar-type evacuated tubes (with water or air as the working fluid), concentrating collectors, “4th generation” solar collectors using nanofluids as the working fluid.
- New methodologies for the modelling of collectors and systems, development of tools for the integrated design of large-scale solar heating plants
- Solar-air conditioning, cooling technologies utilizing a thermal source (such absorption and desiccant cooling systems).

- **Analysis & design of thermal storage systems**

- Energetic behavior of in-ground storage tanks of non-metallic liner, estimation of heat losses (experimental work and numerical simulation). Temperature fields (inside and around the tank), numerical simulation of hydrodynamic phenomena coupled with ground heat transfer. Static and dynamic (charging-discharging) modes of operation.

- Phase-change materials (PCM) as storage media, for low and high temperatures.
- Studies of liner properties of in-ground water tanks, particularly mechanical strength, thermal-insulating and water-tight properties, aiming at long-term reliability under real operating conditions of strong thermal cycling.
- Optimal design of water inlet-outlet systems for main types of commercial storage tanks, using fluid-dynamics and heat-transfer principles.

▪ **Metrology of energy quantities**

- Methods-equipment for evaluation of the energy performance, the measurement of thermophysical properties of materials (with emphasis on nanofluids),
- Development-implementation of complex measurement systems and error propagation for complex measuring architectures
- Estimation of uncertainty of results in a generalized-uncertainty environment.

▪ **Thermal distillation - desalination**

- System design and the development of new types of stills, coupled with solar collectors and the modelling (simulation and experimental validation) of the systems developed.
- Design of new, more efficient desalination units based on the humidification-dehumidification principle, use of micro-porous membranes.
- Hybrid systems aiming at improvements of overall process efficiency through integration in a multi-source, multi-use environment.

▪ **Mechanical/solar-assisted drying processes & systems**

- Design optimization of hot-air mechanical dryers through the numerical simulation of flow and heat/mass transport phenomena for attainment of uniform drying conditions
- Implementation of large-scale practical applications and pilot-type installations
- Investigation of the optimum drying conditions for various products (drying curves), development of models for the drying process.
- Further promotion of solar energy as a heat source for drying, using solar air collectors

Achievements

1. Completion of the energy-autonomous building named "Prometheus Pyrphoros" ("Prometheus the Fire-Bringer"), which integrates state-of-the-art energy savings technologies by exploiting, in particular, solar energy and geothermy.
2. Two international patent applications for : a) New-Type Solar Collectors and b) Storage tank of non-metal liner based on concrete and carrying internal thermal insulation.
3. Successful completion of the project AKMON, under the COMMUNITY SUPPORT FRAMEWORK Program, with the participation of 17 industrial companies and aiming at the extension of material and non-material infrastructure of the Laboratory towards a more competitive, reliable and efficient provision of scientific services.
4. Key contribution of the Laboratory into the development and application of the Solar Keymark (SKM) European Certification Scheme at a national level, in cooperation with the Greek solar product manufacturing branch.

Specialized Services

- Efficiency and qualification tests for solar collector and systems according to European and International Standards (EN 12975-2, EN 12976-2, ISO 9806-1, ISO 9806-2, ISO 9459-2) and certification of prediction of annual collector energy output
- Measurements of optical properties of materials (ASTM E 424, ASTM E 408)
- Rating and performance tests for non-ducted air conditioners and heat pumps according to international standards (ISO 5151)
- Performance characterization of stores for solar heating systems (EN 12977-3 standard) and heat exchangers
- Determination of the thermal resistance of thermal insulation and construction materials (ISO 8302, DIN 52615) and of the density of cellular plastics and rubbers (EN ISO, ISO 2896845)
- Specialized studies and consulting in the areas of optimal energy design, manufacturing processes for solar collectors and systems, design and development of new products, energy savings, development and organization of specialized laboratories, metrology
- Modelling of energy systems and processes, particularly by means of fluid flow and heat transfer analysis. Development of relevant design criteria

Education

Doctoral Dissertations in Progress

1. Essam Mohamed, “Application of electric power generation technologies from renewable energy sources for sea-water desalination by means of reverse osmosis”, Agricultural University of Athens, Department of Natural Resources and Agricultural Engineering.
2. George Panaras, “Theoretical and experimental investigation of a solar solid desiccant air conditioning system”, Aristotle University of Thessaloniki, School of Engineering Department of Mechanical Engineering.
3. Chryssovalantoy Lamnatou, “Development and Energetic Optimization of an Autonomous Dryer for agricultural products using Solar Energy ”, Aristotle University of Thessaloniki, School of Engineering, Department of Mechanical Engineering.
4. Kaloudis Efstathios, “Simulation of Turbulent Flow and Heat Transfer in Solar and other Energy Systems”, University of Patras, School of Engineering, Department of Mechanical and Aeronautical Engineering.

Diploma Thesis

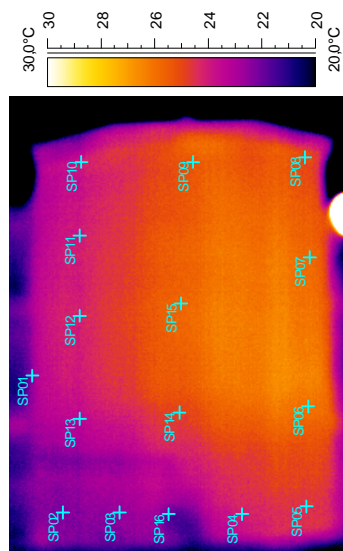
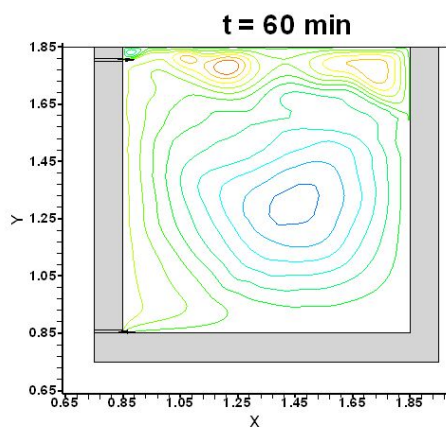
1. Panagiotis Kyriakopoulos, (May 2008) “Investigation and characterization of the energetic behavior of an evacuated-tube air solar collector”, Technological Educational Institution of Western Macedonia, Kozani, Department of Mechanical Engineering/Energy Division.



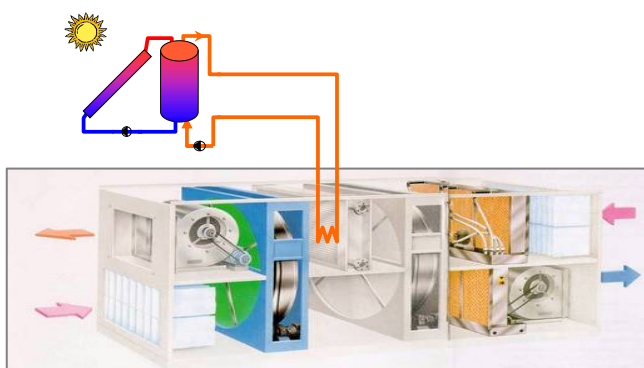
General view of the outdoor measurement and testing facilities



The energy-autonomous building "Prometheus"



ComputersSimulation of flow in underground thermal storage tanks (left) and infrared thermography application in heat loss estimation from a cylindrical storage tank (right)



Schematic diagram of a solar desiccant air-conditioning system



THERMAL HYDRAULICS AND MULTIPHASE FLOW LABORATORY (THEMLAB)

Head: C. Housiadas

Personnel

Researchers and Functional Scientific Personnel	1
Other Scientists:	1
Co-operating Researchers:	1
Scholarships:	3
Technicians:	1
Post-doc fellows:	-
Graduate students (diploma):	1

Subject

THEMLAB, created in 2006, is exploiting the longstanding experience of INT-RP in the field of Thermal-Hydraulics and Multiphase Flows and shapes them according to the needs and challenges of current R&D applications requiring similar scientific know-how. THEMLAB conducts basic and applied research covering seemingly distant and diverse topics such as nuclear safety, nanotechnology and health sciences. This is achieved by taking advantage of common underlying physical phenomena: we are developing quite versatile, common methods and corresponding tools for the numerical simulation of multiphase flows. The focus is on dispersed multiphase flows (aerosol flows) and computational fluid mechanics. With such “in-silico” investigations we are able to provide scientific knowledge to a broad range of current applications, in fields like nuclear safety, industrial hygiene, environmental health, aerosol medicine, bio-fluid mechanics.

Activities

The activities of THEMLAB include:

- Reactor Safety
- Aerosol Flows
- Multiphase Systems
- Scientific Computing
- Computational Fluid Dynamics
- Bio-fluid Mechanics
- Fundamental Fluid Mechanics



The computer cluster THALES (THERmofluid & Aero-bio-colloidal Large-scale Engineering Simulations).

Achievements

The basic equipment of the Laboratory is computing infrastructure. An advanced IBM computer cluster (CPU farm) is in operation since 2007, named THALES (THERmofluid & Aero-bio-colloidal Large-scale Engineering Simulations). THALES is intended to serve primarily as a computational fluid dynamics (CFD) platform. However, the cluster is designed to serve the needs of not only the THEMLAB laboratory, but also of the Institute. During 2008 the computing infrastructure was upgraded by adding new servers and now THALES permits about 160 parallel processes. Besides an improvement in our infrastructure, during 2008 we succeeded in consolidating our activities in the strategic R&D area of engineered nanoparticles health effects. This was achieved by our participation in two new FP7 projects (Nanotest, NanoImpactNet), in which we will be studying nanoparticles-biofluid interactions. Nanoparticles health effects is a timely R&D area of much current attention due to its implications to nanotechnology safety.

Education

Doctoral Dissertations in progress

1. Μητράκος Δ., «Αριθμητική προσομοίωση πολυφασικής ροής σε διασπορά-εφαρμογή στη δυναμική της ροής σωματιδίων» σε συνεργασία με τη Σχολή Μηχανολόγων Μηχανικών του Εθνικού Μετσόβιου Πολυτεχνείου (σε στάδιο συγγραφής)
2. Πηλού Μ., «Μελέτη της αλληλεπίδρασης σωματιδίων και ρέοντων βιορευστών» σε συνεργασία με τη Σχολή Μηχανολόγων Μηχανικών του Εθνικού Μετσόβιου Πολυτεχνείου (2ο έτος)
3. Μακρής Ε., «Αριθμητική προσομοίωση πρόσκρουσης-εναπόθεσης μικρο- νάνο-σωματιδίων σε εσωτερικές ροές πολύπλοκης γεωμετρίας με ταυτόχρονη δυναμική αερολύματος» σε συνεργασία με τη Σχολή Μηχανολόγων Μηχανικών του Εθνικού Μετσόβιου Πολυτεχνείου (1^ο έτος)

Scientific visitors

1. Demou E., ETH Zurich, Biological doses from occupational exposure during nanoparticle synthesis, June-July 2008

4. Publications 2008

1. Nuclear Research Reactor Laboratory (NRRL)

1. PEER-REVIEWED JOURNALS

1. G. Apostolopoulos, K. Mergia and A.G. Youtsos, "Neutron scattering techniques as a tool for non-destructive testing", International Journal of Microstructure and Materials Properties, 2008, (accepted)
2. G. Apostolopoulos, "On-line statistical processing of radiation detector pulse trains with time-varying count rates", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, Volume 595 (2008) 464-473
3. K. Mergia and S. Messoloras, "Small Angle Neutron Scattering Study of the Amorphous $\text{Fe}_{90}\text{Nd}_3\text{Zr}_7$ Spin-Glass Alloy", J. Phys.: Condens. Matter 20 (2008) 104219
4. K. Mergia, D. Lafatzis, N. Moutis, Th. Speliotis, G. Apostolopoulos and F. Cousin, "Oxidation behaviour of SiC coatings", Applied Physics A 92 (2008) 387-395
5. G. Apostolopoulos, K. Mergia and S. Messoloras, "Venetian blinds' type stacked neutron mirrors", Nucl. Instr. Meth. Phys. Res. A 586 (2008) 100-104
6. K. Mergia and N. Boukos, "Structural, thermal, electrical and magnetic properties of Eurofer 97 steel", J. Nucl. Mater. 373 (2008) 1
7. N. Moutis, D. Suarez-Sandoval and D. Niarchos, "Voltage-induced modification in magnetic coercivity of patterned Co50Fe50 thin film on piezoelectric substrate", J. Mag. Mag. Mater. 320 (2008) 1050-1555
8. N. Moutis, T. Speliotis, I. Panagiotopoulos, , and M. Ziese, "Magnetotransport properties of cobalt-iron pyrite films", Thin Solid Films 516 (2008) 2078-2081
9. D. Mitrakos, S. Chatzidakis, E.P. Hinis, L.E. Herranz, F. Parozzi, C. Housiadas. "A simple mechanistic model for particle penetration and plugging in tubes and cracks", Nuclear Engineering and Design, 238 (2008) 3370-3378.
10. M. Varvayanni, N. Catsaros, M. Antonopoulos-Domis, «Evaluation of nuclear heating of small samples in a research reactor core», Annals of Nuclear Energy, 35, 1414-1420, 2008.
11. M. Varvayanni, N. Catsaros, M. Antonopoulos-Domis, «A point kernel model for the energy deposited on samples from gamma radiation in a research reactor core», Annals of Nuclear Energy, 35, 2351-2356, 2008
12. M. Varvayanni, P. Savva, N. Catsaros, M. Antonopoulos-Domis, "Homogeneous zones definition in deterministic codes and effect on computed neutronic parameters", Annals of Nuclear Energy, 2008, (accepted).

2. PEER-REVIEWED CONFERENCE PROCEEDINGS

1. Muniategui, I. López-Galilea, G. Pintsuk, C. Garcia-Rosales, V. Liedtke and K. Mergia, "Development of high performance oxidation resistant C/SiC/B4C composites", 1st International Conference on New Materials for Extreme Environment, San Sebastian, 2-4 June 2008

2. C.Jimenez, X.Azpiroz, C.Wilhelmi, S.Messoloras and K. Mergia, “News developments in the C/SiC to NIMONIC brazing”, 1st International Conference on New Materials for Extreme Environment, San Sebastian, 2-4 June 2008
3. K. Mergia, V. Liedtke, Th. Speliotis and G. Apostolopoulos, “Thermo-mechanical behaviour of HfO₂ Coatings for aerospace applications”, 1st International Conference on New Materials for Extreme Environment, San Sebastian, 2-4 June 2008
4. K. Mergia, M. Grattarola, C. Gualco, S. Messoloras and M. Hofmann, “Residual Stress Measurements on Mo/Cu and Mo/CuCrZr tiles using neutron diffraction”, 1st International Conference on New Materials for Extreme Environment, San Sebastian, 2-4 June 2008
5. N. V. Moutis, C. A. Himenez, Th. Speliotis, X. A. Azpiroz, K. Mergia and S. Messoloras, “Graphite – Nimonic alloy brazing”, 1st International Conference on New Materials for Extreme Environment, San Sebastian, 2-4 June 2008
6. L.T. Baczewski, K. Mergia, A. Petrouchik, A.Wawro, J. Kisielewski, A. Maziewski, F. Ott, “Interface magnetism in ultra-thin Mo/Co multilayers”, International Conference on Magnetism and Magnetic Materials, Madrid, 2008
7. M. Varvayanni, N. Catsaros, M. Antonopoulos-Domis, “Estimation of the nuclear heating of samples irradiated in research reactors”, Annual Meeting on Nuclear Technology 2008, May 27-29, Hamburg, Germany, 2008
8. M. Varvayanni, N. Catsaros, M. Antonopoulos-Domis, «Control rod depletion estimation methodology», Annual Meeting on Nuclear Technology 2008, May 27-29, Hamburg, Germany, 2008
9. M. Varvayanni, P. Savva, N. Catsaros, M. Antonopoulos-Domis, «Gamma heating dependence on fuel enrichment:: A numerical experiment», TOPSAFE 2008, ENS Conference on Safety of Nuclear Installations, 30Sept. – 3 Oct. Dubrovnic, Croatia, 2008

3. WORKSHOPS

1. I.E. Stamatelatos, “Neutron Activation Analysis at the Greek Research Reactor facility: Future prospects”, Regional Workshop on Harmonization Procedures related to Nuclear Analytical Techniques, IAEA RER-1006, Athens, Greece, 13-17 October 2008
2. F. Tzika, “Calibration of a Large Sample Neutron Activation Analysis Technique for the Characterization of Archaeological Objects”, Regional Workshop on Harmonization Procedures related to Nuclear Analytical Techniques, IAEA RER-1006, Athens, Greece, 13-17 October 2008
3. I.E. Stamatelatos, K. Mergia, A. Savidou, G. Apostolopoulos,, S. Chatzidakis, D. Kontogeorgakos, F. Tzika, S. Messoloras, A.G. Youtsos, “Efficient Utilization of the Greek Research Reactor through Regional Networking in the Mediterranean Region”, IAEA Technical Meeting on Strategic Planning for Sustainability - Mediterranean Region: Research Reactor Utilization, 19-22 February 2008, Vienna, Austria
4. A. Savidou, F. Tzika, S. Hatzidakis, I.E. Stamatelatos, “Application of the ALARA Principle in Dismantling and Disposal of a Research Reactor Primary Cooling System Delay Tank”. 11th European ALARA Network Workshop: ALARA in Radioactive Waste Management, Athens, Greece, 9-11 April, 2008.
5. A. Savidou, F. Tzika, S. Valakis, S. Hatzidakis, I.E. Stamatelatos, Decommissioning plan of the primary cooling system at the Greek Research Reactor (GRR-1), Workshop on Size Reduction of Components for Decommissioning of Nuclear Facilities”, CEN/SCK, Mol, Belgium, 8-10 October 2008.

6. A. Savidou, F. Tzika, S. Valakis, S. Hatzidakis, I.E. Stamatelatos, Decommissioning plan of the primary cooling system at the Greek Research Reactor (GRR-1), Workshop on Waste Management and Clearance, ENRESA, Spain, 13-18 October 2008.
7. S. Chatzidakis, “Review and Assessment of Greek Research Reactor Safety Documents”, IAEA Technical Meeting on Review and Assessment of Research Reactor Safety Documents, Budapest, Hungary, 30 June – 4 July 2008
8. S. Chatzidakis, “Knowledge Management planning and implementation methods and techniques in Greece”, IAEA Workshop on Knowledge Management for Nuclear R&D Organizations, Karlsruhe, Germany, 5 – 9 May 2008
9. S. Chatzidakis, “Safety Culture challenges and methods in Greece”, IAEA Promotion of Safety Culture in Research Reactor Operating Organizations, Vienna, Austria, 20–24 October 2008

4. SCIENTIFIC REPORTS

1. F. Tzika, T. Vasilopoulou and I.E. Stamatelatos, “Efficiency characterization of coaxial high purity germanium semiconductor detector using MCNP code” NDTTWA/2008/M1/001 (2008)
2. T. Vasilopoulou, F. Tzika and I.E. Stamatelatos “Comparison of Monte Carlo codes MCNP and PENELOPE for gamma ray efficiency characterization of High Purity Germanium Semiconductor detectors” NDTTWA/2008/M1/002 (2008)
3. I.E. Stamatelatos, F. Tzika “Evaluation of induced activity and gamma dose rate levels in EUROFER-97” NDTTWA/2008/M1/003 (2008)
4. F.Tzika, D. Kontogeorgakos, V. Vasilopoulou and I.E. Stamatelatos “Application of the Monte Carlo Method for the Calibration of an In-situ Gamma spectrometer” NDTTWA/2008/M1/004 (2008)
5. D. Kontogeorgakos and I.E. Stamatelatos, “Prediction of Neutron Field Characteristics At GRR-1 Irradiation Positions: Neutron Energy Spectra” NDTTWA/2008/M2/001 (2008)
6. G. Apostolopoulos, K. Mergia, M. Gjoka, and S. Messoloras, “Microstructure, magnetic, thermal and electrical properties of Fe-Cr alloys”, Fusion RTD Activities, Association EURATOM-Hellenic Republic, Annual Report 1/1 – 31/12/2007
7. K. Mergia, N. Boukos, and A. Travlos, “Detailed metallurgical characterisation (including ageing effects) of the EU ODS steel”, Fusion RTD Activities, Association EURATOM-Hellenic Republic, Annual Report 1/1 – 31/12/2007

2. Environmental Radioactivity Laboratory (ERL)

1. PEER-REVIEWED JOURNALS

1. Thébault Hervé, Alessia M. Rodriguez y Baena, Bruno Andral, José Benedicto Albaladejo, Alexandru Bologa, Victor Egorov, Heleni Florou, Tahar El Khoukhi Goran Kniewald, Abdelkader Noureddine, Mai Pham, Sayhan Topcuoglu and Michel Warnau, (2008). ³⁷Cs baseline levels in the Mediterranean and Black Sea: A cross-basin survey of the CIESM Mediterranean Mussel Watch Programme. *Marine Pollution Bulletin* 57 (2008) pp:801-806.
2. Lazaridis M, Aleksandropoulou V, Hanssen JE, Dye C, Eleftheriadis K, Katsivela E, (2008), *J. of the Air & Waste Manag. Assoc.*, Vol. 58, (3) Pages: 346-356
3. Zbyněk Večeřa, Pavel Mikuška, Jiří Smolík, Kostas Eleftheriadis, Charlotte Bryant, Ian Colbeck and Mihalís Lazaridis, (2008), Shipboard Measurements of Nitrogen Dioxide, Nitrous Acid, Nitric Acid and Ozone in the Eastern Mediterranean Sea, *Water, Air, and Soil Pollution: Focus*, Volume 8, (1), February 2008, Pages 117-125
4. A. Karanasiou, K. Eleftheriadis, S. Vratolis, P. Zarbas, N. Mihalopoulos, C. Mitsakou¹ C. Housiadas, M. Lazaridis, J. Ondracek and L. Dzumbova, (2008), Size Distribution of Inorganic Species and Their Inhaled Dose in a Detergent Industrial Workplace, *Water, Air, and Soil Pollution: Focus* 8 (1), pp. 117-125
5. M. Lazaridis, L. Dzumbova, I. Kopanakis, J. Ondracek, T. Glytsos, V. Aleksandropoulou, A. Voulgarakis, E. Katsivela, N. Mihalopoulos and K. Eleftheriadis, (2008), PM₁₀ and PM_{2.5} Levels in the Eastern Mediterranean (Akrotiri Research Station, Crete, Greece) *Water, Air, and Soil Pollution*, Vol: 189 Issue: 1-4 PP: 85-101

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1. Evangeliou N., Florou H., Bokoros P., Scoullou M., (2008) “ Seasonal distribution of ¹³⁷Cs in eastern Mediterranean Sea: Horizontal and vertical dispersion in two regions”, *Journal of Environmental Radioactivity* (in press).
2. Eleftheriadis, K., S. Vratolis, and S. Nyeki (2008), “Aerosol black carbon in the European Arctic: Measurements at Zeppelin station”, Ny-Ålesund, Svalbard from 1998–2007, *Geophys. Res. Lett.*, 36, L02809, doi:10.1029/2008GL035741.(in press)
3. Florou H., Tsytsugina V., Polikarpov G. G., Vosniakos F. K., Evangeliou N, (2008) “Genotoxic effects in *Oligochaeta* from areas of elevated natural and artificial radioactivity.”, *JEPE* (accepted on November 2008).
4. Karanasiou A. A., Siskos P.A., Eleftheriadis K., (2008) “Assessment of source apportionment on fine and coarse urban aerosol size fractions by Positive Matrix Factorization analysis”, *Atmos. Environ*
5. Trabidou Georgia and Florou Heleny, (2008) “ The radiological impact on humans inhabited an insular area of elevated natural background radioactivity”, *Radiation Protection Dosimetry* (Accepted).
6. Trabidou G. and Florou H., (2008) “Natural radioactivity as an impact factor in drinking water quality”, *Proc.: Desalination* (Accepted).

7. Evangeliou N., Psomiadou Ch., Michaleas, St., Florou H., Scoullos M., (2008) "Determination of particle export flux in the water column by using Th-234/U-238 disequilibrium approach: The case of Saronikos gulf", Proc.: Desalination (Accepted).

2. PEER-REVIEWED CONFERENCE PROCEEDINGS

1. Psaltaki M. G., Florou H., Markatos N.C., 2008. A model of the behaviour of Cs-137 in marine environment (a finite-volume method implementation). Proc.: 1st WSEAS Int. Conf. On Finite Elements – Finite Volumes – Boundary Elements (F-and B' 08), Malta September 11-13, 2008.
2. Florou H., 2008. The use of *Mytilus galloprovincialis* as a bio-indicator for radiological quality assessment in the Greek marine environment. Proc.: Aqua 2008. 3rd Int. Conference Water Science and Technology with emphasis on water & climate. Kapodestrian University of Athens & Association of Greek Chemists. 16 – 19 October 2008, Exhibition Center HELEXPO PALACE Athens
3. Trabidou G. and Florou H., 2008. Natural radioactivity as an impact factor in drinking water quality. Proc.: Aqua 2008. 3rd Int. Conference Water Science and Technology with emphasis on water & climate. Kapodestrian University of Athens & Association of Greek Chemists. 16 – 19 October 2008, Exhibition Center HELEXPO PALACE Athens.
4. Evangeliou N., Psomiadou Ch., Michaleas, St., Florou H., Scoullos M., 2008. Determination of particle export flux in the water column by using Th-234/U-238 disequilibrium approach: The case of Saronikos gulf. Proc.: Aqua 2008. 3rd Int. Conference Water Science and Technology with emphasis on water & climate. Kapodestrian University of Athens & Association of Greek Chemists. 16 – 19 October 2008, Exhibition Center HELEXPO PALACE Athens.
5. Poupkou, I. Ziomas, A. Papayannis, P. Georgopoulos, C. Efstathiou, K. Eleftheriadis, K. Markakis, N. Sifakis, C. Housiadas, P. Nicolopoulou-Stamati, G. Avdikos, M. Lazaridis and T. Giannaros. Evaluation of aerosol and ozone simulations over Athens using in situ sensors and LIDAR techniques combined with health indicators European Aerosol Conference, 24-29 August, Thessaloniki, Greece
6. Papayannis, G. Georgoussis, R. Mamouri, G. Tsaknakis, G. Avdikos, K. Eleftheriadis, S. Vratolis, V. Amiridis, C. Housiadas, P. Neofytou and Y. Roukoutakis. First near-horizontal aerosol measurements over Athens, Greece using a volume scanning eye-safe lidar system
7. K. Barbounis, S. Vratolis, K. Eleftheriadis and G. Biskos. Comparison of the performance of three aerosol charge neutralizers. European Aerosol Conference, 24-29 August, Thessaloniki, Greece
8. S. Nyeki, S. Vratolis and K. Eleftheriadis. Aerosol black carbon in the European Arctic: Measurements at Zeppelin station, Ny-Ålesund, Svalbard from 1998 – 2007. European Aerosol Conference, 24-29 August, Thessaloniki, Greece
9. Eleftheriadis K., Vratolis S., Karanasiou A., Andronopoulos S., Sfetsos A., Gounaris N., Maggos T., Vasilakos C., Neofytou P., Housiadas C., Papayannis A., Tsaknakis G., Georgoussis G., Avdikos G., Chontidiadis K., Roukoutakis Y., Vernardos G., Sofianopoulos M., Alexandropoulou V, Lazaridis M., Kostenidou E. and S. N. Pandis, 2008. Development of an operational mapping system for the fine aerosol mass concentration and the estimated population exposure in Attica, Greece. European Aerosol Conference, 24-29 August, Thessaloniki, Greece.
10. Karanasiou A.A, Siskos P.A., Eleftheriadis K., 2008. Contribution of major anthropogenic and natural sources in coarse and fine urban aerosol, resolved by factor analysis. European Aerosol Conference, 24-29 August, Thessaloniki, Greece.

11. Karanasiou A.A, Bakeas E.B., Eleftheriadis K., 2008. Assessment of particulate air pollutants in a suburban area of Athens, with respect to legislation target values and the size distribution of PM mass concentration. European Aerosol Conference, 24-29 August, Thessaloniki, Greece
12. Eleftheriadis, K, Nyeki, S., Holmen K., J. Strom, 2008, On The Dependence of Arctic Light Absorption Coefficient and Equivalent Black Carbon on Aerosol Origin and State of Mixing., 9th International Conference on Carbonaceous Particles in the Atmosphere, 12-14 August 2008, Lawrence Berkeley National Laboratory, Berkeley, California

NATIONAL CONFERENCES

1. Evangeliou, N., Psomiadou, Ch., Scoullos M., and Florou, H., 2008. Activity concentrations of ¹³⁷Cs and ²³⁴Th in the eastern part eastern Saronikos gulf. Proc.: 3rd Environmental Conference of Macedonia. Association of Greek Chemists and Perfecture of Eastern and Central Macedonia, Thessaloniki 14–17 March 2008.
2. Trabidou G., Psomiadou Ch., Florou H., Kritidis P., 2008. Activity concentrations of natural radionuclides in the components of building materials and radiological impact assessment in with respect to the EU legislation. Proc.: 1o Pamhellenic Conference of Building materials and Components – Exhibition. Technical Chamber of Greece, Divani Caravel Hotel, Athens 21-23 May, 2008.
3. Florou H., Evangeliou N., Psomiadou Ch., Chaloulou Ch., Kritidis P., 2008. Radiological impact assessment in insular areas using in situ and laboratory nuclear techniques: Proc. 17th Symposium of the Hellenic Nuclear Physics Society, Ioannina, 30-31 May 2008.
4. Evangeliou N., Psomiadou Ch., Michaleas, St., Florou H., Scoullos M., 2008. A comparative study of caesium-137 profiles in two separated areas of Greece during the period 2005-2007. Proc.: 17th Symposium of the Hellenic Nuclear Physics Society, Ioannina, 30-31 May 2008.

LECTURES-POST GRADUATE COURSES

1. Florou H., 2008. *Environmental impact assessment of LARKO factory: A 20-year retrospective study*. Municipality of Larymna, 29 January 2008 (Simplified).
2. Florou H., Environmental Radioactivity, Post-graduate course, University of Athens.
3. P. Kritidis, Environmental Radioactivity, IAEA post-graduate course, GAEC.

TECHNICAL REPORTS

1. Regular reports of environmental monitoring data to the GAEC.
2. Progress Report on PhD Thesis

3. Health Physics and Environmental Hygiene Laboratory (HPEHL)

1. PEER-REVIEWED JOURNALS

1. Manola KN, Georgakakos VN, Margaritis D, Stavropoulou C, Panos C, Kotsianidis I, Pantelias GE, Sambani C. Disruption of the ETV6 gene as a consequence of a rare translocation (12;12)(p13;q13) in treatment-induced acute myeloid leukemia after breast cancer. *Cancer Genet Cytogenet.* 2008; 180:37-42.
2. Stavropoulou C, Sambani C, Rigana H, Georgakakos VN, Voutsinas G, Manola KN, Pantelias GE, Makropoulos V, Hellenic MDS Study Group. Low frequency of the glutathione-S-transferase T1-null genotype in patients with primary myelodysplastic syndrome and 5q deletion. *Leukemia* 2008; 22:1643-6.
3. Stavropoulou C, Georgakakos VN, Manola KN, Pagoni M, Garofalaki M, Pantelias GE, Sambani C. 5'RARA submicroscopic deletion from new variant translocation involving chromosomes 15, 17, and 18, in a case of acute promyelocytic leukemia. *Cancer Genet Cytogenet.* 2008; 182:50-5.
4. Bousquet M, Quelen C, Rosati R, Mansat-De Mas V, La Starza R, Bastard C, Lippert E, Talmant P, Lafage-Pochitaloff M, Leroux D, Gervais C, Viguié F, Lai JL, Terre C, Beverlo B, Sambani C, Hagemeijer A, Marynen P, Delsol G, Dastugue N, Mecucci C, Brousset P. Myeloid cell differentiation arrest by miR-125b-1 in myelodysplastic syndrome and acute myeloid leukemia with the t(2;11)(p21;q23) translocation. *J Exp Med.* 2008; 205:2499-506.
5. Manola KN, Georgakakos VN, Stavropoulou C, Spyridonidis A, Angelopoulou MK, Vlachadami I, Katsigiannis A, Roussou P, Pantelias GE, Sambani C. Jumping translocations in hematological malignancies: a cytogenetic study of five cases. *Cancer Genet Cytogenet* 2008; 187:85-94.
6. Manola KN, Sambani C, Karakasis D, Kalliakosta G, Harhalakis N, Papaioannou M. Leukemias associated with Turner syndrome: report of three cases and review of the literature. *Leuk Res* 2008; 32:481-6.
7. Hatzi VI, GI Terzoudi, V Makropoulos, C Maravelias, and GE Pantelias. Pre-irradiation exposure of peripheral blood lymphocytes to glutaraldehyde induces radiosensitization by increasing the initial yield of radiation-induced chromosomal aberrations. *Mutagenesis* 2008; 23:101-9.
8. Terzoudi G.I., S.K. Singh, G.E. Pantelias, G. Iliakis. Premature Chromosome Condensation Reveals DNA-PK Independent Pathways of Chromosome Break Repair. *Int J Oncol* 2008; 33: 8719.

2. PEER-REVIEWED CONFERENCE PROCEEDINGS

1. Manola K., V. Georgakakos, C. Stavropoulou, A. Spyridonidis, M. Angelopoulou, I. Vlachadami, P. Roussou, G. Pantelias, C. Sambani. Jumping Translocations in Hematological Malignancies: Molecular Cytogenetic study of four cases. The 13th Congress of the European Hematology Association, Copenhagen, Denmark. June 12-15, 2008.
2. Stavropoulou C., V. Georgakakos, K. Manola, G. Pantelias, C. Sambani. Comparative Study of Conventional Cytogenetics and FISH for EGR1 in Patients with Primary

Myelodysplastic Syndrome and 5q Deletion. The 13th Congress of the European Hematology Association, Copenhagen, Denmark. June 12-15, 2008.

3. Terzoudi G.I., S.K. Singh, G.E. Pantelias, G. Iliakis. Premature Chromosome Condensation Reveals DNA-PK Independent Pathways of Chromosome Break Repair. The 36th annual meeting of the European Radiation Research Society, Tours, France, 1-5 September 2008.
4. Terzoudi G.I., V. Hatzi, K. Barszczewska, G. Iliakis, G.E. Pantelias. A New Cytogenetic Screening Methodology to Evaluate Individual Susceptibility to Radiation Sensitivity. The 36th annual meeting of the European Radiation Research Society, Tours, France, 1-5 September 2008.
5. Bousquet M, Quelen C, Rosati R, Mansat-De Mas V, La Starza R, Bastard C, Lippert E, Talmant P, Lafage-Pochitaloff M, Leroux D, Gervais C, Viguié F, Lai JL, Terre C, Beverlo B, Sambani C, Hagemeijer A, Marynen P, Delsol G, Dastugue N, Mecucci C, Brousset P. Myeloid cell differentiation arrest by miR-125b-1 in myelodysplastic syndrome and acute myeloid leukemia with the t(2;11)(p21;q23) translocation. 4th ELN Workshop "Genetics of MDS", Perugia, Italy. October 2-3, 2008.
6. Manola KN, Parcharidou A, Papadakis V, Kalntremtziou M, Stavropoulou C, Georgakakos VN, Paisiou A, Peristeri I, Pantelias GE, Sambani C, Polychronopoulou S. Cytogenetic diagnostics and outcome in a series of thirty three Greek pediatric acute myeloid leukemia patients. Blood (ASH Annual Meeting Abstracts), Nov 2008; 112: 4889. 50th Annual Meeting of American Society of Hematology (ASH), December 6-9, 2008, San Francisco CA, USA.

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5. Προσδιορισμός Πολυαρωματικών Υδρογονοανθράκων PM10 αιωρούμενης σωματιδιακής με βαρομετρική μέθοδο στο εργοστάσιο «ΚΑΜΠΑΚΑΣ» στην Β' ΒΙ.ΠΕ. Βόλου.
6. Μετρήσεις Ολικών Πτητικών Υδρογονοανθράκων και Ολικού Οργανικού Άνθρακα στα Καμιναέρια και περιμετρικά της Βιομηχανίας Ιντερκέμ Α.Ε. και Μετρήσεις Φυσικοχημικών Παραμέτρων στο Θαλασσινό Νερό της Παράκτιας Ζώνης της Βιομηχανίας Ιντερκέμ Α.Ε.
7. Μετρήσεις Ολικών Πτητικών Υδρογονοανθράκων Ολικού Οργανικού Άνθρακα και Ανόργανων Ενώσεων στην Έξοδο Κατασκευής Φιλτραρίσματος Καμιναιριών, στην βιομηχανική περιοχή της Πάτρας
8. Δειγματοληψία και Ανάλυση ΠΑΥ στον ατμοσφαιρικό αέρα, προσδιορισμός ολικής σωματιδιακής ύλης και PM10 εντός του οικισμού Αντίκυρας και Αγίου Νικολάου Βοιωτίας, Οικολογική Κίνηση Αντίκυρας η «ARTEMIS».
9. Μετρήσεις πολυκυκλικών αρωματικών υδρογονοανθράκων σε σωματίδια PM10 και δειγματοληψία αέριας και σωματιδιακής φάσης για προσδιορισμό διοξινών, σε περιοχή της Βέροιας, Δήμος Βέροιας.
10. Μετρήσεις πολυκυκλικών αρωματικών υδρογονοανθράκων σε σωματίδια PM10 και δειγματοληψία αέριας και σωματιδιακής φάσης για προσδιορισμό διοξινών, στο κτίριο της Διεύθυνσης Δασών Ανατολικής Αττικής.
11. Μετρήσεις Πτητικών Οργανικών Ενώσεων (βενζόλιο, τολουόλιο, ξυλόλιο, φορμαλδεύδη, ακεταλδεύδη, ακετόνη) και Θειούχων Ενώσεων (μεθυλο-μερκαπτάνης, διθειάνθρακα) σε αντλιοστάσιο του βιολογικού καθαρισμού Χαλκίδας (Πραγματοποιήθηκαν 2 δειγματοληψίες εντός του 2008)
12. Μετρήσεις Πτητικών Οργανικών Ενώσεων (βενζόλιο, τολουόλιο, ξυλόλιο, φορμαλδεύδη, ακεταλδεύδη, ακετόνη), Θειούχων Ενώσεων (μεθυλο-μερκαπτάνης, διθειάνθρακα) και αμμωνίας (NH₃) στην μονάδα κομποστοποίησης ορنيθοτροφείου στα Οινόφυτα.
13. Μετρήσεις Πτητικών Οργανικών Ενώσεων (βενζόλιο, τολουόλιο, ξυλόλιο, φορμαλδεύδη, ακεταλδεύδη, ακετόνη) και Θειούχων Ενώσεων (μεθυλο-μερκαπτάνης, διθειάνθρακα) σε βιολογικούς σταθμούς στην ευρύτερη περιοχή της Θεσσαλονίκης.

14. Μετρήσεις Πτητικών Οργανικών Ενώσεων (βενζόλιο, τολουόλιο, ξυλόλιο, φορμαλδεύδη, ακεταλδεύδη, ακετόνη) και Θειούχων Ενώσεων (μεθυλο-μερκαπτάνης, διθειάνθρακα) σε επιλεγμένα σημεία του βιολογικού καθαρισμού Κερατέας.
15. Μετρήσεις ολικών πτητικών υδρογονανθράκων και ολικού οργανικού άνθρακα στα καμινάκια και σε επιλεγμένους εσωτερικούς χώρους της βιομηχανίας χρωμάτων BIBEXPOM Α.Ε
16. Προσδιορισμός Πολυαρωματικών Υδρογονανθράκων PM10 αιωρούμενης σωματιδιακής με βαρομετρική μέθοδο στο εργοστάσιο «ΚΑΜΠΑΚΑΣ» στην Ξάνθη

LECTURES

1. Th. Steriotis & A.K. Stubos, “NESSHY - Novel Efficient Solid Storage for Hydrogen”, Materials Innovations in an Emerging Hydrogen Economy conference, 24-27 February 2008, Cocoa Beach, FL, USA.
2. A.K. Stubos, “Materials for Hydrogen Storage”, University of Crete - Symposium on Hydrogen Storage, 6 May 2008, Heraklion, Greece
3. Th. Steriotis & A.K. Stubos, “Synthesis and characterization of metal doped carbon foams for Hydrogen Storage”, International Energy Agency - Hydrogen Implementing Agreement - Expert Meeting of Hydrogen Storage - Task 22, 6-10 October 2008, Villa Mondragone, Castelli Romani (Roma), Italy
4. Th. Steriotis & A.K. Stubos, “Novel Materials for Hydrogen Storage”, 1st International Workshop NAPEN 2008, Nanoporous Materials in Energy & Environment, 12-15 October 2008, Chania, Greece.
5. A.K. Stubos, “NESSHY - Novel Efficient Solid Storage for Hydrogen”, European Hydrogen Program Review Days, 13-14 October 2008, Brussels.
6. A.K. Stubos, “HYSIC- International Cooperation on Hydrogen Storage – The IPHE Perspective” IPHE Steering Committee meeting, 15 October 2008, Brussels.
7. A.K. Stubos, “Novel Efficient Solid Storage for Hydrogen – An Overview of NESSHY- HYSIC projects”, HYSIC Workshop: Hydrogen Storage in Solids, September 15-17, Beijing, China.
8. Th. Steriotis & A.K. Stubos, “Metal doped carbon foams for hydrogen Storage” 2009 Gordon Research Conference on Hydrogen-Metal systems, 12-17 July 2009, Barga, Italy.

5. System Reliability and Industrial Safety Laboratory (SRISL)

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1. Aneziris O. N., Papazoglou I.A., Baksteen H., Mud M., Ale B.J., Bellamy L.J., Hale AR, Bloemhoff A., Post J., Oh J., (2008), Quantified Risk Assessment for Fall from Heights, *Safety Science*, Volume 46, Issue 2, 198-220.
2. Aneziris O. N., Papazoglou I.A., Mud M. , Banksteen H., Ale B.J, Bellamy L.J., Hale AR, Bloemhoff A., Post J. Oh J (2008). Towards Risk Assessment for crane activities, *Safety Science*, Volume 48, Issue 6, 872-884.
3. Papazoglou I.A., Aneziris O.N., Konstandinidou M., Giakoumatos I., (2008), Accident Sequence Analysis for producing and storing explosives, *Accident Analysis & Prevention*, In Press, Corrected Proof.
4. Nijs Jan Duijm, Cécile Fiévez, Marko Gerbec, Ulrich Hauptmanns, Myrto Konstandinidou (2008), Management of health, safety and environment in process industry, *Safety Science*, Volume 46, Issue 6, July 2008, Pages 908-920.
5. M Konstandinidou, Z Nivolianitou, C Kiranoudis, and N Markatos (2008), Evaluation of significant transitions in the influencing factors of human reliability, *Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability*, Volume 222, Issue 1, 2008.
6. Quantifying occupational risk: The development of an occupational risk model” (B.J.M. Ale, H. Baksteen, L.J. Bellamy, A. Bloemhof, L. Goossens, A. Hale, M.L. Mud, J.I.H. Oh, I.A. Papazoglou, J. Post and J.Y. Whiston) *Safety Science*, Vol 46 Issue 2 (2008) pp 176-185
7. “The software tool storybuilder and the analysis of the horrible stories of occupational accidents” (L.J. Bellamy, B.J.M. Ale, J.Y. Whiston, M.L. Mud, H. Baksteen, A.R. Hale, I.A. Papazoglou, A. Bloemhoff, M. Damen and J.I.H. Oh) *Safety Science*, Vol. 46, Issue 2 (2008) pp. 186-197
8. “Occupational Safety and Risk at ESREL 2006” (I. A. Papazoglou and C. Guedes Soares) Vol 46, Issue 6 (2008) 869-871

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78. Myrto Konstandinidou, Dr. Zoe Nivolianitou, Massimo Librizzi, Pr. Enrico Zio, "Short report on Fuzzy Probability Estimator", 2008.
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6. Solar & Other Energy Systems Laboratory (SESL)

1. PEER-REVIEWED JOURNALS

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2. Essam S. M., Papadakis G., Mathioulakis E., Belessiotis V., A direct coupled photovoltaic seawater reverse osmosis desalination system toward battery based systems — a technical and economical experimental comparative study, *Desalination*, Volume 221, Issues 1-3, 1 March 2008, Pages 17-22
3. Papanicolaou E. and Belessiotis V., “Patterns of double-diffusive natural convection with opposing buoyancy forces : comparative study in asymmetric trapezoidal and equivalent rectangular enclosures”, *ASME J. Heat Transfer*, vol. 130(9), pp. 092501-1 ÷ 092501-14, 2008

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2. Mathioulakis E and H. Fath, Chapter “ADS Concepts, Choice of Pairs and Market Information” in the collective book “Autonomous Desalination System Concepts Handbook”, S. Sozen & S. Teksoy Editors, Istanbul, 2008

7. Thermal Hydraulics and Multiphase Flow Laboratory (THEMLAB)

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2. PEER REVIEWED CONFERENCE PROCEEDINGS

1. C. Housiadas, P. Papazafiri, P. Neofytou, K. Eleftheriadis, L. Tran, "Characterization and monitoring of biological doses from inhalation exposure to nano and fine particles in industrial workplace", International Conference on Safe Production & Use of Nanomaterials (nanoSAFE'08), Grenoble, November 3-7, (2008).
2. E. Demou, S. Hellweg, L. Tran, P. Neofytou, D. Mitrakos, C. Housiadas, "From Inhalation Exposure to Effective Dose during Nanoparticle Synthesis", 2nd International Nanotoxicology Conference, Zurich, September 7-10, (2008).
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14. C. Mitsakou, G. Kallos, N. Papantoniou, C. Spyrou, S. Solomos, M. Astitha, C. Housiadas, "Lung dose from mineral saharan dust to greek residents", 26th European Conference of the Society of Environmental Geochemistry and Health (SEGH2008), Athens, March 31-April 2, (2008).

5. Research and Development projects

Research Reactor Laboratory

1. MTR+I3, *Integrated Infrastructure Initiatives for Material Testing Reactors Innovations*, Contract number 036440 (FI60).
2. ΑΚΜΩΝ, *Αναβάθμιση παροχής περιβαλλοντικών υπηρεσιών από το ΙΠΤ-Α*, Αριθ. Προγρ. Γ.Γ.Ε.Τ. 66.
3. GSRT Greece-Montenegro bilateral S&T cooperation project: Comparison of computational codes for the analysis of radioactivity in environmental samples (2006-2008) - Αριθ. Προγρ. Γ.Γ.Ε.Τ. 143-ε.
4. European Fusion Program
5. Integrated Project EXTREMAT "New Materials for Extreme Environments" (2004-2009)
6. FEMaS-CA Fusion Energy Materials Science – Coordination Action (2008-2010), Grant Agreement Number 224752, FP7
7. IAEA CRP “Development of a Monte Carlo Based Calibration Method for Gamma Spectrometry of Marine Samples” [Research Agreement No 14564/R0]
8. IAEA CRP “Assessment of source term, radionuclides transport within containment / confinement and release to the environment of the Greek research reactor facility” [Research Agreement No. 13827/R0]
9. IAEA CRP “Large sample neutron activation analysis of heterogeneous solid waste” [Research Agreement No. 14565/R0]
10. Επιχειρησιακό Πρόγραμμα Ανταγωνιστικότητας (ΕΠΙΑΝ), Έργο «Ολοκληρωμένο Εθνικό Κέντρο Περιβαλλοντικής Τεχνολογίας».

Health Physics & Environmental Health Laboratory

1. ΑΚΜΩΝ - ΕΠΙΑΝ (Μέτρο 4.2, Δράση 4.2.2) “Εργαστήριο Ακτινοπροστασίας ΕΚΕΦΕ ‘Δ’: Αναβάθμιση παροχής υπηρεσιών κυτταρογενετικής ανάλυσης λευχαιμικών και προλευχαιμικών νοσημάτων” (04ΑΚΜΩΝ144) (1/12/2006 – 30/6/2008) (Χρηματοδότηση από ΓΓΕΤ 374.400 EURO)
2. “Βιοδοσιμετρία ακτινοβολιών και κυτταρογενετική μελέτη λευχαιμικών νοσημάτων”. Αυτοχρηματοδοτούμενο έργο παροχής υπηρεσιών (Εισροές: ≈280.000 €/έτος)
3. “Εξειδικευμένες Υπηρεσίες Ακτινοπροστασίας”. Αυτοχρηματοδοτούμενο έργο παροχής υπηρεσιών.

Environmental Radioactivity Laboratory

1. RER/7/003 Marine environmental assessment of the Mediterranean Sea (IAEA) (Total 250 000 EYPΩ)
2. RER/7/005 programme for harmonization of real-time data and simulation/adaptation to models (2008-2013) (Total 395 000 EYPΩ)
3. Mussel Watch (CIESM) (Frame)
4. MYTIMED (INTERREG) (Frame)
5. Radioactivity measurements of consuming goods, materials, and other samples (third party services) (50 000 EYPΩ)
6. Design and evaluation of environmental studies (10 000 EYPΩ)
7. GSRT PEP Artiki (AEROMETRISI) Development of an operational mapping system of the atmospheric particulate matter concentration and the estimated population exposure in Attica", within the structural funds programme "Consortiums for Research and Technological Development in High Priority Areas" with has a CEC contribution of 75%. (2/7/06 - 31/5/08) (Total 230 000 €)
8. GSRT-NONEU-"Evaluation of Aerosol and Ozone Photochemical Models over Athens using in situ sensors (DOAS) and lidar techniques combined with health indicators". Period-2007-2008 (Total 13000 €)
9. GSRT: Upgrade of Environmental Technology Services from the Institute of Nuclear Technology & Radiation Protection "AKMON" 2005-2008 (Total 275359€)
10. GSRT: Environmental Research Infrastructure Co-operation of Institute of Physical Chemistry and INT-RP (Total 1.772.500 €)
11. Services to Industrial and Public authority clients for: Calibration and validation of aerosol/particulate matter (PM10 PM2.5 PM1) measurement infrastructure according to EN12341 standard, isokinetic sampling of aerosol and gases from stacks under regulation 2000/76/EC, Analysis of trace and earth metallic elements in aerosol samples, Environmental impact assessment for arsenic, cadmium, mercury, nickel in ambient air regulated under DIRECTIVE 2004/107/EC (Total 9800 €)

Environmental Research Laboratory

1. NoE-HYSAFE - Safety of Hydrogen as an Energy Carrier, (SES6-CT-2004-502630), (1/3/04-28/2/09) (Total NCSR "D" Budget 314,394 EURO, EC Funding 55%).
2. IP-STORHY - Hydrogen Storage Systems for Automotive Application, (SES6-CT-2004-502667), (1/3/04-31/8/08) (Total NCSR "D" Budget 252,300 EURO, EC Funding: 50%)
3. IP-EURANOS - European Approach to nuclear and radiological emergency management and rehabilitation strategies (FI6R-CT-2004-508843) (1/4/04-30/6/09) (Total NCSR "D" Budget 170,108 EURO, EC Funding: 50%).

4. CA - ENGINE – Enhanced geothermal innovative network for Europe (019760) (1/11/2005, duration: 30 months) (Total NCSR “D” Budget 38,400 EURO, EC Funding 100%)
5. STREP - TESTNET Towards European Sectorial Testing Networks for Environmental Technologies (018311) (1/9/2005 – 30/9/2008) (Total NCSR “D” Budget 104,220 EURO, EC Funding 50%).
6. IP-NESSHY – Novel Efficient Solid Storage for Hydrogen (SES6-CT 2005-518271) (1/1/2006-31/12/2010) (Total NCSR “D” Budget 1,413,000 EURO, EC Funding 889,000)
7. STREP-FP6, HYPER Installation Permitting Guidance for Hydrogen and Fuel Cells Stationary Applications, 039028 (1/11/06-31/01/09) (Total NCSR “D” Budget 83,200 EURO, EC Funding 50%)
8. FP7-NANOHY Novel nanostructured materials for hydrogen storage, Grant Agreement No 210092, (1/1/2008, duration: 45 months) (Total NCSR “D” Budget 28,5800 EURO, EC Funding 214,350)
9. SSA-HYSIC Enhancing International Cooperation in running FP6 Hydrogen Solid Storage Activities, Contract No 038941(SES6), (1/1/07-31/12/08) (Total NCSR “D” Budget 25,000 EURO, EC Funding 100%)
10. ΑΚΜΩΝ - ΕΠΑΝ (Μέτρο 4.2, Δράση 4.2.2) Αναβάθμιση παροχής περιβαλλοντικών υπηρεσιών από το ΠΠΑ (04ΑΚΜΩΝ66) (19/5/2005 – 31/5/2008) (Χρηματοδότηση από ΓΓΕΤ 74,000 EURO)
11. ΠΙΣΤΟΠΟΙΗΣΗ - ΕΠΑΝ (Μέτρο 1.2 ‘ΕΘΝΙΚΟ ΣΥΣΤΗΜΑ ΠΟΙΟΤΗΤΑΣ’, Δράση 1.2.2 ΠΙΣΤΟΠΟΙΗΣΗ) Ενίσχυση της υφισταμένης υποδομής του εργαστηρίου Περιβαλλοντικών Ερευνών (ΕΠΕΡ) του Ινστιτούτου Πυρηνικής Τεχνολογίας – Ακτινοπροστασίας του ΕΚΕΦΕ «ΔΗΜΟΚΡΙΤΟΣ» για την παροχή υπηρεσιών δοκιμών (Κωδ ΟΠΣ 102250) (19/9/2005 – 30/6/2009) (Χρηματοδότηση από ΥΠΑΝ 180,000 EURO)
12. ΔΗΜΙΟΥΡΓΙΑ ΠΕΡΙΦΕΡΕΙΑΚΩΝ ΠΟΛΩΝ ΚΑΙΝΟΤΟΜΙΑΣ (ΠΠΚ) (Μέτρο 4.6, Δράση 4.6.1) Πόλος Καινοτομίας Δυτικής Μακεδονίας Synenergia (Κωδ 04ΠΠΚ06) (1/11/06-31/10/08) (Χρηματοδότηση από ΓΓΕΤ 50,000 EURO)
13. ΠΕΠ ΑΤΤΙΚΗΣ – Μέτρο 1.2 «Ανάπτυξη επιχειρησιακού συστήματος αποτύπωσης (χαρτογράφησης) των επιπέδων συγκέντρωσης αιωρούμενων σωματιδίων και της εκτιμώμενης έκθεσης πληθυσμού στην Αττική» (Κωδ ΑΤΤ-111) (1/4/2006-31/3/2008) (Χρηματοδότηση από ΓΓΕΤ 63,000 EURO)
14. ΠΕΠ ΔΥΤΙΚΗΣ ΕΛΛΑΔΑΣ - Μέτρο 3.4 «Μοντελοποίηση και προσομοίωση των φυσικοχημικών διαδικασιών στην ατμόσφαιρα για τον έλεγχο και τη δυνατότητα πρόβλεψης της ατμοσφαιρικής ρύπανσης (Κωδ ΔΕΛ-18) (1/4/2006-31/1/2008) (Χρηματοδότηση από ΓΓΕΤ 41,632.11 EURO)

System Reliability and Industrial Safety Laboratory

1. “WORM Metamorphosis Phase”, (RIVM, Netherlands) (€ 186.000)
2. “RAM”, (RIVM Netherlands) (€ 104.000)
3. VIRTUALIS “Virtual reality and human factors”, (FP6-IP, DG Research, 2005-2009) (€ 203.620,79)
4. «Εκπόνηση και ιεράρχηση δράσεων για την υγιεινή και ασφάλεια στην εργασία στο πλαίσιο του νέου Ε.Π. «ΑΝΘΡΩΠΙΝΟΙ ΠΟΡΟΙ 2007-2013» (2007-2008), (€ 50.000)
5. iNTeg-Risk: Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks (2008-2013) (€ 137.600)

Solar & Other Energy Systems Laboratory

1. **Δράση 3.1.2/ Μ 3.1/ΕΠΑΝ**, "Βέλτιστος ενεργειακός σχεδιασμός και χαρακτηρισμός προϊόντων ηλιακής ενέργειας και διατάξεων αποθήκευσης θερμότητας", 2007-2009, προϋπολογισμός 336.030 €, (ΕΡΓΟ ΓΕΛ 1456)
2. **Π.Υ.**, Παροχή Εξειδικευμένων Επιστημονικών & Τεχνολογικών Υπηρεσιών στον τομέα των ΑΠΕ, 2003-2009, προϋπολογισμός 450.000 €, (ΕΡΓΟ ΓΕΛ 1103)
3. **MEDA** , "Autonomous desalination system concepts for sea water and brackish water in rural areas with renewable energies – Potentials, Technologies, Field Experience, Socio-technical and Socio-economic impacts – ADIRA", 2003-2008, προϋπολογισμός 240.255 €, (ΕΡΓΟ ΓΕΛ 1111)
4. **ΠΕΝΕΛ 2003 (ΕΠΑΝ / Μ 8.3 / ΙΙΙ ΚΠΣ)**, "Ανάπτυξη και ενεργειακή βελτιστοποίηση αυτόνομου ξηραντηρίου γεωργικών προϊόντων με χρήση ηλιακής ενέργειας", 2005-2008, προϋπολογισμός 46.758 €, (ΕΡΓΟ ΓΕΛ 1262)
5. **Intelligent Energy – Europe**, "SolarKeymark-II - Large open EU market for solar thermal products" 2006-2008, προϋπολογισμός 47.160 €, (ΕΡΓΟ ΓΕΛ 1288)
6. **Διακρατική Συνεργασία Ελλάδα – ΤΥΝΗΣΙΑ**, "Autonomous Low Visual Impact Solar Hot Water System", 2006-2008, προϋπολογισμός 15.740 €, (ΕΡΓΟ ΓΕΛ 1373)

Thermal Hydraulics And Multiphase Flow Laboratory

1. FP6 NoE, FI6O-CT-2004-509065 (SARNET): Network of Excellence for a Sustainable Integration of European Research on Severe Accident Phenomenology (2004-2008).
2. FP6 CA, GOCE-Contract No 037019 (HENVINET): Health and Environment Network (2006-2009).

3. OP COMPETITIVENESS (EPIAN), GSRT, GR-USA scientific and technological cooperation project: Evaluation of Aerosol and Ozone Photochemical Models over Athens using in situ sensors (DOAS) and lidar techniques combined with health indicators, (2006-2008), (jointly with ERL Laboratory).
4. OP COMPETITIVENESS (EPIAN), GSRT (AEROMETRISI): Development of an operational information system for the particulate matter concentrations and the associated exposure and doses to the population of the Greater Athens Area, (2006-2008), (jointly with ERL and EREL Laboratories).
5. FP7-HEALTH-2007-A, CP Project No 201335 (NANOTEST): Development of methodology for alternative testing strategies for the assessment of the toxicological profile of nanoparticles used in medical diagnostics (2008-2011).
6. FP7-NMP-2007-CSA-1, CSA Project No 218539 (NanoIMPACTnet): Europe-wide Cooperation and Coordination in the Study of the Health and Environmental Impact of Nanomaterials (2008-2012).