

Geochemical mapping of polluted areas and environmental risk assessment of contaminated soils associated with mining activities: El Campillo, (Huelva province, Spain)

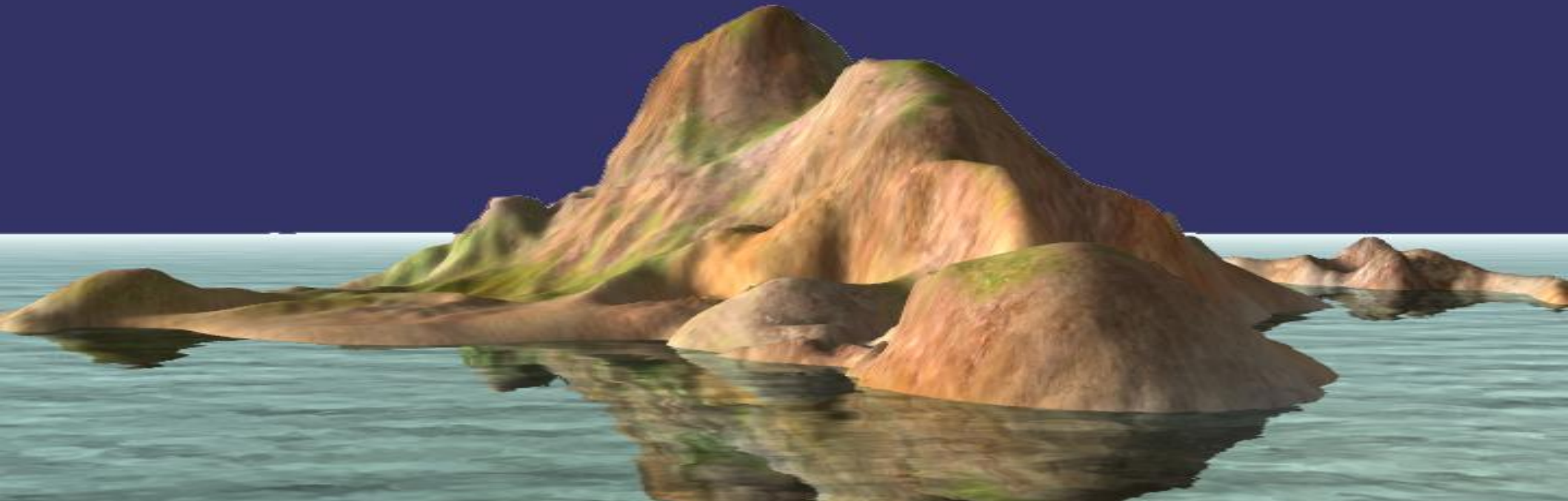
Maria Clara Zuluaga, Stefano Albanese, Benedetto De Vivo,
Jose Miguel Nieto, Robert Ayuso, Gianluca Norini



1. Introduction

Soils are affected by dispersion of pollutants as a result of their close relationship with the atmosphere, superficial process and the groundwater. The distribution and type of contamination depend closely on climate, rain, drainage, vegetation, lithology and human activities.

Geochemical mapping with Geographic Information Systems (GIS) and lead isotopic analysis are techniques that can be used for mapping and monitoring the extent of soil contamination.



2. Localization of the case study

The present work is dedicated to the environmental geochemical mapping and environmental risk evaluation in El Campillo, SW Spain; the area is located in the Rio Tinto mining district.



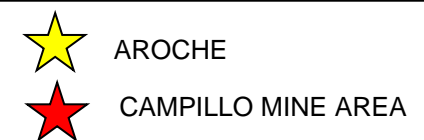
2. Geology of the case study

El Campillo Mining area: Pyritic Belt, is characterized by abundant polymetallic sulfides that have been exploited for over 5000 years.

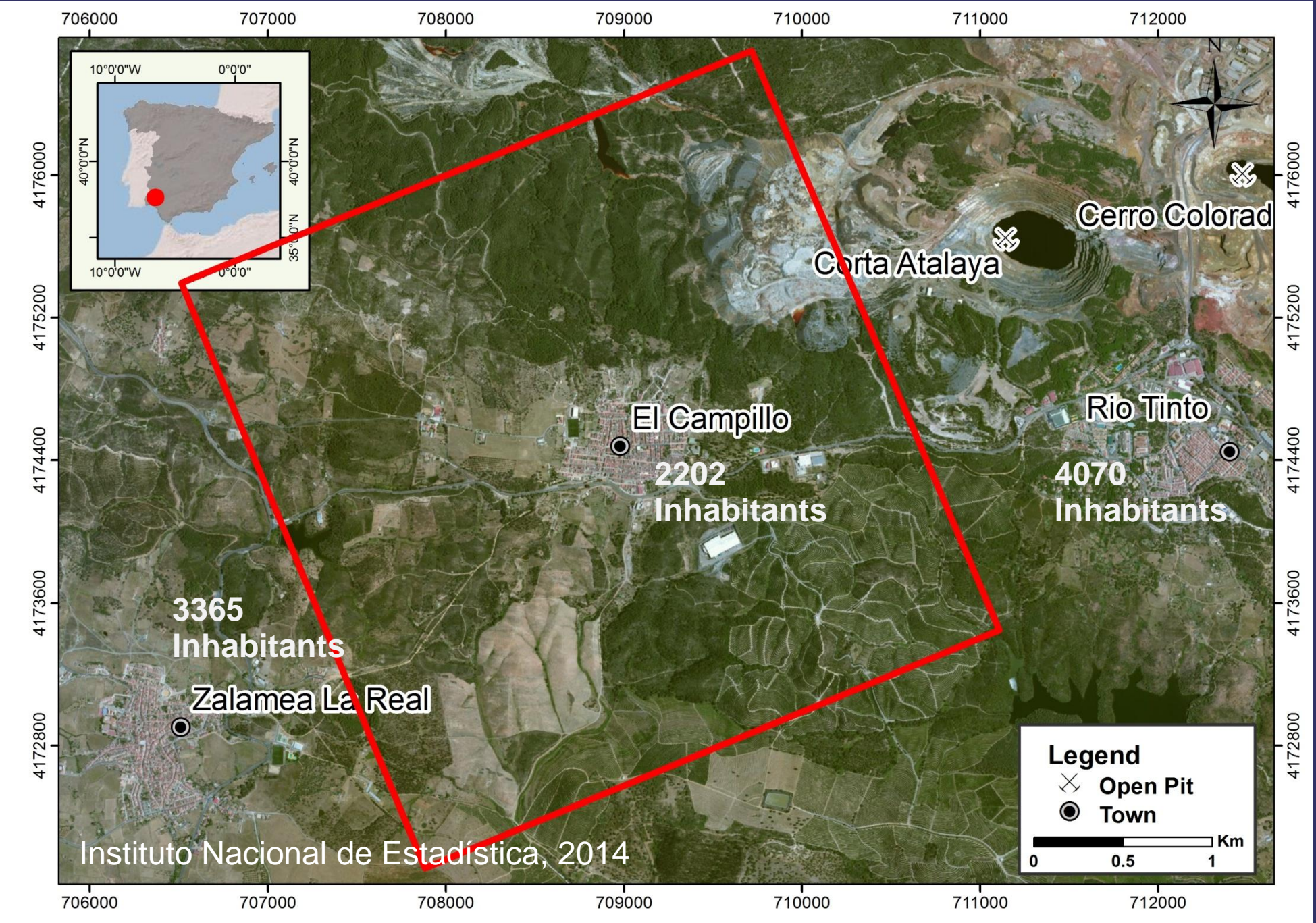
Aroche: Ossa morena zone, metamorphic rocks



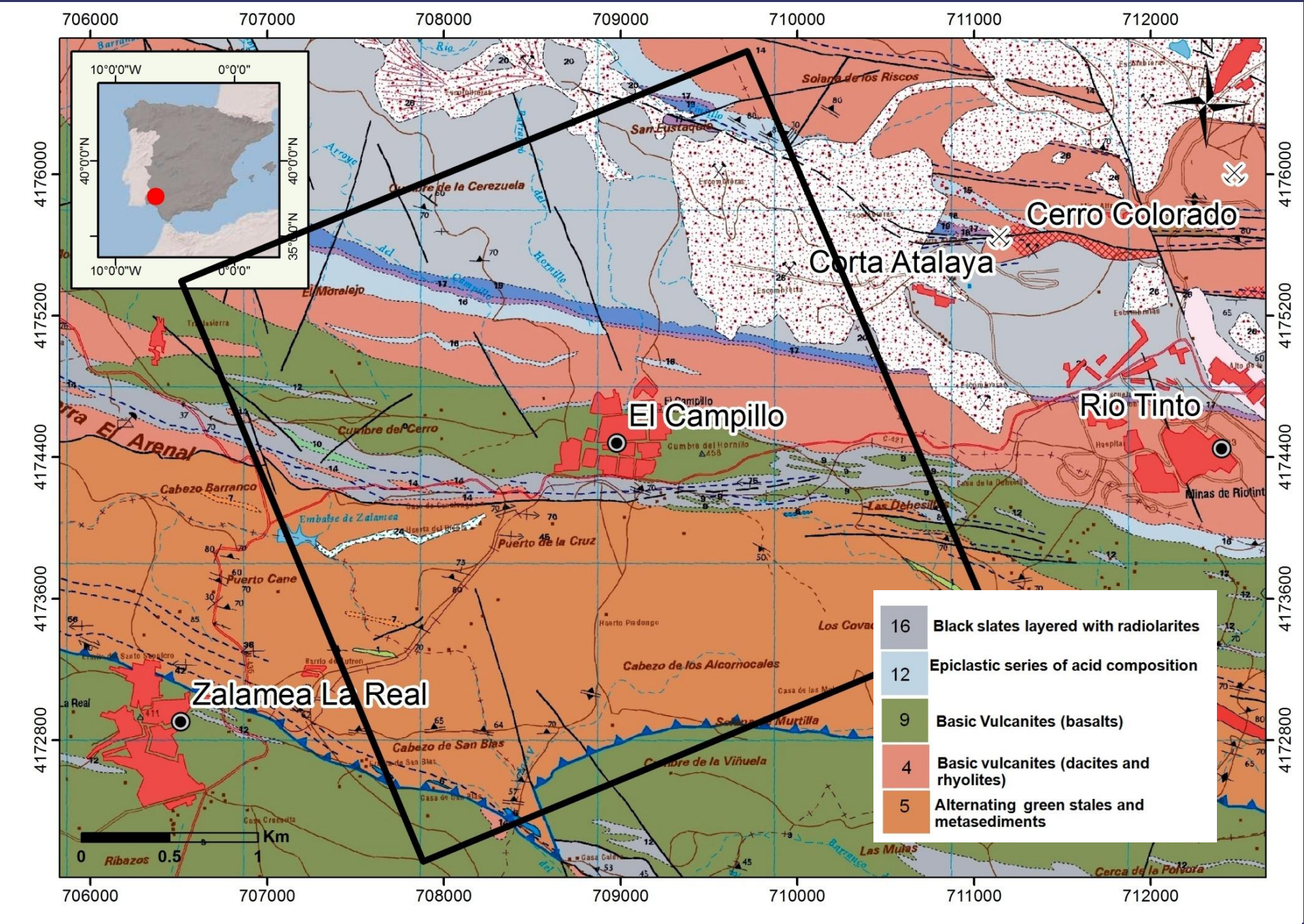
Instituto Geológico y Minero de España (2014)



2. Study area



2. Study area



3. Metodology

3.1. Soil sampling collection

3.2. Sampling preparation

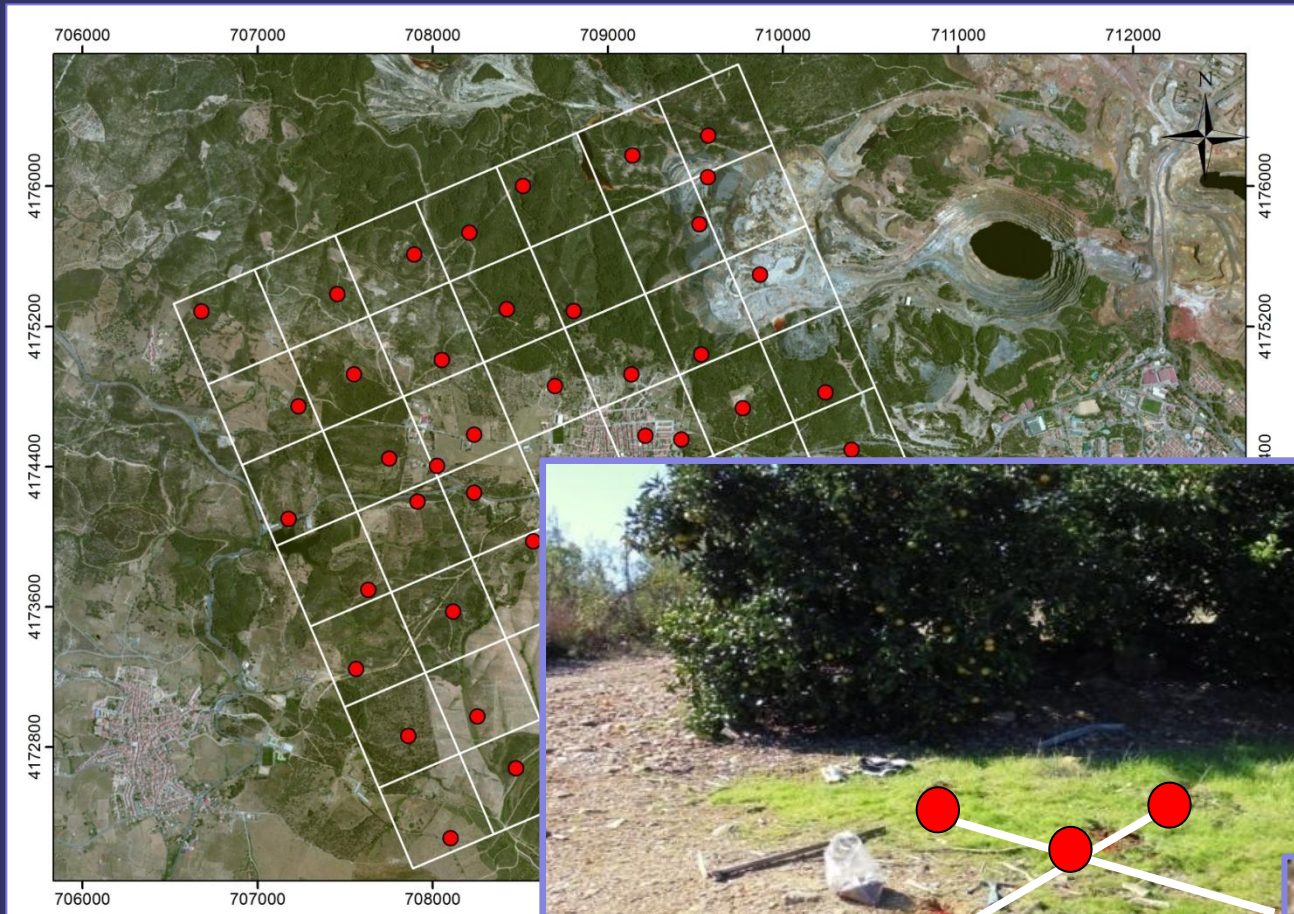
3.3. Statistical analysis (baseline definition)

3.4. Geochemical cartography

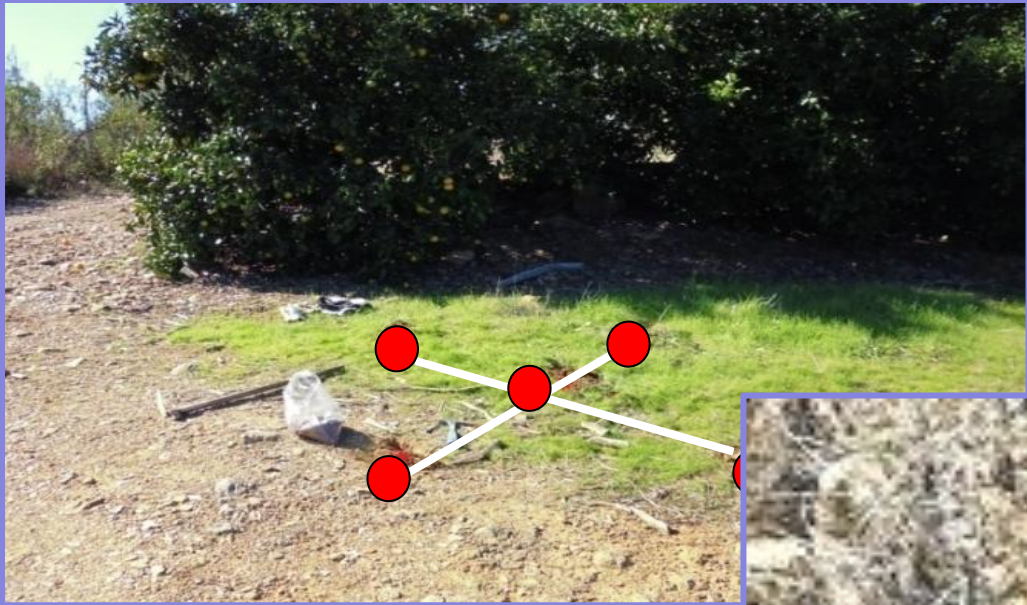
3.5. Hair sampling

3.6. Pb isotopic analysis

3. Soil sampling



Samples 52
Grid = 0.5x0.5 km



**(Foregs et al,
1998)**



Top Soil (first 25 cm)

3.2. Sampling preparation and ICP-MS analysis

Start with batch of soil samples from in situ sampling

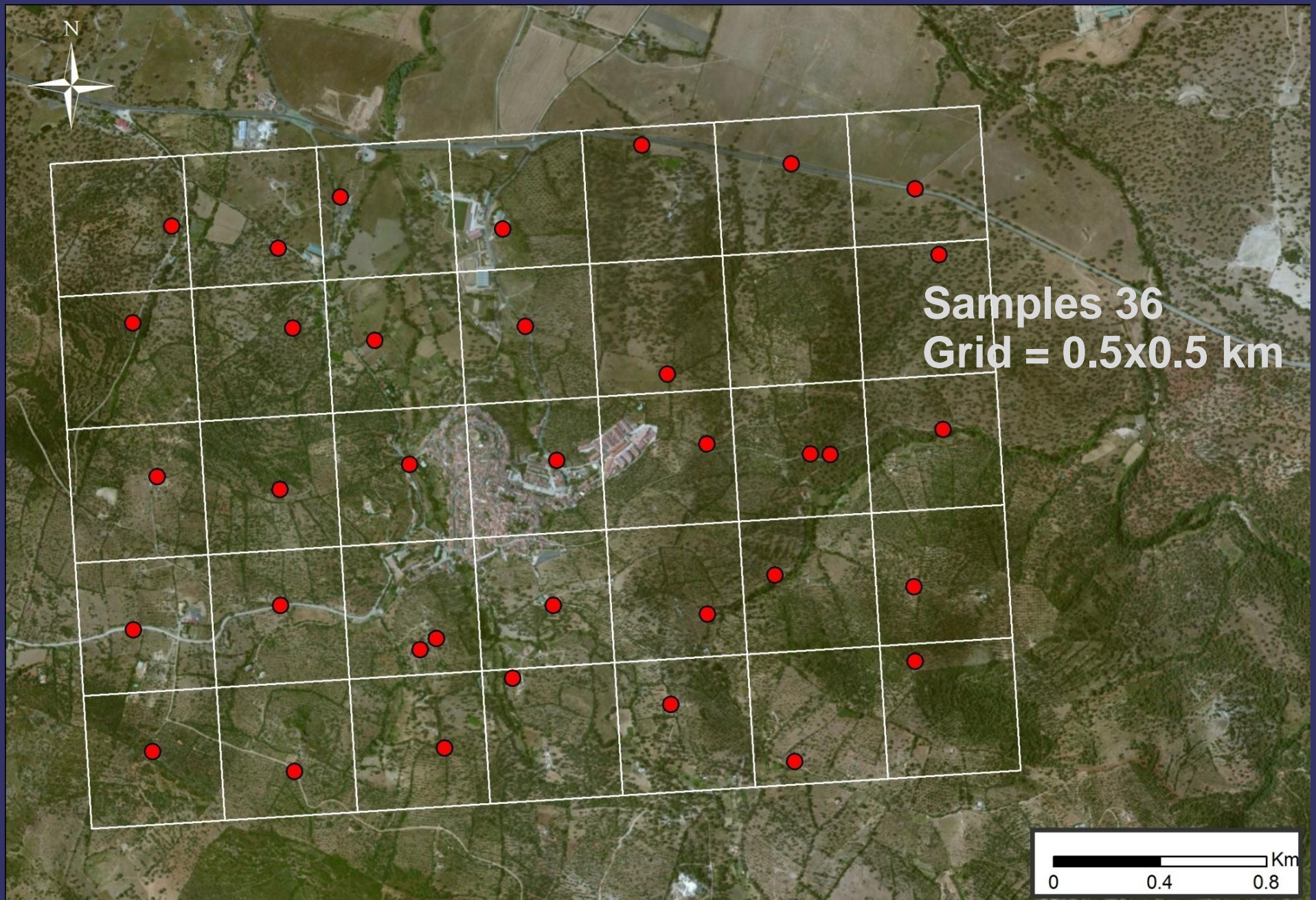
Drying at room temperature

Sieving through 2 mm sieve

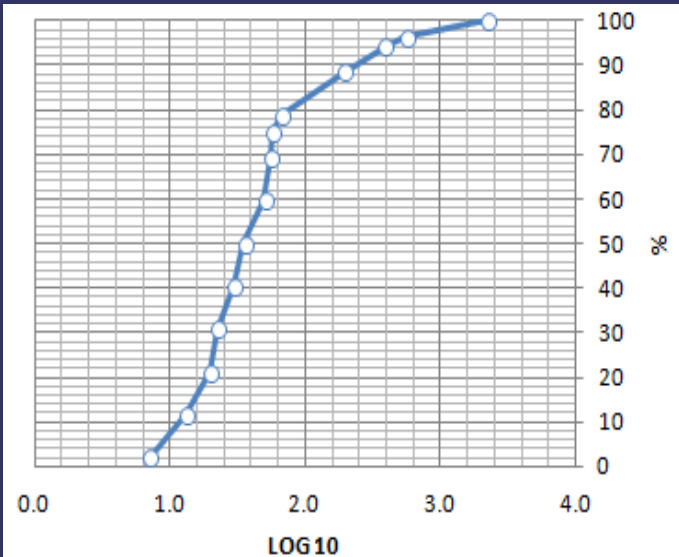
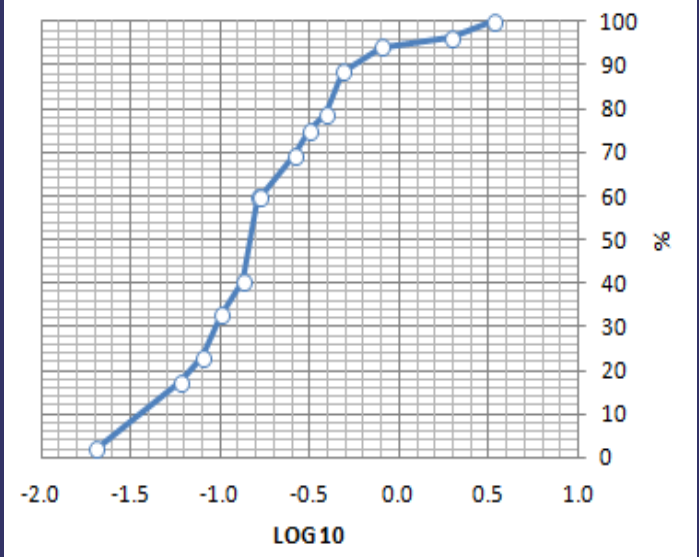
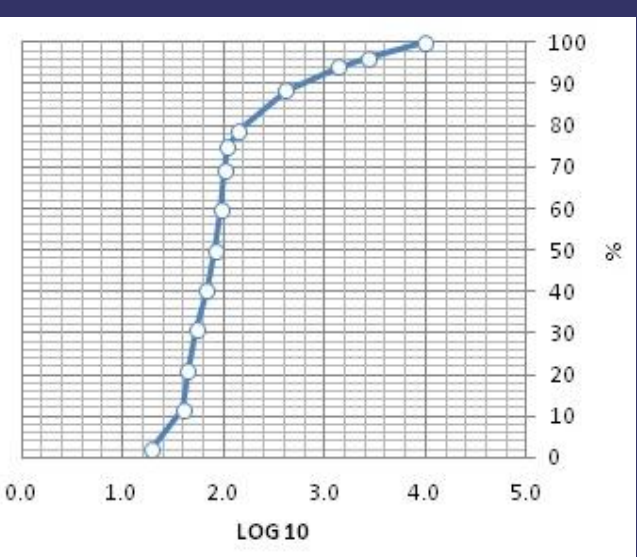
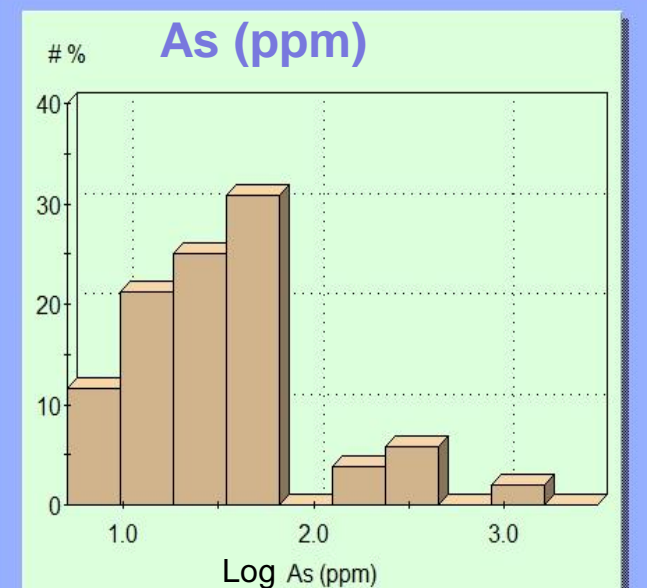
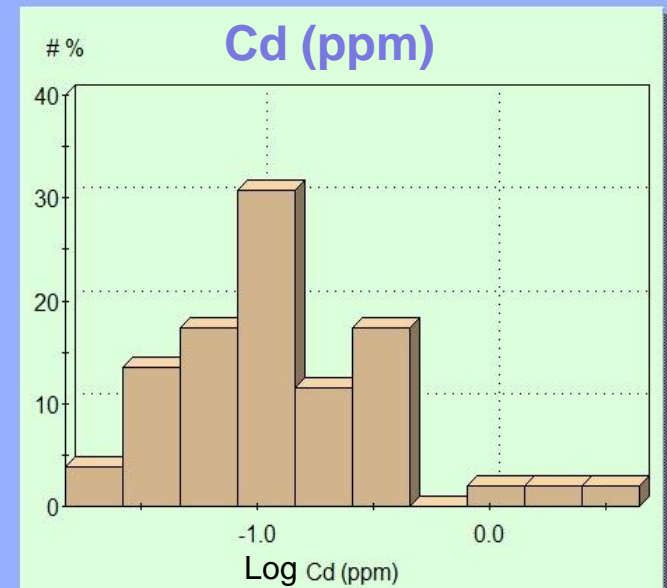
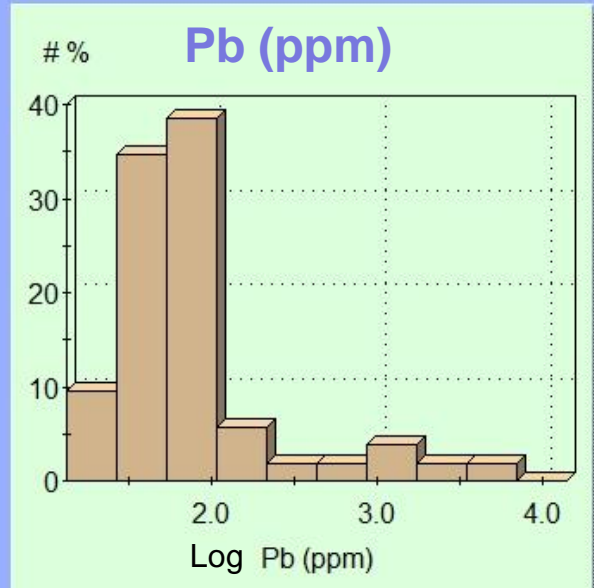
Sieving through 0.150 mm sieve



3.2. Sampling Grid: Aroche (Used for Reference Values)

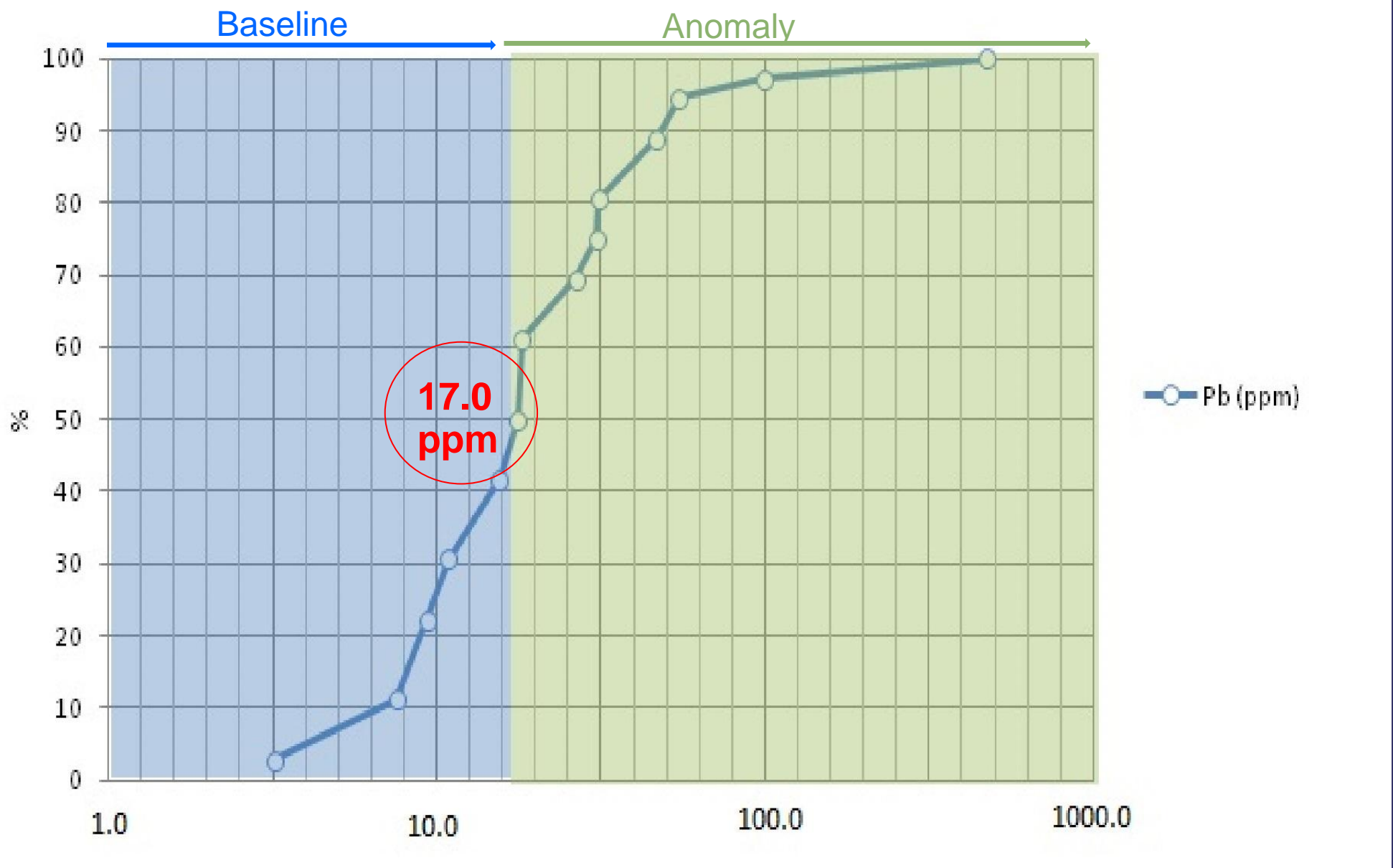


3.3. Statistical Analysis (Baseline definition) El Campillo



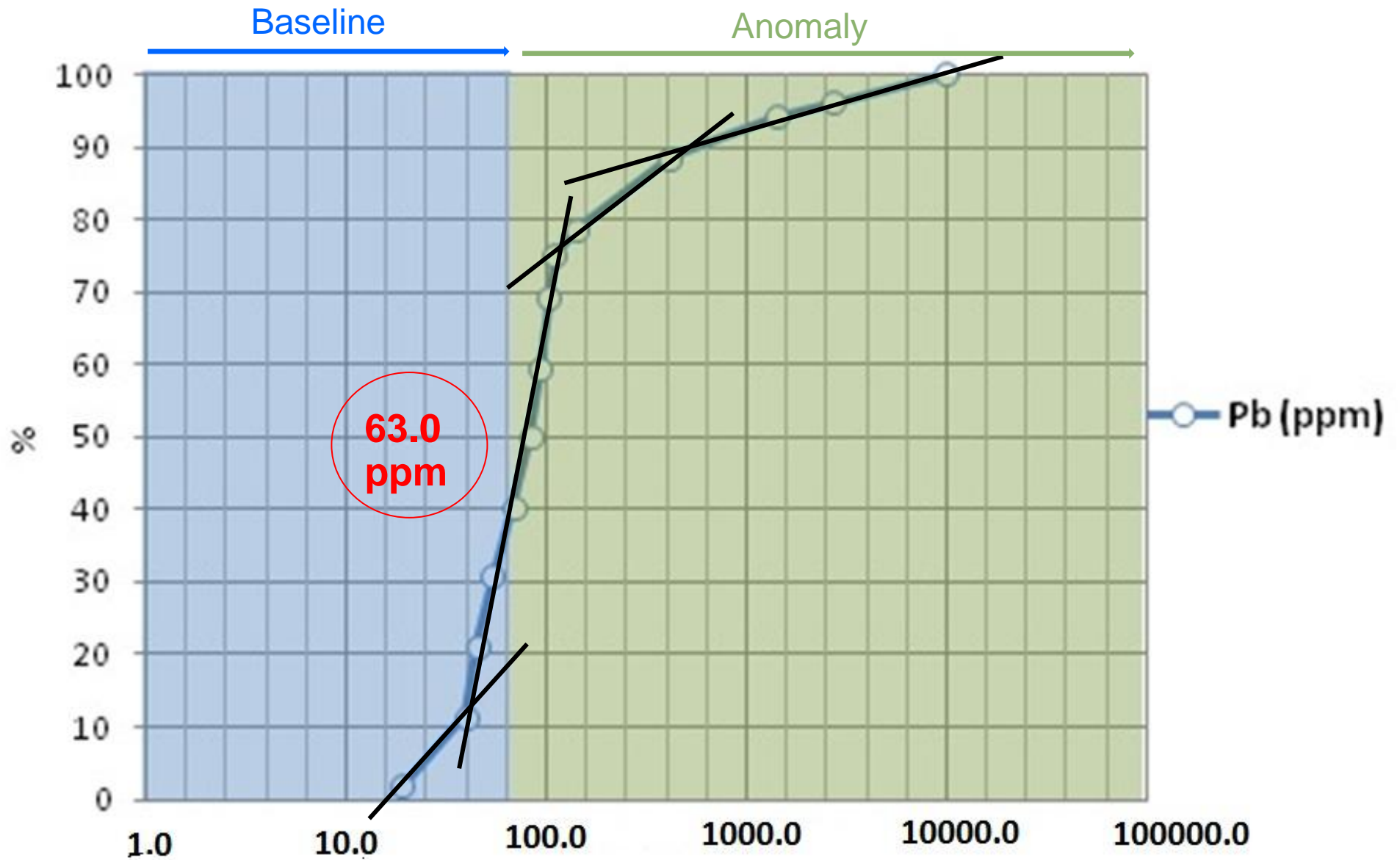
3.3. Statistical Analysis (Baseline definition) Aroche

Cumulative Frequency Curve

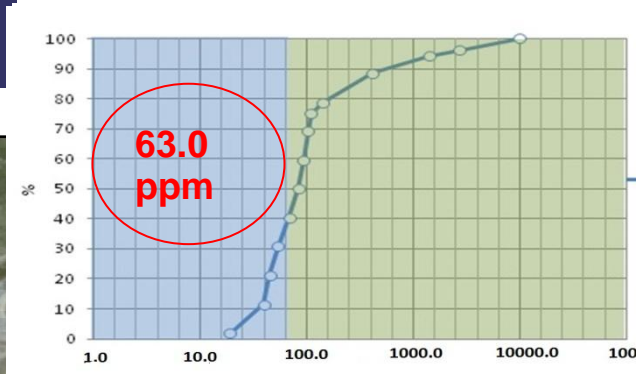
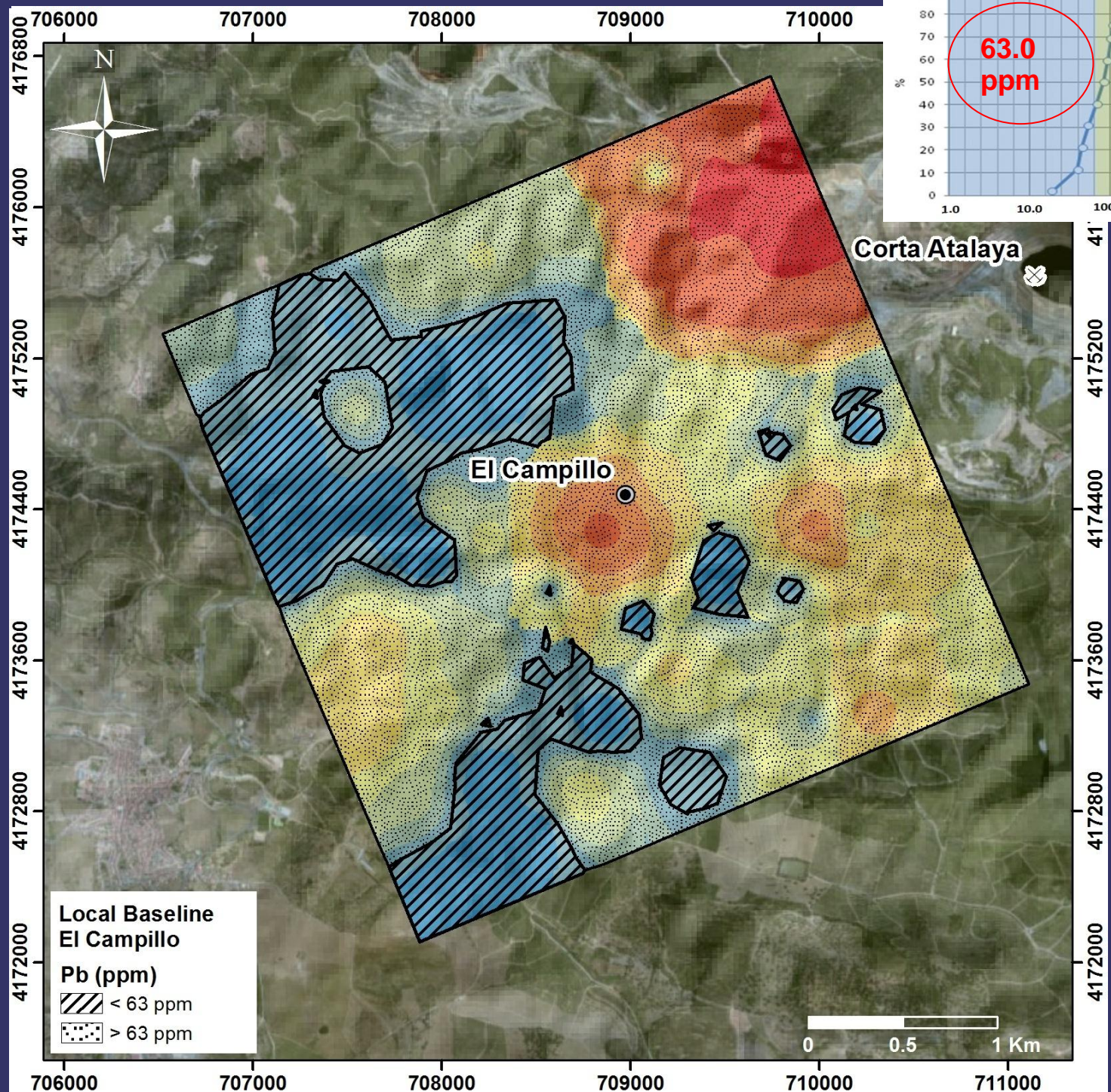


3.3. Statistical Analysis (Baseline definition) El Campillo

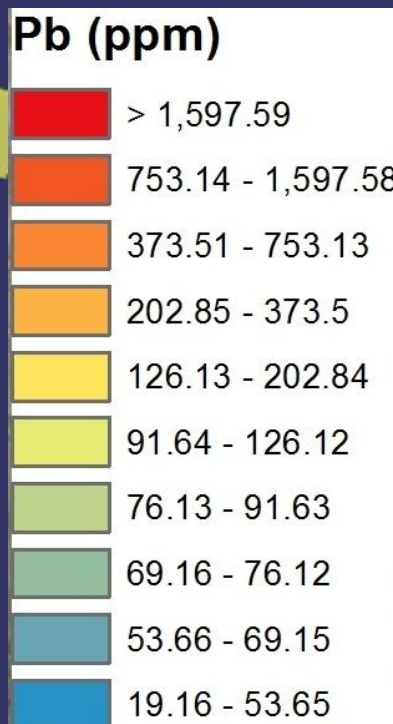
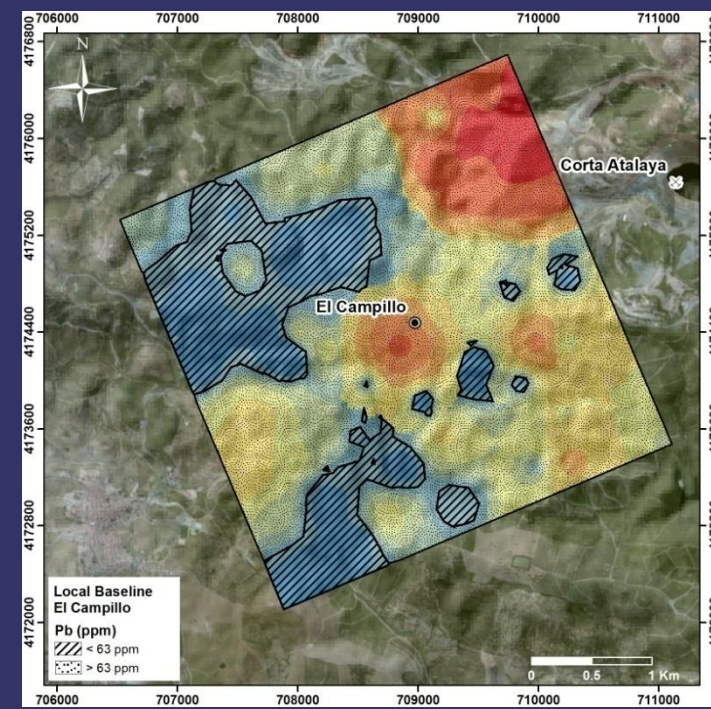
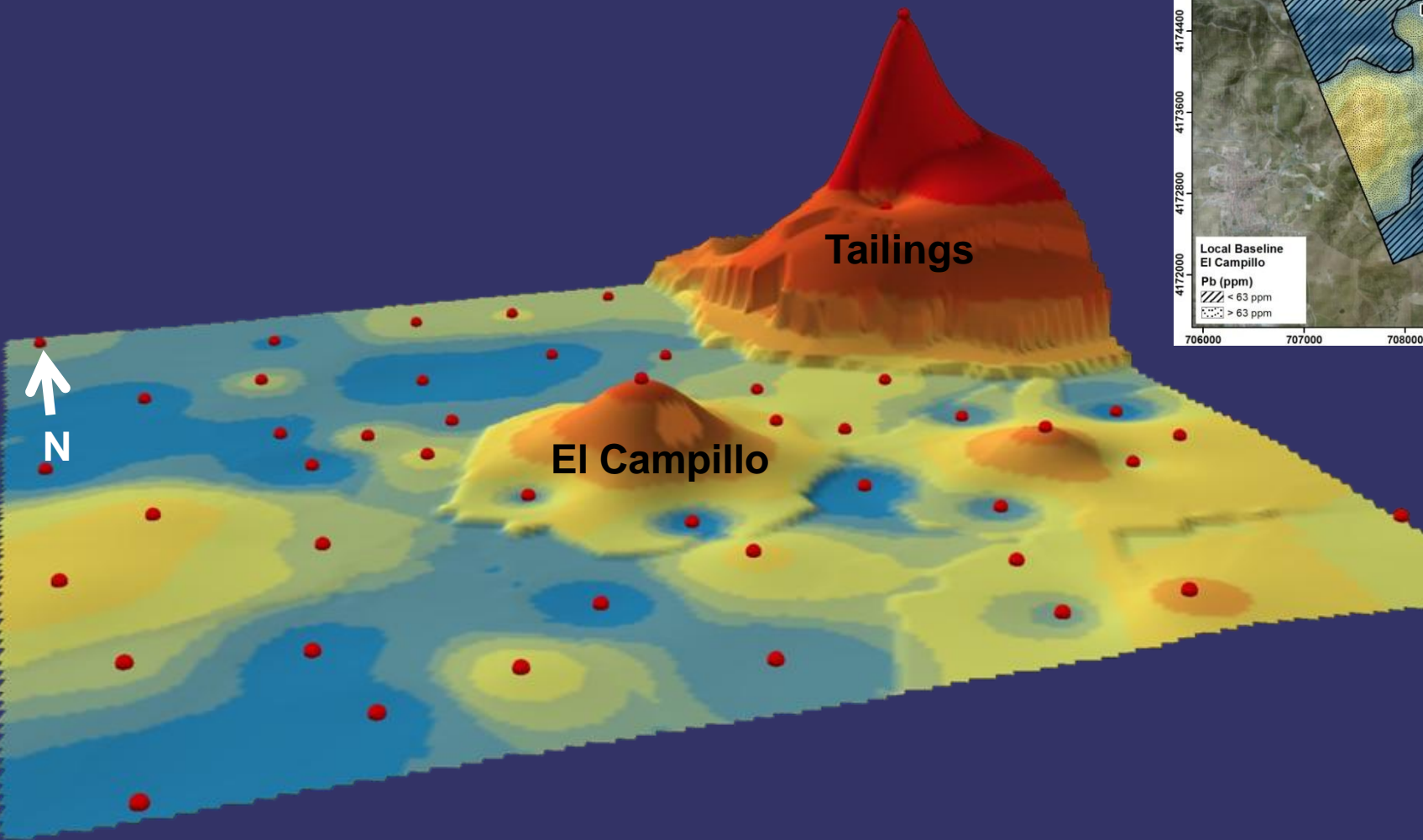
Cumulative Frequency Curve



3.4. Geochemical cartography:

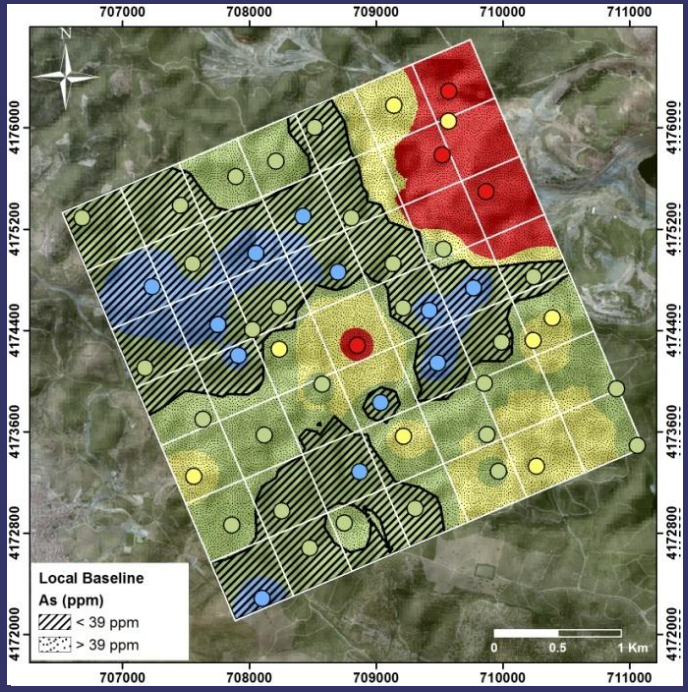


3.4. Geochemical cartography

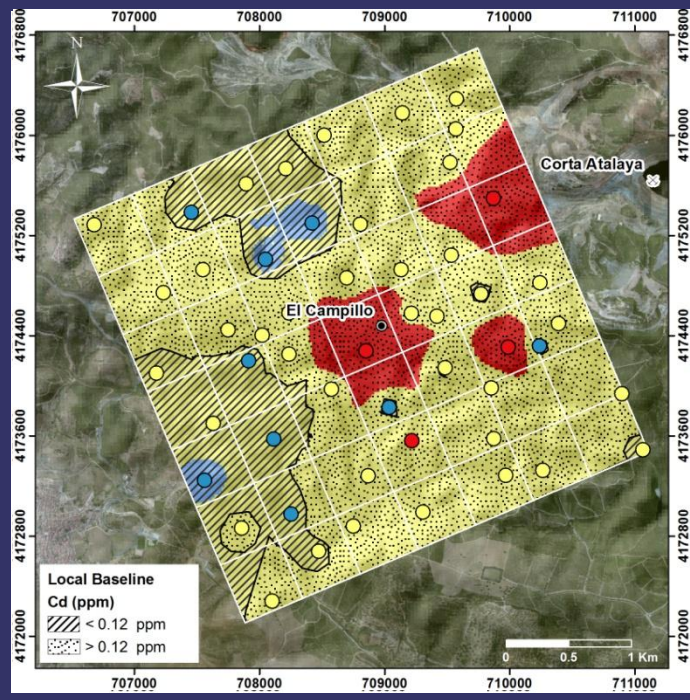


3.4. Geochemical cartography

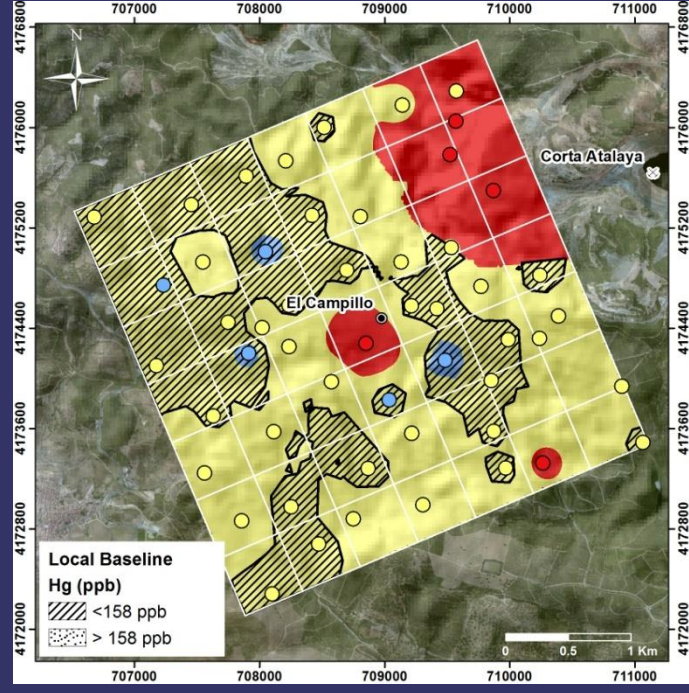
As (ppm)



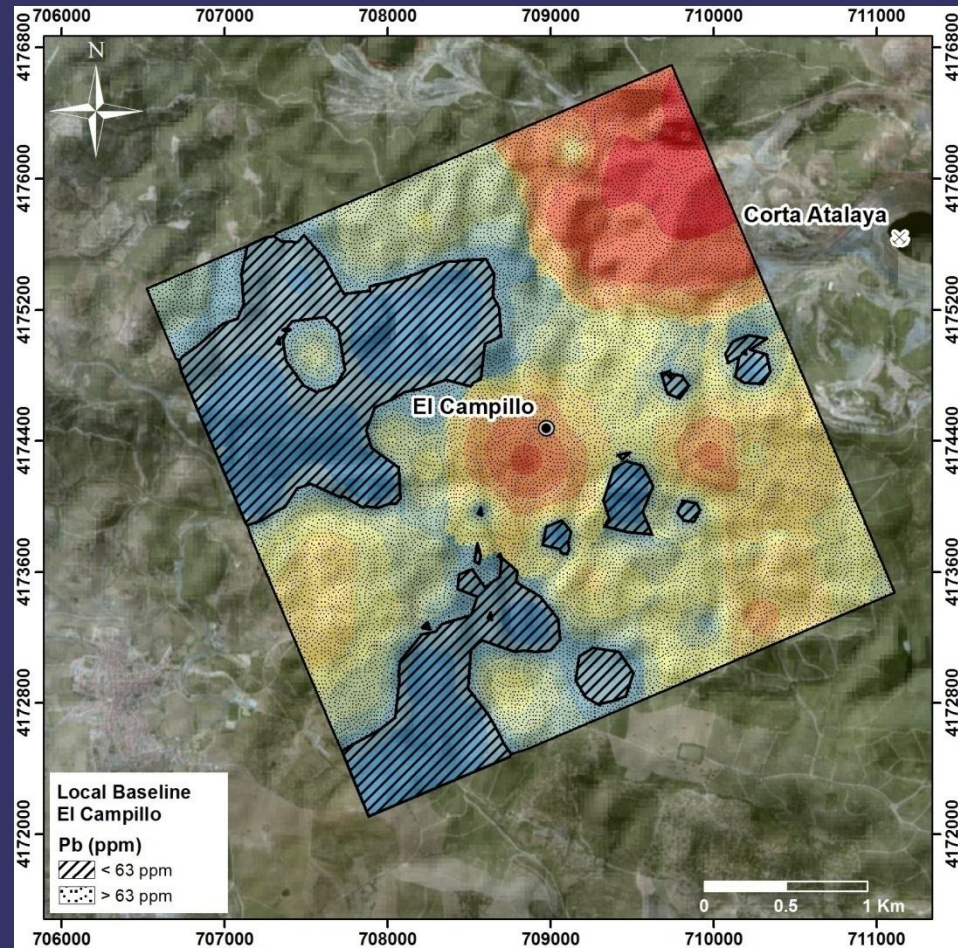
Cd (ppm)



Hg (ppb)

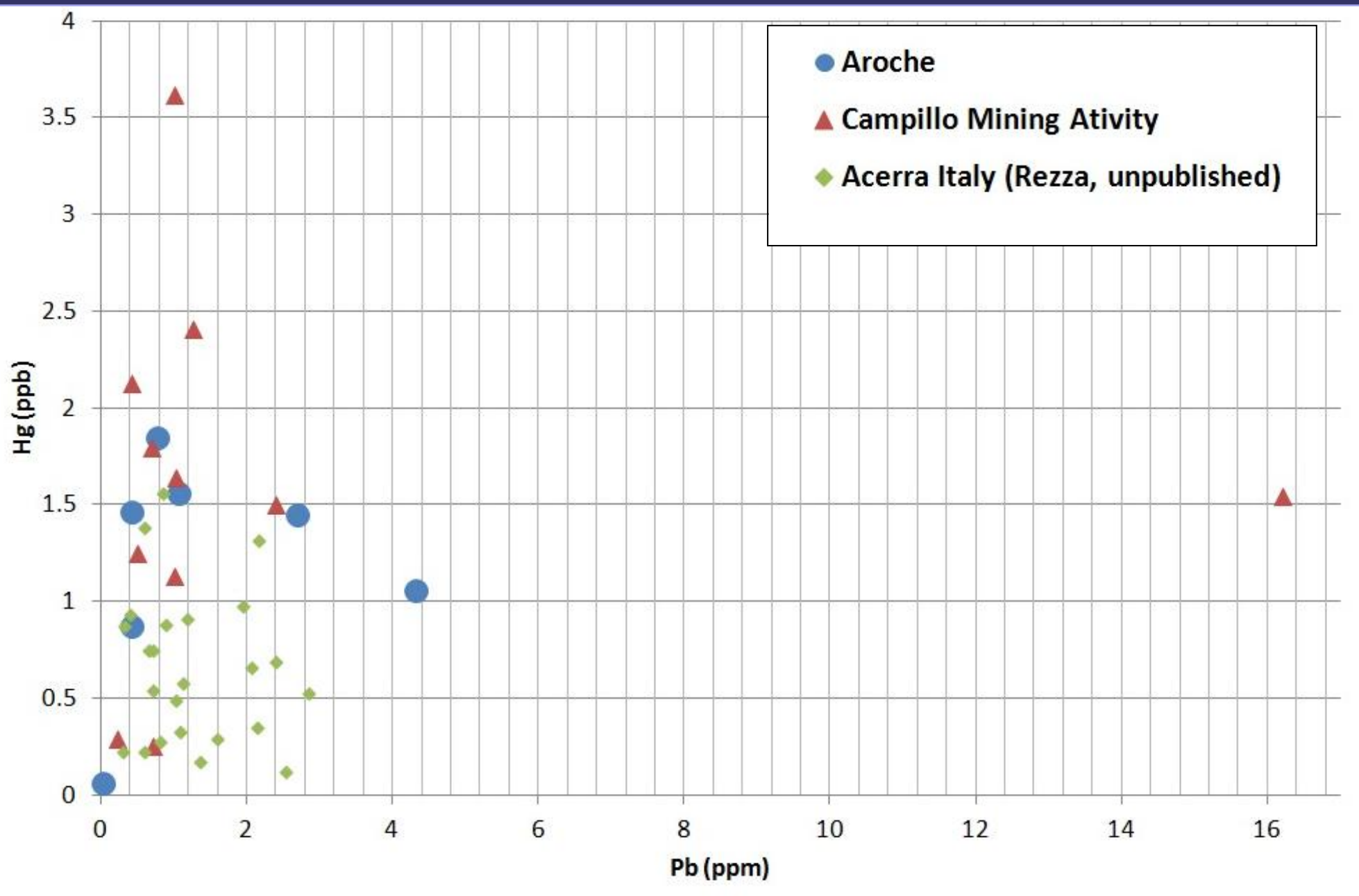


3.5. Hair Sampling



3.5 Hair samples, statistical analysis

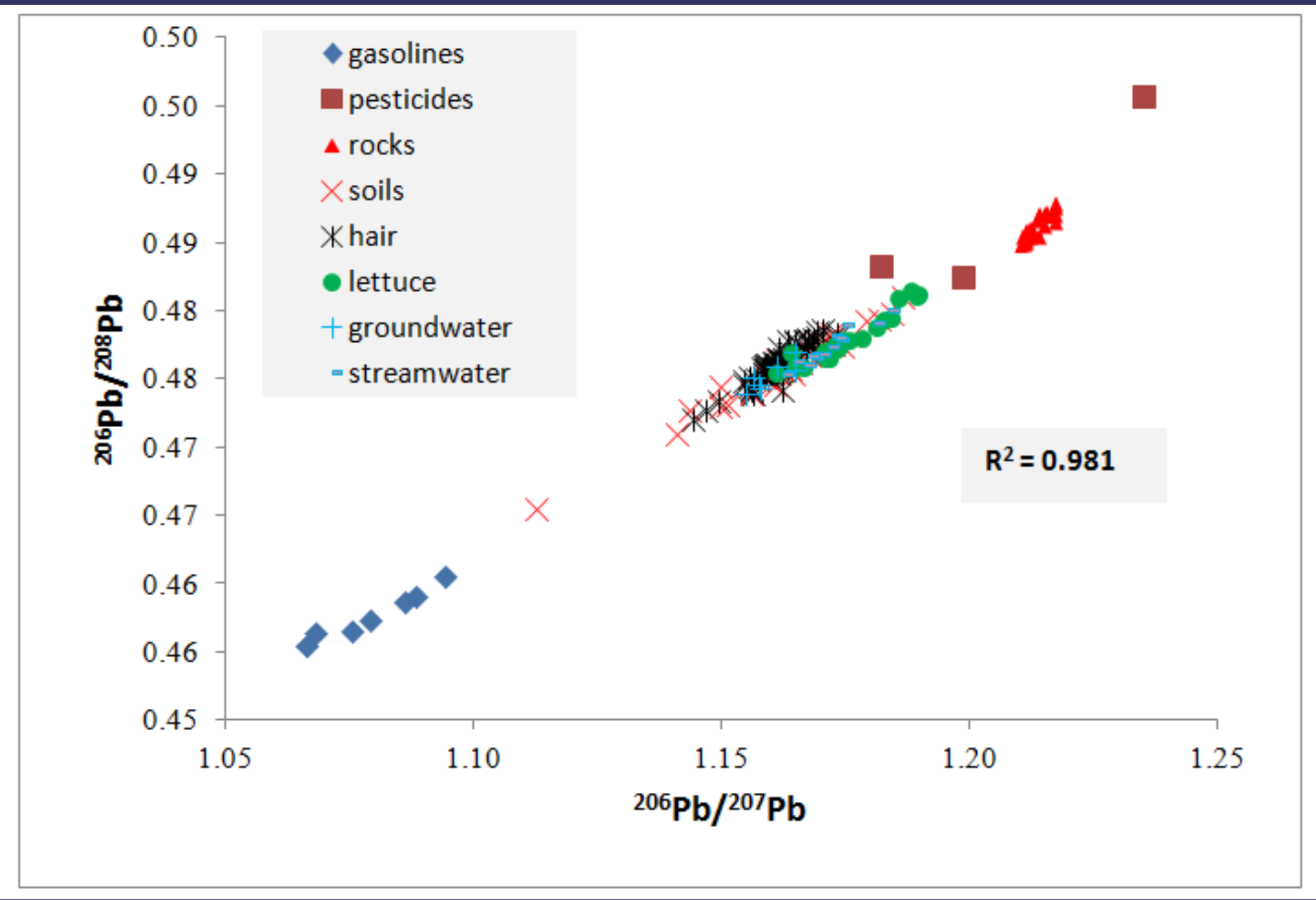
ICP-MS analysis, Mercury (ppb) vs Lead ppm)



3.6. Lead isotopical Analysis



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Cicchella et al, in stampa J. Env. Geochem, & Health.)

Next steps

Baseline Aroche vs. baseline El Campillo

Recognize different contamination sources in the soil and food chain

Risk analysis using fractal interpolation and isotopic signatures



A man wearing a light-colored long-sleeved shirt, light-colored trousers, and a flat cap is riding a brown donkey. The donkey is carrying a large, light-colored sack on its back. They are on a dirt path in a rural, hilly area with sparse vegetation and a fence in the background. A red car is visible in the distance. The text "Gracias!!!!!" is overlaid in yellow on the right side of the image.

Gracias!!!!!