

Book of Abstracts

**Modern approaches of the environment-climate
change interconnectivity
2-nd edition
September 20-23, 2023
Galați**

Section 1. Atmosphere, climate. Topography. Hydrology. Energy. Remote sensing.

THE DYNAMICS OF OFFSHORE RENEWABLE ENERGY IN THE EUROPEAN NEARSHORE IN THE CONTEXT OF THE CLIMATE CHANGE.

Eugen Rusu¹, Liliana Rusu¹

¹“Dunarea de Jos” University of Galati, 111 Domneasca St., 80008 Galati, Romania
e-mail: erusu@ugal.ro

The higher dynamics of the climate change becomes obvious in the last decades and there is enough evidence that the accelerated economic development of the last century, and especially the high energy demand and production, influences this dynamics. In this context, the European Green Deal draws an ambitious roadmap towards a low carbon future and on a sustainable development based on clean and renewable energy sources. From this perspective, a special attention is paid to the offshore renewable energy (ORE) sector. ORE is abundant and its effective extraction may represent one of the most significant technological challenges of the 21st century. Motivated by the above reasons, the objective of the present work is to analyze the ORE potential in the coastal environment of Europe. The emphasis is given to the offshore wind, which represents already certitude in the Baltic and North Seas and a rapid extension is also expected in the Mediterranean and the Black Seas. The analysis of the wind energy potential along the entire European nearshore is made based on data from the European Centre for Medium-Range Weather Forecast considering the last three decades. Furthermore, an analysis of the future expected wind data is also carried out considering the results provided by the Regional Climate Models until the end of the 21st century under various RCP (acronym from Representative Concentration Pathway) scenarios. Finally, the synergy between the wind power and other offshore renewable energy resources is also discussed. This concerns especially the wave and solar energy. The work is still ongoing and the future dynamics of the resources is going to be evaluated considering also the SSP (acronym from Shared Socioeconomic Pathway) scenarios.

Acknowledgements.

This work was carried out in the framework of the research project CLIMEWAR (CLimate change IMPact Evaluation on future WAve conditions at Regional scale for the Black and Mediterranean seas marine system), supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P4-PCE-2021-0015, within PNCDI III.

References:

1. Onea F, Rusu E, Rusu L., (2021): Assessment of the Offshore Wind Energy Potential in the Romanian Exclusive Economic Zone. *Journal of Marine Science and Engineering*. 2021; 9(5):531.
2. Onea, F.; Rusu, E., (2022): An Evaluation of Marine Renewable Energy Resources Complementarity in the Portuguese Nearshore. *J. Mar. Sci. Eng.* 2022, 10, 1901.
3. Onea, F., Rusu, E., (2022): A Spatial Analysis of the Offshore Wind Energy Potential Related to the Mediterranean Islands, *Energy Reports* 2022, Vol 8/S16, pp 99-105; <https://authors.elsevier.com/sd/article/S2352484722021849>
4. Raileanu, A., Onea, F., Rusu, E., (2020): An Overview of the Expected Shoreline Impact of the Marine Energy Farms Operating in Different Coastal Environments. *JMSE*. 8, 228 (2020).
5. Ruiz, A., Onea, F., Rusu, E., (2020): Study Concerning the Expected Dynamics of the Wind Energy Resources in the Iberian Nearshore, *Energies* 2020, 13(18), 4832.
6. Rusu E, Onea F., (2016): Estimation of the wave energy conversion efficiency in the Atlantic Ocean close to the European islands. *Renew Energy* 2016, 85, 687-703,
7. Rusu, E., (2020): An evaluation of the wind energy dynamics in the Baltic Sea, past and future projections, *Renewable Energy*, 160, 350-362.
8. Rusu E., Rusu L., (2021): An evaluation of the wave energy resources in the proximity of the wind farms operating in the North Sea, *Energy Reports*, 7 (2021), pp. 19-27.
9. Rusu E. (2022): Marine Renewable Energy: An Important Direction in Taking the Green Road towards a Low Carbon Future. *Energies*. 2022; 15(15): 5480
10. Rusu, E., 2022: Assessment of the wind power dynamics in the North Sea under climate change conditions, *Renewable Energy* 196, August 2022, Pages 466-475.
11. Rusu, E. (2023): Harvesting Offshore Renewable Energy an Important Challenge for the European Coastal Environment. *Sustainable Marine Structures*, Vol 5 (1), 822,
12. Rusu E., (2023): The expected wind power dynamics in the Mediterranean Sea considering different climate change scenarios, accepted for presentation at the 18th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 24-29 September 2023, Dubrovnik, Croatia.

MULTI-UTILITY APPROACHES ON THE EVALUATION OF THE CARBON FOOTPRINT OF URBAN AGGLOMERATIONS: CASE STUDY ON CONSTANTA MUNICIPALITY

Valică Andreea¹, Eden Mamut¹

¹"Ovidius" University of Constanța, Romania
e-mail: valica.andreea@yahoo.com, emamut@univ-ovidius.ro

In a context when the total energy consumption of the world is growing by 3.2% annually, using the natural resources with a very low efficiency and the release of pollutants at all phases of the lifecycle from energy production and distribution to the end-use, the interest for improving energy efficiency, for using sustainable energy sources and for the more effective management of energy, is becoming central in the society.

On other side, the fight against climate change calls for an urgent reduction of CO₂ emissions. In this context, cities are responsible for 75% of the global release of CO₂ to the atmosphere.

In the process of Green Energy Transition there is an increasing interest of local authorities to encourage and promote solutions integrating renewable energy sources in the energy mix of the city. In the City of Constanta there are several projects for upgrading the infrastructure for energy utilities dedicated to the residential sector in different phases of implementation and most of them are motivated by the need for the reduction of the costs of utilities for the end-users and the reduction of the environmental impact.

The approach that has been developed for a quantitative analysis of the Carbon footprint of an urban agglomeration consists on taking into consideration the main energy utilities as electric, gas, thermal, fuels for energy and transportation.

A case study has been carried out for the Municipality of Constanta and the data sets have been used for the computation of the Carbon footprint of the energy utilities of the city.

There were evaluated the renewable energy sources from the region and their potential to contribute to the reduction of the GHG.

Alternative strategies and scenarios for the integration of the renewable energy sources in different rates, time periods for transition, and costs have been evaluated.

A special attention has been given to the intermittence of the renewable energy sources as solar and wind and there were defined possible solutions to overcome the consequences on energy security and safety of the municipal community.

Acknowledgements.

The results were obtained within the Project "Scientific Research on the Development of Advanced Materials and Multiscale Optimization by Integrating Nano-structured Materials in Advanced Energy Systems - MultiScale", contract no. 8 / 01.09.2016, ID: P_40_279, MySMIS code 105531, Competitiveness Operational Program, Priority Axis 1 - Research, Technological Development and Innovation (RDI) in Support of Economic Competitiveness and Business Development, Action: 1.2.3 Project type Partnerships for Knowledge Transfer. The project is co-financed by the European Regional Development Fund through the Competitiveness Operational Program.

References:

1. International Energy Agency, (2023) World Energy Balances: Overview, IEA, Paris. Available online at: <https://www.iea.org/reports/world-energy-balances-overview>;
2. Bejan, A. Mamut, E., (1999), Optimization of Complex Energy Systems, Kluwer Academic Pub. Olanda, ISBN 0-7923-5725-6
3. Mamut, E., Oancea, L., Prodan, G., Ivan, P., Hornet, I., Thermodynamic Modeling and Optimization of a Solar-Thermal / Pellet Boiler District Heating Plant Integrating Nanotechnologies, (2021), Proceedings of ECOS 2021 - The 34th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems, June 27-July 2, 2021, Taormina, Italy
4. Mamut, E., Vilt, C. R., The analysis of sustainability, accesibility and resilience of energy suply by networks of utilities for an urban agglomeration: Case Study on the city of Constanta, in "Sustainable development of Romania in the European context, from VISION to ACTION" (2023) UEFISCDI Publishing House, ISBN 978-606-95687-2-9 (in Romanian).
5. Valică, A. "The use of Small Modular Reactors for assuring the energy security in urban agglomerations", (2023), Bachelor Thesis, Mechanical, Industrial and Maritime Engineering Faculty, "Ovidius" University of Constanța. (in Romanian).
6. Valică, A. "Innovative solution for ensuring energy security in urban agglomerations", (2023) winner of 2nd Prize at the 2023 BSUN Innovation Challenge Contest, Constanța.

CLIMATE CHANGE INFLUENCE ON LIFE QUALITY AND WELLBEING – A CASE STUDY ON AIR QUALITY IN IASI CITY, ROMANIA

Marius Cazacu¹, Ioana Tanasa², Dumitru Botan², Brindusa Sluser³

¹"Gheorghe Asachi" Technical University of Iasi, Department of Physics, Iasi, Romania
e-mail: marius-mihai.cazacu@academic.tuiasi.ro

²"Gheorghe Asachi" Technical University of Iasi, Romania, Faculty of Chemical Engineering and Environmental Protection "Cristofor Simionescu", Department of Environmental Engineering and Management, Iasi, Romania
e-mail: ioana-madalina.tanasa@student.tuiasi.ro; dumitru.botan@student.tuiasi.ro

³"Gheorghe Asachi" Technical University of Iasi, Romania, Faculty of Chemical Engineering and Environmental Protection "Cristofor Simionescu", Department of Environmental Engineering and Management, Iasi, Romania
e-mail: brindusa-mihaela.sluser@academic.tuiasi.ro

Climate change is currently one of the most serious global problems, being closely related to air quality, which, among other factors, depends to a large extent on the weather. At the same time, the quality and well-being of human life is also influenced, all the changes and phenomena produced by global warming and air pollution leading to certain health risks. Thus, air pollutants, depending on the concentrations in which they are found, present a certain degree of toxicity, with either acute or chronic implications on human health. In recent years, there has been an increase in people with cancer, lung, heart or psychological diseases, especially in areas with a high degree of air pollution and a predominantly sedentary lifestyle. Therefore, there is a need for permanent monitoring of climate changes and environmental factors. In this sense, at the level of the city of Iasi in Romania, we studied the evolution of air quality over the last 12 years, more precisely from 2011 to 2022, considering 3 pollutants found in different forms: dust (PM_{2.5}), heavy metal (arsenic) and a gas (carbon monoxide), whose concentrations were selected from the data provided by 3 air quality monitoring stations, finally applying the human health risk index, according to the USEPA method. The results highlighted risks for the vulnerable categories (children and the elderly), for children even obtaining triple values compared to those in the case of adults. Among the 3 pollutants, PM_{2.5} presents the greatest risk for the mentioned categories, the concentrations recorded during the 12 years being varied, but remaining above the alert threshold level. If global warming continues to increase, climate change is expected to produce an increasingly threatening negative impact, having severe effects on nature and people. With all this in mind, it is necessary to monitor all changes produced in the environment because climate changes, quality of life, well-being and air quality are in a close relationship, having an influence one on another.

References:

1. Grecu S. P., Mihailescu B. C., Sluser B. M. (2020). Statistical approach of environmental quality management and political decision-making at local level: Case study Iasi city, Romania. *Environmental Engineering and Management Journal*, vol. 19, 517-530.
2. Kolisnyk A., Chugai A., Mozgovyy A., Soloshych I. (2023). Assessment of the Risks of Toxic Effects of Atmospheric Air Pollution for Humans (On the Example of Cities in Southern Ukraine). *Ecological Engineering & Environmental Technology*, vol. 24(6), 147-154. <https://doi.org/10.12912/27197050/168093>
3. Office of Emergency and Remedial Response, U.S. Risk Assessment Guidance for Superfund. In Volume I: Human Health Evaluation Manual (Part A); Environmental Protection Agency: Washington, DC, USA, 1989.
3. Onwudiwe N.N. (2023). Review on Climate Change Impacts on Air Quality in Nigeria. *Climate Change Impacts on Nigeria*, 217-232. https://doi.org/10.1007/978-3-031-21007-5_12
4. Piracha A., Chaudhary M.T. (2022). Urban Air Pollution, Urban Heat Island and Human Health: A Review of the Literature. *Sustainability*, vol. 14, issue 15, 9234. <https://doi.org/10.3390/su14159234>
5. Sgobba F., Sampaolo A., Patimisco P., Giglio M., Menduni G., Ranieri A.C., Hoelzl C., Rossmadl H., Brehm C., Mackowiak V., et al. (2022). Compact and portable quartz-enhanced photoacoustic spectroscopy sensor for carbon monoxide environmental monitoring in urban areas. *Photoacoustics*, vol. 25.
6. Sluser B., Plavan O., Teodosiu C. (2022). Environmental Impact and Risk Assessment. In *Assessing Progress Towards Sustainability*; Elsevier: Amsterdam, The Netherlands, 189-217.
7. Steg L. (2023). Psychology of Climate Change. *Annual Review of Psychology*, vol. 74, 391-421.
8. Tanasa I., Cazacu M., Sluser B. (2023). Air Quality Integrated Assessment: Environmental Impacts, Risks and Human Health Hazards. *Applied Sciences*, vol. 13.
9. Tashakor M., Behrooz R.D., Asvad S.R., Kaskaoutis D.G. (2022). Tracing of Heavy Metals Embedded in Indoor Dust Particles from the Industrial City of Asaluyeh, South of Iran. *International Journal of Environmental Research and Public Health*, vol. 19.

10. Thangavel P., Park D., Lee Y.-C. (2022). Recent insights into particulate matter (PM_{2.5})-Mediated toxicity in humans: An overview. *International Journal of Environmental Research and Public Health*, vol. 19.
11. United States Environmental Protection Agency, Exposure Assessment Tools by Routes - Inhalation Available online: <https://www.epa.gov/expobox/exposure-assessment-tools-routes-inhalation>.

DISTINCT FLAVORS OF EL-NIÑO IDENTIFIED IN TOTAL CLOUD COVER VARIABILITY

Petru Vaideanu^{1,2}, *Monica Ionita*², *Mirela Voiculescu*³ and *Norel Rimbu*²

¹Faculty of Physics, University of Bucharest, 077125 Măgurele, Romania
e-mail: Vaideanu.Petru@yahoo.com

²Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, 27570, Bremerhaven, Germany
e-mail: Monica.Ionita@awi.de, Norel.Rimbu@awi.de

³Department of Chemistry, Physics and Environment, University "Dunărea de Jos", 800008, Galati, Romania
e-mail: Mirela.Voiculescu@ugal.ro

In this study, we focus on isolating and quantifying the influence of Pacific climate modes on total cloud cover (TCC) variability. Employing reliable satellite observations and state-of-the-art reanalysis outputs spanning the period from 1979 to 2020, we investigate the two primary modes of annual TCC variability, which exhibit significant loadings over the Pacific basin and account for the majority of variance in satellite TCC data. We observe that both Eastern Pacific (EP) El Niño-Southern Oscillation (ENSO) and the Central Pacific (CP) ENSO climate modes significantly influence TCC variability. Moreover, their impact is amplified by two positive feedback mechanisms. These findings could provide insights for future model investigations, enabling more accurate projections of coupled TCC-SST variability responses to the CP and EP ENSO.

Acknowledgements.

Petru Vaideanu was financed by the project PN-III-P1-1.1-PD-2021-0505, Ctr.PD22/2022, CLIMATICFOOTPRINTS, of the Romanian UEFISCDI.

ONE YEAR OF OBSERVATIONS AT THE RADO-GALATI REXDAN REMOTE SENSING STATION

*Mirela Voiculescu*¹, *Daniel Constantin*¹, *Adrian Rosu*¹, *Iulian Alin Rosu*¹

¹"Dunarea de Jos" University of Galati, REXDAN R.I., Faculty of Sciences and Environment
e-mail: Mirela.Voiculescu@ugal.ro, Daniel.Constantin@ugal.ro, Adrian.Rosu@ugal.ro, alin.iulian.rosu@gmail.com

A new cloud remote sensing station has been set up last year in Galati, SE of Romania, part of the REXDAN – UGAL research center, aiming at being part of the ACTRIS European Infrastructure that observes clouds, aerosols and atmospheric trace gases. The station is equipped with three instruments, which started to work synergistically as a cloud observation platform in the beginning of February 2022: cloud radar, multichannel microwave radiometer and ceilometer. Data from this new cloud monitoring station is fed to CLOUDNET. We present here observations of clouds, vertical temperature profiles, boundary layer, acquired with these new instruments for one year, i.e. between 1.03.2022 and 1.03.2023. We also investigate how these compare to model prediction of vertical distribution of clouds.

Acknowledgements.

We acknowledge the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, contract no. 309/10.07.2020.

ANALYSIS OF PM AND CARBONACEOUS AEROSOL MULTI-ANNUAL TRENDS AT THE RADO-BUCHAREST SITE

A.Dandocsi^{1,2}, J. Vasilescu¹, A. Ilie^{1,3}, D. Nicolae¹

¹National Institute of Research and Development for Optoelectronics INOE 2000, Magurele, Romania
e-mail: andrei.dandocsi@inoe.ro

²Faculty of Electronics, Telecommunications and Information Technology, Politehnica University of Bucharest, Bucharest, Romania

³Faculty of Geography, University of Bucharest, Bucharest, Romania.

Particulate matter (PM) is a mixture of particles, including black carbon (BC) which has been associated with detrimental health effects and significant warming effects (Elderbrock et al., 2023). This paper presents results of a 3-years campaign in a peri-urban area. The measurements of PM, including black and total carbon, were conducted using in-situ methods between 2020 to 2022 at the RADO Bucharest site in Măgurele, Romania. For PM mass concentrations across three fractions, the Environmental Dust Monitor EDM 180 instrument was utilized, following the EN12341:2014 European Standards. Additionally, measurements of black carbon and total carbon concentrations within the PM10 fraction were obtained using a TCA08 Total Carbon Analyzer (data for 2022 only) and an AE33 Aethalometer. The collected data underwent filtration and analysis using dedicated software, including the openair package tool, which is designed for air quality data studies (Carslaw and Beevers, 2013). BC and PM fractions retrieved suggest higher loadings during colder months and lower values in April-May.

Acknowledgements.

This work is supported by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, Action 1.1.3 Creating synergies with H2020 Programme, project Strengthen the participation of the ACTRIS-RO consortium in the pan-European research infrastructure ACTRIS, ACTRIS-ROC, MYSMIS code 107596 (ctr. no.337/2021), and by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05 and through Program 1- Development of the national research-development system, Subprogram 1.2 - Institutional performance - Projects to finance the excellent RDI, Contract no.18PFE/30.12.2021.

References:

1. Evan Elderbrock, Alexandra G. Ponette-González, Jenna E. Rindy, Jun-Hak Lee, Kathleen C. Weathers, Yekang Ko (2023). Modeling black carbon removal by city trees: Implications for urban forest planning. *Urban Forestry & Urban Greening*, 86 (128013), <https://doi.org/10.1016/j.ufug.2023.128013>
2. Carslaw, David & Beevers, Sean. (2013). Characterising and understanding emission sources using bivariate polar plots and k-means clustering, *Environmental Modelling & Software*, 40, 325 - 329. <http://dx.doi.org/10.1016/j.envsoft.2012.09.005>.

MOBILE MAPPING OF AIR POLLUTION IN BUCHAREST

A. Ilie^{1,2}, J. Vasilescu¹, A. Dandocsi^{1,3}, D. Nicolae¹, O.G. Tudose⁴

¹ National Institute of Research and Development for Optoelectronics INOE 2000, Magurele, Romania

² Faculty of Geography, University of Bucharest, Bucharest, Romania

³ Faculty of Electronics, Telecommunications and Information Technology, Politehnica University of Bucharest, Bucharest, Romania

⁴ SC INOESY SRL, Iasi, 707410, Romania

High concentrations of particulate matter, including nanoparticles, pose health risks, as highlighted by Zereini (2010). Bucharest, Romania, with a population of 2.1 million and surface of 240 km² (INSSE, 2023), faces considerable air pollution, notably PM and gases high levels. This paper presents preliminary results of the RI-URBANS campaign organized in Bucharest Jan.-Feb. 2023. Mobile monitoring was made for ultrafine particles, particulate matter (PM₁₀, PM_{2.5}, PM₁), and gases (NO₂), covering 100 km route, across diverse urban environment: rush hours, main roads, residential, industrial areas. Data were collected with two instruments: Naneos Partector 2, a nano-particle counter and Soarability Sniffer 4D V2, a particle and gaze counter. The analyzed

data provides results about: sources, population exposure along roads, variances attributed to traffic, and north-south disparities. Ultrafine particles reach a mass concentration of up to 36.6 $\mu\text{g}/\text{m}^3$, and NO_2 reaches a maximum of 16.4 ppb, predominantly in the western and central areas of the city.

Acknowledgement

This work is supported by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, Action 1.1.3 Creating synergies with H2020 Programme, project Strengthen the participation of the ACTRIS-RO consortium in the pan-European research infrastructure ACTRIS, ACTRIS-ROC, MYSMIS code 107596 (ctr.no.337/2021); the RI-URBANS project (Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial Areas, European Union's Horizon 2020 research and innovation program, Green Deal, European Commission, contract 101036245) and by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05 and through Program 1- Development of the national research development system, Subprogram 1.2- Institutional performance - Projects to finance the excellent RDI, Contract no.18PFE/30.12.2021.

References:

1. Zereini, F., & Wiseman, C. L. (2010). Urban airborne particulate matter. *Environ. Sci. Eng.*. http://dx.doi.org/10.1007/978-3-642-12278-1_27.
2. National Institute of Statistics, <https://insse.ro/cms/en>, 2023

CAL/VAL OF THE EARTHCARE MISSION EMPOWERED BY ACTRIS

D. Nicolae¹, L. Belegante¹, V. Nicolae¹, G. Ciocan^{1,2}

¹ National Institute of Research and Development for Optoelectronics INOE 2000, Magurele, Romania
e-mail: nnicol@inoe.ro

² Faculty of Physics, University of Bucharest, Bucharest, Romania

EarthCARE (Cloud, Aerosol, and Radiation Explorer) is the largest and most complex Earth Explorer to date. It is scheduled to launch in 2024 and will utilize high-performance lidar and radar technology with the goal of delivering unprecedented datasets that will allow scientists to study the relationship between clouds, aerosols, and radiation with a level of precision that will significantly enhance our understanding of these highly variable parameters. To validate EarthCARE's relatively short and complex mission, a ground-based network of correlative datasets is urgently needed (EarthCARE European Mission Advisory Group, 2021). The concept requires careful planning, collaboration among established infrastructure members such as ACTRIS with its standardised metadata, customised products, and rigorous quality control and intercalibration. ACTRIS has developed a pilot project to make use of the access to research infrastructures for a coordinated response to these needs. It involves fixed observation stations, central laboratories, data centre and, based on opportunity, mobile platforms. Main activities considered are: preparation for the tools and plans for validation; preparation for data acquisition and rapid processing; pre-launch network rehearsal campaign with fast data delivery; post-launch validation with Near Real Time data delivery; intercalibration with other networks and instruments contributing to Cal/Val.

Acknowledgements.

This work is supported by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, Action 1.1.3 Creating synergies with H2020 Programme, project Strengthen the participation of the ACTRIS-RO consortium in the pan-European research infrastructure ACTRIS, ACTRIS-ROC, MYSMIS code 107596 (ctr.no.337/2021), by the ATMO - ACCESS Integrating Activity under grant agreement No 101008004, and by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05.

References:

1. EarthCARE European Mission Advisory Group (2021). 2nd ESA EarthCARE Cal/Val Workshop Report. EC-RP-ESA-SYS-1229.

FIVE-YEAR ANALYSIS OF AEROSOL OPTICAL PROPERTIES AND DOMINANT TYPES OVER MAGURELE, ROMANIA

G. Ciocan^{1,2}, A. Nemuc¹, D. Nicolae¹

¹National Institute of Research and Development for Optoelectronics INOE 2000, Magurele, Romania

e-mail: gabriela.ciocan@inoe.ro

²Faculty of Physics, University of Bucharest, Bucharest, Romania

Atmospheric aerosols play a significant role in Earth's radiative budget (Tomasi et al. 2017). Their impact on meteorology, air quality, climate, ecosystem and human health depends on the geographic distribution, nature and seasonality of their sources (Ramanathan et al. 2001). This study presents a five-year analysis of aerosol optical properties for the RADO Magurele site, located southwest of Bucharest. Measurements were conducted using the CIMEL Electronique CE318 multiband sunphotometer, a component of the AEROSOL ROBOTIC NETWORK (AERONET). The selected data comprises daily averages of quality level 2.0 for direct sun measurements and level 1.5 for inversion products. This data spans from January 2018 to December 2022. Notably, elevated Aerosol Optical Depth (AOD) values, measured at 500 nm, within the range of 0.25 to 0.39 are observed during summer months, contrasting with lower values of 0.07 to 0.1 during winter months. This recurring pattern throughout the timeframe suggests a seasonal fluctuation of this parameter. Additionally, the results consistently indicate an Angstrom Exponent exceeding values of 1 across all years. This points to the prevalence of fine particles, a conclusion substantiated by the volume size distribution analysis. Further investigation during the classification of dominant aerosol types supports these findings.

Acknowledgements.

This work is supported by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, Action 1.1.3, and by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05 and through Program 1- Development of the national research development system, Subprogram 1.2 - Institutional performance - Projects to finance the excellent RDI, Contract no.18PFE/30.12.2021.

References:

1. Tomasi, C., Fuzzi, S., & Kokhanovsky, A. (Eds.). (2017). Atmospheric aerosols: life cycles and effects on air quality and climate. John Wiley & Sons.
2. Ramanathan, V. C. P. J., Crutzen, P. J., Kiehl, J. T., & Rosenfeld, D. (2001). Aerosols, climate, and the hydrological cycle. *science*, 294(5549), 2119-2124

APPLICATION OF MOBILE MAPPING SYSTEM FOR GEOSPATIAL DATA ACQUISITION

Arseni Maxim¹, Roman Octavian², Rosu Adrian¹, Calmuc Madalina³, Calmuc Valentina Andreea³, Iticescu Catalina¹, Georgescu Puiu Lucian¹

¹ "Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, REXDAN Research Infrastructure, 800201 Galati, Romania

e-mail: maxim.arseni@ugal.ro; Adrian.rosu@ugal.ro; catalina.iticescu@ugal.ro; lucian.georgescu@ugal.ro

² "Dunarea de Jos" University of Galati, Cross-Border Faculty of Humanities, Economics and Engineering, REXDAN Research Infrastructure, 800201 Galati, Romania

e-mail: octavian.roman@ugal.ro

³ "Dunarea de Jos" University of Galati, REXDAN Research Infrastructure, 800201 Galati, Romania

e-mail: madalina.calmuc@ugal.ro; valentina.calmuc@ugal.ro

Currently, the problem of acquiring geospatial data quickly and accurately is becoming more and more relevant. Fast topographic measurements help to solve some tasks, such as planning and automation of managerial decision-making processes; improving the quality and reliability of the initial data for project design; accurate and fast cadastre; the development of integrated traffic management schemes, as well as the creation of the infrastructure for the circulation of unmanned

vehicles. A specific set of initial data is required to solve each problem, while the data must be reliable, as objective as possible, and up-to-date. Thus, it is necessary to introduce and use tools that allow for obtaining reliable initial geospatial data in a short period. Currently, laser scanning is one of the most productive ways to collect large volumes of spatial data. The point cloud obtained from laser scanning is, in fact, a digital copy of the object, which makes it possible to further analyze the data in office conditions. The main purpose of this study is to present a fast mobile scanning method by using a mobile mapping system. The results show that the use of a mobile laser scanner leads to the improvement of the topographical results, the acquisition of a large volume of data, and the improvement of activity efficiency compared to the classical methods of topographical measurements.

Acknowledgements.

The present article was supported by the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021.

References:

1. Elhashash, M., Albanwan, H., & Qin, R. (2022). A review of mobile mapping systems: From sensors to applications. *Sensors*, 22(11), 4262. <https://doi.org/10.3390/s22114262>
2. Qiu, Z., Martínez-Sánchez, J., Brea, V. M., López, P., & Arias, P. (2022). Low-cost mobile mapping system solution for traffic sign segmentation using Azure Kinect. *International Journal of Applied Earth Observation and Geoinformation*, 112, 102895. <https://doi.org/10.1016/j.jag.2022.102895>
3. Chaithavee, S., & Chayakul, T. (2022). Classification of 3D Point Cloud Data from Mobile Mapping System for Detecting Road Surfaces and Potholes using Convolution Neural Networks. *International Journal of Geoinformatics*, 18(6). <https://doi.org/10.52939/ijg.v18i6.2455>

WIND AND TURBULENCE STATISTICS AT MĂGURELE USING DOPPLER WIND LIDAR MEASUREMENTS

R. Pîrloagă^{1,2}, M. Adam¹, A. Ilie^{1,3}, B. Antonescu^{2,4}, S. Andrei¹

¹ National Institute of Research and Development for Optoelectronics—INOE 2000, Măgurele, Romania
e-mail: razvan.pirloaga@inoe.ro

² Faculty of Physics, University of Bucharest, Măgurele, Romania

³ Faculty of Geography, University of Bucharest, Bucharest, Romania

⁴ National Institute for Earth Physics, Măgurele, Romania

This study presents wind and turbulence statistics obtained for the first time in Romania using a Doppler wind lidar located at the Măgurele Center for Atmosphere and Radiation Studies (MARS), 8 km southwest of Bucharest. Measured data was analysed for the period December 2019–November 2021 on a seasonal and diurnal basis. The study shows that horizontal wind speed presents a similar pattern during all seasons: lowest values during the daytime, highest values during the nighttime, and a clear increase in speed values with respect to altitude. Horizontal wind direction presents significant variations for each season. Autumn shows similarities with the summer season, with prevailing directions from east and northeast, while the winter season is characterized by westerly winds. The most variable diurnal wind direction is observed during summer, with nighttime westerly winds and changing directions (from northeast to west) during daytime. The results were compared with ERA5 reanalysis data which shows similar patterns for wind direction and speed, although slightly underestimated.

Acknowledgements.

This work is supported by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05, and through Program 1- Development of the national research development system, Subprogram 1.2 - Institutional performance - Projects to finance the excellent RDI, Contract no.18PFE/30.12.2021 and CCCDI-UEFISCDI (Project No. PN-III-P2-2.1-PED-2021-1938 ctr. nr.713PED/30.06.2022) within PNCDI III. Bogdan Antonescu acknowledge the project the ClimExRo project (DG-2209-64717) funded by the European Climate Foundation.

References:

1. Manninen, A.; Marke, T.; Tuononen, M.; O'Connor, E. Atmospheric Boundary Layer Classification With Doppler Lidar. *J. Geophys. Res. Atmos.* 2018, 123, 8172–8189.
2. Ortiz Amezcua, P.; Martínez-Herrera, A.; Manninen, A.; Pentikäinen, P.; O'Connor, E.; Guerrero-Rascado, J.; Arboledas, L. Wind and Turbulence Statistics in the Urban Boundary Layer over a Mountain–Valley System in Granada, Spain. *Remote Sens.* 2022, 14, 2321.
3. Manninen, A. HALO Lidar Toolbox. Available online: https://github.com/manninenaj/HALO_lidar_toolbox (accessed on 1 February 2023)
4. Hersbach, H.; Bell, B.; Berrisford, P.; Hirahara, S.; Horányi, A.; Muñoz-Sabater, J.; Nicolas, J.; Peubey, C.; Radu, R.; Schepers, D.; et al. The ERA5 global reanalysis. *Q. J. R. Meteorol. Soc.* 2020, 146, 1999–2049.

DID AEROSOL PROPERTIES IN THE LOWER ATMOSPHERE CHANGED IN THE LAST 5 YEARS? A STUDY IN SOUTH-EAST ROMANIA

V. Nicolae¹, L. Belegante¹, G. Ciocan^{1,2}, D. Nicolae¹

¹ National Institute of Research and Development for Optoelectronics INOE 2000, Magurele, Romania
e-mail: victor.nicolae@inoe.ro

² Faculty of Physics, University of Bucharest, Bucharest, Romania

Multi-wavelength polarisation lidars have emerged as highly effective instruments for measuring the particle backscattering within the Earth's atmosphere (Nicolae et al., 2010). The comprehensive statistical analysis in this study encompassed the time frame from 2015 to 2020, wherein a total of 453 datasets acquired at the RADO-Bucharest ACTRIS station situated in Magurele were examined. Each dataset corresponded to a distinct aerosol layer exhibiting substantial aerosol loading. The multiwavelength profiles were utilized to calculate the layer intensive optical parameters. These parameters were then averaged for the lower troposphere and independently for the upper troposphere. The optical properties of aerosols in the two vertical regions are compared, considering the entire period as well as each individual season and year within that period. It is noteworthy that the years 2015 and 2016 exhibited elevated values of the Ångström exponent. The years spanning from 2017 to 2020 have exhibited a notable trend of diminished linear particle depolarization ratios across both the lower and upper regions of the troposphere, with a marginal upturn in 2019. The lidar ratio at wavelengths of 532 and 355 nm exhibits a consistent and marginal decline, along with a corresponding decrease in the Angstrom exponent. This observation suggests that the particles under investigation have grown in size compared to previous years and possess reduced absorption properties.

Acknowledgements.

This work is supported by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, Action 1.1.3 Creating synergies with H2020 Programme, project Strengthen the participation of the ACTRIS-RO consortium in the pan-European research infrastructure ACTRIS, ACTRIS-ROC, MYSMIS code 107596 (ctr.no.337/2021), by the Program 1 - Development of the national research development system, Subprogram 1.2 - Institutional performance - Projects to finance the excellent RDI, Contract no.18PFE/30.12.2021, and by the Core Program within the Romanian National Research Development and Innovation Plan 2022-2027, carried out with the support of MCID, project no. PN 23 05.

References:

1. Nicolae, D., Talianu, C., Trickl, T., Tatarov, B., Nakane, H., Sugimoto, N., Serikov, I., Rizi, V., Iarlori, M., Pelon, J., Flamant, P., Spinhirne, J. (2010). Recent Advances in Atmospheric lidars. INOE Publishing House, ISSN 1584-5508, 2010

FIRST TIME DATA REUNION FOR REXDAN'S RAPID-E+DEVICE ON AEROSOL MONITORING

*Simona Condurache-Bota^{1, 2, *}, Mirela Voiculescu^{1, 2}, Puiu-Lucian Georgescu^{1, 2}, Catalina Iticescu^{1, 2}, Daniel-Eduard Constantin^{1, 2}, Adrian Rosu^{1, 2}*

¹"Dunarea de Jos" University/Faculty of Sciences and Environment, Chemistry, Physics and Environment Department, Galati, Romania
e-mail: scondurache@ugal.ro

² “Dunarea de Jos” University/REXDAN research infrastructure - Integrated system for research and complex monitoring of the environment in the area of the Danube River, Climate Change Observation Platform (POSC Fix), Galati, Romania
e-mail: scondurache@ugal.ro

Automatic measurements for aerosols, in general and for bioaerosols, in particular, is a must for real-time air quality assessment. One reason is to be able to warn the sensitive population in case of dangerous pollution episodes, such as allergenic pollen during the flowering periods of different species. Another reason is to establish the range of aerosols of different sizes in a certain region as compared to the limit levels, such as proper measures can be taken by the policymakers regarding the pollution sources. Rapid-E+ is the most advanced device for real-time aerosol monitoring, based on laser scattering and fluorescence of individual particles. The REXDAN project (An Integrated System for the Complex Research and Monitoring of the Environment in the Danube River Area) brilliantly achieved the creation of a top of the line research center containing a Rapid-E+ device created by Plair, Switzerland. This paper presents a one year reunion of data from the REXDAN's Rapid-E+ device for general aerosol monitoring differentiated by 4 size classes. Sums, averages and maximas were computed, compared and analyzed for their trends. The data show a specific evolution along the seasons. The 0.3 and 0.5 micrometers aerosol measurements correlate very well with the PM_{2.5} values from the city monitoring network.

Acknowledgements.

DINAMIC Project - Excellence and involvement in intelligent development based on research and innovation at the Lower Danube University in Galati - title in Romanian (UDJG); project code: 12PFE/30.12.2021

References:

1. Azad, S., Luglio, D.G., Gordon, T., Thurston, G., & Ghandehari, M. (2023). Particulate matter concentration and composition in the New York City subway system. *Atmospheric Pollution Research*, 14(6), 101767. <https://doi.org/10.1016/j.apr.2023.101767>.
2. Nazneen, Patra, A.K., Kolluru, S.S.R., Dubey, R. & Kumar, S. (2023). Determinants of traffic related atmospheric particulate matter concentrations and their associated health risk at a highway toll plaza in India. *Atmospheric Pollution Research*, 14(6), 101778, <https://doi.org/10.1016/j.apr.2023.101778>.
3. Šaulienė, I., Šukienė, L., Daunys, G., Valiulis, G., Vaitkevičius, L., Matavulj, P., Brdar, S., Panic, M., Sikoparija, B., Clot, B., Crouzy, B., & Sofiev, M. (2019). Automatic pollen recognition with the Rapid-E particle counter: the first-level procedure, experience and next steps. *Atmospheric Measurements Techniques*, 12, 3435–3452, <https://doi.org/10.5194/amt-12-3435-2019>.
4. Tešendić, D., Boberić Krstićev, D., Matavulj, P., Brdar, S., Panić, M., Minić, V., & Šikoparija, B.. (2022). RealForAll: real-time system for automatic detection of airborne pollen, *Enterprise Information Systems*, 16(5), 1793391. <https://doi.org/10.1080/17517575.2020.1793391>.
5. Wang, S., Liu, G., Yi, M., Huang, X., Zhang, H., & Hong, X. (2022). The characteristics of particulate matter during an air pollution process revealed by joint observation of multiple equipments. *Atmospheric Pollution Research*, 13(8), 101487, <https://doi.org/10.1016/j.apr.2022.101487>.
6. Wang, Z., Calderón, L., Patton, A.P., Sorensen Allacci, M., Senick, J., Wener, R., Andrews, C.J. & Mainelis, G. (2016). Comparison of real-time instruments and gravimetric method when measuring particulate matter in a residential building. *Journal of Air Waste Management Association*, 66(11), 1109-1120. <https://doi.org/10.1080/10962247.2016.1201022>.

BENCHMARKING SEVERAL MACHINE LEARNING CLASSIFICATION ALGORITHMS FOR LAND USE/LAND COVER IN DANUBE DELTA (2013-2023) USING MULTISPECTRAL AND SYNTHETIC APERTURE RADAR DATA

*Marian Necula*¹, *Mihaela Păun*^{2, 3}

¹ Bucharest University of Economic Studies, Doctoral School in Economic, Cybernetics and Statistics, Bucharest, Romania

e-mail: neculamarian18@stud.ase.ro

² University of Bucharest, Faculty of Business and Administration, Department of Applied Economics and Quantitative Analysis, Bucharest, Romania

e-mail: mihaela.paun@faa.unibuc.ro

³ Bioinformatics Department, National Institute for R & D for Biological Sciences, 296 Independenței Bd., Bucharest, 060031, Romania

e-mail: mihaela.paun@incdsb.ro

Land use and land cover time series data for continuous monitoring of dynamic river sea systems is an important asset for researchers and policy makers. The paper explores the performance, in terms of ten performance classification metrics (Grandini et al., 2020), of several machine learning classification algorithms (Maxwell et al., 2018) applied on multispectral (Landsat 8/9 and Sentinel 2) and SAR (Sentinel 1) data to provide an algorithm ranking, relative to wetlands monitoring, and a viable time series product of land use and land cover that spans the area of Danube Delta for the past ten years (2013-2023).

Acknowledgements.

This work was carried out through the Core Program within the National Plan for Research, Development and Innovation 2022-2027, carried out with the support of MCID, SAFEMAPS project no. 23020301, Contract no. 7N/2023.

References:

1. Grandini, M., Bagli, E., & Visani, G. (2020). Metrics for Multi-Class Classification: An Overview. <https://doi.org/10.48550/ARXIV.2008.05756>
2. Maxwell, A. E., Warner, T. A., & Fang, F. (2018). Implementation of machine-learning classification in remote sensing: An applied review. *International Journal of Remote Sensing*, 39(9), 2784–2817. <https://doi.org/10.1080/01431161.2018.1433343>

AIR POLLUTION MONITORING USING UAV SENSORS VERSUS HIGH END MONITORS

Adrian Roşu¹, Daniel-Eduard Constantin¹, Mirela Voiculescu¹, Cătălina Iticescu¹, Lucian Puiu Georgescu¹

¹University “Dunarea de Jos” of Galati, Research Infrastructure REXDAN, Galati, Romania
e-mail: adrian.rosu@ugal.ro

Air pollution in large urban environments has become a very suffocating problem where often can be found trace gas emissions sources such as the intensified car traffic and local industry embedded into the city's boundaries. The need to know the level of air quality in cities implied using low-cost compact and mobile air quality monitoring systems. In our study we performed and tested a compact UAV air quality system against traditional air quality monitors based on standardized methods, all the equipment was deployed in the same place at the research facility REXDAN located on one of the most important roads of Galati city. The study aims to test the UAV air quality system to find if it's stable and if it can be used for high-resolution studies for trace gases such as NO₂, SO₂, O₃, PM by comparing recorded data with with standard equipments that can measure one trace gas per equipment.

Acknowledgements.

This work was supported by the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021.

A PREDICTIVE APPROACH FOR GROUND OZONE CONCENTRATION IN THE SOUTH EASTERN AREA OF EUROPE USING NUMERICAL METHODS

Gabriel Murariu^{1,2}, Iulian Racovita¹, Ionut Marin¹, Adrian Rosu^{1,2}, Romica Cretu¹, Lucian Georgescu¹

¹Dept. of Chemistry, Physics and Environment, Faculty of Sciences and Environment, University "Dunarea de Jos" of Galati, 47 Domneasca Street, 800080, Galati, Romania
e-mail: gmurariu@ugal.ro

² The Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area - REXDAN

The study of the dynamics and the recording of the ozone (O₃) concentration level in the lower layers of the atmosphere is a topical problem. Recent research shows a significant negative influence on people's health. Based on the data of continuous observation of surface ozone

concentrations from a number of 51 automatic air monitoring stations that are part of the national network, the variations could be highlighted temporal and spatial of O₃ concentration. Also, the stored data allowed the evaluation and study of the relationships between ozone concentration values and other atmospheric and meteorological factors as NO₂, NO_x, SO₂, etc. Thus, with the help of factorial ANOVA methods, the dynamics and spatial variability of the ozone concentration during the period 2017-2022 were investigated. The results showed the following aspects: there is definitely a seasonal, monthly and diurnal variability of the ozone concentration ($p < 0.05$). The local linear statistical models obtained by including 6 study parameters, offer an accuracy of at least 87.0% for each monitoring point. The concentrations of O₃ in the suburban and urban areas were higher than in the areas where the background level was recorded. The seasonal variation of O₃ concentrations was evident, in the order summer > spring > autumn > winter and was similar in the vast majority of monitoring points, being nevertheless notable differences between the values recorded in neighboring areas. The monthly variation curve showed a bimodal pattern, in which the highest values appeared in May and July, while the lowest values appeared in December. It could be demonstrated that higher temperature is a necessary synoptic condition for ozone pollution in the study area. Considering the existence of significant correlations between ozone concentration, temperature, relative humidity and atmospheric pressure, we were able to propose an automatic numerical calculation module using non-linear RLS and ANN interpolation methods to be able to build distribution maps for average monthly, annual or daily values. The results obtained were superior to those obtained based on linear statistical models and are comparable to those obtained in the literature.

References:

1. Gagliardi, R. V.; Andenna, C. A Machine Learning Approach to Investigate the Surface Ozone Behavior. *Atmosphere* 2020, 11 (11), 1173. <https://doi.org/10.3390/atmos11111173>.
2. Huzlík, J.; Hegrová, J.; Effenberger, K.; Ličbinský, R.; Brtnický, M. Air Quality in Brno City Parks. *Atmosphere* 2020, 11 (5), 510. <https://doi.org/10.3390/atmos11050510>.
3. Brandao, R.; Foroutan, H. Air Quality in Southeast Brazil during COVID-19 Lockdown: A Combined Satellite and Ground-Based Data Analysis. *Atmosphere* 2021, 12 (5), 583. <https://doi.org/10.3390/atmos12050583>.
4. Tian, J.; Fang, C.; Qiu, J.; Wang, J. Analysis of Pollution Characteristics and Influencing Factors of Main Pollutants in the Atmosphere of Shenyang City. *Atmosphere* 2020, 11 (7), 766. <https://doi.org/10.3390/atmos11070766>.
5. WHO | Reducing global health risks through mitigation of short-lived climate pollutants
<http://www.who.int/phe/publications/climate-reducing-health-risks/en/> (accessed May 28, 2021).
6. Zhamsueva, G.; Zayakhanov, A.; Teydypov, V.; Dementeva, A.; Balzhanov, T. Spatial-Temporal Variability of Small Gas Impurities over Lake Baikal during the Forest Fires in the Summer of 2019. *Atmosphere* 2021, 12 (1), 20. <https://doi.org/10.3390/atmos12010020>.
7. Zhang, Y.; Zhao, Y.; Li, J.; Wu, Q.; Wang, H.; Du, H.; Yang, W.; Wang, Z.; Zhu, L. Modeling Ozone Source Apportionment and Performing Sensitivity Analysis in Summer on the North China Plain. *Atmosphere* 2020, 11 (9), 992. <https://doi.org/10.3390/atmos11090992>.
8. Virghileanu, M.; Săvulescu, I.; Mihai, B.-A.; Nistor, C.; Dobre, R. Nitrogen Dioxide (NO₂) Pollution Monitoring with Sentinel-5P Satellite Imagery over Europe during the Coronavirus Pandemic Outbreak. *Remote Sensing* 2020, 12 (21), 3575. <https://doi.org/10.3390/rs12213575>.
9. Cromar, K.; Gladson, L.; Jaimes Palomera, M.; Perlmutter, L. Development of a Health-Based Index to Identify the Association between Air Pollution and Health Effects in Mexico City. *Atmosphere* 2021, 12 (3), 372. <https://doi.org/10.3390/atmos12030372>.
10. Ren, S.; Stroud, C. A.; Belair, S.; Leroyer, S.; Munoz-Alpizar, R.; Moran, M. D.; Zhang, J.; Akingunola, A.; Makar, P. A. Impact of Urbanization on the Predictions of Urban Meteorology and Air Pollutants over Four Major North American Cities. *Atmosphere* 2020, 11 (9), 969. <https://doi.org/10.3390/atmos11090969>.
11. Zhang, T.; Xu, X.; Su, Y. Impacts of Regional Transport and Meteorology on Ground-Level Ozone in Windsor, Canada. *Atmosphere* 2020, 11 (10), 1111. <https://doi.org/10.3390/atmos11101111>.
12. Constantin D. E., A. Merlaud, M. Van Roozendaal, M. Voiculescu, C. Fayt, F. Hendrick, G. Pinardi and L. Georgescu, Measurements of Tropospheric NO₂ in Romania Using a Zenith-Sky Mobile DOAS System and Comparisons with Satellite, Observations, *Sensors*, 13, 3922-3940; doi:10.3390/s130303922, 2013
13. Moreda-Piñeiro, J.; Sánchez-Piñero, J.; Fernández-Amado, M.; Costa-Tomé, P.; Gallego-Fernández, N.; Piñeiro-Iglesias, M.; López-Mahía, P.; Muniategui-Lorenzo, S. Evolution of Gaseous and Particulate Pollutants in the Air: What Changed after Five Lockdown Weeks at a Southwest Atlantic European Region (Northwest of Spain) Due to the SARS-CoV-2 Pandemic? *Atmosphere* 2021, 12 (5), 562. <https://doi.org/10.3390/atmos12050562>.
14. Schuch, D.; Andrade, M. de F.; Zhang, Y.; Dias de Freitas, E.; Bell, M. L. Short-Term Responses of Air Quality to Changes in Emissions under the Representative Concentration Pathway 4.5 Scenario over Brazil. *Atmosphere* 2020, 11 (8), 799. <https://doi.org/10.3390/atmos11080799>.
15. Fang, C.; Wang, L.; Wang, J. Analysis of the Spatial-Temporal Variation of the Surface Ozone Concentration and Its Associated Meteorological Factors in Changchun. *Environments* 2019, 6 (4), 46. <https://doi.org/10.3390/environments6040046>.

EFFECT OF URBAN STORMWATER RUNOFF ON RIVER WATER QUALITY; CASE STUDY IN NORTHEAST POLAND

Katarzyna Glińska-Lewczuk¹, Ewelina Pochdyla¹, Igor Cretescu²

¹University of Warmia and Mazury in Olsztyn, Department of Water Management and Climatology, Plac Łódzki 2, Olsztyn, Poland
e-mail: kaga@uwm.edu.pl

²“Gh.Asachi” Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Department of Environmental Engineering and Management
e-mail: icre@tuiasi.ro

The present study is related to the disturbances problems produced by the progressive increasing of urbanization in some areas located in the frame of large cities. Among these disturbances could be mention: the modification of the hydrological cycle by decreasing the impermeable areas, as well as the damage of the native vegetation. Typical examples of such area are these related to the public roads and parking places, which cannot effectively absorb and purify rainwater. As a result of precipitation, the atmospheric deposition, including the atmospheric pollutants, reach the surface water ecosystems, mainly rivers and lakes, and therefore collects pathogens, heavy metals, sediments and chemical pollutants, which are further transmitted to downstream, towards rivers, lakes, and finally they reach the sea water. Pollutants are not purified naturally unless they are infiltrated. The aim of the present study was to show the changes in storm water quality at several locations along the rainfall runoff in a 30 ha urban sub-catchment located in the city center of Olsztyn (North East Poland). The sampling of water was carried out every season from 7 locations, which also included direct runoff of precipitation. The following water quality indicators were determined: pH, specific conductance, dissolved organic matter, total dissolved solids (TDS), turbidity, as well as concentrations of heavy metals such as Cu(II), Cr(total), Fe(total), Ni(II), Zn(II) and Pb(II). The measurement results showed that as the rainwater runoff from the urban sub-catchment has significantly higher values for TDS, the turbidity and heavy metal concentrations are higher, as well. The highest concentrations of heavy metals were found in storm sewers and surface runoff locations, indicating that urbanization and increased impervious pavement were major sources of heavy metal pollution. This study highlights the importance of storm water quality monitoring in urban catchments, especially during rainfall runoff.

Acknowledgements.

Project financially co-supported by the Polish Minister of Education and Science in the range of the program entitled "Regional Initiative of Excellence" for the years 2019-2023, Project No. 010/RID/2018/19, amount of funding 12.000.000 PLN.

INFLUENCE OF HYDROLOGICAL CONNECTIVITY ON THE HEAVY METALS CONCENTRATION IN WATER AND BOTTOM SEDIMENTS OF COASTAL LAKES

Krzysztof Obolewski¹, Katarzyna Glińska-Lewczuk², Igor Cretescu³

¹Kazimierz Wielki University, Department of Hydrobiology, al. Powstańców Wielkopolskich 10 85-090 Bydgoszcz, Poland
e-mail: obolewsk@ukw.edu.pl

²University of Warmia and Mazury in Olsztyn, Department of Water Management and Climatology, Plac Łódzki 2, Olsztyn, Poland
e-mail: kaga@uwm.edu.pl

³“Gh.Asachi” Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Department of Environmental Engineering and Management
e-mail: icre@tuiasi.ro

A case study related to polish costal lakes is presented aimed to point out the influence of hydrological connectivity on the concentration of different metallic elements found in their water

and bottom sediments. Natural diversity of intermittently closed and open lakes depends on mutual interactions of several factors such as:

- (i) an impact of sea water and land background;
- (ii) temporary meteorological situation;
- (iii) hydrological conditions;
- (iv) the shape of lake basin.

However, some regional, local or even sudden impacts including anthropogenic ones create their final ecological status. To identify heavy metals risk assessment in ICOLLs located in Polish coastline wide range of them were determined in water and bottom sediment samples collected in 10 water reservoirs. Multidimensional data set of 20 variables was explored by the use of chemometrics according to seasonality (Spring, Summer, Autumn), sample type (water, sediment) and level of isolation (fully isolated, partially and fully connected lakes). The results showed that 70.5% and 77% of the data variance can be explained by the use of principal component analysis for waters and sediments, respectively. Waters of fully isolated or partially connected lakes are more abundant with elements such as Ir, Nd and Sm, while less abundant with Pr and Sr. Bottom sediments taken from Jamno lake show significant contamination by heavy metals of the highest environmental concern such as: Cr(III and VI), Cu(II), Ni (II), Ti(III and IV) and Zn(II).

Acknowledgements.

This project was financed under the program of the Polish Minister of Science and Higher Education under the name "Regional Initiative of Excellence" in 2019 – 2023 projects number 008/RID/2018/19 and 010/RID/2018/19 (amount of funding 12.000.000 PLN)

APPLIED STATISTICAL METHODS IN ENVIRONMENTAL SCIENCE

*Drasovean Romana¹, *, Murariu Gabriel¹*

¹"Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, Galati, Romania;
e-mail: rdrasov@ugal.ro, Gabriel.Murariu@ugal.ro.

Statistical methods have experienced rapid development in recent decades.

Statistical analysis is also essential for the field of environmental sciences because it enables understanding environmental problems, assess trends of various magnitudes, and contribute to the research and development of potential solutions to the problems that arise.

The applications of statistical methods to the environmental sciences are many and varied. Around the world, politicians and decision makers are calling for new statistical tools to understand the state the environment.

This paper presents some basic elements of descriptive and inferential statistics.

In order to be able to choose a certain method or several methods to analyze an environmental situation, it is important to know a series of statistical methods. For this purpose, some of the most used statistical methods in the fields of air quality and water resources are briefly reviewed.

References:

1. Giberta, K., Izquierdod, J., Sánchez-Marrà, M., Hamilton, S., Rodríguez-Rodag, I. & Holmesi, G. (2018), Which method to use? An assessment of data mining methods in Environmental Data Science, Environmental Modelling & Software, Volume 110, 3-27.
2. The Framework for the Development of Environment Statistics (FDES) 2013 (2017). United Nations Publication, New York.
3. Drasovean, R., Murariu, G. (2021), Water Quality Parameters and Monitoring Soft Surface Water Quality Using Statistical Approaches, Promising Techniques for Wastewater Treatment and Water Quality Assessment, Intechopen, Moujadin A. and Kevin Summers J., editor), 217. DOI: 10.5772/intechopen.97372

EXPOSING URBAN HEAT ANOMALIES: THERMAL PATTERN ASSESSMENT ACROSS SIX CITIES IN NORTH- EASTERN ROMANIA USING LANDSAT SERIES IMAGERY

Stefanel-Claudiu Cretu^{1,3}, Lucian Sfica², Pavel Ichim², Vlad-Alexandru Amihaesei^{1,4}, Iuliana-Gabriela Breaban²

¹Doctoral School of Geosciences, Department of Geography, Faculty of Geography and Geology, Alexandru Ioan Cuza University of Iasi, Romania

²Department of Geography, Faculty of Geography and Geology, Alexandru Ioan Cuza University of Iasi, Romania

³Active Interventions in Atmosphere, Bucharest, Romania

⁴National Meteorological Administration, Romania

This study presents a comprehensive exploration of Land Surface Temperature (LST) analysis using thermal imagery from the Landsat series (4, 5, 7, 8) within six urban areas located in north-eastern Romania (Iasi, Bacau, Botosani, Suceava, Piatra Neamt, and Vaslui) spanning the years 1988 to 2021. Employing a spatial and temporal approach, we utilize the concept of a space-time cube to visualize and analyze spatiotemporal data. Our analysis employs diverse methodologies, including time-series analysis, integrated spatial and temporal pattern analysis, as well as 2D and 3D visualization techniques. The creation of the space-time cube serves as the foundation for our investigations, enabling the application of various analytical tools to comprehensively understand the aggregated data. Among the key tools utilized, the Emerging Hot Spot Analysis tool identifies statistically significant trends of LST hot and cold spots over time. This tool uncovers evolving, persistent, intensifying, or sporadic LST hot spot patterns at distinct time intervals. Concurrently, the Local Outlier Analysis tool, another essential component, identifies clusters of high or low LST values and detects outliers that exhibit statistically distinct characteristics compared to their spatial and temporal neighbors. Additionally, Time Series Clustering and Change Point Detection tools are employed for our analyses. In conjunction with the LST analysis, we integrate the assessment of Local Climate Zones (LCZs) using the LCZ Generator – an online platform that facilitates the mapping of cities into distinct LCZ categories. The fusion of these two datasets enriches our understanding of thermal patterns, which holds importance for sustainable urban development and effective climate adaptation strategies. Anticipated outcomes include a comprehensive spatial distribution map illustrating hot and cold spots within urban areas. This map, coupled with our findings, will offer valuable insights into phenomena such as the Surface Urban Heat Island (SUHI) effect, localized thermal anomalies, and potential correlations with land use, vegetation cover, imperviousness, and building density.

Acknowledgements.

This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2021-0882, within PNCDI III.

AIR POLLUTION MONITORING USING MOBILE PLATFORMS

Daniel-Eduard Constantin¹, Adrian Roşu¹, Mirela Voiculescu¹, Cătălina Iticescu¹, Lucian Puiu Georgescu¹

¹University Dunarea de Jos of Galati, Research Infrastructure REXDAN, Galati, Romania

e-mail: Daniel.Constantin@ugal.ro

In this work we present air pollution measurements over the city of Galati using mobile platforms. The measurements were performed on the Summer- Fall of 2023 in Galati city, Romania. To carry out the experiments the mobile laboratory for environmental observation within the project REXDAN was used, also an Unmanned Aerial Vehicle (UAV) was deployed. Remote sensing and monitoring equipment were used. The measurements focused on a few gases that are usually determined by environmental protection agencies. These gases are nitrogen dioxide (NO₂) and ozone(O₃). Nitrogen dioxide and tropospheric ozone are trace gases that are formed close to ground

having as the main source the anthropic activities. These gases are toxic being irritant to the lungs, eyes and negatively influences the circulatory system.

Acknowledgements.

This work was supported by the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021

FROM THUNDERSTORM TO TORNADOES: UNPACKING ROMANIA'S SURGE IN SEVERE WEATHER

Bogdan Antonescu

University of Bucharest, Faculty of Physics, Măgurele, Romania/ Future Climate Research, București, Romania.
e-mail: antonescu.bogdan@gmail.com

Unlike the temperature, for example, long-term time series of convective storms producing lightning, abundant precipitation, intense wind, and tornadoes are complicated to obtain. These storms require the presence of an observer and the existence of a system to collect and verify the data. Even if pan-European datasets of convective storms currently exist (for example, the European Severe Weather Database), these datasets are limited in time. An alternative is to analyse the changes in the large-scale environment supporting the formation and evolution of these storms. Thus, the changes in the frequency of the occurrence of convective storms in Romania were analysed in this study based on the ERA5 reanalysis dataset for the period 1940–2022. Three types of storms were considered: thunderstorms, severe thunderstorms, and tornadic thunderstorms. For each storm, different criteria were applied based on, for example, convective available potential energy, the presence of convective precipitation, and vertical wind shear. The results show that the number of hours with conditions supporting thunderstorms and severe thunderstorms has increased in Romania, in particular in the eastern and southeastern parts of the country. This trend can be attributed to increased atmospheric instability. These results have implications for various sectors, including agriculture, infrastructure, and emergency management. Increased frequency and intensity of thunderstorms can lead to crop damage, soil erosion, and flooding, affecting agricultural productivity. Infrastructure such as buildings, roads, and power lines may also be at risk of damage from strong winds, hail, and heavy rainfall associated with severe thunderstorms. Additionally, emergency management agencies need to be prepared for the potential increase in severe weather events and develop strategies to effectively respond and minimise the impact on the population and the economy.

THE STUDY OF THE TRANSITION TO CLIMATE NEUTRALITY BASED ON EUROPEAN GREEN ECONOMY DEVELOPMENT MODELS

*Zlati Monica Laura*¹

¹Dunărea de Jos University, Faculty of Economics and Business Administration, Business Administration Department, Galati, Romania
e-mail: monica.zlati@ugal.ro

The axiological question of our certification is whether achieving carbon neutrality is feasible given the existing constraints of economic development and climate change. Our aim is to examine the policy measures envisaged at EU level to assess the impact of innovation on the green economy and quality of life. The main objectives of this study are: To assess the extent to which policy implementation in Member States influences the R&D process, and to propose potential models for promoting the green economy in Europe. The methods used in this study are mainly empirical and analytical. These methods are based on a comprehensive review of existing literature,

econometric modelling techniques, trend synthesis and forecasting. These approaches involve extensive data processing and the use of SPSS statistical software. The results include the formulation of development models related to the green economy at both European and national levels. To conclude, this study provides a valuable contribution to the early identification of vulnerabilities that could potentially affect progress towards climate neutrality by developing the European green economy.

Section 2. Water and Soil Sciences. Ecology. Genetics. Ichthyology.

SPIRULINA (ARTHROSPIRA PLATENSIS VAR TOLIARA): A SUSTAINABLE SOLUTION FOR ENVIRONMENTAL CHALLENGES AND NUTRITION

Antonio Fidimirina Telesphore¹, Valerie Lalao Razafindratovo Andriamanamisata¹, Andreea Veronica Botezatu², Rodica Dinică², Bianca Furdui^{2*}

¹University of Antananarivo, Faculty Sciences and Technology, Department of Food Science and Nutrition, Antananarivo, Madagascar

e-mail: fidimirina.telesphore@gmail.com

²"Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, Galati, Romania

e-mail: bfurdui@ugal.

The world needs a more adapted solution to the depletion of natural fisheries and forestry resources, and to the pollution caused by the overproduction and over-exploitation of food resources, which has a significant impact on the environment and climate (Benton et al., 2021). With its exceptional protein-rich composition, spirulina represents a sustainable and environmentally-friendly alternative to conventional sources of animal protein. This research highlights the implications of spirulina's unique nutritional and phytochemical profile for addressing environmental challenges and its potential contributions. In this study, *Arthrospira platensis* var Toliara was chartered to demonstrate its nutritional profile and functional properties. Physico-chemical and functional analyses were carried out on spirulina dry biomass. The results confirmed the protein richness of the microalgae, ranging from over 40%. Phytochemical screening of the powder extracts showed the presence of significant phenolic and flavonoid compounds. By promoting the cultivation and consumption of spirulina, we can reduce the pressure on the agricultural industry, thereby limiting deforestation and greenhouse gas emissions associated with intensive livestock farming.

Acknowledgements.

The authors gratefully acknowledge to the Francophony University Agency (AUF) and Romania Government for the Eugen Ionescu mobility programme

References:

1. Benton, T. G., Carling Bieg, Harwatt, H., Wellesley, L., & Pudasaini, R. (2021). Food system impacts on biodiversity loss: Three levers for food system transformation in support of nature. *Energy, Environment and Resources Programme*, 1-71. <https://doi.org/10.13140/RG.2.2.34045.28640>

MONITORING THE VEGETATION OF HALIDES ON SALTED SOILS IN THE NEIGHBOURHOOD OF MURIGHIOL IN THE CONTEXT OF CLIMATE CHANGES

Mamut, F. A.¹, Tusa, I. M.¹, Sidoroff, M.¹, Paraschiv, M.¹, Mamut, E.², Presura, A.²

¹National Institute of R&D for Biological Sciences, Bucharest, Romania

e-mail: filis.mamut@incdsb.ro, iris.tusa@incdsb.ro, manuela.sidoroff@incdsb.ro, maria.presura@incdsb.ro

²Black Sea Universities Network, Constanta, Romania

e-mail: emamut@bsun.org, apresura@bsun.org

The Danube Delta stands as one of Europe's most susceptible regions to climate change. With anticipated risks such as declining water levels on the Danube River side and a gradual rise in sea levels, the entire hydrological landscape of the Delta is expected to undergo significant transformations. These changes will likely impact the concentrations of pollutants flowing in from the river side and the salt concentration with the inputs from the sea side. Consequently, essential processes, may undergo profound shifts as a result, both in aquatic and related soils.

Numerous communities are currently grappling with inadequate freshwater supply and depletion of the quality of the farming lands, and the region is exceptionally vulnerable, lacking the necessary adaptive capacity to cope with the impacts of climate change. To address this pressing

issue, immediate implementation of a comprehensive masterplan is imperative, backed by well-informed, knowledge-based solutions.

The proposed paper is presenting the results of research activities carried out as part of a project funded by European Regional Development Fund through the Competitiveness Operational Program for Romania 2014–2020. The project aims to contribute and facilitate the use of Nature-based Solutions NbS, in the Danube Delta for enhancing the resilience to Climate Changes.

The paper includes the results of the following activities:

- Selection of types of halides that could be adapted to salted soils
- Monitoring the vegetation processes of selected samples of halides in the real conditions of salted soils located in the neighborhood of Murighiol
- Evaluation of different Multiscale and Multiphysics models for hierarchical and complex phenomena of vegetation of halides on salted soils
- Evaluation of the climate risk analysis methods and methodologies for resilience building in river-sea Deltaic Ecosystem.

Acknowledgements.

“Analysis of the potential for sustainable use of vegetation specific to the Danube-Danube Delta-Black Sea system” project, awarded by the European Regional Development Fund through the Competitiveness Operational Program 2014–2020, contract no.108630

References:

1. Mamut, E., Paraschiv, M., Sidoroff, M., Presura, A., (2023) Digital Twin Application for Monitoring the Impact of Climate Change on the Eutrophication and Biofiltration of the Danube River Waters in the St. George Branch, Int. Conf “Natural Hazards and Climate Change”, Szeged, Hungary.
2. Mamut, E., Paraschiv, M., Sidoroff, M., Presura, A., Mamut, F. A., (2023) Multicriteria & Multiscale Methods on Sustainable Development in the context of Climate Change - ARSINOE Project, „Deltas & Wetlands” DDNI Scientific Event Community, 30-th edition Deltas & Wetlands International Symposium, Tulcea, Romania.

ICHTHYOFAUNA OF THE PRUT RIVER ECOSYSTEM IN TERRITORIAL LIMITS OF THE REPUBLIC OF MOLDOVA

Dumitru Bulat¹, Denis Bulat¹, Elena Zubcov¹, Laurenția Ungureanu¹, Lucia Bilețchi¹

¹Institute of Zoology, Moldova State University, 1, Academiei Street, MD-2028, Chisinau, Republic of Moldova.

The Prut River is a transboundary river, which cross the territory of Ukraine, Romania and Republic of Moldova and discharges into the Danube River at about 164 km from de Danube mouth. The investigations carried out in 2010-2023 in the Prut River ecosystems within territorial limits of the Republic of Moldova revealed an ichthyofauna consisting of 62 species from 13 orders and 22 families: Petromyzontiformes, with Petromyzontidae family (1 species), Acipenseriformes, with Acipenseridae family (2 species), Clupeiformes, with Clupeidae family (1 species), Salmoniformes, with Salmonidae family (1 species), Esociformes, with Esocidae family (1 species), Umbridae family (1 species), Cypriniformes, with Cyprinidae family (4 species), Xenocyprididae family (3 species), Tincidae family (1 species), Acheilognathidae family (1 species), Leuciscidae family (15 species), Gobionidae family (4 species), Nemacheilidae family (1 species), Cobitidae family (6 species), Siluriformes, with Siluridae family (1 species), Gadiformes, with Lotidae family (1 species), Perciformes/Gasterosteoides, with Gasterosteidae family (2 species), Sygnathiformes, with Sygnathidae family (1 species), Perciformes/Percoidei, with Percidae (7 species), Gobiiformes, with Gobiidae family (6 species), Odontobutidae family (1 species), Centrarchiformes, with Centrarchidae family (1 species).

Species structure is dominated by Cypriniformes (56.45%), followed by Perciformes (11.29%) and Gobiiformes (11.29%). The effects of climate change, expressed through long-term droughts followed by massive floods on extensive areas, caused a more active spread of species from various piscicolous areas within the Danube basin. A new species was identified in the Prut River in 2010 – *Gymnocephalus baloni* (Holcık & Hensel, 1974). Later, in 2015, the species *Benthophilus nudus* (Berg, 1898) was recorded for the first time in the Prut River, and in 2022 – *Rutilus virgo* (Heckel,

1852). The obvious biological progression of Gobiidae species in last decades is an alarming sign related to the stability of native ichthyocenoses. The analysis of the flow, spatial, trophic and reproductive preferences of fish denoted that most of them are eurytopic, benthic, omnivorous, lithophilic or phytophilic.

Analyze of the data on the ichthyofauna of the Prut hydrographic basin (within the territorial limits of the Republic of Moldova) in a multi-annual aspect revealed an insignificant increase in the number of species – from 55 species in 1976-1977 to 62 species in the recent study. This fact is explained, on the one hand, by the active processes of secondary self-expansion and anthropochoric translocation, which led to the artificial enrichment of species diversity, and on the other hand, the artificial increase in ichthyofaunal diversity was compensated by the disappearance or decimation of the populations of some native stenobiotic species (Bulat, 2019).

Acknowledgements.

The investigations were carried out within the framework of the project no. 20.80009.7007.06 AQUABIO (State Program 2020-2023, Republic of Moldova) and EU funded projects MIS ETC 1676 INPOLDE, BSB165 HydroEcoNex, BSB 27 MONITOX.

PHYSICO-CHEMICAL CHARACTERISTICS OF THE WATER COLUMN IN THE WESTERN BLACK SEA

Muşat Teodor-Alexandru¹, Balan Sorin Vasile¹, Vasiliu Dan-Lucian¹, Lupaşcu Naliana¹, Rădulescu Florina¹, Buşe Andra¹, Florea Daniela¹

¹National Research-Development Institute for Marine Geology and Geoecology - GeoEcoMar
e-mail: teodormusat@geoecomar.ro

This paper investigates the physical and chemical characteristics of the water column in the western Black Sea. The data used in this analysis was collected between 2010 and 2022 by NIRD GeoEcoMar, on board the R/V Mare Nigrum, using a CTD SBE 25 equipment.

Permanent halocline, located at depths between 50m and 150m, is the layer of water that shows a significant increase in salinity with depth (0.0.3 PSU/m). This layer plays a crucial role in the vertical stratification of the water column in the Black Sea, restricting ventilation of the lower layers, with consequences on the distribution of marine biodiversity. Our study highlighted seasonal changes in halocline position and thickness and identified possible causes of these variations, such as the influence of rivers intake and thermal regime.

Suboxic layer, separating the oxic zone ($O_2 > 20 \mu M$) from the anoxic zone (O_2 - undetectable), is an area specific to the water column where dissolved O_2 and H_2S coexist in low concentrations. The spatial extent and temporal variation of this suboxic layer were investigated, recognizing its importance in biogeochemical cycles and its impact on marine ecosystems.

The Cold Intermediate Layer (CIL) was defined in the 1990s as the layer of water bounded by the 8 °C isobath. This layer is formed in the northwest of the Black Sea during the winter period and has the role of refreshing the surface layers with nutrients. The position of this layer in the water column and the temperature value in its core can be indicators of climate change.

In conclusion, this paper brings new information about the physicochemical characteristics of the western Black Sea water column, highlighting the influence of recent climate changes in the overall functioning of the marine ecosystem.

Acknowledgements.

(framework of the Nucleus Program, projects, PN 19 20 01 02 Multidisciplinary research for improvement knowledge of the interaction between climate change and anthropic pressures and its effects on the Black Sea ecosystem and PN 23 30 01 03 Improving the monitoring program of the Romanian shelf of the Black Sea in order to increase the capacity to evaluate and predict the impact of multi-stressors on marine ecosystem services).

HEAVY METALS CONTAMINATION IN THE SURFACE SEDIMENTS OF THE NW BLACK SEA SHELF, ROMANIA

Andra Bucse^{1,2}, Dan Vasiliu¹, Naliana Lupascu¹, Sorin Balan¹, Daniela Florea¹, Teodor Musat¹, Florina Radulescu¹

¹ National Institute for Research and Development on Marine Geology and Geoecology –GeoEcoMar, 23-25 Dimitrie Onciul Str., 024053, Bucharest, Romania

² University POLITEHNICA of Bucharest, Faculty of Applied Chemistry and Material Science, 1-7 Gh. Polizu Street, 011061, Bucharest, Romania,
e-mail: andra.bucse@geoecomar.ro

The paper aims at assessing the heavy metal contamination of sediment samples collected from 30 stations within the Romanian shelf (NW Black Sea). Concentrations of seven trace metals Pb, Hg, Cr, Cu, Ni, As and Zn, were determined from surface sediments (0-2 cm depth) using some specific spectrometric techniques.

Higher values of Cr, Cu, Zn, Pb and Hg concentrations were determined in the Portița Bay (especially in the vicinity of the oil platforms), as well as in the stations in front of the mouths of the Sf. Gheorghe arms and Sulina. Also, Cu, Ni, As and Pb showed high concentrations along the Danube's plume direction. In the shallow waters of the Romanian southern coast, where direct anthropogenic influence on the coastal ecosystem is stronger, heavy metal concentrations did not show high values, except for stations located in front of Mangalia and Constanta ports, where higher concentrations of Cr were also noted.

Acknowledgements.

(framework of the Nucleus Program, projects, PN 19 20 01 02 Multidisciplinary research for improvement knowledge of the interaction between climate change and anthropic pressures and its effects on the Black Sea ecosystem and PN 23 30 01 03 Improving the monitoring program of the Romanian shelf of the Black Sea in order to increase the capacity to evaluate and predict the impact of multi-stressors on marine ecosystem services)

AMBIENT GAMMA DOSE RATE IN GALATI MUNICIPALITY

Antoaneta Ene¹

¹ "Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, INPOLDE research center, Galati, Romania
e-mail: aene@ugal.ro

The investigation of the level of environmental radioactivity and assessing the health risk of gamma-emitting radionuclides are of great importance in environmental management and evaluation of radiological hazards for population health and ecosystems. Taking into consideration the strong penetration power of gamma radiations, their measurement in the environmental compartments is considered as significant. The work highlights the results obtained for field measurements of the ambient gamma dose rate in selected sites of Galati municipality, SE Romania, and presents a comparison with outdoor reported values for other Romanian localities, legislated norms and world averages.

Acknowledgements.

The technical support was provided by the Rexdan Research Infrastructure, created through the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, contract no. 309/10.07.2020.

References:

1. Ene, A. (2021). Ionizing radiation in the environment – radiological risk. In: Ecotoxicological methodological guide for environmental monitoring: problematics, laboratory techniques and health risk investigation (Zubcov E., Ene A. – Eds.), Ed. Tipografia Centrala, Chisinau, pages: 97–111.

FIRST RECORD OF GAMBUSIA HOLBROOKI (EASTERN MOSQUITOFISH), AN INVASIVE FISH IN THE TUZLA LAKE, ROMANIA

Ana Bianca Pavel¹, Gabriel Iordache¹, Catalina Gavrilă^{1*}, George Tiganov²

¹ National Institute for Research and Development on Marine Geology and Geo-ecology- GeoEcoMar, 23-25 Dimitrie Onciul St, 024053 Bucharest, Romania

Corresponding author e-mail: catalina.gavrila@geoecomar.ro

² National Institute for Marine Research "Grigore Antipa", Constanta, Romania

The current study reveals the first record of *Gambusia holbrooki* (eastern mosquitofish), an invasive fish in the Tuzla Lake, Romania. The investigated area is located 150 m from the shore of the Black Sea and is adjacent to Lake Techirghiol. The formation of the lake occurred due to human factors and was favored by natural factors. During the field campaigns carried out by NIRD GeoEcoMar in Lake Tuzla, in October 2022, a series of measurements and samples collection were carried out. The individuals of *Gambusia holbrooki* were found in the samples collected with the limnological net. The main objective of this contribution is the presentation of the first occurrence of the invasive species of eastern mosquitofish in Tuzla Lake. It is recognized as "a superior invader" due to the "invasiveness" characteristics of the species. It is important to monitor this species in Tuzla Lake to observe the impact on the rest of the fish populations, considering that this lake is used as a fish farm. In our current case, it is difficult to estimate the potential impact of *Gambusia holbrooki* in Lake Tuzla. Because there is no data on the fish population in the lake before it became a fish farm, it is difficult to say when the lake was populated with this species. One of the hypotheses of the introduction of this species into the lake would be when the stocking would have been done with the juvenile fish having accidentally arrived in the lake. It is important to monitor this species in the Tuzla Lake, to observe the impact on the rest of the fish populations, considering the history of this species. Even more, due to the fact that this lake is used as a fish farm.

Acknowledgements.

This work was carried out as part of the project "Analysis of the potential for sustainable use of vegetation specific to the Danube-Delta system Danube-Black Sea - D3MN" POC/78/1/2. The research leading to these results was supported by the Ministry of Education and Scientific Research - "Program Nucleu": 13N/08.02.2019 - PN19-20-04-01. The authors also thank the anonymous reviewers for all suggestions provided for improving the manuscript.

MEDIUM-TERM MANAGEMENT OF FOREST FUND IN GALATI COUNTY

Carmelia Mariana Bălănică Dragomir¹

¹"Dunărea de Jos" University of Galați, Domnească Street, no. 47, Galați, 800008, România

e-mail: carmelia.dragomir@ugal.ro

The conservation of forests implies the rational use of forest resources, in other words, the prevention or at the same time the limitation of harmful effects is extremely important taking into account the long-term supply of wood. This study analyzes the way in which the forest fund is managed in Galati county in the period 2017-2021 depending on the types of works, types of cuts as well as the evolution of the volume of harvested wood by ownership and species. The area of Galati County occupied by the forest fund is approx. 36500 ha, the percentage occupied by the area of the forest fund being 8.17%. The total area covered with cutting in 2017 was 6425 ha and 3961 ha in 2021. In 2017, 27.2 mc various soft species and 22.4 mc various hard species were cut, compared to 2021 were cut 29.2 mc various soft species and 16.4 various hard species.

References:

1. National Forest Administration- Romsilva, (2022). Annual report regarding the activity of the National Directorate of Forests-Romsilva for the year 2022, revised with the final financial results on 31.12.2022
2. MMAP. The National Forest Strategy 2030, (2022). Ministry of Environment, Waters and Forests: Bucharest, Romania, 2022. Available online: <http://www.mmediu.ro/categorie/strategia-nationala-a-padurilor-2022-2031/386> (accessed on 30 July 2023).

3. The Romanian Forest Research and Management Institute, "National Forest Inventory" <https://roifn.ro/site/rezultate-ifn-2/> (accessed on 25 July 2023).

THE EPIGEAN-HYPOGEAN CONTINUUM CONCEPT

*Octavian Pacioglu*¹

¹ National Institute of Research and Development for Biological Sciences, Bucharest, Romania
e-mail: octavian.pacioglu@incdsb.ro

Combining the most recent predictions of Ecological Stoichiometry and the Metabolic Theory of Ecology, the Epigean-Hypogean Continuum concept provides a theoretical framework aiming to explain the patterns observed along the surface–subterranean continuum in streams. It is predicted that the main factors constraining the structure and functioning of communities and food webs are the decline in the quantity and diversity of basal resources along this gradient, along with nutrients availability in water that affects food quality. With increasing availability of dissolved nutrients in water, sinking-cave streams are hypothesized to fluctuate between being N and/ or P co-limited to C-limited. Combined, the quantity, quality, and diversity of basal resources regulate subterranean aquatic communities through bottom–up mechanisms, reflected in a decreased flux of macronutrients through food webs. The consequences of these bottom–up effects are decreased abundance, biomass, secondary production, consumption rate, and mean body size of communities, together with potential increases in the elemental imbalance for macronutrients, omnivory, trophic position, and niche width and overlap among aquatic consumers along the surface–subterranean continuum. The bottom–up effects induce changes in the topology of stream food webs, which become shorter, with lower trophic diversity at the base of the network, but increased connectance along this environmental gradient.

Acknowledgements.

National Core Program—Romanian Ministry of Research and Innovation, Romania, Project SIA-PRO 23020101 and Romanian National Authority for Scientific Research and Innovation (UEFISCDI), Romania, Project Number PN-III-P1-1.1-TE-2021-0221.

References:

1. Pacioglu, O., Amărioarei, A., Duțu, L. T., Plăvan, G., Ițcuș, C., Plăvan, O., ... & Iwan Jones, J. (2021). The structure and functionality of communities and food webs in streams along the epigean–hypogean continuum: unifying ecological stoichiometry and metabolic theory of ecology. *Aquatic Sciences*, 83, 1-20.

SOIL-WATER SYSTEM MANAGEMENT FOR CONSERVATIVE AGRICULTURE

*Ana Virsta*¹, *Mirela Alina Sandu*¹

¹ University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Land Reclamation and Environmental Engineering, 59 Marasti Blvd, District 1, Bucharest, Romania

Soil is a dynamic living complex in which we find a balance between water, air, organic and inorganic particles and micro-organisms. Climatic conditions, agricultural exploitation and some of the agricultural techniques used have caused changes leading to imbalances such as: reduced fertility due to erosion and overcultivation, altered water regime, reduced biodiversity. The concept of conservative agriculture emerged almost a century ago, when the US and Canada experienced severe sandstorms in the 1930s, known as the Dust Bowl. As a result of aggressive dryland farming, drought and high winds caused massive erosion, culminating in 1934 when some 40 million hectares of land lost some or all its humus horizon. The term 'conservation agriculture' came much later, around 1990. Conservation agriculture means changing the way we think and act about farming. Conservation farming means that all plant residues from the land and from food preparation can be returned to the natural cycle, either for mulching or for composting. Considering the fact that in Romania the biodegradable fraction of waste is about 60%, the

advantage is twofold: on the one hand, we reduce the amount of waste sent to landfills, reaching a recycling rate of over 50%, and on the other hand, we enrich the soil structure with humus, whose benefits are undeniable. In some countries, conservation farming covers significant areas: over 30% in the USA, over 32% in Argentina, 52% in Paraguay, etc. In Romania, Conservation Farming - declared as such - is applied on about 100,000 ha by a group of 53 farmers in an association. Conservative agriculture is seen as an alternative to meet the need for increased agricultural production based on sustainable agricultural activities with the aim of increasing production and product stability, and the environment.

References:

1. Choden, T.; Ghaley, B.B. 2021. A Portfolio of Effective Water and Soil Conservation Practices for Arable Production Systems in Europe and North Africa. *Sustainability*.13, 2726. <https://doi.org/10.3390/su13052726>.
2. Löbmann, M. T.; Maring, L.; Prokop, G.; Brils, J.; Bender, J.; Bispo, A.; Helming, K. 2022. Systems knowledge for sustainable soil and land management. *Science of The Total Environment*. Vol 822. <https://doi.org/10.1016/j.scitotenv.2022.153389>.

DIVERSITY OF RHIZOBIA ASSOCIATED WITH MEDIC PLANTS (*MEDICAGO* SPP.) IN EASTERN ROMANIA

Andrei Ștefan¹, Jannick Van Cauwenberghe^{2,3}, Craita Maria Rosu⁴, Catalina Stedel⁴, Crystal Chan³, Ellen L. Simms³, Catalina Iticescu⁶, Emmanouil Flemetakis⁵, Rodica Catalina Efrose^{4,6*}

¹"Grigore Antipa" National Museum of Natural History, Bucharest, Romania

²Institute of Biodiversity, Faculty of Biological Sciences, Cluster of Excellence Balance of the Microverse, Friedrich-Schiller-University Jena, Jena, Germany

³Department of Integrative Biology, University of California, Berkeley CA, USA

⁴Department of Biotechnology, School of Food, Biotechnology and Development, Agricultural University of Athens, Athens, Greece.

⁵Department of Experimental and Applied Biology, NIRDBS-Institute of Biological Research Iași, Iași, Romania.

⁶Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, 'Dunarea de Jos' University of Galati, Romania

e-mail: rodica.efrose@icbiasi.ro

Nitrogen is essential for life on planet Earth, being part of nucleic acids, proteins, vitamins and signalling molecules across all biological kingdoms. Biological nitrogen fixation (BNF) is the process by which certain prokaryotes are able to incorporate inert atmospheric nitrogen gas into organic molecules. 'Rhizobia' is a collective term used to describe proteobacteria capable of fixing nitrogen while in symbiosis with plants of the Fabaceae family. In order to identify and characterize rhizobia able to nodulate cultivated and wildy-grown *Medicago* spp. plants, a polyphasic approach was employed. Partial barcoding of 16S rDNA was sufficient to discriminate the isolated rhizobia into four groups: *Sinorhizobium meliloti*, *S. medicae*, *Rhizobium leguminosarum* and *Mesorhizobium* sp. Further typing of the chromosomal genes (atpD, glnII, recA) and plasmid genes (nodA, nifH) increased the phylogenetic resolution. The discordant topologies between the chromosomal and nodA phylogenies suggest the acquisition of nodulation genes by *Mesorhizobium* sp. Through horizontal gene transfer. Only *S. meliloti* and *R. leguminosarum* were identified in the nodules of *Medicago sativa* while *M. falcata* hosted only *S. meliloti* and *Mesorhizobium* sp. *Medicago lupulina* was the only plant species to host all four identified rhizobial groups and the only one to host *S. medicae*, the rhizobia showing clear host-plant preference.

Acknowledgements.

This work was supported by the UEFISCDI PN-II-ID-PCE-2011-3-1011 funding grant (contract no: 292/5.10.2011), the Core-Program, within the National Plan for Research, Development and Innovation 2022-2027 (project no. 7N/23020402/2023) and the project ResPonSE, (contract no. 760010/30.12.2022), developed with the support of the Romanian Ministry of Research, Innovation and Digitalization, and by the project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, (contract no. 309/10.07.2021, SMIS code 127065).

ASSESSING THE MERCURY BIOACCESSIBILITY FROM FISH DURING COOKING AND CO-INGESTION

Ștefania-Adelina Milea^{1}, Nina-Nicoleta Lazăr¹, Ira-Adeline Simionov^{1,2}, Ștefan-Mihai Petrea^{1,2}, Mădălina Calmuc¹, Valentina Calmuc¹, Puiu-Lucian Georgescu^{1,3}, Cătălina Iticescu^{1,3}*

¹REXDAN Research Infrastructure, "Dunarea de Jos" University of Galati, George Coșbuc Street, 98, Galati, Romania
e-mail: adelina.milea@ugal.ro

²Dunărea de Jos University of Galati, Faculty of Food Science and Engineering, Domnească Street 111, 800201, Galati, Romania

³Department of Chemistry, Physics and Environment, Faculty of Science and Environment, "Dunarea de Jos" University of Galati, Romania, REXDAN Research Infrastructure

Previous research has found that directly discharging urban waste and agricultural chemicals into rivers influences aquatic ecosystems. Fish are essential to the human diet since they provide multiple health benefits. Metals are commonly accumulated in the fish body, which may afterward be ingested by human consumers and generate severe health issues. Fish consumption is the primary source of human mercury exposure. Nevertheless, there are substantial variations between the identified and anticipated mercury levels regarding bioavailability. In this study, the effects of different cooking methods and the co-ingestion of certain components on mercury bioaccessibility were examined. In vitro digestion model was used to determine the bioaccessible mercury percentage in fish. Following that, the impact of co-ingested food products on mercury levels in heat-treated fish was investigated. The antioxidant activity of several dietary components was studied as a possible sustainer of mercury bioaccessibility as the final objective of this research. These findings suggested that some nutrients and food processing methods may have an effective role in reducing the bioaccessibility of other chemical pollutants prevalent in food sources.

Acknowledgements.

Funding: This research was funded by Fondo Proserpina S.R.L., grant number 2506/2022, "The impact of heavy metals and microplastics from aquatic organisms on human health".

The technical support was provided by the REXDAN Research Infrastructure, the infrastructure created through the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/ 10.07.2020.

References:

1. Brodtkorb, A., Egger, L., Alminger, M., Alvito, P., Assunção, R., Ballance, S., & Recio, I. (2019). INFOGEST static in vitro simulation of gastrointestinal food digestion. *Nature Protocols*, 14(4), 991–1014. <https://doi.org/10.1038/s41596-018-0119-1>.
2. Tahity, T., Islam, M.R.U., Bhuiyan, N.Z., Choudhury, T.R., Yu, J., Noman, M.A., Hosen, M.M., Quraishi, S.B., Paray, B.A., & Arai, T. 2022. Heavy Metals Accumulation in Tissues of Wild and Farmed Barramundi from the Northern Bay of Bengal Coast, and Its Estimated Human Health Risks. *Toxics*, 10, 410. <https://doi.org/10.3390/toxics10080410>.
3. Anacleto, P., Barbosa, V., Alves, R. N., Maulvault, A. L., Bronze, M. R., & Marques, A. (2020). Green tea infusion reduces mercury bioaccessibility and dietary exposure from raw and cooked fish. *Food and Chemical Toxicology: An International Journal Published for the British Industrial Biological Research Association*, 145, 111717. <https://doi.org/10.1016/j.fct.2020.111717>
4. Jadán-Piedra, C., Vélez, D., & Devesa, V. (2018). In vitro evaluation of dietary compounds to reduce mercury bioavailability. *Food Chemistry*, 248, 353–359. <https://doi.org/10.1016/j.foodchem.2017.12.012>.

LONG-TERM DYNAMICS OF CHIRONOMIDAE FAUNA IN DANUBE DELTA LAKES: IMPLICATIONS FOR AQUATIC ECOSYSTEM HEALTH AND RECOVERY

Orhan Ibram^{1,2}, Maria Cătălina Topa², Adrian Burada¹, Lucian P. Georgescu², Cătălina Iticescu²

¹ "Danube Delta" National Institute for Research and Development, 165 Babadag Street, Tulcea – 820112, Romania
e-mail: orhan.ibram@ddni.ro

² "Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, 47 Domneasca Street, 800080, Galati, Romania
e-mail: catalina.topa@ugal.ro

Chironomidae, a widely distributed family of dipteran insects, plays a key role in aquatic ecosystems by serving as indicators of water quality through their larval stages. The Danube Delta, characterized by its extensive network of shallow lakes, natural channels, and man-made canals, stands as a significant biodiversity area, thus, the trophic state of the Delta's aquatic ecosystems experienced a notable increase during the early 1980s, leading to significant alterations in various biotic components.

This research aims to elucidate the complex long-term changes within the chironomid fauna composition across the Danube Delta lakes. To achieve this, we conducted a comprehensive investigation that mixes historical data from the 1950s (a reference era) and the 1980s (marking the onset of rapid eutrophication) with contemporary findings derived from an extensive survey. The survey encompassed six lakes and was conducted across three distinct seasons, resulting in the identification of 42 chironomid species.

Comparing the survey results to historical records revealed intriguing patterns. During the reference period, a total of 28 species were documented, with a mere 16 species overlapping with the present-day survey data. Notably, *Chironomus plumosus*, a dominant species during the hypertrophic period, emerged as a significant component in both the reference and contemporary datasets. This observation underscores the resilience and adaptability of certain chironomid species across dynamic environmental conditions.

Acknowledgements.

This work was supported by the project “An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, cofinanced by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021”.

PLASTICS - A POTENTIAL THREAT TO ENVIRONMENT, FOOD SECURITY, AND HEALTH

Nina-Nicoleta Lazăr¹, Mădălina Călmuc¹, Ștefania-Adelina Milea¹, Puiu-Lucian Georgescu¹, Cătălina Iticescu¹

¹“Dunărea de Jos” University of Galati, REXDAN Research Infrastructure, Galați, Romania
e-mail: nina.condurache@ugal.ro

Even though it simplifies life, the production and usage of plastic have environmental consequences that endanger the planet and all species existing on it. Annually, the Earth suffocates in enormous amounts of plastic – almost 370 million metric tons estimated to be wasted in 2020. While resilient to disintegration, the abrasion, UV light, or/and biodegradation of plastics, generate particles of different sizes and shapes that easily spread and reach any environment. Plastics are now common contaminants as a consequence. Each year a substantial quantity of plastic waste deposits in the soil. Since they can absorb particles on their surfaces or through their roots, plants act as entrance points for plastics in the trophic chain. Five grams of plastic per individual are estimated to be absorbed every week through food consumption, with some of these particles even reaching into the bloodstream. But plastic particles are also vectors for heavy metals and pathogenic microorganisms that, once introduced, impact both the plants and the human body. Recent studies show the negative effects of plastic particles on edible plants, as well as the quantities identified in certain fruits and vegetables on the market. This study reviews data from literature on the uptake and presence of microplastics in fruits and vegetables to provide a state of the art. However, to accurately and realistically estimate the levels of microplastics present in the edible plants we eat, more research is nonetheless required taking into count that at least 400 g of fruits and vegetables per day are recommended to sustain good health.

Acknowledgements.

The present study was supported by the project “An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area” REXDAN, SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021.

References:

1. Gan, Q., Cui, J., & Jin, B. (2023). Environmental microplastics: Classification, sources, fates, and effects on plants. *Chemosphere*, 313, 137559. <https://doi.org/10.1016/j.chemosphere.2022.137559>
2. Nutrition – Data and statistics. (n.d.). Retrieved February 1, 2023, from <https://www.who.int/europe/news-room/photo-stories/item/data-and-statistics>
3. Plastics—The Facts 2022 • Plastics Europe. (n.d.). Plastics Europe. Retrieved January 27, 2023, from <https://plasticseurope.org/knowledge-hub/plastics-the-facts-2022>

BACTERIAL COMMUNITIES ASSOCIATED WITH THE TUBE-DWELLING POLYCHAETE *MELINNA PALMATA* GRUBE, 1870 AND SEDIMENTS (STUDY CASE: ROMANIAN BLACK SEA SHELF)

Selma Menabit^{1,2}, *Paris Lavin*³, *Tatiana Begun*¹, *Mihaela Mureșan*¹, *Adrian Teacă*¹, *Cristina Purcarea*²

¹National Institute for Research and Development on Marine Geology and Geoecology-GeoEcoMar, 024053 Bucharest, Romania

²Department of Microbiology, Institute of Biology Bucharest of the Romanian Academy, 060031 Bucharest, Romania

³ Facultad de Ciencias del Mar y Recursos Biológicos, Departamento de Biotecnología, Universidad de Antofagasta, Antofagasta 1240000, Chile

Bacteria associated with marine invertebrate play a fundamental role in the biology, ecology and evolution of their hosts, being able to produce secondary metabolites with biotechnological and bioengineering applications. Although many studies have been focused on the microbial populations of benthic and pelagic habitats, our knowledge on bacteria colonizing tube-dwelling polychaetes is still lacking. Therefore, we provide a first characterization of *Melinna palmata*'s microbiome. Specifically, the main objective of our study was to assess the bacterial diversity, composition and functionality of polychaete *M. palmata* and its surrounding sediments from the Romanian Black Sea shelf, to highlight the extent to which the environment contributes to the enrichment of the species' microbiota. Our findings showed that tissues harbored a distinct bacterial diversity and composition compared to sediments, but no significant differences between communities along the depth gradient have been observed. In terms of abundance, Synechococcales, Rhodobacterales, Actinomarinales, Rhizobiales, Planctomycetales, Pirellulales, and Clostridiales orders dominated the tissues, while Microtrichales, Anaerolineales, Caldilineales and Campylobacterales were higher represented within sediments. The amino acid metabolism was the dominant function for bacteria of both analysed matrices, followed by genes involved in carbohydrate, energy, cofactors and vitamins metabolism, slightly increased within tissues. The current contribution will serve as a baseline for further research aimed to fully understand the diversity and functions of microbial communities associated with polychaetes.

Acknowledgements.

The study was financially supported by the Romanian Ministry of Research as part of the CORE Programme project PN 23300202.

ACCUMULATION AND DISTRIBUTION OF METALS IN DIFFERENT PARTS OF TWO AQUATIC PLANTS FROM DANUBE DELTA BIOSPHERE RESERVE

*Mihaela Cudalbeanu Dragoi*¹, *Maria Daniela Ionică Mihăilă*², *Mihaela Timofti*², *Bianca Furdui*², *Rodica Mihaela Dinică*²

¹ University of Agronomic Sciences and Veterinary Medicine of Bucharest, 011464 Bucharest, Romania
e-mail: mcudalbeanu@gmail.com

² University „Dunărea de Jos” of Galați, Department of Chemistry, Physics and Environment, Domnească street, nr. 111, 800201 Galați, România
e-mail: maria.mihaila@ugal.ro, mtimofti@ugal.ro, bfurdui@ugal.ro, rodica.dinica@ugal.ro

Nutrients are absorbed by plants mainly from the soil during growth and development processes, a process in which not only essential nutrients but also non-essential and even toxic elements are absorbed. Their accumulation in plants is influenced both by the type of plant and by the

characteristics of the environment. Also, the accumulation of these nutrients, essential and non-essential elements depend on the part of the plant (leaves, stems, flower or roots).

Studying the accumulation of these essential, non-essential or toxic elements is important to know the chemical, nutritional or toxic content of plants and at the same time helps to select plants capable of absorbing toxic elements to improve the quality of the environment.

This study aimed to quantitatively determine inorganic micro- and macronutrients, as well as heavy metals in selected aquatic plants from the Danube delta Biosphere Reserve. Different anatomical parts of aquatic plants, namely *Nymphaea alba* and *Iris pseudacorus* were analysed comparatively.

References:

1. Cudalbeanu, M.; Ghinea, I.O.; Furdui, B.; Dah-Nouvlessounon, D.; Raclea, R.; Costache, T.; Cuculea, I.E.; Urlan, F.; Dinica, R.M. Exploring New Antioxidant and Mineral Compounds from *Nymphaea alba* Wild-Grown in Danube Delta Biosphere. *Molecules* 2018, 23, 1247. <https://doi.org/10.3390/molecules23061247>.

PHENOLICS, FLAVONOIDS CONTENTS AND SECONDARY METABOLITES ISOLATED FROM VACCINIUM SECUNDIFLORUM (ERICACEA)

Mampionona Michela Rasoanirina^{1,3}, *Rodica Mihaela Dinica*², *Andreea Veronica Botezatu*², *Rivoarison Randrianasolo*¹, *Dimby Andrianina Ralambomanana*³

¹Université d'Antananarivo, Laboratoire de Chimie Analytique et de Formulation, Faculté des Sciences, Madagascar
e-mail: rmampiononamichela@gmail.com

²University „Dunărea de Jos” of Galați, Department of Chemistry, Physics and Environment, Domnească street, nr. 111, 800201 Galați, România
e-mail:rodica.dinica@ugal.ro

³Laboratoire de Produits Naturels et Biotechnologie, Faculté des Sciences, Université d'Antananarivo, Madagascar
e-mail: rmampiononamichela@gmail.com.

Malagasy flora is characterized by a high endemic biodiversity. During several year of study, research on the genus *Vaccinium* has shown very important scientific results in term of chemical composition and biological activities. An in-depth study has been carried out on the aerial parts of *Vaccinium secundiflorum*, an endemic plant from Madagascar, rich in flavonoids and polyphenols. In order to determine in which fractions there is a majority content of flavonoids and polyphenols, we determined the total polyphenols and flavonoids content of each fraction of our plant. The study on the dichloromethane fraction also allowed us to isolate some triterpenes such as oleanolic acid, ursolic acid; sterol by the chromatographic methods and the spectroscopic method. The results showed us that the majority of flavonoids and polyphenols are on the ethyl acetate fraction with rate 59.80 % for flavonoids and 46.91 % for polyphenols, while, 50.51 % of crude extract contains flavonoids and 45.02% of polyphenols.

Keywords: *Vaccinium*, plant, flavonoids, polyphenols, triterpenes, Madagascar.

Acknowledgements.

This work was funded by Agence Universitaire de la Francophonie (AUF) and Romania Government through Eugen Ionescu mobility program. Gratefully acknowledge to University Dunarea de Jos, Galati; Dr. Wendkouni Leila Marie Esther BELEM KABRE and Mr Chadhuilli Mzembaba.

References:

1. Tundis R., Tenuta M.C., Loizzo M. R., Marco Bonesi , Finetti, F., Trabalzini, L., Deguin, B., **2021**. *Vaccinium* Species (Ericaceae): From Chemical Composition to Bio-Functional Activities. *Appl. Sci.*, 11, 5655.

<https://doi.org/10.3390/app11125655>

2. Cazanevscaia Busuioc, A. , Costea, G.V., Botezatu Dediu, A.V., Furdui, B., Dinica.R.M. 2023. *Ucumis metuliferus* L. Fruits Extract with Antioxidant, Anti-Inflammatory, and Antidiabetic Properties as Source of Ursolic Acid. *Separations*, 10,274. <https://doi.org/10.3390/separations10050274>.

COMPARATIVE STUDY OF MICRO- AND MACRO-ELEMENTS IN THE LEAVES AND FRUITS OF SOME SPECIES FROM THE CURCUBIRACEAE FAMILY CULTIVATED IN THE DANUBE AREA

*Anna Busuioc*¹, *Andreea Veronica Botezatu*¹, *Valentina Călmuc*¹, *Mădălina Călmuc*¹, *Bianca Furdui*¹, *Rodica Mihaela Dinică*^{*1}

¹ University „Dunărea de Jos” of Galați, Department of Chemistry, Physics and Environment, Domnească street, nr. 111, 800201 Galați, România

e-mail: anna.cazanevscaia@ugal.ro, andreea.botezatu@ugal.ro, valentina.calmuc@ugal.ro, madalina.calmuc@ugal.ro, bfurdui@ugal.ro, rodica.dinica@ugal.ro

Micro- and macroelements are two categories of essential elements in plant life for growth and development. The elements are actively involved in processes such as photosynthesis, respiration, protein synthesis, carbohydrate metabolism and nutrient transport through plants.

Two types of plant materials, the fruits and leaves of the species *M. charantia*, *C. metuliferus*, and *B. hispida* which were adapted to cultivation in the area of the Danube basin, were analyzed by the ICP-MS technique. The fruits and leaves were oven-dried or freeze-dried.

Through the ICP/MS method, the presence of chemical elements with high values, such as potassium, calcium, magnesium and iron, was highlighted in all the analyzed species. The comparative study between the fruit and leaf samples, their composition differs. Thus, it was demonstrated that the plant material obtained from fruits has a higher content of micro and macro elements valid for all analyzed species.

References:

1. Busuioc, A.C.; Botezatu, A.V.D.; Furdui, B.; Vinatoru, C.; Maggi, F.; Caprioli, G.; Dinica, R.M. Comparative Study of the Chemical Compositions and Antioxidant Activities of Fresh Juices from Romanian Cucurbitaceae Varieties. *Molecules* 2020, 25, doi:10.3390/molecules25225468.

MULTICLASS PESTICIDE RESIDUES IN SURFACE WATER COLLECTED FROM MIDDLE AND LOWER COURSE OF OLT RIVER, ROMANIA

*Geana Elisabeta-Irina*¹, *Corina Teodora Ciucure*², *Livia Alexandra Dinu*²

¹ National Research and Development Institute for Cryogenics and Isotopic Technologies, Rm. Valcea, Romania
e-mail: irina.geana@icsi.ro

² National Institute for Research and Development in Microtechnologies (IMT Bucharest), Voluntari (Ilfov), Romania

The widespread application of pesticides in agriculture has led to greater disposal of pesticide residues in aquatic environments around the world. The chemical diversity of pesticides has evolved in recent decades, and the pesticides used today are generally more polar, less persistent and less negative impacts.

The present study aims to investigate the distribution of different pesticides classes in surface waters collected in September 2022 from the middle and lower course of Olt River, including the Olt River, reservoirs and major tributaries, in order to identify areas with potential ecological risk. For that, target analytical methods were applied in order to quantify organophosphorus, organophosphates, triazines, carbamates, acid herbicide and polar pesticides including glyphosate, its main metabolite aminomethylphosphonic acid and glufosinate by UHPLC-Orbitrap HRMS.

Target analysis of multiclass pesticide residues coupled with the multivariate statistical analysis of the data revealed the spatial distribution of the investigated pesticides along the middle and lower basin of the Olt River, thus allowing the detection of several contamination point sources associated with municipalities water treatment plants and agricultural activities. Among the studied pesticide classes, acid herbicides were quantified in higher amounts, higher concentrations corresponding to chloramben (24.66-252.87 µg/L) and 2,4,5-T (trichloro phenoxy acid) (2.09-343.40 µg/L). Monitoring programs are needed to assess the degree of pesticide pollution, as support for

the decision-making process and the development of measures to reduce the use of pesticides in agriculture.

Acknowledgements.

This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CCCDI - UEFISCDI, project number PN-III-P2-2.1-PED-2021-3279, within PNCDI III, c tr. 704PED/2022

ASSESSMENT OF HEAVY METALS CONTAMINATION OF SURFACE SEDIMENTS OF COSTINEȘTI LAKE

Florea Daniela¹, Bușe Andra¹, Vasiliu Dan-Lucian¹, Bălan Sorin¹, Lupașcu Naliana¹, Rădulescu Florina¹, Pavel Ana-Bianca¹, Iordache Gabriel¹

¹National Research-Development Institute for Marine Geology and Geoecology – GeoEcoMar, Constanta
e-mail: daniela.florea@geoecomar.ro

Top layer (0-2 cm) of the sediments were sampled in October 2022 from 11 sampling stations distributed within the coastal Lake Costinesti (Romania). Some heavy metals (Cu, Ni and Zn), as well as major components (CaCO₃ and TOC) were investigated in the surface sediments in order to assess the heavy metal pollution. The pollution level was estimated based on some indexes such as: the Contamination Factor (CF) and Geoaccumulation index (Igeo). The values of those indexes varied within 0.07 – 0.12 (Cu), 0.90 – 1.38 (Ni), 0.09 – 0.13 (Zn) for CF and - 4.40 – - 3.68 (Cu), - 0.74 – - 0.12 (Ni), - 4.11 – - 3.53 (Zn) for Igeo, showing a low level of metal pollution. The ecological quality assessment of Costinești Lake was determined based on the above-mentioned investigations complemented with the biological indices, indicating a good ecological status.

Acknowledgements.

This work was carried out as part of the project "Analysis of the potential for sustainable use of vegetation specific to the Danube-Delta system Danube-Black Sea - D3MN" POC/78/1/2. The research leading to their results was financed by the Ministry of Research and Innovation - "Program Nucleu" PN 19 20 04 02.

STUDY ON THE PRESENCE OF PHARMACEUTICAL RESIDUES IN THE LOWER DANUBE RIVER BASIN

Valentina Andreea Calmuc¹, Madalina Calmuc¹, Catalina Iticescu¹, Puiu Lucian Georgescu¹

¹REX DAN Research Infrastructure, "Dunarea de Jos" University of Galati, 98 George Cosbuc Street, 800385 Galati, Romania
e-mail: valentina.calmuc@ugal.ro

The Danube is the second longest river in Europe and flows into the Black Sea, where the Danube Delta is formed. Pollution of the Danube River with emerging pollutants is a topical issue in various fields of scientific research. The category of emerging pollutants includes the following classes of compounds: microplastics, pesticides, pharmaceuticals, personal care products, disinfection by-products, and perfluorinated compounds. In the present study, the occurrence of pharmaceuticals was analysed in surface waters sampled from different stations located in the Lower Danube Basin. The results obtained with the UHPLC-MS/MS equipment confirm that the most frequently detected pharmaceutical substances were caffeine (psychoactive stimulant), carbamazepine (anticonvulsant), metformin (antidiabetic), and sulfamethoxazole (antibiotic).

Acknowledgements.

The technical support was provided by the Rexdan Research Infrastructure, created through the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, contract no. 309/10.07.2020.

References:

1. Bayabil, H.K., Teshome, F.T., Li, Y.C., 2022. Emerging Contaminants in Soil and Water. *Front. Environ. Sci.* 10.
2. Geissen, V., Mol, H., Klumpp, E., Umlauf, G., Nadal, M., van der Ploeg, M., van de Zee, S.E.A.T.M., Ritsema, C.J., 2015. Emerging pollutants in the environment: A challenge for water resource management. *Int. Soil Water Conserv. Res.* 3, 57-65. <https://doi.org/10.1016/j.iswcr.2015.03.002>
3. József, T., Kiss, S., Muzslay, F., Máté, O., Stromájer, G., Stromájer-Rácz, T., 2023. Detection and Quantification of Pharmaceutical Residues in the Pest County Section of the River Danube. *Water* 15, 1755. <https://doi.org/10.3390/w15091755>
4. Kondor, A.C., Jakab, G., Vancsik, A., Filep, T., Szeberényi, J., Szabó, L., Maász, G., Ferincz, Á., Dobosy, P., Szalai, Z., 2020. Occurrence of pharmaceuticals in the Danube and drinking water wells: Efficiency of riverbank filtration. *Environ. Pollut.* 265, 114893. <https://doi.org/10.1016/j.envpol.2020.114893>

STUDY OF HEAVY MINERALS PRESENCE IN SEDIMENT SAMPLED FROM REPRESENTATIVE SECTORS FOR THE LOWER DANUBE RIVER

Florin Bogos¹, Albert Scricieiu¹

¹National Institute for Research and Development on Marine Geology and Geoecology-GeoEcoMar, Bucharest, Romania
e-mail: florin.bogos@geocomar.ro

The Romanian part of the Danube River is an important watercourse which plays a pivotal role in shaping the geomorphology and sediment dynamics of the surrounding regions. This study sought to examine the composition, distribution, and origin of heavy minerals in the sediments of the Lower Danube River. We aimed to uncover the geological mechanisms that have impacted the deposition and dynamics of sediment.

In total, 45 sediment samples from 5 predetermined sectors (Isaccea, Giurgiulești, Seimeni, Oltenița Aval and Oltenița Amonte) have been collected in the field campaign conducted in April of 2023.

Findings suggest the prevalence of several key heavy minerals, such as zircon, tourmaline, garnet, epidote, disthene, rutile, and amphiboles, among others. These minerals exhibit distinct morphologies and compositions, reflecting their diverse origins from both local and distant geological formations. By comparing the mineral assemblages in the sediments with potential source rocks and formations in the surrounding area, we intended to understand the contributions of various tributaries and geological formations to the sediment load of the Romanian sector of the Danube River.

According to the component concentrations of the heavy minerals found within our analyzed samples, it has been determined that the garnet-hornblende-disthene-epidote association is dominant. Most likely, the source rocks are represented by the metamorphic rocks of the Southern Carpathians, which contribute significantly through the left tributaries of the Danube.

The study emphasizes the need for continuous research to refine our understanding of sediment sources and transport patterns. It also underscores the importance of interdisciplinary approaches in addressing complex environmental challenges and guiding sustainable river management practices in the Romanian Danube basin.

Acknowledgements.

The study was financially supported by the Romanian Ministry of Research as part of the CORE Programme project PN 23300303 "Optimizarea gestionării durabile a resurselor naturale, creșterea securității apei și a rezilienței ecosistemelor din bazinul inferior al Dunării, afectat de schimbările climatice și intervențiile antropice".

GROUNDWATER CONTAMINATION WITH HYDROCARBONS IN AN OLD PETROLEUM PRODUCTS STORAGE

Cristian Mugurel Iorga¹, Maria Cătălina Țopa¹, Mihaela Marilena Stancu²

¹"Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, European Centre of Excellence for the Environment, Domneasca Street, no. 111, 80020

e-mail: cristian.iorga@ugal.ro; catalina.topa@ugal.ro

²Institute of Biology Bucharest of Romanian Academy, 296 Splaiul Independentei, 060031 Bucharest, Romania
email: mihaela.stancu@ibiol.ro

Along with the increase in the demand for petroleum products worldwide, the activity of the petroleum industry intensified, which resulted in the occupation of new land surfaces. Important quantities of petroleum hydrocarbons are spilled into the environment and pollute both the soil and the water (e.g., underground water) having a negative impact on the environment and on human health, too. Up to now various treatment strategies and technologies have been developed to remove such toxic organic compounds from the petroleum contaminated environment. As a result of the use of different remediation strategies the affected areas can be recovered and returned to their natural circuit. Using different microbiological methods four groups of bacteria (i.e. hydrocarbon-degrading, hydrocarbon-tolerant, heterotrophic bacteria, and enterobacteria) were detected in the analyzed underground water sample collected from an old petroleum products storage. The content of the petroleum products in the underground water was above the limit allowed by national and international environmental standards. The interaction of petroleum hydrocarbons with the environment significantly modifies the bacterial activity in contaminated sites. The study of the relationship between the indigenous bacteria capable to tolerate and degrade hydrocarbons and the concentration of petroleum hydrocarbons in the contaminated underground water could provide important information about the possibilities of mitigating the negative effects on the receptors and reducing the concentrations of the petroleum products pollutants.

Acknowledgements.

The study was funded by project no.769/2022 from the "Dunărea de Jos" University of Galati and project no. RO1567-IBB05/2022 from the Institute of Biology Bucharest of Romanian Academy

FLORISTIC DIVERSITY OF SOME MEDICINAL PLANTS USED IN TRADITIONAL MEDICINE IN BURKINA FASO

Armandine Lema^{1}, Mindiériba Jean Bangou¹, Andreea Veronica Botezatu², Rodica Mihaela Dinică²*

¹Nazi BONI University / Laboratory for Research and Education in Animal Health and Biotechnology (LARESBA) Bobo Dioulasso, Burkina Faso

e-mail: armandinelema26@gmail.com, feliciabangou@yahoo.fr

² University „Dunărea de Jos” of Galați, Department of Chemistry, Physics and Environment, Domnească street, nr. 111, 800201 Galați, România

e-mail: andreea.botezatu@ugal.ro,

Traditional medicine has been based since ancient times on the healing power associated with the biodiversity of the environment, its pharmacopoeia containing medicines obtained from herbs, bark, roots, minerals, animals and various materials found in nature. As a result, the exploration of plants and the preservation of ecosystem health have direct effects on human and global health. Today, the WHO estimates that about 80% of the world's inhabitants use traditional medicine for their primary health care. This study is part of the identification of medicinal plants used by the Burkinabe population to treat peptic ulcers. The approach technique was an ethnobotanical survey carried out among traditional healers. The information sought related on the one hand to the respondents and on the other hand to the local and scientific names of the medicinal plants as well as the organs used. This was a semi-structured interview with each traditional healer. At the end of the study, 290 traditional healers were surveyed with a predominance of the male sex, ie 69.66% of men against 30% of women. Similarly, 113 species of medicinal plants were identified in the different study cities. These species belong to 48 botanical families. The most represented families were those of Caesalpiniaceae (9 species) and those of Combretaceae (8 species). This study is a

very valuable source of information for subsequent research in the field of plant biodiversity in order to protect these species which occupy a primordial place in the environment.

Keywords: ethnobotanical survey, traditional healers, medicinal plants.

Acknowledgements.

The authors salute the frank and kind collaboration of the traditional healers who participated in the study.

References:

1. Lema A., Bangou MJ., Sawadogo M., Thiombiano HM., Ouoba YH. (2022). Medicinal plant recipes used in the management of peptic ulcers in Burkina Faso: ethnobotanical study. *International Journal of Science and Research Archive*, 06(01), 263-278. DOI: <https://doi.org/10.30574/ijrsra.2022.6.1.0133>.

ASSESSMENT OF THE MICROPLASTICS PRESENCE IN THE LOWER DANUBE WATER AND SEDIMENT

Madalina Calmuc¹, Valentina Andreea Calmuc¹, Maxim Arseni¹, Adrian Rosu¹, Nina-Nicoleta Lazar¹, Puiu-Lucian Georgescu¹, Catalina Iticescu¹

¹REXDAN Research Infrastructure, "Dunarea de Jos" University of Galati, 98 George Cosbuc Street, 800385 Galati, Romania

e-mail: madalina.calmuc@ugal.ro

Currently, microplastics are considered ubiquitous emerging pollutants in aquatic environments. Monitoring the presence of microplastics (MPs) in aquatic ecosystems is crucial due to their toxicity to the biota. Processes such as biofilms, adsorption, and accumulation of other pollutants determine the distribution of plastic fragments throughout the water column and in sediment. The present study assessed the presence of microplastics in the Lower Danube water at the surface, depth, and in sediment. The samples were processed and analyzed in the Spectrometry Laboratory within REXDAN Research Infrastructure from "Dunarea de Jos" University of Galati, Romania. The obtained results revealed the presence of plastic fragments of different shapes, sizes, colours, and compositions in all the samples collected.

Acknowledgements.

The technical support was provided by the REXDAN Research Infrastructure, created through the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, contract no. 309/10.07.2020.

References:

1. Franzellitti, S., Canesi, L., Auguste, M., Wathsala, R.H.G.R., Fabbri, E., (2019). Microplastic exposure and effects in aquatic organisms: A physiological perspective. *Environ. Toxicol. Pharmacol.* (68), 37–51. <https://doi.org/10.1016/j.etap.2019.03.009>
2. Wei, J., Chen, M., Wang, J., (2023). Insight into combined pollution of antibiotics and microplastics in aquatic and soil environment: Environmental behavior, interaction mechanism and associated impact of resistant genes. *TrAC Trends Anal. Chem.* (166), 117214. <https://doi.org/10.1016/j.trac.2023.117214>
3. Yang, L., Zhang, Y., Kang, S., Wang, Z., Wu, C., 2021. Microplastics in freshwater sediment: A review on methods, occurrence, and sources. *Sci. Total Environ.* (754), 141948. <https://doi.org/10.1016/j.scitotenv.2020.141948>

ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) IN FRESHWATER AND BIOTA SAMPLES FROM THE LOWER DANUBE RIVER

Codreanu Andreea-Miruna¹, Călmuc Valentina-Andreea², Milea Adelina Ștefania¹, Dîrțu Alin^{3,1}, Iticescu Cătălina², Georgescu Puiu Lucian²

¹ REXDAN Research Infrastructure, "Dunarea de Jos" University of Galati, Galati, Romania

e-mail: miru.an@yahoo.com, adelina.milea@ugal.ro

² REXDAN Research Infrastructure, “Dunarea de Jos” University of Galati, Galati, Romania; Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, “Dunarea de Jos” University of Galati, Galati, Romania

e-mail: valentina.calmuc@ugal.ro, catalina.iticescu@ugal.ro, lucian.georgescu@ugal.ro

³ Faculty of Chemistry, Department of Analytical Chemistry, „Alexandru Ioan Cuza” University of Iasi, Iasi, Romania
e-mail: alin.dirtu@uaic.ro

Per- and Polyfluoroalkyl Substances (PFAS) are considered emerging persistent organic pollutants that present high levels of chemical, thermal and biological stability. This study documents PFAS occurrence in freshwater samples collected from 16 stations along the Lower Danube River and also in several species of fish that are found in the Danube River. The following fish organs were tested: muscle, liver and gills. Prior to the analysis, the environmental samples were submitted to sample preparation. Therefore, the freshwater samples were extracted using the Thermo Scientific AutoTrace 280 Solid-Phase Extraction Instrument and the fish samples were extracted using the QuEChERS method. Ultra-High- Performance Liquid Chromatography analysis was carried out using a Thermo Scientific Vanquish Flex Liquid Chromatograph System coupled to Thermo Scientific Orbitrap Exploris 120 High-Resolution Mass Spectrometer (UHPLC-HRMS). The MS was operated in a negative mode using an ElectroSpray Ionization (ESI) ion source with a 120,000 resolution (FWHM) at m/z 200. The UHPLC-HRMS system provided excellent qualitative confirmation in Full MS mode and quantitative sensitivity in the MS2 mode; it also resolved more target ions from matrix interferences in complex samples. The method was shown to be fit-for-purpose and may be explored for future expansion into other environmental and food matrices.

Acknowledgements.

The technical support was provided by the Rexdan Research Infrastructure, created through the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, project co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014–2020, contract no. 309/10.07.2020.

References:

1. Goodrow S. M., Ruppel B., Lippincott R. L., Post G. B., Procopio N. A. (2020). Investigation of levels of perfluoroalkyl substances in surface water, sediment and fish tissue in New Jersey, USA. *Science of the Total Environment*, 729 (138839): 1-9. <https://doi.org/10.1016/j.scitotenv.2020.138839>
2. Ng K., Alygizakis N., Androulakakis A., Galani A., Aalizadeh R., Thomaidis N. S., Slobodnik J. (2022). Target and suspect screening of 4777 per- and polyfluoroalkyl substances (PFAS) in river water, wastewater, groundwater and biota samples in the Danube River Basin. *Journal of Hazardous Materials*, 436(129276): 1-10.
3. Pasecnaja E., Bartkevics V., Zacs D. (2022). Occurrence of selected per- and polyfluorinated alkyl substances (PFASs) in food available on the European market – A review on levels and human exposure assessment. *Chemosphere*, 287 (132378): 1-14. <https://doi.org/10.1016/j.chemosphere.2021.132378>

SEASONAL AND SPATIAL VARIABILITY OF E. COLI AND ENTEROCOCCI CONTAMINATION IN THE MARINE WATER ALONG THE ROMANIAN COASTLINE

Eduard C. Milea^{1, 2}, Marian Necula²

¹National Institute of Research and Development for Biological Sciences, Bucharest, Romania
e-mail: eduard.milea@incdsb.ro

²Bucharest University of Economic Studies, Cybernetics and Economic Statistics, Bucharest, Romania
e-mail: neculamarian18@stud.ase.ro

The main objective of this study is to investigate the seasonal and spatial variability of E. coli and Enterococci contamination levels in water collected from several resorts on the Romanian coast. In order to achieve this objective, public datasets, including regular measurements during the summer season, of E. coli/Enterococci concentration in water were used.

The results show that there are significant variations in contamination levels between resorts and at different times of the year, probably due to variations in infrastructure, population and water resource management. Also, temporal trends show an increase in enterobacteria concentration

during the summer season, with the exception of 2020 reflecting the decrease in tourism due to the COVID-19 pandemic.

In conclusion, this study highlights the importance of continuous monitoring of water quality in Romanian seaside resorts, especially during the summer season, to ensure public health and to implement appropriate management measures. It also highlights the need for more rigorous approaches to wastewater management and environmental education to minimise the impact of human activities on the quality of the marine environment.

Acknowledgements.

This work was carried out through the Core Program within the National Plan for Research, Development and Innovation 2022-2027, carried out with the support of MCID, SIA-PRO project no. 23020101, Contract no. 7N/2023

References:

1. Tselemonis, A.; Stefanis, C.; Giorgi, E.; Kalmpourtzi, A.; Olmpasalis, I.; Tselemonis, A.; Adam, M.; Kontogiorgis, C.; Dokas, I.M.; Bezirtzoglou, E.; et al. Coastal Water Quality Modelling Using E. coli, Meteorological Parameters and Machine Learning Algorithms. *Int. J. Environ. Res. Public Health* 2023, 20, 6216. <https://doi.org/10.3390/ijerph20136216>
2. Yael Rozen, Shimshon Belkin, Survival of enteric bacteria in seawater, *FEMS Microbiology Reviews*, Volume 25, Issue 5, December 2001, Pages 513–529, <https://doi.org/10.1111/j.1574-6976.2001.tb00589.x>

THE CARBON FOOTPRINT FROM ROMANIAN WASTEWATER TREATMENT PLANTS

Mirela-Alina Sandu¹, Adriana – Magdalena Pienaru¹

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Land Reclamation and Environmental Engineering, 59 Marasti Blvd, District 1, Bucharest, Romania

The primary objective of the Wastewater Treatment Plants (WWTPs) is to remove pollutants from wastewater to ensure the protection of the receiving water body (Figիր et al., 2019). Research has shown that sewage treatment plants are an undeniable source of man-made greenhouse gas emissions that lead to global warming and climate change (Larsen, 2015; Sweetapple et al, 2014). Carbon emissions from wastewater treatment plants are emissions related to the collected, treated and final disposal of treated wastewater and the resulting sludge. Carbon footprint may be reduced to a minimum through energy and chemical inputs into treatment processes and maximising wastewater energy generation through carbon and heat capture (Pagilla, 2022). The embedded carbon or embodied carbon footprint of WWTPs includes the total amount of greenhouse gas emissions from their construction, maintenance and disposal (Nayeb et al., 2019). In households and certain industries in Romania, 20.0 million population equivalents (p.e.) of wastewater are generated every day, treated in 642 plants before being discharged, 434 biological treatment plants, 174 biological treatment plants with nitrogen and phosphorus removal, and 34 primary treatment plants. Only 12% of urban wastewater in Romania is treated in accordance with UWWTD requirements and this is well below the EU average of 76%.

Acknowledgements.

This paper was carried out with the financial support of University of Agronomic Sciences and Veterinary Medicine of Bucharest – Romania, Research Project 1059/15.06.2022, acronym HybridPraxisLab in the competition IPC 2022.

References:

1. Figիր, D., Teodosiu, C., Fiore, S. (2019). Environmental and Energy Assessment of Municipal Wastewater Treatment Plants in Italy and Romania: A Comparative Study. *Water*, 11(8), 1611. <https://doi.org/10.3390/w11081611>
2. Larsen, T.A. (2015). CO2 neutral wastewater treatment plants or robust, climate friendly wastewater management? A system perspective. *Water Res.*, 87, 513–521.
3. Pagilla, K.R. (2022). Book chapter. Pathways to Water Sector Decarbonization, Carbon Capture and Utilization. Chapter 4: Operational optimization and control strategies for decarbonization in WRRFs. IWA Publishing. doi: https://doi.org/10.2166/9781789061796_0051
4. Sweetapple, C., Fu, G., Butler, D. (2014). Identifying sensitive sources and key control handles for the reduction of greenhouse gas emissions from wastewater treatment. *Water Res.*, 62, 249–259.

MONITORING OF WATER AND SEDIMENT QUALITY THROUGH STATISTICAL ANALYSIS AND GEOSPATIAL DETERMINATION OF POLLUTANTS IN THE PREDELTAIC AREA OF THE LOWER DANUBE, ROMANIA

Maria Catalina Topa¹, Maxim Arseni¹, Gabriel Murariu¹, Valentina Calmuc¹, Catalina Iticescu¹, Lucian P. Georgescu¹

¹Rexdan Research Infrastructure - "Dunarea de Jos" University of Galati, Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, 47 Domneasca Street, 800080, Galati, Romania
e-mail: catalina.topa@ugal.ro

Currently, the importance of updating water and sediment quality monitoring on the Danube River basin, is considered of interest by using a holistic approach for measuring some physical-chemical quality indicators in the pre-deltaic area, the confluence region between the rivers Siret, Prut and Danube. This area acquires special importance, especially since the Danube water in this area is the main source of water supply. Thus, the present study aims to assess the quality and the level of contamination of water and sediment of the Lower Danube waters through determining the influence of anthropogenic and industrial activities in the area through the input of tributaries. In this purpose, statistical analysis and pollutions maps with the Water Quality Indicator (WQI) calculated based on physical-chemical parameters, were carried out to highlight the contribution of each process in the seasonal dynamics and also to evaluate the self-purification capacity of the Danube. The evaluations led to an estimate of the bioaccumulation factors that could coherently explain the values of the measurements obtained.

Acknowledgements.

This work was supported by the project "2 SOFT /1.2/139 Advanced nanotechnology-based approaches to waste water purification form organic pollutants and their monitoring in water bodies project".

This work was supported by the project "An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065, cofinanced by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021".

CARBON NANOFIBERS AND MULTILAYER CARBON NANOTUBES – BASED SENSORS FOR QUANTIFICATION OF HEAVY METAL ION IN SURFACE WATER SAMPLES

Ancuta Dinu (Iacob)^{1,2}, Alexandra Virginia Bounegru², Constantin Apetrei², Catalina Iticescu², Lucian Georgescu Puiu²

¹Community Pharmacy S.C. ELIXIR S.R.L., 20 Domneasca Street, 800008 Galați, Romania

²Department of Chemistry, Physics and Environment, Faculty of Sciences and Environment, "Dunărea de Jos" University of Galati, 47 Domneasca Street, 800008 Galați, Romania

Carbon nanotubes (CNTs) and multilayered carbon nanofibers (MWCNFs) have attracted significant attention in the last decade due to their physical and electronic properties. These nanomaterials have proven to be very attractive in the field of sensors and biosensors, offering a series of benefits due to excellent electrical conductivity, high chemical stability, very good biocompatibility for the purpose of integrating biological components, such as enzymes [1],[2]. In this study, the electrochemical responses of some sensors based on CNTs and MWCNFs developed for the detection of heavy metal ions Cd²⁺, Pb²⁺, Cu²⁺, and Hg²⁺ from surface water samples were developed and comparatively analyzed. The SWASV (square wave anodic stripping voltammetry) method was used for the electrochemical analysis of the devices, which proved to be precise, reproducible and stable for this study. The obtained results highlighted the excellent performance of the SPE/CNT sensor compared to the SPE/MWCNF, thus making it a genuine instrument with applicability in the environmental field.

Acknowledgements.

The present paper was supported by the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065.

References:

1. Ferrier, D.C.; Honeychurch, K.C. Carbon Nanotube (CNT)-Based Biosensors. *Biosensors* **2021**, *11*, 486, doi:10.3390/bios11120486.
2. Huang, H.; Chen, T.; Liu, X.; Ma, H. Ultrasensitive and Simultaneous Detection of Heavy Metal Ions Based on Three-Dimensional Graphene-Carbon Nanotubes Hybrid Electrode Materials. *Analytica Chimica Acta* **2014**, *852*, 45–54, doi:10.1016/j.aca.2014.09.010.

DEVELOPMENT OF A GRAPHENE AND PEDOT-BASED ELECTROCHEMICAL SENSOR FOR THE DETERMINATION OF CATECHOL IN WATER SAMPLES

Bounegru Alexandra Virginia¹, Dinu (Jacob) Ancuta¹, Apetrei Constantin¹

¹ Department of Chemistry, Physics and Environment, Faculty of Sciences and Environment, "Dunărea de Jos" University of Galati, 47 Domneasca Street, 800008 Galați, Romania

Water contamination by phenolic compounds from sources such as industries, agriculture, and natural phenomena is a significant concern, necessitating the development of efficient detection methods. Traditional analysis techniques, while precise, often require complex equipment and extended periods of time. In contrast, electrochemical methods present a promising option due to their high sensitivity and speed (F.S.M. et al., 2017), (Mainali, 2020). This research focuses on enhancing electrochemical detection methods for catechol by employing sensors modified with materials such as graphene and PEDOT (poly(3,4-ethylenedioxythiophene)) to enhance their performance characteristics. The deposition of the PEDOT film was conducted using chronoamperometry, while the detection and quantification of catechol was carried out through square wave voltammetry (SWV). Preliminary results indicate that these modifications can yield promising outcomes, with a limit of detection (LOD) reaching the nanomolar range, signifying the ability to detect even minute quantities of the analyte in water samples. The study specifically employs voltammetric methods, such as SWV, to quantify the sensitive and accurate electrochemical responses generated by the modified sensors when exposed to catechol. This study highlights that these modified electrochemical sensors, combined with voltammetric methods, could offer an efficient and sensitive way to monitor catechol in water, with significant implications for environmental preservation and public health.

Acknowledgements.

The present paper was supported by the project An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN, SMIS code 127065.

References:

1. F.S.M., B., B.S., I., & K., M.-J. (2017). Optimization Method for Simultaneous Extraction and Detection of Imazapic and Imazapyr Herbicides in Soil and Water Using HPLC-UV with Verification of LC-MS. *Sains Malaysiana*, *46*(12), 2339–2348. <https://doi.org/10.17576/jsm-2017-4612-10>
2. Mainali, K. (2020). Phenolic Compounds Contaminants in Water: A Glance. *Current Trends in Civil & Structural Engineering*, *4*(4). <https://doi.org/10.33552/CTCSE.2020.04.000593>

CHROMATOGRAPHIC METHODS IN TANDEM WITH MOLECULAR OR ELEMENTAL MASS SPECTROMETRY AS COMPLEMENTAR TECHNIQUES FOR DETERMINATION OF FUNGICIDES IN FOOD

A.C. Dirtu^{1,2}, G. Lavison-Bompard¹, A. Ducrocq¹, C. Inthavong¹, T. Guérin¹, P. Jitaru¹

¹ University Paris-Est, National French Agency for Food Safety and Security (ANSES), Laboratory for Food Safety, F-94701 Maisons-Alfort, France

² Department of Chemistry, Alexandru Ioan Cuza University of Iasi, Carol I Blvd., No. 11, 700506, Iasi, Romania
e-mail: alin.dirtu@uaic.ro

Dithiocarbamates (DTC) have been extensively used as fungicides for more than fifty years due to their cost-effectiveness and their antifungal properties against a large panel of plant diseases. Despite the significant environmental and food chain impact of DTCs, the current analytical approaches for their determination suffer from serious drawbacks. The European reference method for this purpose relies on non-selective quantification by indirect determination: after acidic hydrolysis, the sum DTCs is measured via the generated carbon disulfide by gas chromatography. A multi-approach strategy was applied throughout this study in order to increase knowledge on the DTCs determination in food matrices from the following perspectives:

(i) determination of DTCs per class, depending on their chemical structure, as well as of their degradation products. The methods are based on hydrophilic interaction liquid chromatography (HILIC) or reverse phase (RP) HPLC hyphenated to either molecular or elemental mass spectrometry (MS) techniques through the detection of organic DTCs, metals and/or sulfur moieties;

(ii) selective and simultaneous determination of the three individually EU regulated DTCs (thiram, ziram and propineb) as well as of the DTCs degradation products by the use of HILIC-MS/MS.

The proposed analytical methodologies were in-house validated for the determination of the target analytes from several fruit and vegetable matrices over a wide concentration range. The results showed that the analysis of DTCs by class as well as of their degradation products from fruits and vegetables can be achieved by a multi-approach methodology especially when employing soft surface extraction techniques and further separate and detect by the use of HILIC or RP-HPLC coupled to electrospray-MS/MS or to ICP-QQQ-MS.

Acknowledgements.

This work has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie Action. Grant Agreement No. 753053.

MULTIFRACTALS ANALYSIS AND INTELLIGENT ARTIFICIAL TOOLS FOR ASSESSING AND FORECASTING WATER QUALITY AND FOREST LAND: CASE STUDY - GALATI AREA.

Simona Moldovanu^{1,3}, Luminita Moraru^{2,3}, Puiu-Lucian Georgescu^{2,4}, Catalina Iticescu^{2,4}

¹Department of Computer Science and Information Technology, Faculty of Automation, Computers, Electrical Engineering and Electronics, Dunarea de Jos University of Galati, 47 Domneasca Street, 800008 Galati, Romania.

²Faculty of Sciences and Environment, Department of Chemistry, Physics and Environment, Dunarea de Jos University of Galati, 47 Domneasca Street, 800008, Romania.

³The Modelling & Simulation Laboratory SMLab, Dunarea de Jos University of Galati, 47 Domneasca Street, 800008 Galati, Romania.

⁴REX DAN Research Infrastructure, "Dunarea de Jos" University of Galati, 98 George Cosbuc Street, 800385 Galati, Romania

Forest management influences the environment and human health as well, by changing the climate, weather, water, air, biodiversity, wildlife, disease risk and food security. The forest management can lead to beneficial or detrimental effects on water quality depending on the extent and type of management activities within them. The need for both sensitive forest management to protect water resources and changes in water quality to protect forests has been recognised. Spatial and temporal changes in forest coverage and water quality highlight the importance of monitoring. Comparing satellite images from the same region recorded at different times is an approach that aims to identify changes in land coverage and understand forest spatial pattern change over time. The multifractals analysis leads to the determination of the percentage of land coverage, the dynamics of the natural reforestation process, the location of mature trees and the determination of areas where the landscape has changed drastically due to deforestation and / or reforestation. The multifractal measures are correlated to changes in the forest structure in order to identify the

percentage of crown areas in the forest area, the existence of natural reforestation, the areas with mature trees. They determine those areas where the landscape has changed drastically due to deforestation and reforestation, the vertical development of the forest floors and finally, to give an automatic method to investigate the aerial images for surveilling, understanding and predicting the forest changes.

Water quality index (WQI) is an important dynamic attribute in the characterization of the water health and quality. A new forecast scheme for water quality based on the qualitative classes, including very good (0 - 25), good (26 - 50), poor (51 - 75), very poor (76 - 100) and extremely polluted/non-potable (> 100) using Artificial Intelligence is a meaningful method of protecting public health because of its possibility to provide early warning regarding harmful water pollutants. The Cascade-forward network models successfully forecast the short-term WQI as they may learn historic patterns and determine the nonlinear relationships between the input and output variables.

These approaches could be relevant to all stakeholders involved in sustainable water and forestry management.