



UNIVERSITY OF PATRAS

SCHOOL OF SCIENCE

DEPARTMENT OF PHYSICS

LABORATORY OF ATMOSPHERIC PHYSICS

Activity Report 2013

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Laboratory of Atmospheric Physics of the University of Patras

Activity Report 2013

Note of the Head of the LAPUP

This is the second issue of the Activity Report of the Laboratory of Atmospheric Physics of the University of Patras, for the year 2013. Your comments are more than welcome and can be addressed to athanarg@upatras.gr

Location

The main facilities of the LAPUP are located on the 3rd floor of Physics Building B at the main campus of the University of Patras in Rion, Achaia. The LAPUP operates also two weather stations and a complete radiometric station located in the campus of the University of Patras.

Staff

Faculty Members

- Athanassios A. Argiriou, Physicist (U. Patras) - D.E.A. (I.N.P. Grenoble) - Ph.D. (Univ. Aix-Marseille 1), Associate Professor (Head of the LAPUP)
- Andreas Kazantzidis, Physicist - M.Sc. - Ph.D. (Aristotle University of Thessaloniki), Assistant Professor with tenure
- Anastasia Rapti, Physicist - Ph.D. (University of Patras), Lecturer with tenure
- Ioannis Kioutsoukis, Physicist - M.Sc. - Ph.D. (Aristotle University of Thessaloniki), Lecturer, appointment pending.

Graduate Students

Ph.D. Candidates

- Kotti Maria – Christina, Physicist, University of Patras – M.Sc., National & Kapodistrian University of Athens (Use of modern techniques for solar radiation measurement and estimation for energy applications)
- Mamara Anna, Mathematician – M.Sc. (Homogenization of meteorological parameters)
- Nikitidou Efterpi, Physicist - M.Sc., Aristotle University of Thessaloniki (Variability of optical properties of aerosols and clouds and their effect on the energy balance in the atmosphere)
- Salamalikis Vasileios, Physicist - M.Sc., University of Patras (Stable isotopes in atmospheric processes)

- Tzoumanikas Panayiotis, Computer and Informatics Engineer, M.Sc., University of Patras, (Estimation of atmospheric parameters using digital image processing)
- Roukounakis Nikolaos, MEng Chemical Engineering, University of Birmingham, MSc Environmental Technology, Imperial College London (The application of a high-resolution weather forecasting model for estimating GPS tropospheric delay over complex terrain)
- Kolokythas Constantinos, Hellenic Air Force - Meteorologist, M.Sc. in Environmental Sciences, University of Patras (Wind energy forecast – Topography and extreme weather events impact)

Research Associates

- Daskalos Emmanuel, Physicist – M.Sc. (Under contract in the frame of the ETCP Greece – Italy 2007 -2013 Program “CESAPO”)
- Dimopoulos Spiros, Computer Engineer, M.Sc., Ph.D. (Under contract in the frame of the FP7 project “ENORASIS”)
- Kanakaris Ioannis, Informatics for Business Planning Engineer (Under contract in the frame of the ETCP Greece – Italy 2007 -2013 Program “CESAPO”)
- Karagiannidis Athanassios, Physicist – M.Sc. – Ph.D. (Under contract in the frame of the ETCP Greece – Italy 2007 -2013 Program “CESAPO”)
- Katragkou Eleni, Physicist, M.Sc., Ph.D. (Under contract in the frame of the FP7 project “ENORASIS”)
- Kokonozi Athina, Physicist, M.Sc., Ph.D. (Under contract in the frame of the FP7 project “ENORASIS”)
- Poupkou Anastasia, Physicist – M.Sc. – Ph.D. (Under contract in the frame of the ETCP Greece – Italy 2007 -2013 Program “CESAPO”)
- Liora Natalia, Physicist – M.Sc. (Under contract in the frame of the ETCP Greece – Italy 2007 -2013 Program “CESAPO”)

Research Facilities

The research infrastructure of the LAPUP includes instrumentation for the measurement and calibration of meteorological instrumentation and computing facilities.

Research Instrumentation

- Fully equipped chamber for indoor calibration of pyranometers.



- Two automated weather stations measuring ambient temperature and relative humidity, wind speed and direction, atmospheric pressure, and precipitation amount and rate.



- System for hygrometer calibration using saturated salts solutions.
- System for atmospheric water vapor collection for stable isotope analysis.



- Handheld thermometers and hygrometers.
- Precision multimeters for electric and electronic measurements.
- An automated radiometric station including a) instrumentation for the measurement of global and diffuse horizontal solar irradiance (station of the Hellenic Network of Solar Energy, www.helionet.gr) and sunshine duration and b) a sky camera.



- A narrowband multifilter radiometer NILU-UV6 for UV and PAR measurements (station of the Greek National UV Network, www.uvnet.gr).
- A Grimm Environmental Dust Monitor measuring PM_{10} , $PM_{2.5}$ and PM_1 (via the Environmental Laboratory of the School of Science)

Computing facilities

- Three cluster computers for detailed weather forecast and air pollution modeling.
- PCs/data loggers for data collection connected to the weather and radiometric stations.



- A computer facility for online collection of satellite images (EUMETCAST system)
- A network of 10 PCs for other types of computing (simulations and data processing).

Software

- GNU Fortran (GFortran) (<http://gcc.gnu.org/fortran/>)
- IBM SPSS Statistics – central license of the University of Patras (<http://www-01.ibm.com/software/analytics/spss/products/statistics/>)
- R free software environment for statistical computing and graphics (<http://www.r-project.org/>)
- R studio interface for R (<http://www.rstudio.com/>)
- Maxima Computer Algebra System (<http://maxima.sourceforge.net/>)
- Weather Research and Forecasting (WRF) Model mesoscale numerical weather prediction system (<http://www.wrf-model.org>)
- A suite of radiative transfer models (LibRadtran, TUV, SMARTS etc.)

Teaching Activities

During the reporting period, the LAPUP staff taught several undergraduate and graduate courses.

Undergraduate Programs

- Atmospheric Physics I (7th semester, Dept. of Physics, University of Patras)
- Atmospheric Physics II (8th semester, Dept. of Physics, University of Patras)
- Atmospheric Pollution (7th semester, Dept. of Physics, University of Patras)
- Differential Equations (2nd semester, Dept. of Physics, University of Patras)
- Environmental Physics (3rd semester, Dept. of Physics, University of Patras)
- Meteorology – Climatology (7th semester, Dept. of Geology, University of Patras)
- Physics Laboratory III (Thermodynamics – Waves – Optics) (3rd semester, Dept. of Physics, University of Patras)
- Physics Laboratory IV (Electromagnetism) (4th semester, Dept. of Physics, University of Patras)
- Thermodynamics – Waves - Optics (2nd semester, Dept. of Physics, University of Patras)

Graduate Programs

Graduate Program on Energy & Environment, Department of Physics, University of Patras

- Dynamic Meteorology (1st Semester)
- Environmental Physics (1st Semester)
- Atmospheric modeling (1st Semester)
- Radiative transfer modeling (1st Semester)

Interdisciplinary Graduate Program on Environmental Sciences, University of Patras

- Environmental Physics (1st Semester)
- Meteorological Sensors (2nd Semester)

Interdisciplinary Graduate Program on Electronics and Information Processing, University of Patras

- Meteorological Sensors (2nd Semester)
- Geophysical – Atmospheric Signals and Remote Sensing (2nd Semester)

Environmental & Marine Geochemistry Program on Environmental Sciences, Dept. of Geology, University of Patras

- Atmospheric Pollution Meteorology (1st Semester)

Environmental Physics, Dept. of Physics, Aristotle University of Thessaloniki

- Radiation Distribution Modeling

The diploma, M.Sc. and Ph.D. theses, presented in 2013 were:

Diploma Theses

1. Spyridon Kallivokas, Investigation of the correlation of isotopic composition of precipitation in Europe and the North Atlantic Oscillation Index, July 2013
2. Nikolaos Kostaras, Study of the precipitation recorded by the weather station of the University of Patras for the period 1973 – 1982, October 2013
3. Emmanuel Thramboulidis (Department of Electrical Engineering – University of Patras), Improving weather forecast using Artificial Neural Networks for the optimization of building energy management systems, June 2013
4. Ismini Karantza, Correlation between SW and UV irradiance over Europe”, September 2013

Ph.D. Theses

1. Efterpi Nikitidou, Variability of optical properties of aerosols and clouds and their effect on the energy balance in the atmosphere, June 2013

Research Activities

The main research axes of the LAPUP include:

- Measurements, quality control, processing and homogenization of meteorological and environmental time series.
- Stable isotopes ($\delta^{18}\text{O}$ & $\delta^2\text{H}$) in rain and in atmospheric water vapor.
- Ultraviolet radiation: Measurements, modeling and biological dose rates.
- Solar Radiation: Measurements, modeling and solar energy.
- Artificial intelligence methods applied to atmospheric and environmental physics problems.
- Weather and atmospheric pollution forecasting modeling.

In the frame of the above research axes, the LAPUP carried out a number of research projects that led to a series of publications in international scientific journals and conferences.

Research projects

- Stable isotopes in biospheric – atmospheric – earth system research (COST Action ES0806 - SIBAE). European Science Foundation, 5/2009 – 4/2013, www.sibae.ethz.ch/cost-sibae/
- Weather Intelligence for Renewable energies (WIRE, COST Action ES1002), European Science Foundation, 11/2010 – 11/2014
- Hellenic Network of Solar Energy (General Secretariat of research and Technology, Greece), 1/2011 – 3/2013, www.helionet.gr

- Contribution of Emission Sources on the Air quality of the Port-cities in Greece and Italy. ETCP GREECE – ITALY 2007-2013 – European Commission, 11/2011 – 10/2013, www.cesapo.upatras.gr
- ENvironmental Optimization of IRrigation Management with the Combined uSe and Integration of High Precision Satellite Data, Advanced Modelling, Process Control and Business Innovation (ENORASIS), FP7-ENV Project ENORASIS, Grant Agreement 282949, 01/ 2012 – 12/2014, www.enorasis.eu/
- Direct Normal Irradiance NowCasting Methods for optimized operation of concentrating solar technologies (DNICast), Grant Agreement 608623, 10/2013 – 09/2017

Publications in peer-reviewed journals

1. Detection and Correction of Inhomogeneities in Greek Climate Temperature Series, Anna Mamara, Athanassios A. Argiriou, Manolis Anadranistakis, [International Journal of Climatology](#), in press, 2013
2. Determination of measuring sites for solar irradiance based on cluster analysis of satellite – derived cloud estimations, A. Zagouras, A. Kazantzidis, E. Nikitidou, A. A. Argiriou, [Solar Energy](#), 97:1-11, 2013
3. The aerosol forcing efficiency in the UV region and the estimation of single scattering albedo at a typical West European site, E. Nikitidou, A. Kazantzidis, V. De Bock, H. De Backer, , [Atmospheric Environment](#), 69, 313-320, 2013
4. Weather maps classification over Greek domain based on isobaric line patterns, Athanassios Zagouras, Athanassios A. Argiriou, George Economou, Spiros Fotopoulos, Helena A. Flocas, , [Theoretical and Applied Climatology](#), 114(3):691-704, 2013
5. Skin Cancer Risks Avoided by the Montreal Protocol—Worldwide Modeling Integrating Coupled Climate-Chemistry Models with a Risk Model for UV, Arjan van Dijk, Harry Slaper, Peter N. den Outer, Olaf Morgenstern, Peter Braesicke, John A. Pyle, Hella Garny, Andrea Stenke, Martin Dameris, Andreas Kazantzidis, Kleareti Tourpali, Alkiviadis F. Bais, , [Photochemistry and Photobiology](#), 89: 234–246, 2013
6. Homogenization of mean monthly temperature time series of Greece, Anna Mamara, Athanassios A. Argiriou, Manolis Anadranistakis, , [International Journal of Climatology](#), Volume 33, Issue 12, October 2013, Pages: 2649–2666, 2013

Publications in peer-review international conferences

1. A. Poupkou, N. Liora, A. Karagiannidis, T. Giannaros, D. Melas, A. Argiourou, Maritime sector emissions contribution to the particulate matter pollution in a Mediterranean city-port: A modeling approach, [33rd International Technical Meeting on Air Pollution Modeling and its Application](#), Miami, Florida, USA, 26-30 August 2013
2. A. Poupkou, N. Liora, A. Karagiannidis, T. Giannaros, D. Melas, A. Argiourou, Air quality in a Mediterranean city-port: Particulate matter source apportionment using the WRF-CAMx modeling system, [European Aerosol Conference](#), Prague, 1-6 September 2013

3. *The aerosol effect on Direct Normal Irradiance in Europe based on satellite data*, E. Nikitidou, A. Kazantzidis, V.Salamalikis, [International Conference Energy & Meteorology 2013](#), 25-28 June 2013, Toulouse, France
4. *The Hellenic Network of Solar Energy (HNSE)*, A. Kazantzidis, A.Bais, E. Nikitidou, P.Tzoumanikas, V.Salamalikis, D. Melas, [International Conference Energy & Meteorology 2013](#), 25-28 June 2013, Toulouse, France
5. *A modelling approach to determine how much UVB radiation is available across the UK for the cutaneous production of vitamin D*, Andreas Kazantzidis, Andrew Smedley, Richard Kift, Mark D Farrar, Jacqueline Berry, Lesley E Rhodes,, Ann R Webb, [5th Congress of the European Society for Photobiology](#), Liège (Belgium), 2-6 September 2013

Dissemination activities

“Careers in Atmospheric Physics – Meteorology”, A. Argiriou, invited talk in the “Career Fair” event organized in Patras, March 29th, 2013.