HARMONIOUS
uas for environmental monitoring

HARMONIOUS

UAS Techniques for Environmental Monitoring

Nunzio ROMANO – Valencia (Spain) – 15/02/2018

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Funded by the Horizon 2020 Framework Programme
of the European Union

Use of UAV and 3D flow model for evaluating the effectiveness to remediate contaminated sites

A. Capolupo, P. Nasta, M. Palladino, E. Cervelli, L. Boccia, N. Romano
University of Napoli Federico II, Napoli, Italy

The Problem

Unfortunately, a great concern is now floating around this SIN area because of the alarm arose around the problem of the "waste emergency" (Terra dei Fuochi).

Dangerous pollutants such as dioxins, are found in the area, particularly around Acerra. High levels of polychlorinated biphenyls (PCBs) were detected.

The illegal burning of waste, for example to recover copper from wiring, is known to release dioxins into the atmosphere.

The Site of National Interest (SIN) "Litorale Domizio Flegreo Agro Aversano" is a large part of the Campania Region Plain, which is made up by a NW–SE elongated structural depression crossed by the Volturno River, bounded to the north-east by the Southern Apennines chain and to the southwest by the Tyrrhenian Sea.

This is a very significant environmental and landscape area, where tourism and agriculture of great value are combined, and coexist with successful industrial activities (agricultural and food, textile, leather tanning industry).

Major Motivations

The entire community is aware that soil is a critically important component of the earth's biosphere, not only because of its food production function, but also as the safe-keeper of local, regional, and global environmental quality.

Soil restoration by conventional techniques (excavation-land filling, soil washing) leads to a strong reduction of soil fertility because of their toxicity and prevents soil to keep its ecological functions.

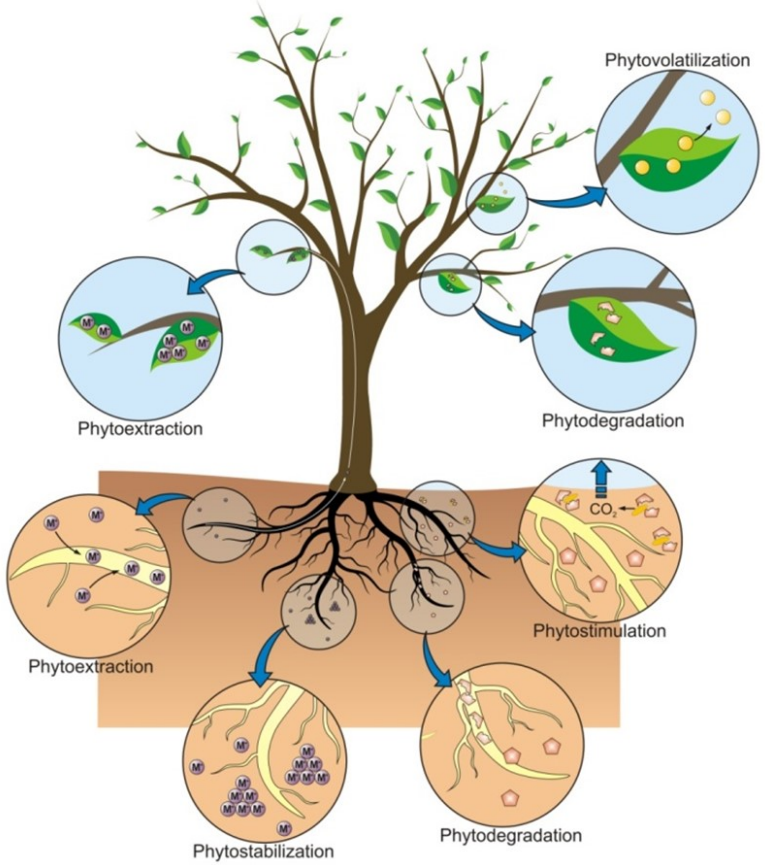
In most cases, using these techniques the remediated soils are not suitable for agriculture, and consequently land becomes devoted to residential buildings, shopping malls, and industrial estates.

Instead, there is a consistent need for environmentally sound soil restoration techniques that enable to both break down harmful compounds and to retain all of the soil properties necessary to allow the growth of crops.

Using biotic elements to clean up contaminated soils seems a logical solution with respect to chemical and mechanical reduction that are, in itself, a further upsetting of the balance of the soil system.

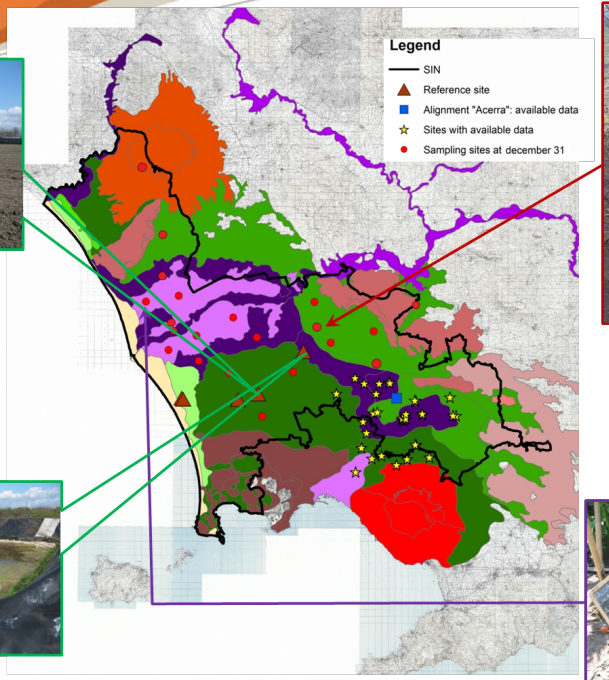
The Solution

To "**keep soils alive**", it is necessary to employ methods that can improve its activity and physiology based on the use of natural and eco-compatible treatments.



This is the essence of the EU-Life+ project "**ECOREMED:** ***Implementation of eco-compatible protocols for agricultural soil remediation in Litorale domizio-Agro aversano NIPS***".

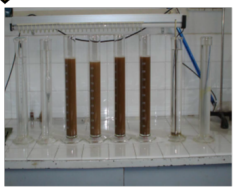
Soil Hydraulic Characterization



Validation

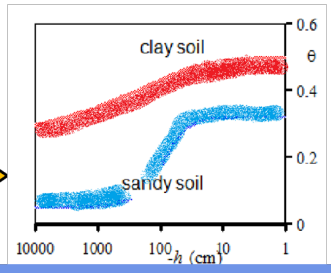
Disturbed and undisturbed soil samples are collected at two depths in the units of the Land System Map available for the SIN area. Measured soil physical and hydraulic variables are: oven-dry bulk density, texture, organic carbon, θ_{sat}, K_{sat}, water retention and hydraulic conductivity functions.

To make the soil hydrologic characterization feasible, various pedo-transfer functions (PTFs) are employed.
PTFs are then verified and calibrated using measured soil hydraulic properties obtained in the laboratory through the evaporation method on the undisturbed soil cores



texture, ρ_b, OM, etc.

PTF



cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Trentola test site

Trentola test site

BEFORE: Nov. 2012

June/August 2013

SVILUPPO DI PROTOCOLLI ECO-COMPA
PER LA BONIFICA DEI SUOLI INQUINA
NEL SIN LITORALE DOMIZIO-AGRO AVI

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

HARMONIOUS
UAS for environmental monitoring

PROGETTO LIFE11 ENV/IT/275

ECOREMED

AFTER: March 2014

IMPLEMENTATION OF ECO-COMPATIBLE PROTOCOLS
FOR AGRICULTURAL SOIL REMEDIATION
IN LITORALE DOMIZIO-AGRO AVERSANO NIPS

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

HARMONIOUS
UAS for environmental monitoring

PROGETTO LIFE11 ENV/IT/275

ECOREMED

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

HARMONIOUS
UAS for environmental monitoring

Monitoring devices at Trentola

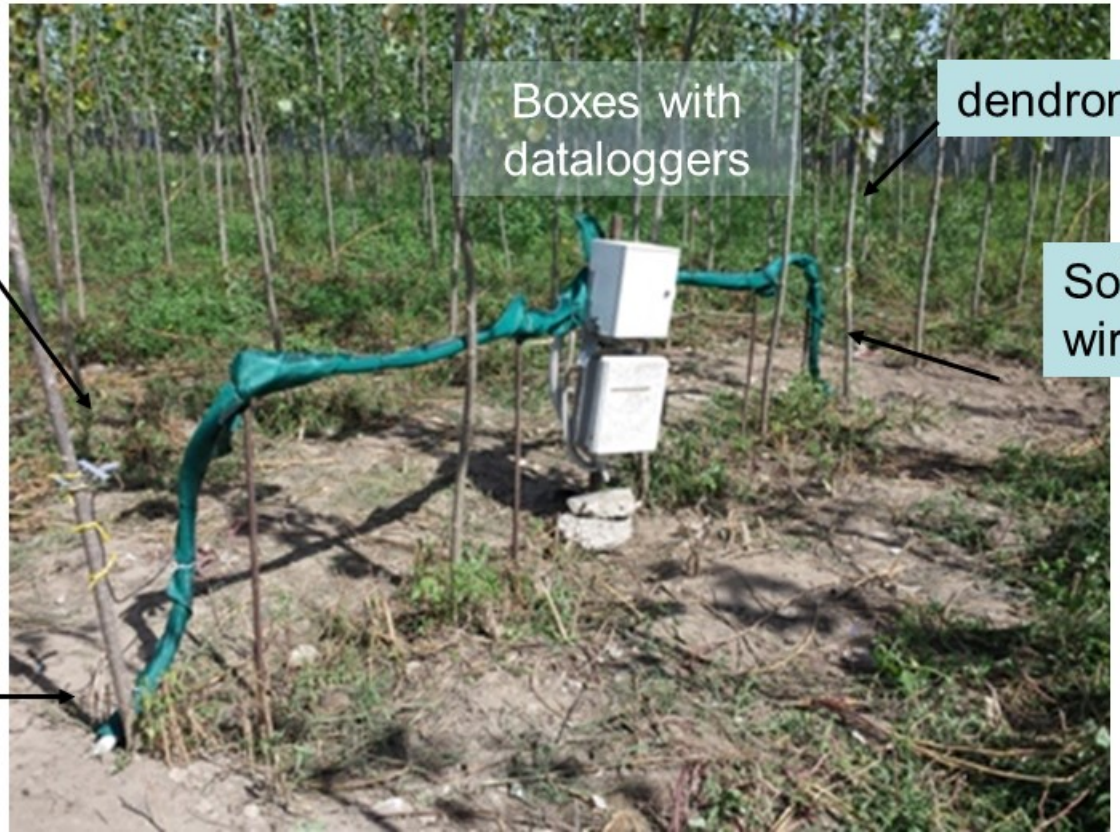
Azione C6: Probes for soil moisture, temperature, Salinity and water potential, before installation in two soil profiles

soil water potential probes

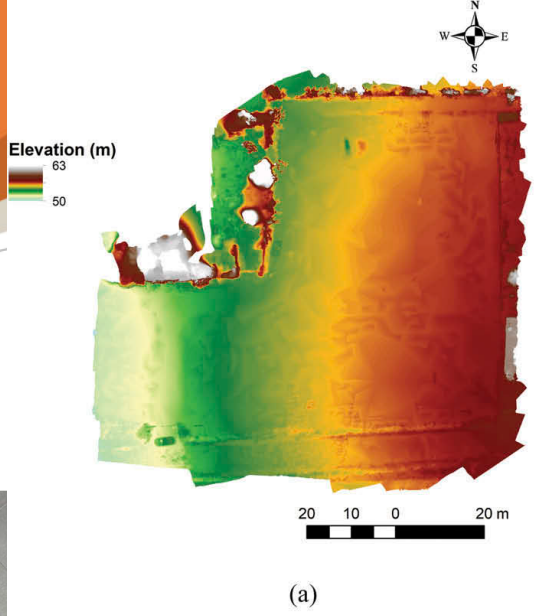
soil moisture, temperature, and salinity probes

cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

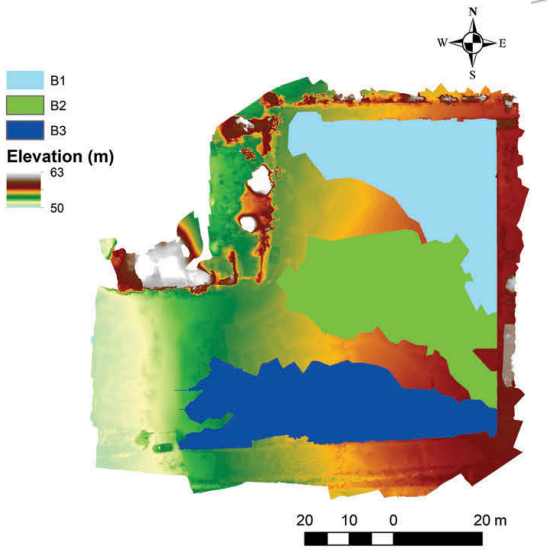
Monitoring devices at Trentola



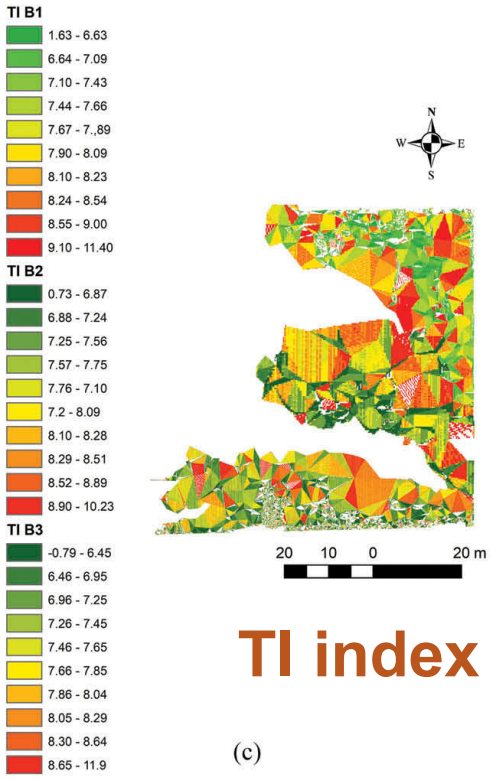
Terrain attributes vs. Cd concentrations



(a)

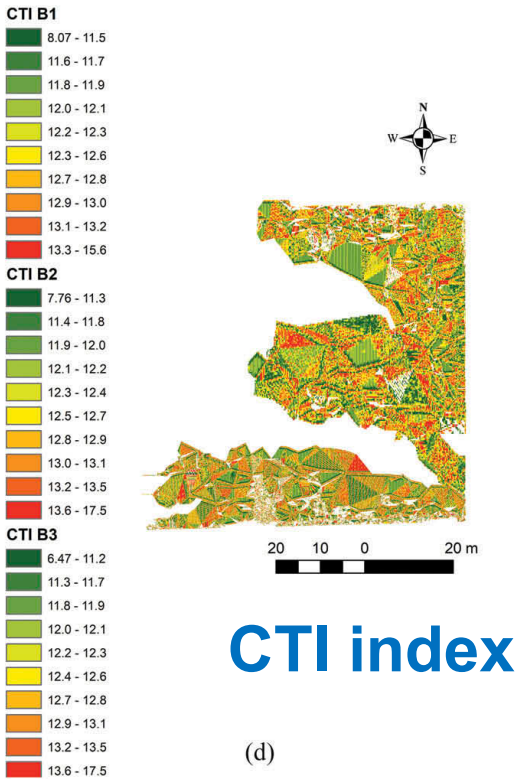


(b)



(c)

TI index

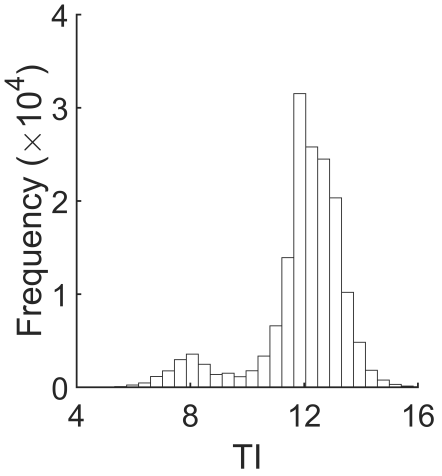


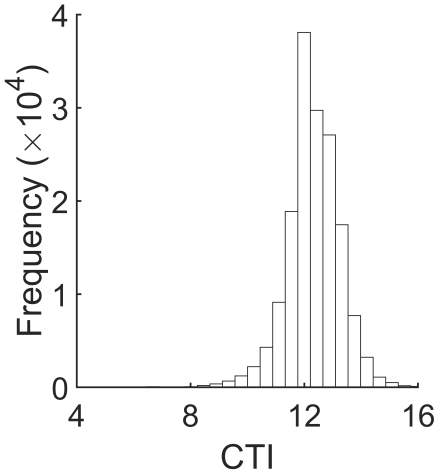
(d)

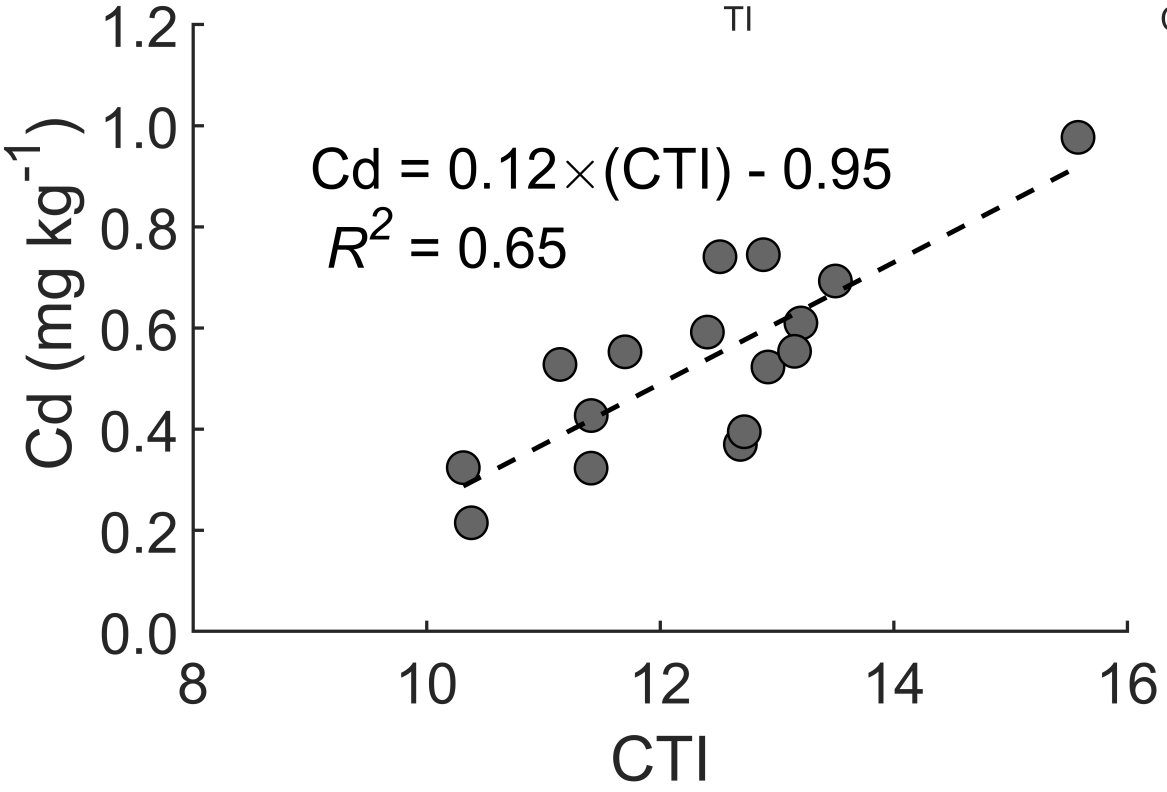
CTI index

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Terrain attributes vs. Cd concentrations



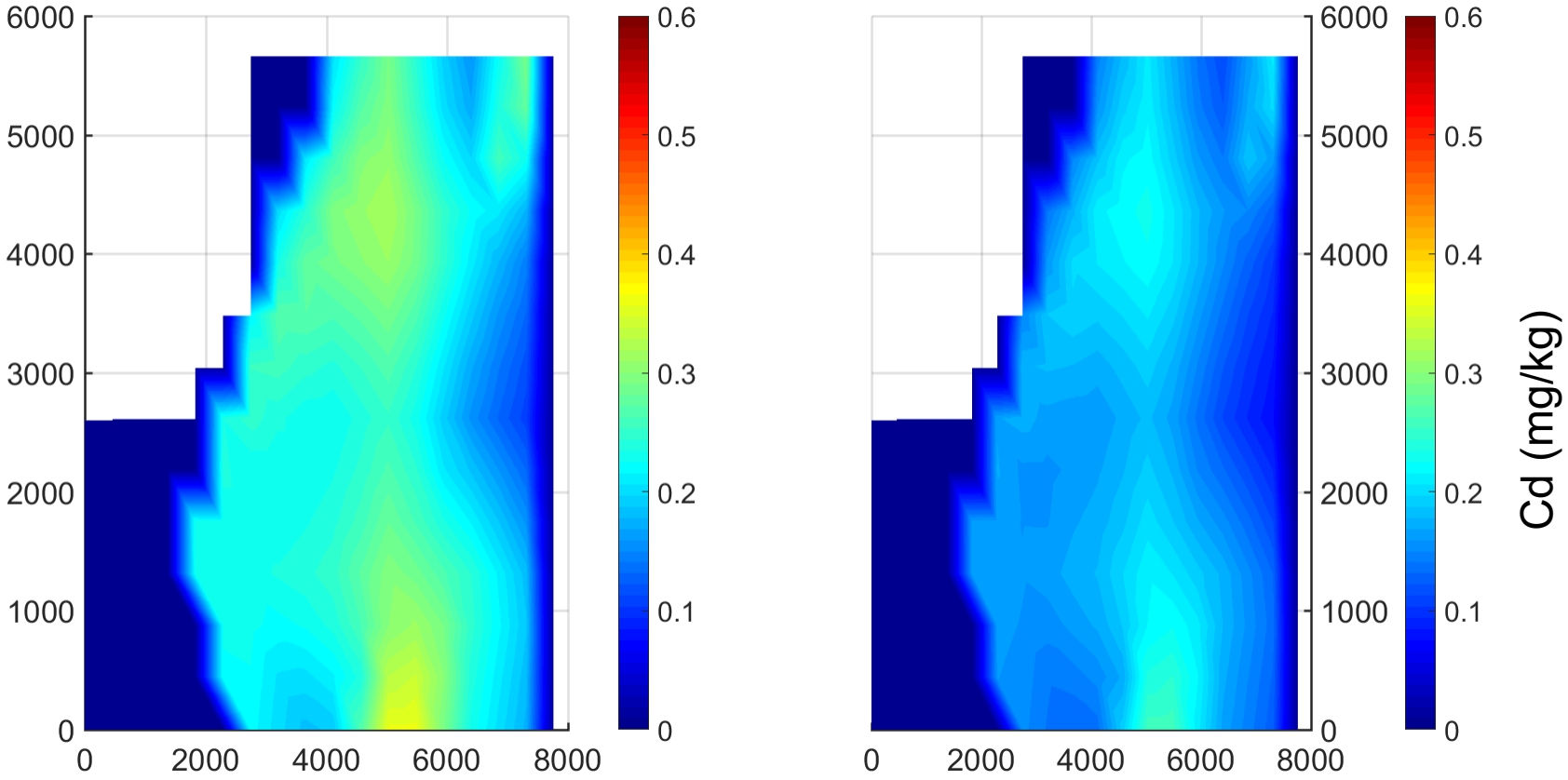




Capolupo et al., 2018, Int.J. Remote sensing

Capolupo et al., 2018, Int.J. Remote sensing

3D Richards' Model Simulations



bare soil

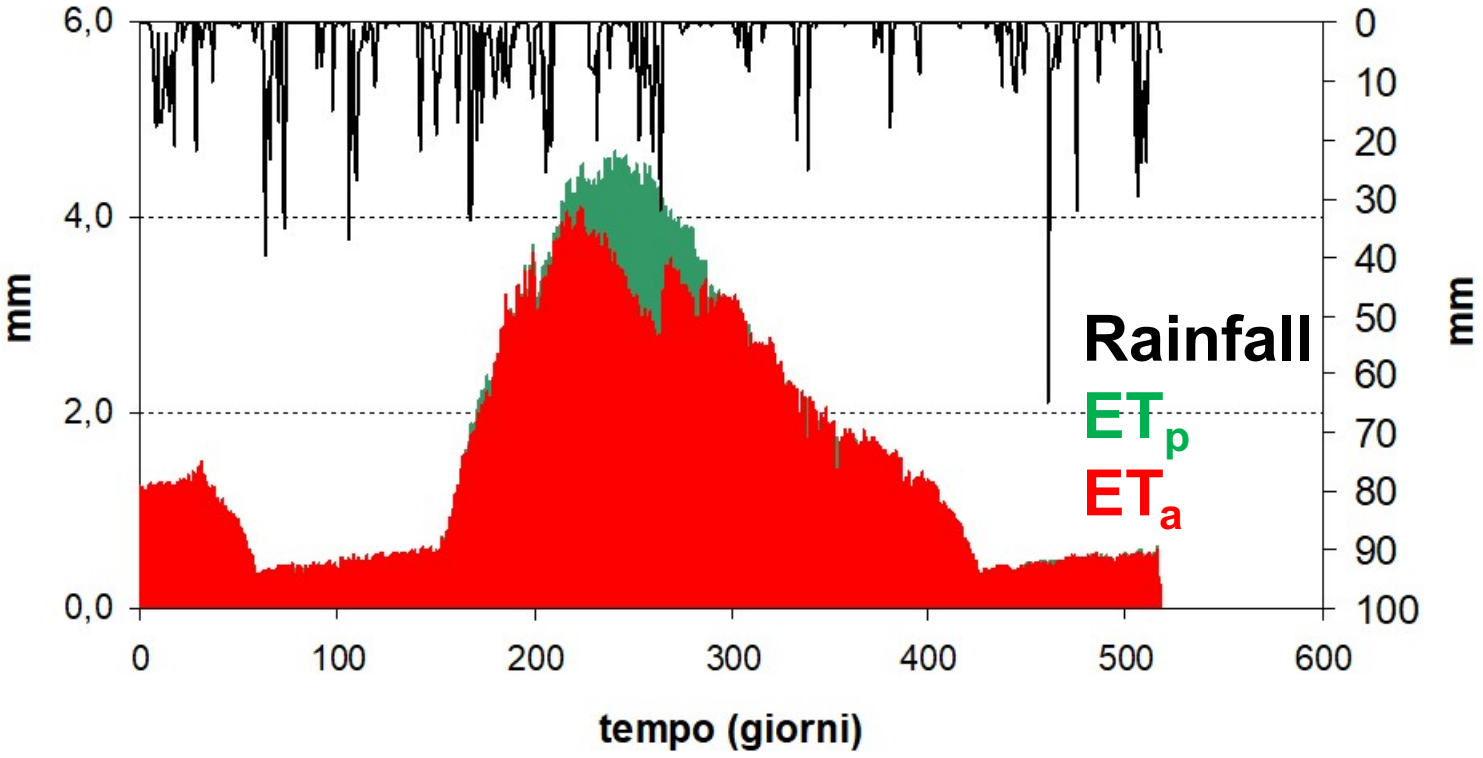
soil with poplar trees

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

HARMONIOUS UAS for environmental monitoring

Concluding remarks

➢ UAS is very effective for micro-topography, but also an effective bridge between soil-moisture and vegetation issues



cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

HARMONIOUS UAS for environmental monitoring

HARMONIOUS
uas for environmental monitoring

HARMONIOUS

UAS Techniques for Environmental Monitoring

Nunzio ROMANO – Valencia (Spain) – 15/02/2018

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Funded by the Horizon 2020 Framework Programme
of the European Union