Presentation of General Physics and Didactics Section

Prof. Dr. Polikron Dhoqina

Section of General Physics and Didactics

- Prof. Dr. Polikron Dhoqina General Physics, History of Physics
- Dr. Silvana Miço General Physics, Didactics of Physics, Structure of Matter
- Dr. Daniela Halili General Physics, Didactics of Physics
- Dr. Alion Alizoti Computer-Based Physics Teaching
- Dr. Safet Sula General Physics

Education Research Activities

Goals: To study how students learn physics and how to improve the quality of teaching.

The group ***research activities*** include:

- Teacher training
- Physics university teaching
- Physics high school teaching
- Conceptual physics
- Computer based teaching methods
- Development of critical thinking skills
- Development of student problem-solving skills
- Experimentation in physics teaching (collecting data, testing, surveys)

Prof. Dr. Polikron Dhoqina

Didactics of Physics

- Hands-on science in elementary school
- Understanding physics concepts
- University and high school physics teaching methods
- Students' motivation to learn physics
- Smartphones in learning physics concepts
- The Attitude of High-School Students Regarding Online Learning

Applied physics

- The distribution of natural radioactivity in soils, water and sand
- Radiation dose for medical workers
- Measurements of indoor radon concentrations
- The study of radioactive and non-radioactive air pollutants
- Environmental pollution monitoring

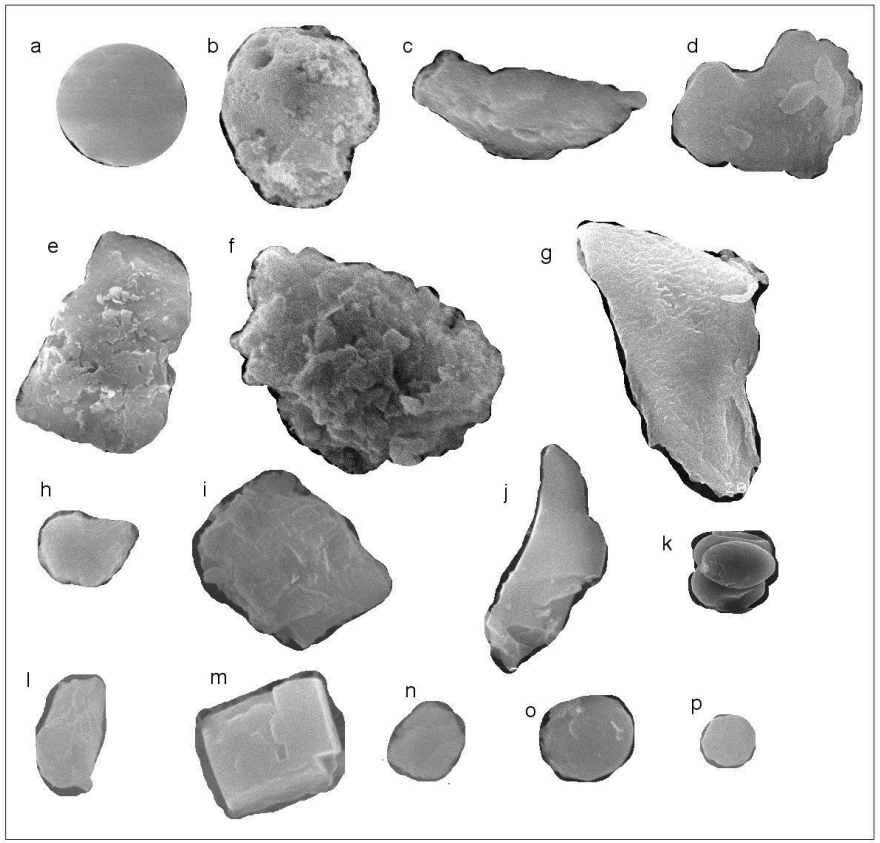
Dr. Silvana Miço

Physics Education

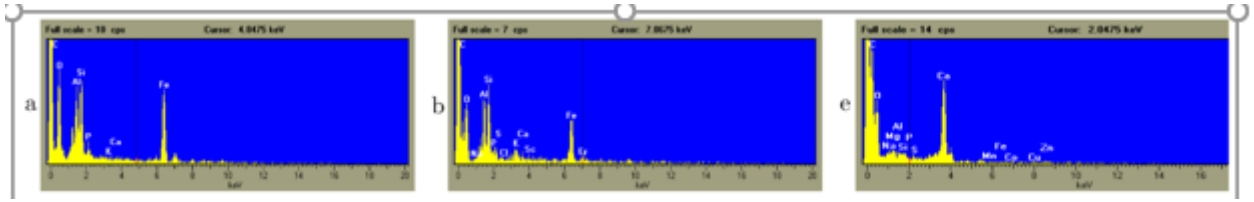
- Impact of teaching methods on students learning
- How students learn physics: attitudes and motivation
- Conceptual foundations in physics
- Research-based teaching method
- The effect of using strategies for solving physics problems
- Learning and experimentation through technology (PhET, Tracker)

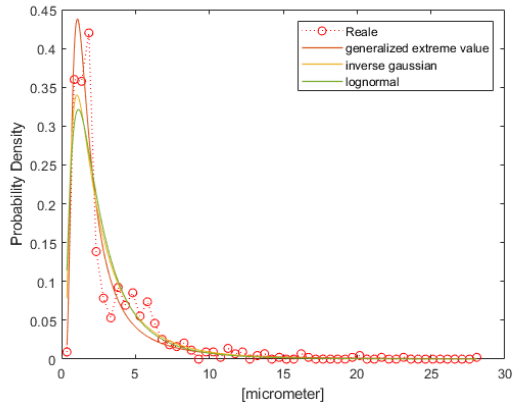
Spectroscopic methods for studying atmospheric aerosol properties

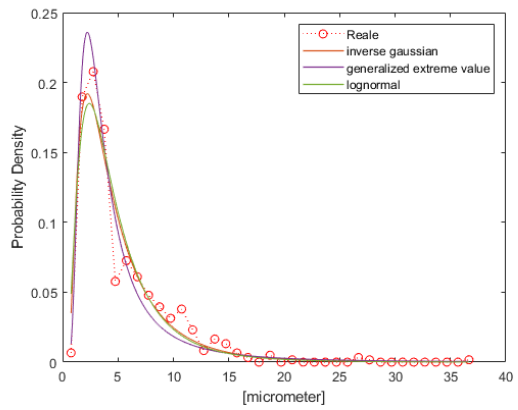
- Physical and chemical characterization of aerosol particles by using SEM-EDX technique.



Nr.	A (μm^2)	p (μm)	d_F (μm)	R	AR	Elem. compos dominant	ρ	d_{pa} (μm)	d_{ev} (μm)	χ	d_{ps} (μm)	d_a (μm)
a	22.1	17.5	5.47	0.98	1.05	Si, Al, Fe	2.6	5.31	5.40	1.01	5.36	8.4
b	37.2	25.9	7.83	0.83	1.20	Si, Al, Fe	2.6	6.88	7.31	1.07	7.08	10.1
c	28.7	32.6	10.59	0.37	2.70	Si, Al, Fe	2.6	6.05	8.42	1.32	7.32	6.1







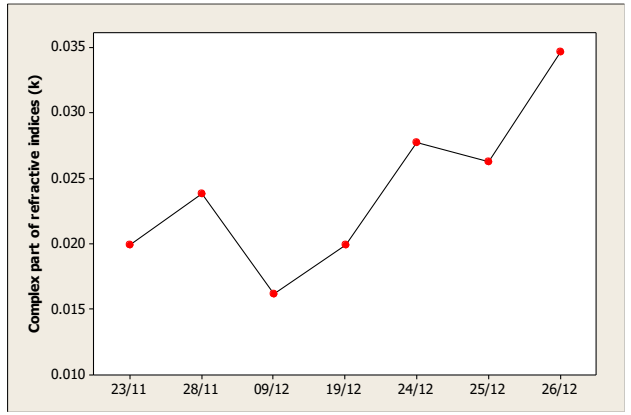
Classification of atmospheric aerosol particles

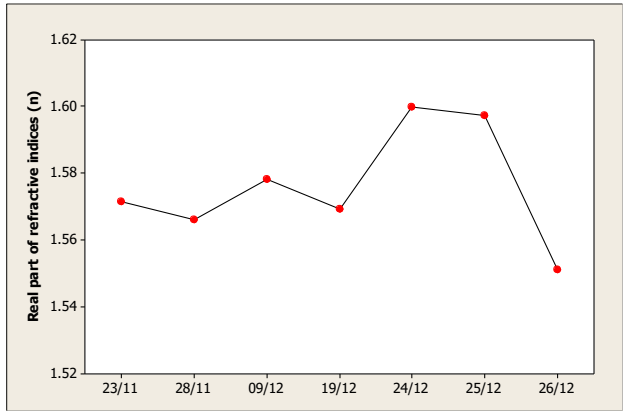
Groups	Sub-groups	Chemical composition	Morph.	Size (µm)
Alumino -silicates	Si- Al- / fly ash Si- Al- / soil	Si, Al dominant, moderate amounts of Fe and Ca with Na, Mg, Cr, S, and P content.	Spherical Irregular	0.5-5 0.5-30
Ca-rich	Kalcite (CaCO3)	Ca dominant with amounts Al, Si, Mg, S and K.	Irregular	0.5-30
Soot	C-O	C content higher than O.	Aggregate	0.5-4
Biogenic	C-O	C and O in the same amounts and N, P, Cl and S contents.	Typical	1-20
Si-rich	Si-O	Si dominant variable amounts of Al, Na, Mg and trace of S, K and Ca.	Irregular	1-10
Fe-rich	Fe-0	Fe dominant with traces of Na, Mg, Al, Si, k, Ca, Cr, Mn, Co and Zn.	Irregular	1-10
Sea salt	Fresh + aged	Cl and Na with content of K, Ca, Mg and Si.	Crystal or rounded	1-5
Mixed	Variable components	Variable combination of Ca, Si, Al, Mn, Cd,	Irregular or rounded	0.5-10

Optical properties and morphology of aerosol particles

Complex Refractive Index of Aerosol Samples

Particle counters are calibrated using polystyrene latex spheres with refractive indices $m=1.5-0.0i$
The real part n of refractive index: from 1.55 to 1.60;
Imaginary part k: from 0.016 to 0.032
Average refractive index $m=1.57-0.02i$

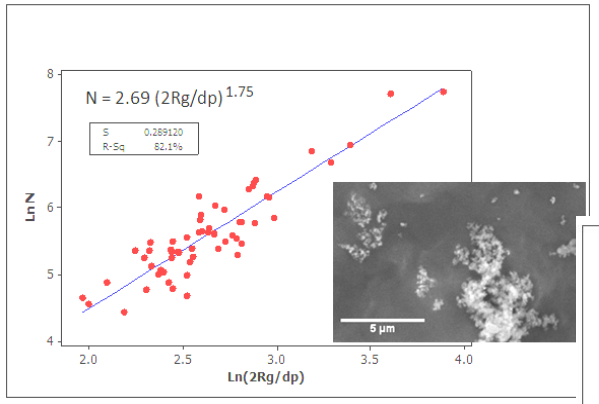


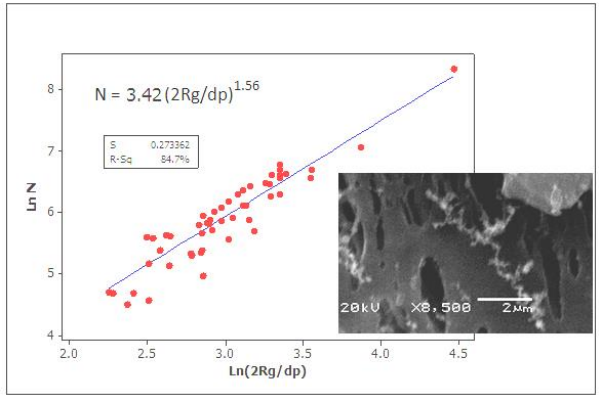


- The imaginary part - higher in the samples with higher percentage of soot particles.
- The variation of the real part is mainly influenced by the variation of metal oxides

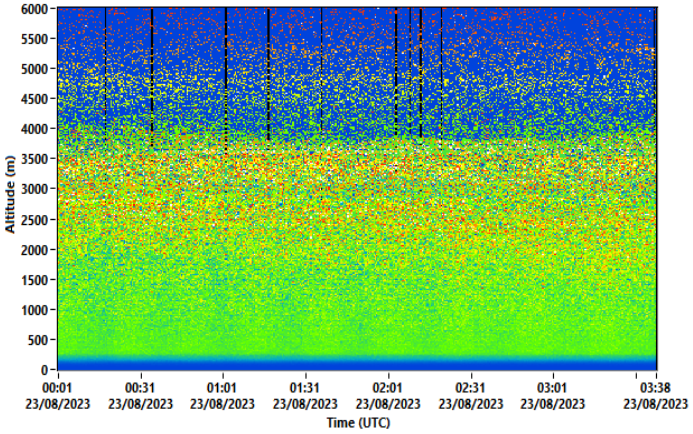
Fractal dimension of soot aggregates

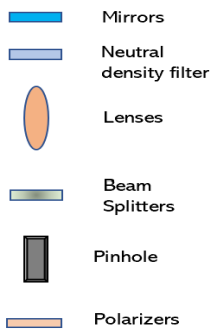
The chain-like shaped aggregates with an elongated and opened structure - lower value of the fractal dimension Df.
The highest value of Df - the most compact aggregate and the most closed morphology.

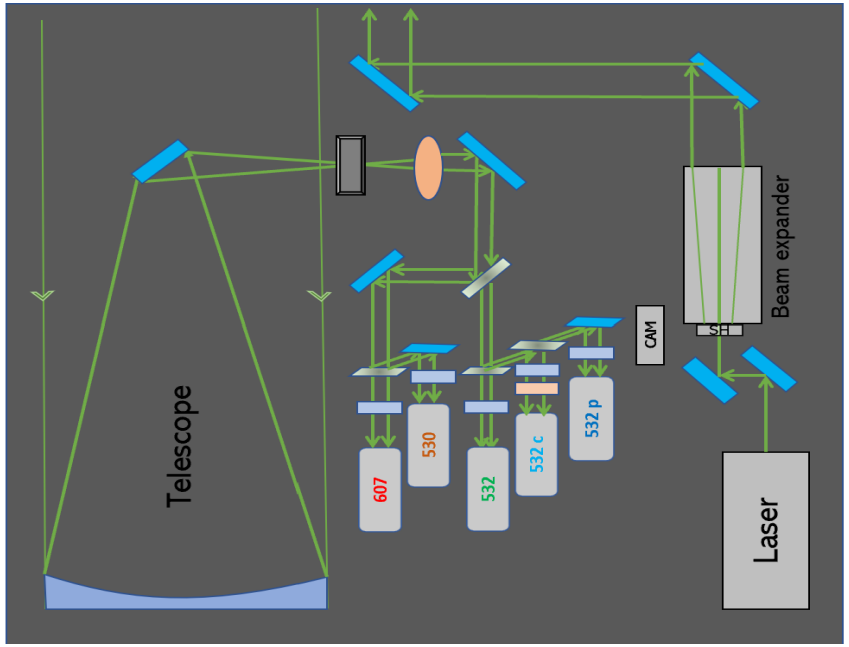


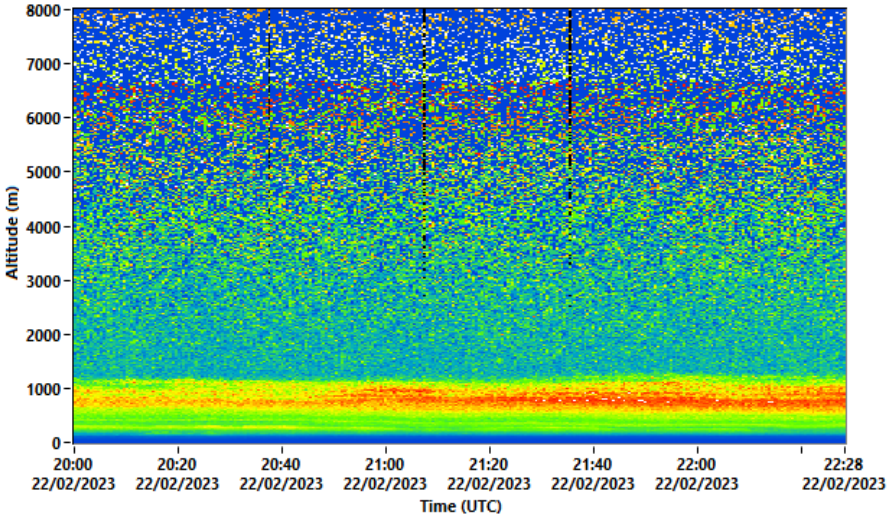


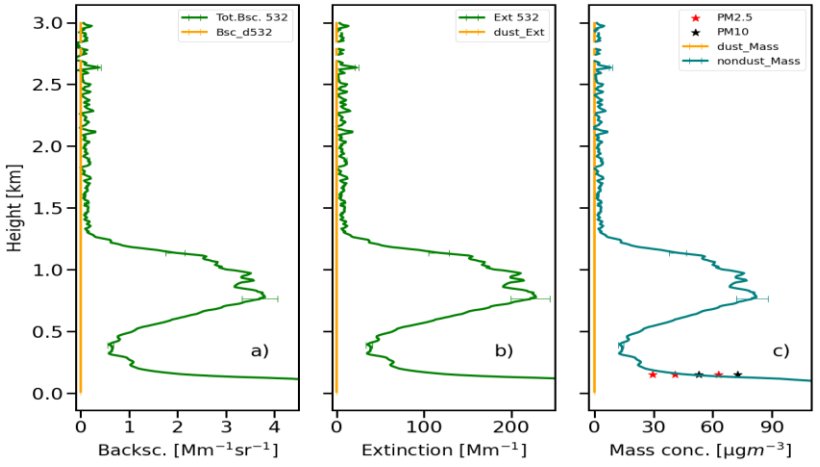
Vertical profiles of aerosol optical properties by LIDAR

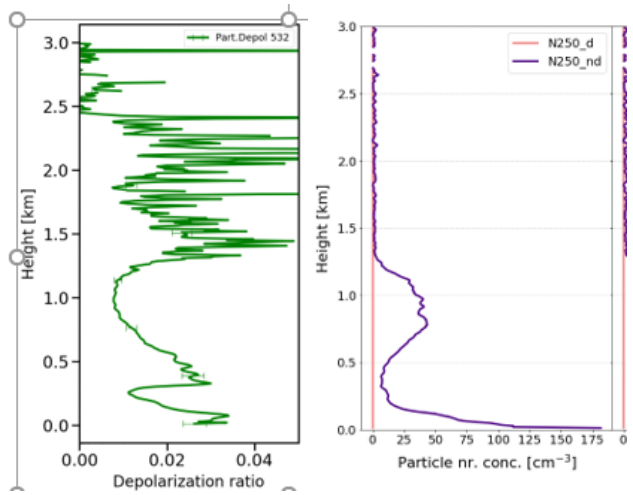












Dr. Daniela Halili

Renewable energies

- Study of solar energy potential in main regions of Albania
- Mapping regional variation of cost of hot water
- Regional distribution of life cycle cost of electrical energy produced by photovoltaics in Albania
- Estimatation of the level of fulfillment of annual needs for producing hot water for sanitary needs by solar energy and consequently the needs for compensation of energy from central grid of electricity
- Estimation of economic parameters of solar collectors
- Influence of inclination angle on the efficiency of a flat plate solar collector

Monography: Group of athors "Alternativa të energjisë së ripërtëritshme"

Study of solar energy potential in main regions of Albania

- Solar energy is one of the main future sources of renewable energies in Albania.
- Our country is considered a country with a good regime of solar energy and with a high potential of solar radiation with a mean value of 1600 kWh/m^2 per year.

Map of Average annual insolation (kWh/m^2/day)

Mapping regional variation of cost of hot water

- Albania is a sunny region with high annual average insolation of 7.63 kWh/m2*d.
- Use of solar collectors to provide hot water for domestic use results to be very cost effective. Mean cost of thermal energy produced by solar collectors is 0.046Euro/kWh.
- Here it is represented a map of distribution of costs of thermal energy produced by solar collectors in main cities of Albania.

Map of Average Cost of energy (€/ KW h)

Dr. Alion Alizoti

Physics Education

- New methodologies in physics education
- Using computer simulations in teaching physics concepts
- Aided RGB analyses of images
- The application of multiple parallel diodes to control large currents
- New technologies to detect electron beam signals
- Understanding the nature of science through experiments - The experimental study of Galileo thermometer
- Contemporary tendencies in physics education

Msc. Safet Sula

The study of time series

- Improving the analysis of hydrologic time data series in our basins and economic impact of hydro-industries.
- Alternative methodological analysis of hydrologic time data series
- A case study of hydrometric variables in the lakes of Drin cascade, Albania