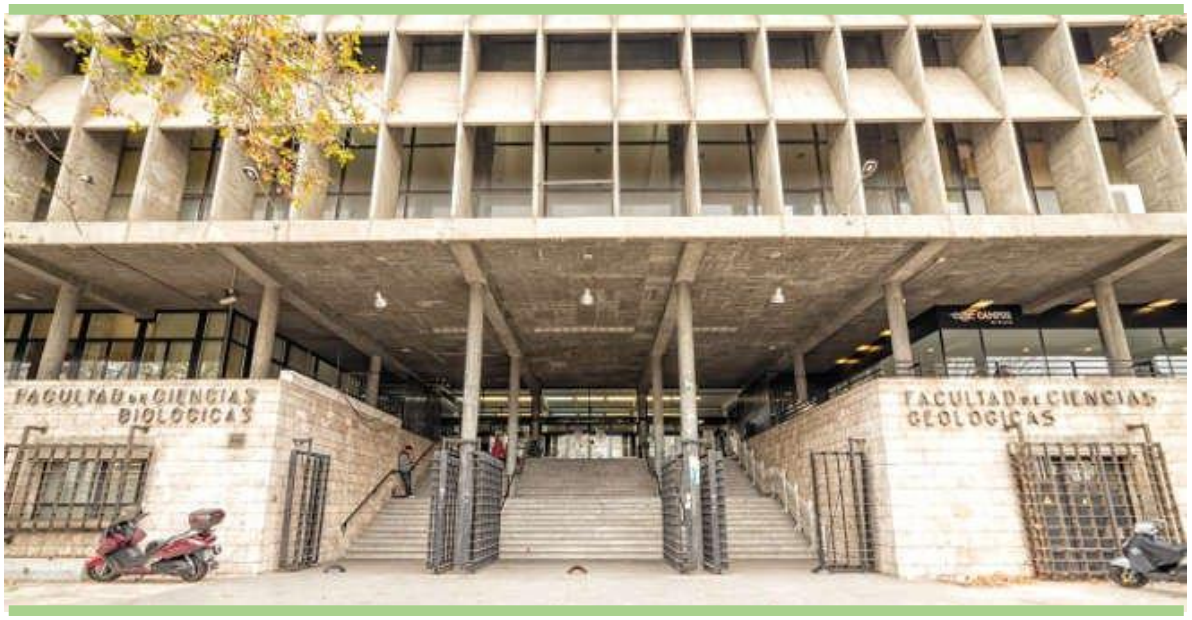
14th NECLIME Workshop on Taxonomy of Cenozoic Palynomorphs
30th-31st October 2025
Madrid, Spain

SCIENTIFIC PROGRAM AND ABSTRACTS



Faculty of Geological Sciences, Complutense University of Madrid

ORGANISING COMMITTEE

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Overview of past meetings of the Neclime Working Group on Palynology (2010–2025)

Year	Location	Country
2010	Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences	Sofia, Bulgaria
2011	W. Szafer Institute of Botany, Polish Academy of Sciences	Cracow, Poland
2012	Institute of Botany	Sofia, Bulgaria
2013	Faculty of Natural Sciences, Comenius University	Bratislava, Slovakia
2014	Faculty of Engineering, Dumlupınar University	Kütahya, Turkey
2015	Polish Geological Institute	Warsaw, Poland
2016	Faculty of Natural Sciences, Comenius University	Bratislava, Slovakia
2017	Czech Academy of Sciences	Brno, Czech Republic
2018	Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences	Sofia, Bulgaria
2019	Senckenberg Research Station of Quaternary Palaeontology	Weimar, Germany
2022	Faculty of Natural Sciences, Comenius University	Bratislava, Slovakia
2023	Faculty of Engineering, Akdeniz University	Antalya, Turkey
2024	W. Szafer Institute of Botany, Polish Academy of Sciences	Cracow, Poland
2025	Faculty of Geological Sciences, Complutense University	Madrid, Spain

SCIENTIFIC PROGRAM

Day 1. Thursday 30th October

9:30 – 10:00	Registration & Badge pickup
10:00	Welcome by Alfonso Muñoz Martín, Dean of the Faculty of Earth Sciences
	Welcome by Manuel Casas-Gallego and Marianna Kováčová
10:30 – 11:15	Lisa Schiersch, Angela A. Bruch, Eliso Kvavadze: Quantifying the relationship between the regional vegetation and the pollen record of Armenia and Georgia
	Angela A. Bruch, Lisa Schiersch, Tigran Ghrejyan: Pollen from a recently extinct Armenian beetle - *Glaphyrus calvaster* ZAITZEV 1923
11:15 – 11:45	Coffee break
	Poster: Julia López Martínez, Manuel Casas-Gallego, Eduardo Barrón: Palynological study of the Oligocene of Olocau (Valencia-Lliria Basin): paleoenvironmental and paleoclimatic reconstruction
11:45 – 12:30	Manuel Casas-Gallego, Eduardo Barrón: A walk through some European Neogene palynomorph species not represented in the Atlas of the Polish Neogene
	Martina Stebich, Anoop Ambili, Arshid Jehangir, Salman Khan, Praveen K. Mishra, Sushma Prasad, Torsten Utescher: Holocene vegetation, climate dynamics, and human impact in the Kashmir Valley (NW Himalaya, India)
12:30 – 14:00	Lunch
14:00 – 16:00	Visit to the Botanical Garden of the Complutense University
16:00 – 18:00	Sightseeing of Madrid city center
(Time to be decided)	Neclime workshop dinner

Day 2. Friday 31st October

10:00 – 10:30	Gil Machado: Digitalization and artificial intelligence applied to palynology
10:30 – 11:30	Round table discussions and NECLIME-related topics
11:30 – 12:00	Coffee break
12:00 – 14:00	Hands-on microscope activities. Pollen reference collection revision and discussion on fossil material (including slides brought by attendees)
14:00 – 15:00	Lunch (typical Spanish time, if attendees survive)
15:00 – 16:00	Microscope activities continue (or visit to the palaeontological collecion of the department).
16:00 – 17:00	Final discussion & closing remarks

ABSTRACTS

Pollen from a recently extinct Armenian beetle - *Glaphyrus calvaster* ZAITZEV 1923

Angela A. Bruch[1] , Lisa Schiersch[1] , Tigran Ghrejyan[2]

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Glaphyridae (bumble bee scarab beetles) are pollen feeding beetles specialized on specific flowering plants for feeding and mating. In 1936, a few specimens were collected during a botanical expedition in Armenia and determined at the Zoological Institute as *Glaphyrus calvaster* ZAITZEV 1923. This species is a narrow local endemic to Armenia and is known from only a few specimens collected at different times from 1868 to 1936. Since then, no other specimens of this species have been recorded. The area of collection is destroyed in the meantime by anthropogenic activities, and the original environment unknown. Recently, pollen grains were extracted from one of those beetle specimens from the historical collection with the aim to define (or confirm) the area of sampling and the preferred habitat (i.e. feeding plant) of this species. Pollen preserved on the surface of the specimen seem to indicate the plant from which the beetle was collected, and probably a generally open vegetation in the vicinity of a settlement at the sampling site. Pollen from the gut of the beetle needs further investigations.

A walk through some European Neogene palynomorph species not represented in the Atlas of the Polish Neogene

Manuel Casas-Gallego[1], Eduardo Barrón[2]

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The *Atlas of Pollen and Spores of the Polish Neogene* is a monumental reference that has guided palynologists researching the European Neogene since the publication of its first volume in 2001. It provides invaluable descriptions of numerous fossil palynomorphs, including the most abundant taxa recorded across Europe. This presentation aims both to celebrate this outstanding work and to provide information

on 10 palynomorph species commonly found in Neogene deposits from the Iberian Peninsula but not represented in the Atlas. These include *Armeria* type, *Cistacearumpollenites rotundus*, *Disanthuspollenites operculatus*, *Parrotiapollenites asper*, *Perfotricolpites digitatus*, *Pistaciapollenites heteroporatus*, *Rhamnaceaepollenites triquetrus*, *Ricinuspollenites helodes*, *Rutacearumpollenites* sp. (*Poncirus* type), and *Vitispollenites tener*.

A brief description of each species is provided, highlighting diagnostic features useful for identification, as well as remarks on their stratigraphic ranges and the composition of the palynofloras in which they occur. Most of the plants that produced these pollen types were probably characteristic of the Iberian Neogene vegetation rather than that of central and eastern Europe, reflecting regional floristic diversity and climatic differences.

Palynological study of the Oligocene site of Olocau (Valencia): paleoenvironmental and paleoclimatic reconstruction

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This study presents a paleopalynological analysis of nine stratigraphic levels from the Olocau outcrop (Valencia–Llíria Basin, eastern Spain). The recorded assemblages allowed the reconstruction of the vegetation, environments, and climate that developed in this area during the Cenozoic, as well as an estimation of the age of the studied materials.

A total of 6,898 palynomorphs were identified, corresponding to 46 taxa that include spores of algae, fungi, and ferns, as well as pollen grains of gymnosperms and angiosperms. The most abundant forms are para-species related to the extant genera *Taxodium*, *Pinus*, *Alnus*, *Carya*, *Engelhardia*, and *Ostrya*. Using the "Integrated Plant Record" (IPR) method, the reconstructed vegetation was dominated by mesophytic mixed forests, mainly composed of conifers and deciduous arboreal angiosperms, with a low proportion of thermophilous evergreen elements. These forests are characteristic of temperate and humid environments. This is consistent with the paleoclimatic estimates obtained through the Coexistence Approach, which indicate a mean annual temperature between 13.8 °C and 18.5 °C and a mean annual precipitation of 748–1,355 mm.

The presence of the fossil species *Aglaoreidia pristina*, whose stratigraphic range extends from the late Eocene to the late Oligocene, together with the abundance of arctotertiary taxa, allows the site to be assigned to the Chattian (late Oligocene, 27.82–23.03 Ma). These results are particularly relevant given the scarcity of data on the Iberian flora during the Oligocene.

Digitalization and artificial intelligence applied to palynology

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Palynology remains a foundational discipline within both paleontology and stratigraphy, playing a critical role in academic research and industrial applications. A persistent challenge in this field is the need to expedite data acquisition without compromising analytical rigor or data quality. Although the importance of this issue has been acknowledged for decades, progress has predominantly focused on enhancing data visualization and interpretation through digital stratigraphic charts, paleoenvironmental indices, and related graphical tools. In contrast, the acquisition of primary data continues to depend on time-intensive microscopic analysis, wherein a trained specialist manually identifies and counts palynomorphs (s.l.) and occasionally captures photomicrographs.

Additional complications arise from the degradation of legacy slide collections, often mounted in unstable media that deteriorate over time (e.g., yellowing, drying), potentially leading to the irreversible loss of critical data, including type specimens and unique samples that cannot be reprocessed. Recent advances in high-resolution scanning technologies, initially developed for medical pathology, have been successfully adapted for palynological applications. These systems enable the creation of virtual slide collections, which are fully digitized and accessible via standard computing interfaces. These virtual slides offer a shareable format that supports traditional observational methods while significantly increasing processing speed. Furthermore, they support the integration of interpretive metadata, such as taxonomic annotations, in a format that adheres to the FAIR principles—ensuring data is findable, accessible, interoperable, and reusable.

This technological innovation facilitates the application of artificial intelligence, particularly computer vision techniques, to automate the identification and quantification of palynological components. These algorithms can detect and classify key palynomorph taxa and other organic matter types, enabling automated analysis

for applications such as kerogen typing, paleoenvironmental reconstruction, and biostratigraphic interpretation. Here, we present a digitalization workflow currently in production, alongside the development status of our AI-based analytical system. This system is now capable of automatically recognizing and quantifying various categories of organic particles (e.g., phytoclasts, amorphous organic matter, spores), and can generate paleoenvironmental indices, ternary plots, and other visual outputs to support stratigraphic and paleoecological assessments.

Quantifying the relationship between the regional vegetation and the pollen record of Armenia and Georgia

Lisa Schiersch[1], Angela A. Bruch[1], Eliso Kvavadze[2]

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The Southern Caucasus, a biodiversity hotspot and rich in all kinds of resources, plays an important role for scientific investigations, as various groups of hominins occupied the region during the Pleistocene. In order to get a wider understanding of the circumstances and behaviors of our ancestors it is necessary to understand the paleoenvironmental conditions.

Pollen analysis provide information about vegetation and climate processes and can be used for paleoenvironmental reconstructions. In this study modern subfossil soil surface samples will be the base to establish a regional statistical relationship between the standing vegetation, climate and the pollen record. This method will be applied to the fossil record to detect regional differences in plant communities, as well as their development during different time periods indicating climatic changes.

Preliminary results show strong correlations between vegetation type and pollen assemblage. Open environments, represented by steppes and alpine meadows are characterized by grasses and herbaceous plants, especially Asteraceae, with little to no woody vegetation. Semi-deserts stick out due to a high abundance of Amaranthaceae and other herbaceous plant pollen. Whereas closed environments are characterized by a high abundance of woody plants, primarily trees including few herbaceous plants and grasses.

The resulting statistical correlation will be applied on fossil assemblages from Pleistocene sites of Armenia (e.g. Upper Paleolithic site Aghitu-3 cave) and Georgia to reconstruct the past vegetation and climate for the different groups of hominins occupied this region. Preliminary results confirm, that this method is a useful tool for

palaeoecological reconstructions, providing information about the dynamics of vegetation and climate during the Pleistocene in the Southern Caucasus.

Holocene Vegetation, Climate Dynamics, and Human Impact in the Kashmir Valley (NW Himalaya, India)

Martina Stebich, Anoop Ambili, Arshid Jehangir, Salman Khan, Praveen K Mishra, Sushma Prasad, Torsten Utescher

As part of a multidisciplinary study, a Holocene sediment profile from Lake Manasbal (Kashmir Valley, NW Himalaya) was analyzed palynologically. Selected pollen taxa from each sample were examined using Principal Component Analysis (PCA). In addition, Canonical Correspondence Analysis (CCA) was applied to explore the relationships between the pollen dataset and geochemical proxies Al100 and Ca/Ti, which indicate runoff and drying, respectively.

The data-sparse and ecologically sensitive study area lies under the influence of the westerlies at the northwestern margin of the Indian Summer Monsoon (ISM). The new pollen record provides the first continuous palaeoecological evidence from the Kashmir Valley spanning the past ~12,500 years. Key findings include a shift from conifer-dominated open forests during the Late Glacial to denser, cool-mixed forests at the onset of the Holocene. The results indicate warmer and more humid conditions during the Early Holocene (until ~7 ka BP). The long-term trend is punctuated by intervals of enhanced rainfall and intensified river dynamics, alternating with distinct drought phases.

From 6.2 ka BP onward, the pollen record shows the first indications of human influence in the study area. With the onset of a dry phase around 4 ka BP, human impact increases markedly, consistent with regional archaeological evidence. The CCA results suggest that vegetation dynamics during the Early and Middle Holocene were mainly controlled by humidity, whereas later pollen assemblages were strongly overprinted by human activities.

Beyond pollen frequencies, Plant Functional Type (PFT) diversity analysis was conducted to assess ecosystem changes and functional biodiversity. Overall, pollen diversity increased steadily throughout the Holocene, with an acceleration linked to intensified human activity. Climate-driven changes, on both long and short timescales, are most clearly reflected in woody PFT diversity. Consistent with the pollen data, PFT results indicate a predominantly humid Early Holocene followed by progressively drier conditions during the mid- to late Holocene.

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