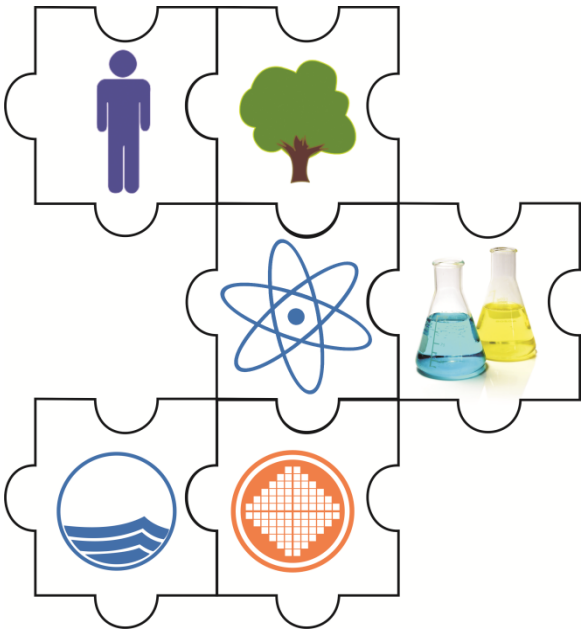

Institute of Nuclear Technology
& Radiation Protection

annual Report 2011

ANNUAL REPORT 2011

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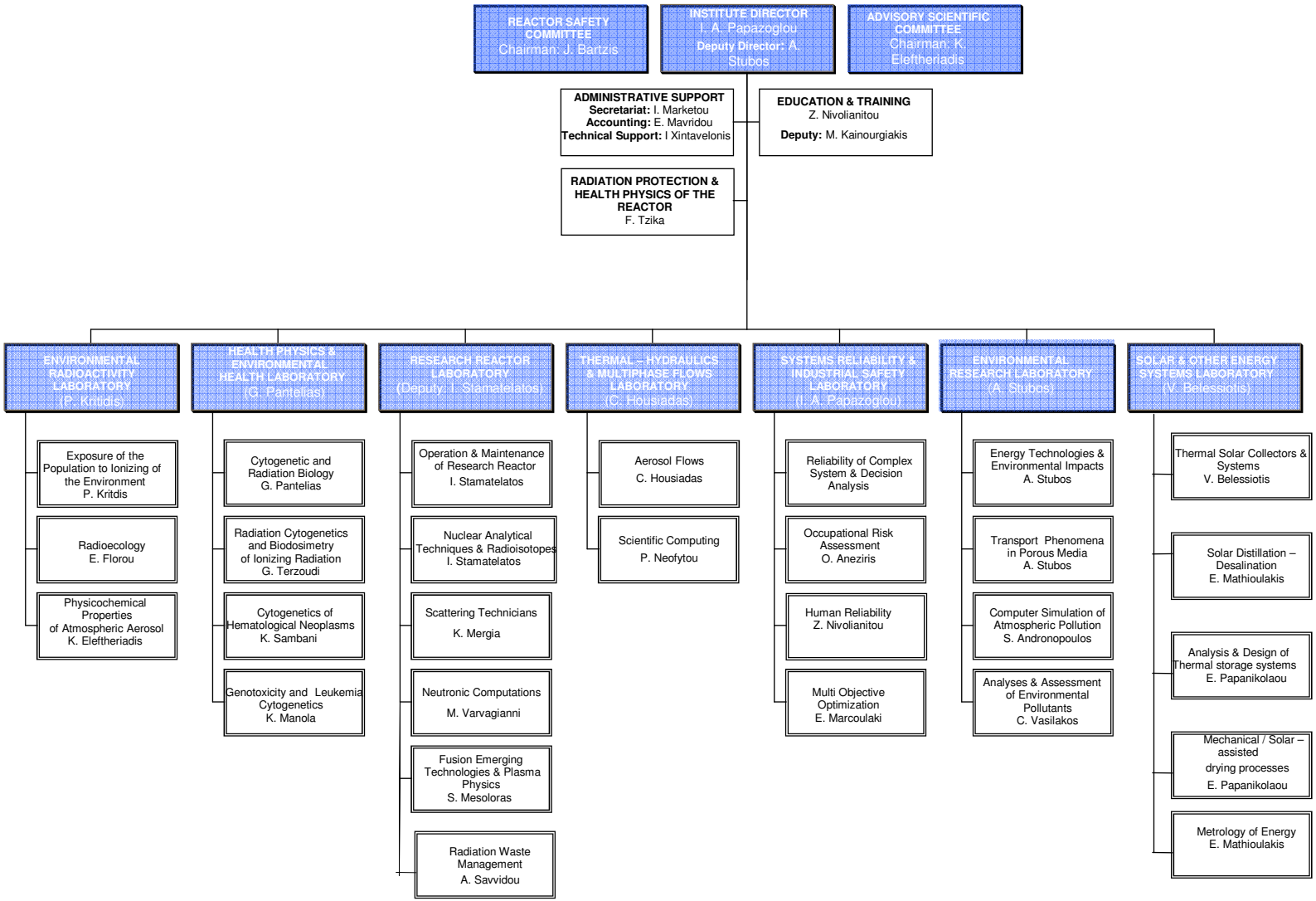
ORGANIZATIONAL CHART 2010



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 the number of their citations. Furthermore, the Institute and its staff have provided the Greek Society with a number of specialized and technologically advanced services. Although the Nuclear Research Reactor formed the basis of the Institute when it was founded in 1985, today the Institute has expanded beyond nuclear technology into six additional laboratories performing R&D in various specific topics in the fields of Nuclear Technology, Energy Technology, Environmental Technology and Safety & Security.

Research and Development activities based on the Nuclear Research Reactor form the nucleus of the *Nuclear Research Reactor Laboratory (NRRL).* An ambitious refurbishment /upgrading program of the reactor systems is being implemented. Modernization of the reactor will allow its safe and continuous operation and exploitation for the development and characterization of advanced materials for aerospace, fusion and fission applications and the production of medical isotopes transforming part of the NRRL to a Centre of Excellence in Neutron Science. The Nuclear Research 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.

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 is the focus of the R&D activities of the *Environmental Radioactivity Laboratory (ERL).*

Research in air quality and dispersion of pollutants, nanomaterials and their use in energy and environmental issues, hydrogen safety and storage are the main areas of work of the *Environmental Research Laboratory (EREL).*

System analysis focused on reliability of large technological systems, quantification of uncertainties, development of decision support systems, optimization techniques and assessment and management of technological and natural risks form the basis of work of the *System Reliability and Industrial Safety Laboratory (SRISL).*

Solar thermal energy utilization and energy savings, with emphasis on the development of new products, methods and analytical tools constitute the fields of expertise of the *Thermal Energy Systems Laboratory (TESL).*

Biological dosimetry and cancer cytogenetics for the evaluation of radiation sensitivity, cancer proneness, myelodysplastic and leukemic diseases are the R&D activities of the *Health Physics & Environmental Health Laboratory (HPEHL).*

Thermal-hydraulics and multiphase-flow, areas of longstanding experience in the INT-RP, are applied in new R&D applications requiring similar scientific know-how, like aerosol medicine, nanotoxicology, industrial hygiene, environmental health, and particle-biofluid mechanics by the *Thermal–Hydraulics and Multiphase Flows Laboratory (THEMLAB).*

2010 has been a transition year for the Institute. Korean Energy Power Company (KEPCO), a world wide known Architect Engineer for Nuclear Power Plants continued the design of the new Primary Cooling System of the Nuclear Research Reactor with strong interaction and feedback from the NRRL staff. The design of the new PCS is expected to be completed in 2011, and the new PCS installed also in 2011. Publications in international peer-reviewed scientific journals have increased significantly to 89 (46% increase over 2009), while the number of publications in peer-reviewed full proceedings of international conferences was 90 slightly over that (85) of 2009. Personnel increased to 134(4% over 2009) Funding from external sources (beyond and above the regular budget of the Greek government) remained at the general level of the last two years at 2MECU.

Looking into the future, the Institute of Nuclear Technology & Radiation Protection will try to focus the scope of its research activities in selected areas of the energy, environment safety and health sectors in accordance to its 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

Institute of Nuclear Technology & Radiation Protection Annual Report 2011

Activity Report / Perspective

1. ACTIVITY REPORT

Research and Development activities of the Institute of Nuclear Technology – Radiation Protection (INT-RP) are performed in seven laboratories and 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 a unique infrastructure for the benefit of the Greek research community and society. 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. Experimental facilities for research and technology have been developed around the reactor. 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 researchers form all over Greece, neighbouring and other European countries. These large scale facilities, utilizing the reactor produced neutrons, are unique in the Balkan and East Mediterranean region and render the Greek Research Reactor 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 carrying out research and development in 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.

• -constitutes an integrated radiation protection capability in Greece, a significant fact, 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 noteworthy 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, thus constituting 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.

• -through specific activities in the Laboratories of Environmental Research and System Reliability and Industrial Safety INT-RP represents the sole capability in Greece for Quantitative Risk Assessment in nuclear installations and Emergency Response Planning Following a nuclear accident.

II. Environmental Technology

Activities in this area, involve a large (larger than the critical mass) number of researchers and specialized technical personnel of the INT-RP. More specifically, the INT-RP has the ability of 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 research and environmental quality evaluation studies. While research on

radioecology has ranked the ERL among the best in this domain, recently research on aerosols has become a subject of increased interest.

• -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 System Reliability and Industrial Safety Laboratory (SRISL) is mainly concerned with R&D in matters of risk assessment and management of large technological systems including the effects of large industrial accidents in the Environment. A great number of Greek industrial installations have been analyzed with respect to the effects of large industrial accidents in the frame work of the "SEVESO" directive.

• -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.

As a result of these activities the INT-RP constitutes one of the most experienced and reliable consultants of the Greek public and private sectors in matters of environmental protection.

III. Energy Technology

• -Selected topics in both fission and fusion 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 Environmental Research Laboratory (EREL) has developed significant research activity in the areas of hydrogen technologies (emphasis placed upon issues of safety and storage), energy efficient separations (emphasis given to nonporous media characterization and applications) and enhanced hydrocarbon recovery from underground reservoirs (with emphasis on the simulation of fluid flow and dispersion processes).

• -The SRISL is also concerned with R&D in matters of risk assessment and management of large technological systems including energy-related systems. A number of risk assessments performed by SRISL involved oil-refineries LPG and LNG installations.

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. 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. Safety and Security

• -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 six 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.

In past year EREL has been involved in R&D efforts in the area of Security. More specifically, in the FP7 collaboration project STARTRANS, security of interdependent and interconnected transportation networks has been examined. To that extend a strategic risk analysis framework has been derived, and examples on the Attica transportation integrated network thoroughly analyzed. There is ongoing work in the area of crisis and emergency management through the participation in the CRiSYS FP7-CSA project aspiring to define a roadmap for the 2013 Demonstration Phase II programme, and PRACTICE FP7-IP that will develop Integrated Concepts and and Equipment for aiding Preparedness and Resilience against CBRN Terrorism.

1.1. Scientific Achievements in 2011

Thirty seven projects were active during 2010 and performed by the staff of the seven laboratories. Details of these projects are given in the sections describing the activities of the laboratories. The main scientific achievements are listed here:

1. Refurbishment of the Research Reactor (Conceptual and Preliminary desin of ne Primary Cooling System and removal and safe temporary storage of the reactor pool internals)
2. Nuclear Analytical Techniques (Development and applications of a Large Sample Neutron Activation Analysis technique for inhomogeneous bulk archaeological samples and large object)
3. Radiation detection and measurement (Development of computational models for HPGe detectors; Testing efficiency transfer codes for equivalence)
4. Radiation Protection (Development of methods for nuclear reactor occupational radiation exposure contro)
5. Radiological evaluation of materials for fusion technology (*In-situ* gamma-ray spectrometry for characterization of components of a future fusion power plant)
6. Decommissioning of nuclear facilities and radioactive waste management(Characterization by in-situ gamma spectroscopy, Characterization by sampling, Decontamination technique, Radioactive Waste Management*)*
7. Fusion Materials Technology
    a. Structural & Magnetic properties of Iron-Chromium alloys
    b. Radiation Damage in Iron – Chromium model alloys
8. New Materials for Extreme Environment
9. Fusion Energy Materials Science
10. Applications of Neutron Scattering techniques
    a. Neutron reflectivity measurements on magnetic multilayers
    b. Small-Angle neutron scattering investigation of porosity and agglomeration phenomena
    c. Inelastic neutron scattering techniques for proton dynamics at high energy transfers
11. Materials and Nanotechnology
    a. Magnetic layered structures
    b. Charge trapping memories with atomic layer deposited high-k dielectrics capping layers
12. Computational Nuclear Technology

a. Application of advanced neutronic codes for reactor core calculations
b. Modification/improvement of existing codes for use in neutronic calculations
c. Development of new codes for applications in Nuclear Technology

13. Nuclear Reactor Safety
    a. analyzing the thermal-hydraulic behavior of small scale facilities and extrapolating the results to the actual plant size
    b. employing established codes that accurately model the physical phenomena taking place in the system

14. Environmental Radioactivity Monitoring
15. Radioecology
    a. Climate change use of radionuclide kinetic as a tool for the carbon cycle research
    b. Comparative effects of radionuclides and conventional pollutants using sensitive tools.
    c. Use of bio-indicators for the environmental quality assessment in the Mediterranean sea.
    d. Modelling and assessment of pollutants impact on marine ecosystems
    e. Partisciapation to IAEA TC programs
16. Investigation of Artic Aerosol Properties with emphasis on the formation and mixing state of cloud condensation nuclei
17. The DEM-Athens Urban background Monitoring station for Aerosol properties
18. Development of A Cost Efficient Policy Tool for reduction of particulate matter in AIR (ACEPT-AIR)
19. Energy Technologies and Environmental Impact: R&D services to the public and private sectors
20. Computational modelling in the areas of meteorology, atmospheric pollution, global warming, emergency response and security
21. Climate change studies
22. Characterization of and Transport in Porous and Composite Media
23. Air quality studies. Chemical analysis of environmental pollutants
24. Pollution control technologies. Photocatalytic removal of air pollutants
25. Hydrogen Technologies (storage and safety)
26. Occupational Risk Management
27. Virtual Reality and Human Factors (VIRTHUALIS)
28. Early Recognition, Monitoring, and Integrated Management of Emerging, New Technology Related Risk (iNTeg-Risk)
29. Multi-Objective Optimization
30. Bayesian Analysis of Industrial Incidents
31. International Conference ESREL 2010
32. Provision of Specialized Scientific and Technical Services in the Renewable Energy Source Sector
33. Quality Assurance in solar thermal heating and cooling technology - keeping track with recent and upcoming developments (QAiST)
34. Targeted Research and Development on Thermal Solar Collectors, Solar Systems and Thermal Storage Devices
35. Participation in the Health and Environment Network
36. Development of a methodology to assess the toxicological profile of nanoparticles used in medical diagnostics, based on alternative testing strategies
37. Europe-wide Cooperation and Coordination in the Study of the Health and Environmental Impact of Nanomaterials
38. Simulation of bio-fluids flows
39. Effect of individual radiosensitivity on absorbed dose and risk estimation
40. Karyotyping, molecular cytogenetics and genotyping in hematological neoplasms

1.2. Perspective and Mid Term Objectives

Work in 2011 is expected to continue in the same basic areas described in the previous section. In particular,

- -A Strategic Planning for upgrading, full operation and exploitation of the Nuclear Research Reactor foreseeing 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. 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.
- -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.

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.

1.3. 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 advanced tecnhology 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 2010 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. As of 2008 the number of publications reported in Table 1 and Figure 1 has been corrected so that publications that appear as "in press" in one year do not appear again in the next year.

- -INT-RP continues to be financially healthy. Funding in 2010 amounted to almost 2 Mecu. However, a trend of diminishing external financing observed in the overall research sector in Greece and in Demokritos affected our Institute too. Special effort will be devoted to increase the number of the externally financed research development projects. This external financing will play an ever increasing role in view of the decreasing state financing owing to the general economic crisis of Greece. INT-RP remains, nevertheless, in a position to self-finance significant building and 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 175.000€ 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 2009 slightly elevated (4%) in the last three years of the decade. It is noteworthy that about 25% are "fixed-term" temporal employees.

Table 1. Publications and Impact Factor in 2011				
LABORATORY	**PUBLICATIONS**		**IN PRESS**	**IMPACT FACTOR**
	Papers (in refereed Scientific Journals)	Papers (in Conference Proceedings)		
Nuclear Research Reactor				
Environmental Radioactivity				
Health Physics & Environmental Health				
Environmental Research	23	52	12	55.502
System Reliability & Industrial Safety				
Solar & Other Energy Systems				
Thermal-Hydraulic & Multiphase Flow				
Total				

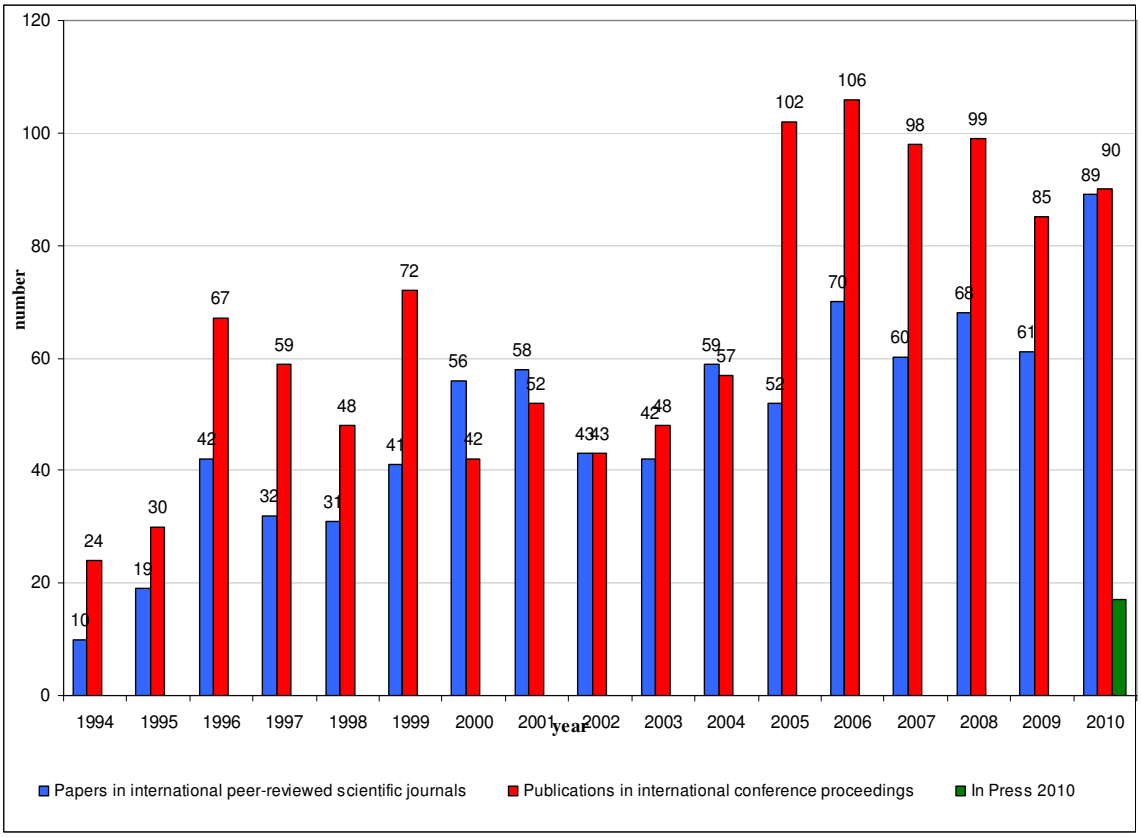


Figure 1: Temporal variation of INT-RP publications

Table 2. Funding 2011					
Laboratories	**Funding (in Euro)**				
	International Competitive Programs	*National Competitive Programs*	*Provision of Services*	*Matching Funds*	**Total**
Nuclear Research Reactor					
Environmental Radioactivity					
Health Physics & Environmental Health					
Environmental Research	614.375	97.628	45.991	0	757.994
System Reliability & Industrial Safety					
Solar & Other Energy Systems					
Thermal-Hydraulic & Multiphase Flow					
INT-RP					
Total					

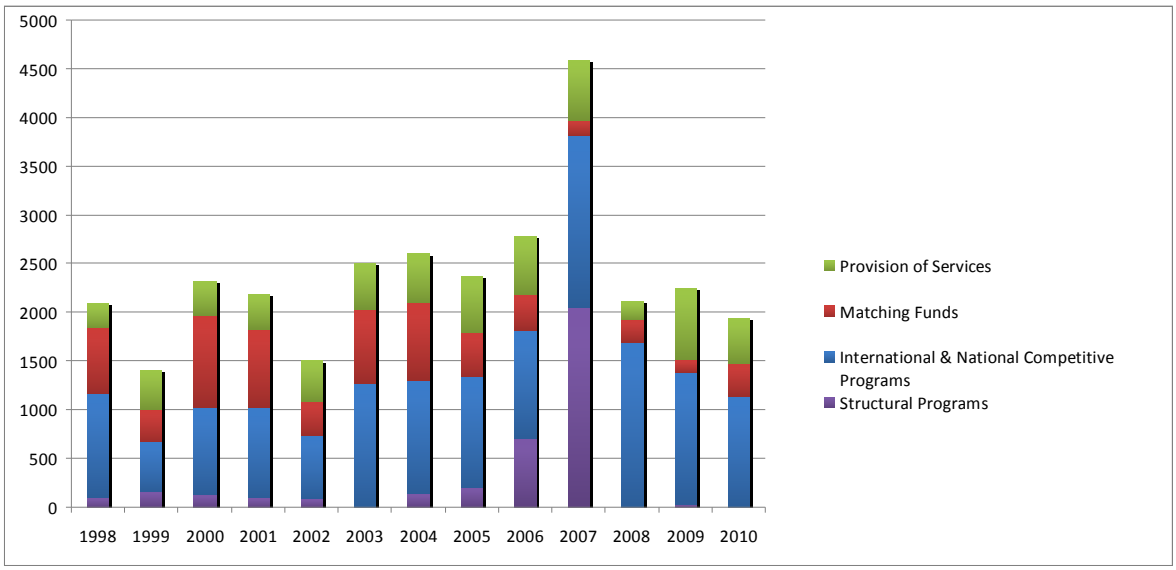


Figure 2: Temporal variation in INT-RP external funding

Table 3. PERSONNEL OVER THE LAST TEN YEARS											
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Researchers (A, B, C) and Specialised Scientific Personnel	25	24	24	26	22	22	24	31	32	32	32
Post - Doctoral Researchers (in 2010 post doctoral researchers under long term contract were added to this category)	5	3	4	2	2	2	4	7	3	20	24
Scientific Technical Personnel	6	5	15	15	11	11	14	15	14	15	17
Technical Personnel	23	23	25	25	27	28	30	32	27	31	30
Administrative Personnel	6	4	2	2	2	2	3	2	2	7	7
Ph-D Students (personnel under fixed duration scholarship, temporal personnel or without payment)	11	8	11	11	8	9	14	14	13	24	23
Scientific Personnel Under Fixed-Term contracts (*in 2010, the personnel of this category was distributed to the categories above according to their qualifications)	33	38	31	30	38	38	22	23	32	*	*
Total	**109**	**105**	**112**	**111**	**110**	**112**	**111**	**124**	**123**	**129**	**134**

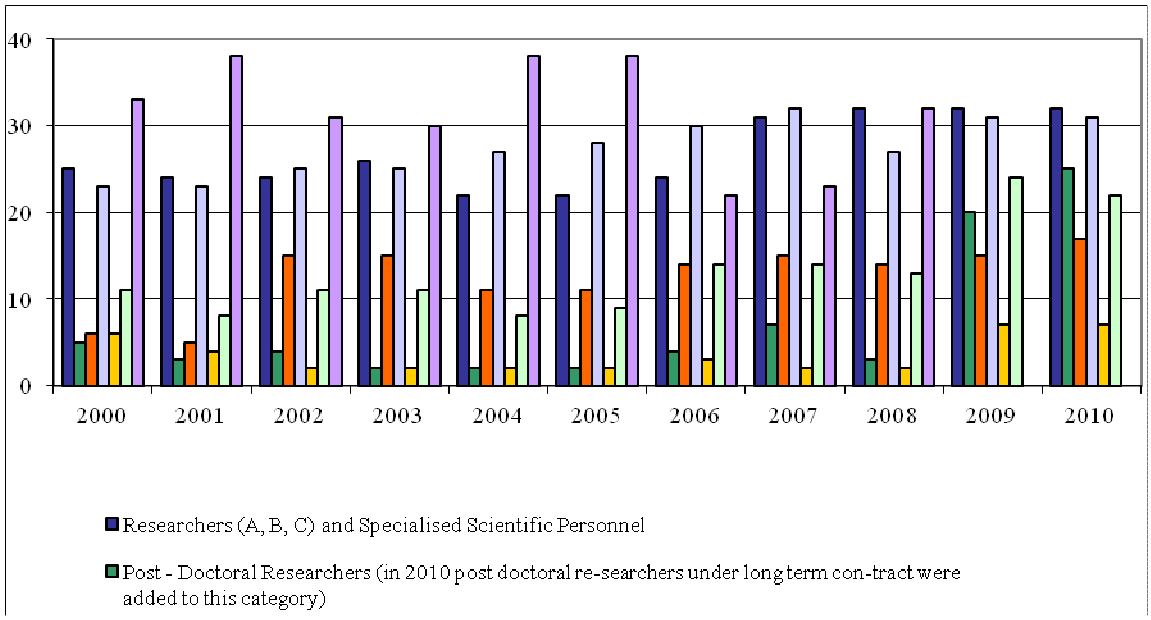


Figure 3: Temporal variation in INT-RP personnel

Table 4. INSTITUTE ACCOUNT-EXPENDITURE 2011							
	EMPLOYMENT ON FIXED TERM CONTRACTS	TRAVEL	CONSUMABLES	EQUIPMENT	OTHER EXPENSES	DIRECT TRANSFER TO LABORATORIES	TOTAL
INT-RP (General)							
System Reliability & Industrial SafetyLaboratory)							
Thermal Hydraulics & MultiphaseFlow Laboratory							
Environmental Research Laboratory	10						
Health Physics & EnvironmentalHealth Laboratory							
Nuclear Research Reactor Laboratory							
Environmental Radioactivity Laboratory							
Solar & other Energy Systems Laboratory							
General Total							

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Laboratories

ENVIRONMENTAL RESEARCH LABORATORY (EREL)

Head: Dr. A. Stubos

Personnel

Researchers **6**

Dr Athanasios Stubos (Research Director)
Dr Spyros Andronopoulos (Senior Researcher)
Dr Georgia Charalambopoulou (Senior Researcher)
Dr Michalis Kainourgiakis (Senior Researcher)
Dr Alexandros Venetsanos (Senior Researcher)
Dr Diamando Vlachogiannis (Senior Researcher)

Post Doc Researchers **12**

Dr Christos Chatzichristos
Dr Thomas Maggos
Dr Athanasios Sfetsos
Dr Rafaella-Eleni Sotiropoulou
Dr Andreas Yiotis
Dr Kyriaki Bairachtari
Dr Manos Stamatakis
Dr Efthimios Tagaris
Dr Mary Konstantakou
Dr Nikos Papadimitriou
Dr Dikaia Saraga
Dr Vasiliki Tsiouri

Scientific Technical Personnel **6**

Mr Nikolaos Gounaris
Ms Kalliopi Konte
Mr Ioannis Xintavelonis
Ms Ioanna Tzagkaroulaki
Mr Stelios Karozis
Mr Nikos Moustakidis

PhD Students **5**

Mr Nektarios Koutsourakis
Ms Stella Giannissi
Ms Stella Pateraki
Mr Ioannis Psychogios
Mr Ilias Tolias

Administrative **1**

Ms Argyro Panayiotou

Overview

The Environmental Research Laboratory (EREL) is part of the Institute of Nuclear Technology-Radiation Protection of the National Centre for Scientific Research “Demokritos” (NCSRD). 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 air pollution and gas sorption measurements 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 with ISO 9001 for software development in atmospheric applications and is accredited according to EN 17025 for specific gas pollutant measurements (particulate matter, volatile organics, etc). EREL carries out several research projects with substantial external funding, in several of which it acts 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). The merits and prospects of the Laboratory at the national and regional level have been acknowledged by the EC and a RegPot Grant has been awarded to EREL for the enhancement of its R&D potential and infrastructure.

Objectives

In line with current international trends, EREL places emphasis on R&D activities relevant to energy technologies and particularly hydrogen technology (with emphasis on storage and safety aspects), CO2 sequestration issues, 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, energy (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. Furthermore, EREL provides air quality studies, through chemical analysis of air pollutants and carries out research in the field of environmental protection through photocatalytic applications

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 international research projects and the associated external funding attracted, (ii) the large number of scientific publications in high impact factor international journals and conferences, (iii) the provision of advanced R&D services to Public and Private Organizations, (iv) the organisation of international conferences, (v) the participation in International networks and (vi) the fact that several of its staff act as national representatives and invited experts in various international organisations.

R & D Activities

1) Energy Technologies and Environmental Impact

Sustainable development is one of the major issues in the energy and environment agenda internationally. The subject of this EREL activity puts emphasis on a number of topics that serve sustainable development purposes (reduction of environmental impact of energy technologies, alternative fuel technologies, etc). These topics are clearly pursued in the current and forthcoming EC Framework Programs for research.

In 2011, the activities of EREL related to Energy Technologies and their Environmental Impact have continued with distinct short and medium to long term objectives.

Long term Research

- Emphasis on Hydrogen technologies (storage and safety)

- -CFD developments and applications in Biomedical and other systems (Lattice Boltzmann method, Non-Newtonian fluids, Molecular Simulations)
- -Energy technology studies (hydrogen, gas separations) using CFD simulations and stochastic approaches

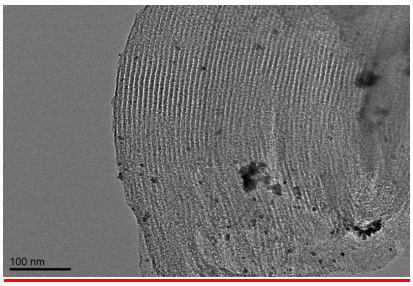
Medium term Research

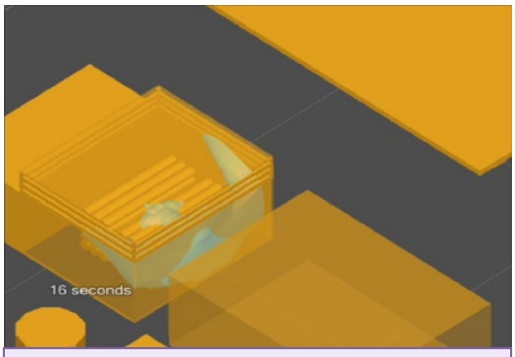
- Hydrogen technologies (storage and safety)
- Energy technologies simulation-assessment (hydrocarbons recovery, porous membranes)
- Gas storage in solid materials (CO_2, H_2)

Short term (R&D services)

- Underground reservoir simulation and characterization
- Safety assessment for hydrogen and toxic gas installations
- Environmental impact studies (private and public sectors)

In the field of hydrogen technologies and particularly storage, emphasis is currently placed on the development and characterisation of novel carbon structures (e.g. templated carbons, carbon foams, carbon aerogels etc.), as well as the investigation of the spillover phenomenon (US patent filed). EREL participates in several FP7 projects including the Hydrogen and Fuel Cells European – wide infrastructure H2FC. The 5-year FP6 Integrated Project NESSHY, which gathered together all current European actors on solid storage of hydrogen, has been successfully completed under the coordination of EREL. International collaborations (NREL, USA) have continued and. EREL has installed and tested during 2011 extended infrastructure (in computational and experimental terms) for H-storage studies in solids. Regarding hydrogen safety, EREL has further extended and applied its in-house developed advanced simulation tools.



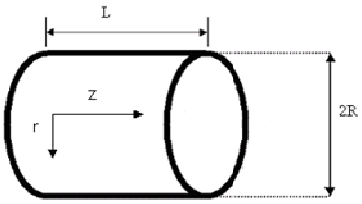


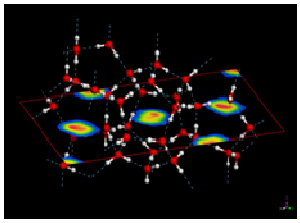
Storage room of a hydrogen refueling station containing 35 × 250 L cylinders at 400 bar and natural ventilation. Modelled is the transient leak from one cylinder with leak diameter 0.8 mm. Shown is the flammable hydrogen air cloud 16 seconds after the start of release. Release calculations with the GAJET code. Dispersion calculations with the ADREA-HF code

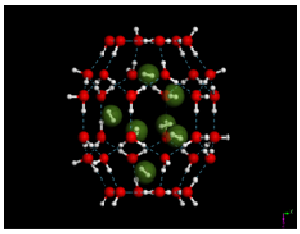
Focus has been given in advanced turbulence modelling through LES, in hydrogen combustion simulation methodologies, in code parallelization techniqhes and in multiphase – multicomponent simulations.

In the frame of such activities, EREL has developed a broad range of cooperation with the Public and Private Sectors both in Greece and (mainly) internationally, while it participates actively in international projects (FP7) and scientific networks (HySafe).

Finally, EREL possesses significant project management experience through participation in and coordination of several multinational collaborative projects.





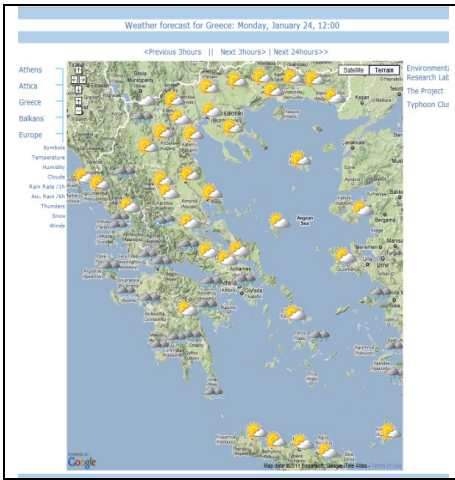


2) Computational modelling in the areas of meteorology, atmospheric pollution, global warming, emergency response and security

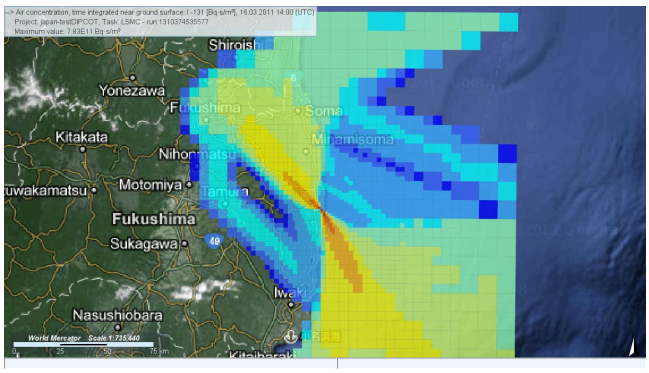
EREL has continued its activities in developing state-of-the-art software for simulations of atmospheric dispersion of pollutants in complex terrains and for diagnostic and prognostic meteorology. Additionally, activities in the area of climate change have been advanced by installing new global modelling software. Already existing simulation codes in EREL have been updated and their applications have been expanded to accommodate new needs in the areas of air quality in regional scale and emergency response to long-range atmospheric dispersion of hazardous pollutants. More specifically:

- EREL participates in the project entitled "Towards a self-sustaining European Technology Platform (NERIS-TP) on Preparedness for Nuclear and Radiological Emergency Response and Recovery", co-funded by the FP7 of the European Atomic Energy Community. The tasks of EREL concern mainly the processing and provision of prognostic meteorological data to Decision Support Systems. At the same time EREL continues to update and support the operational meteorological diagnostic model and the atmospheric dispersion model DIPCOT that are integrated in the European Decision Support System for nuclear emergencies RODOS. EREL participates also in the Nuclear Technology Team of the Greek Atomic Energy Commission's National Emergency Response Plan, in charge of producing prognoses of radionuclides atmospheric dispersion in cases of nuclear emergencies.
- The operational weather forecasting (http://www2.ipta.demokritos.gr/forecast/) system of EREL, has been updated in 2010 and its computational domain has been expanded to cover spatially the entire Europe and North Africa. This gives EREL the potential to calculate air quality from local to regional scales over Europe but also to simulate long-range atmospheric dispersion for emergency response purposes. Specific studies for wind shear analysis using very high resolution of MM5 have been performed.
- EREL has continued to perform targeted studies using the CMAQ numerical model for the region of Attica, focusing on the impact on shipping emissions, land use changes and in particular the extensive application of green roofs and determination of source impacts using the adjoint version of the model. EREL has started participating in the AQMEII (Air Quality Model Evaluation International Initiative) and has continued participating in ENSEMBLE (System to reconcile disparate national long range dispersion forecasts). This work has been supported by the compilation of new emission inventories for Attica and the application of the SMOKE tool.

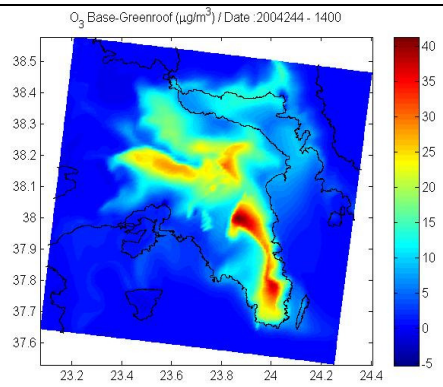
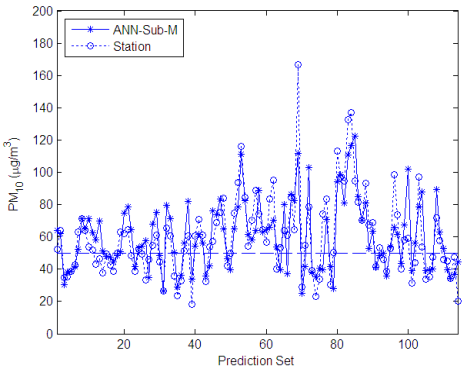
- EREL has developed advanced modelling tools for the time series analysis of daily PM10 data from Attica. Novel models based on sub-sampling of data and the application of source identification tools, e.g. Granger causality, have been applied.
- In the area of global modelling, the proposal submitted to the National Strategic Reference Framework (NSRF) proposing the study of climate change and air quality in Greece, focusing on the assessment of their environmental and socio-economic impacts at a local level in the future, has been approved for funding and the project will commence soon. Towards that direction, two global models (the NASA GISS Model E global climate model and the NASA Global Modeling Initiative (GMI) chemistry and transport model) were installed on the existing computational infrastructure of the EREL. Moreover the Climate Data Analysis Tool (CDAT) which is software specifically designed for scientific calculations and graphics with focus on the needs of climate modellers has been installed.
- The activities in the novel area of inverse modelling were carried out in the following directions: data assimilation of measurements in atmospheric dispersion models to improve the quality of prognoses and to evaluate the unknown or uncertain rate of emission of pollutants from a source; source apportionment of particulate matter indoors to identify and characterize sources by combining measurements and statistical methods; inverse modelling for air quality to evaluate the influence of air pollution sources on pollution levels and the inter-dependency between reacting pollutants.
- Computational modelling activities have continued for the evaluation of exposure to hazardous atmospheric pollutants, both outdoors and indoors, and in the area of large eddy simulation of complex turbulent flows.
- In the area of security, a new activity has been initiated through the participation of EREL in the FP7 projects
  - STARTRANS, that concerns security of interdependent and interconnected transportation networks. To that extend a strategic risk analysis framework has been derived, and examples on the Attica transportation integrated network thoroughly analysed.
  - CRiSYS aspiring to define a roadmap for the 2013 Demonstration Phase II programme,
  - PRACTICE FP7-IP that will develop Integrated Concepts and and Equipment for aiding Preparedness and Resilience against CBRN Terrorism.



Daily Weather forecast from EREL operational model (snapshot for 24/1/2011)



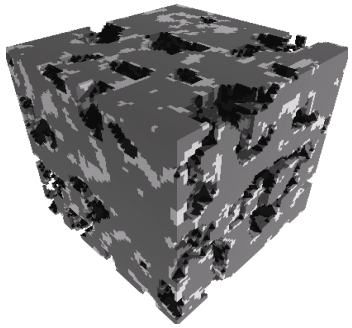
I-131 time-integrated concentration in air (Bq s/m3) on 16/3/2011 simulated by model DIPCOT in RODOS system for the Fukushima nuclear accident

	
Changes in O3 as a result of Green roofs at 14:00 hr on August 31, 2004	Time series forecasting of the LR-Sub-M model in Aristotelous

3) Characterization of and Transport in Porous and Composite Media

Nanotechnology and related topics constitute one of the major scientific and technological areas in today's research programs internationally. The subject of this EREL activity puts emphasis on topics that deal with nanoporous materials and nanocomposites characterization and applications in environmental, energy and biomedical problems.

In 2011, these activities have continued with distinct short and medium to long term aims.



Long and Medium term Research

- -Emphasis on correlating porous structure characteristics to macroscopic transport properties of porous materials
- Nanoporous and composite material characterization

Short term (R&D services)

- -Nanoporous and composite material characterization and performance assessment

EREL specializes in the characterization of a wide range of nanostructured materials for environmental, energy and industrial processing applications with emphasis on inorganic and hybrid porous media. The lab has been at the forefront of experimental techniques in the field of sorption, diffusion and (X-ray and Neutron) scattering. In addition, it has extended activities in multiscale numerical simulation for the modelling of materials and processes by molecular, mesoscopic or

macroscopic techniques (Monte Carlo, molecular dynamics, Lattice-Boltzmann, standard CFD approaches).

A fully equipped laboratory has been developed and undergone extensive tseting for the characterization of nanoporous / composite materials via gas sorption based techniques. Pressure-Composition-Temperature (PCT) gravimetric techniques can measure isotherms at pre-selected temperatures from 80 to 600 K at pressures up to 150 bar, while monitoring the kinetics of gas adsorption at each pressure step. In this way, the total sorption capacities at the experimental temperature can be directly obtained as a function of pressure, while kinetic response analysis can generate effective diffusion coefficients (and/or reaction constants) again as a function of pressure. By performing a set of isotherms at different temperatures isosteric heats of sorption as well as diffusion activation energies can be calculated. Alternatively, capacity, kinetic and thermodynamic properties can be studied through isobars (concentration at constant pressure as a function of temperature). Finally, Temperature Programmed Desorption (TPD) measurements provide a simple and swift means for the determination of the gas release temperature and heats of desorption. On the other hand, PCT volumetric techniques measure the Gibbs excess isotherms and can in principle provide the same information as gravimetry. The relevant instrumentation of EREL includes:

Pressure-Composition isotherms, kinetics and life cycle measurements:

– Intelligent Gravimetric Analyser (High vacuum to 20 bar, 77-623 K)

– High-pressure multi-component gravimetric systems (High vacuum to 150 bar, 77-623 K).

– In-house developed volumetric high pressure PCT apparatus (High vacuum to 200 bar, near ambient to 573 K).

– Automated volumetric PCT apparatus (0.01 to 170 bar, sample environment from cryogenic to 773 K).

Surface area & pore size analysis of porous solids: Pore size analyser & Mercury porosimeter.

Cycle-life measurements can also be employed in order to make an overall assessment of the materials performance as gas storage media.

4) Chemical analysis of environmental pollutants

EREL has continued its long standing activities in air pollution research and services provision, through R&D projects and contracts with industry (public and private enterprises). More specifically, the activities of the lab were focused on three main directions:

Indoor and outdoor Air Quality

The current activities focus on the assessment of indoor/outdoor air quality and pollutants emissions from industries through:

• -Airborne Particulate Matter (TSP, PM10, PM2.5 and PM1) measurements with low and high volume samplers.

• -Volatile Organic Compounds (n-alkanes, aromatic H/C, aldehydes and ketones, sulfur compounds etc) sampling and analysis in indoor, outdoor and occupational environment.

• -Chemical analysis of particulate matter for the detection of OC/EC, ions and PAHs and cross-correlation with atmospheric pollution indicators in order to estimate their origin.

• -Inorganic compounds measurements (NOX, SO2, O3, CO) in indoor, outdoor and occupational environment

• -Isokinetic stack sampling for the determination of air pollutants emissions from industries

• -Meteorological measurements (WS, WD, T, RH) in order to investigate the role of meteorology to the recorded air pollutants' values.

• -Particle counts up to very high concentrations (particles/litre) and dust mass distribution in different size ranges in order to relate the results with health symptoms of the people living or working in a building

• -PM personal cloud measurements with portable, small and unobstructive exposure sampling devices.

• - Receptor modelling application (Principal Component Analysis, Positive Matrix Factorization, Chemical Mass Balance, ME etc) for the identification of sources and quantitative assessment of their contribution.

EREL provision of services

Photocatalysis

The current activities focus on Laboratory and Real scale applications of innovative photocatalytic materials for testing the ***removal/oxidation of air pollutants*** *in the urban and indoor environment.*

• -A large number of innovative materials were tested for their ability to degrade air pollutants. Within a specially designed reactor, the evaluation of the materials' photocatalytic performance is carried out through the calculation of certain photocatalytic and chemical kinetics parameters. Additionally, the mechanisms of the chemical reactions taking place between nanomaterials and gaseous pollutants were investigated.

QA/QC

EREL is accredited by the Hellenic Accreditation System S.A (ESYD) under **ELOT EN ISO/IEC 17025:2005 Standard**, to carry out the following tests

• Sampling and determination of PM10

• Determination of PAHs-collection on sorbent backed filters with GC-MS analysis

• Pumped sampling and analysis of benzene by GC / TDS

The certificate is valid until July 2012 provided that the laboratory is complying with the above standard and the ESYD criteria. Annual controls (like the one carried out successfully in 2011) prove the compliance of EREL.

(a) (b) (c)

Selected pictures of EREL Equipment: (a) GC-FID (Agilent) (b) GC-MS (Agilent) & Ion Chromatography (DIONEX1100) (c) EREL's Outdoor Environmental Monitoring Station

Education

PhD Theses

1. Tsiouri Vasiliki (2011): Development of Data Assimilation methods in Atmospheric Dispersion models- Department of Mechanical Engineering, University of Western Macedonia.
2. Saraga Dikaia (2011): Particulate Matter (PM) source apportionment in indoor air- Mechanical Engineering Department, University of Western Macedonia

3. Papanikolaou E. (2011): Modeling Hydrogen and other lighter than air gas indoor dispersion using CFD methods, School of Chemical Engineering, National Technical University of Athens

Institute of Nuclear Technology & Radiation ProtectionAnnual Report 2011

Publications 2011

4. Environmental Research Laboratory (EREL)

1. PEER-REVIEWED JOURNALS

1. Papadimitriou N.I., Tsimpanogiannis I.N., Stubos A.K., Martin Á., Rovetto L., Florusse L.J., Peters C.J., Experimental and Computational Investigation of the sII Binary He–THF Hydrate, *J. Physical Chemistry B*, 115 (6), pp 1411–1415 DOI: 10.1021/jp105451m, 2011 (IF 3.603)
2. Tsiouri V., Kovalets I., Andronopoulos S., Bartzis J.G., Development and first tests of a data assimilation algorithm in a Lagrangian puff atmospheric dispersion model, *International Journal of Environment and Pollution*, 44 (1-4), pp147-155, 2011 (IF 0.626)
3. Tsiouri V., Kovalets I., Andronopoulos S., Bartzis J., Emission rate estimation through data assimilation of gamma dose measurements in a Lagrangian atmospheric dispersion model, *Radiation Protection Dosimetry* 148 (1), pp 34-44, DOI: 10.1093/rpd/ncq592, 2011 (IF 0.966)
4. Efthimiou G.C., Bartzis J.G., Koutsourakis N., Modelling concentration fluctuations and individual exposure in complex urban environments, *Journal of Wind Engineering and Industrial Aerodynamics*, 99 (4), pp 349-356, 2011 (IF 1.213)
5. Sfetsos A., Bartzis J., Real time, high resolution Regional Weather and Air Quality Forecasting System in West Macedonia, Greece*, International Journal of Environment and Pollution*, 44 - Issue 1/2/3/4 , pp 244-251, 2011 (IF 0.626)
6. Leventakis G., Sfetsos A., Moustakidis N., Grizis V., Nikitakos N., The development of a strategic risk analysis framework for interconnected surface transportation systems, *International Journal of Critical Infrastructures*, 7, No. 3, pp 177-199, 2011 (IF)
7. Barahona D., Sotiropoulou R., Nenes A., Global distribution of cloud droplet number concentration, autoconversion rate, and aerosol indirect effect under diabatic droplet activation, *J. Geophys. Res.*, 116, D09203, DOI:10.1029/2010JD015274, 2011 (IF 3.303)
8. Kovalets I.V., Andronopoulos S., Venetsanos A.G., Bartzis J.G., Identification of strength and location of stationary point source of atmospheric pollutant in urban conditions using computational fluid dynamics model, *Mathematics and Computers in Simulation* 82, pp 244–257, 2011 (IF 0.812)
9. Saraga D., Pateraki S., Papadopoulos A., Vasilakos Ch., Maggos Th., Studying the indoor air quality in three non-residential environments of different use: A museum, a printery industry and an office, *Building and Environment*, 46, no11, pp 2333-2341, DOI: 10.1016/j.buildenv .2011.05.013, 2011 (IF 2.129)
10. Gotzias A., Heiberg-Andersen H., Kainourgiakis M., Steriotis T., A grand canonical Monte Carlo study of hydrogen adsorption in carbon nanohorns and nanocones at 77 K, *Carbon* 49 (8) , pp. 2715-2724, 2011 (IF 4.893)
11. Ampoumogli A., Th. Steriotis, P. Trikalitis, D. Giasafaki, E. Gil Bardaji, M. Fichtner and G. Charalambopoulou, Nanostructured composites of mesoporous carbons and boranates as hydrogen storage materials, *J. Alloys & Compounds*, 509 (2011) S705-S708 (IF 2.134)
12. Bourlinos A.B., Zboril R., Kubala M., P.Stathi, Deligiannakis Y., Karakassides M.A, Steriotis T.A, Stubos A.K., Fabrication of fluorescent nanodiamond@C core-shell hybrids via mild carbonization of sodium cholate-nanodiamond complexes, *Journal of Materials Science*, 46 (24), pp 7912-7916, DOI: 10.1007/s10853-011-5911-z, Dec 2011 (IF 1.855)
13. Giasafaki D., Bourlinos A., Charalambopoulou G., Stubos A., Steriotis T., Nanoporous carbon - metal composites for hydrogen storage, *Central European Journal of Chemistry*, 9 (5), pp 948-952, DOI: 10.2478/s11532-011-0081-z, 2011 (IF 0.991)
14. Zitko R., Van Midden H.J.P., Zupanic E., Prodan A., Makridis S.S., Niarchos D., Stubos A.K, Hydrogenation properties of the TiB(x) structures, *International Journal of Hydrogen Energy*, 36 (19), pp 12268-12278, DOI: 10.1016/j.ijhydene.2011.06.087, 2011 (IF 4.053)

15. Stamatakis E., Stubos A., Muller J., Scale prediction in liquid flow through porous media: A geochemical model for the simulation of $CaCO_3$ deposition at the near-well region, *Journal of Geochemical Exploration,* Vol. 108, Issue 2, pp.115-125, DOI: 10.1016/ j.gexplo.2010.11.004, Feb 2011 (IF 2.125)

16. Bourlinos A.B., Karakassides M.A., Stathi P., Deligiannakis Y., Zboril R., Dallas P., Steriotis T.A., Stubos A.K., Trapalis C., Pyrolytic formation of a carbonaceous solid for heavy metal adsorption, *Journal of Materials Science*, 46 (4), pp 975-982, DOI: 10.1007/s10853-010-4854-0, 2011 (IF 1.855)

17. Psofogiannakis G.M., Steriotis T.A., Bourlinos A.B., Kouvelos E.P., Charalambopoulou G.C., Stubos A.K., Froudakis G.E., Enhanced hydrogen storage by spillover on metal-doped carbon foam: an experimental and computational study, *Nanoscale*, 3(3), pp 933-936, DOI: 10.1039 /c0nr00767f, 2011 (νέο περιοδικό)

18. Adams P., Bengaouer A., Cariteau B., Molkov V., Venetsanos A.G., Allowable hydrogen permeation rate from road vehicles, *Int. J. Hydrogen Energy*, 36(3), pp 2742-2749, 2011, http://dx.doi.org/10.1016 /j.ijhydene.2010.04.161 (IF 4.053)

19. Venetsanos A.G., Adams P., Azkarate I., Bengaouer A., Brett L., Carcassi M.N., Engebø A., Gallego E., Gavrikov A.I., Hansen O.R., Hawksworth S., Jordan T., Kessler A., Kumar S., Molkov V., Nilsen S., Reinecke E., Stöcklin M., Schmidtchen U., Teodorczyk A., Tigreat D., Versloot N.H.A., On the use of hydrogen in confined spaces: Results from the internal project InsHyde, *Int. J. Hydrogen Energy*, 36 (3), pp 2693-2699, 2011, http://dx.doi.org/10.1016/j.ijhydene.2010.05.030 (IF 4.053).

20. Papanikolaou E., Venetsanos A.G., Schiavetti M., Carcassi M., Markatos N., Consequence assessment of the BBC hydrogen refueling station, using the ADREA-HF code, *Int. J. Hydrogen Energy,* 36 (3), pp 2573-2581, 2011, http://dx.doi.org/10.1016/j.ijhydene.2010.04.088 (IF 4.053)

21. Papanikolaou E., Venetsanos A.G., Cerchiara G.M., Carcassi M., Markatos N., CFD Simulations on Small Hydrogen Releases inside a Ventilated Facility and Assessment of Ventilation Efficiency, *Int. J. Hydrogen Energy*, 36 (3), pp 2597-2605, 2011, http://dx.doi.org/10.1016 /j.ijhydene.2010.04.119 (IF 4.053)

22. Ham K., Marangon A., Middha P., Versloot N., Carcassi M., Hansen O., Schiavetti M., Papanikolaou E., Venetsanos A., Engebo A., Saw JL., Saffers J-B., Flores A., Serbanescu D., Benchmark exercise on risk assessment methods applied to a virtual hydrogen refueling station, *Int. J. Hydrogen Energy*, 36 (3), pp 2666-2677, 2011, http://dx.doi.org/10.1016/j.ijhydene. 2010.04.118 (IF 4.053)

23. Brennan S., Bengaouer A., Carcassi M., Cerchiara G., Evans G., Friedrich A., Gentilhomme O., Houf W., Kotchourko A., Kotchourko N., Kudriakov S., Makarov D., Molkov V., Papanikolaou E., Pitre C., Royle M., Schefer R., Stern G., Venetsanos A.G., Veser A., Willoughby D., Yanez J., Hydrogen and fuel cell stationary applications: key findings of modelling and experimental work in the HyPer project, *Int. J. Hydrogen Energy*, 36 (3), pp 2711-2720, 2011 http://dx.doi.org /10.1016/j.ijhydene. 2010.04.127 (IF 4.053)

ACCEPTED 2011

1. S. Andronopoulos, I. Mavroidis, A.G. Venetsanos, J.G. Bartzis, Modelling of atmospheric flow and dispersion in the wake of a cylindrical obstacle, *International Journal of Environment and Pollution*, 2011, accepted (IF 0.626)

2. S. Andronopoulos, A. Sfetsos, D. Vlachogiannis, A. Yiotis, N. Gounaris, Application of adjoint CMAQ chemical transport model in the Athens greater area: sensitivities study on ozone concentrations, *International Journal of Environment and Pollution*, 2011, in press (IF 0.626)

3. G. Efthimiou, J. G. Bartzis, S. Andronopoulos, A. Sfetsos, Air dispersion modelling for individual exposure studies, *International Journal of Environment and Pollution*, 2011, accepted (IF 0.626)

4. D. Hristu-Varsakelis, S. Karagianni, M. Pempetzoglou, A. Sfetsos, Optimizing production in the Greek economy: Exploring the Interaction between Greenhouse Gas emissions and Solid Waste via Input-Output Analysis, *Journal of Economic Systems Research,* 2011, accepted (IF 1.442)

5. Liao K.J., Amar P., Tagaris E. and Russell A.G., Development of Risk-based Air Quality Management Strategies under Impacts of Climate Change, *Journal of Air & Waste Management Association*, 2011, in press (IF 1.567)

6. Giasafaki D., Bourlinos A., Charalambopoulou G., Stubos A., Steriotis Th., Synthesis and characterization of nanoporous carbon-metal composites for hydrogen storage, *Microporous and Mesoporous Materials*, 2011, in press (IF 3.22)

7. E. D. Koultoukis, S.S. Makridis, L. Rφntzsch, E. Pavlidou, A. Ioannidou, E. S. Kikkinides, A. K. Stubos, Structural, Microchemistry, and Hydrogenation Properties of TiMn 0_4Fe0_2V0_4, TiMn0_1Fe0_2V0_7 and Ti0_4Zr0_6Mn0_4Fe0_2V0_4 Metal Hydrides, *Journal of Nanoscience and Nanotechnology*, 2011, in press (IF 1.351)

8. Tsimpanogiannis I.N., Papadimitriou N.I., A.K. Stubos, On the Limitation of the van der Waals-Platteeuw-based Thermodynamic Models for Hydrates with Multiple Occupancy of Cavities, *Mol. Phys*., 2011, accepted (IF 1.743)

9. Kontos A.G., Katsanaki A., Likodimos V., Maggos T., Kim D., Vasilakos C., Dionysiou D.D., Schmuki P., Falaras P., Continuous flow photocatalytic oxidation of nitrogen oxides over anodized nanotubular titania films, *Chemical Engineering Journal* DOI:10.1016/j.cej.2011.10.072, 2011, in press (IF 3.074)

10. St. Pateraki, D.N. Asimakopoulos, H.A. Flocas, Th. Maggos and Ch.Vasilakos, 2011, The role of meteorology on different sized aerosol fractions (PM10, PM2.5, PM2.5-10), *Science of The Total Environment*, DOI: 10.1016/j.scitotenv.2011.12.064, 2011, in press (IF 3.19)

11. V.D. Binas, K. Sambani, T. Maggos, A. Katsanaki, G. Kiriakidis, Synthesis and photocatalytic activity of Mn–doped TiO_2 nanostructured powders under UV and Visible light, *Applied Catalysis B: Environmental,* DOI:10.1016/j.apcatb.2011.11.021, 2011, in press (IF 4.749)

12. A. Ampoumogli, T. Steriotis, P. Trikalitis, E. G. Bardaji, M. Fichtner, A. Stubos, G. Charalambopoulou, Synthesis and characterisation of a mesoporous carbon/calcium borohydride nanocomposite for hydrogen storage, *Int. J. Hydrogen Energy,* accepted, 2011, DOI 10.1016/j.ijhydene.2012.02.028 (IF 4.053)

2. PEER-REVIEWED CONFERENCE PROCEEDINGS

1. V. Tsiouri, S. Andronopoulos, I. Kovalets, L. Dyer and J. Bartzis, 2011: Radioactive Release rate estimation through data assimilation of gamma dose rate measurements. 14th International Conference on Harmonization within Atmospheric Dispersion Modeling for Regulatory Purposes, Kos Island, Greece, 2-6 October 2011.

2. Koutsourakis N., Venetsanos A.G., Bartzis J.G., Tolias I.C. and Markatos N.C., Pollutant dispersion study in asymmetric street canyons using Large Eddy Simulation, 7th GRACM International Congress on Computational Mechanics, 30 June - 2 July 2011, Athens, Greece.

3. G. Leventakis, A. Sfetsos, N. Moustakidis, S. Andronopoulos, A. Ramfos, D. Zisiadis, N. Nikitakos, V. Gkrizis, N. Athanasiadis, S. Tönjes, S. Kopsidas, A security risk analysis framework for interconnected transportation systems, 8th International Conference on Information Systems for Crisis Response and Management, ISCRAM2011, 8-11 May 2011, Lisbon, Portugal

4. D. Vlachogiannis, A. Sfetsos, N. Gounaris and A. Papadopoulos, Computational study of the effects of induced land use changes on meteorological patterns during hot weather events in an urban environment, 14th Int. Conf. on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Kos Greece, Oct. 2-6, 2011
5. A. Sfetsos, D. Vlachogiannis, N. Gounaris, A. Papadopoulos, Modelling investigation of the impact of marine emissions on the atmospheric quality of the Aegean islands, 14th Int. Conf. on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Kos Greece, Oct. 2-6, 2011
6. A. Sfetsos, Z. Adelman, D. Vlachogiannis, N. Gounaris, E. Tagaris, S. Karozis, A. Yiotis, S. Andronopoulos, Development of the NCSR Demokritos real time airquality operational modeling platform, 14th Int. Conf. on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Kos Greece, Oct. 2-6, 2011
7. M. Konstantakou, A. Gotzias, A.K. Stubos and Th.A. Steriotis, GCMC based Pore Size Distributions for the Characterization of Porous Carbons: Choosing the Interaction Potentials, 2nd International workshop on NAnoPorous Materials for the ENvironmental and Energy Applications (NAPEN) Workshop 2011, 9 – 13 June 2011, Rhodes, Greece.
8. E. Tagaris, REP Sotiropoulou, N. Gounaris and S. Andronopoulos, Modelling PM2.5 concentrations over Europe, European Aerosol Conference (EAC2011), Manchester, UK, September 2011
9. Kovalets, S. Andronopoulos, A.G. Venetsanos, J.G. Bartzis, Identification of source and location of stationary point source of atmospheric pollutant in urban conditions with computational fluid dynamics model, 14th International Conference on Harmonization within Atmospheric Dispersion Modeling for Regulatory Purposes, Kos Island, Greece, 2-6 October 2011
10. E. Tagaris, R.E.P. Sotiropoulou, N. Gounaris, S. Andronopoulos, Air-quality over Europe: Application of CMAQ modelling system, 14th International Conference on Harmonization within Atmospheric Dispersion Modeling for Regulatory Purposes, Kos Island, Greece, 2-6 October 2011
11. Sotiropoulou R.E.P., N. Meskhidze, J. Kouatchou, L. Oreopoulos, J. M. Rodriguez and A. Nenes, Sensitivity of cloud radiative forcing to cloud formation parameterization under three different meteorological fields, European Aerosol Conference (EAC), Manchester, UK, September 2011
12. Sotiropoulou R.E.P., D. Barahona, A. Nenes, Global distribution of cloud droplet number concentration, autoconversion rate and first aerosol indirect effect under diabatic droplet activation, European Aerosol Conference (EAC), Manchester, UK, September 2011
13. Kikkinides E.S., Kainourgiakis M.E., Yiotis A.G., Stubos A.K. Liquid-gas equilibrium thermodynamics and bubble dynamics using a Lattice Boltzmann model for Lennard-Jones fluids, 8th International Conference for Mesoscopic Methods in Engineering and Science (ICMMES), 4-8 July 2011, Lyon, France.
14. Yiotis A.G., Kainourgiakis M.E., Stubos A.K, Salin D., Modeling blob dynamics in pore networks by means of the Lattice Boltzmann method, 3rd Interpore Conference, 29-31 March 2011, Bordeaux, France.
15. Giannissi S.G., Venetsanos A.G., Bartzis J.G., Markatos N., Willoughby D.B. and Royle M., CFD Modeling of LH2 Dispersion using the ADREA-HF Code, 4th International conference on hydrogen safety, 12-14 September 2011, San Francisco, USA.
16. Venetsanos A.G., Tolias I., Baraldi D., Benz S., Cariteau B., Garcia J., Hansen O.R., Jäkel C., Ledin S., Middha P., Papanikolaou E., IA-HYSAFE Standard Benchmark Exercise SBEP-V21: Hydrogen release and accumulation within a non-ventilated ambient pressure garage at low release rates, 4th International conference on hydrogen safety, 12-14 September 2011, San Francisco, USA.

17. Koutsourakis N., Venetsanos, A.G., Bartzis, J.G., LES modelling of hydrogen release and accumulation within a non-ventilated ambient pressure garage using the ADREA-HF CFD code, 4th International conference on hydrogen safety, 12-14 September 2011, San Francisco, USA.

18. Papadopoulos A., Vlachogiannis D., Maggos T., Karayiannis M. I., Comparison of the purity of different commercially available CO_2 types and the effect of a simple purification procedure, 16th International Symposium On Environmental Pollution and its Impact on Life in the Mediterranean Region, 24 -27th September 2011, Ioannina, Greece, 05-p-16

19. Papadopoulos A., Vlachogiannis D., Maggos T., Sfetsos A. , Karayiannis M. I., Comparison of an SFE extraction and thermal desorption of a house dust sample 16th International Symposium On Environmental Pollution and its Impact on Life in the Mediterranean Region, 24 -27th September 2011, Ioannina, Greece, 05-p-17

20. Katsanaki A., Maggos Th., Vasilakos Ch., Kontos A., Falaras P., Application of TiO2-containing construction materials to the photocatalytic removal of urban air pollutants, European Symposium on Photocatalysis, 29-30 Sep. 2011, Bordeaux, p.5.14

21. Kontos A.G., Katsanaki A., Likodimos V., Maggos Th., Kim D., Vasilakos Ch., Dionysiou D., Vlachos G.D., Schmuki P., Falaras P., Photocatalytic decomposition of atmospheric pollutants using anodized TiO2 nanotubes European Symposium on Photocatalysis, 29-30 Sep. 2011, Bordeaux, p.5.24

22. St. Pateraki, Th. Maggos, D. N. Asimakopoulos, H. A. Flocas and Ch.Vasilakos, Atmospheric circulation role on PM fractions, European Aerosol Conference 2011 (EAC 2011), 4-9th September 2011, Manchester, 8P 179

23. E. Diapouli, M.I. Gini, V. Vasilatou, Th. Maggos, St. Pateraki, A. Katsanaki, D. Saraga, K. Eleftheriadis, Occupational Exposure to Particulate and Gaseous Pollutants in a Photocopy/Printing Center, 3rd International Conference on Environmental Management, Engineering, Planning and Economics, Skiathos Island, Greece, 19 – 24 June, 2011

24. E. Diapouli, M. I. Gini, V. Vasilatou, Th. Maggos, St. Pateraki, A. Katsanaki, D. Saraga, K. Eleftheriadis, Workers exposure to particulate and gaseous pollutants in a photocopy / printing center, European Aerosol Conference 2011 (EAC 2011), 4-9th September 2011, Manchester, 11D4

25. St. Pateraki, D.N. Asimakopoulos, J. Sciare, Th. Maggos, Ch.Vasilakos, Particles number and concentration patterns in the coastal area of Aegina, Athens, 16th International Symposium On Environmental Pollution and its Impact on Life in the Mediterranean Region, 24 -27th September 2011, Ioannina, Greece, 05-p-18

26. M. Seleventi, D. E. Saraga, C.G. Helmis, Ch. Vasilakos, Th. Maggos. PM2.5 indoor/outdoor relationship and chemical composition in ions and OC/EC in an apartment in the centre of Athens. MESAEP 2011. Ioannina 24th-27th September 2011

27. D. E. Saraga, L. Volanis, C. G. Helmis, D. Missia, C. Vasilakos, T. Maggos. Exposure to respirable PM fraction in 16 indoor workplaces. CEMEPE 2011, Skiathos island 19th-24th June 2011

28. E. Tolis, D. E. Saraga, G. Ammari, Th. Gougoulas, C. Papaioannou, A. Sarioglou, E. Kougioumtzidis, Ath. Sfetsos, J.G. Bartzis. Particulate matter (PM) and source apportionment studies during winter and summer period for the city of Kozani, Greece. MESAEP 2011. Ioannina 24th-27th September 2011

29. C. Tolias, N. I. Papadimitriou, A. G. Venetsanos, Benefits from the parallel computational mechanics programs in modern low-cost shared memory architectures, 7th GRACM International Congress on Computational Mechanics, Athens, Greece, June 30 – July 2, 2011

30. S.S. Makridis, Ch. N. Christodoulou, E. Psomaki-Karra, G. Karagiorgis, L. Röntzsch, A.K. Stubos, Two stage hydrogen compressor by using nanopowders of AB5 and AB2 type of metal hydrides, 5th International Meeting on Developments in Materials, Processes and Applications

of Emerging Technologies, Alvor, Portugal 27-29 June 2011

31. Ioannidou, S.S. Makridis, L. Röntzsch, E.S. Kikkinides, A.K. Stubos, Improvement of hydrogen ability in nanocomposite Zr-Ti-Cr-V-Ni intermetallic compounds, 5th International Meeting on Developments in Materials, Processes and Applications of Emerging Technologies, Alvor, Portugal, 27-29 June 2011
32. N. Anagnostou, S.S. Makridis, A.K. Stubos, Hydrogen ability study of TiFe0.65Mn0.3V0.05, TiFe0.6Mn0.3V0.1, Ti0.8Ta0.2Fe0.7Mn0.3 and Ti0.6Ta0.4Fe0.7Mn0.3, NANOSMAT 2011, 6th NANOSMAT Conference (International Conference on Surfaces, Coatings and Nanostructured Materials), 17-20 October, 2011
33. Banos, S.S. Makridis, A.K. Stubos, Surface and magnetic analysis of Sm-Co-Fe-Zr-B ribbons, NANOSMAT 2011, 6th NANOSMAT Conference (International Conference on Surfaces, Coatings and Nanostructured Materials), 17-20 October, 2011
34. E. Psomaki-Karra, S.S. Makridis, Ch. N. Christodoulou, A.K. Stubos, Interstitial hydrogen absorption-desorption in Zr-Ti-Fe-Cr-B nanopowders, NANOSMAT 2011, 6th NANOSMAT Conference (International Conference on Surfaces, Coatings and Nanostructured Materials), 17-20 October, 2011
35. Papadimitriou, N.I., Tsimpanogiannis, I.N., A.K. Stubos, Monte Carlo Simulations of Methane Hydrates, 7th International Conference on Gas Hydrates, Edinburgh, United Kingdom, July 17-21, 2011
36. Tsimpanogiannis, I.N., P.C. Lichtner, Methane Solubility in Water under Hydrate Equilibrium Conditions: Single Pore and Pore-Network Studies, 7th International Conference on Gas Hydrates, Edinburgh, United Kingdom, July 17-21, 2011
37. Tsimpanogiannis, I.N., P.C. Lichtner, Gas Saturation Resulting from Hydrate Dissociation in a Porous Medium: Comparison between Analytical and Pore-Network Studies, 7th International Conference on Gas Hydrates, Edinburgh, United Kingdom, July 17-21, 2011
38. Papadimitriou, N.I., Tsimpanogiannis, I.N., Stubos A.K., Monte Carlo Simulations of the sI Carbon Dioxide Hydrate, Thermodynamics 2011, Athens, Greece, September 1-3, 2011.
39. Tsimpanogiannis I.N., Papadimitriou N.I., Stubos A.K., On the Limitation of the van der Waals-Platteeuw-based Models for Cage Occupancy Predictions of Gas Hydrates during Multiple Occupancy, Thermodynamics 2011, Athens, Greece, September 1-3, 2011.
40. D. Giasafaki, A. Bourlinos, G. Charalambopoulou, A. Stubos, Th. Steriotis, Synthesis and characterisation of nanoporous carbon - metal composites for hydrogen storage applications, 9th International Symposium on the Characterisation of Porous Solids - COPS IX, Dresden-Germany, 5-8 June 2011.
41. Ampoumogli, Th. Steriotis, P. Trikalitis, G. Charalambopoulou, Thermal decomposition properties of boranates confined in nanoporous carbons, 9th International Symposium on the Characterisation of Porous Solids - COPS IX, Dresden-Germany, 5-8 June 2011.
42. Th. Steriotis, G. Charalambopoulou, A. Stubos, Advanced Materials for Hydrogen Storage, 2nd International Workshop on NAnoPorous Materials for ENvironmental and ENergy Applications (NAPEN 2011), Rhodes-Greece, 9-13 June 2011.
43. G. Charalambopoulou, A. Bourlinos, D. Giasafaki, A. Ampoumogli, P. Trikalitis, A. Stubos, Th. Steriotis, Hydrogen Storage with the use of Nanoporous Carbon Supports and Scaffolds, 2nd International Workshop on NAnoPorous Materials for ENvironmental and ENergy Applications (NAPEN 2011), Rhodes-Greece, 9-13 June 2011.
44. Th. Steriotis, G. Charalambopoulou, A. Bourlinos, D. Giasafaki, A. Ampoumogli, P. Trikalitis, A. Stubos, Hydrogen storage with the use of nanoporous carbon supports and scaffolds, International Conference on Hydrogen Production (ICH2P-11), Thessaloniki-Greece, 19-22 June 2011.

45. N.I. Papadimitriou, M.E. Kainourgiakis, G.C. Charalambopoulou, S. Karozis, A.K. Stubos, A Molecular Dynamics study of the stratum corneum lipid phase, THERMODYNAMICS 2011, Athens-Greece, 31 August – 3 September 2011.

GREEK CONFERENCES

1. Μ. Κωνσταντάκου, Α. Γκότζιας, Α.Κ. Στούμπος και Θ.Α. Στεριώτης, Η μέθοδος προσδιορισμού κατανομής μεγέθους πόρων (PSD) στο χαρακτηρισμό νανοπορωδών ανθράκων: επιλέγοντας τα δυναμικά αλληλεπίδρασης, 5ο Πανελλήνιο Συμπόσιο Πορωδών Υλικών, Πανεπιστημιούπολη Βουτών, Ηράκλειο, Κρήτη, 30 Ιουνίου — 1 Ιουλίου 2011
2. Σ.Γ. Γιαννίση, Α.Γ. Βενετσάνος, Ν. Μαρκάτος, Ι. Μπάρτζης, Μοντελοποίηση Ατμοσφαιρικής Διασποράς Υγροποιημένου Φυσικού Αερίου, 8ο Πανελλήνιο Συνέδριο Χημικής Μηχανικής, 26-28 Μαΐου 2011.
3. Η.Χ. Τόλιας, Α. Γ. Βενετσάνος, Σ. Γ. Γιαννίση, Παραλληλοποίηση του κώδικα υπολογιστικής ρευστομηχανικής ADREA-HF και εφαρμογή σε θέματα διασποράς υδρογόνου, 8ο Πανελλήνιο Επιστημονικό Συνέδριο Χημικής Μηχανικής, Θεσσαλονίκη 2011
4. Δ. Γιασαφάκη, Α. Μπουρλίνος, Γ. Χαραλαμποπούλου, Α. Στούμπος, Θ. Στεριώτης, "Σύνθεση και Χαρακτηρισμός Νανοπορωδών Σύνθετων Υλικών Άνθρακα-Μετάλλου για Αποθήκευση Υδρογόνου", 5ο Πανελλήνιο Συμπόσιο Πορωδών Υλικών, Ηράκλειο Κρήτης, 30 Ιουνίου - 1 Ιουλίου 2011.
5. Α.Γ. Γιώτης, Α.Κ. Στούμπος, Ι.Ν. Τσιμπανογιάννης, Γ. Γιώρτσος, Προσομοίωση διεργασιών ξήρανσης σε πυρώδη υλικά βάσει πρότυπων δικτύων πόρων, 5ο Πανελλήνιο Συμπόσιο Πορωδών Υλικών, Ηράκλειο Κρήτης, 30 Ιουνίου - 1 Ιουλίου 2011.
6. Α. Αμπουμόγλι, Θ. Στεριώτης, Π. Τρικαλίτης, Γ. Χαραλαμποπούλου, Μελέτη Νανοσύνθετων Υλικών Άνθρακα-Βοροϋδριδίου του Ασβεστίου για Αποθήκευση Υδρογόνου, 5ο Πανελλήνιο Συμπόσιο Πορωδών Υλικών, Ηράκλειο Κρήτης, 30 Ιουνίου - 1 Ιουλίου 2011.
7. Σ. Καρόζης, Μ. Καινουργιάκης, Ι. Ψυχογιός και Α. Στούμπος, Σύγκριση της προσομοίωσης ανόπτησης και της μεθόδου Lattice-Boltzmann στην εύρεση της χωρικής κατανομής ρευστών φάσεων σε πορώδη μέσα, 8ο Πανελλήνιο Επιστημονικό Συνέδριο Χημικής Μηχανικής Θεσσαλονίκη 26-28 Μαΐου 2011

BOOKS and REPORTS

1. Th.A. Steriotis, G.C. Charalambopoulou, A.K. Stubos, Advanced Materials for Hydrogen Storage (Chapter 14), in Nanoporous Materials: Advanced Techniques for Characterization, Modeling and Processing, Ed. N. Kanellopoulos, RC Press (Taylor & Francis), 2011.
2. **e-book**: Ch. Economides, N. Stromplos, A. Sfetsos, Compilation of the Greek regional NAMEA Tables for the year 2005, in M. Llop (Eds) Air Pollution: Economic Modeling and Control Policies, Bentham e-Books, eISBN: 978-1-60805-217-2, 2011.
3. A. Sfetsos, A comprehensive overview of short term wind forecasting models based on time series analysis, In Gopalakrishnan Kasthurira (ed), Soft Computing in Green and Renewable Energy Systems, Studies in Fuzziness and Soft Computing, 2011, Volume 269/2011 Springer – Verlag.
4. M. Konstantakou, A. Gotzias, M. Kainourgiakis, A.K. Stubos and Th.A. Steriotis, Grand Canonical Monte Carlo Simulations of Gas Adsorption in Carbon Nano pores, in Applications of Monte Carlo Method in Science and Engineering, Shaul Mordechai (Ed), Intech, February 2011, 653-676

5. Kikkinides, E.S., Kainourgiakis M.E., Yiotis A.G., Stubos A.K., A Lattice Boltzmann Method for Non Ideal Gases Based on the Gradient Theory of Interfaces, Computer Aided Chemical Engineering, 29 , pp. 1598-1602 (2011)
6. AK. Tsakalof, K.A. Bairachtari, BINDING MEDIA IDENTIFICATION IN ART OBJECTS BY GAS CHROMATOGRAPHY -MASS SPECTROMETRY in Conservation Science – An Application of Instrumental Analysis in the Preservation of Cultural Heritage, E.A. Varella (ed.), SPRINGER (Berlin/New York) 2011, in press

TECHNICAL REPORTS

1. D. Vlachogiannis, A. Sfetsos and N. Gounaris, Atmospheric Dispersion of NOx and CO from the Independent Natural Gas Fired Combined Cycle Power Plant (CCPP) in Modi (Fthiotida, Greece), Technical Report to EXERGIA, November 2011.
2. D. Vlachogiannis, A. Sfetsos and N. Gounaris, EMISSIONS DISPERSION MODELLING OF THE TAP's (TRANS ADRIATIC PIPELINE) COMPRESSOR STATION (CS1) IN N. MESIMVRIA (GREECE), Technical Report to EXERGIA, July 2011.
3. Air quality measurements in school classrooms
4. Air pollutants emission & ambient measurements at Interchem Industry
5. PAHs analysis in air samples of ALOUMINIUM S.A
6. PAHs analysis in air samples (Dioxin Lab)
7. Ambient Air Quality study in the areas of two proposed compressor stations locations in Northern Greece (EXERGIA)

INVITED LECTURES

1. G. Charalambopoulou, A. Bourlinos, D. Giasafaki, A. Ampoumogli, P. Trikalitis, A. Stubos, Th. Steriotis, Hydrogen Storage based on Nanoporous Carbon Supports and Scaffolds, Processes in Isotopes and Molecules (PIM 2011), Cluj Napoca-Romania, 29 September-1 October 2011

Institute of Nuclear Technology & Radiation ProtectionAnnual Report 2011

Research and Development projects

Environmental Research Laboratory

1. FP7-NANOHY Novel nanostructured materials for hydrogen storage, Grant Agreement No 210092, (1/1/2008 – 31/12/11) (Total NCSR "D" Budget 285,800 EURO, EC Funding 214,350 EURO)
2. FP7-CSA - PERL - Enhancing the Research Potential of the NCSR "Demokritos" Environmental Research Laboratory in the European, National and Regional Research Areas (FP7 229773), (1/1/09 – 31/12/11) (Total NCSR "D" Budget 1,135,000 EURO, EC Funding 797,000 EURO).
3. FP7 STAR-TRANS Strategic Risk Assessment and Contingency Planning in Interconnected Transport Networks (FP7-225594) (1/11/09-30/4/12) (Total NCSR "D" Budget 271,000 EURO, EC Funding 205,500 EURO)
4. FP7-PEOPLE-2009-IAPP ATLAS-H2 - Advanced Metal Hydride Tanks for Integrated Hydrogen Applications (Grant 251562) (1/7/10-30/6/14) (Total NCSR "D" Budget 526,039 EURO)
5. FP7-CRISYS Critical Response in Security and Safety Emergencies (CRISYS - FP7 261682) (1/2/11-31/7/12) (Total NCSR "D" Budget 42,300 EURO, EC Funding 37,717 EURO)
6. FP7- PRACTICE Preparedness and Resilience against CBRN Terrorism using Integrated Concepts and Equipment (PRACTICE - FP7 261728) (1/3/11-30/10/14) (Total NCSR "D" Budget 210,900 EURO, EC Funding 158,175 EURO)
7. FP7 Euratom Fission 2010 NERIS-TP Towards a self-sustaining European Technology Platform (NERIS-TP) or preparedness for nuclear and radiological emergency response and recovery (Grant 269718, 1/2/2011-31/1/2014) (Total NCSR "D" Budget 141,000 EURO, EC Funding 74,000 EURO)
8. FP7-INFRASTRUCTURES-2011-1 H2FC - Integrating European Infrastructure to support science and development of Hydrogen- and Fuel Cell Technologies towards European Strategy for Sustainable, Competitive and Secure Energy (Grant Agreement No 284522) (1/11/2011 - 31/10/2015) (Total NCSR "D" Budget 371,195.00 EURO, EC Funding: 304,931.25 EURO)
9. COST Action MP1103 "Nanostructured materials for solid-state hydrogen storage" (4 years: 25/10/2011 - 24/10/2015) (Total NCSR "D" Budget 20,000 EURO)
10. COST Action ES1102 VALUE - Validating and Integrating Downscaling Methods for Climate Change Research, (4 years: 17/5/2011 – 16/5/ 2015) (Total NCSR "D" Budget 20,000 EURO)
11. ΥΠΔΒΜΘ – ΓΓΕΤ/ΕΥΔ/ΕΠΕΔΒΜ «Ενίσχυση Μεταδιδακτόρων Ερευνητών/τριών»: ARTESIAN – Advanced Laboratory Procedures for Optimized Management of Underground Geological reservoirs, (21/12/2011 – 20/12/2014) (Total NCSR "D" Budget 149,219.88 EURO)
12. ΓΓΕΤ -Κουπόνια καινοτομίας για μικρομεσαίες επιχειρήσεις ΓΓΕΤ 10577 Ανάπτυξη μοντέλων για την μελέτη χρηματοοικονομικών μεγεθών, (02/9/2010 -2/1/2011) (Total NCSR "D" Budget 7,000 EURO)
13. ΓΓΕΤ Κουπόνια καινοτομίας για μικρομεσαίες επιχειρήσεις ΓΓΕΤ 10826, Ανάπτυξη λογισμικού προσομοίωσης της μεταφοράς ρύπων σε υπόγεια ύδατα, (10/9/2010 -10/1/2011), (Total NCSR "D" Budget 7,000 EURO)
14. ΥΠΔΒΜΘ – ΓΓΕΤ, ΕΣΠΑ 2007-2013, ΔΡΑΣΗ ΕΘΝΙΚΗΣ ΕΜΒΕΛΕΙΑΣ «ΣΥΝΕΡΓΑΣΙΑ», ΠΡΑΞΗ Ι:«Συνεργατικά έργα μικρής και μεσαίας κλίμακας», Μελέτη κλιματικών μεταβολών και ατμοσφαιρικής ρύπανσης στην Ελλάδα: εκτίμηση μελλοντικών περιβαλλοντικών και κοινωνικο-οικονομικών επιπτώσεων σε τοπικό επίπεδο – Επιπτώσεις Κλιματικής Αλλαγής) (11/2/2011-10/2/2014) (Total NCSR "D" Budget 216,000 EURO)
15. ΥΠΔΒΜΘ – ΓΓΕΤ/ΕΥΔΕ/ΕΤΑΚ, ΕΣΠΑ 2007-2013, ΔΡΑΣΗ ΕΘΝΙΚΗΣ ΕΜΒΕΛΕΙΑΣ «Ενίσχυση Μικρομεσαίων Επιχειρήσεων», Ανάπτυξη Καινοτόμων Μοντέλων Εκτίμησης Οικονομικών Κινδύνων για τη Λήψη Κρίσιμων Επιχειρηματικών Αποφάσεων" (9/3/2011-31/8/2012) (Total NCSR "D" Budget 28,000 EURO)

16. Provision of advanced services to the public and private sectors: (e.g. INTERCHEM, EXERGIA, AGET HERACLES, Hellenic Railways, Ministry of Education, Aluminum S.A, PLINIOS, etc)