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ATAPUERCA

XVII World UISPP Congress
XVII^e Congrès Mondial de l'UISPP
XVII Congreso Mundial de UISPP

Session A12

Detecting the Landscape(s) - Remote Sensing Techniques from
Research to Heritage Management

Walking over Magoulas: Mapping Neolithic Tell Settlements in Thessaly (Greece) Using Integrated Archaeo-geophysical Techniques

Cuenca García, Carmen (carmen@ims.forth.gr); A. Sarris, T. Kalayci, S. François-Xavier; G. Cantoro, J. Donati, M. Manataki, K. Vouzaxakis, V. Rondiri, P. Arachoviti, K. Almatzi, D. Efstathiou, E. Stamelou

Walking over Magoulas

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Ευρωπαϊκή Ένωση
Ευρωπαϊκό Κοινωνικό Ταμείο



ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ & ΘΡΗΣΚΕΥΜΑΤΩΝ, ΠΟΛΙΤΙΣΜΟΥ & ΑΘΛΗΤΙΣΜΟΥ
ΕΙΔΙΚΗ ΥΠΗΡΕΣΙΑ ΔΙΑΧΕΙΡΙΣΗΣ

Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



CONTENTS

- Introduction
- Methods
- Results
- Conclusion

INTRODUCTION

METHODS

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WHAT IS A MAGOULA?



THE STUDY AREA

Thessaly (Central Greece) is well known for the concentration of these prehistoric sites



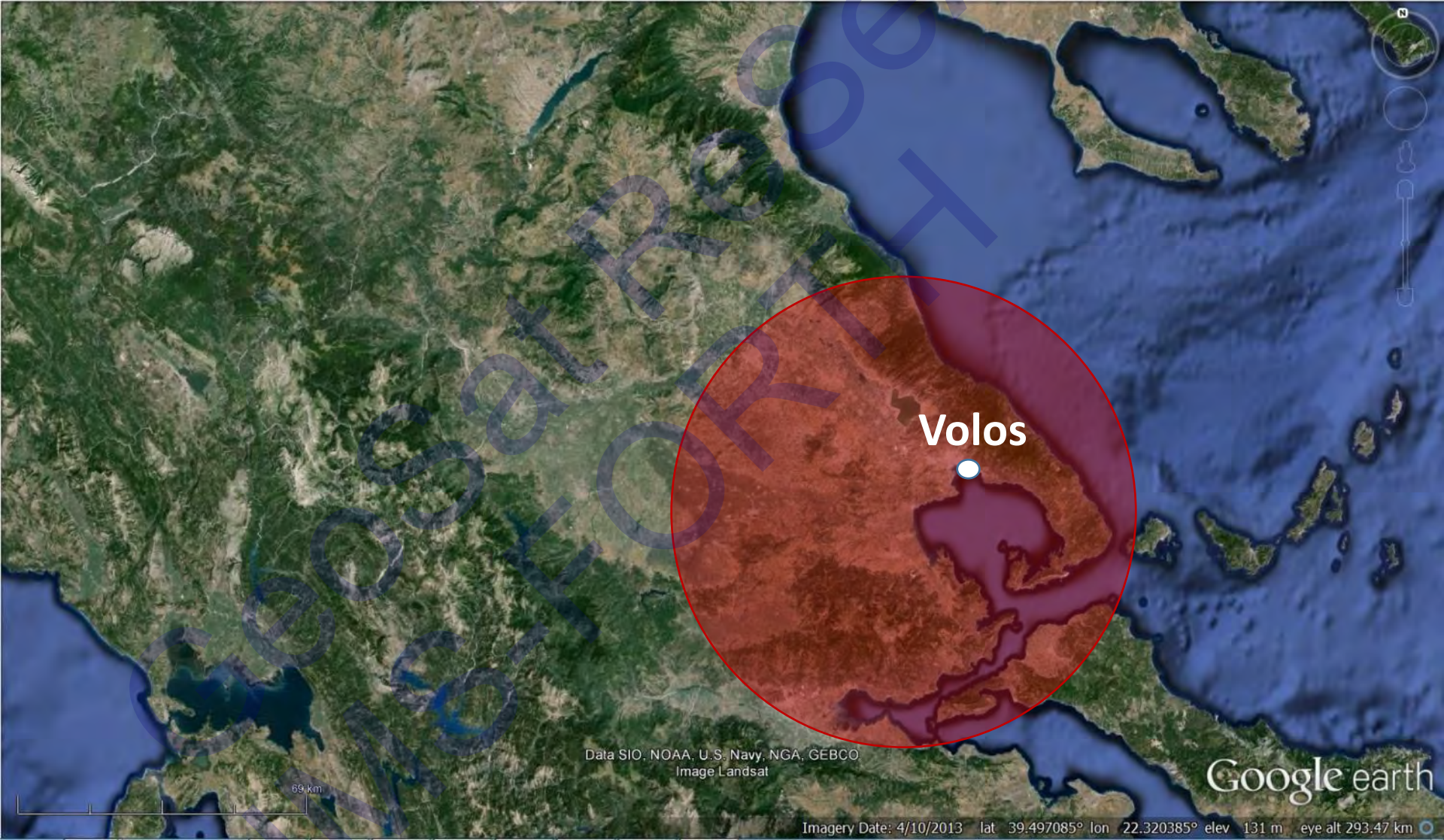
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THE STUDY AREA



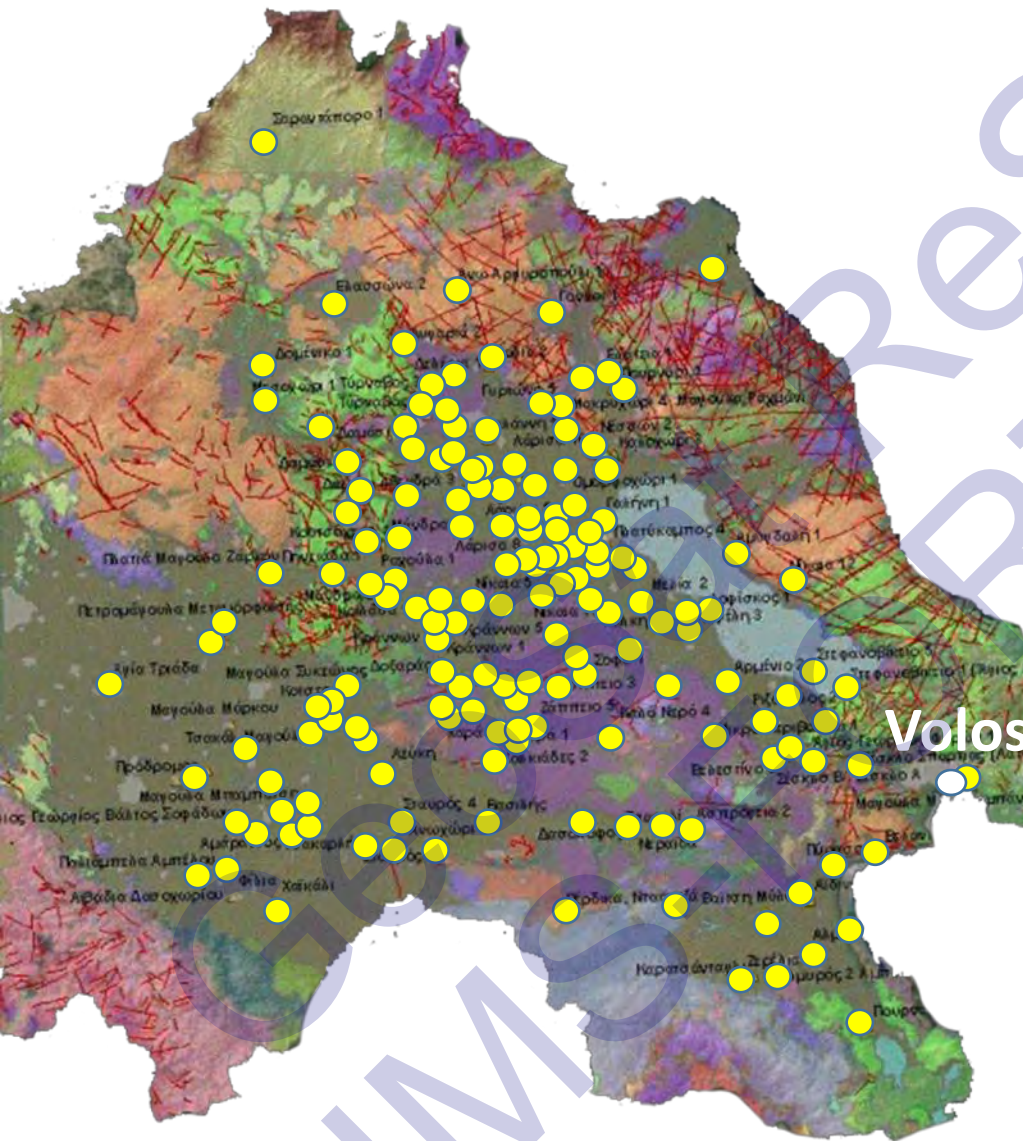
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THE STUDY AREA



- The 342 Thessalian magoulas documented are located at the alluvial plains.
- 181 sites (53% of the total) are established on alluvial deposits
- 81 sites on fluvial deposits areas with intense morphologic relief.
- These formations are of low altitude & are ideal for cultivation.

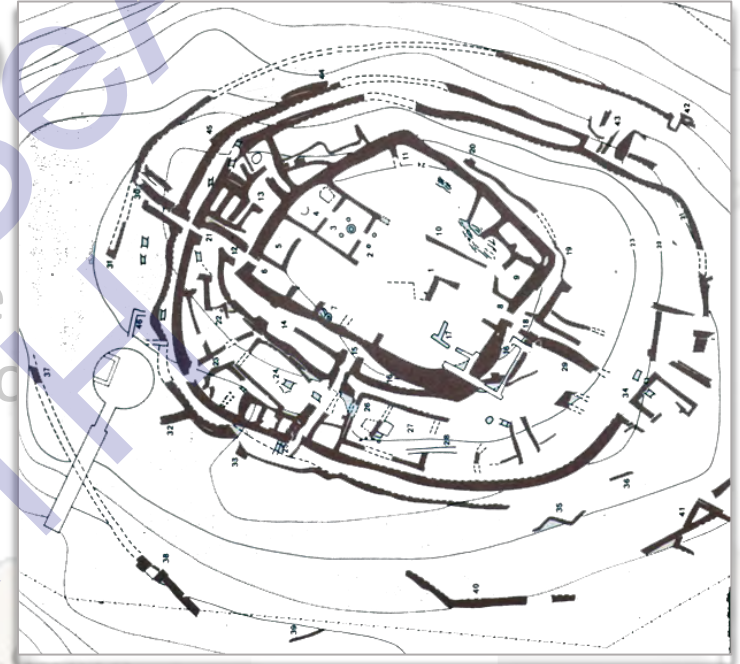
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THE SIGNIFICANCE OF THE AREA NEOLITHIC THESSALY (6800-3200 BC)



Sesklo

Early Neolithic (7th millennium BC) - Middle Bronze Age, with its peak in Middle Neolithic (5th millennium BC)

Dimini

Late Neolithic period (end of the 5th millennium BC) - Late Bronze Age



OPEN QUESTIONS ON NEOLITHIC THESSALY

accumulation
debris mounds character occupation sites
extent flood-plain layout settlements
habitation origin establishment
Thessaly originated long-lasting Origion produced tell-sites
term landscape distribution patterns human-occupation
man-made questions gap understanding archaeological prehistoric
reconstruct Tell development origination fertile



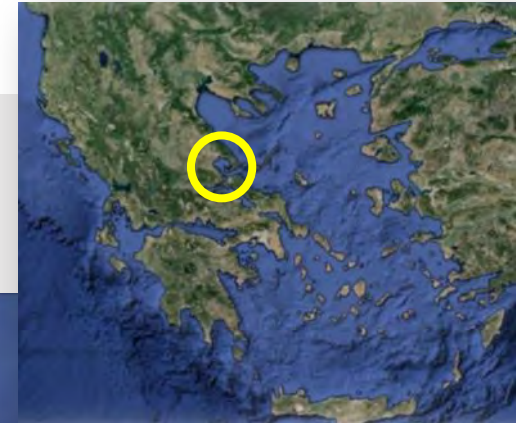
AIM OF OUR STUDY

(Innovative Geophysical Approaches for the Study of Early Agricultural Villages of Neolithic Thessaly)

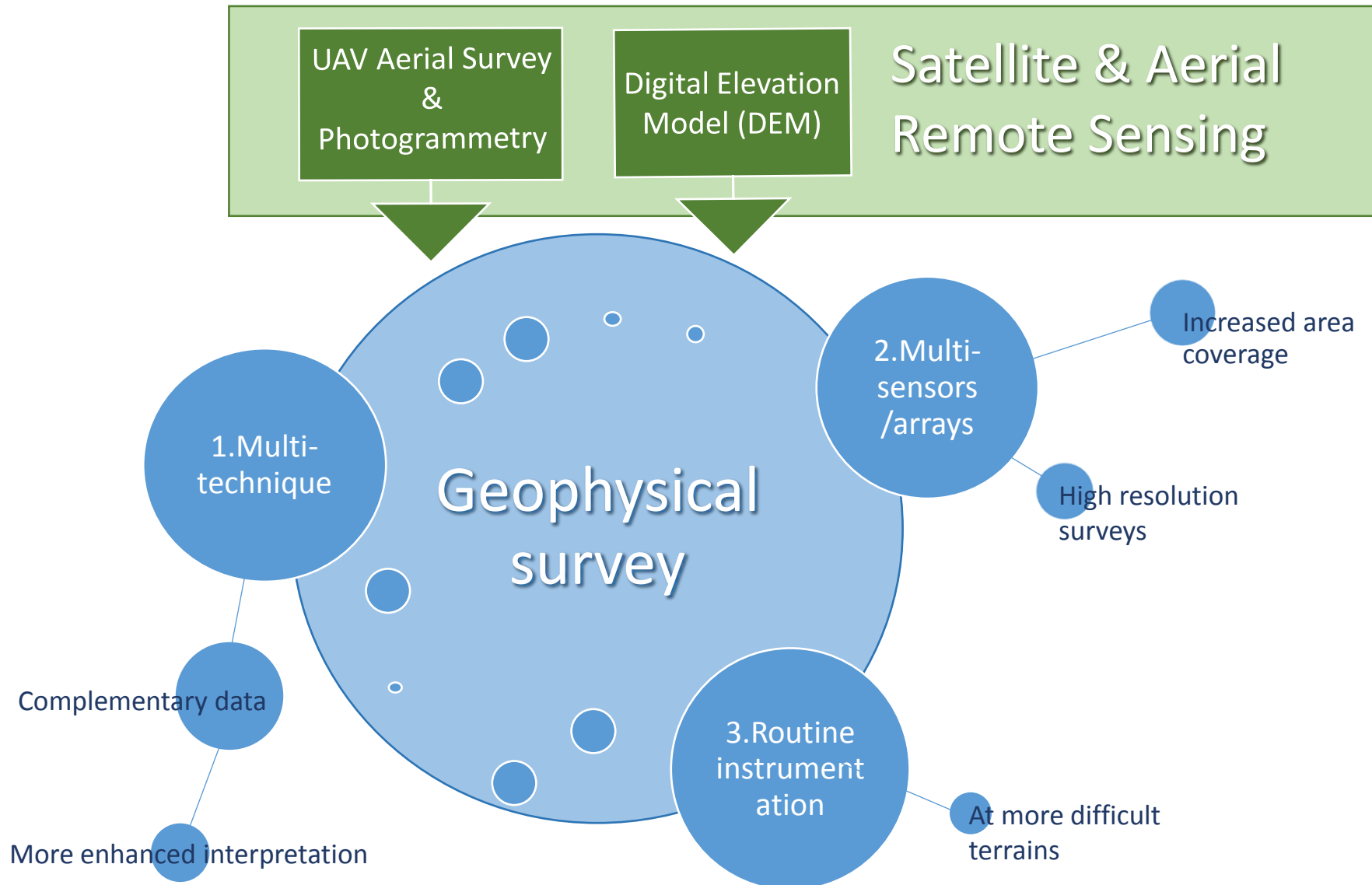
- The on-going project IGEAN focuses on the investigation of several magoulas in eastern Thessaly.
- It aims to **reconstruct the major habitation patterns of the Neolithic farming groups** in the area **using** high resolution, cost-effective & non-destructive **geophysical, satellite and aerial remote sensing** innovative techniques.
- The key objective is to compare data collected from as many sites as possible and to interpret them in accordance with the known information.
- After a century of research on Neolithic Thessaly, it is the first time that a large amount of comparable data is available.

MAGOULA'S LOCATION

The IGEAN Project



THE INTEGRATED GEOPHYSICAL SURVEY



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MAGNETOMETRY



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MAGNETOMETRY



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FREQUENCY DOMAIN ELECTROMAGNETIC INDUCTION



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FREQUENCY DOMAIN ELECTROMAGNETIC INDUCTION



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GROUND-PENETRATING RADAR (GPR)



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GROUND-PENETRATING RADAR (GPR)



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EARTH RESISTANCE MAPPING



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DATA COLLECTION



INTRODUCTION

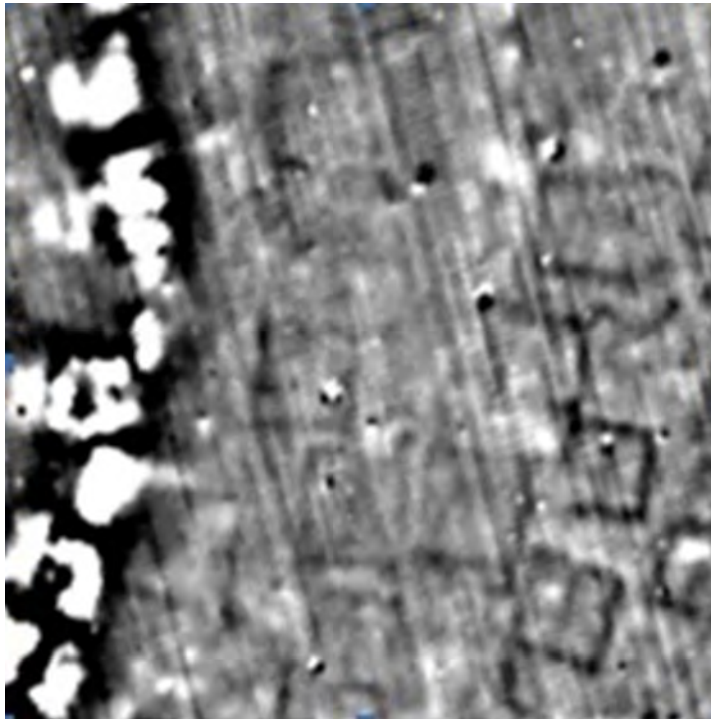
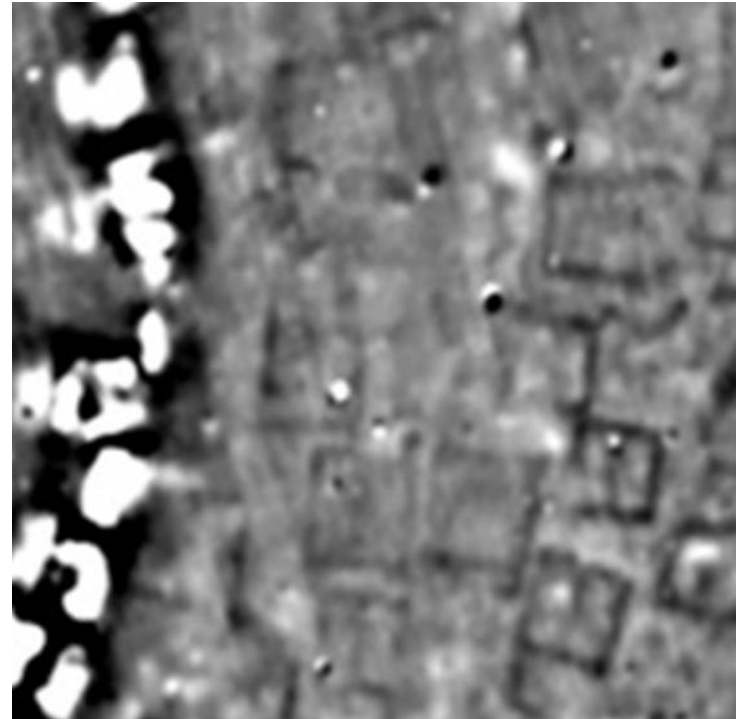
METHODS

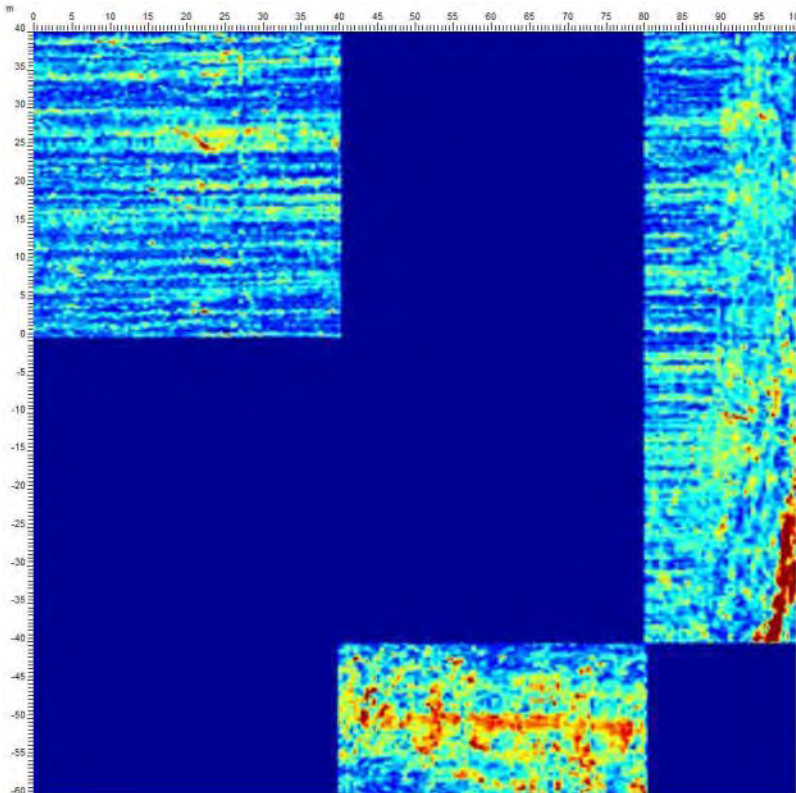
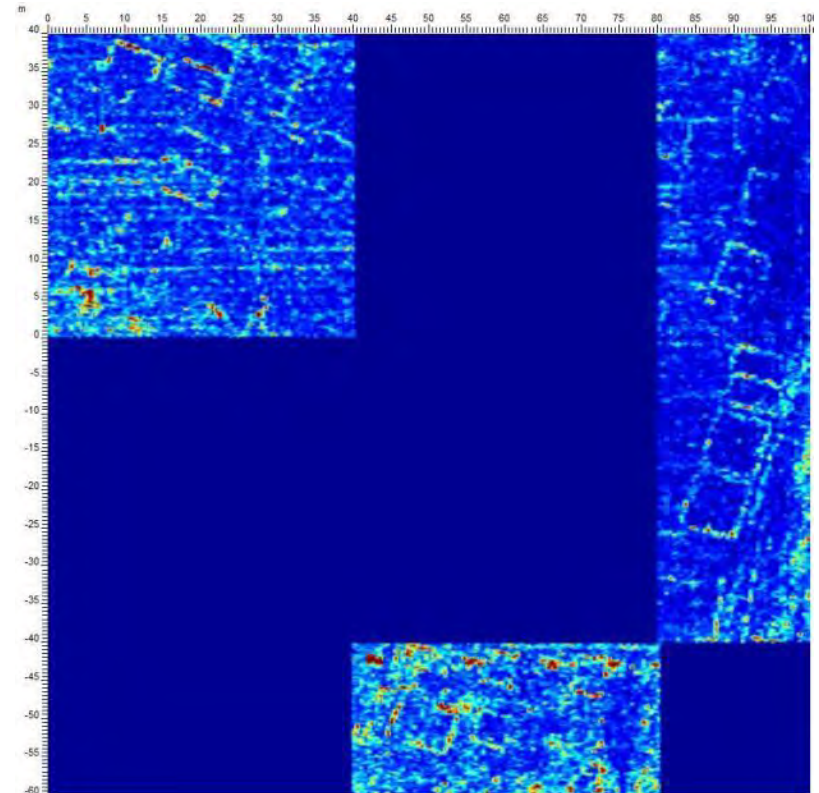
RESULTS

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DATA COLLECTION



DATA PROCESSING**Magnetometer Data (Magoula Almiriotiki)****Clipped Data****Processed Data**

DATA PROCESSING**GPR Data (Magoula Almiriotiki)****Raw Data****Processed Data**

ALMIRIOTIKI

MAGNETOMETRY

GROUP A

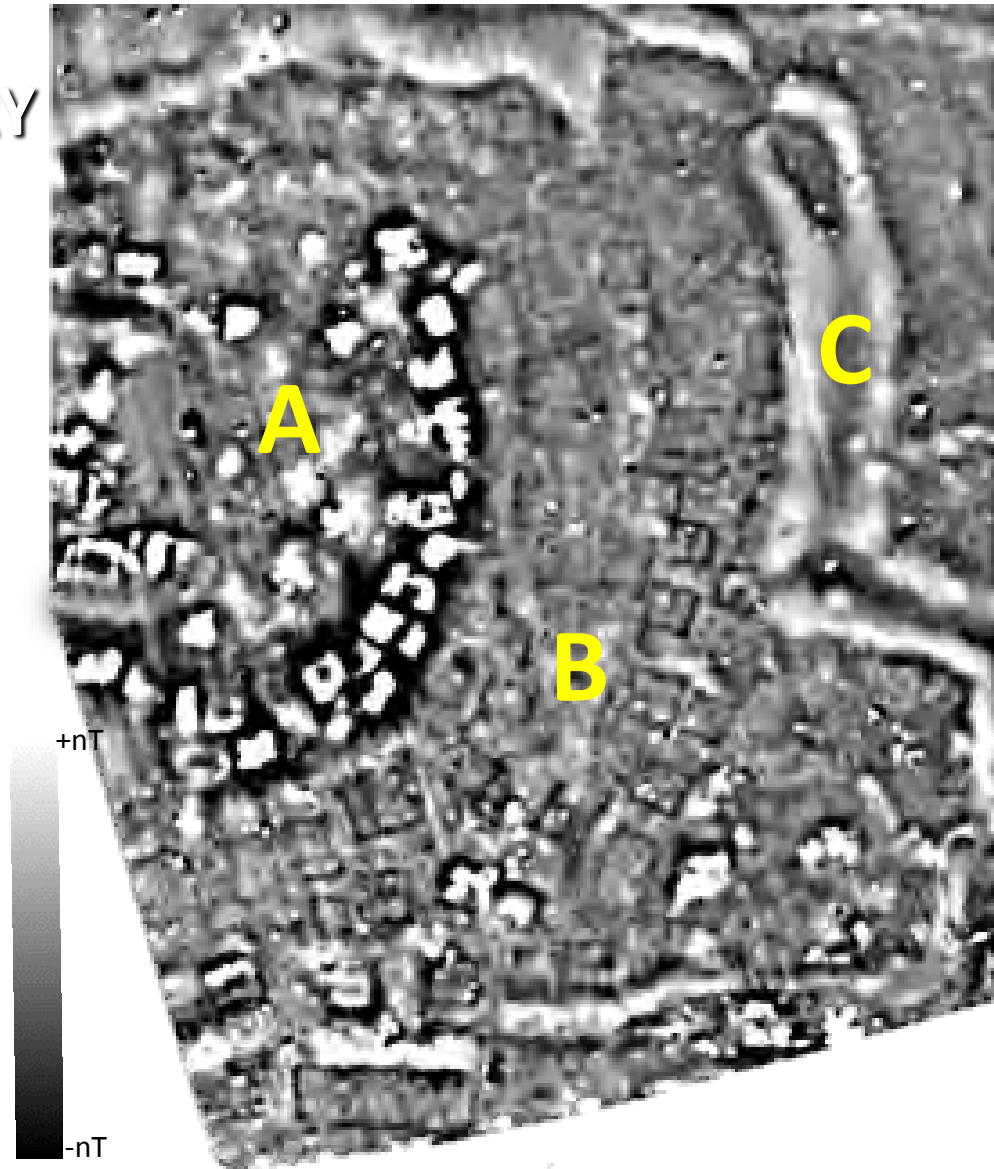
- Strong magnetic anomalies (burning?, destruction phase?, workshops?)
- ~ 34 rectangular structures
- Walls, openings, orientation

GROUP B

- Negative magnetic anomalies (sedimentary building materials, non-burnt daub?)
- ~ 55 rectangular structures
- Internal divisions

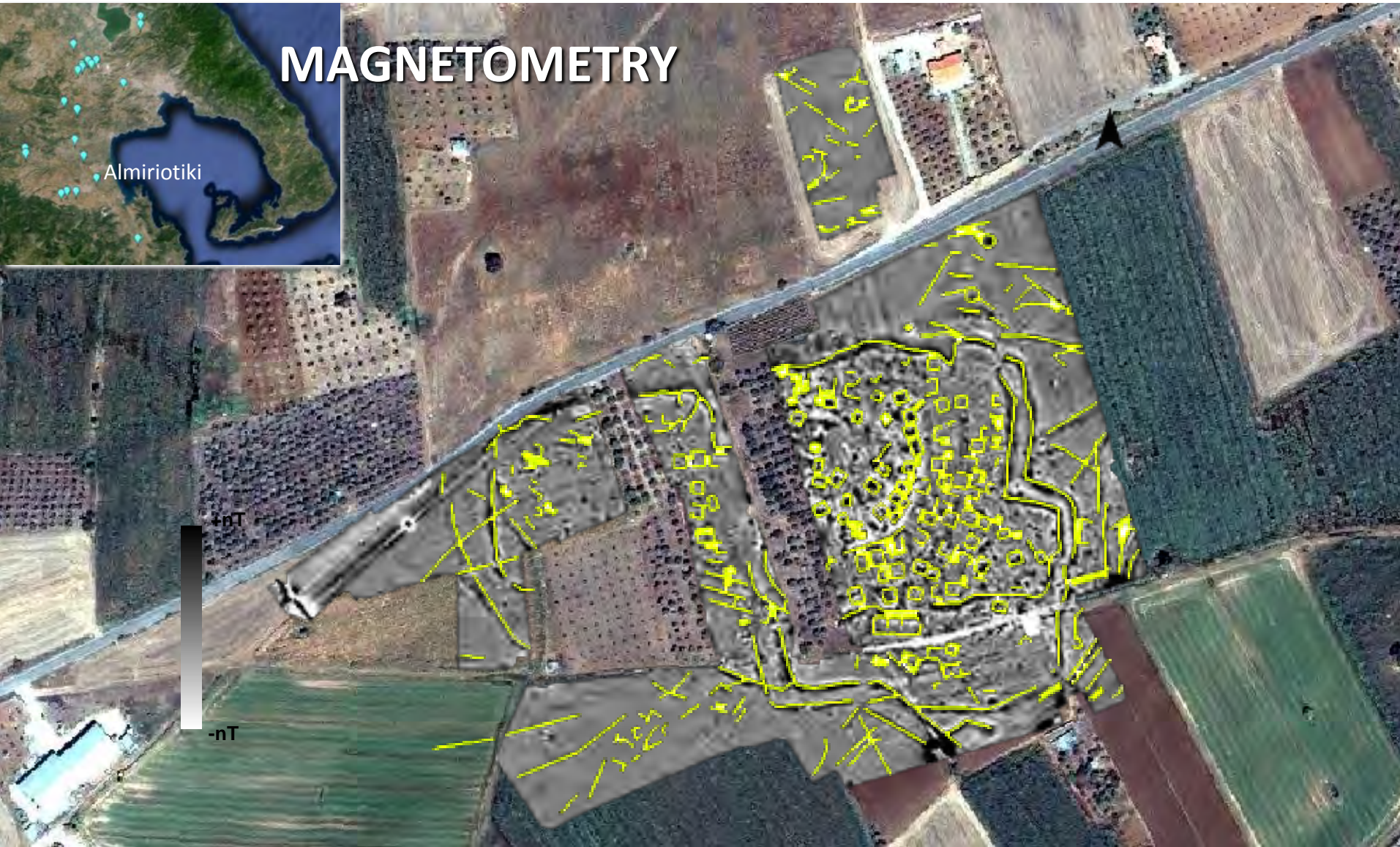
GROUP C

- Positive linear magnetic anomalies (enhanced susceptibility of fill materials)
- Double ditch enclosure

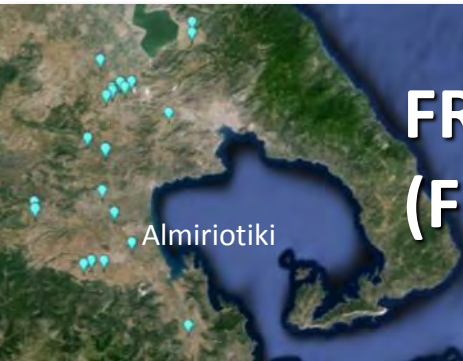


ALMIRIOTIKI

MAGNETOMETRY



ALMIRIOTIKI

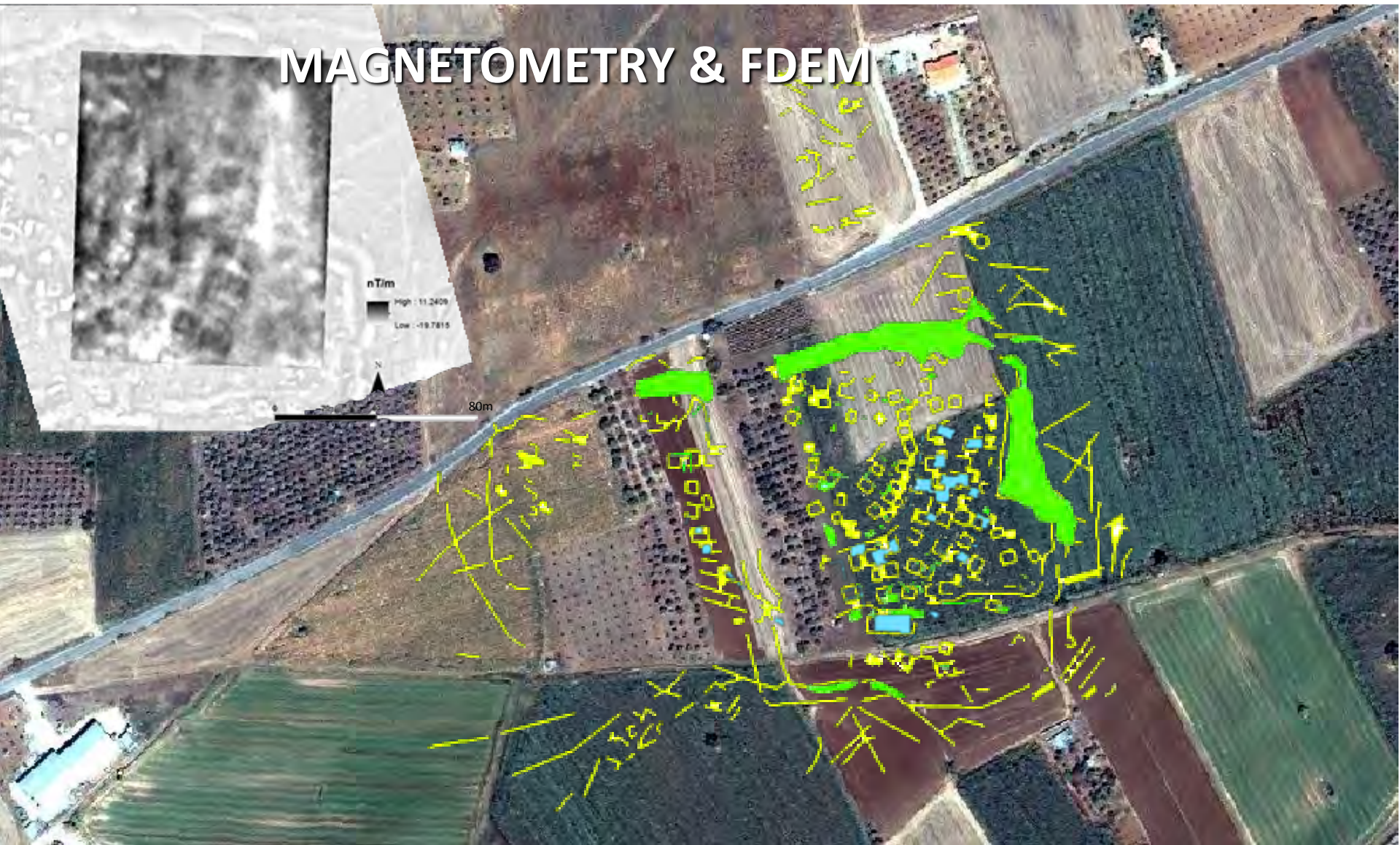
FREQUENCY DOMAIN ELECTROMAGNETICS
(FDEM)

Quadrature_conductivity

Inphase_magnetic susceptibility

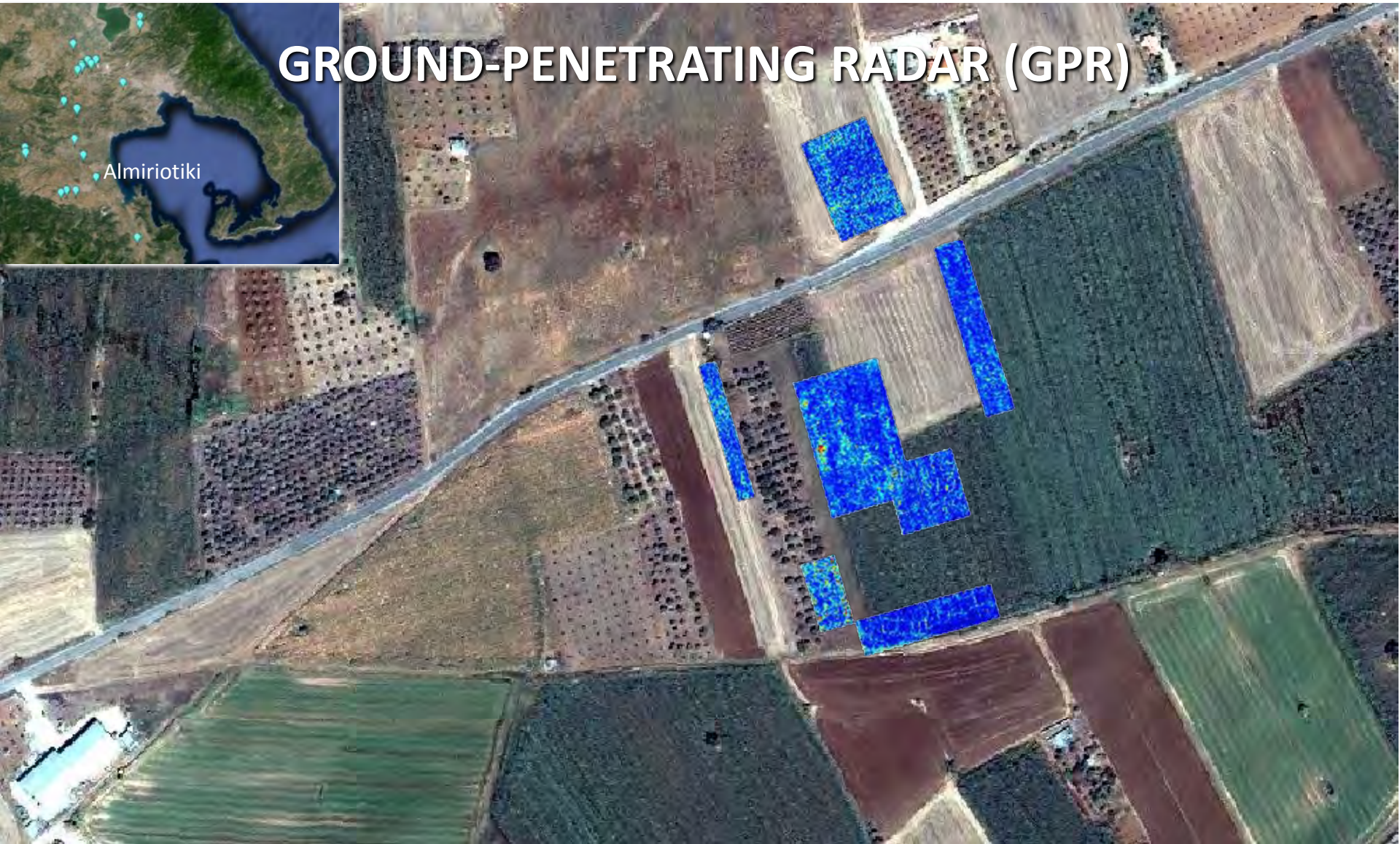
ALMIRIOTIKI

MAGNETOMETRY & FDEM



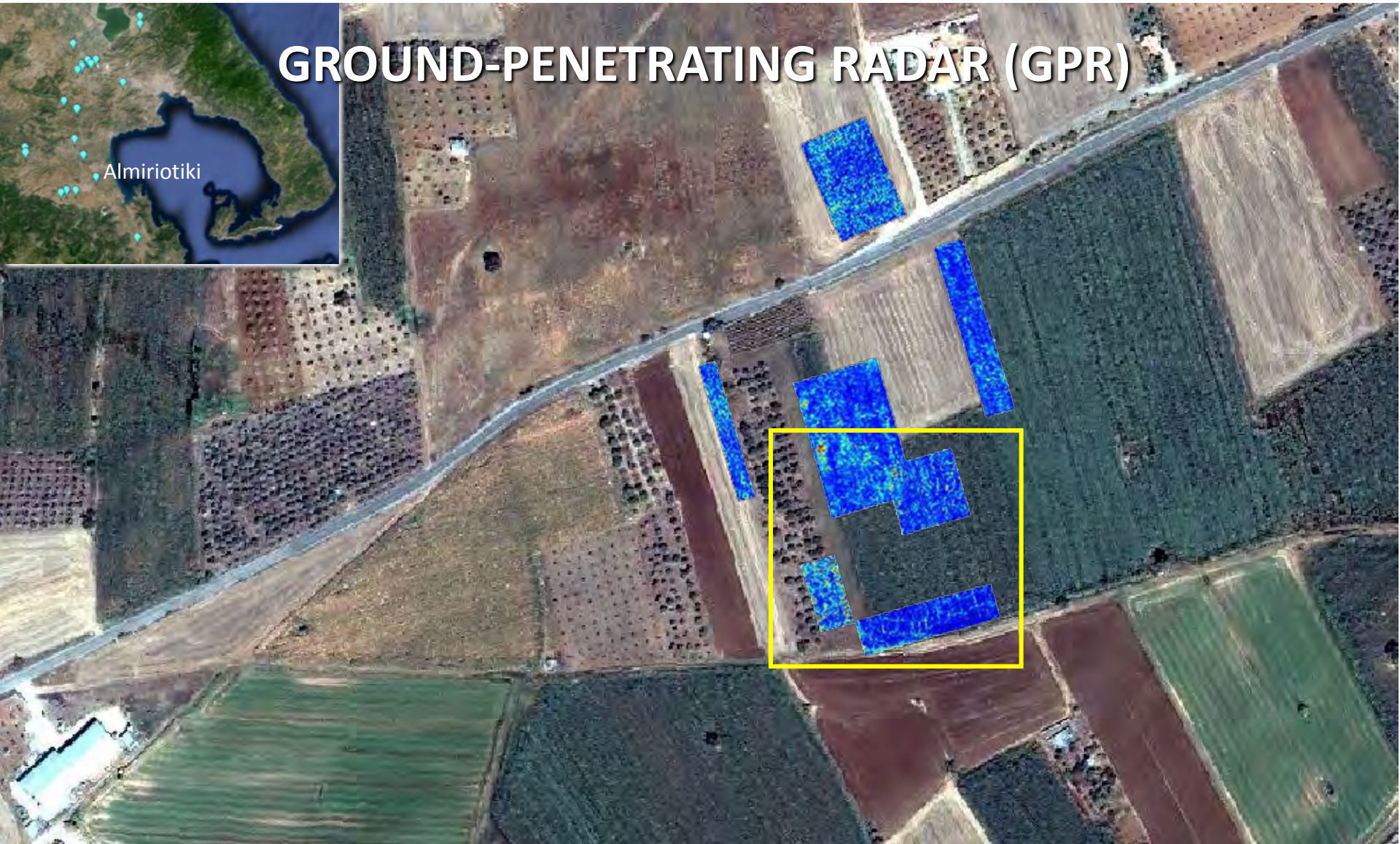
ALMIRIOTIKI

GROUND-PENETRATING RADAR (GPR)



ALMIRIOTIKI

GROUND-PENETRATING RADAR (GPR)

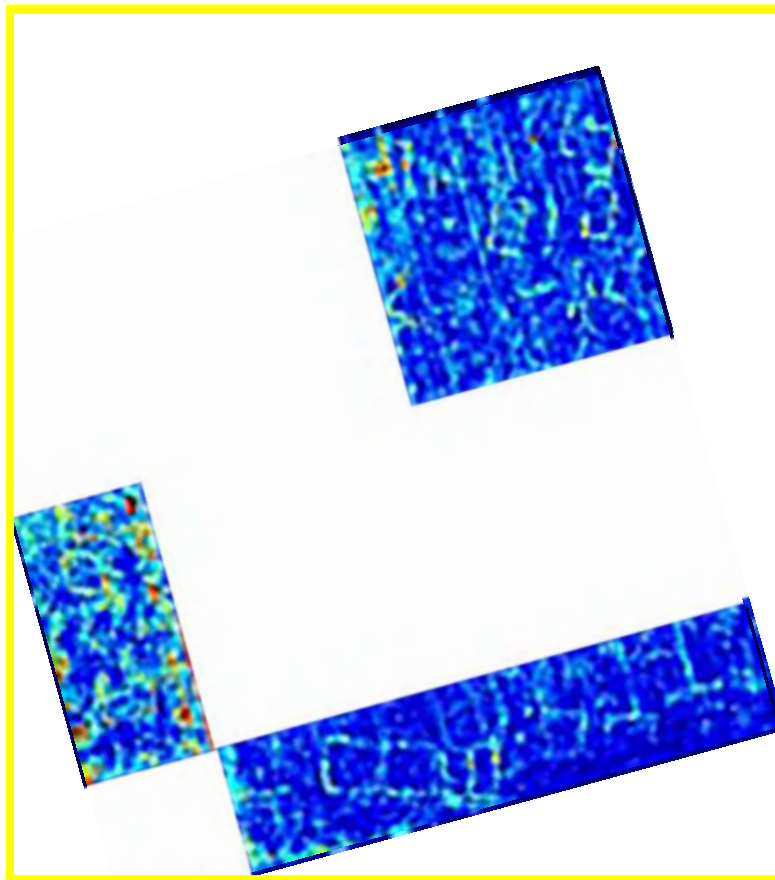


ALMIRIOTIKI



GROUND-PENETRATING RADAR (GPR)

- Detailed structures
- Depth information
- Highly conductive soil...wait for dry conditions
- Single channel NOGGIN system provided better results than the multi-channel MALA GPR

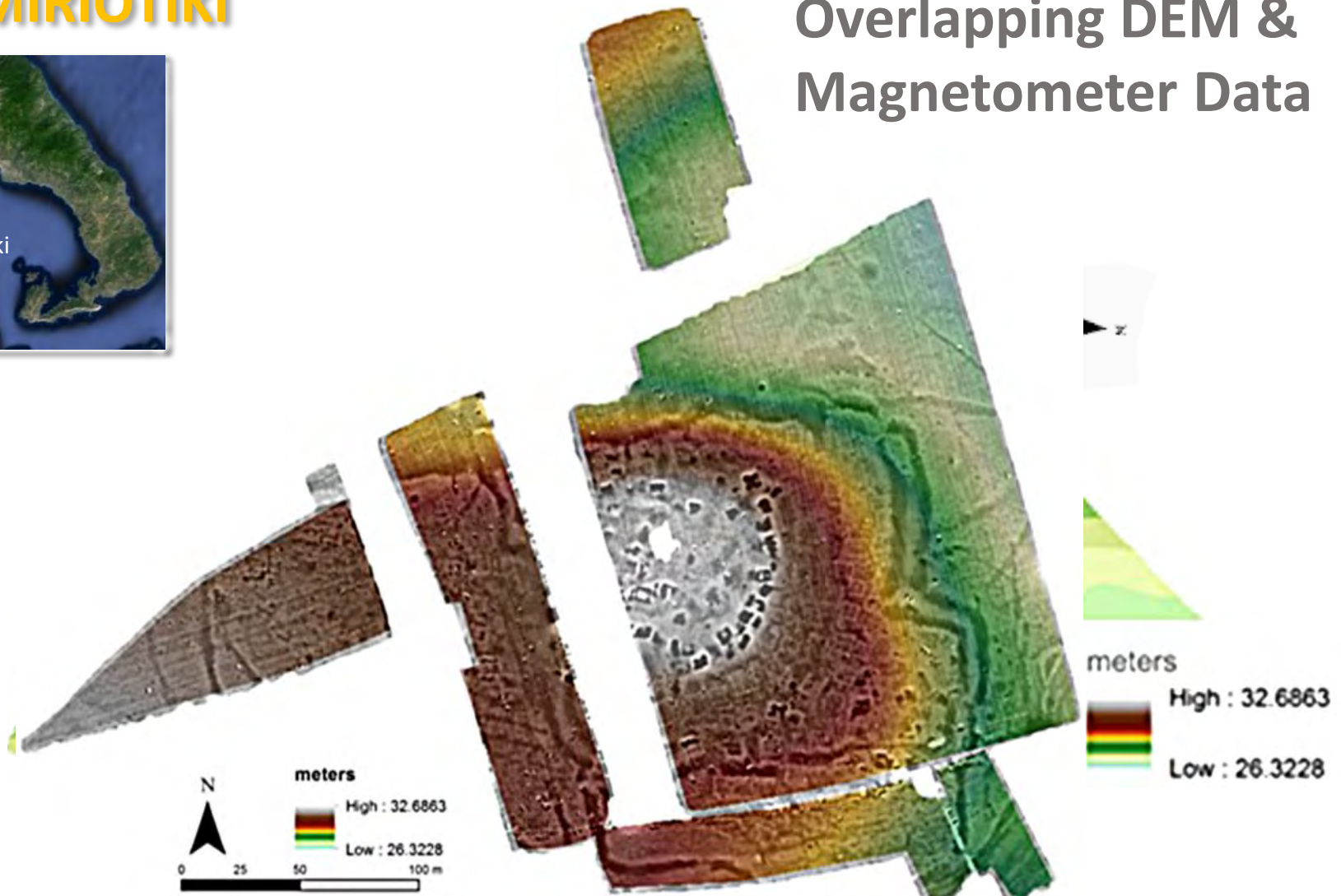


1.10-1.20m

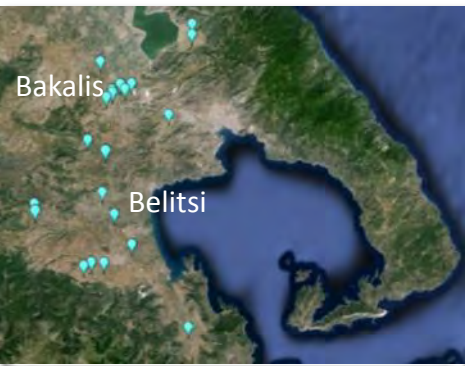
ALMIRIOTIKI



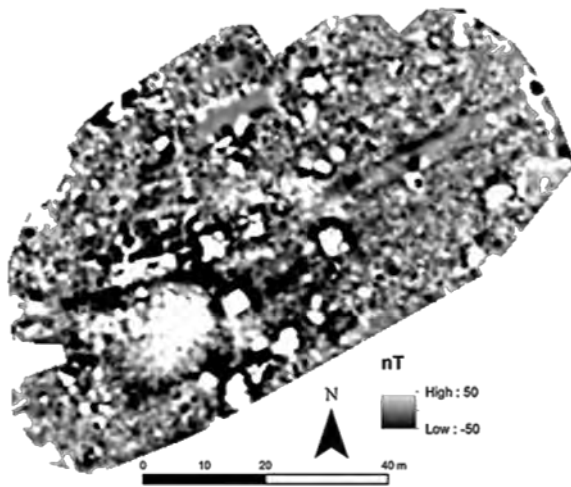
Overlapping DEM & Magnetometer Data



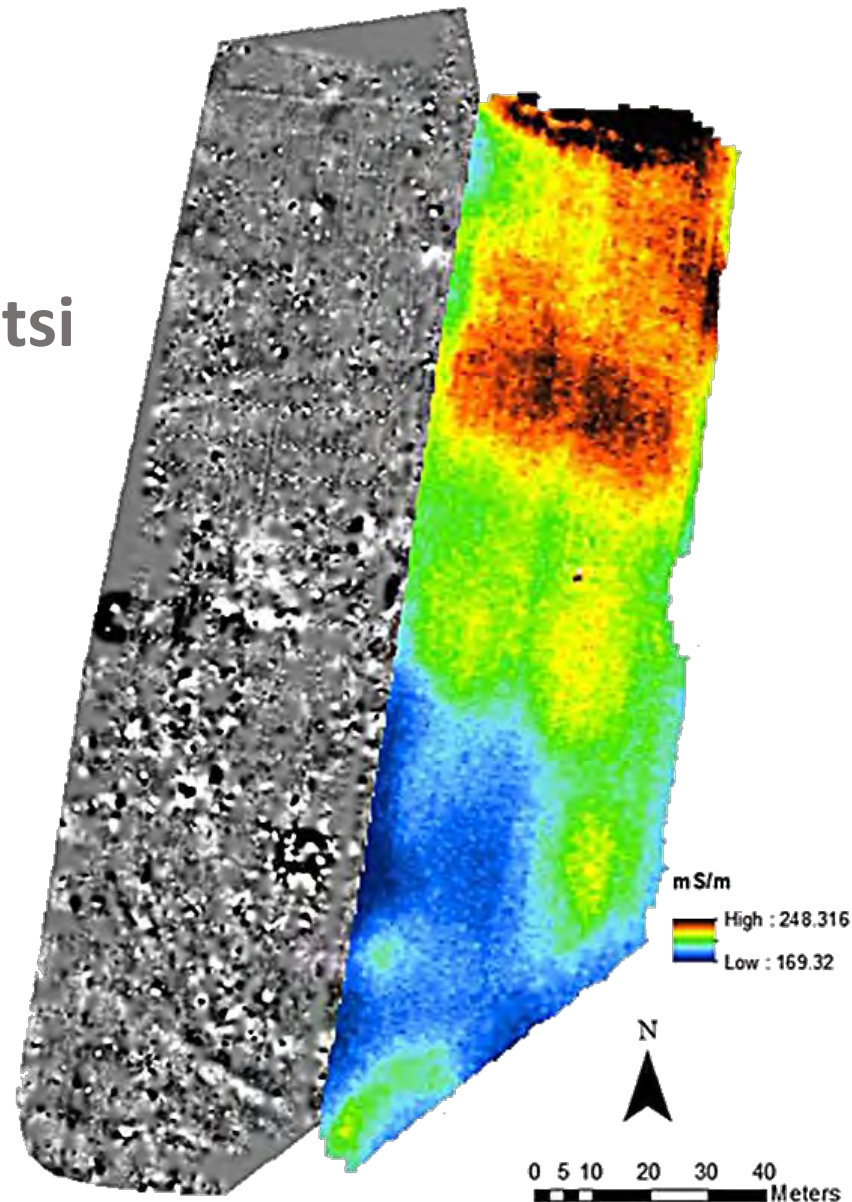
OTHER MAGOULAS



Bakalis



Belitsi



OTHER MAGOULAS



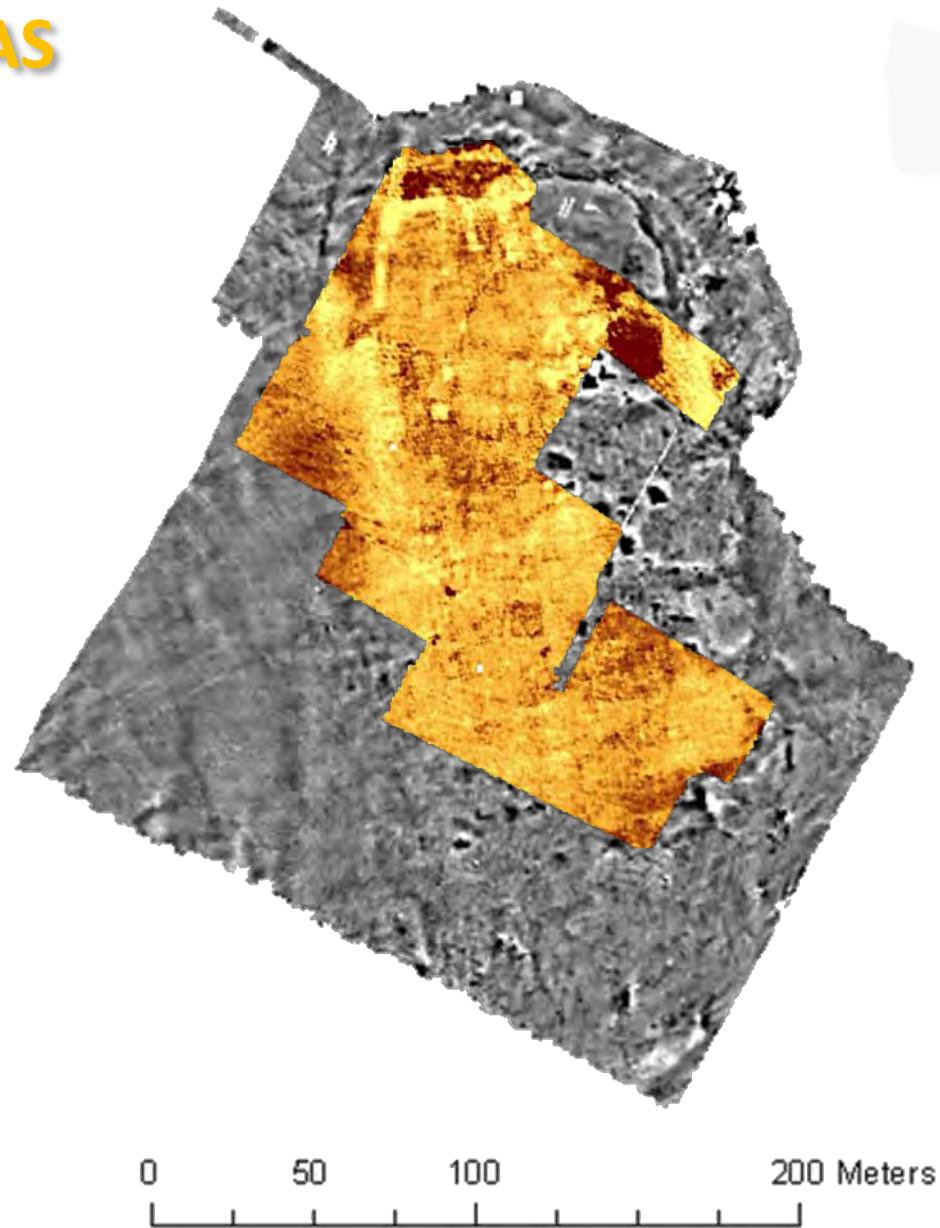
Rizomilos



OTHER MAGOULAS



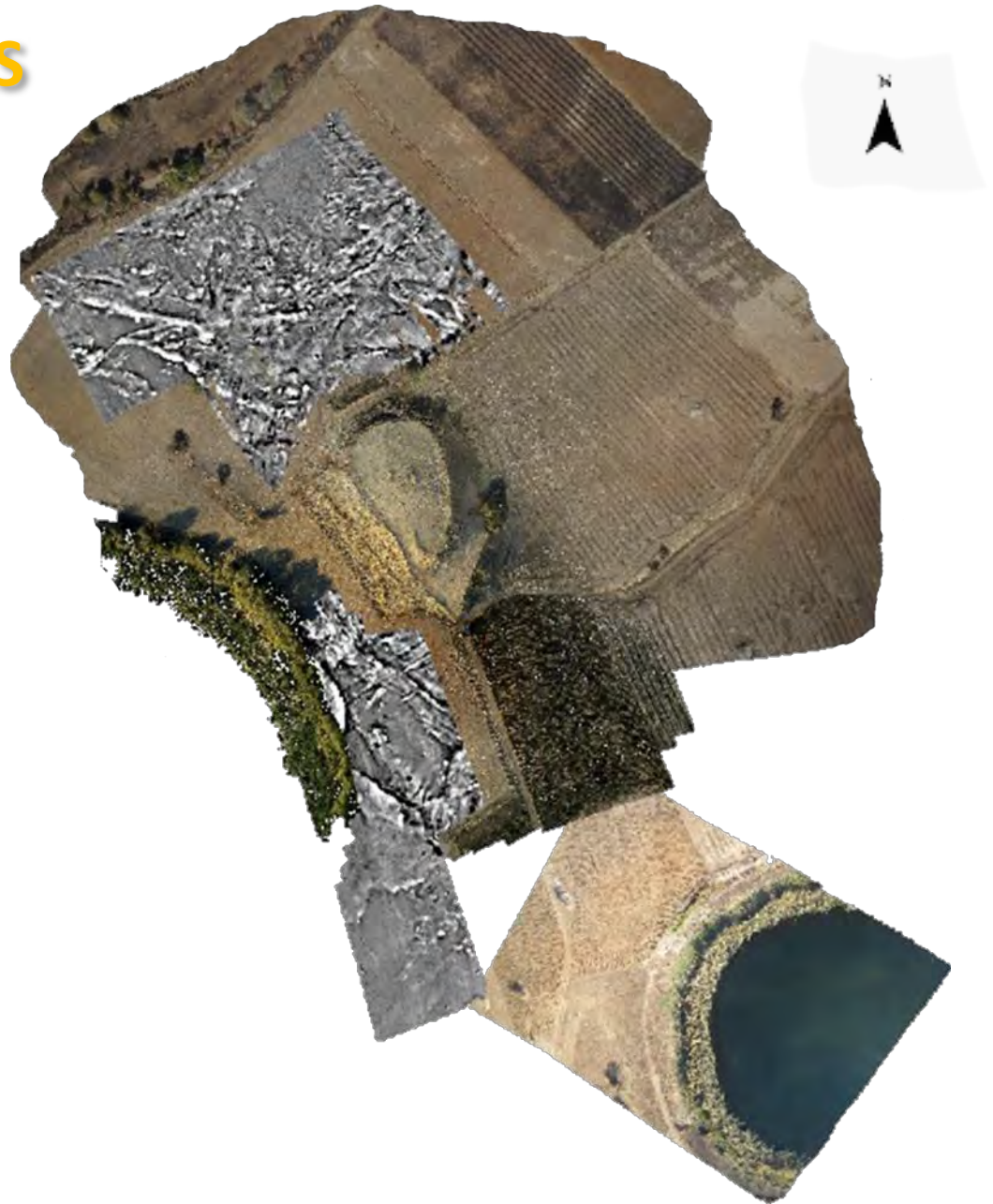
Perdika 1



OTHER MAGOULAS



Zerelia



- This on-going project has already surveyed 16 magoulas, covering a total area of ~96ha in 29 days.
- Future work will include further surveys, analysis of satellite data, soil geochemical analyses of particular features & ground-truthing.



- This research is providing with key information related to the structural layout of tell sites in Thessaly as well as shedding light on questions relating to their origin & long-lasting character.
- ...but it is also allowing a methodological assessment on the use of archaeo-geophysics that will provide with a tool-box to be used in the future. Therefore, developing the discipline in the study of such type of prehistoric sites.



All in a cost-effective & non-destructive manner

THANK YOU



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Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



ΕΥΡΩΠΑΪΚΟ ΚΟΙΝΩΝΙΚΟ ΤΑΜΕΙΟ