

# Mapping sustaining soils in prehispanic western Mexico

Archaeopedology as a tool for understanding ancient agriculture.

**Antoine Dorison**

PhD candidate

Paris 1 university / CNRS

Dpt. of Archaeology of the Americas

**Dr. Christina Siebe**

Researcher

UNAM, Institute of Geology

Dpt. of soil science



ArchAm  
UMR 8096  
Archéologie  
des Amériques



UNIVERSITÉ PARIS 1  
**PANTHÉON SORBONNE**



\*musée du quai Branly



# Ouverture

## Soils and archaeology



© D. Simonin



Aztec agriculture,  
Codex florentino, book IV

# 1. Research background



# The Zacúsecha project (2009

- )

► Heir of the Michoacán projects I and II (1983 -1991) and Zacapu III (1994-1998)

## MESOAMERICA ON THE EVE OF THE SPANISH CONQUEST (~AD1500)



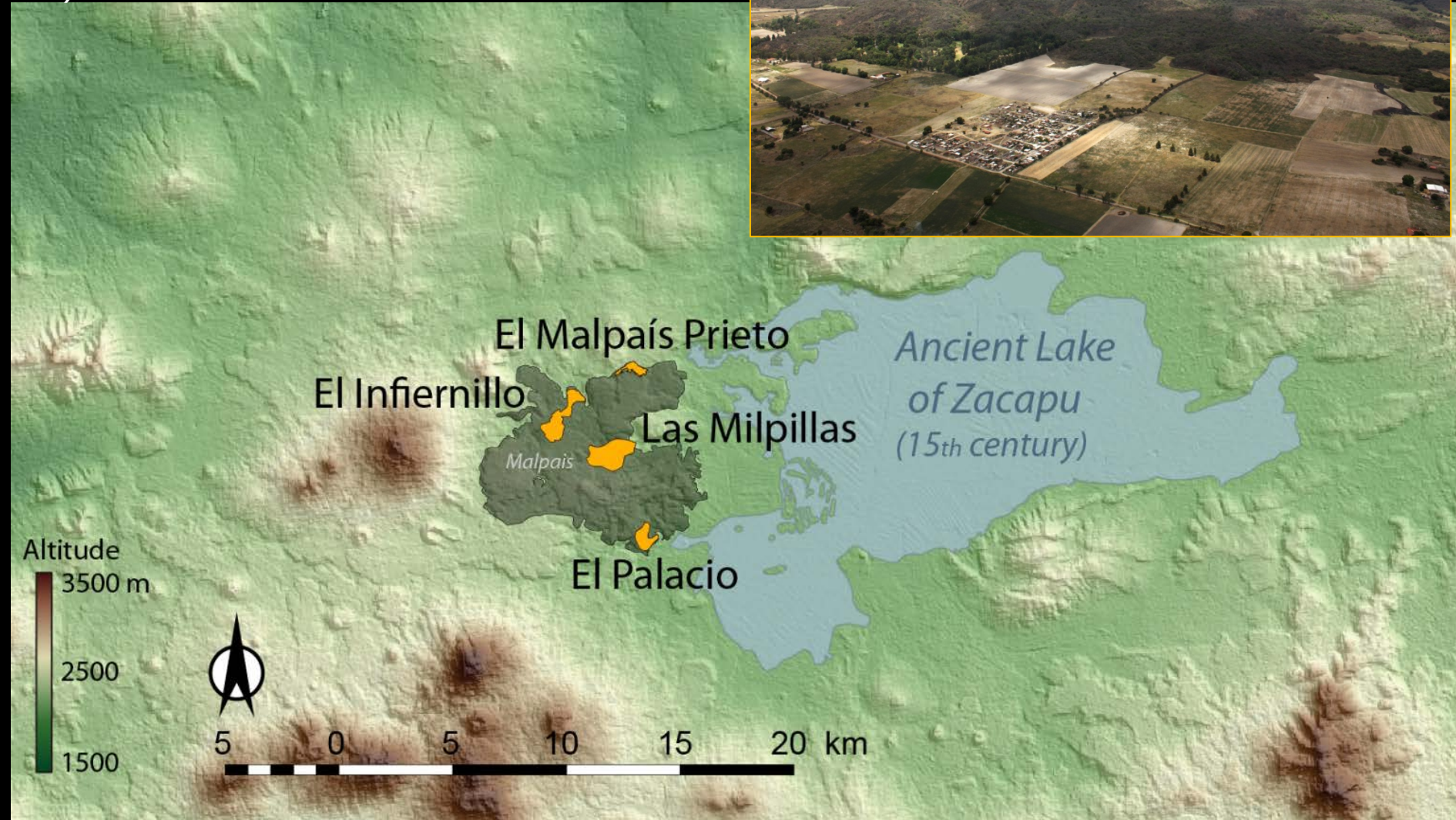
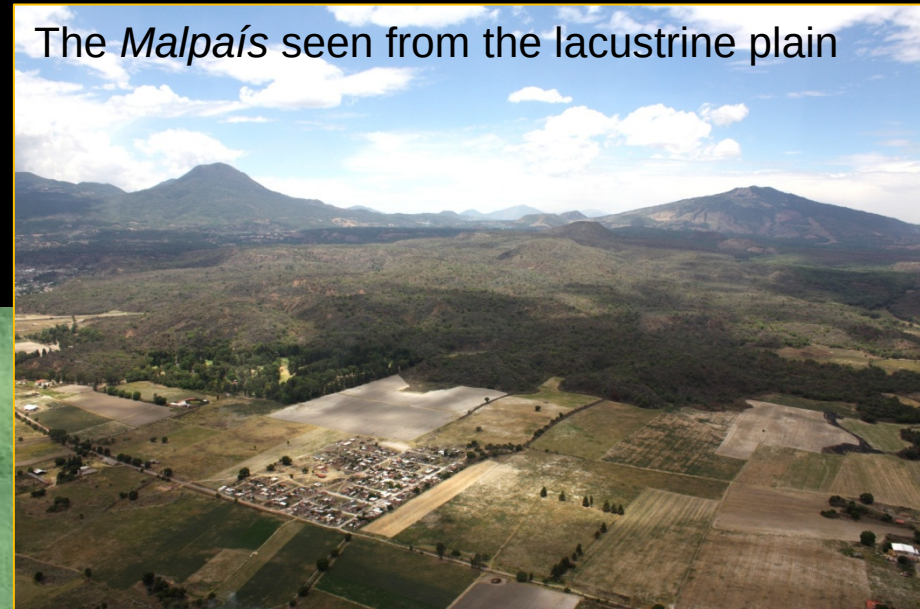


Research background :

# The Malpaís of Zacapu

► A superposition of Holocene lava flows over 50 sq km (3 are less than 3000 years old)

The *Malpaís* seen from the lacustrine plain





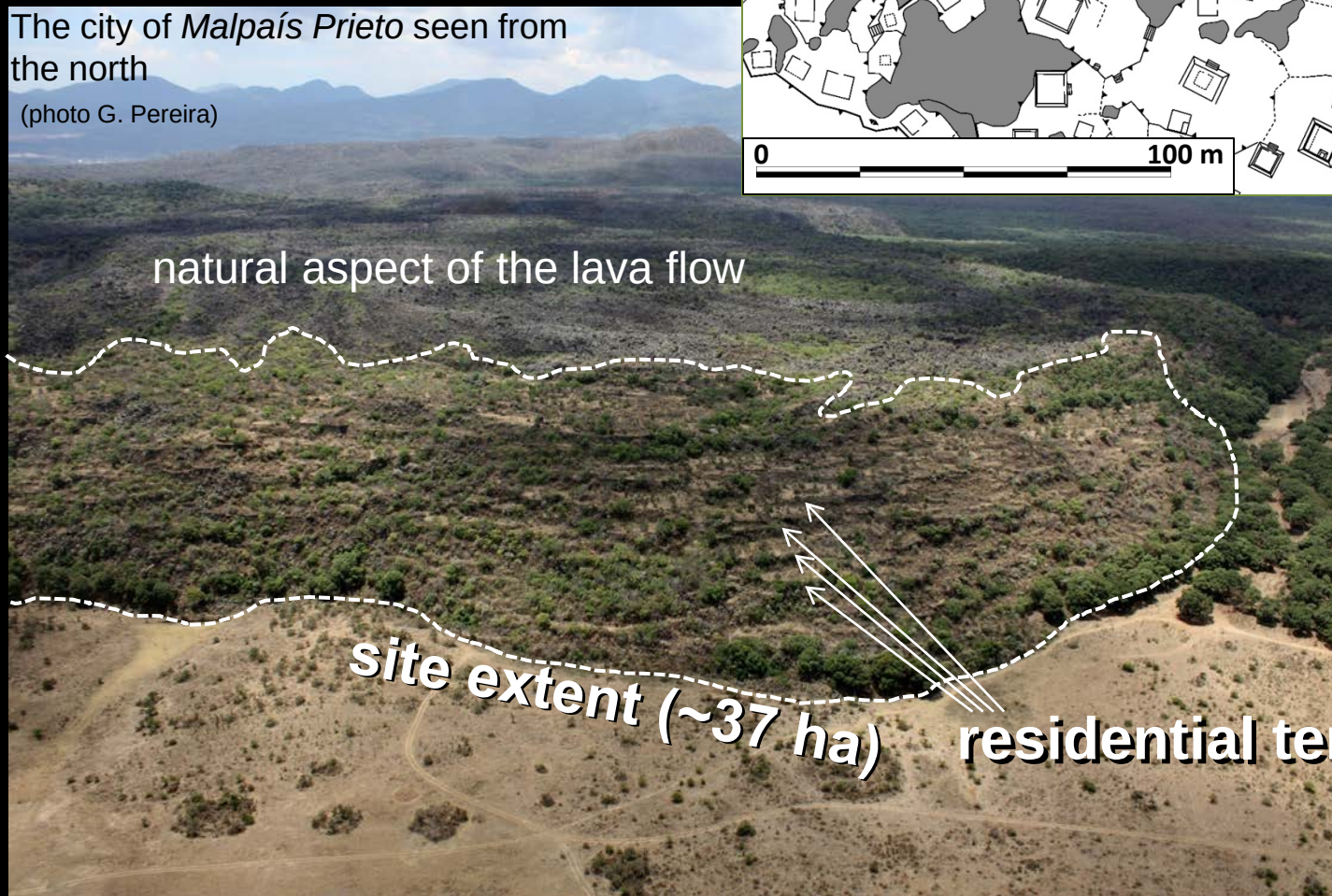
Research background :  
archaeology

# The Malpaís urban centres

- ▶ 16 000 to 20 000 inhabitants
- ▶ Occupation from AD 1250 to 1450
- ▶ 3 km away from each other

The city of *Malpaís Prieto* seen from the north

(photo G. Pereira)



↑ Example of settlement density on *Malpaís Prieto*

(mapping from Forest, 2014)

▶ On the right side, one of the 13 civic places of the city

▶ On the left side, a residential area



# Economy of the cities

## ► Agriculture

- primarily maize, completed by beans
- peppers ? Agave ?... → no archaeological evidence yet

## ► Secondly (as it seems) :

- Hunting and fishing
- Gathering of wild species

## ► No beast of burden





# Research background : environment

## A good cartographic basis

► **1970's** : field work references for the 1 : 250 000 national cartography (geology, land use, pedology, climatology... ) → punctual updates but somewhat old

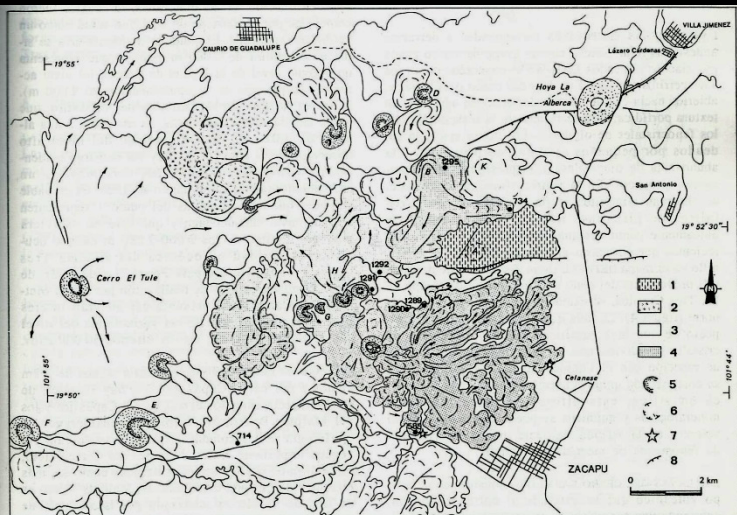
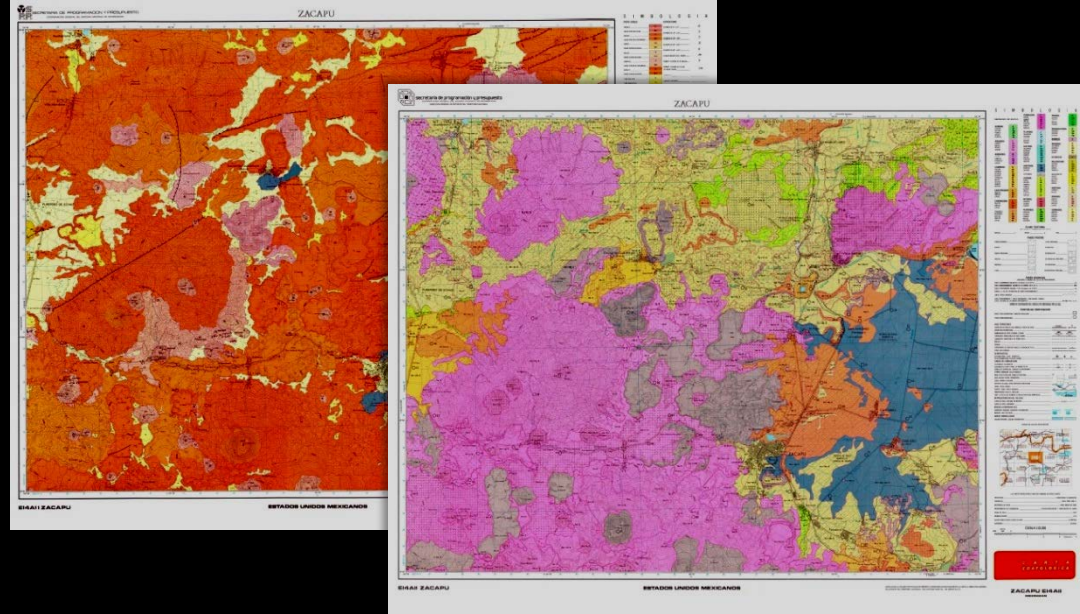
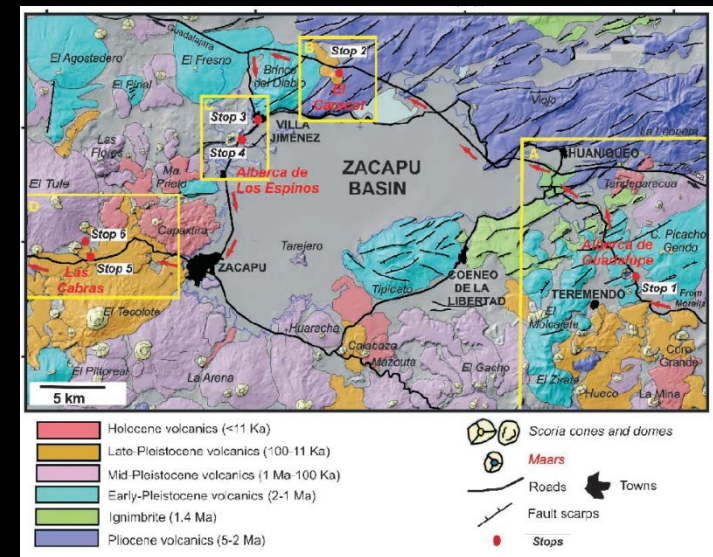


Figura 4 - Mapa geológico de la región de Zacapu, Michoacán norte-central. Lavas pliocénicas: 1, andesitas; 2, dacitas; 3, lavas del Cuaternario; 4, lavas holocénicas del sistema volcánico Tres Cerritos-Capáxtiro-Malpás Prieto; 5, conos escoriáceos; 6, maar de la Hoya la Alberca; 7, yacimientos de diatomitas debajo de las coladas del Capáxtiro; 8, fallas principales. Los números refieren a las muestras estudiadas y las letras a localidades en el texto, por orden de descripción.

► **2010's** : new geological investigation by the UNAM → dating of the volcanic formations

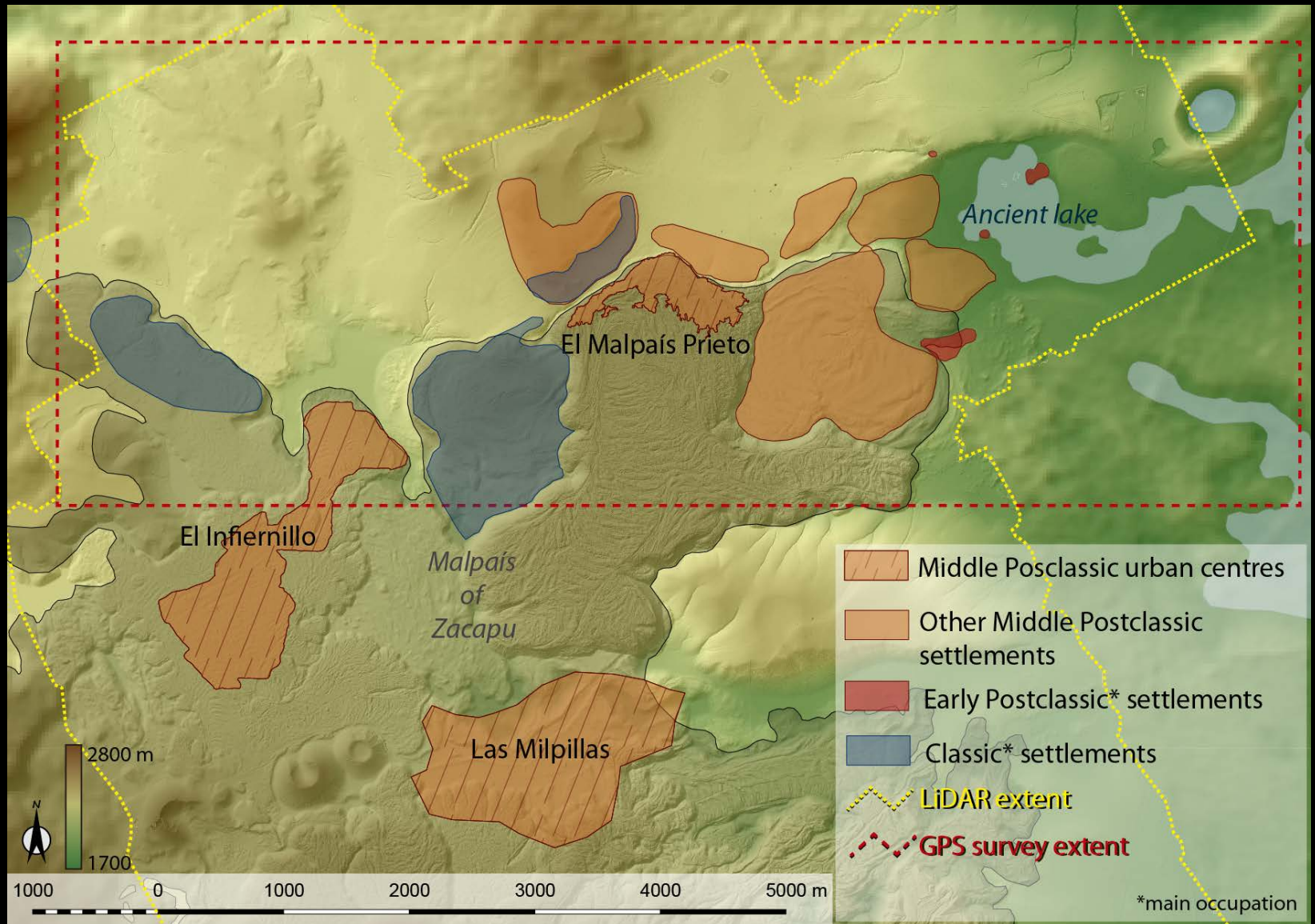


► **1980-90's** : geology, geomorphology, vegetation, sedimentology alongside the archaeological investigation





## 2. Methodologies





## Research background

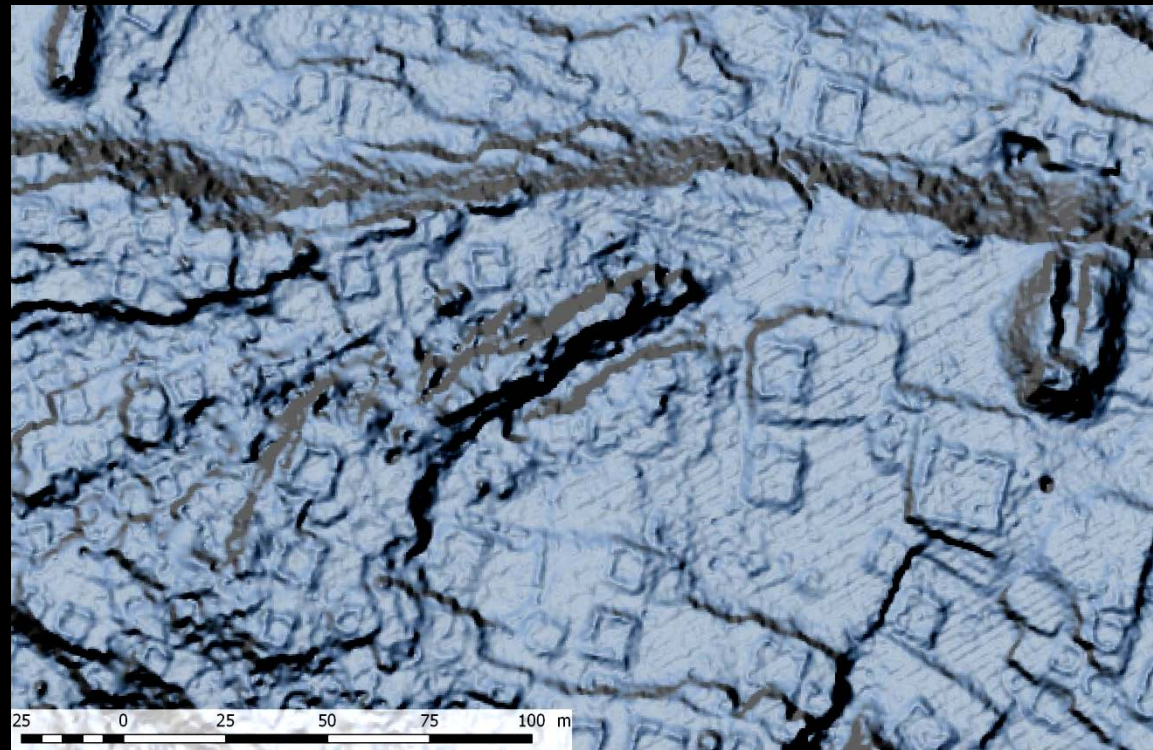
# Satellite imagery and DEM

- ▶ Google earth, Birdseye
- ▶ Aerial photographs from the 1970's
- ▶ ASTER GDEM 90 m resolution
- ▶ LiDAR

**TOP** : GPS mapping 2009 - 2011  
(from Forest, 2014)



**DOWN** : LiDAR imagery (2015)

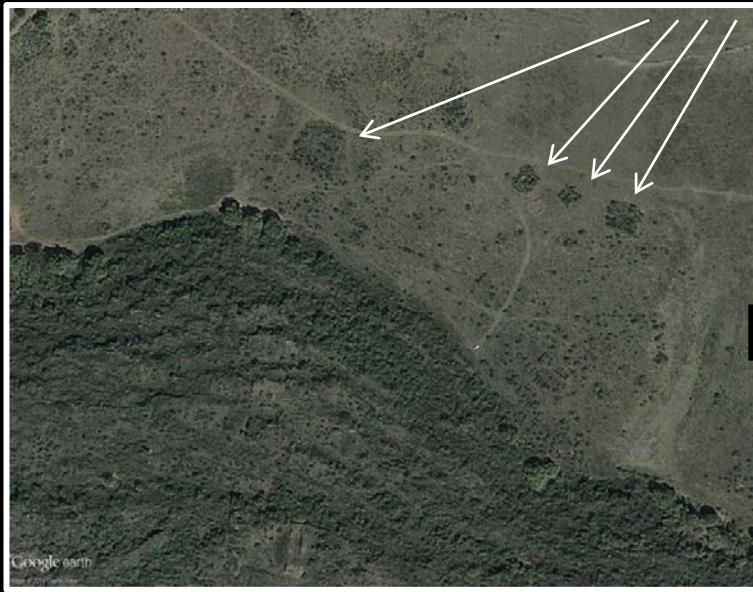




# Methodologies

## Field archaeology

### ► Survey guided by satellite images interpretation



### ► Systematic survey under the canopy





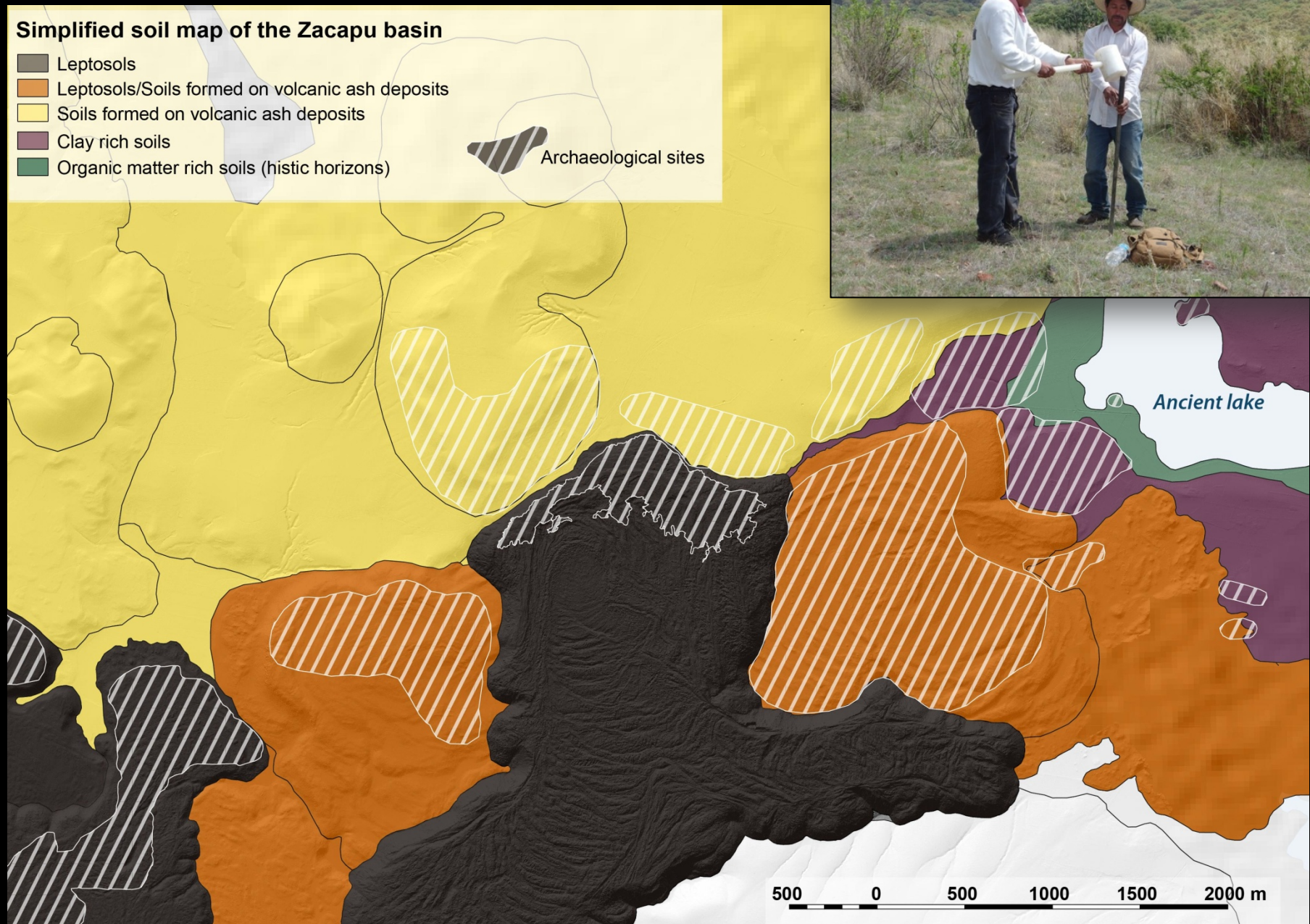
# Methodologies Field archaeology





# Methodologies

## Soil survey





### 3. Results and discussion



## Results and discussion

# The lacustrine plain



- ▶ Thick organic matter rich layers
- ▶ Histic horizons
- ▶ Waterlogging





# Results and discussion

## The highlands



- Pedogenesis on volcanic ash deposits
- Fertile andosol-like soils





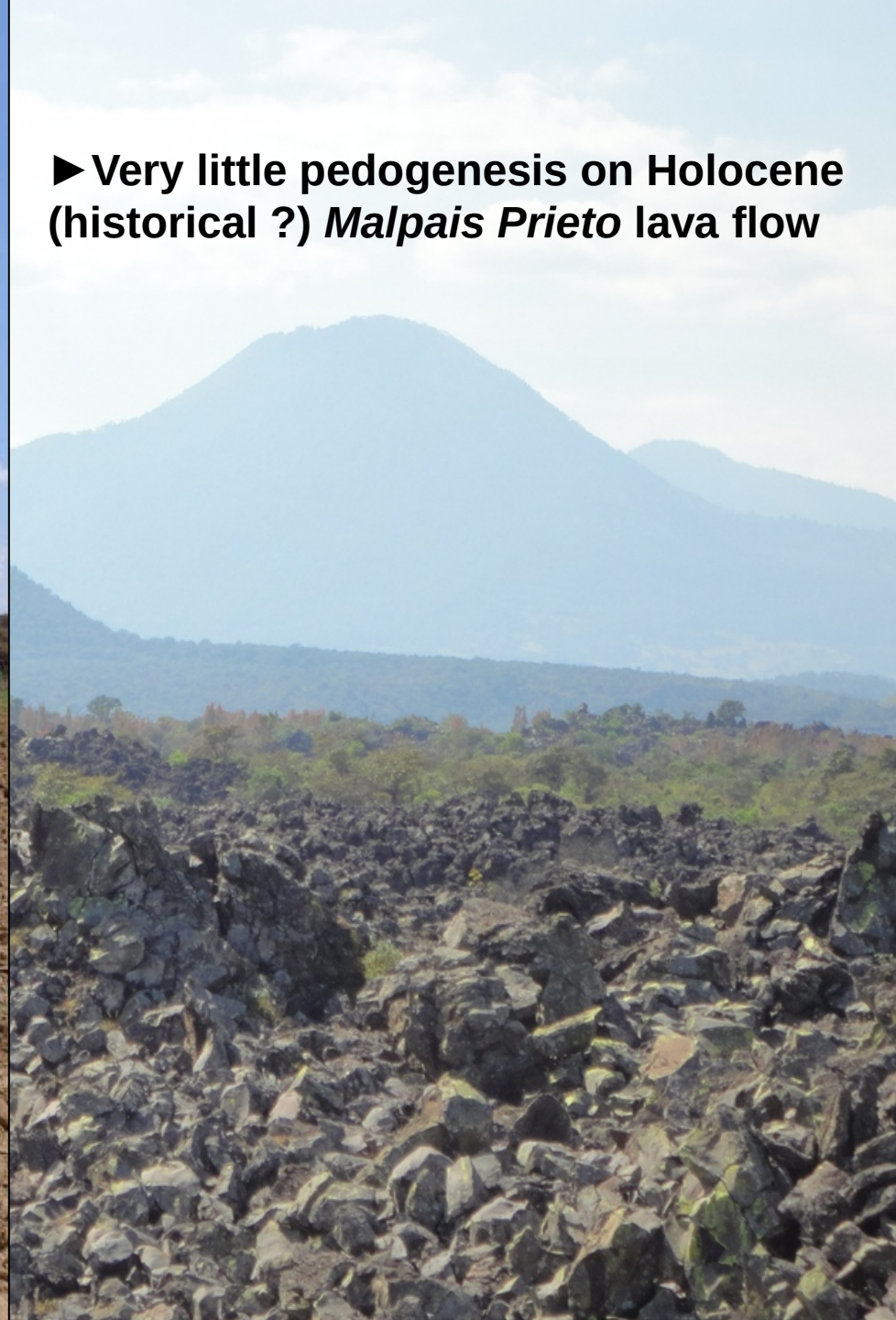
# The

## Malpaís

► Mid-Pleistocene lava flow with rock outcrops, leptosols and deep soils in between the ridges of the flow



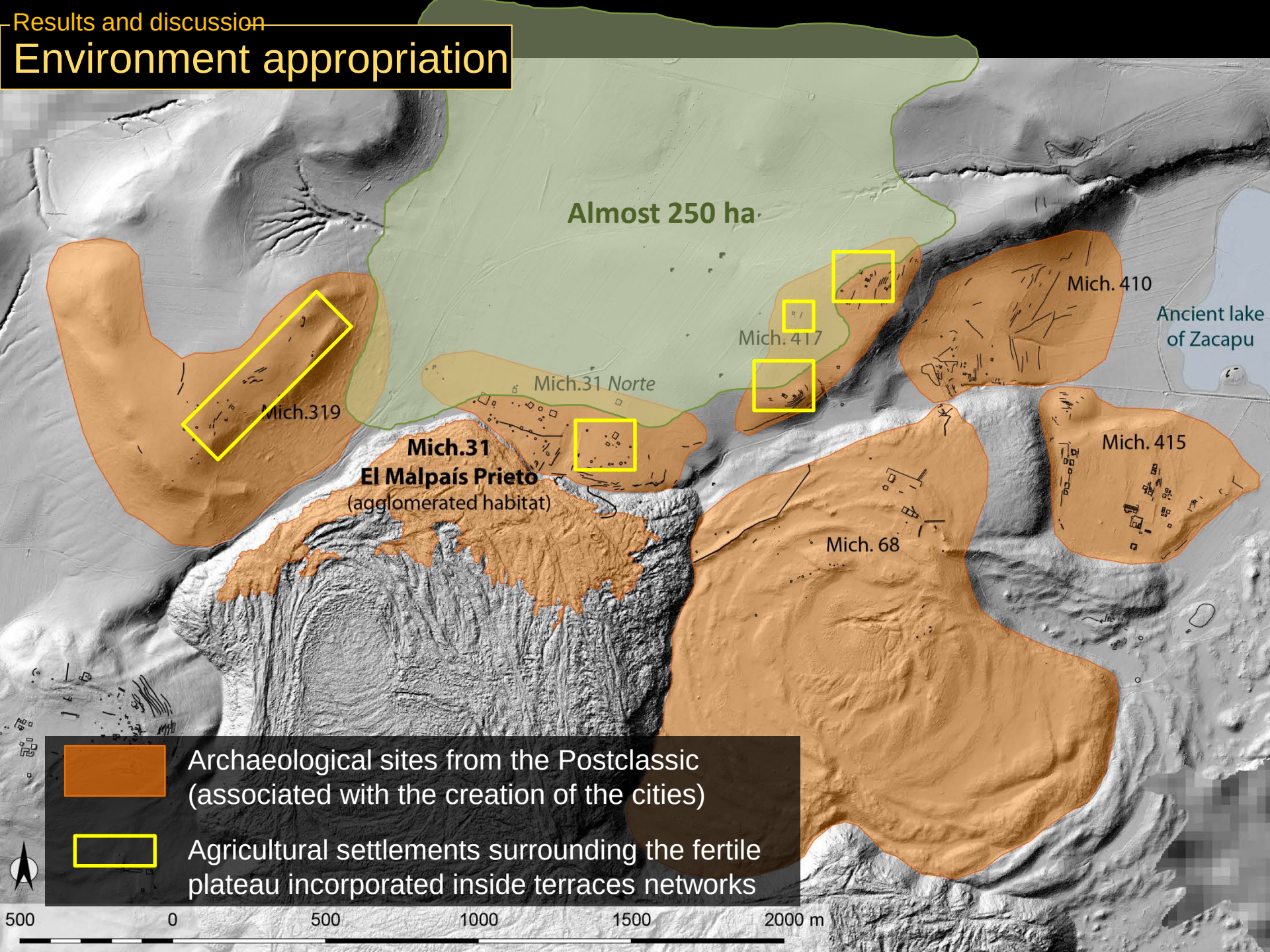
► Very little pedogenesis on Holocene (historical ?) *Malpais Prieto* lava flow





# Results and discussion

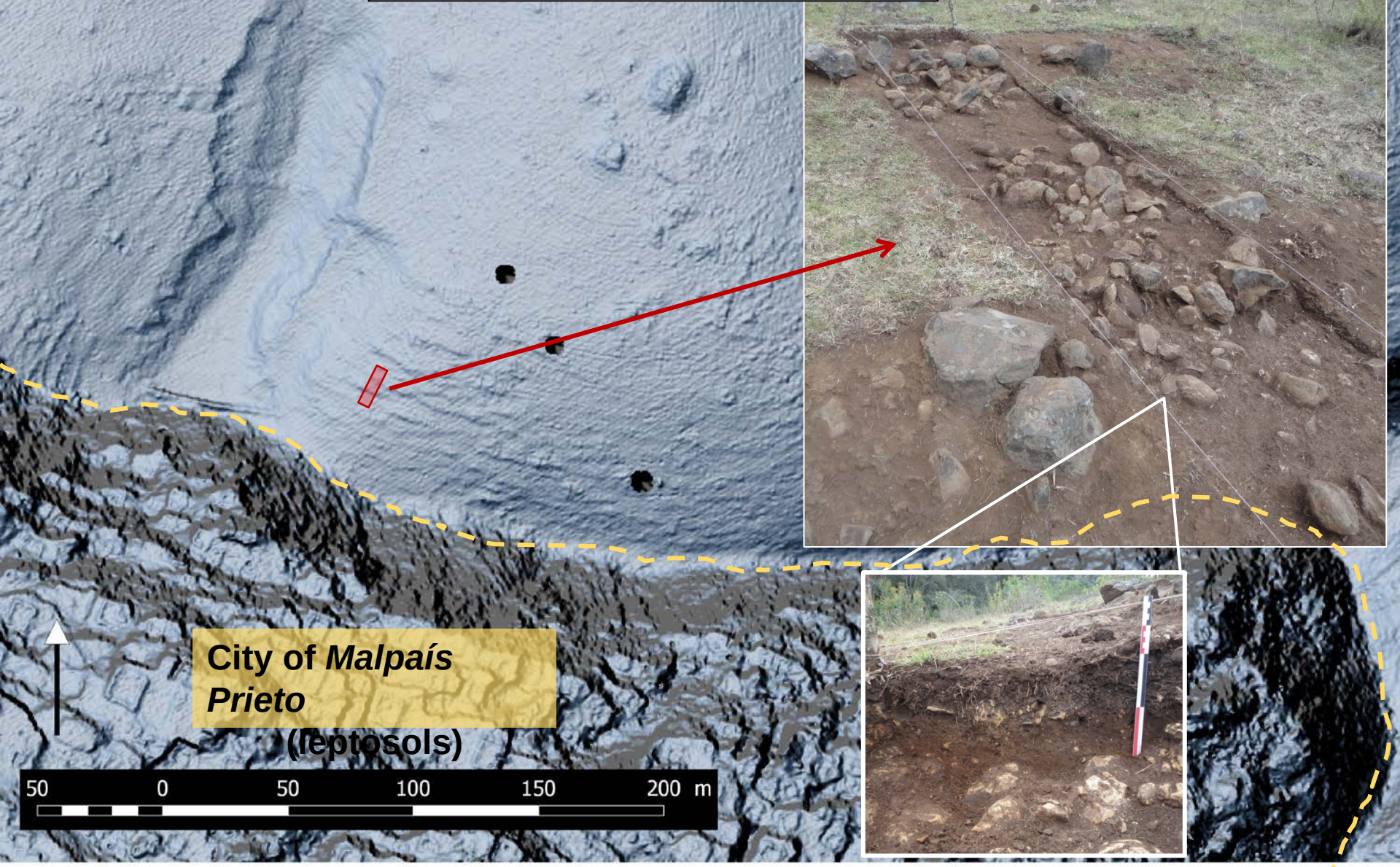
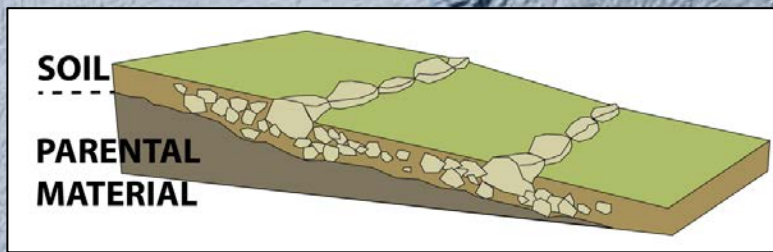
## Environment appropriation





# Results and discussion

## Contour terraces



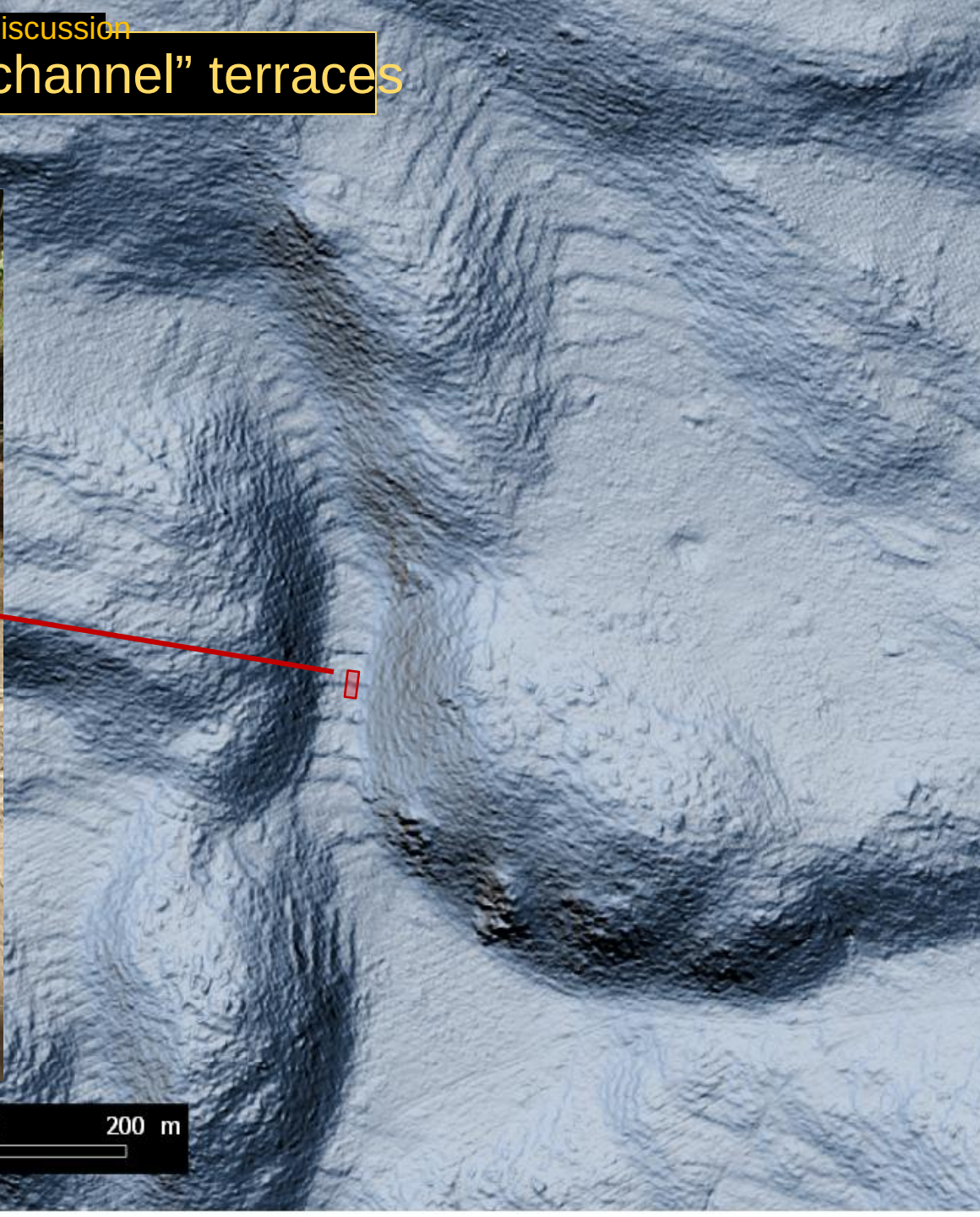
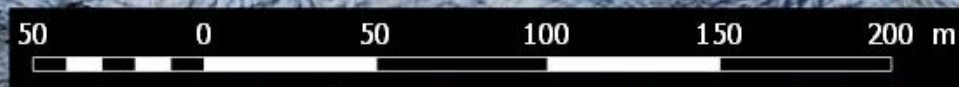
**City of Malpaís Prieto**

(leptosols)

50 0 50 100 150 200 m



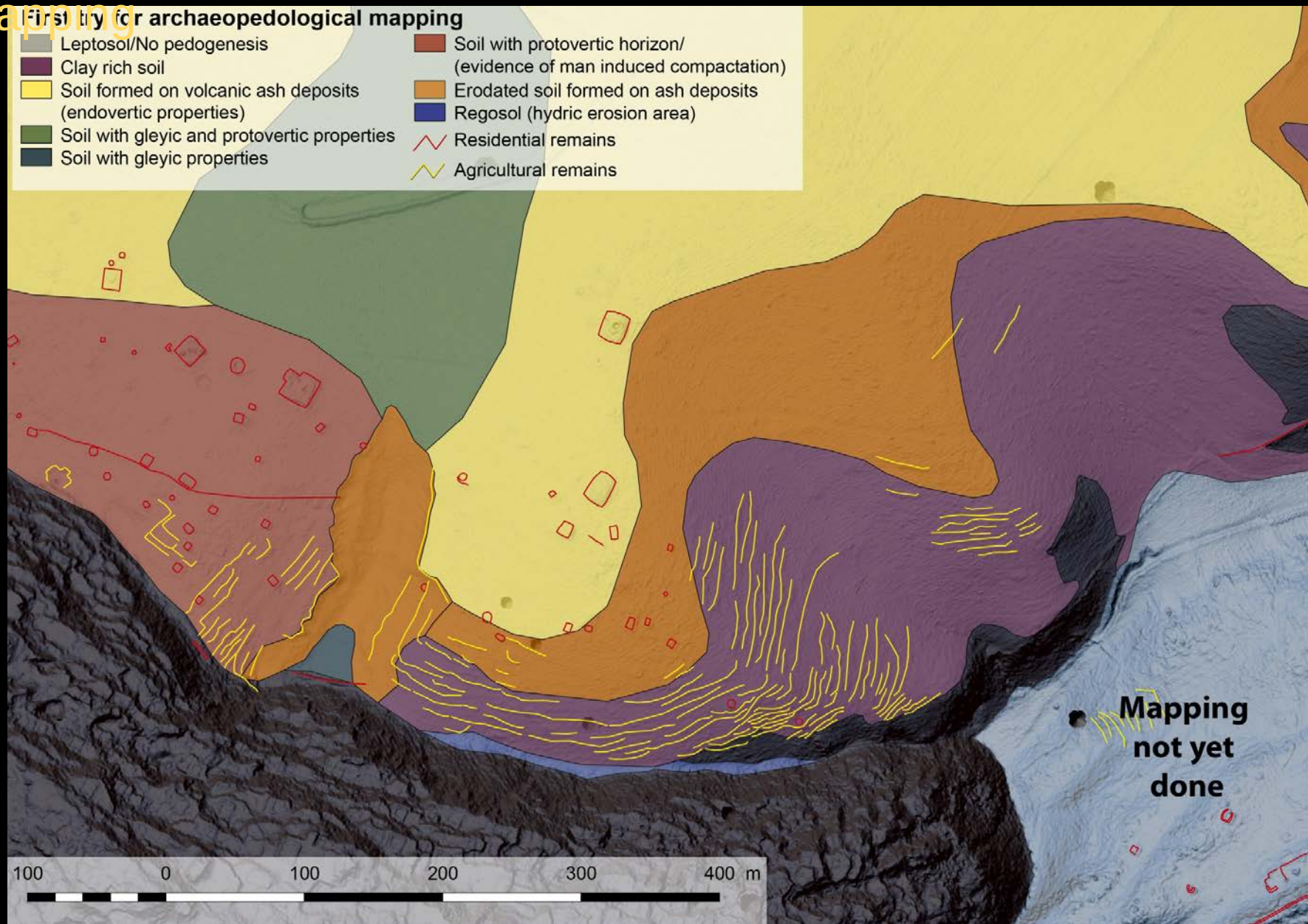
# "Cross-channel" terraces





# Archaeology : a relevant tool in soil

## mapping





# Ethnological evidence for raised

fields

Current raised fields on the shores of a vestigial part of the lake





# Plagiarizing Canned Heat : Let's work together

Thank you for your attention



*"Es esta provincia de muchos valles llanos y hermosos, y todos labrados y sembrados sin haber en ella cosa vacua."*

Contact :