



UNIVERSITY OF PATRAS

SCHOOL OF SCIENCE

DEPARTMENT OF PHYSICS

LABORATORY OF ATMOSPHERIC PHYSICS

Activity Report 2014

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Kioutsioukis**

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Laboratory of Atmospheric Physics of the University of Patras

Activity Report 2014

Note of the Head of the LAPUP

This is the third issue of the Activity Report of the Laboratory of Atmospheric Physics of the University of Patras, for the year 2014. Your comments are more than welcome and can be addressed to athanarg@upatras.gr

You can follow our activities via the following links:

Laboratory Web Page: www.atmosphere-upatras.gr

LAPUP weather forecast page: www.weather.upatras.gr

The LAPUP on Facebook:

<https://www.facebook.com/LaboratoryOfAtmosphericPhysicsUniversityOfPatras>

Staff

Faculty Members

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

Graduate Students

Ph.D. Candidates

- Galanaki Elissavet, Physicist, M.Sc. in Environmental Physics & Meteorology, National & Kapodistrian University of Athens, (Climatology of lightning activity in Greece)
- Kolokythas Constantinos, Hellenic Air Force - Meteorologist, M.Sc. in Environmental Sciences, University of Patras (Wind energy forecast – Topography and extreme weather events impact)
- 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., University of the Aegean (Homogenization of meteorological parameters)
- Proestakis Manolis, Physicist, M.Sc. in Environmental Physics, University of Bremen (Study of the indirect effect of aerosols in clouds using ground and satellite measurements)
- 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)
- 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)
- Varotsou Eufrosyni, Physicist, M.Sc. in Environmental Sciences, University of Patras (Study and characteristics of the urban microclimate in Patras, Greece – Urban heat island effect)

Research Associates

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

Teaching Activities

During the reporting period, the LAPUP faculty taught the following 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)
- Physics (1st semester, Dept. of Biology)

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)

The diploma, M.Sc. and Ph.D. theses, presented in 2014 were:

Diploma Theses

1. Petropoulos Nikolaos, Estimation of solar surface irradiance from synchronized measurements of sunshine duration
2. Kaltsi Chariklia, Estimation of risks and benefits from human exposure on ultraviolet radiation in Greece with the synergetic use of climate data and radiative transfer models

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.
- Energy meteorology.
- Artificial intelligence methods applied to atmospheric and environmental physics problems.
- Chemical Weather forecasting
- Atmospheric Modelling and Predictability
- Ensemble Forecasting
- Uncertainty propagation and Sensitivity analysis of model output

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

- Weather Intelligence for Renewable energies (WIRE, COST Action ES1002), European Science Foundation, 11/2010 – 11/2014
- 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 – 04/2014, 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/
- Pollution monitoring of ship emissions: an integrated approach for harbors of the Adriatic basin (POSEIDON). MED Maritime Integrated Projects, 06/2014 – 05/2015, www.medmaritimeprojects.eu/section/poseidon
- Modelling approach to determine the duration and intensity of sunlight exposure required to maintain and achieve adequate vitamin D status in winter in ‘at risk’ population groups, Subcontractor, University of Manchester, funded by the Department of Health, UK, 12/2012 – 5/2014.
- Direct Normal Irradiance Nowcasting methods for optimized operation of concentrating solar technologies (DNICast), FP7-Energy project, 10/2013 – 9/2017.
- Food-based solutions for optimal vitamin D nutrition and health through the life cycle (ODIN), FP7-Health Project, 7/2014 – 9/2014.

Publications in peer-reviewed journals

1. De praeceptis ferendis: good practice in multi-model ensembles, I. Kioutsioukis and S. Galmarini, Atmospheric Chemistry and Physics, 14, 11791-11815, 2014
2. Further evidence of important environmental information content in red-to-green ratios as depicted in paintings by great masters, C.S. Zerefos, P. Tetsis, A. Kazantzidis, V. Amiridis, S.C. Zerefos, J. Luterbacher, K. Eleftheratos, E. Gerasopoulos, S. Kazadzis, A. Papayannis, Atmospheric Chemistry and Physics, 14/2987-3-15, 2014
3. Estimation of direct normal irradiance from measured global and corrected diffuse horizontal irradiance, M.C. Kotti, A.A. Argiriou, A. Kazantzidis, Energy, 2014
4. The aerosol effect on direct normal irradiance in Europe under clear skies, E. Nikitidou, A. Kazantzidis, V. Salamalikis, , Renewable Energy, 68, 475-484, 2014
5. Detection and Correction of Inhomogeneities in Greek Climate Temperature Series, Anna Mamara, Athanassios A. Argiriou, Manolis Anadranistakis, International Journal of Climatology, 34 (10), 3024-3043, 2014.
6. Accuracy of ground surface broadband shortwave radiation monitoring, L. Vuilleumier, M. Hauser, C. Félix, F. Vignola, P. Blanc, A. Kazantzidis, B. Calpini, Journal of Geophysical Research, 10.1002/2014JD022335, 2014.

Presentations in peer-reviewed international conferences

1. Kolokythas K. V., Argiriou A. A. Homogenization of mean monthly precipitation time series. Proc. 12 International Conference of Meteorology, Climatology and Physics of the Atmosphere, Heraklion, 28 – 31 May 2014, Vol. 1, pp. 598-603, ISBN-978-960-524-430-9.

2. Mamara A., Argiriou A.A., An dranistakis M. Homogenization of Greek Climate Temperature Series. Proc. 12 International Conference of Meteorology, Climatology and Physics of the Atmosphere, Heraklion, 28 – 31 May 2014, Vol. 2, pp. 173-177, ISBN-978-960-524-430-9.
3. Salamalikis V., Argiriou A. A., Lykoudis S, Dotsika E., An isotope-evaporation model for the investigation of the sub-cloud evaporation effect in precipitation. Proc. 12 International Conference of Meteorology, Climatology and Physics of the Atmosphere, Heraklion, 28 – 31 May 2014, Vol. 3, pp. 133-138, ISBN-978-960-524-430-9.
4. Zempila M.M., S. Kazadzis, E. Nikitidou, P. Tzoumanikas, V. Salamalikis, E. Kosmidis, D. Melas, C.S. Zerefos, K. Fragkos, I. Fountoulakis, Th. Drosoglou, M.C. Kotti, The Hellenic Solar Energy Network: validation and products, A.F. Bais, A. Kazantzidis, Th. Giannaros, 12th International Conference on Meteorology, Climatology and Physics of the Atmosphere, Vol. 1, 102-106, 2014.
5. Kazadzis S., I.P. Raptis, V. Psiloglou, A. Kazantzidis, A.F. Bais, Solar radiation measurements and model calculations at inclined surfaces, 12th International Conference on Meteorology, Climatology and Physics of the Atmosphere, Vol. 1. 535-539, 2014.
6. Kazantzidis A. , A. Heimo Current state report on Weather Intelligence for Renewable Energy (WIRE) in the frame of COST Action ES1002, , 12th International Conference on Meteorology, Climatology and Physics of the Atmosphere, Vol. 1, 540-544, 2014.
7. Kazantzidis A. , A. Zagouras, V. Salamalikis, E. Nikitidou, Development of a neural network model of cloudiness forecasting for solar energy purposes, 12th International Conference on Meteorology, Climatology and Physics of the Atmosphere, Vol. 1, 545-550, 2014.
8. Kioutsioukis I., V. Salamalikis, M.C. Kotti, A. Kazantzidis, Meteorological ensemble simulations for hydrological applications, , 12th International Conference on Meteorology, Climatology and Physics of the Atmosphere, Vol. 1, 571-575, 2014.
9. Kazantzidis A., Estimating solar radiation via Sky Imager, Workshop on “Weather Intelligence for Renewable Urban Areas”, 2nd – 3rd June 2014, Risø Campus, Technical University of Denmark, Roskilde, Denmark.
10. Tzoumanikas P., A. Kazantzidis, Cloud detection and classification with the use of whole-sky ground-based images Workshop on Processing Techniques for the Detection of Atmospheric Constituents and the Estimation and Forecasting of Solar Irradiance from All-Sky Imagers, 24-25/6/2014, Patras, Greece.
11. Kotti MC, P. Tzoumanikas. A. Kazantzidis, M Hauser, L. Vuilleumier, Analysis of results from the COST ES1002 Direct Normal Intercomparison based on cloud detection from all-sky camera, Workshop on Processing Techniques for the Detection of Atmospheric Constituents and the Estimation and Forecasting of Solar Irradiance from All-Sky Imagers, 24-25/6/2014, Patras, Greece.
12. Salamalikis V., P. Blanc, A. Kazantzidis, On the induced uncertainties in direct normal irradiance calculations under cloud-free conditions due to aerosol optical depth from MACC re-analysis data, 14th EMS Annual Meeting/ 10th European Conference on Applied Climatology (ECAC), 06-10 October 2014, Prague, Czech Republic.

13. Kazantzidis A., A. Zagouras, V. Salamalakis, E. Nikitidou, Development of a neural network model of cloudiness forecasting for solar energy purposes in Greece, 14th EMS Annual Meeting/ 10th European Conference on Applied Climatology (ECAC), 06-10 October 2014, Prague, Czech Republic.
14. Kotti MC, L. Vuilleumier, A. Kazantzidis, M. Hauser, P. Tzoumanikas, Analysis of results from the COST ES1002 DNI inter-comparison based on cloud detection from all-sky cameras, 14th EMS Annual Meeting/ 10th European Conference on Applied Climatology (ECAC), 06-10 October 2014, Prague, Czech Republic.
15. Kazantzidis A., Short-term power forecasting with all-sky imagers, Workshop on Renewable Energies Forecasting-State of the art & challenges for the future, Organized by COST Action ES1002 WIRE and hosted by Mines Paristech, 22/10/2014, Paris, France.
16. Kazantzidis A., E. Nikitidou, P. Tzoumanikas, V. Salamalakis, MC Kotti, Climatology, measurements and forecasts of solar irradiance in Greece, 10th National Conference on Renewable Energy Sources, 26-28/11/2014, Thessaloniki, Greece.
17. Kioutsioukis I., A. Kazantzidis, A. de Meij, H. Jakobs, High Resolution weather forecasting with WRF for irrigation decision support, IRLA2014 International Symposium, 26-28/11/2014, Patras, Greece.

Organization of Conferences and Workshops

- International Workshop on the Impact of Maritime Activities on the Air Quality of Port Cities of Patras and Brindisi, Thessaloniki, Greece, January 30-31, 2014. Organized in the frame of the CESAPO project (ETCP GREECE – ITALY 2007-2013)
- COST ES 1002 international workshop on “Processing techniques for the detection of atmospheric constituents and the estimation and forecasting of solar irradiance from all-sky images”, 24-25/6/2014, Patras, Greece (<http://www.sky-camera-workshop.info/>).

Dissemination activities

- Interviews and statements of A. Kazantzidis at media for the results published in Atmospheric Chemistry and Physics about the study of famous paintings for the estimation of pollution levels in the Earth's past atmosphere. Example links: Press Release from the European Geosciences Union (<http://www.egu.eu/news/106/famous-paintings-help-study-the-earths-past-atmosphere/>), Statement in New York Times (http://www.nytimes.com/2014/04/01/science/on-canvas-clues-about-air-pollution.html?_r=0)
- Courses on sailing meteorology, at the Sailing Club of Patras.
- Set-up of 1 km by 1 km horizontal resolution forecasts for the area of the Gulf of Patras, in the frame of the organization of the Hellenic Offshore Sailing Championship 2014 - International Offshore Sailing Regatta in Patras by the Sailing Club of Patras (ΙΟΠ), June 2014.



- “Ozone and UV radiation: myths and reality”, Science Cafe event, Patras, Greece, June 5, 2014. Talk by A. Kazantzidis in the series of lectures organized by the Navarino Environmental Observatory.
- Weather forecasts for several local media.