

UNIVERSITY OF PATRAS

SCHOOL OF SCIENCE

DEPARTMENT OF PHYSICS

LABORATORY OF ATMOSPHERIC PHYSICS

Activity Report 2017

**Athanassios A. Argiriou, Andreas Kazantzidis, Ioannis
Kioutsioukis**

December 2018

Patras, Greece



Laboratory of Atmospheric Physics of the University of Patras¹

Activity Report 2017

Note of the Head of the LAPUP

This is the fifth issue of the Activity Report of the Laboratory of Atmospheric Physics of the University of Patras, for the year 2017. It is also the very first issue I'm editing as new Head of the Lab.

For ten years, LAPUP was run by Professor Athanassios Argiriou. LAPUP started with dilapidated infrastructure, practically zero personnel and infrastructure. In fact, there was no reason to publish an Activity report. At that time, I was still working as a postdoc researcher at the Aristotle University of Thessaloniki: LAPUP was completely unknown, I was not aware of it despite that the Greek research community in atmospheric sciences is small and well-connected. Nowadays, LAPUP is able to present a bouquet of activities including fully renewed Bachelor and MSc courses with new instrumentation, IT facilities, upgraded lab exercises as well as a variety of international collaborations and research projects.

I am indebted Professor Athanasios Argiriou for his leadership and continuous support all these years. Moreover, I thank him for giving me the opportunity to serve the LAPUP as the new Head although he has the highest ranking. I do hope that with his experience and expertise, the remarkable job of our third faculty member, Assistant Professor Ioannis Kioutsoukis, as well as the great support by our postdoc researchers and PhD students, we will continue to report progress, innovation and enjoy atmospheric physics!

Patras, April 25, 2018

Associate Professor Andreas Kazantzidis

¹ Your comments are more than welcome and can be addressed to akaza@upatras.gr
You can follow our activities via the following links:
Laboratory Web Page: www.atmoshpere-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 (University of Patras), D.E.A. (I.N.P. Grenoble) - Ph.D. (Univ. Aix-Marseille 1), Professor (2006 -).
- Andreas Kazantzidis, Physicist, M.Sc., Ph.D. (Aristotle University of Thessaloniki), Associate Professor (2015 -).
- Ioannis Kioutsoukis, Physicist, M.Sc. (Aristotle University of Thessaloniki), Ph.D. (Aristotle University of Thessaloniki, Joint Research Centre Ispra), Assistant Professor (2016 -).

Postgraduate Researchers

- Salamalikis Vasileios, Physicist - M.Sc., University of Patras (Stable isotopes in atmospheric processes).

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).
- 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).
- Tzoumanikas Panayiotis, Computer and Informatics Engineer, M.Sc., University of Patras, (Estimation of atmospheric parameters using digital image processing).
- Ioannis Vamvakas, Physicist – M.Sc., University of Patras (Cloud and aerosol effects on solar irradiance).
- Geogre Kosmopoulos, Physicist – M.Sc. University of Patras (Effect of atmospheric constituents on solar irradiance).
- Elias Dimadis, Matematician (University of Patras), M.Sc. (University of Piraeus) (Homogenization of Atmospheric Time Series).

Research Associates

- Kanakaris Ioannis, Informatics for Business Planning Engineer (Technical Educational Institute of Patras), M.Sc. in Accounting (Price Waterhouse Coopers S.A.)

Teaching Activities

During the reporting period, the LAPUP faculty taught the following undergraduate and graduate courses.

Undergraduate Programs

- Atmospheric Physics I - Meteorology (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)
- Calculus (1st semester, Dept. of Physics, University of Patras)
- Differential Equations (2nd semester, Dept. of Physics, University of Patras)
- Introduction to Environmental Physics (5th semester, Dept. of Physics, University of Patras)
- Dynamical Systems (7th semester, Dept. of Physics, University of Patras)
- Meteorology – Climatology (7th semester, Dept. of Geology, University of Patras)
- Atmospheric Physics I-Meteorology I (7th semester, Dept. of Mathematics, University of Patras)
- Atmospheric Physics II-Meteorology II (8th semester, Dept. of Mathematics, University of Patras)
- Physics Laboratory II (Mechanics – Fluid Mechanics) (2nd semester, Dept. of Physics, 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)

Graduate Programs

Graduate Program on Applied Meteorology and Environmental Physics

- Dynamic and Synoptic Meteorology (1st semester)
- Radiation and Atmosphere (1st semester)
- Measurements and Data Processing in Atmospheric Sciences (1st semester)
- Energy Meteorology (2nd semester)
- Statistical Methods in Atmospheric Sciences (2nd semester)
- Atmospheric Modelling (2nd semester)

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

- Dynamic Meteorology (1st semester)
- Environmental Physics (1st semester)
- Radiation and Atmosphere (1st semester)



- Atmospheric modeling (2nd semester)
- Energy Meteorology (2nd 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)

Interdisciplinary Graduate Program on Distributed green electricity and advanced network infrastructure management and economy, University of Patras

- Energy Meteorology (2nd semester)

Theses

Ph.D. Theses

-

M.Sc. Theses

Solar resource methodologies and typical values in Greece, Apostolopoulou Ekaterini

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 Modeling, Ensemble Forecasting, and Predictability.
- Uncertainty propagation and Sensitivity analysis of model output.
- Modeling Environment and Vector-borne Disease Interaction.

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.

On-going research projects

- Direct Normal Irradiance Nowcasting methods for optimized operation of concentrating solar technologies (DNICast), FP7-Energy project, 10/2013 – 9/2017.
- Air Quality Model Evaluation International Initiative (AQMEII 1, 2 and 3), 2011-2017.
- MENA Hybrid Solar System (HYMENSO), ERANETMED, 11/2016 – 10/2018.
- Intelligent Methods for solar resource and forecasting with the use of high spatial and temporal resolution datasets, Greek State Scholarship Foundation, 6/2016 – 8/2017.
- Aerosol and cloud effects on solar irradiance, Hellenic Foundation for Research & Innovation, 11/2017-7/2019.
- Solar Resource for High Penetration and Large Scale Applications, International Energy Agency - Photovoltaic Power Systems Program Task 16, 7/2017 – 6/2020

Publications in peer-reviewed journals

1. The impact of the energy performance regulations' updated on the construction technology, economics and energy aspects of new residential buildings: The case of Greece, 83. Gaglia, A.G., Tsikaloudaki, A.G., Laskos, C.M., Dialynas, E.N., Argiriou, A.A. , , [Energy & Buildings](#), 155:225-237, 2017.

2. Atmospheric impact of ship traffic in four Adriatic-Ionian port-cities: Comparison and harmonization of different approaches. , E. Merico, A. Gambaro, A. Argiriou, A. Alebic-Juretic, E. Barbaro, D. Cesari, L. Chasapidis, S. Dimopoulos, A. Dinoi, A. Donateo, C. Giannaros, E. Gregoris, A. Karagiannidis, A.G. Konstandopoulos, T. Ivošević, N. Liora, D. Melas, B. Mifka, I. Orlic, A. Poupkou, K. Sarovic, A. Tsakis, R. Giua, T. Pastore, A. Nocioni, D. Contini, , [Transportation Research Part D](#), 50: 431-445, 2017.

3. High resolution air temperature climatology for Greece for the period 1971 – 2000., A. Mamara, M. Anadranistakis, A.A. Argiriou, T. Szentimrey, T. Kovacs, A. Bezes, Z. Bihari, [Meteorol. Appl.](#), 24: 191-205, 2017.

4. Energy efficiency of PV panels under real outdoor conditions–An experimental assessment in Athens, Greece, Gaglia A.G., Lykoudis S., Argiriou A.A., Balaras C.A., Dialynas E., [Renewable Energy](#), 101:236-243, 2017.

5. New challenges in solar resource and forecasting in Greece, A. Kazantzidis, E. Nikitidou, V. Salamalikis, P. Tzoumanikas, A. Zagouras, International Journal of Sustainable Energy, <http://dx.doi.org/10.1080/14786451.2017.1280495>, 2017

6. Measurements and model simulations of solar radiation at tilted planes, towards the maximization of energy capture, P.I. Raptis, S. Kazadzis, B. Psiloglou, N. Kouremeti, P. Kosmopoulos, A. Kazantzidis, *Energy*, 130, 570-580, 2017.
7. Developing an intelligent ICT system for environmentally optimized irrigation management in agriculture, P. Syropoulou, M. Symeonidou., S. Tekes, R. Wawer, A. Kazantzidis, V. Crnojevic, A. Bruggeman, *Journal of Agricultural Informatics*, 8(2),22-32, 2017.
8. Performance Evaluation of Radiation Sensors for the Solar, Energy Sector, L. Vuilleumier, C. Félix, F. Vignola, P. Blanc, J. Badosa, A. Kazantzidis and B. Calpini, *Meteorologische Zeitschrift*, Vol. 26, No. 5, 485–505, 2017.
9. Short-term cloudiness forecasting for solar energy purposes in Greece, based on satellite-derived information, E. Nikitidou, A. Zagouras, V. Salamalikis, A. Kazantzidis, *Meteorology and Atmospheric Physics*, DOI 10.1007/s00703-017-0559-0, 2017.
10. Im, U., Brandt, J., Geels, C., Hansen, K. M., Christensen, J. H., Andersen, M. S., Solazzo, E., Kioutsioukis, I., Alyuz, U., Balzarini, A., Baro, R., Bellasio, R., Bianconi, R., Bieser, J., Colette, A., Curci, G., Farrow, A., Flemming, J., Fraser, A., Jimenez-Guerrero, P., Kitwiroon, N., Liang, C.-K., Pirovano, G., Pozzoli, L., Prank, M., Rose, R., Sokhi, R., Tuccella, P., Unal, A., Vivanco, M. G., West, J., Yarwood, G., Hogrefe, C., and Galmarini, S.: Assessment and economic valuation of air pollution impacts on human health over Europe and the United States as calculated by a multi-model ensemble in the frame work of AQMEII3, *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-751>, 2017.

Presentations in peer-reviewed international conferences

1. Mamara A, Anadranistakis M, Argiriou A A, Homogenization and gridding of the Greek time series. 9th Seminar for Homogenisation and Quality Control in Climatological Databases and 4rth Conference on Spatial Interpolation Techniques in Climatology and Meteorology, Budapest, Hungary, April 3 – 7, 2017.
2. Argiriou A A, Mamara A, Dimadis E, Homogenization of the Hellenic cloudiness time series, 11th EUMETNET Data Management Workshop Placing climate data to social service: From observations to archives, Zagreb, Croatia, 10 – 17 October 2017.
3. Application of Simple All-sky Imagers for the Estimation of Aerosol Optical Depth, A. Kazantzidis, P. Tzoumanikas, E. Nikitidou, V. Salamalikis, S. Wilbert, C. Prah, *SolarPACES Conference 2016*, October 11-14, 2016, Abu Dhabi, United Arab Emirates, AIP Conference Proceedings 1850, 140012, <https://doi.org/10.1063/1.4984520>, 2017.

4. Short-term forecasting of high resolution local DNI maps with multiple fish-eye cameras in stereoscopic mode, P. Blanc , P. Massip , A. Kazantzidis , P. Tzoumanikas, P. Kuhn , S. Wilbert , D. Schüler , C. Prah, SolarPACES Conference 2016, October 11-14, 2016, Abu Dhabi, United Arab Emirates, AIP Conference Proceedings 1850, 140004, <https://doi.org/10.1063/1.4984512>, 2017.
5. Derivation and forecast of circumsolar radiation from whole-sky cameras and satellite sensors, L. Bugliaro, S. Wilbert, A. Kazantzidis, SolarPACES Conference 2016, October 11-14, 2016, Abu Dhabi, United Arab Emirates.
6. Evaluation of Rotating Shadowband Irradiometer accuracy, L. Vuilleumier, F. Vignola, P. Blanc, J. Badosa, A. Kazantzidis, SolarPACES Conference 2016, October 11-14, 2016, Abu Dhabi, United Arab Emirates.
7. Validation of spatially resolved all sky imager derived DNI nowcasts, Pascal Kuhn, Stefan Wilbert, David Schüler, Christoph Prah, Thomas Haase, Lourdes Ramirez, Luis Zarzalejo, Angela Meyer, Laurent Vuilleumier, Philippe Blanc, Jean Dubrana, Andreas Kazantzidis, Marion Schroedter-Homscheidt, Tobias Hirsch, and Robert Pitz-Paal AIP Conference Proceedings 1850, 140014 (2017); doi: 10.1063/1.4984522
8. Combined CSP – PV plants for MENA Region, D. Benitez, A. Kazantzidis, A. Al-Salaymeh, S. Bouaichaoui, A. Guizani, 4th International Conference Energy & Meteorology (ICEM), 27-29 June 2017, Bari, Italy.
9. On the use of the MODIS collection 6 for aerosol optical properties for solar energy resource estimations over the Mediterranean region, I. Vamvakas, V. Salamalikis, A. Kazantzidis, 4th International Conference Energy & Meteorology (ICEM), 27-29 June 2017, Bari, Italy.
10. Cloud Classification in All-Sky Images Using Residual Encoding of Local Descriptors, S. Oikonomou, I. Theodorakopoulos, S. Photopoulos, A. Kazantzidis, 4th International Conference Energy & Meteorology (ICEM), 27-29 June 2017, Bari, Italy.
11. Shadow camera system for the validation of nowcasted plant-size irradiance maps, P. Kuhn, S. Wilbert, C. Prah, A. Kazantzidis, P. Blanc, L. Zarzalejo, L. Ramirez, A. Meyer, L. Vuilleumier, R. Pitz-Paal, European Meteorological Society Annual Meeting: European Conference on Applied Meteorology & Climatology, 4-8 September 2017, Dublin, Ireland.
12. Estimation of cloud coverage/ type and aerosol optical depth with all-sky imagers at Plataforma Solar de Almeria, Spain, A. Kazantzidis, P. Tzoumanikas, E. Nikitidou, V. Salamalikis, S. Wilbert, P. Kuhn, P. Blanc, European Meteorological Society Annual Meeting: European Conference on Applied Meteorology & Climatology, 4-8 September 2017, Dublin, Ireland.
13. Determination of ultraviolet exposure and vitamin D status in a group of female adolescents in Greece, A. Kazantzidis, S. Giapoutzidou, European Meteorological Society Annual Meeting: European Conference on Applied Meteorology & Climatology, 4-8 September 2017, Dublin, Ireland.
14. How much sunlight exposure is required to safely provide adequate vitamin D?, A.R. Webb, A. Kazantzidis, M. Farrar, R. Kift, K. Cashman, L.E. Rhodes, European Society for Photobiology 2017 Congress, 4-8 September 2017, Pisa, Italy.



15. Air pollution monitoring in ports: experience gained from EU and potential applications in Greek ports, P. Symeonidis, A. Kazantzidis, T. Bakkas, A. Charalambous, I. Basiotis, 7th Greek Conference on Management and Improvement of Coastal Zones, 20-22/11/2017, Athens, Greece
16. Aether: A real time monitoring system for airborne particulate matter in Patras, Greece, G. Kosmopoulos, V.Salamalikis, P. Tzoumanikas, A. Argiriou, A. Kazantzidis, International Conference "Smart Cities and Mobility as a Service", 7-8 December 2017, Patras, Greece

Organization of Conferences and Workshops

- World Meteorology Day event, March 23rd, 2017, University of Patras Conference Center.

Dissemination activities

- Sailing Meteorology – A free course offered for the students of the sailing schools of the Sailing Club of Patras (IOP).
- Guided visits in the Lab for high school students.
- Weather forecasts for several local news media.
- Talks in events organized by local nonprofit organizations.
- Talks and exercises on Copernicus data

Invited talks

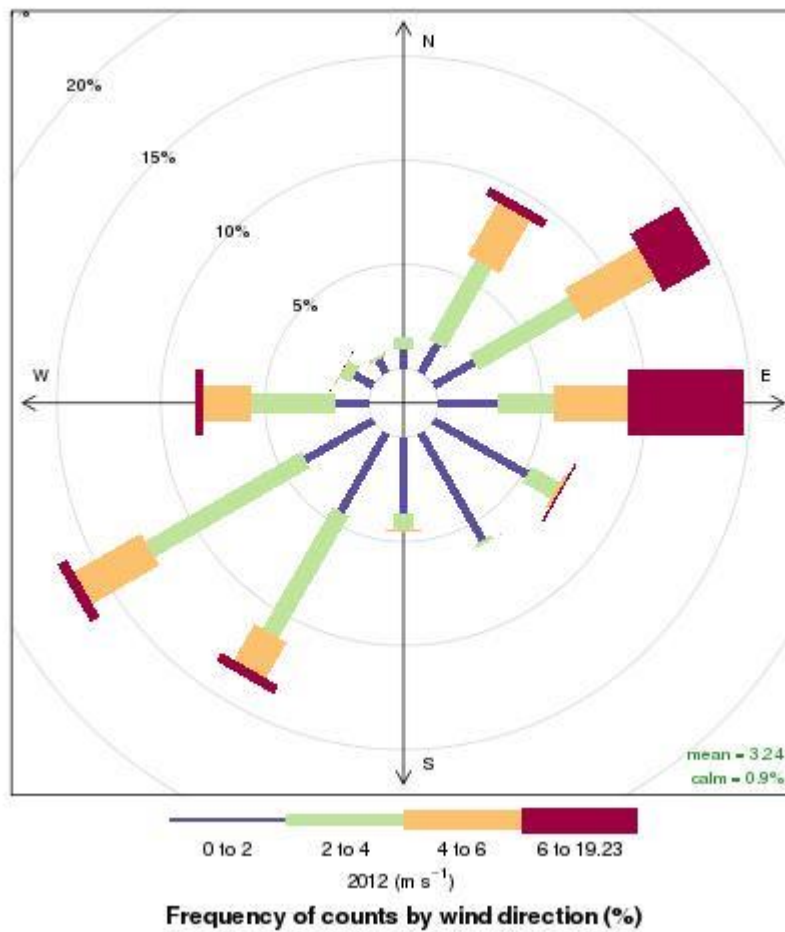
-

Weather Bulletin

Summary

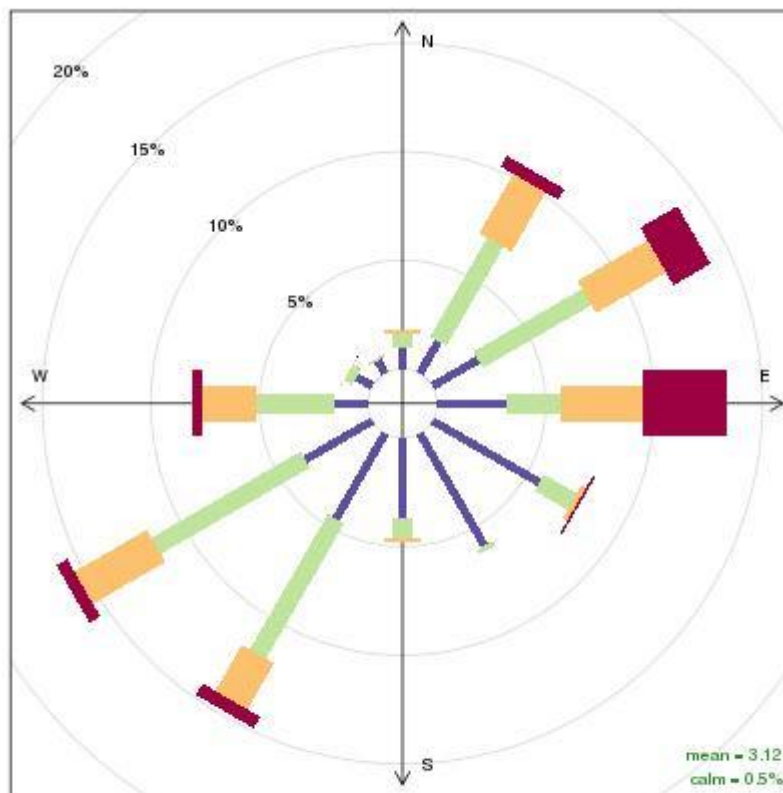
2012	Min	Max	Annual Average (Total for precipitation)
T (°C)	-0.1	38.4	17.9
RH (%)	8.5	91.3	61.5
WV [gust] (m.s ⁻¹)		19.2 [30]	
RF (mm)			1 182.8
p (hPa)	978	1027	1009

T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at 24.78 m)



2013	Min	Max	Annual Average (Total for precipitation)
T (°C)	0.4	35.7	17.7
RH (%)	5	91.3	62.4
WV [gust] (m.s ⁻¹)		19.2 [30]	
RF (mm)			958.6
p (hPa)	985	1029	1008

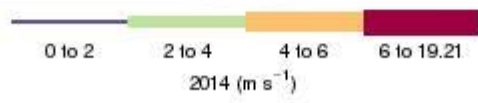
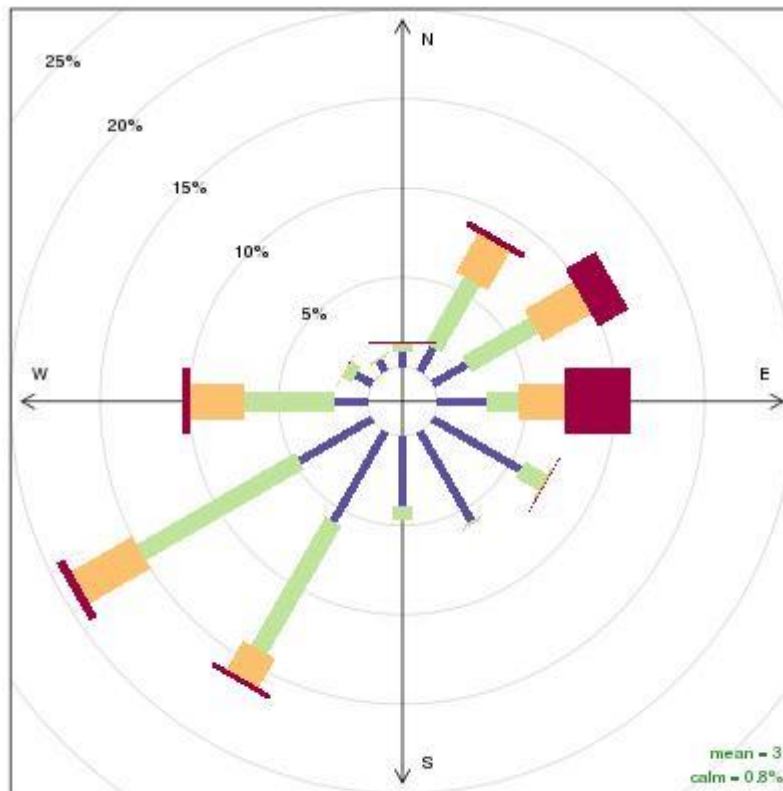
T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at 24.78 m)



0 to 2 2 to 4 4 to 6 6 to 19.21
2013 (m s⁻¹)
Frequency of counts by wind direction (%)

2014	Min	Max	Annual Average (Total for precipitation)
T (°C)	3.2	35.8	17.3
RH (%)	9.4	91.2	68.1
WV [gust] (m.s ⁻¹)		19.2 [30]	
RF (mm)			976.6
p (hPa)	989	1023	1009

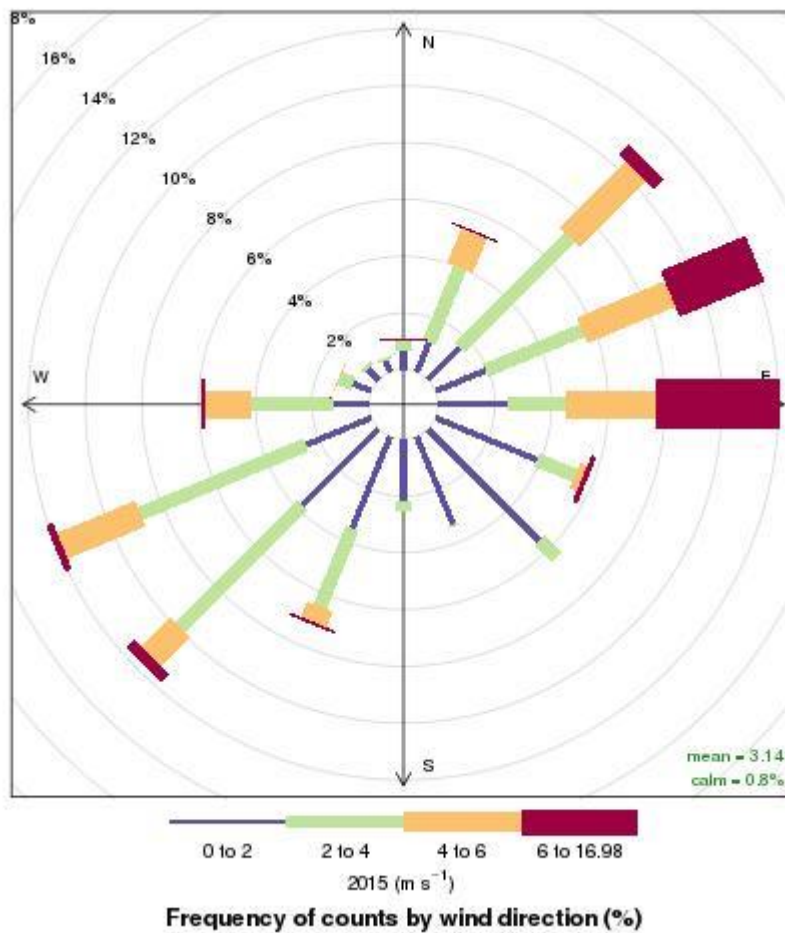
T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at m.s.l.h.)



Frequency of counts by wind direction (%)

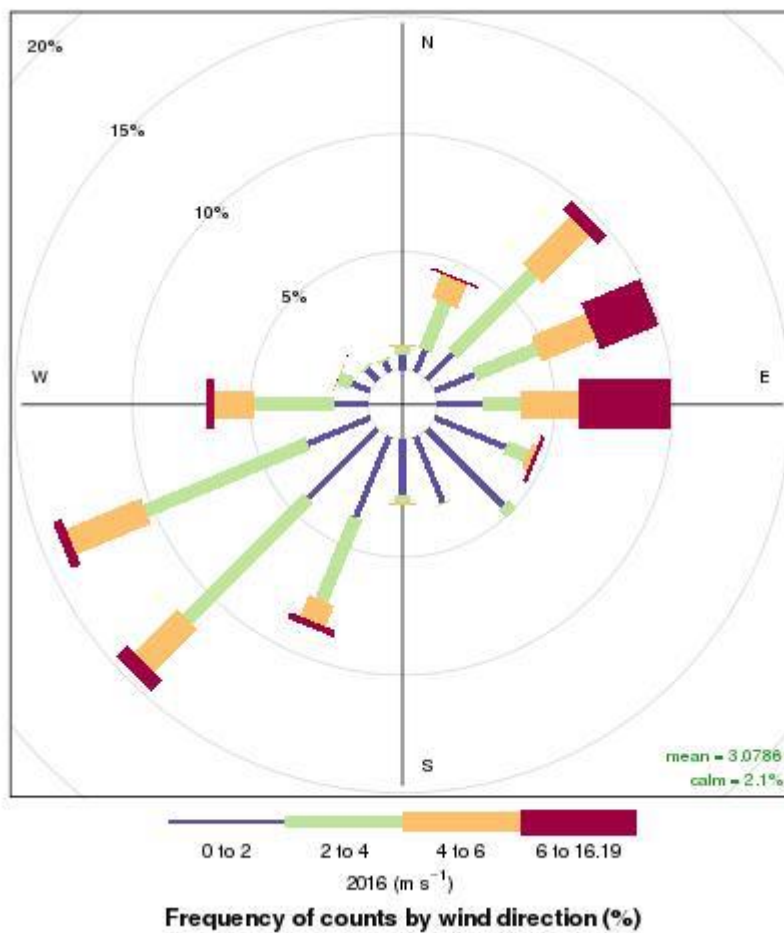
2015	Min	Max	Annual Average (Total for precipitation)
T (°C)	-0.5	37.9	18.2
RH (%)	5.8	97.7	63
WV [gust] (m.s ⁻¹)		17 [53]	
RF (mm)			803.6
p (hPa)	987	1030	1010

T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at 24.78 m)



2016	Min	Max	Annual Average (Total for precipitation)
T (°C)	1.0(4)	38.8	19.2
RH (%)	11.73	97.7	64
WV [gust] (m.s ⁻¹)		17 [53]	
RF (mm)			772.4
p (hPa)	990	1029	1010

T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at 24.78 m)



2017	Min	Max	Annual Average (Total for precipitation)
T (°C)	-1.2	40.4	18.1
RH (%)	9.15	97.7	62.7
RF (mm)			813.0
p (hPa)	978	1026	1010.3

T: air temperature, RH: relative humidity, RF: precipitation, p (pressure at 24.78 m)

