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AARG 2026 ANNUAL MEETING

10-12 September 2026
Plzeň, Czechia

Conference Information Booklet

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Aerial Archaeology Research Group sees the aerial perspective as integral to the pursuit of key questions in archaeology and heritage, including landscape character, long term landscape change, human ecodynamics, and the experience of place. We are a community of archaeologists, heritage professionals, researchers, students and independent scholars dedicated to education, research and outreach initiatives involving the acquisition and application of data from airborne and spaceborne platforms. AARG provides opportunities for networking, mentorship, and exchanges of ideas on theories, methods and technologies related to aerial archaeology. The organization supports an annual conference, workshops, training schools, and publications.



Founded in 1998, the **Department of Archaeology at the University of West Bohemia** (*Katedra archeologie FF ZČU*) provides teaching in archaeology with a focus on Prehistory, the Middle Ages, and the Early Modern period. The programme equips students with a strong theoretical foundation and a deep understanding of the material heritage of the past and its relevance for contemporary society. The department is also actively engaged in both theoretical and field archaeology, with a focus on archaeological methodology, non-destructive approaches, and the development of complex archaeological databases. Its activities are supported by two specialised research centres — the Centre for Digital Archaeology (CDA) and the Centre for Archaeological Applications (CAA).



Established in 1878, the **West Bohemian Museum in Plzeň** (*Západočeské muzeum v Plzni*) is a major research institution conducting scientific work in archaeology, art history, ethnology, history, museology, theatre studies, and natural sciences. With a collection of approximately two million items, it ranks among the largest museums in Czechia. The main building includes a library, reading room, and lecture hall. The museum manages several branches, including West Bohemian Museum (Main Building), Ethnographic Museum of the Plzeň Region, Puppet Museum, Museum of Religious Art of the Plzeň Diocese, Dr. Bohuslav Horák Museum in Rokycany, Water Hammer Mill in Dobřív.



University of West Bohemia in Pilsen, UWB (*Západočeská univerzita v Plzni, ZČU*) is a public university founded in 1991 through the merger of the College of Mechanical and Electrical Engineering and the Faculty of Education in Plzeň. Today, it offers over 300 study programmes across nine faculties and more than 60 departments. The programmes are spanning engineering, natural sciences, economics, humanities, arts, law, education, and health care. UWB is a member of the European Universities Alliance EUPeace, reflecting its commitment to international collaboration, innovation, and academic excellence.



The **Faculty of Arts, University of West Bohemia** (*Fakulta filozofická Západočeské univerzity v Plzni, FF ZČU*) is a dynamic centre for education and research offering a wide range of programmes in social sciences and humanities. Established in 1999, the Faculty offers programmes in the traditional fields of philosophy, archaeology, and history, but is also focused on studies of the modern society, the Middle East and African regions, the post-Soviet area, deprived localities, the history of science and technology, the history of international relations, paleoanthropology, the transformation of post-communist society, or international security.



The **Centre for Digital Archaeology, CDA** (*Centrum digitální archeologie, CDA*) is a specialised scientific research facility focusing on basic and applied research in the field of spatial data analysis and interpretation in archaeology and architecture, with a special focus on heritage. It is part of the Department of Archaeology at the University of West Bohemia in Pilsen, which is one of the unique institutions in the Czech archaeological environment due to its long-standing specialisation in landscape and spatial archaeology.

Here to help

If you need to contact one of the conference organisers, please use the mobile numbers below. These can also be given to family or friends if they are unable to contact you directly in an emergency.

Lenka Starková **+420 737 877 104**

Łukasz Banaszek **+44 7785 761 069**

Welcome reception

► **Wednesday 9th September 19:00 – 21:00**

Faculty of Arts, University of West Bohemia
Sedláčkova 268/38
301 00 Plzeň



Mapy: <https://mapy.com/s/nukogatofo>

Google Maps: <https://maps.app.goo.gl/kNYSeY9ZRRMi9CTf8>

Accessibility information

The building does not offer full barrier-free access. Entry is possible with assistance, as there is a single step at the entrance. Furthermore, barrier-free restrooms are not available within this specific building; however, they can be accessed in a nearby University of West Bohemia (UWB) building. If you require assistance or have specific accessibility needs, please contact the organisers in advance.

Conference venue

► **Thursday 10th September 8:40 – 17:40**

► **Friday 11th September 9:00 – 17:10**

West Bohemian Museum
Kopeckého sady 2
301 00 Plzeň



Mapy: <https://mapy.com/s/cubuletede>

Google Maps: <https://maps.app.goo.gl/SRMarCDTjhwjjBra6>

Accessibility information

The Museum's building is equipped with access ramps and an elevator to make all the exhibition rooms accessible for disabled visitors. The elevator is only intended for disabled visitors with their escorts and may only be operated by a trained employee.

Conference dinner

► **Friday 11th September 19:00 – 21:00**

Pilsner Urquell Hall / Red Hall
U Prazdroje 64/7
301 00 Plzeň



Mapy: <https://mapy.com/s/kezemefato>

Google Maps: <https://maps.app.goo.gl/HdEFAtox7W8CHFYDA>

Accessibility information

Restaurant Na Spilce offers barrier-free access, making it fully accessible for guests with physical disabilities. The premises are designed to ensure a comfortable visit for wheelchair users. The restaurant is located directly within the **Pilsner Urquell Brewery** complex.

Horní Beřkovice-Kostomlaty pod Řípem-Budyně nad Ohří-Terezín field trip

► **Saturday 12th September 08:15 – 18:30**

Meeting point

Bus parking (Parkoviště autobusů Štruncovy sady)
Pallova
301 00 Plzeň

Mapy: <https://mapy.com/s/nutojajoha>

Google Maps: <https://maps.app.goo.gl/1p7KqxyJVSpKsY55A>

Timetable

Please refer to the following itinerary for key timings:

	Start	End
Gather at bus parking (next to the Doosan Arena)	8:15	8:30
Horní Beřkovice visit	10:15	10:45
Kostomlaty pod Řípem visit	11:00	11:30
Budyně nad Ohří visit + lunch break on the way	12:45	14:00
Terezín visit	14:30	16:00
Václav Havel Airport Prague drop-off stop		17:30
Return travel to Plzeň	17:30	18:30

Accessibility information

Horní Beřkovice: Approx. 150 m walk on an unpaved, uneven path. The route is not suitable for wheelchair users.

Kostomlaty pod Řípem: Approx. 300–400 m walk across grassy terrain with slight unevenness. The route may be difficult for wheelchair users in wet conditions.

Budyně nad Ohří: Mostly barrier-free access within the castle complex. Surfaces are paved or compacted gravel, with accessible toilet facilities available.

Terezín Small Fortress-Casemates: The route includes uneven historic surfaces, narrow passages, low ceilings, and several flights of stairs. The casemates are not wheelchair accessible and may be challenging for visitors with limited mobility.

Guided tour of Plzeň

► **Saturday 12th September 10:00 – 12:30**

Meeting point

Tourist Information Centre
Náměstí Republiky 290/41
301 00 Plzeň

Mapy: <https://mapy.com/s/mocudefava>

Google Maps: <https://maps.app.goo.gl/jDsdjExS4NRhYC4B6>

General information

Plzeň (Pilsen) is a major city in West Bohemia and the capital of the Plzeň Region. It lies at the confluence of four rivers: Mže, Úhlava, Úslava and Radbuza, together forming the Berounka River.



Founded as a royal city in the late 13th century, Plzeň became an important town for trade on routes linking Bohemia with Bavaria. By the 14th century, it had grown to be the third-largest city in Bohemia. The city was besieged three times during the 15th century Hussite Wars, when it became a centre of resistance against the Hussites. During the Thirty Years' War in the early 17th century, the city was temporarily occupied after the Siege of Plzeň. In the 19th century, the city rapidly industrialised and became home to the Škoda Works, which became one of the most important engineering companies in Austria-Hungary and later in Czechoslovakia. The city is known worldwide as the home of Pilsner beer, created by Bavarian brewer Josef Groll in the city in 1842; today, the Pilsner Urquell Brewery is the largest brewery in the Czechia.

The city is an important cultural, economic, and administrative centre with a rich architectural heritage, with key landmarks such as the St. Bartholomew's Cathedral, Renaissance Town Hall, Franciscan Monastery and Archdeanery, the Great Synagogue (the second largest synagogue in Europe), historic underground system. The historic city centre is protected as an urban monument reservation and was European Capital of Culture in 2015.

More information on various attractions and activities can be found at the [Visit Plzeň](#) website.

Plzeňský Prazdroj (Pilsen Brewery)

The tradition of brewing beer in Plzeň began immediately after the city was founded in 1295. At that time, the Czech King Wenceslaus II granted the "brewing right" (*právo várečné*) to the burghers of Plzeň. This highly profitable privilege allowed owners to sell beer within their own homes. However, these top-fermented beers varied significantly in quality. Criticisms of their poor standard culminated in 1838, when 36 barrels of beer were reportedly poured out in the city square for being unfit for consumption and even harmful to health. This quest for quality led the local brewers to the idea of establishing a new brewery and hiring a master brewer who could create a truly delicious beer.

In 1842, the burghers of Plzeň, privileged with the brewing right, joined forces to build the **Burghers' Brewery** (*Měšťanský pivovar*). The first batch of the lager that would later conquer the world under the name **Pilsner Urquell** was brewed on October 5th of that year by brewmaster **Josef Groll**. Thanks to its crisp and delicious taste, the lager quickly gained popularity both at home and abroad. Today, beer from Plzeňský Prazdroj is exported to more than 50 countries worldwide, with its brewhouses producing up to 11 million hectolitres of beer annually.



Getting to Plzeň

Air

The closest airport to Plzeň is Václav Havel Airport Prague (PRG). Other nearby airports with international connections can be found in Karlovy Vary, Nuremberg and Munich. Václav Havel Airport Prague (PRG) is the largest airport in Czechia, and it serves as the main gateway to Central Europe, serving nearly 14 million passengers in 2023. Over 60 airlines connect Prague with more than 160 destinations worldwide.

From the Prague airport, you can reach Plzeň by train, by bus or by road.

Train

The railway lines that go to Plzeň are as follows: Prague, České Budějovice, Klatovy (Železná Ruda), Domažlice, Cheb and Žatec. Plzeň only has direct international train connections with Germany (Regensburg and Munich). The Western Express (*Západní Express*) offers the fastest connection from the centre of Plzeň to the centre of Prague. The Express leaves every hour and takes approximately 1 hour and 15 minutes to arrive at its destination. We recommend reserving your tickets beforehand.

If you are arriving from Václav Havel Airport in Prague, you must first travel from the airport to Prague Main Railway Station (*Praha hlavní nádraží*):

- Airport Express (AE) is the most convenient direct bus from Terminals 1 and 2 to the Main Station. It runs every 15-30 minutes, and the journey takes approx. 40 minutes. The fare is 100 CZK.
- The cheapest option is the public transport MHD: take Trolleybus 59 to *Nádraží Veleslavín* (Metro A) and continue to the city centre.
- A direct trip to the station by car takes about 25–30 minutes (e.g. Bolt or Uber, estimated cost around 2000-2500 CZK).

More info:

► **České dráhy** (Czech Railways)

► **Idos**

We recommend downloading the "Můj vlak" app (**My Train mobile app**) or purchasing tickets at the station terminal.

Bus

The Flixbus buses travel to Plzeň from Prague every hour. The journey takes approx. 1 hour. Buses leave for Plzeň several times a day from the Florence bus station in the centre of Prague. In addition, an array of international bus lines also stops in Plzeň.

If you are arriving from Václav Havel Airport in Prague, the most frequent bus connection is via Zličín:

- Airport → Zličín: take bus 100 (the journey takes about 18 minutes and requires a Prague Integrated Transport (PID) ticket)
- Zličín → Plzeň: from the Zličín bus terminal, take a FlixBus towards Plzeň

Total travel time is approx. 1 hour 20 minutes (including transfer).

More info:

- ▶ **Idos**
- ▶ **FlixBus**
- ▶ **Regiojet**

We strongly suggest booking your long-distance bus tickets in advance online, especially during peak hours.

Road

The European route E50, one of the longest E-roads on the continent, passes through Plzeň.

Recommendation

We recommend watching the 'Honest Guide' (*Kluci z Prahy*) YouTube channel to get the best local tips on avoiding tourist traps:

- **ATM scam**
- **Taxi scam**
- **Currency Exchange**

Accommodation

There is a wide range of accommodation options in Plzeň located near the conference venue. Below is a list of our recommended locations:

- Hotels: **Marriott, Central, Vienna house, Purkmistr, Rango**
- Guesthouse: **Penzion Wallis**

Most hotel options can be found on **Visit Plzeň** or **Booking.com**.

Visitor attractions

More information on various attractions and activities can be found on **Visit Plzeň**.

Getting around Plzeň

Public transport

Plzeň City Transport Company (PMDP) is the operator of public transportation within the city of Plzeň and its surrounding areas. The city's transit network is comprised of trams, trolleybuses, and buses. Details of routes and timetables can be found at **PMDP** website.

Cycling

Pilsen Bike is a shared e-bike service in the city of Plzeň. The e-bikes are designed for short trips around the city and are available to everyone. All bikes are electric-assisted, equipped with a GPS unit, and feature safety elements such as automatic front and rear lights, fenders, a bell, reflective elements, and more. In total, you'll find 300 e-bikes in the city, which can be located at more than 150 locations. More info can be found at **PMDP Bikesharing** website.

Schéma městské veřejné dopravy v Plzni Linienetz / Public transport routes

Platnost od 1. 4. 2025

Plzeňské městské
dopravní podniky **PMDP**

Legenda / Legende / Key

2 30 Linky s krátkým intervalem (1, 2, 4, 16, 30, 33, 41)
/ Lines with short interval / Lines with a short interval

11 20 Linky s delším intervalem
/ Lines with longer intervals / Lines with longer intervals

Obousměrná zastávka
/ Haltestelle / Stop

Zastávka na znamení
/ Bedarfshaltestelle / Request stop

Zastávka v zobrazeném směru
/ Haltestelle nur in abgebildeter Richtung / Stop only in displayed direction

Úsek pásmového provozu
/ Abschnitt mit zonenweisem Betrieb / Route with zonal operation

Jednosměrný úsek
/ Einbahnstrecke / One-way route

30 11 Konečná zastávka
/ Endhaltestelle / Terminal stop

Autobusová a vlakové nádraží
/ Omnibusbahnhof und Bahnhof / Bus and train station

H+ Nemocnice a poliklinika
/ Krankenhaus und Poliklinik / Hospital and polyclinic

P+R Parkoviště P+R
/ P+R Parkplatz / P+R parking lot

Zákaznické centrum PMDP
/ PMDP Kundenzentrum / PMDP Shop

Turistické a sportovní cíle
/ Touristische und sportliche Ziele / Tourist and sports destinations

Synagoga

Zóna 001 Tarifní zóna / Tarifzone / Tariff zone

Infolinka: 371 655 600

Po-Pá 7:00-18:00

[facebook.com/mhdplzen](https://www.facebook.com/mhdplzen)

[youtube.com/PMDPas](https://www.youtube.com/PMDPas)

[instagram.com/pmdp_oficialni_stranka](https://www.instagram.com/pmdp_oficialni_stranka)

www.pmdp.cz

f /aerialarchaeologyresearchgroup
m aerialarchaeology.bsky.social



2026 AARG ANNUAL MEETING

10-12 September 2026
Plzeň, Czechia

aargonline.com/wp/aarg2026

Photo: M. Čížek, Institute of Archaeology in Prague

Conference Programme

Wednesday, 9th September

19:00-21:00	Welcome reception
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Thursday, 10th September

08:40-09:20	Registration	
09:20-10:00	Welcome	
Session: Czech perspectives on archaeological landscapes		
10:00-10:20	Martin Gojda, Lenka Starková & Ondřej Baier	Bohemian Rhapsody. From air survey to archaeological remote sensing in Bohemia's digital age archaeology
10:20-10:40	Michaela Prišťáková, Martin Košťál, Peter Milo & Andrej Aladzov	Extensive UAV LiDAR survey of Bulgaria
10:40-10:50	Discussion	
10:50-11:20	Coffee break	
Session: Technical developments		
11:20-11:40	Filip Hájek	Satellite-based spectral separability of submerged ceramic scatters in shallow coastal waters: a case study from Nissia Coves, Cyprus
11:40-12:00	Barbora Weissová, Katrin Dorfner & Alex Šrollerů	Less is more? Evaluation of the utilization of low- and high-resolution LiDAR point clouds in archaeological research
12:00-12:20	Piotr Wroniecki	The point of last return. A simple algorithm for quick archaeological LiDAR filtering and DTM/DFM creation
12:20-12:40	José Ruiz Flores, Florian Cousseau & Leonardo García Sanjuán	Archaeology of movement: Empirical problems and methodological solutions for the study of ancient pathways
12:40-13:00	Rob Shaw	Out of sight: Assessing the effectiveness of UAV LiDAR on Irish archaeological landscapes
13:00-13:10	Discussion	
13:10-14:00	Lunch break	
Session: Aerial approach to Mediterranean landscapes		
14:00-14:20	Maria Lucrècia Centelles-Fullana, Carmen Cuenca-	Hidden routes: Identifying Iberian Iron Age pathways with ALS data

	García, Ole Risbøl & Valeria Martín Sidro	
14:20-14:40	Antonio Jesús Ortiz Villarejo	New insights into the Malaventura Fortress: Integrated remote sensing, historical data and high-resolution LiDAR analysis
14:40-15:00	Elise Fovet & Zoran Čučković	Unveiling Roman centuriation in northern Istria: a lidar breakthrough
15:00-15:20	Sara Popovic, Marko Rukavina & Žiga Kokalj	Roman centuriation beyond modern borders: New perspectives from national and transnational ALS datasets
15:20-15:40	Michael Doneus & Nives Doneus	Aerial archaeology and airborne laser scanning for the discovery of Roman agricultural practices in Istria, Croatia
15:40-15:50	Discussion	
15:50-16:40	Coffee break and poster session	
16:40-17:40	AARG AGM	

Friday, 11th September

Session: Archaeological landscapes beyond Europe		
09:00-09:20	Robert Bewley	Desert landscapes survey
09:20-09:40	Oliver Hatswell, Ian Moffat, Amy Roberts & Jarrad Kowlessar	Utilising advanced remote sensing techniques to reconstruct archaeological palaeohydrological landscapes in the Dead Heart of Australia
09:40-10:00	Filip Wałdoch, Zuzanna Wygnańska & Hany Kahwagi-Janho	Megalithic landscapes of Akkar (Lebanon) from the perspective of historic aerial photographs
10:00-10:20	Grzegorz Kiarszys	The Chelyabinsk roadside picnic: Spectres of nuclear disasters in the southern Urals
10:20-10:30	Discussion	
10:30-11:00	Coffee break	
Session: Aerial archaeology across Europe Part 1: Water and fire		
11:00-11:20	Dave Cowley, Mike Middleton & Juliette Mitchell	Topography matters – case studies from Scotland on the use of height data for modelling the palaeolandscape
11:20-11:40	Jaan Verliefden, Jan Trachet, Jeroen Verhegge, Wouter Maes, Philippe De Smedt, Bente Majchczack, Dennis Wilken, Immo Trinks, Sarah Bäuml, Stefan	Drones in a drowned delta – Documenting disappearing medieval landscapes in the Eastern Scheldt

	Krojer & Wim De Clercq	
11:40-12:00	Edward Pollard, Susan Curran, Robert Shaw, Cormac Duffy, Rebecca O'Reilly & Hannah Boyd	Modelling climate change risk to archaeological sites in Donegal Bay (Ireland)
12:00-12:20	Sally Evans	An aerial archaeological response to the Langdale Moor fire
12:20-12:30	Discussion	
12:30-13:20	Lunch break	
Session: Aerial archaeology across Europe Part 2: Cemetery, war and forest		
13:20-13:40	Máté Szabó, Attila Papp & Teofil Rétfalvi	Cemeteries from space
13:40-14:00	Marcin Czarnowicz	Landscape after the battle: The use of aerial archaeology, historical cartography, and archival research in reconstructing the Carpathian landscape: The case of the Jasiel area in the Polish Carpathians
14:00-14:20	Jakub Sobko	The archaeological landscape of warfare as a conservation target: From research to heritage protection in the Rawka and Bzura river basins (1914-1915)
14:20-14:40	Daniel Hunt	Revealing the hidden landscapes of the 'People's Forest': Aerial mapping in Epping Forest, London
14:40-14:50	Discussion	
14:50-15:20	Coffee break	
Session: Aerial archaeology across Europe Part 3: Complexity and consistency		
15:20-15:40	Mirosław Furmanek & Piotr Wroniecki	Systematic aerial archaeological prospection in Southern Poland: An overview
15:40-16:00	Joel Goodchild	Perceiving complexity in archaeological landscapes with drone-based multispectral survey
16:00-16:20	Hrvoje Kalafatić, Bartul Šiljeg & Rajna Šošić-Klindžić	Neolithic landscapes under cultivation: Integrating aerial archaeology and magnetometry for the detection and interpretation of settlement sites in Eastern Croatia
16:20-16:40	Susan Curran	Beyond the Hill of Tara: an aerial, geophysical, and toponymic approach to identifying Ireland's 'Tara' landscapes
16:40-16:50	Discussion	
16:50-17:10	Wrap-up	
19:00-21:00	Conference dinner	

Saturday, 12th September

08:30-18:30	Horní Beřkovice-Kostomlaty pod Řípem-Budyně nad Ohří-Terezín field trip (lunch provided)
10:00-12:30	Guided tour of Plzeň

Abstracts

Day 1. Thursday, 10th September

Session: Czech perspectives on archaeological landscapes		
10:00-10:20	Martin Gojda, Lenka Starková, Ondřej Baier	Bohemian Rhapsody. From air survey to archaeological remote sensing in Bohemia's digital age archaeology
10:20-10:40	Michaela Prišťáková, Martin Košťál, Peter Milo, Andrej Aladzov	Extensive UAV LiDAR survey of Bulgaria

Bohemian Rhapsody. From air survey to archaeological remote sensing in Bohemia's digital age archaeology

Martin Gojda, Lenka Starková (University of West Bohemia, Plzeň, Czechia), Ondřej Baier (Institute of Archaeology, Czech Academy of Sciences, Prague, Czechia)

Remote archaeological sensing/survey represents a set of methods through which archaeology acquires such a vast quantity and qualitative diversity of information about the relics of settlement activities of our ancestors that, in the fields of data collection, recording, and documentation of archaeological, architectural-historical, and urban heritage, this type of survey occupies one of the foremost heuristic positions. Since the pioneering beginnings of the intentional search for immovable archaeological sources, remote sensing and the aerial imaging of historical landscapes have undergone dynamic development, driven primarily by the continuously accelerating progress of technical disciplines.

The aim of this presentation is to outline the transformations in archaeological survey, documentation, processing, and storage of aerial archaeological data in Bohemia, the Czech Republic from its beginnings in the 1990s to the present day. Particular emphasis is placed on developments that have occurred in recent years, as the current pace of innovation in methods of remote surface survey from the air is influencing research into landscape history to an extent unparalleled by any previous stage in the development of this field. The long-standing phase of "aerial archaeology" (understood as visual prospection and the acquisition of oblique photographs from a light aircraft using a hand-held camera) has evolved into a digital phase of remote archaeological sensing. This new phase encompasses a range of innovative prospection methods capable of producing diverse forms of imagery (or data transformed into visual representations) and of supporting their processing and analysis through sophisticated procedures and algorithms.

In addition to discussing the heuristic phase of the long-term aerial archaeology programme conducted by the Prague Archaeological Institute of the Czech Academy of Sciences between 1992 and 2015, the presentation will address how this institution currently processes aerial photographs acquired during active low-altitude survey flights in that period into digital orthorectified and georeferenced maps, as well as detailed plans of individual sites.

The presentation will subsequently report on the potential of the modern hardware and software infrastructure currently available at the Centre for Digital Archaeology at the University of West Bohemia in Pilsen, and on the projects in which these remote archaeological survey tools are beginning to be applied, thereby ensuring a smooth continuation of the programme previously developed at the AI.

Extensive UAV LiDAR survey of Bulgaria

Michaela Prišťáková, Martin Košťál, Peter Milo, Andrej Aladzov (Department of Archaeology and Museology, Faculty of Arts, Masaryk University, Brno, Czechia)

In recent years, rapid technological progress has opened up the use of tools that were previously accessible only to a limited group of specialists. A particularly important example is LiDAR technology, especially when deployed on UAV platforms equipped with RTK GPS. For archaeology, this development creates new possibilities for documenting landscapes and archaeological sites under favourable conditions, independently and without dependence on externally supplied datasets.

Nevertheless, the wider availability of documentation equipment also introduces substantial challenges, above all in relation to data extraction, processing, and interpretation. This is especially relevant in the context of open science, where the objective is to rely on workflows constrained primarily by hardware capabilities rather than by expensive proprietary software.

This paper presents archaeological research at large sites in Bulgaria, based mainly on UAV LiDAR survey. The LiDAR results are used to map and interpret the landscape, and are further combined with geophysical survey and archaeological excavations. In total, about 66.6 km² were surveyed. The sites differ in size, terrain, and land cover, which created challenges during data collection and later validation.

Session: Technical developments		
11:20-11:40	Filip Hájek	Satellite-based spectral separability of submerged ceramic scatters in shallow coastal waters: a case study from Nissia Coves, Cyprus
11:40-12:00	Barbora Weisssová, Katrin Dorfner, Alex Šrollerů	Less is more? Evaluation of the utilization of low- and high-resolution LiDAR point clouds in archaeological research
12:00-12:20	Piotr Wroniecki	The point of last return. A simple algorithm for quick archaeological LiDAR filtering and DTM/DFM creation
12:20-12:40	José Ruiz Flores, Florian Cousseau, Leonardo García Sanjuán	Archaeology of movement: Empirical problems and methodological solutions for the study of ancient pathways
12:40-13:00	Rob Shaw	Out of sight: Assessing the effectiveness of UAV LiDAR on Irish archaeological landscapes

Satellite-based spectral separability of submerged ceramic scatters in shallow coastal waters: a case study from Nissia Coves, Cyprus

Filip Hájek (Institute of Archaeology of the Czech Academy of Sciences, Brno, Czechia)

Submerged ceramic scatters, also conceptualized as amphorascapes, are a frequent component of underwater cultural heritage in the Mediterranean Sea, representing dispersed shipwreck cargo and/or repeated anchorage and shelter activities. Despite their informative value, such sites often remain under-recorded and are challenging targets for systematic prospection (Demesticha 2015). Freely accessible satellite archives enable regional-scale

analysis of coastal zones; however, applications in submerged environments remain limited due to water depth and optical properties, turbidity, surface reflection, sea state, and biofouling.

This study evaluates whether a shallow-water ceramic scatter at the pilot site of Nissia Coves, Cyprus, can be spectrally discriminated from surrounding seabed substrates using multispectral satellite imagery. It proposes a separability-led workflow intended to support scalable, semi-automated screening in shallow coastal waters. Sentinel-2 imagery from 2020–2022 was processed in Google Earth Engine and analyzed through alternative temporal strategies, including single scenes and monthly, seasonal, and annual median composites. A range of spectral representations was explored, including individual bands, band ratios, spectral indices, and depth-invariant formulations. Feature combinations and temporal windows were ranked using the Jeffries–Matusita distance to quantify class separability.

The Sentinel-2 analysis indicates that monthly median composites generally yielded higher separability than individual scenes, including selected sunglint-corrected imagery, suggesting that robust temporal aggregation can mitigate episodic surface effects in this setting. Peak separability was observed in spring, whereas longer compositing windows tended to reduce class distinction. For selected high-performing time windows, PlanetScope SuperDove imagery was additionally tested to assess whether higher spatial resolution and additional visible bands improve the discrimination of small submerged ceramic scatters. Although demonstrated on a single well-documented site, the workflow is designed for extension to additional locations, target types, sensors, and correction schemes.

References

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Less is more? Evaluation of the utilization of low- and high-resolution LiDAR point clouds in archaeological research

Barbora Weissová, Katrin Dorfner (Institute of Classical Archaeology, Charles University, Prague, Czechia), Alex Šrollerů (Department of Applied Geoinformatics and Cartography, Charles University, Prague, Czechia)

This paper examines the potential of low- and high-resolution LiDAR (Light Detection and Ranging) point clouds for archaeological research, with particular emphasis on their effectiveness in feature detection within forested mining landscapes. The study was conducted in the densely wooded West Osogovo Mountains, Republic of North Macedonia, within the framework of the project Peak under the Canopy: Mining Landscapes of the West Osogovo Mountains, supported by PRIMUS (25/SSH/007).

The low-resolution LiDAR dataset, provided by the Agency of Real Estate Cadastre of the Republic of North Macedonia was acquired in September–October 2019 using a Riegl VQ-780i scanner mounted on a Cessna 402B aircraft. The resulting digital terrain model (DTM) has an average density of approximately 5 ground points per sq. m. To maximize the interpretability of this dataset, a dedicated visualization approach was developed, focusing on the clear representation of concave archaeological features, particularly mining pits.

The high-resolution LiDAR dataset was acquired in March 2026 using a DJI M350 RTK UAV equipped with a DJI Zenmuse L2 sensor. The resulting DTM reaches a very high point density (> 1000 points ground points per sq. m).

Archaeological features identified through remote sensing were subsequently verified through field survey conducted in spring 2026. Although the effectiveness of LiDAR-based archaeological prospection is generally considered to depend strongly on point cloud density and data quality, the results of this study indicate that high-resolution data provide only limited advantages for the initial detection of archaeological features in the investigated landscape. While the higher-density dataset offers greater detail and supports more precise documentation of identified features, the lower-resolution dataset proved equally effective for the primary identification and mapping of mining-related archaeological remains. These findings contribute to the ongoing discussion regarding the cost-effectiveness and practical applicability of LiDAR datasets of varying resolutions in archaeological landscape research.

The point of last return. A simple algorithm for quick archaeological LiDAR filtering and DTM/DFM creation

Piotr Wroniecki (Montefortino Prospection & Digitalisation, Switzerland)

Archaeology has specific, often niche needs that are rarely catered to by commercial or open-source software developers and so it requires approaches built for its own purposes. This algorithm grew out of repeated experience with open LiDAR data from governmental survey services, where potentially significant archaeological features are routinely obscured by misclassification of points: low-lying archaeology is frequently assigned to the low or medium vegetation classes, while ruined architecture is pushed into high vegetation.

Most users of this data are not equipped to filter and inspect the point cloud themselves and depend instead on these ready-made classifications. The approach proposed here reduces the needs of archaeology to a deliberately simple concept ground, buildings, and ruined architecture which together form the cultural landscape and encompass perhaps 95% of the data archaeologically relevant to most surveys. In ideal conditions this information should be captured in the last return of a given pulse but reality is imperfect, and surveys are often flown in conditions unfavourable to archaeology, leaving much important data buried within the cloud. Simply discarding all non-last-return points leaves behind spikes of vegetation and clumps of such spikes, and the aim of this algorithm is to detect and remove these noise artefacts while preserving the delicate archaeology beneath them. Still a work in progress, the method draws on ideas adapted from standard approaches to processing geophysical data.

Archaeology of movement: Empirical problems and methodological solutions for the study of ancient pathways

José Ruiz Flores, Florian Cousseau, Leonardo García Sanjuán (University of Sevilla, Spain)

The archaeology of paths has developed enormously in recent decades. Thanks to the emphasis on connectivity and human movement, a multitude of studies have begun to emerge that approach these infrastructures from very different perspectives. One of the most successful approaches is undoubtedly GIS analysis, particularly the detection of possible roads through the use of LCP. However, despite the undeniable contribution that these new methodologies have made to science in the field of Landscape Archaeology, in many cases the capabilities of the algorithms are overestimated or unknown (many articles do not even mention which ones are used). Similarly, we reduce roads to lines on maps, without much empirical evidence of a multitude of archaeologically measurable factors of their material nature. And for now, AI-powered studies are not developed enough to allow uncritical use that can lead to mistake archaeological features with shadows of the model. That is why we propose that it is necessary to carry out a critical and comprehensive review of the study of

archaeological roads in order to propose certain quality criteria that can be used for a more empirical study of these infrastructures that have connected humans for millennia. In this sense, remote sensing and the survey through aerial photography has proven to be one of the main techniques to successfully detect ancient paths in flat terrain. And to stress this we will review the potential of aerial survey with a site case in Alcala de Guadaira, a town near Seville (Andalusia, Spain) located in one of the most important roads of the region since at least the Copper Age.

Out of sight: Assessing the effectiveness of UAV LiDAR on Irish archaeological landscapes

Rob Shaw (The Discovery Programme, Dublin, Ireland)

The increasing accessibility of UAV-mounted LiDAR systems presents new opportunities for high-resolution archaeological prospection, particularly in landscapes where vegetation has historically limited survey effectiveness. This paper evaluates the performance of UAV-based LiDAR in the detection and interpretation of archaeological features across a range of Irish environments, drawing on field experience using the DJI M400 platform equipped with the Zenmuse L3 sensor.

Survey data was collected across multiple site types characterised by differing vegetation conditions, including improved pasture, rough grassland, scrub, and forestry. These datasets are assessed in terms of ground point density, canopy penetration, feature visibility, and overall data quality. Particular attention is paid to how vegetation structure and seasonal factors influence the ability of UAV Lidar to resolve subtle earthworks and previously unrecorded features.

The results are compared with existing airborne lidar datasets to evaluate relative advantages and limitations. While airborne lidar offers broader spatial coverage and established processing workflows, UAV-based systems demonstrate significant benefits in terms of flexibility, temporal control, and the ability to target specific areas at higher spatial resolution. However, challenges remain regarding survey efficiency, data consistency, and processing demands.

This study highlights the conditions under which UAV lidar provides meaningful improvements over traditional airborne survey, and where its application may be constrained. The paper contributes to ongoing discussions about integrating UAV-based approaches into archaeological survey methodologies, particularly in complex, vegetation-rich landscapes such as those found in Ireland.

Session: Aerial approach to Mediterranean landscapes

14:00-14:20	Maria Lucrècia Centelles-Fullana, Carmen Cuenca-García, Ole Risbøl, Valeria Martín Sidro	Hidden routes: Identifying Iberian Iron Age pathways with ALS data
14:20-14:40	Antonio Jesús Ortiz Villarejo	New insights into the Malaventura Fortress: Integrated remote sensing, historical data and high-resolution LiDAR analysis
14:40-15:00	Elise Fovet, Zoran Čučković	Unveiling Roman centuriation in northern Istria: a lidar breakthrough

15:00-15:20	Sara Popovic, Marko Rukavina, Žiga Kokalj	Roman centuriation beyond modern borders: New perspectives from national and transnational ALS datasets
15:20-15:40	Michael Doneus, Nives Doneus	Aerial archaeology and airborne laser scanning for the discovery of Roman agricultural practices in Istria, Croatia

Hidden routes: Identifying Iberian Iron Age pathways with ALS data

Maria Lucrècia Centelles-Fullana, Carmen Cuenca-García (Department of Prehistory, Archaeology and Ancient History, Universitat de València, Spain), Ole Risbøl (Institutt for arkeologi og kulturhistorie, NTNU Vitenskapsmuseet, Trondheim, Norway), Valeria Martín Sidro (Department of Prehistory, Archaeology and Ancient History, Universitat de València, Spain)

Throughout history, communication routes have constituted a fundamental element in the organization of territory. However, their archaeological identification usually remains a considerable challenge. In the case of the Iberian world in Spain, the study of paths is made difficult by the often non-monumental nature of these structures and by the historic transformations of the landscape.

Despite the existence of specific archaeological evidence such as rock-cut cart tracks or earthen paths built with dry stone techniques (Arasa, 2023), many of the Iberian routes remain invisible on the surface due to erosion, reforestation or agricultural reuse. In this context, several recent studies have modelled communication routes in the Valencian territory for this period using landscape-based approaches and Geographic Information Systems (Quixal Santos, 2020). These works have proposed networks of paths based on the spatial relationships between settlements, strategic resources and natural passages through the relief, contributing significantly to the understanding of regional mobility during the Iron Age in this region. However, many of these approaches rely primarily on predictive models and indirect data, which raises the need to contrast them with morphological evidence preserved in the landscape. The availability of high-resolution ALS data plays a central role in testing these hypotheses through the identification of features and archaeological elements linked to road systems (Nuninger et al., 2020).

This paper explores the potential of Airborne Laser Scanning (ALS) for the detection and analysis of paths from the Iberian period in the Valencian region in eastern Spain. Using digital terrain models and a range of LiDAR visualisation techniques, the study exploits ALS to highlight landscape features that could relate to passage structures or routeways influenced by topography. These features are examined in relation to known archaeological data and field observations in order to discuss their possible interpretation and explore criteria for distinguishing ancient routes from modern disturbances or agricultural features.

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New insights into the Malaventura Fortress: Integrated remote sensing, historical data and high-resolution LiDAR analysis

Antonio Jesús Ortiz Villarejo (University of Jaén, Spain)

This communication presents results from the project "Revealing Malaventura Fortress: An Archaeological Investigation Through LiDAR Documentation," funded by the AARG 2025 grant.

Located in the Despeñaperros Natural Park (Spain), the Malaventura fortification remains poorly studied due to its severe deterioration and the dense holm oak forest that obstructs traditional documentation. To overcome these barriers, we utilized a high-density drone made LiDAR point cloud to generate a Digital Terrain Model (DTM) with a resolution finer than 1.5 cm/pixel. Using the Relief Visualization Toolbox (RVT), several advanced micro-relief enhancement techniques were applied—including Sky-View Factor, Openness, and Local Relief Model (LRM), among others—to identify previously hidden structures and layout.

These LiDAR-derived products are integrated with historical documentation and cartography, aerial photogrammetry and multispectral data from the DIGITALSCAPE project. This multi-source synthesis allows us, for the first time, to produce a precise plan of the fortress and propose its access routes. Beyond documentation, this approach provides the data necessary to reconstruct the site's history and assess how climatic factors and environmental erosion have impacted its conservation, clarifying its strategic role within the surrounding landscape.

Unveiling Roman centuriation in northern Istria: a lidar breakthrough

Elise Fovet (MSH Clermont-Ferrand, Université Clermont-Auvergne-CNRS, France), Zoran Čučković (CHEC, Université Clermont-Auvergne, France)

This paper presents the first evidence of Roman centuriation in northern Istria (Croatia), a region previously considered devoid of such land division system. Using high-resolution Croatian national lidar data (2022–2023) and appropriate topographic visualisation algorithms (TPI, Toposhade), we identified numerous traces of limites (cadastral boundaries). These align with the module and orientation typical of the Istrian centuriation, demonstrating that it was not limited to the southern colonies of Pola and Parentium, but extended across the entire 80 km of the western coastline, forming a largely uniform grid. Unlike southern Istria, where Roman boundaries persist in modern field systems, northern traces are fossilised, materialised by micro-reliefs (low embankments), which are primarily preserved in overgrown and uncultivated areas, or as "ghosts" features in the ploughsoil. More generally, we will also discuss the quality and potential of available lidar data in Croatia, as well as the choice of appropriate data processing and visualisation techniques.

Roman centuriation beyond modern borders: New perspectives from national and transnational ALS datasets

Sara Popović (Arheoprojekt, Zagreb, Croatia), Marko Rukavina (Faculty of Architecture, University of Zagreb, Croatia), Žiga Kokalj (Research Centre of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia)

The increasing availability of high-resolution airborne laser scanning (ALS) data is transforming the study of Roman cadastral landscapes. While research on Roman centuriation has traditionally focused on individual systems and limited geographical areas, national and

transnational ALS datasets now enable analyses at unprecedented spatial scales. This paper explores how such datasets contribute not only to the identification of previously unknown centuriation systems but also to a better understanding of their territorial extent, mutual relationships, and broader role in Roman landscape organization.

The study integrates ALS-derived terrain models from Croatia, Slovenia and Friuli-Venezia Giulia in Italy to investigate Roman land division across the northern Adriatic and Pannonian regions. In Istria, the analysis has revealed a previously unrecognized centuriation grid whose relationship to the principal Roman land division system of the peninsula raises new questions concerning the organization of Roman land division in the region. In northern Dalmatia, ALS data have enabled the reconstruction of the limits of the centuriation associated with Iader while also revealing a second cadastral system immediately to its east, prompting a reassessment of the spatial and administrative relationships between the two. Furthermore, national ALS coverage has made possible the first systematic investigation of the Croatian Pannonian lowlands, leading to the identification of two previously unknown centuriation grids in a region where such evidence has remained largely undocumented.

These results demonstrate that large-scale ALS datasets are reshaping the study of Roman centuriation by enabling analyses that transcend modern political boundaries and regional research traditions. Beyond the discovery of new cadastral systems, they provide a framework for examining interactions between neighbouring grids, defining territorial limits, and reassessing the scale and complexity of Roman land division across diverse landscapes.

Aerial archaeology and airborne laser scanning for the discovery of Roman agricultural practices in Istria, Croatia

Michael Doneus (Department of Prehistoric and Historical Archaeology, University of Vienna, Austria), Nives Doneus (Vienna Institute for Archaeological Science, University of Vienna, Austria)

Our image of the Roman landscape of Istria is shaped by research into land surveying evidence and large-scale architectural remains of Roman villas. The detection and mapping of other, less dramatic features require systematic, large-scale prospection. This presentation discusses one example of this approach, which is based on the systematic evaluation of digital feature models (DFMs) that have been created using a green laser and a sophisticated archaeology-driven ground point filtering strategy, and aerial photographs taken during the same data acquisition flight.

The case study area covers approx. 24 km² of land and underwater terrain in Medulin Bay, Istria, Croatia. Processed, visualised and interpreted for archaeological purposes, the data reveal not only features ranging from prehistoric hilltop settlements to modern military installations, but also a complex picture of the Roman land use. Of particular interest is the large number of Roman planting pits, which were detected from aerial photographs already three decades ago. However, recent and historical aerial photographs show that the minimum area of the pits extend over 13 ha. They can only be seen in areas under cultivation or otherwise free of maquis vegetation. Under maquis, the DFM shows regular grids of eroded former boundaries with a layout of approximately 37 x 37 m that is clearly connected to these planting pits. Together, planting pits and grids, on the area of at least 21 hectares, are currently interpreted as remains of large-scale Roman agriculture in form of orchards or tree nurseries. Starting this summer, a new research project will investigate whether this interpretation is valid and examine the use of planting pits in the context of large-scale Roman agriculture.

Poster session

Traces of the past: Tracking the development of the agricultural landscape in the Kraslice region across centuries*Klára Hanáková (Department of Archaeology, University of West Bohemia, Plzeň, Czechia)*

For several years, the author has been researching the historical landscape of the Kraslice region (Czech Republic, western part of the Ore Mountains). This study focuses on the analysis of agricultural land use across nine cadastral areas, representing villages and towns whose built-up areas and outlying lands (intravilan and extravilan) have evolved from the Medieval or Early Modern periods to the present. The selected areas include the medieval settlements of Kostelní–Počátky–Kámen (villages), Mlýnská (village), Krásná (village), and Kraslice (town), as well as the early modern settlements of Krásná Lípa (town), Rotava (originally a village, later a town), and Bublava (village). The land use analysis is based on a comparative study of the 19th-century Imperial Imprints of the Stable Cadastre, historical aerial photographs from the 1950s, 1960s, and 1970s, and current agricultural land use maps. These areas are located in a foothill region near the national border; as a result, they experienced distinct development trajectories. The poster illustrates their development, expansion, or subsequent decline, which was profoundly shaped by the socio-political events of the second half of the 20th century.

From Irish barrows to Herzegovinian mounds: cross-regional adaptation of an archaeological detection model

Nejc Čož (Research Centre of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia), Luka Škerjanec, Žiga Kokalj (Research Centre of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia, Postgraduate School ZRC SAZU, Ljubljana, Slovenia)

The Automatic Detection of Archaeological Features (ADAF) tool employs convolutional neural networks for semantic segmentation of airborne laser scanning (ALS) data to detect archaeological structures. Initially trained on Irish and UK datasets, ADAF was developed to assist in detecting barrows, ringforts, and enclosures in Irish landscapes.

This study evaluates the transfer of ADAF from its original geographical context to southern Herzegovina, using high-resolution ALS data collected within the ERC-funded project STONE. The main challenge is the transferability of the model between two markedly different landscapes: Irish barrows are mainly found in low, rolling terrain, whereas burial mounds in Herzegovina are located in rugged Dinaric karst, often densely clustered and interspersed with natural rock formations. Generalizability is further complicated by the variability within the Irish barrow class, which encompasses topographically diverse features, while the application in Herzegovina focuses solely on mound-like structures.

The detection model trained on Irish data alone detected nearly half of the known mounds in the test area, with few false positives. Retraining the model with curated data from Herzegovina significantly improved its performance, demonstrating the importance of regional training data and confirming that shared morphological signals can support cross-regional model adaptation in archaeological prospection.

Quantifying charcoal production within the circumferences of two mining industries in central Norway

Mats Kåre Kviseth Sporseem, Ole Risbøl (Norwegian University of Science and Technology, Trondheim, Norway)

Pre-industrial production of mined iron and copper in Norway dates back to the 16th century and took place at a number of iron and copper works in central and southeastern parts of the country. In addition to access to ore and water power, charcoal—used both for roasting the ore and for fuelling the smelting furnaces—was essential to the production process.

Charcoal was produced within so-called circumferences, i.e., large areas surrounding the works where farmers and peasants were legally obligated to produce and supply charcoal to the plants. The demand was substantial, and traces of charcoal production are still visible in the landscape today, with thousands of charcoal kilns found in forested areas.

Despite the extensive documentation of single charcoal kilns, researchers have seldom examined the overall scale of production across larger areas. In this poster, we present an ongoing study in which LiDAR is used to map charcoal kilns within two circumferences associated with an ironwork and a copper work, respectively.

The main aim is to quantify charcoal production as a basis for investigating the relationship between charcoal and metal production. In addition, the study explores whether charcoal production was sustainable, examines potential conflicts with other uses of forest resources, and seeks to better understand the role of farmers and peasants in this production system.

From bike rides to buried treasures: How hobby drone flights uncover archaeological secrets

Simon Seyfried (Independent, Germany)

This poster presents a private hobby project focused on the detection and analysis of archaeological crop marks using a combination of UAV-based surveys, hyperspectral imaging, and Sentinel-2 satellite remote sensing. The work is based on activities conducted independently during 2025 and 2026, primarily as part of recreational cycling tours and travel, alongside a single professional hyperspectral drone flight enabled by the (former?) author's employer.

The UAV surveys were carried out using a consumer-grade drone during personal trips, capturing high-resolution RGB imagery of crop marks in various regions. These opportunistic flights allowed for the documentation of subsurface archaeological features such as ditches, enclosures, and pits, which became visible as vegetation differences in agricultural fields. The data was occasionally processed into orthomosaics and analysed visually in GIS software to identify and map potential sites.

In addition to these private surveys, the author had the unique opportunity to conduct a hyperspectral drone flight using a professional setup provided by his employer. This flight targeted a known archaeological area, enabling the collection of high-resolution hyperspectral data to analyse not only vegetation stress but also other traits like availability of nutrients. The hyperspectral data was processed to calculate indices for providing deeper insights into the relationship between buried features and surface vegetation.

To contextualize the sites, Sentinel-2 satellite imagery was used to assess the broader occurrence of crop marks and their correlation with vegetation anomalies. By analysing multi-temporal Sentinel-2 data, the project explored how large-scale, open-access satellite observations could complement the detailed, local-scale UAV and hyperspectral data. This approach allowed for more efficient logistics and understanding of real time phenology of agricultural vegetation.

The poster highlights the potential of combining low-cost, hobbyist UAV surveys with professional hyperspectral data and open-access satellite imagery for archaeological

prospection. It demonstrates how private, recreational activities can contribute to the documentation and analysis of crop marks, while also showcasing the added value of high-end remote sensing techniques when available. The project underscores the accessibility of modern remote sensing tools for non-professional researchers and the importance of citizen science in supplementing traditional archaeological methods.

A karst landscape in the Yorkshire Dales National Park

Alison Deegan (Independent, UK)

This poster will include interim results of an ongoing project in the Westmorland Dales, which are part of the Yorkshire Dales National Park, England. It will demonstrate some of the challenges faced in this particular environment: low resolution lidar imagery and sparse historical air photo coverage; identifying stone-on-bedrock structures; and dating features where re-use of sites across centuries is not uncommon. This project is funded by Historic England.

Reflections on the UAV survey in the Akkar hinterland (Lebanon)

Filip Wałdoch (Independent, Poland)

Zuzanna Wygnańska (Institute of Mediterranean and Oriental Cultures PAS, Warsaw, Poland)

Hany Kahwagi-Janho (Holy Spirit University of Kaslik, Jounieh, Lebanon)

In this poster, we will present our methodology and the reflections arising from working in a very challenging hilly landscape of northern Lebanon. The project involved surveying the basalt hills of Akkar, rising from 300 to 600 meters above sea level, to identify above ground stone structures, mostly megalithic. These hills are characterized by very deep wadis. Combined with steep slopes and dense vegetation, this posed a huge challenge for both remote sensing and on-foot surveying. Thus, the UAV served two functions in this survey. The first was a very standard one: conducting photogrammetric flights. The goal was to collect higher-resolution data. This preceded the on-foot exploration and allowed us to determine whether the area showed promise. Given the limited time in the field, this proved to be a very important part of the work. The challenging terrain also required less conventional solutions. The drone was also used to take oblique aerial photographs, complementing the foot survey. This added an extra dimension to the field documentation and allowed for better and faster decision-making.

Recording archaeology at risk: Digital survey of Tepenec Castle

Tomáš Kroupa, Lenka Starková, Tomáš Náhlík (Department of Archaeology, University of West Bohemia, Plzeň, Czechia)

Tepenec Castle (Twingenberg/Karlsburg), a medieval fortification in the Nízký Jeseník Highlands of the Czech Republic, represents a case of an archaeological monument undergoing progressive destruction by active limestone quarrying. As extraction continues, the remaining parts of the site are expected to disappear entirely in the future. This raises an important question: to what extent can detailed digital documentation preserve archaeological information and support the interpretation of a site before its final loss?

To address this issue, a comprehensive survey was carried out using UAV-based LiDAR, terrestrial laser scanning, digital photogrammetry, and GIS analysis. The resulting datasets enabled the identification of fortifications, communication routes, masonry remains, and the

spatial organisation of the castle. Particular attention was paid to the entrance complex and a prominent structure within the castle core, tentatively interpreted as a tower. The results show that integrated digital recording provides a reliable basis for the interpretation of heavily disturbed archaeological sites and creates a lasting record of cultural heritage threatened by irreversible loss.

A changing climate, changing cropmarks: Observations in Hungary

Zoltán Czajlik (Institute of Archaeological Sciences, Eötvös Loránd University, Budapest, Hungary)

Since 1993, the Aerial Archaeology Archive of the Institute of Archaeology at the Eötvös Loránd University has preserved a significant number of aerial photographs from every early summer season. These clearly show the cropmark characteristic of Hungary. Due to the large area of cultivated land, winter wheat is of particular importance; in addition, a significant number of cropmarks have been identified in winter barley, triticale, and corn. Due to years of low precipitation, the area planted with the latter began to decline starting in 2022, which also affects the detection of cropmarks: in recent years, we have observed very few cropmarks in corn. However, the area planted with phacelia, used for soil regeneration, is increasing, and we have been identifying cropmarks in it since 2008.

Even more striking is the change regarding the ideal, easily observable timing of cropmarks: while conditions were best between June 10 and 20 in the 1990s, the season now begins around May 10 in certain areas.

Based on the above, observations related to cropmarks indicate a trend that reflects the drying and warming of Hungary's climate.

Integrating geophysics with high-resolution LiDAR and multispectral survey

Kimberley Teale (Archaeological Research Services Ltd, UK)

This presentation explores how archaeological prospection can be strengthened by integrating geophysical survey data with high-resolution LiDAR and multispectral imagery, along with supporting evidence from historic mapping and wider landscape analysis. Using case studies from various development-led projects, it shows that no single technique provides a complete picture: magnetometry, LiDAR and multispectral survey each reveal different aspects of buried archaeology, and the best path is in the use of multiple sources of information. The presentation argues that archaeologists should move beyond relying on geophysics alone and use multiple accessible datasets to better understand sites and landscapes

Contract archaeology and highway projects in Romania: interdisciplinary challenges and opportunities

Mihai Florea (National History Museum of Romania, Bucharest, Romania)

Călin Șuteu (Gigapixel Art S.R.L., Cugir, Romania)

Corina Borș (National History Museum of Romania, Bucharest, Romania)

Carmen Miu Bem (National Company for Road Infrastructure Administration, Bucharest, Romania)

The presentation provides an overview on contract archaeology in the framework of large-scale highway infrastructure projects, with particular emphasis on interdisciplinary

collaboration between archaeologists, engineers, construction companies, and public authorities. It addresses the main challenges associated with balancing infrastructure development and cultural heritage protection.

The highway project, the Sibiu-Pitești highway (sections 2 and 3) examined in this case study presented particular challenges due to its close connection with the nomination of the Frontiers of the Roman Empire – Dacia for registration on the UNESCO World Heritage List. As the proposed route crossed or passed nearby areas associated with the Roman frontier system in Romania, the archaeological work had to take into account not only the investigation of individual sites, but also the wider historical and cultural landscape in which these heritage assets were located.

At the same time, the project provided an opportunity to develop and apply a broader archaeological research methodology. The research team of the National History Museum of Romania adopted, for section 3 (37,4 km along a rather steep landscape), an integrated approach that combined preventive archaeological investigations with landscape archaeology, spatial analysis, non-invasive survey methods, and the assessment of visual and spatial relationships between archaeological sites and their surrounding environment.

This approach enabled the archaeological evidence to be interpreted within a wider territorial context, rather than as a series of isolated (fragmented) discoveries. It also contributed to a better understanding of the organization, visibility, and strategic role of the Roman frontier landscape, while supporting the development of appropriate measures for protecting cultural heritage during the planning and construction of the motorway.

Through this case study, the presentation demonstrates how contract archaeology can be coming an important framework for interdisciplinary research, heritage management, and informed decision-making in major infrastructure projects.

Mapping ghost scars: a remote sensing analysis of the 1977 Wapno salt mine disaster and its impact on the landscape

Lidia Żuk (Faculty of Archaeology, Adam Mickiewicz University, Poznań, Poland)

On August 5, 1977, the improper exploitation of the Tadeusz Kościuszko salt mine in Wapno (west-central Poland) – then one of the country's primary salt production centres – culminated in a major anthropogenic disaster. Groundwater flooded the underground mine workings, triggering catastrophic ground subsidence and surface collapse that led to a massive exodus and the permanent evacuation of more than 1,400 residents. While existing research has focused primarily on the geophysical aspects of this event – including salt mechanics and radar interferometry – the human, material, and cultural dimensions of this reshaped landscape remain largely unexplored.

This poster contributes to the archaeology of the Anthropocene by employing multi-temporal Earth Observation (EO) data to analyse landscape change before and after the disaster. Through a comparative analysis of topographic maps, aerial photographs, and satellite imagery from both periods, supplemented by modern Airborne Laser Scanning (ALS) data, this study traces how human miscalculation became permanently written into the local landscape. The “before” captures the height of Wapno's rapid post-war industrial expansion between 1956 and 1965, when the mine served as a vital economic and social anchor for the local community. This thriving, high-density mid-century settlement – defined by organised miners' housing, gardens, and active infrastructure – is vividly documented in the first post-war vertical aerial photographs taken by the Head Office of Geodesy and Cartography in the 1960s.

Conversely, the rapid physical erasure of this cultural core is traced through a high-resolution time series of declassified American satellite imagery spanning 1976–1978 and capturing the landscape immediately before and after the collapse. This sequence is complemented by a flight strip of vertical aerial photographs acquired by the Head Office of Geodesy and Cartography on 19 June 1978 to document the immediate aftermath. Together, these sources provide a high-resolution chronicle of destruction, visualising the process through which active community spaces were erased and transformed into a hazardous, waterlogged void and fenced-off exclusion areas.

Special emphasis is placed on mapping the material scars and ghost infrastructure left by the disaster, most strikingly represented by a prominent gap in the local railway line and the remains of destroyed housing. Furthermore, the remote sensing data illustrates the spatial adaptation of the surviving community. Forced to turn its back on its historical centre, the village's post-1977 residential growth expanded outward like ripples on a pond, shifting away from the hazardous salt dome. Ultimately, this presentation demonstrates how comparative multi-temporal remote sensing can document the profound spatial trauma and physical resilience of a community fundamentally reshaped by industrial failure.

Water, terrain and settlement: Reconstructing human-landscape relationships in Mesopotamia

Lenka Starková, Tomáš Náhlík, Karel Nováček (Department of Archaeology, University of West Bohemia, Plzeň, Czechia)

Water availability and landscape topography are commonly regarded as key factors influencing settlement location in the past. In the mountainous regions of northern Kurdistan, however, the relationship between environmental conditions and settlement strategies remains insufficiently understood. This paper examines whether the reconstruction of hydrological and geomorphological conditions can explain the observed distribution of archaeological sites and contribute to the prediction of previously unidentified settlements. The study focuses on the Koya region (northern Iraq) and combines remote sensing data, digital elevation models, hydrological modelling, and GIS-based spatial analyses with the results of archaeological survey. Particular attention is paid to water accessibility, terrain morphology, drainage networks, and the spatial relationships between settlements and their surrounding landscapes.

Preliminary results suggest that settlement location was shaped by a combination of hydrological and topographic variables rather than by proximity to water sources alone. The paper discusses the potential of landscape-based predictive models for archaeological prospection and evaluates their applicability for identifying previously undocumented sites in regions where systematic fieldwork remains challenging.

Day 2. Friday, 11th September

Session: Archaeological landscapes beyond Europe		
09:00-09:20	Robert Bewley	Desert landscapes survey
09:20-09:40	Oliver Hatswell, Ian Moffat, Amy Roberts, Jarrad Kowlessar	Utilising advanced remote sensing techniques to reconstruct archaeological palaeohydrological landscapes in the Dead Heart of Australia
09:40-10:00	Filip Wałdoch, Zuzanna Wygnańska, Hany Kahwagi-Janho	Megalithic landscapes of Akkar (Lebanon) from the perspective of historic aerial photographs
10:00-10:20	Grzegorz Kiarszys	The Chelyabinsk roadside picnic: Spectres of nuclear disasters in the southern Urals

Desert landscapes survey: Introducing a new project in the Middle East

Bob Bewley (University of Oxford and CBRL, UK)

This new project will explore archaeological landscapes discovered through the analysis of satellite imagery and aerial reconnaissance, combining aerial photography with field survey. Two areas have been chosen, one, in the eastern black-basalt desert, or the badia, where there has been over 25 years of aerial survey (Aerial Archaeological in Jordan project) and fieldwork. This survey is in co-operation with the Eastern Badia Archaeology (EBAP) project, directed by Dr Alexander Wasse.

The second area, in southern Jordan, is a different type of volcanic landscape, with basalt “mesas”, surrounded by a sandy desert. This region has only ever been surveyed from the air, so the field visits will be breaking new ground. This paper will explore the nature of these archaeological landscapes, exploring what we already know about them, what we hope to find, as well as the challenges of undertaking aerial survey and fieldwork in this part of the world.

Utilising advanced remote sensing techniques to reconstruct archaeological palaeohydrological landscapes in the Dead Heart of Australia

Oliver Hatswell, Ian Moffat, Amy Roberts, Jarrad Kowlessar (Flinders University and Yandruwandha Yawarrawarrka Traditional Land Owners (Aboriginal Corporation), Adelaide, Australia)

The Coongie Lake region is a system of freshwater wetlands located in some of the most arid and desolate country in Australia. Much of the region receives less than 200 mm of annual rainfall and is intermittently replenished by large volumes of slow-moving monsoonal floodwaters from the desert margins. While Lake Coongie and parts of the main channel often contain water, most other lakes in the system are ephemeral and inundate only during major flood events. Despite this, the area was permanently occupied by Aboriginal people at the time of European contact, although no archaeological survey has revealed any material culture older than ~3,000 years BP. Did Aboriginal peoples first populate this region in the Late Holocene, or is the absence of older archaeological evidence due to the region's inaccessibility and complex geomorphology? This research aims to explore this question by examining water availability within this system over the past 40,000 years.

This research utilised supervised classification of daily MODIS satellite imagery, alongside stream gauge and rainfall data, to identify patterns in rainfall, stream discharge, and water availability, and extrapolated these results into the past using paleoclimate data. By identifying patterns in rainfall and water movement, this research reconstructs the past landscape and hydrology within the Coongie Lakes to understand how frequently water was available in this system, when it was most often available, and which lakes and channels had water available for the longest periods.

This information will assist in contextualising the landscape in which Aboriginal people lived, in determining whether the region would have been more hospitable to long-term settlement or to short-term opportunistic exploitation, and in identifying areas within the system with higher potential for archaeological findings.

Megalithic landscapes of Akkar (Lebanon) from the perspective of historic aerial photographs

Filip Wałdoch (Independent, Poland)

Zuzanna Wygnańska (Institute of Mediterranean and Oriental Cultures PAS, Warsaw, Poland)

Hany Kahwagi-Janho (Holy Spirit University of Kaslik, Jounieh, Lebanon)

The Megalithic Landscape of Akkar (Lebanon) was researched during Project *MEG-a: The first megalith builders of the northern Levant. A multidisciplinary investigation of Akkar's archaeological landscape (Lebanon, 4th-3th millennia BC)*. (founded by NSF no. 2020/39/I/HS3/0299). In this presentation, we focus only on part of the survey: the application of remote sensing methods. We examine the potential of historic aerial photography for studying megalithic landscapes in the Akkar region. The use of aerial archaeology in this region began in the 1920s-30s with the work of A. Poidebard, though he did not study megaliths. More recently, J. Bradbury (2011) applied remote sensing methods using satellite imagery in Syria, mainly for megalithic structures adjacent to our area of interest. In this paper, we examine a source that has not yet been fully explored: vertical aerial photographs taken by the Lebanese Army in 1956 and 1969. Here, we present preliminary analyses of 23 photos from 1956 and 23 from 1969. On these, we identified 187 features connected with human activity in the 4th-3rd millennia BC, including 34 megalithic tombs. Out of these identified structures, 21 tombs had already been non-existent. This is an important finding regarding our understanding of megalithic landscapes. If so much information was lost in the last 50 years, we now have only a small percentage of megalithic tombs remaining. This also helps to explain discrepancies between our research and the initial studies of these megaliths conducted by M. Tallon (1958). Today, it is impossible to count the same number of structures. This reduction results from settlement expansion and more invasive alterations to the landscape.

These novel data significantly alter our interpretation of the megalithic landscape. First, given that a substantial volume of archaeological information has been lost over the past 50 years, the current state of preservation represents only a small fraction of the original megalithic tombs. This loss further elucidates the discrepancies between our current findings and the pioneering studies of these megaliths conducted by M. Tallon in the 1950s. These disparities are primarily attributable to modern settlement expansion and increasingly invasive anthropogenic alterations to the landscape. However, archival aerial photography facilitates the assessment of potential original distribution patterns, thereby allowing for a comprehensive reinterpretation of the megalithic landscape within this region.

References

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The Chelyabinsk roadside picnic: Spectres of nuclear disasters in the southern Urals

Grzegorz Kiarszys (*Faculty of Archaeology, University of Szczecin, Poland*)

My presentation examines the Mayak Chemical Combine in the Southern Urals, with a particular focus on the material and discursive traces of nuclear disasters. Mayak functioned as a secret plutonium production centre and played a central role in the Soviet nuclear weapons programme, while also becoming the site of one of the most severe nuclear disasters in history – the Kyshtym disaster of 1957. Owing to long-term secrecy, restricted access, and the fragmentary nature of the available evidence, Mayak constitutes a particularly challenging subject of archaeological and historical inquiry.

The study adopts a multidisciplinary approach, combining landscape archaeology with the analysis of heterogeneous narrative sources. These include official Soviet and post-Soviet records, Western intelligence materials (including CIA reports), press accounts, written eyewitness testimonies, and representations drawn from popular culture. A key methodological component is the use of declassified U.S. reconnaissance satellite imagery from the CORONA, GAMBIT, and HEXAGON programmes (1960s–1970s), which provides independent insight into the spatial and infrastructural development of Mayak and its surrounding landscape.

The paper also engages with the concept of the persistence of past events in material and cultural landscapes. The environmental consequences of nuclear weapons production and related accidents—such as contaminated rivers, abandoned settlements, and restricted zones – are understood as enduring material traces that embody the legacy of Cold War technologies. At the same time, these landscapes are embedded within broader cultural imaginaries shaped by secrecy, fear, and speculation.

The study demonstrates that, alongside official records, alternative forms of representation can offer valuable insights for archaeological research on the recent past. The integration of satellite imagery with archival and intelligence materials contributes to a more comprehensive understanding of secret Cold War infrastructures. A landscape-based approach also enables the verification and visualisation of events previously known only from written accounts or personal testimonies—an aspect of particular importance in cases where the scale of events contrasts with the limited availability of corroborating evidence. Finally, the paper underscores the interpretative value of popular culture as a source which, despite requiring careful critical evaluation, reflects broader cultural contexts and enriches archaeological analysis.

Session: Aerial archaeology across Europe Part 1: Water and fire

11:00-11:20	Dave Cowley, Mike Middleton, Juliette Mitchell	Topography matters – case studies from Scotland on the use of height data for modelling the palaeolandscape
11:20-11:40	Jaan Verliefden, Jan Trachet, Jeroen Verhegge, Wouter Maes, Philippe De	Drones in a drowned delta – Documenting disappearing medieval landscapes in the Eastern Scheldt

	Smedt, Bente Majchczack, Dennis Wilken, Immo Trinks, Sarah Bäumlér, Stefan Krojer, Wim De Clercq	
11:40-12:00	Edward Pollard, Susan Curran, Robert Shaw, Cormac Duffy, Rebecca O'Reilly, Hannah Boyd	Modelling climate change risk to archaeological sites in Donegal Bay (Ireland)
12:00-12:20	Sally Evans	An aerial archaeological response to the Langdale Moor fire

Topography matters – case studies from Scotland on the use of height data for modelling the palaeolandscape

Dave Cowley, Mike Middleton (Historic Environment Scotland, UK), Juliette Mitchell (The SCAPE Trust, University of St Andrews, UK)

Topography, whether in terms of absolute altitude or variability in characteristics like drainage, is an important aspect of how human populations occupied and used landscapes. However, the scale of landform modification over time can mean that reconstructing these aspects of the palaeolandscape can be impossible or highly complex. There is also an underlying question of how and whether aspects of reconstructed palaeolandscapes related to past populations and their inhabitation and use of the landscape.

This paper presents multiscale case studies that range from the regional to site specific in eastern and southern Scotland to explore the utility of height data and digital terrain models to understand the palaeolandscape. Using hydrology tools in GIS to model aspects of flow and drainage, case studies include site specific explorations of neolithic cursus monuments that provide insights into the siting of individual monuments, and at a local scale on the disposition of Roman communication routes and early medieval cemeteries. Finally at a regional scale, modelling provides insights into the representativity of known distributions of Iron Age settlements and the definition of settlement and non-settlement zones. In all these cases the critical exploration of models of aspects of past palaeolandscape have demonstrable explanatory power.

Drones in a drowned delta – Documenting disappearing medieval landscapes in the Eastern Scheldt

Jaan Verliefden, Jan Trachet, Jeroen Verhegge, Wouter Maes, Philippe De Smedt, Bente Majchczack, Dennis Wilken, Immo Trinks, Sarah Bäumlér, Stefan Krojer & Wim De Clercq (Ghent University, Belgium)

This research investigates the drowned medieval landscapes of the Eastern Scheldt (The Netherlands), where accelerating erosion and sea-level rise increasingly threaten exceptionally well-preserved intertidal archaeological heritage. These drowned villages and their surrounding reclaimed landscapes form a unique archive of medieval habitation, land reclamation, and environmental change. However, their dynamic intertidal context poses major methodological challenges for archaeological prospection, monitoring, and long-term heritage management. This paper presents ongoing research into the development of integrated survey and monitoring strategies for these vulnerable coastal landscapes using remote sensing

methods. These are applied alongside terrestrial and marine survey methods, which will not be discussed in the presentation.

A first remote sensing research line focuses on the analysis of historical aerial photographs and legacy remote sensing data. These datasets reveal traces of the broader drowned rural landscape, including former field systems, drainage structures, roads, and peat extraction features that are only intermittently visible on the tidal flats and the subtidal area. Diachronic analysis of aerial imagery might provide insights into long-term landscape erosion, sediment dynamics, and the gradual exposure and erosion of landscape-archaeological remains.

A second research component investigates the application of UAV-based survey techniques at the drowned villages of Tolsende and Nieuwlande. UAV photogrammetry and LiDAR are used to rapidly document exposed structural remains and changing surface conditions during low tide, while UAV-mounted magnetometry has mapped large-scale buried settlement features and village topography beneath the mudflat surface. Apart from a first use-case test centred on the church area of Tolsende, the paper evaluates initial conclusions regarding the complementarity, limitations, and practical applicability of these techniques within the operational constraints of intertidal environments.

By combining historical aerial imagery with UAV-based remote sensing and geophysical survey, the project aims to develop more effective methodologies for documenting and monitoring endangered intertidal heritage landscapes. The presentation therefore addresses not only the reconstruction of drowned medieval landscapes, but also the broader challenge of how aerial archaeology and remote sensing can contribute to the sustainable management of rapidly disappearing coastal heritage under conditions of accelerating environmental change.

Modelling climate change risk to archaeological sites in Donegal Bay (Ireland)

Edward Pollard, Susan Curran, Robert Shaw, Cormac Duffy, Rebecca O'Reilly & Hannah Boyd (The Discovery Programme, Dublin, Ireland)

Coastal archaeological landscapes are increasingly threatened by erosion driven by sea-level rise, changing storm regimes, and intensified precipitation associated with climate change. This paper presents the results of 2024 and 2025 Uncrewed Aerial Vehicle (UAV) surveys, supported by the AARG Fund, the Royal Irish Academy and National Monument Service, which were conducted at St. John's Point and Doorin Point on the northern coast of Donegal Bay on the NW coast of Ireland. The surveys form part of a wider Coastal Zone Assessment programme that has identified over 350 cultural heritage features across three bays and estuaries separated by two actively eroding headlands.

Nine shoreline locations were selected for UAV survey based on their cultural significance and vulnerability to erosion. High-resolution orthomosaics and Digital Elevation Models (DEMs) were generated to record approximately 50 archaeological features. These include a late medieval tower house and bawn, an associated friary, a harbour associated with a medieval church, a possible early medieval eroding slag heap, two early medieval circular enclosures undergoing cliff retreat, a complex intertidal harbour system, a promontory fort, and cairns and a hut site exposed within a dune system.

The UAV survey enabled detailed mapping of intertidal and cliff-edge features that are difficult to document through traditional ground survey. The integration of orthomosaics and DEMs has allowed the identification and measurement of archaeological features that are partially obscured on the intertidal zone and coast edge. These datasets not only document the present condition of the sites but also establish a baseline against which future change can be

monitored. The results highlight the diversity of coastal activity along the Donegal coastline, including settlement, maritime infrastructure, and industrial production, while also demonstrating landscape change affecting these sites. The survey provides a high-resolution baseline dataset for monitoring future coastal erosion and illustrates the value of UAV-based approaches for the documentation and management of vulnerable coastal cultural heritage.

An aerial archaeological response to the Langdale Moor fire

Sally Evans (Historic England, UK)

Wildfire events are an increasing threat to upland landscapes in England, exposing, damaging, and transforming archaeological resources at unprecedented scales. This paper presents a rapid-response aerial archaeological survey undertaken following the Langdale Moor fire, which began in late July 2025 within Langdale Forest (c. 5 sq. km) before escalating significantly in August 2025. A shift in wind direction, combined with the presence of unexploded ordnance (UXO) (leftover from the moor's previous use as a military training area and triggered to detonate as a result of the extreme heat of the fire) resulted in the fire breaching established firebreaks. The fire ultimately impacted approximately 25 sq km of moorland and burned uncontrolled for many weeks, in conditions further complicated by ongoing ordnance detonation.

The scale and inaccessibility of the burn area created significant access issues. Ground-based field survey was prevented by both ongoing fire conditions and the presence of UXO. In contrast, aerial operations were restricted within a military-controlled airspace associated with RAF Fylingdales (the High Energy Radar Area, HERTA), limiting access to parts of the southern burn area. These combined constraints necessitated a flexible and opportunistic aerial-first approach. The Aerial Survey Team was able to rapidly deploy to accessible areas, capturing high-resolution imagery even where ground access was not possible, informing both fire responders and heritage management teams.

The team undertook systematic mapping and monument recording across the affected area. There are over 40 scheduled monuments and nine listed building within the impacted zone, as well as extensive non-designated archaeology. Preliminary assessment indicates that at least 20 Scheduled Monuments were damaged as a direct result of the fire, or by the creation of firebreaks intended to prevent its spread.

Aerial survey enabled timely documentation, condition assessment, and landscape-scale interpretation under severe access constraints. This work has supported the National Park's ongoing site management and informed mitigation strategies for protected monuments.

The Langdale wildfire highlights both the vulnerability of upland heritage to wildfire and the critical role aerial survey can play in disaster response, as well as the opportunity to develop guidance for future wildfire response in archaeologically sensitive landscapes.

Session: Aerial archaeology across Europe Part 2: Cemetery, war and forest

13:20-13:40	Máté Szabó, Attila Papp, Teofil Rétfalvi	Cemeteries from space
13:40-14:00	Marcin Czarnowicz	Landscape after the battle: The use of aerial archaeology, historical cartography, and archival research in reconstructing the Carpathian landscape: The case of the Jasiel area in the Polish Carpathians

14:00-14:20	Jakub Sobko	The archaeological landscape of warfare as a conservation target: From research to heritage protection in the Rawka and Bzura river basins (1914-1915)
14:20-14:40	Daniel Hunt	Revealing the hidden landscapes of the 'People's Forest': Aerial mapping in Epping Forest, London

Cemeteries from space

Máté Szabó, Attila Papp, Teofil Rétfalvi (Hungarian National Museum Public Collections Centre, National Institute of Archaeology, Budapest, Hungary)

Aerial archaeology is widely recognized as one of the most effective methods for identifying burial grounds. The discovery and documentation of these sites are of exceptional importance for both heritage protection and archaeological research. Although the methodology is well established and supported by numerous case studies, a systematic survey of archaeological cemeteries—particularly inhumation burials—has yet to be undertaken in Hungary.

Our project, “Cemeteries from Space”, aims to comprehensively identify, map, and investigate archaeological cemeteries and other archaeological features preserved in the landscape through the extensive use of aerial archaeology, broad interdisciplinary collaboration, and artificial intelligence. Beyond site detection and mapping, we work with local museums and communities to carry out exploratory excavations, establish reliable chronologies, and refine research methods through the integration of natural-science approaches.

Landscape after the battle: The use of aerial archaeology, historical cartography, and archival research in reconstructing the Carpathian landscape: The case of the Jasiel area in the Polish Carpathians

Marcin Czarnowicz (Jagiellonian University, Kraków, Poland)

The borderlands of Poland, Slovakia, and Ukraine are among the most sparsely populated regions of Europe. However, this was not always the case. The valleys of the rivers that have their sources here were once vibrant and densely inhabited. The local population relied primarily on pastoralism, while important trade routes connecting Kraków with Hungary crossed these mountainous areas.

In the nineteenth century AD, the region studied by our team underwent a profound transformation as a result of the Industrial Revolution. Two developments in particular—the construction of railways and the discovery of crude oil—dramatically changed the face of the Carpathian region. Yet history can be remarkably unpredictable. Today, it is difficult to find traces not only of the industrial facilities that once processed “rock oil,” but also of most of the people who inhabited these borderlands. This situation resulted from the ethnic conflicts that intensified during the Second World War. Valleys such as the Jasiołka Valley were completely depopulated, and their inhabitants were dispersed across the so-called “Recovered Territories” that Poland acquired following the agreements reached at the Yalta Conference.

Today, only the application of methods such as remote sensing, airborne laser scanning, spatial modelling, and other digital approaches—combined with the creation of comprehensive databases incorporating information derived from archival research—makes it possible to reconstruct the landscape of this once-thriving region.

Within the framework of the “Landscape After the Battle” project, I seek to reconstruct the world in which the events of the Great War unfolded more than 110 years ago, placing historical events within their broader social and geographical context.

During my presentation, I would like to introduce the aims of the project and share its results, demonstrating how the Jasiołka Valley looked more than a century ago and how it appears today.

The archaeological landscape of warfare as a conservation target: From research to heritage protection in the Rawka and Bzura river basins (1914-1915)

Jakub Sobko (Doctoral School of Humanities, University of Lodz, Poland; Voivodeship Office for the Protection of Monuments in Lodz, Poland)

Material remains of twentieth-century warfare constitute a persistent but still insufficiently recognised component of the cultural landscape in Poland. A particularly significant category is formed by large-scale archaeological landscapes of World War I, preserved both as surface-visible terrain features and subsurface stratigraphy. This paper presents the case of the Rawka and Bzura river basins (central Poland), a key theatre of intense military operations in 1914–1915, including early large-scale use of chemical weapons.

The study draws on non-invasive research conducted between 2014 and 2025 under the direction of Prof. Anna Zalewska. These investigations employed aerial imagery analysis and LiDAR-derived data to identify, document, and interpret extensive battlefield remains across approximately 220 km². Particular attention is given to two large-area archaeological sites (Humin 3 and Joachimów-Mogily 3; total area 3.75 km²), characterised by well-preserved field fortifications and a high density of burial sites, including formal cemeteries and dispersed human remains.

The aim of the presentation is to demonstrate the transition from large-scale, non-invasive archaeological research to the implementation of formal heritage protection. The paper discusses the conservation process that led to the inscription of selected areas into the national heritage register, highlighting the methodological role of aerial and LiDAR data in delimiting site boundaries.

Based on the author’s direct involvement in this process, the paper offers a critical reflection on the possibilities and limitations of existing heritage protection frameworks in relation to extensive conflict landscapes. Particular emphasis is placed on the challenges of translating remotely sensed data into legally and administratively effective conservation measures.

Revealing the hidden landscapes of the ‘People’s Forest’: Aerial mapping in Epping Forest, London

Daniel Hunt (Historic England, UK)

Straddling Greater London and the county of Essex is Epping Forest, a diverse green belt of woodland and open grasslands that stands as one of the last surviving vestiges of the medieval Forest of Essex. Preserved within its modern bounds is a multi-period archaeological landscape; all embedded within one of Europe’s most densely urbanised regions. However, despite the recognised richness of its historic environment, systematic landscape-scale mapping of archaeological remains within the Forest has, until recently, remained limited.

The Epping Forest Aerial Investigation and Mapping Project set out with the aim of improving the record of archaeological sites preserved within the forest by creating a new publicly

accessible dataset to be used to help promote and manage the Forest's rich archaeological landscapes.

The project combined the use of high-resolution (0.25 m) lidar commissioned by City of London Corporation in 2023 with targeted analysis of aerial photographs held by the Historic England Archive to record visible archaeology. This integrated approach enabled the mapping of over 200 archaeological sites—more than 180 previously unrecorded—and proved effective in overcoming the challenges posed by woodland and the Forest's dynamic open urban greenspaces. Lidar was critical for detecting earthworks beneath the woodland canopy, while aerial photography covering the more open areas proved particularly valuable in identifying the extent of an extensive Second World War landscape.

Using the data created the City of London Corporation have begun a programme of volunteer-led research and monument condition recording to continue to build a better understanding of the Forest's archaeological sites. Historic England also remains engaged in the forest with ongoing analytical earthwork surveys of the Forest's two hillforts: Ambresbury Banks and Loughton Camp.

Session: Aerial archaeology across Europe Part 3: Complexity and consistency		
15:20-15:40	Mirosław Furmanek, Piotr Wroniecki	Systematic aerial archaeological prospection in Southern Poland: An overview
15:40-16:00	Joel Goodchild	Perceiving complexity in archaeological landscapes with drone-based multispectral survey
16:00-16:20	Hrvoje Kalafatić, Bartul Šiljeg, Rajna Šošić-Klindžić	Neolithic landscapes under cultivation: Integrating aerial archaeology and magnetometry for the detection and interpretation of settlement sites in Eastern Croatia
16:20-16:40	Susan Curran	Beyond the Hill of Tara: an aerial, geophysical, and toponymic approach to identifying Ireland's 'Tara' landscapes

Systematic aerial archaeological prospection in Southern Poland: An overview

Mirosław Furmanek (Institute of Archaeology, University of Wrocław, Poland), Piotr Wroniecki (Montefortino Prospection & Digitalisation, Switzerland)

Over the last two decades, systematic aerial archaeological prospection has significantly changed our understanding of the archaeological landscapes of southern Poland. Although previous research, based largely on long-term fieldwalking programmes and numerous rescue excavations, greatly increased the number of known archaeological sites, several categories of monuments and landscape structures remained poorly recognised or almost invisible in the record.

Regular aerial flights, combined with field walking, geophysical survey and the analysis of openly available remote-sensing data, has revealed a much more complex and diverse archaeological landscape in Lesser Poland and Silesia. The documented evidence includes Neolithic rondels, various enclosures from the Neolithic, Eneolithic and Bronze Age, barrow cemeteries, settlement complexes, medieval moated sites and villages, early modern fortifications, and other traces of past spatial organisation.

These discoveries invite a reassessment of how prehistoric, medieval and early modern communities created, organised and transformed their landscapes. Of particular importance is

the identification of monumental and spatially extensive structures whose presence changes interpretations of social organisation, ritual practice, territoriality, settlement processes and communication. Aerial archaeology has therefore not merely added new points to the archaeological map of southern Poland; it has fundamentally reshaped the way the development of its cultural landscape can be understood.

Perceiving complexity in archaeological landscapes with drone-based multispectral survey

Joel Goodchild (AOC Archaeology, UK)

Recent developments in UAV technology have greatly increased access to aerial survey methods and the range of remote sensing techniques available to archaeologists when considering non-intrusive survey options for site evaluation. Rather than treating each prospection technique as a new means of maximising detection, it is through the reconciliation of contrasting datasets that variation within and between sites can be properly explored and understood. With reference to a Historic England research project and a multispectral survey ahead of a large solar development in the UK, this talk will explore how, at a landscape scale, the value of combining multiple prospection techniques lies not only in identifying more features, but in revealing the complexity inherent in archaeological landscapes, enabling a more nuanced, research-orientated approach.

Neolithic landscapes under cultivation: Integrating aerial archaeology and magnetometry for the detection and interpretation of settlement sites in Eastern Croatia

Hrvoje Kalafatić, Bartul Šiljeg (Institute of Archaeology, Zagreb, Croatia), Rajna Šošić-Klindžić (Faculty of Humanities and Social Sciences, University of Zagreb, Croatia)

The agricultural landscapes of eastern Croatia preserve a rich archaeological record of prehistoric settlement, most notably from the Neolithic period, including circular ditched enclosures and other settlement features. However, the visibility of these sites is strongly influenced by environmental conditions, agricultural practices, and long-term landscape transformation. This paper presents the results of an integrated study combining aerial archaeological evidence and magnetometric survey data to evaluate the detectability and preservation of prehistoric settlement sites across different environmental and land-use settings. The research compares archaeological features identified through aerial reconnaissance, cropmarks, and remote sensing with magnetometry data collected at several prehistoric sites in eastern Croatia. Particular attention is paid to the influence of vegetation development, seasonal variability, and intensive cultivation on the visibility of archaeological remains. The study examines the relationship between archaeological features visible from the air and those detected through geophysical prospection, assessing the advantages and limitations of both approaches in the documentation and interpretation of prehistoric settlements. The paper argues that combining aerial archaeology and magnetometry offers a robust framework for documenting, interpreting, and safeguarding prehistoric cultural landscapes in regions subject to intensive agricultural exploitation.

Beyond the Hill of Tara: an aerial, geophysical, and toponymic approach to identifying Ireland's 'Tara' landscapes

Susan Curran (The Discovery Programme, Dublin, Ireland)

The Hill of Tara, Co. Meath, seat of kings and high kings, scene of myth and legend, holds a symbolic and significant place in Irish archaeological discourse. As one of the best-known archaeological complexes in Ireland, it has been viewed through an interdisciplinary prism of landscape studies that includes archaeology, folklore, language, and environmental science. But is it the only one, and what does it mean? Clues to the existence of multiple 'Taras' are found within historical literary and documentary sources, also surviving in placenames across the island of Ireland. Some of these sites can be located within the landscape, often with associated archaeological remains, whereas others remain more elusive. This paper presents the findings of an ongoing project (funded by the Research Ireland COALESCE Scheme 2024) exploring the connections between these diverse 'Tara' places. The project undertakes a systematic appraisal of the archaeological significance, monumental arrangement, and artefactual associations of the landscapes through the application and analysis of lidar, orthophotography, detailed UAV mapping, and geophysical survey. The acquisition of new data and the re-use of extant information, including remote sensing data, can shed new light on the origins, functions, definition of space, and potential inter-relationships of these places.