Chara Malesi, PhD researcher, NKUA

Chara Malesi graduated from the Mathematics Department of the Kapodistrian University of Athens in 2023. She received her M.Sc. degree in the field of “Atmospheric Physics and Meteorology” from the Physics Department of the National and Kapodistrian University of Athens in 2025. Her Master thesis focused on the monitoring of urban air pollution using a Scanning LiDAR system. She is a PhD Candidate since May 2025. She investigates the vertical and horizontal distribution of aerosols utilizing a synergistic approach that combines active and passive remote sensing techniques. Her research focus on the analysis of the daily and seasonal variability of the particle load, the classification of their types as well as the estimation of their optical thickness, vertical stratification and transport mechanisms using data from a multi-wavelength ground-based LiDAR (Light Detection and Ranging) system, the MAX-DOAS (Multi-Axis Differential Optical Absorption Spectroscopy) system and a scanning LiDAR system (PMeye)

Synergistic retrieval of aerosol optical properties and mass concentrations from scanning LiDAR measurements and AERONET inversion products

Atmospheric aerosols significantly affect the environment and human health, making their quantification and spatial mapping essential. Advanced laser remote sensing systems, such as the PMeye scanning LiDAR by Raymetrics S.A., enable continuous, high-resolution monitoring of urban pollution and its evolution.

This study analyzes data from two campaigns conducted in 2024 at the Vasilikos Power Station (Cyprus) and the Port of Piraeus (Greece). Measurement days were selected using aerosol-type classification from AERONET optical properties, ensuring the presence of dust. Numerical models (SKIRON, CAMS, GEOS-5, HYSPLIT) were used to confirm meteorological conditions and dust transport, supporting both day selection and data interpretation.

The novelty of the study lies in using near-ground scanning to separate aerosol backscatter into dust and anthropogenic emissions, and to derive their horizontal concentration distribution—an approach not previously applied, as earlier work mainly relied on vertical measurements. Low-altitude horizontal scans enable direct detection of aerosols most relevant to human exposure.

Overall, combining PMeye measurements with models and satellite data demonstrates the system’s potential for accurate pollution monitoring and for identifying emission sources, offering valuable support for urban environmental management.

Archontoula Karageorgopoulou, PhD researcher, NKUA

Archontoula Karageorgopoulou graduated in 2020 from the Physics' department of the National and Kapodistrian University of Athens, having chosen the field of Environmental Physics-Meteorology. In July 2022 she received a Master's degree in "Applied Physics", specializing in Environmental Physics at the National and Kapodistrian University of Athens. She specializes in air quality studies since both her bachelor's and diploma's thesis focused on atmospheric issues. Her bachelor's thesis focused on studying the emissions of various pollutants, particles, and greenhouse gases in the atmosphere from different source categories in Greece. Her master's thesis investigated the characterization of aerosols using AERONET data. Mrs. Karageorgopoulou started her Ph.D studies, under the supervision of Dr. Giannakaki in December 2022. She participated in the research program entitled «Atmospheric pollen characterization using active remote sensors» (Acronym: APOC). During this period, she is involved in the research program «Space derived aerosol-dependent Cloud Properties» (Acronym: SCOPE). She investigates the retrieval of Cloud Condensation Nuclei and Ice Nucleation Particles for different aerosol types based on ground and space-based lidar sensors. She participated as the primary contributing author in the preparation and submission of three conference posters and as a co-author in two others. Furthermore, she has authored a peer-reviewed scientific paper titled: "CALIPSO Overpasses During Three Atmospheric Pollen Events Detected by Hirst-Type Volumetric Samplers in Two Urban Cities in Greece", published in Atmosphere (https://www.mdpi.com/2073-4433/16/3/317).

Spatial Variability of CCN and INP Conversion Factors in European AERONET Stations

An extended analysis was conducted using AERONET Version 3 Level 1.5 inversion products from all available European sun–sky photometer stations, incorporating the full temporal record of both long-established and recently deployed sites to maximize spatial coverage, observational representativeness, and overall regional completeness. Only retrievals obtained under sufficiently strong aerosol loading were retained to secure robust optical inversions. Aerosol-type separation was performed following established optical criteria based on the Ångström exponent (AE) and the particle linear depolarization ratio (PLDR), allowing distinction among dust-dominated, pure dust, pollution-dominated, and pure pollution aerosol conditions, while the single scattering albedo (SSA) at 1020 nm was further used to differentiate the absorbing characteristics within polluted aerosol classes. This harmonized and physically consistent classification framework provided a coherent basis for the subsequent CCN and INP conversion analysis across Europe, upon which the computation of conversion factors was then carried out. AOD at 532 nm was reconstructed from AOD at 440 nm using the Ångström exponent to ensure direct compatibility with the AERONET inversion products. From the retrieved size distributions, number

concentrations in CCN- and INP-relevant radii were derived, enabling a physical link between aerosol microstructure and column extinction. The resulting conversion factors provide a transferable relationship between column optical properties and particle microphysical abundance and can be applied to ground-based lidar extinction profiles to retrieve CCN and INP concentrations as a function of height across the European domain.

Iliana Koutsoupi, PhD researcher, NKUA

Iliana Koutsoupi graduated from the Physics Department of the University of Patras in 2021. During the Bachelor studies, she studied the fluid mechanics of the tropical cyclones. She received her M.Sc. degree in the field of “Atmospheric Physics and Meteorology” from the Physics Department of the National and Kapodistrian University of Athens in 2023. Her Master thesis focused on the relationship of atmospheric blocking and heatwaves over Europe and the Mediterranean region. She is a PhD Candidate since May 2023. Her main scientific interests are the rain and clouds microphysical properties and formation mechanisms over the Mediterranean region using satellite radars’ data, while she has also studied the atmospheric dynamics applied in Tropical-Like Cyclones and Omega blocks.

A study cloud – aerosol interaction over the Mediterranean region using active remote sensing

Within the Space-derived Aerosol-dependent Cloud Properties (SCOPE) project, we combine CloudSat’s Cloud Profiling Radar (CPR) and CALIPSO’s CALIOP Lidar, in order to retrieve cloud microphysical properties and aerosol types over the Mediterranean for a three-year period. Firstly, cloud liquid and ice water paths are derived from the CPR and evaluated against ERA5 reanalysis. Results show that ERA5 underestimate the ice water path, especially above the sea, while satellite observations indicate a significant ice content. We also examine the seasonal variations in cloud phase and we represent the spatial distribution of the different cloud types across the region. Our final step is to introduce an algorithm developed for investigating cloud–aerosol interactions above this climate-change hotspot, providing statistics for each cloud type about their correlation with the aerosols.

Aris Georgoulis, Post Doc. Researcher, NKUA

Aristeidis K. Georgoulias (AKG) is a Physicist with a Master's degree in Environmental Physics (Aristotle University of Thessaloniki - AUTH). In 2011, he obtained his PhD from the Department of Environmental Engineering, Democritus University of Thrace (DUTH). After his PhD, AKG received a two-years postdoctoral fellowship to lead his own scientific project (QUADIEEMS) at the Department of Meteorology and Climatology of AUTH and the Multiphase Chemistry Department of the Max Planck Institute for Chemistry (MPIC) in Mainz, Germany. During the last decade AKG worked for various institutions (universities, institutes and companies) in Greece, Cyprus and the Netherlands in the field of atmospheric physics, satellite remote sensing, atmospheric pollution and climate change. His research focuses on the investigation of aerosols, clouds, trace gases, radiation and their interrelations, atmospheric pollution, its trends and its effect on human health as seen from satellites as well as on the analysis and interpretation of regional and global climate simulations. So far, AKG has participated in 18 research projects being author (15 papers) or co-author (33 papers) of 48 scientific articles in peer reviewed scientific journals (References: 1576 and h-index: 22 according to Scopus, 02/04/2025), 3 book chapters, and more than 100 papers/abstracts presented at national and international conferences and has served as a reviewer for the Dutch Research Council (NWO) and for around 30 scientific journals. He is also a contributing author of the IPCC Working Group I (WGI) Sixth Assessment Report (Chapter 6).

Spaceborne lidar CCN retrievals with the SCOPE algorithm: The important role of smoke

An improved algorithm based on the POlarization LIdar PHOtometer Networking (POLIPHON) method is presented for retrieving cloud condensation nuclei (CCN) concentration profiles from spaceborne lidar observations. This algorithm was developed within the Space-derived Aerosol-dependent Cloud Properties (SCOPE) project, building on earlier studies that demonstrated the feasibility of using measurements from the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) mission to estimate CCN. The results are validated against aircraft measurements, and the importance of selecting appropriate conversion factors is examined in detail. We also introduce the use of conversion factors derived from CALIPSO aerosol typing for CCN retrievals, an advancement first established within SCOPE. The analysis underscores the strong impact of smoke on CCN concentrations and shows that assumptions regarding the aging state of smoke can significantly influence the retrieval outcomes.