ArchaeoLandscapes Europe

Heritage – Data – Knowledge

Transnational Cooperation Between Heritage Agencies, Universities and other Stake-holders

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ArcLand HERITAGE · DATA · KNOWLEDGE

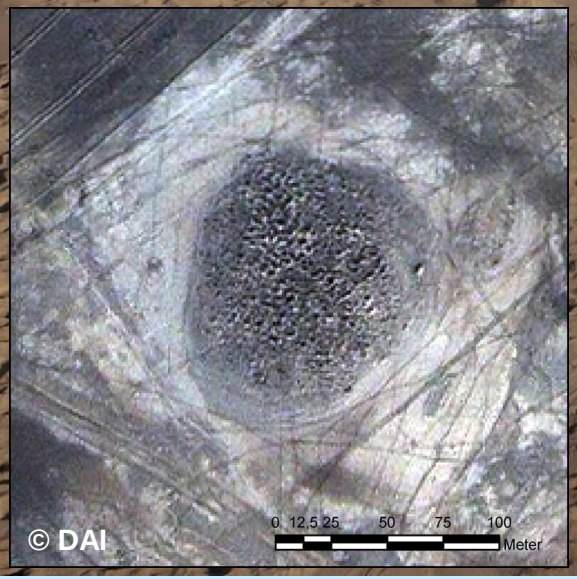
Education and Culture DG Culture Programme

Content

- Introduction of methods & techniques
  - Aerial Archaeology
  - Satellite Imagery
  - LiDAR/ALS
  - Geophysical Surveying
- The *ArcLand* Project

Visible features in Cultural Heritage Management

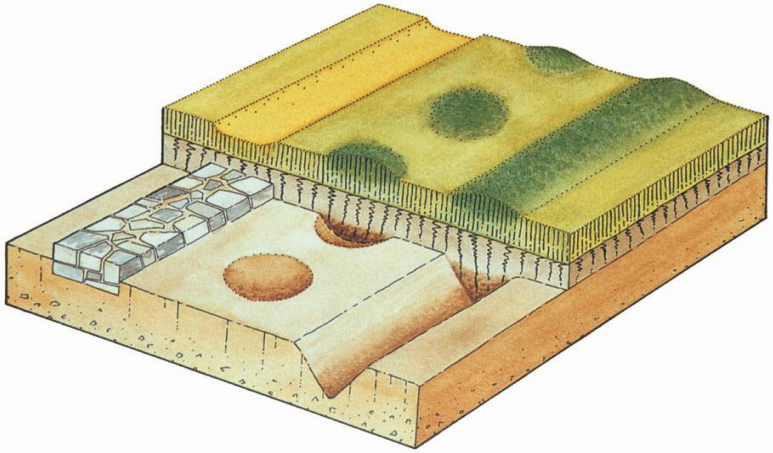
Looting of Cultural Heritage



Non-invasive methods

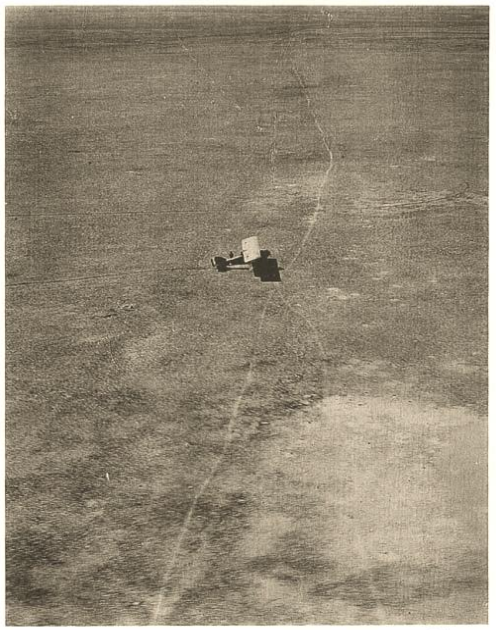
Aerial Archaeology

- dependent on weather, climate, etc. so cannot be used at all times and everywhere
- not all features show on aerial pictures (at all times)
- relatively coarse as regards the details of the documented sites
- expert knowledge & experience needed



Roman road in Syriah

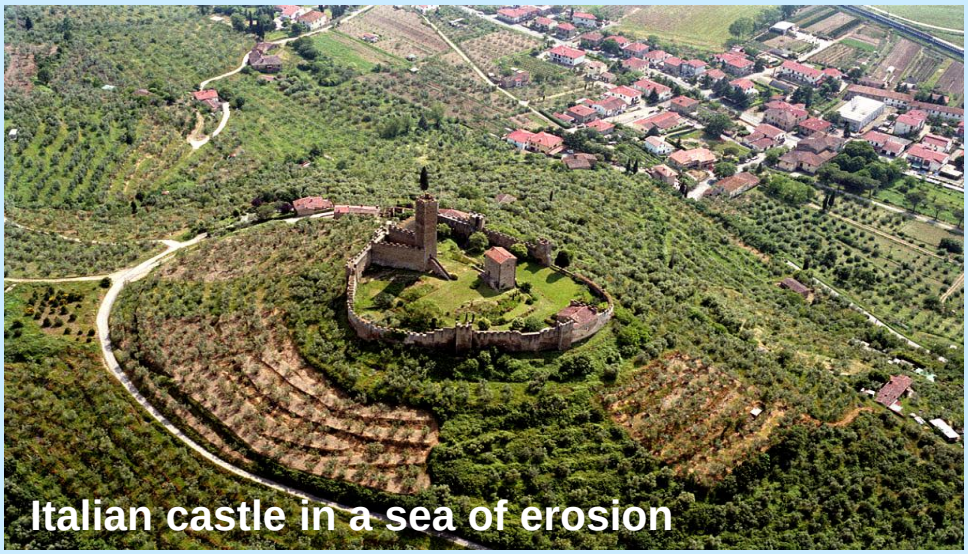
de Boysson



de Boysson

Aerial Archaeology

- very time effective
- can give a first glimpse of what is there
- can cover very large areas in a short time
- existing airphotos can be used as well
- documentation of site threads (erosion, construction sites, …)

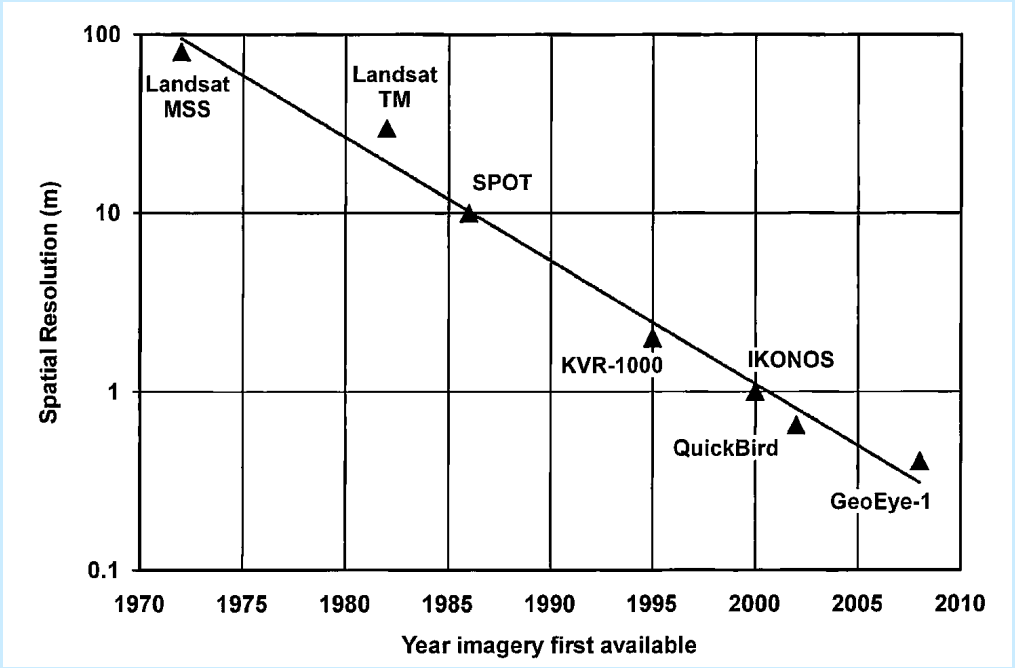


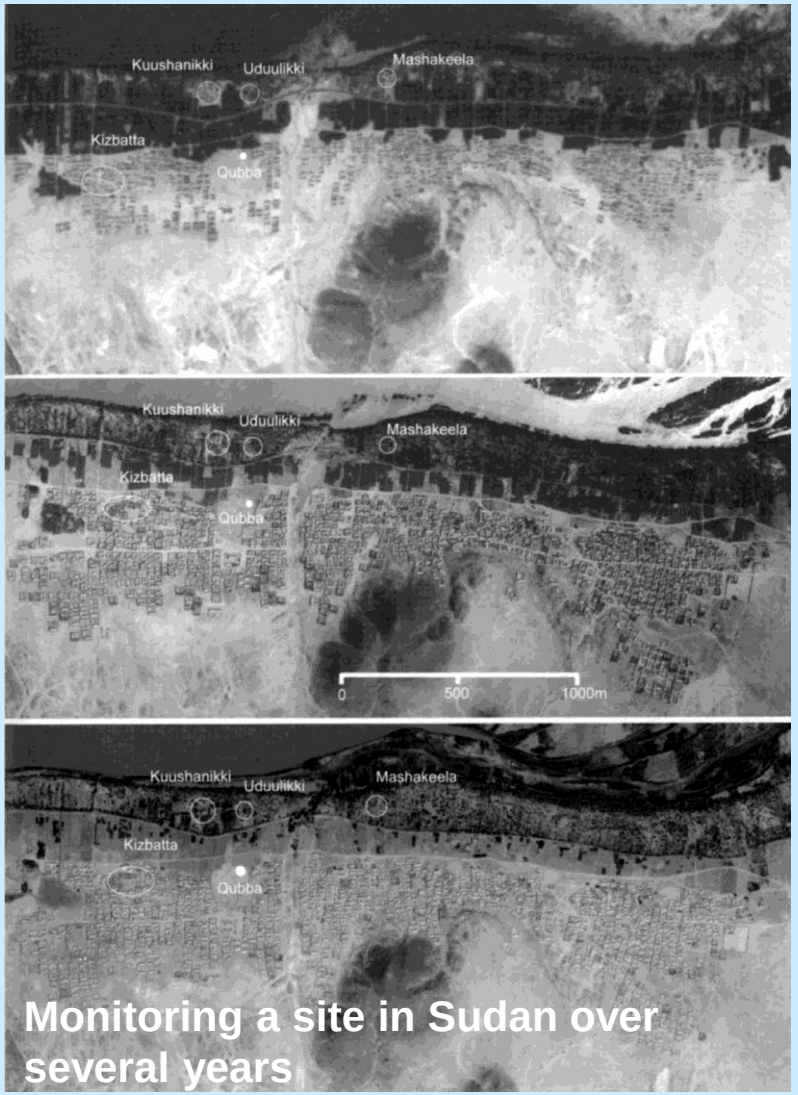
Italian castle in a sea of erosion

Prehistoric site in S-Italy

Satellite Imagery

- increasing availability of high resolution images
- large area coverage
- interpretation of images needs high amount of expert knowledge and experience



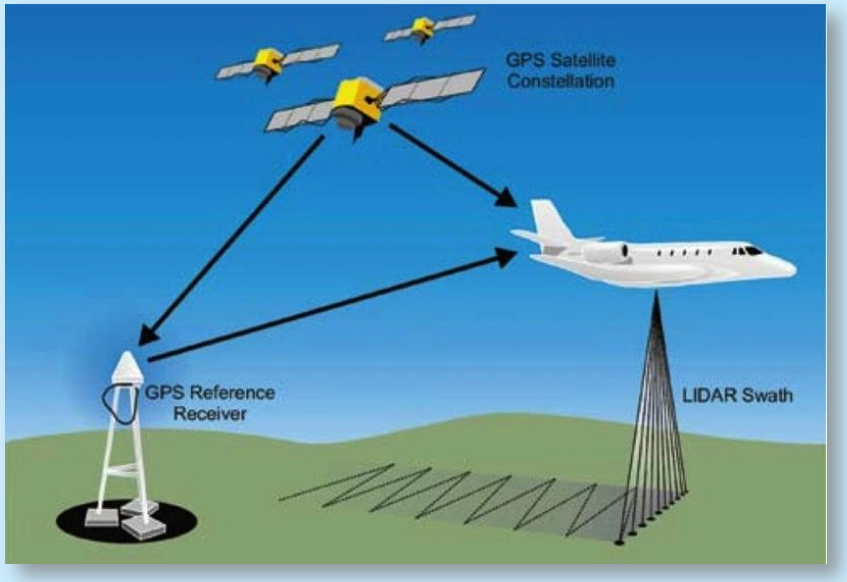


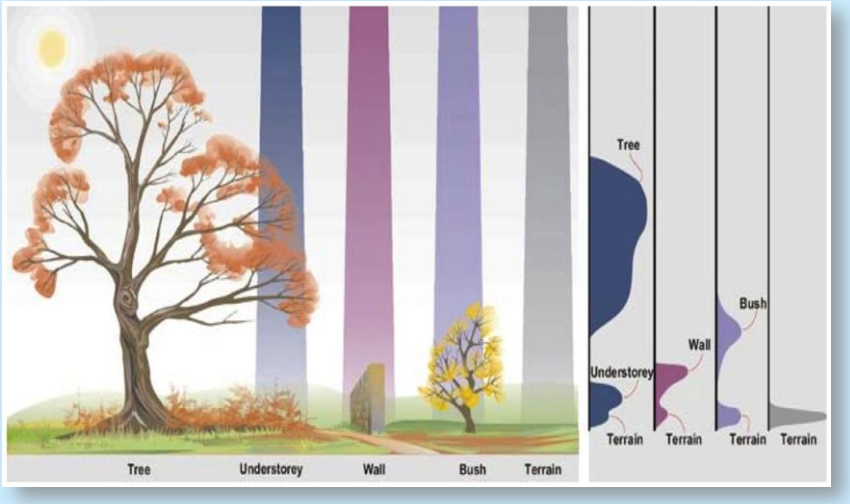
LiDAR/ALS

LiDAR (**Li**ght **D**etection **A**nd **R**anging) – **ALS** (**A**irborne **L**aser **S**canning)

Radar-like measurements of height differences on the ground (ramparts, ditches, walls, field systems), even in forested areas

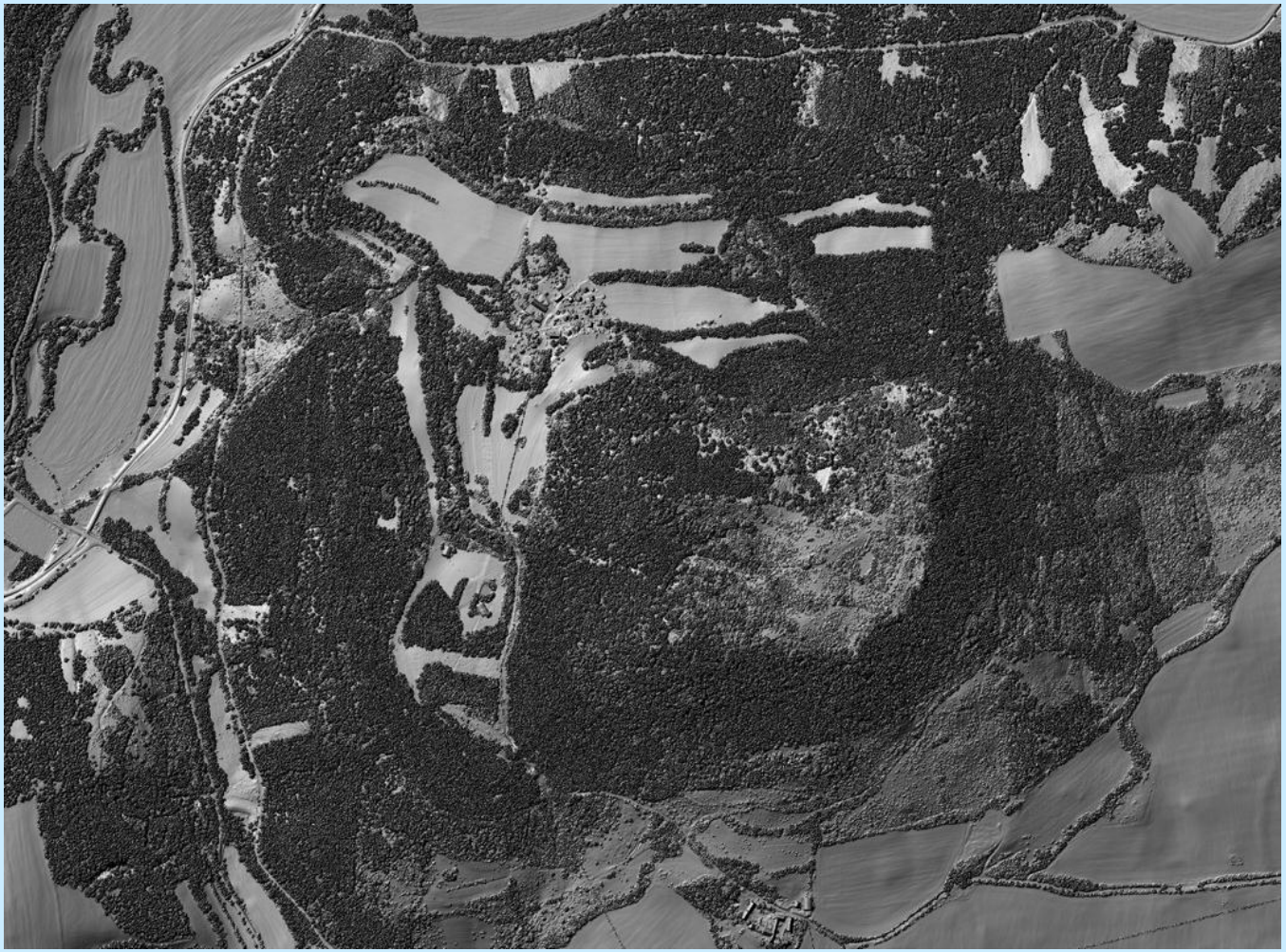
In use e.g. in jungle areas in Cambodia (Angkor) and Southern America





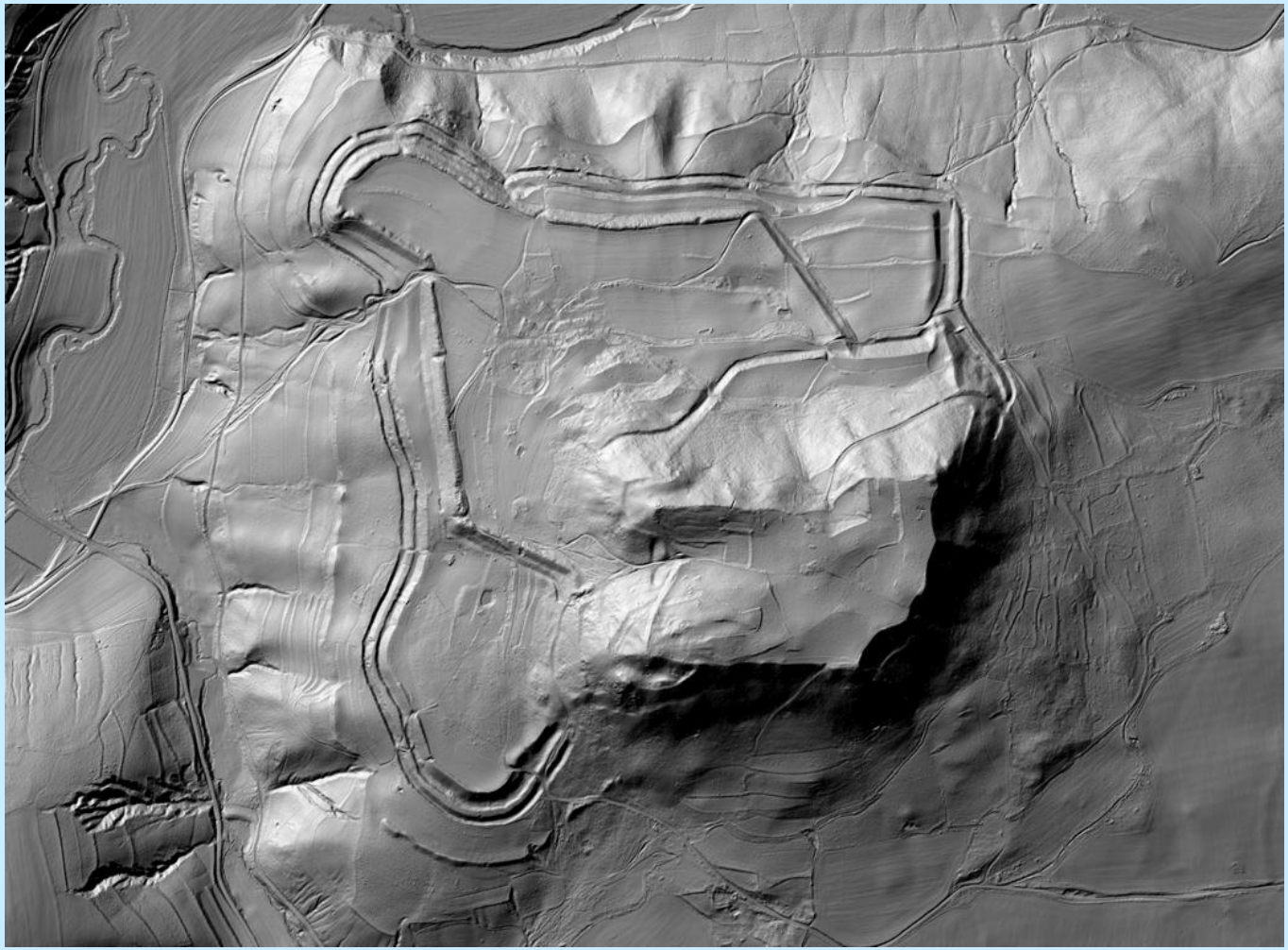
LiDAR/ALS

Celtic hillfort Vladař in Bohemia – with forest canopy



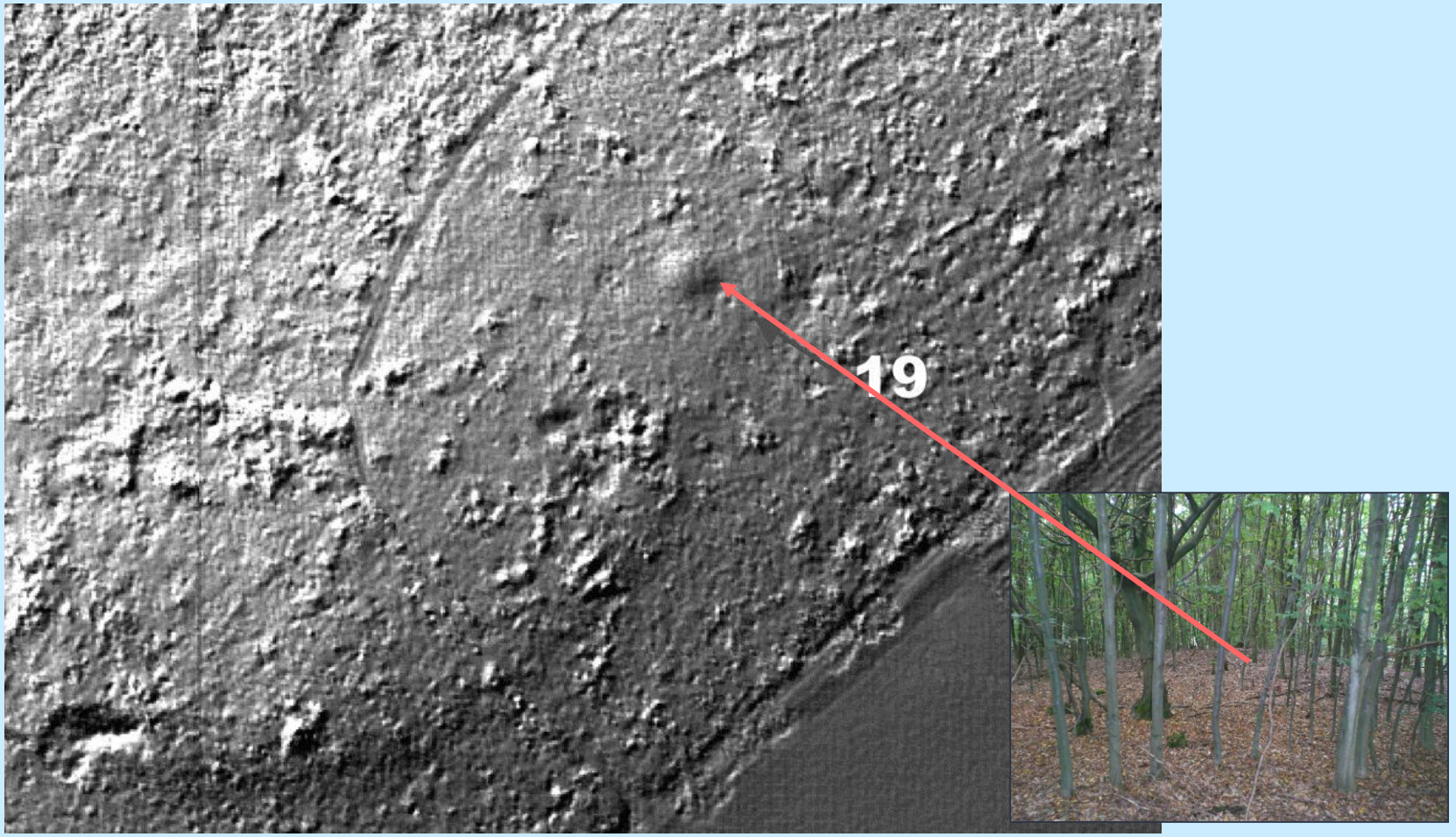
LiDAR/ALS

Celtic hillfort Vladař in Bohemia – without forest canopy



LiDAR/ALS

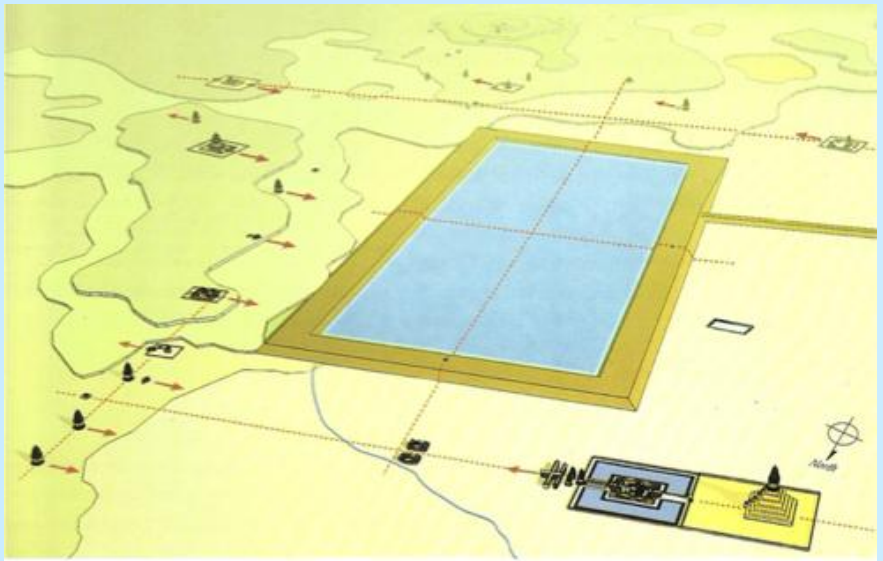
Detecting so far unknown grave mounds in the forest near a Celtic hillfort in Germany

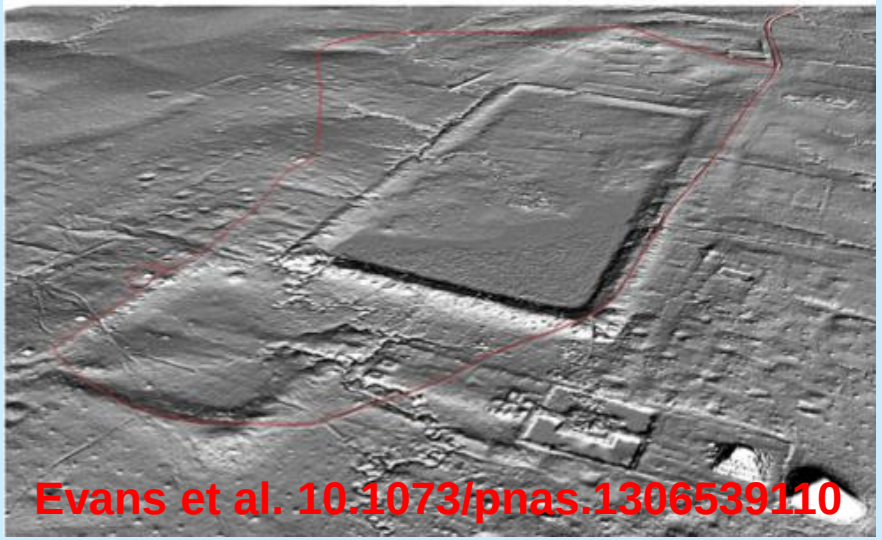


LiDAR/ALS

- only shows 3dimensional features
- high degree of expert knowledge & experience needed

- semi automatic analyses are possible (highlighting potentially interesting features)
- works in forested areas
- covers large areas





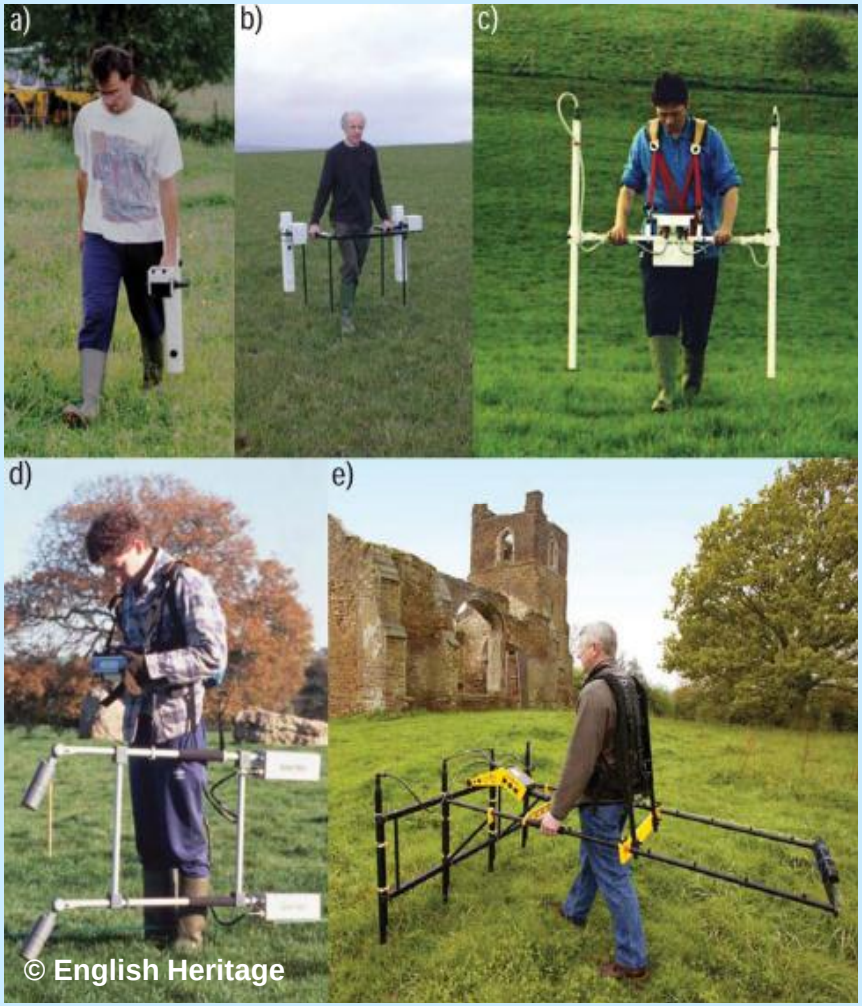
Geophysical Surveys

Geophysical surveying methods comprise a variety of different techniques:

- Magnetometer survey
- Earth resistance survey (geoelectric survey)
- Ground-penetrating radar (GPR)

Magnetometer Survey

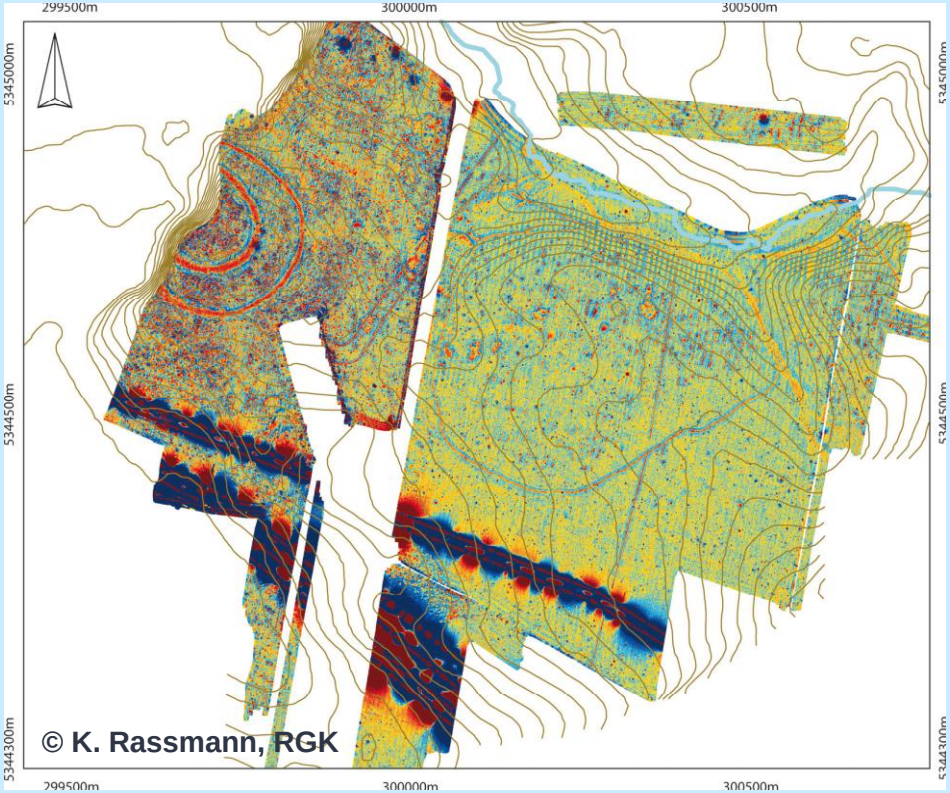
- uses one or more sensors to measure the gradient of the magnetic field i.e. the difference between the natural magnetic field of the Earth and the structures that have been cause by human impact
- each kind of material has its own magnetic property, they all result in a different disturbance of the Earth's magnetic field

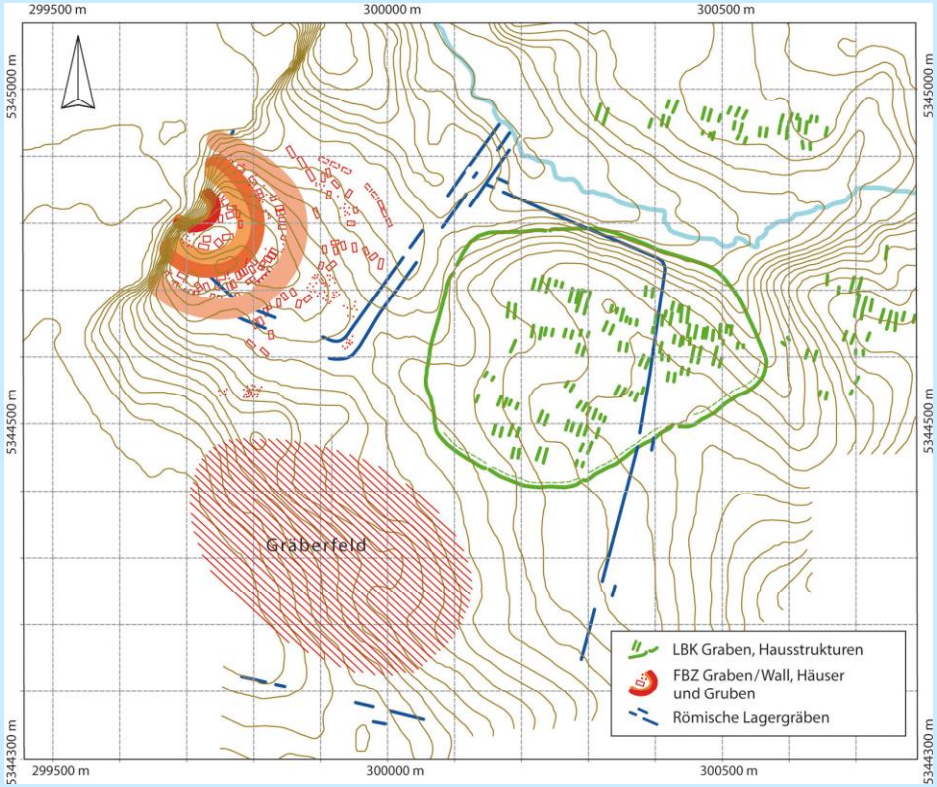


Magnetometer Survey

- rapidly generates data of large scale areas, showing a wide variety of anomalies that have been cause by different kinds of human activities
- other than earth resistance surveys, magnetometers do not usually detect walls or other stone structures (if not burned) directly

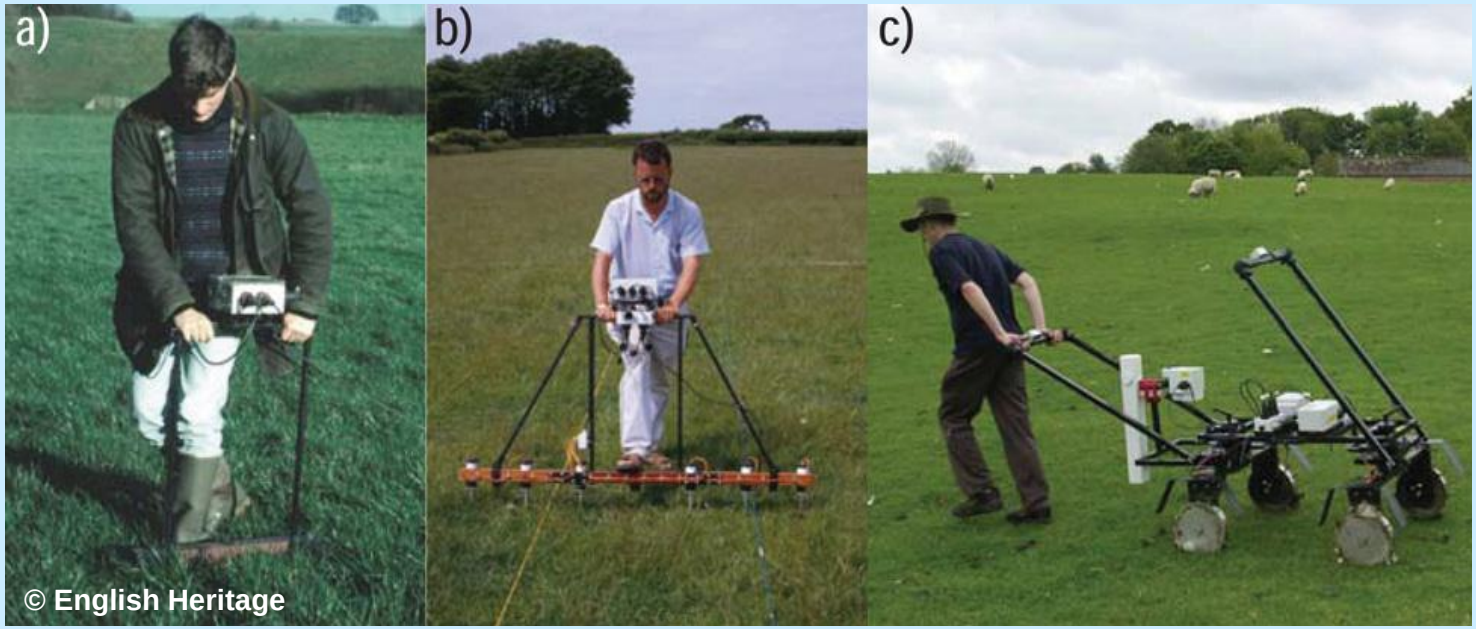
Magnetometer Survey





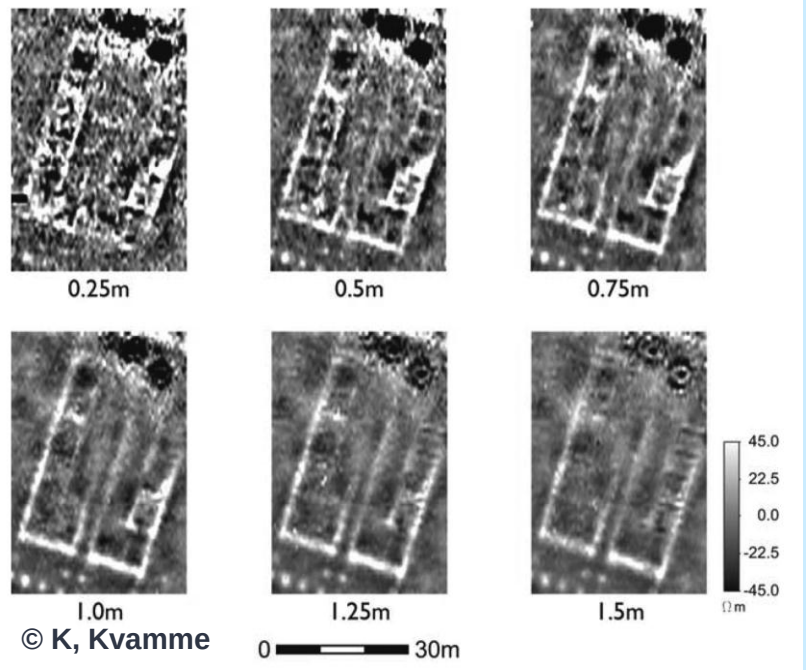
Geoelectrical Survey

- Earth resistance survey (geoelectric survey) is measuring the local electrical resistance by inserting two or more sensors into the ground, which produce electrical circuits
- Features like ditches often contain more moisture than the surrounding soil and therefore have less resistivity while wall structures, foundation walls and so on usually have a higher resistivity



Geoelectrical Survey

- The main disadvantage of a resistance survey is the limitation caused by the need for the sensors to make direct electrical contact by the insertion of electrodes. As a result resistance survey is mainly used for smaller areas

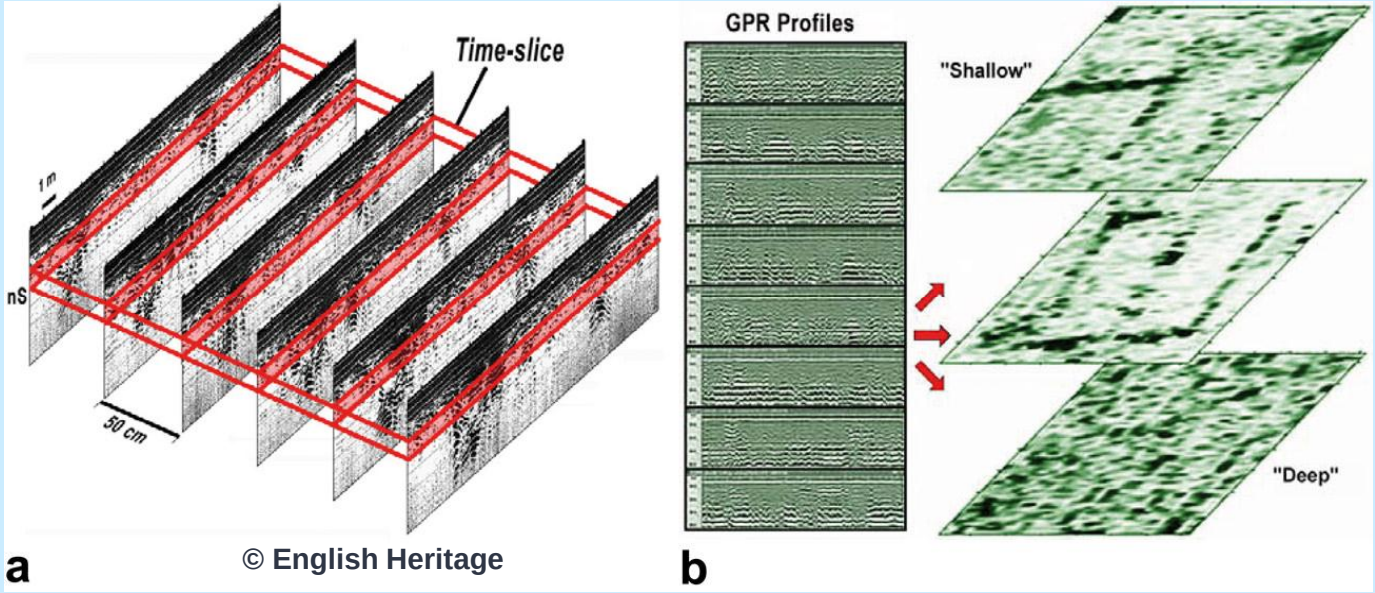


Ground-Penetrating Radar

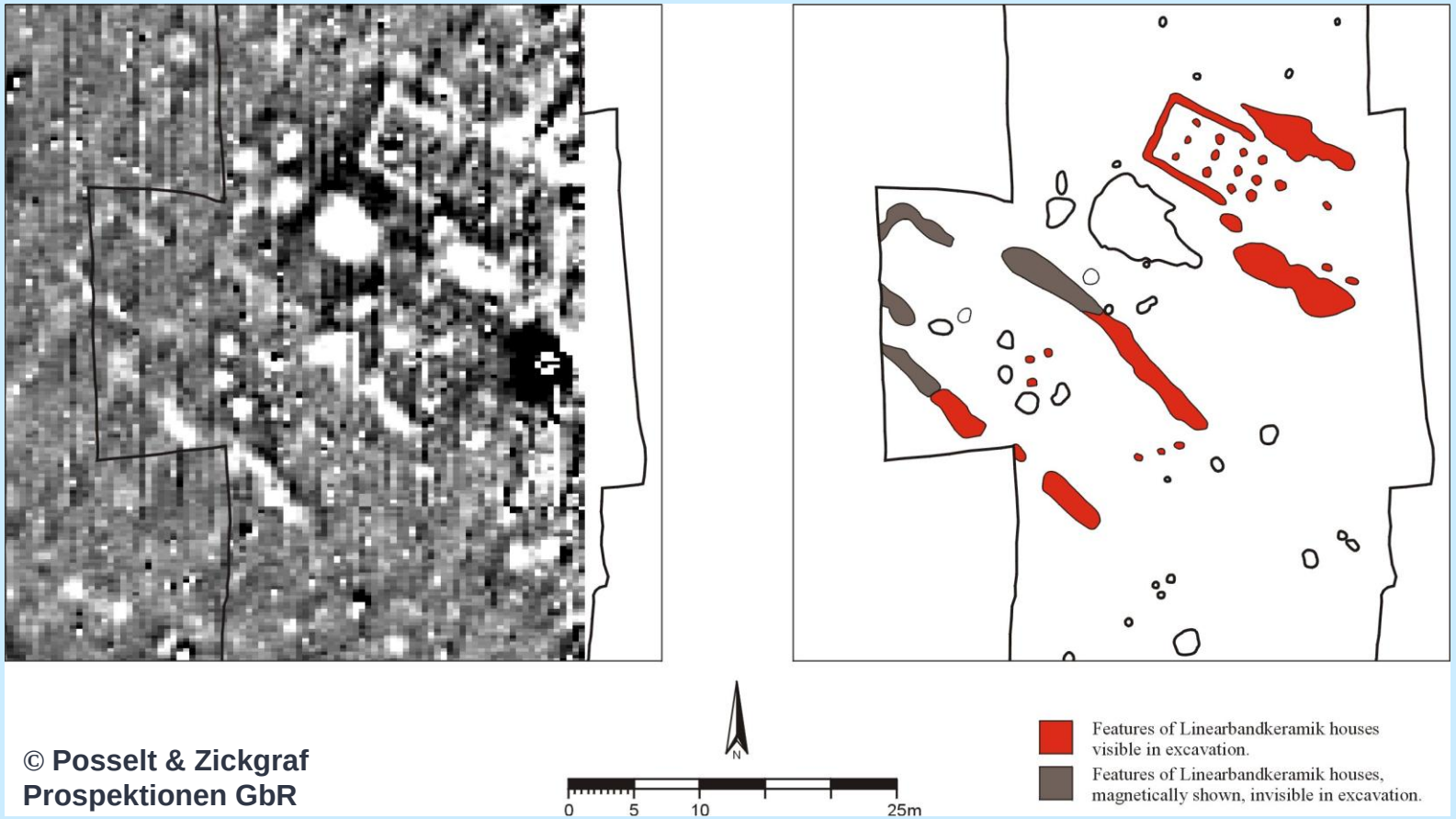
- Ground-penetrating radar (GPR) can measure not only planar features but also estimate the depth of features
- A radar signal or electromagnetic impulse is send into the ground, which causes different kinds of reflections (travel time of signals), depending on the depth and the structure of the soil and of buried features
- the resulting data represents a profile information, that can be interpolated into a planview by taking into account the results of several, densely measured profiles

Ground-Penetrating Radar

- The main disadvantage of GPR is its dependency on ideal soil conditions
- Another problem is the low speed of measurements, especially when used for larger areas



Geophysics – Making Invisible Things Visible



Bad Homburg-Ober-Eschbach/Ober-Erlenbach 2001.
Fluxgate-Magnetometer (Ferex) dynamics +/- 3 nT (white/black)
Magnetogram and interpretive drawing of LBK-houses 1 and 2

Geophysics – Making Invisible Things Visible

Bad Homburg-Ober-Eschbach/Ober-Erlenbach 2001
Section of circular ditch with invisible feature.

Surveying Methods – A Conclusion

The large variety of modern surveying methods have a number of great advantages:

- non-destructive
- amend each other
- very precise
- nearly complete
- cover large areas
- fast
- can discover “invisible” features
- ideal to monitor sites
- much lower costs than caused by excavations

But all these techniques need a high amount of expert knowledge and experience to be successfully implemented!

ArchaeoLandscapes Europe – ArcLand

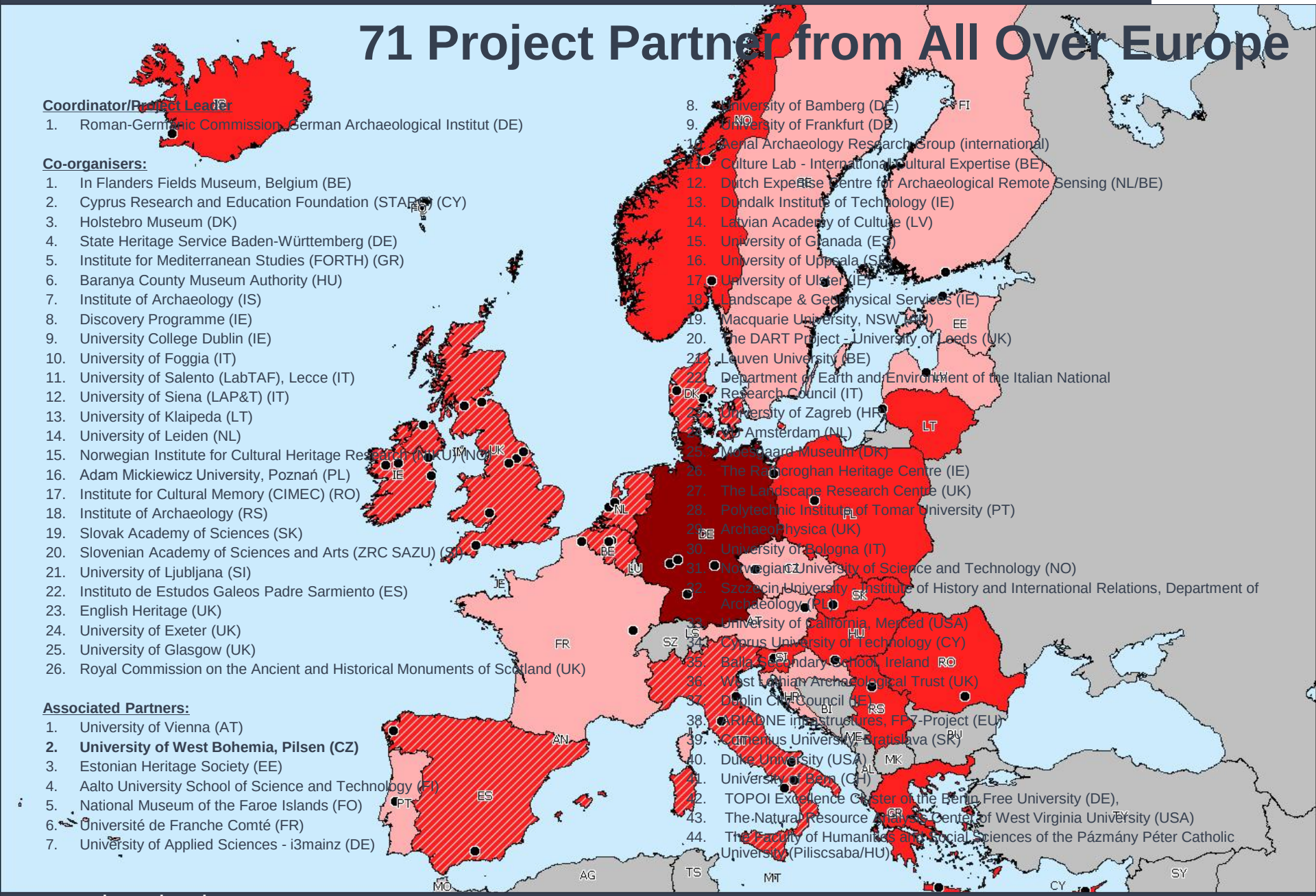
***ArchaeoLandscapes Europe* is supported by the EU within the framework of the Culture 2007-2013 programme:**

- **Agreement Number: 2010-1486**
- **Start: 15th September 2010**
- **End: 14th September 2015**
- **EU Advancement: 2,5 Mio €**
- **Total Budget: 5 Mio €**
- **Partner Institutions: 71 (at present)**

Roman-Germanic Commission/DAI

ArcLand
HERITAGE · DATA · KNOWLEDGE

71 Project Partner from All Over Europe



Coordinator/Project Leader

1. Roman-Germanic Commission, German Archaeological Institut (DE)

Co-organisers:

1. In Flanders Fields Museum, Belgium (BE)
2. Cyprus Research and Education Foundation (STARC) (CY)
3. Holstebro Museum (DK)
4. State Heritage Service Baden-Württemberg (DE)
5. Institute for Mediterranean Studies (FORTH) (GR)
6. Baranya County Museum Authority (HU)
7. Institute of Archaeology (IS)
8. Discovery Programme (IE)
9. University College Dublin (IE)
10. University of Foggia (IT)
11. University of Salento (LabTAF), Lecce (IT)
12. University of Siena (LAP&T) (IT)
13. University of Klaipeda (LT)
14. University of Leiden (NL)
15. Norwegian Institute for Cultural Heritage Research (NIKU) (NO)
16. Adam Mickiewicz University, Poznań (PL)
17. Institute for Cultural Memory (CIMEC) (RO)
18. Institute of Archaeology (RS)
19. Slovak Academy of Sciences (SK)
20. Slovenian Academy of Sciences and Arts (ZRC SAZU) (SI)
21. University of Ljubljana (SI)
22. Instituto de Estudos Galeos Padre Sarmiento (ES)
23. English Heritage (UK)
24. University of Exeter (UK)
25. University of Glasgow (UK)
26. Royal Commission on the Ancient and Historical Monuments of Scotland (UK)

Associated Partners:

1. University of Vienna (AT)
2. **University of West Bohemia, Pilsen (CZ)**
3. Estonian Heritage Society (EE)
4. Aalto University School of Science and Technology (FI)
5. National Museum of the Faroe Islands (FO)
6. Université de Franche Comté (FR)
7. University of Applied Sciences - i3mainz (DE)
8. University of Bamberg (DE)
9. University of Frankfurt (DE)
10. Aerial Archaeology Research Group (international)
11. Culture Lab - International Cultural Expertise (BE)
12. Dutch Expertise Centre for Archaeological Remote Sensing (NL/BE)
13. Dundalk Institute of Technology (IE)
14. Latvian Academy of Culture (LV)
15. University of Granada (ES)
16. University of Uppsala (SE)
17. University of Ulster (IE)
18. Landscape & Geophysical Services (IE)
19. Macquarie University, NSW (AU)
20. The DART Project - University of Leeds (UK)
21. Leuven University (BE)
22. Department of Earth and Environment of the Italian National Research Council (IT)
23. University of Zagreb (HR)
24. VU Amsterdam (NL)
25. Moesgaard Museum (DK)
26. The Ramcroghan Heritage Centre (IE)
27. The Landscape Research Centre (UK)
28. Polytechnic Institute of Tomar University (PT)
29. ArchaeoPhysica (UK)
30. University of Bologna (IT)
31. Norwegian University of Science and Technology (NO)
32. Szczecin University - Institute of History and International Relations, Department of Archaeology (PL)
33. University of California, Merced (USA)
34. Cyprus University of Technology (CY)
35. Balla Secondary School, Ireland
36. West Cornwall Archaeological Trust (UK)
37. Dublin City Council (IE)
38. ARIADNE infrastructures, FP7-Project (EU)
39. Comenius University Bratislava (SK)
40. Duke University (USA)
41. University of Bern (CH)
42. TOPOI Excellence Cluster of the Berlin Free University (DE),
43. The Natural Resource Analysis Center of West Virginia University (USA)
44. The Faculty of Humanities and Social Sciences of the Pázmány Péter Catholic University (Piliscsaba/HU)

ArchaeoLandscapes Europe – ArcLand

Project Aims

"To increase public appreciation, understanding and conservation .....

of the landscape and archaeological heritage of Europe ....

through the application and international sharing of skills and experience ....

in airborne and other forms of remote sensing”

ArchaeoLandscapes Europe – ArcLand

Project Activities

- Technical Workshops: LiDAR, Aerial Archaeology, Geophysics, Satellite Imagery, UAV, Integrated Data Analyses & GIS, …
- Aerial Archaeology Training Schools
- International Conferences & Conference Sessions
- Symposia, Workshops, Meetings, ...
- Publications (Monographs, Flyer, Conference Papers, Best Practices Guides, ...)
- Website http://www.archaeolandscapes.eu (the site is currently under maintenance and will be updated continuously)
- Grants for Students and Young Researchers from Europe to participate in Workshops, Schools and Conferences

Resume

- One can only protect, monitor and manage what s/he knows

–> large scale surveys are not only a technique for archaeological research but also for Cultural Heritage Management

- Site protection is an expensive as well as a time consuming task

–> modern geophysical and remote sensing methods are a possible solution

- the use of surveying methods needs expert knowledge and experience
- that knowledge isn't evenly distributed in Europe, hence the EU funded the *ArchaeoLandscapes Europe* project to overcome these inequalities
- such a model should work for Africa as well if there is a multinational or African-European collaboration to organise workshops, to exchange students and experts, to enforce common rules etc.

Roman-Germanic Commission/DAI

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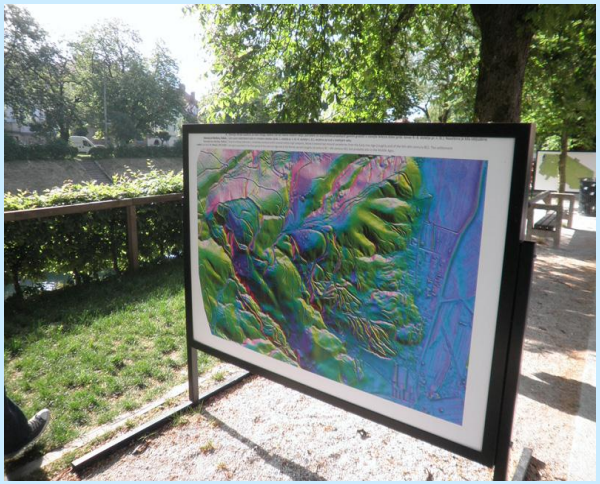

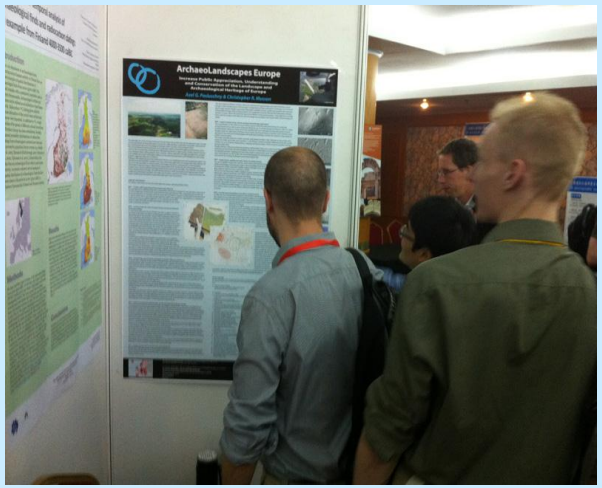

Thank you very much for your attention