Addressing today’s infrastructure challenges using SAR data

Dr Skevi Perdikou, Technology Manager

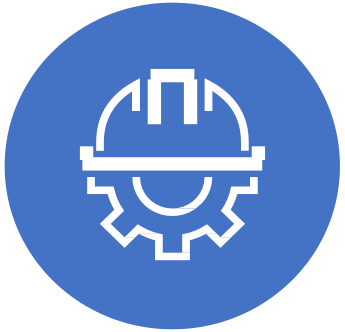
GEOFEM

skevi.perdikou@geofem.com

Who we are

GEOFEM

Established in 2007



Geotechnical engineering

Satellite Remote Sensing

GIS

We help maximise the resilience of infrastructure and the built environment to climate change and geohazards through a combination of the above services.

The Great Infrastructure Challenge

Ageing

Heavier use

Climate change

Declining budgets

Geohazards

Coastal erosion: $500 million/yr US alone

Landslides: $878 million/yr globally

Sinkholes: $300 million/yr US alone

Clay subsidence: $12 billion/yr globally

"Geohazards are difficult to manage and yet the numbers continue to increase with climate change"
World Bank, 2020

The problem

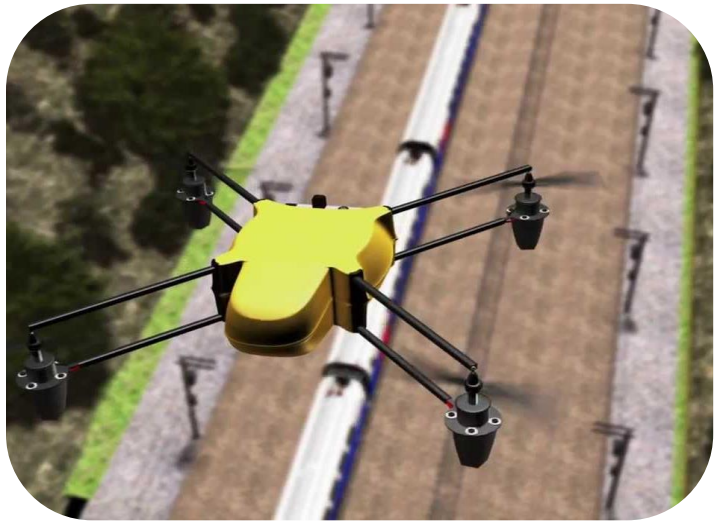
Geohazards can occur anywhere. How to check thousands of km of infrastructure?

Maintenance is often reactive which consumes budgets year after year.

Climate change resilience is low so the disruption will only get worse.

Other solutions

Traditional (visual inspection): hazardous, infrequent, subjective, hard to trend

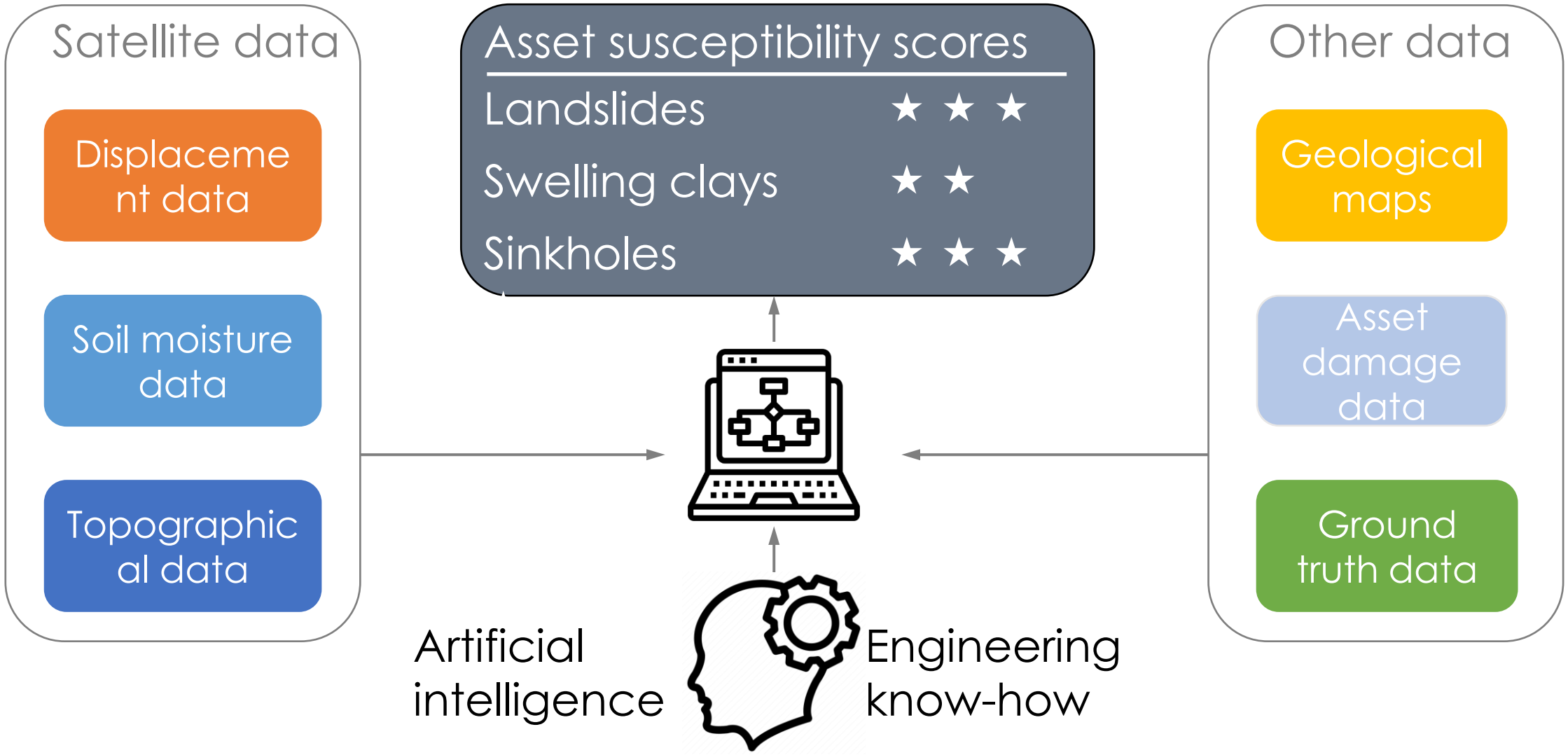


Mobile (drones, aircraft, vehicles): weather-dependent, less frequent, hard to trend

Infrastructure Condition

- Displacement measurements
- Soil moisture estimations: indicators of poor drainage – a trigger mechanism for many geohazards
- **Susceptibility of infrastructure to geohazards**
- **Identification of causal factors: synergy of SAR & FEA**

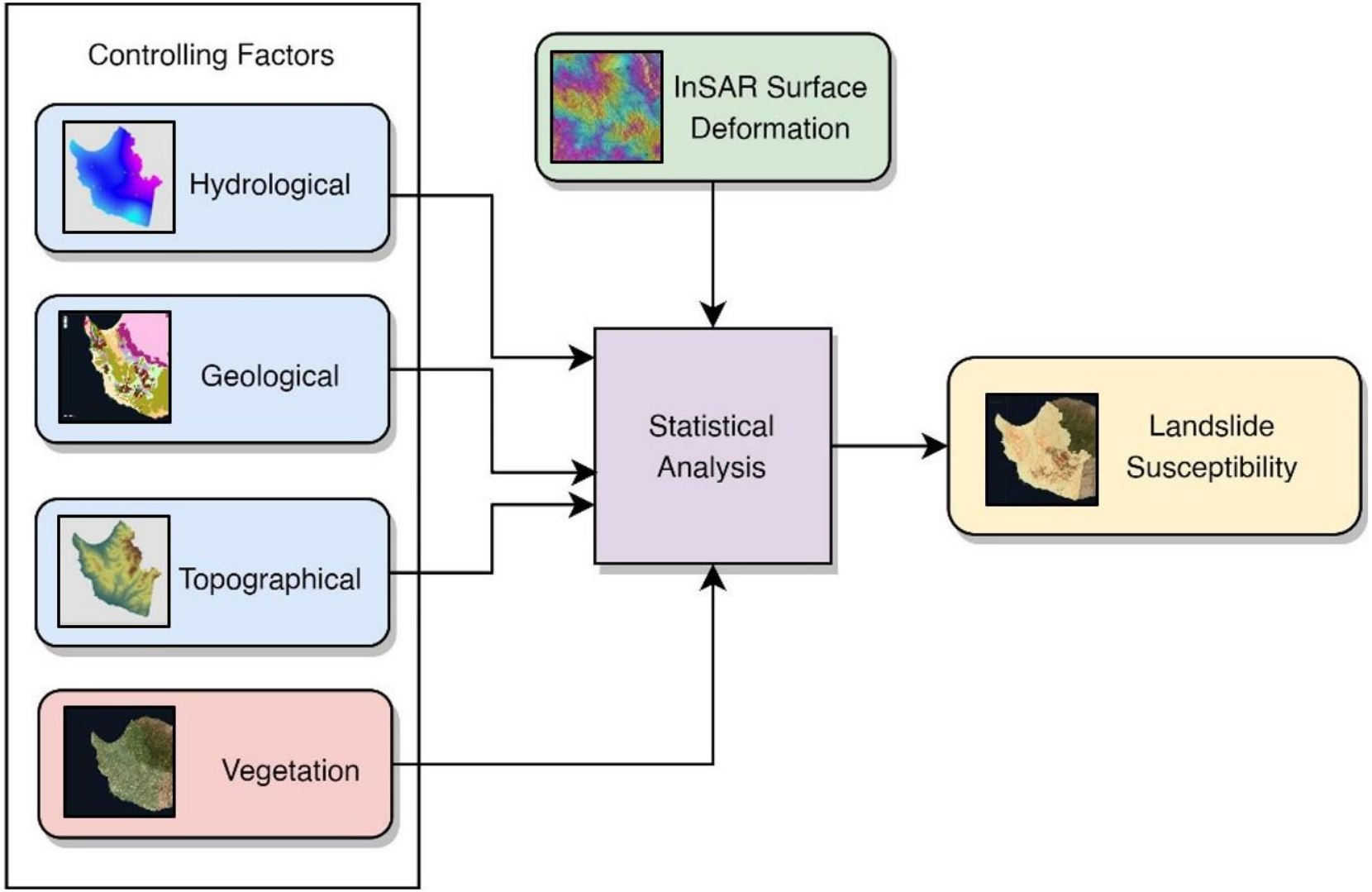
Satellite data with engineering insight



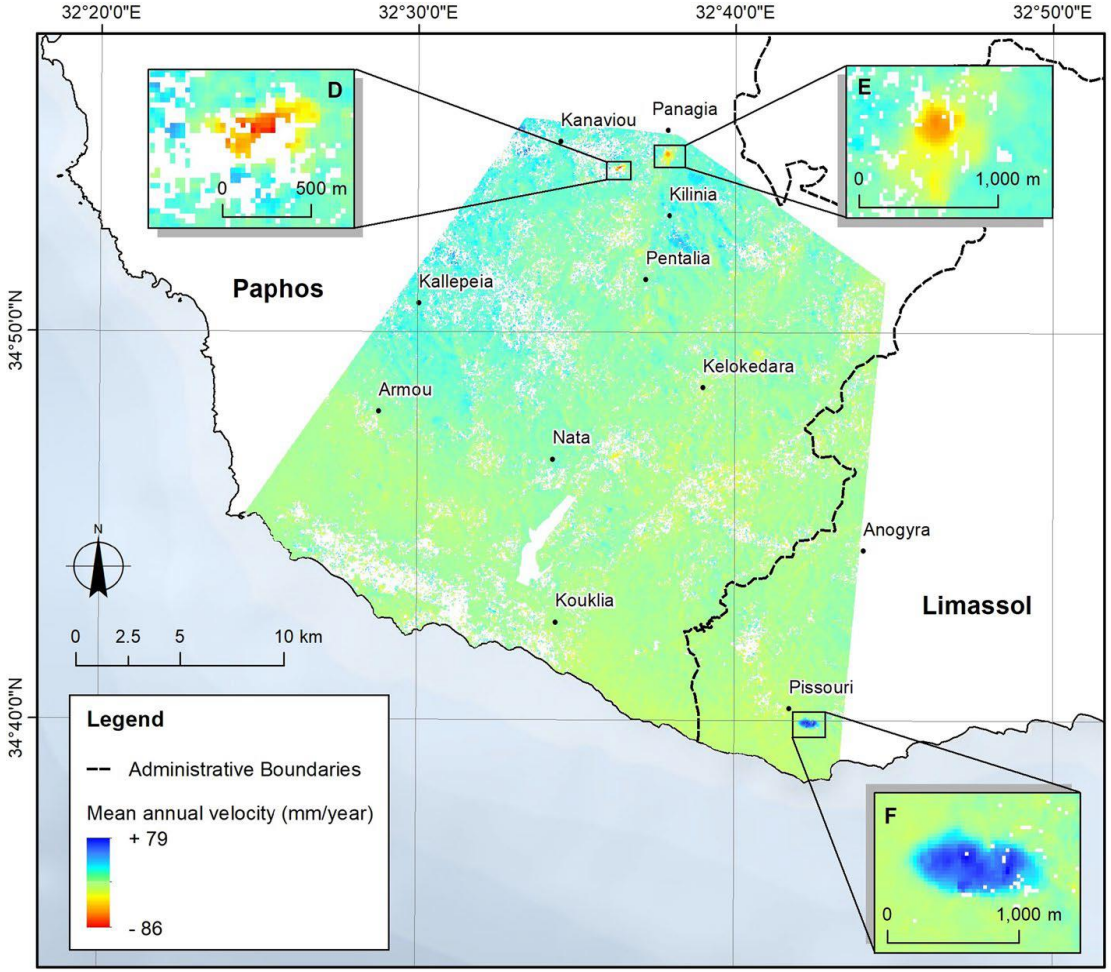
Satellite data with engineering insight

- **50%** cheaper
- **200** times faster
- **More** accurate
- **High** frequency
- **Non-disruptive**
- **Automated**
- **Retrospective**

Susceptibility to landslides

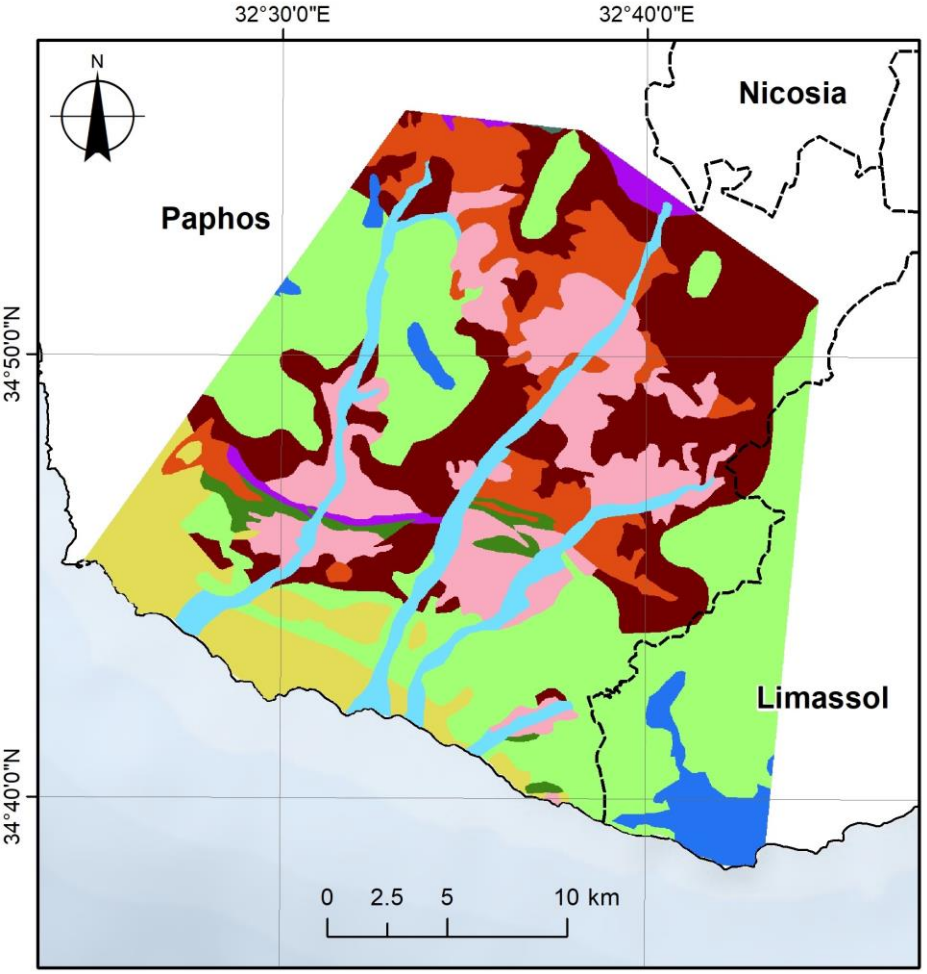


Susceptibility to landslides



Mean annual ***horizontal*** velocity: mm/year

Susceptibility to landslides

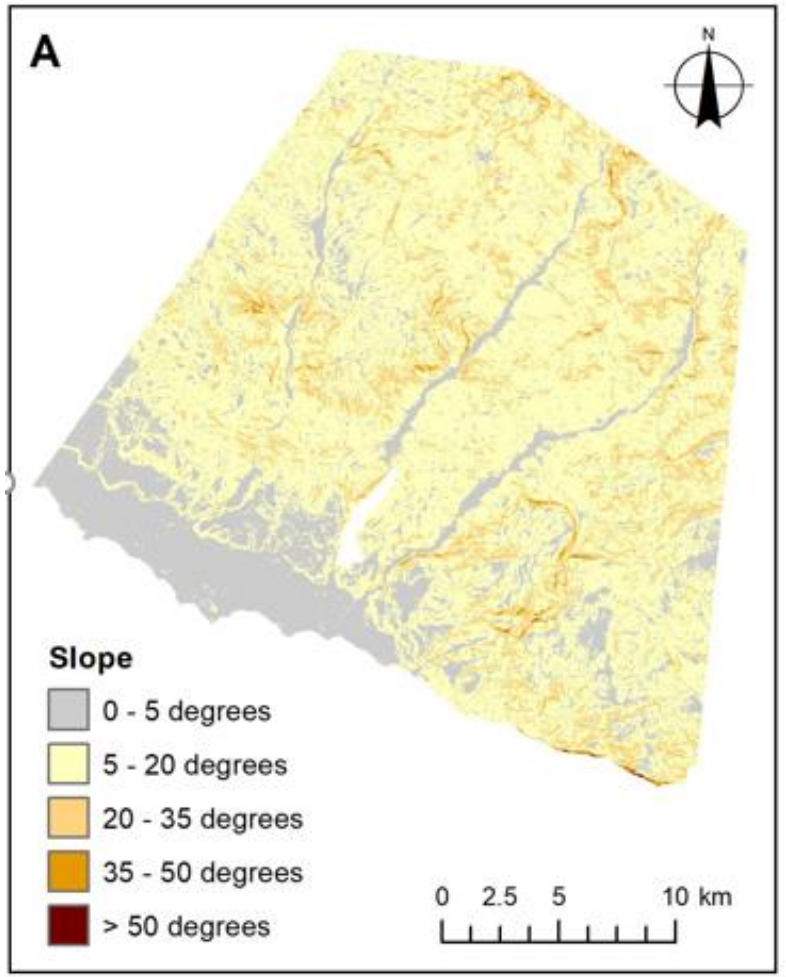


Legend

- Administrative Boundaries

Geology

- Sheeted Dykes (Diabase)
- Upper and Lower Pillow Lavas and Basal Group
- Alluvium - Colluvium
- Moni, Kannaviou and Pera Pedi Formations - Bentonitic
- Apalos, Athalassa, Kakkaristra and Nicosia Formations
- Kalavaso and Pachna Formations
- Terrace Deposits, Fanglomerate
- Lefkara, Kalogrea-Ardana and Lapithos Formations
- Mamonia Complex
- Harzburgite and Serpentinite



Susceptibility to landslides

EYEGIS
Infrastructure Asset Management

Natural Hazards
https://doi.org/10.1007/s11069-020-04433-7

ORIGINAL PAPER

Check for updates

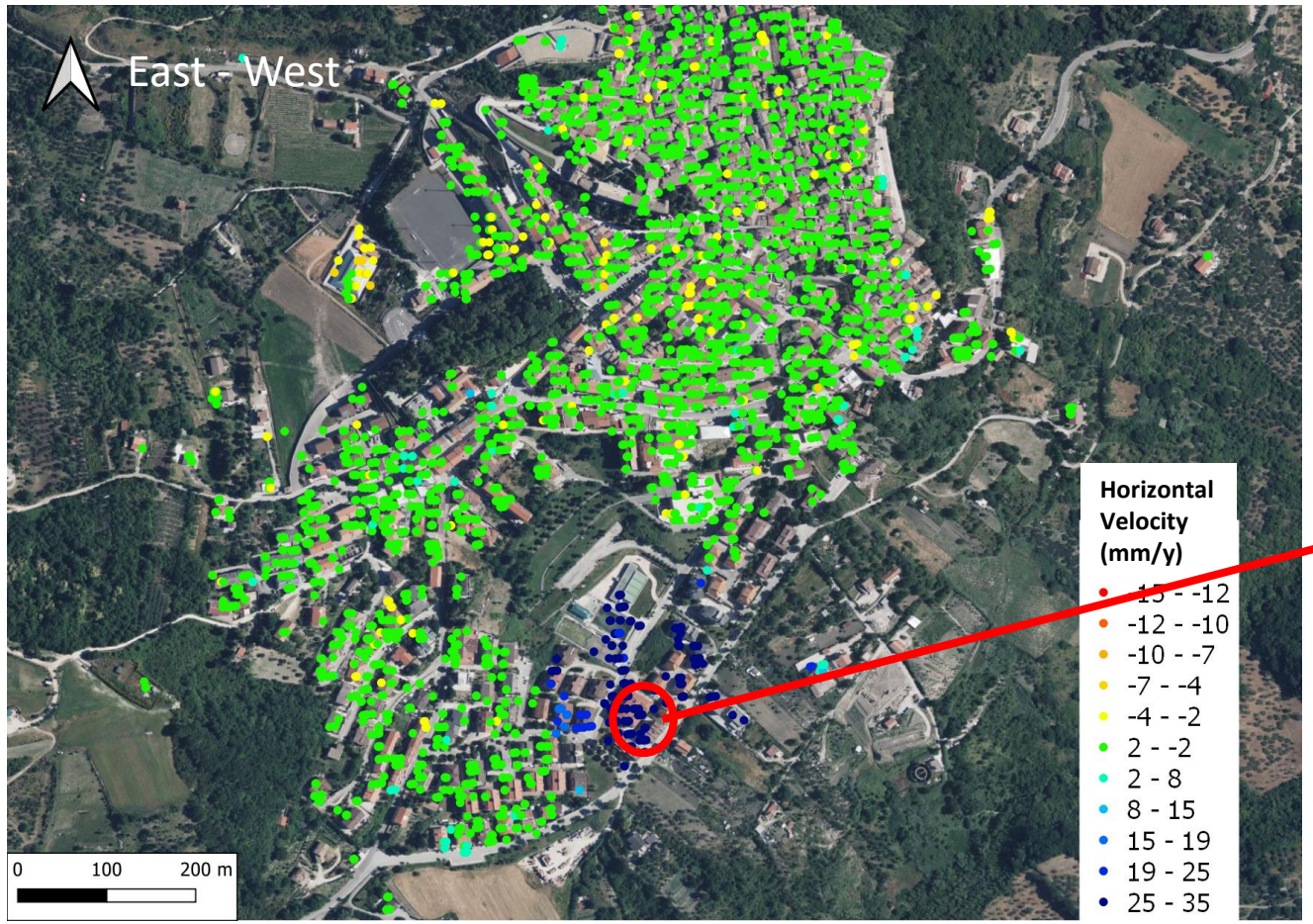
The application of DInSAR and Bayesian statistics for the assessment of landslide susceptibility

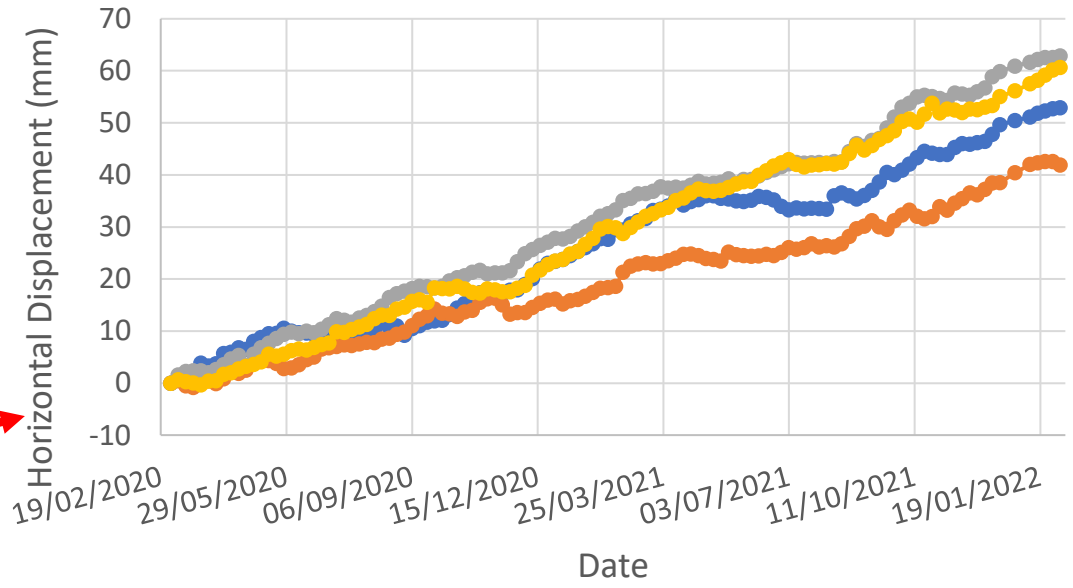
Dimitris Kouhartsiouk[1] · Skevi Perdikou[1]

Received: 8 May 2020 / Accepted: 16 November 2020

Abstract
The use of an inventory map of past landslide events in the derivation of susceptibility models is considered common practice. However, evidence of landslide activity may be lost due to various degrees of modification by subsequent landslides, erosional processes, vegetation growth and anthropic influences. The timely detection of active landslides can form an effective supplement to landslide records for improving the accuracy of landslide susceptibility maps. In this paper, we present a landslide susceptibility assessment carried

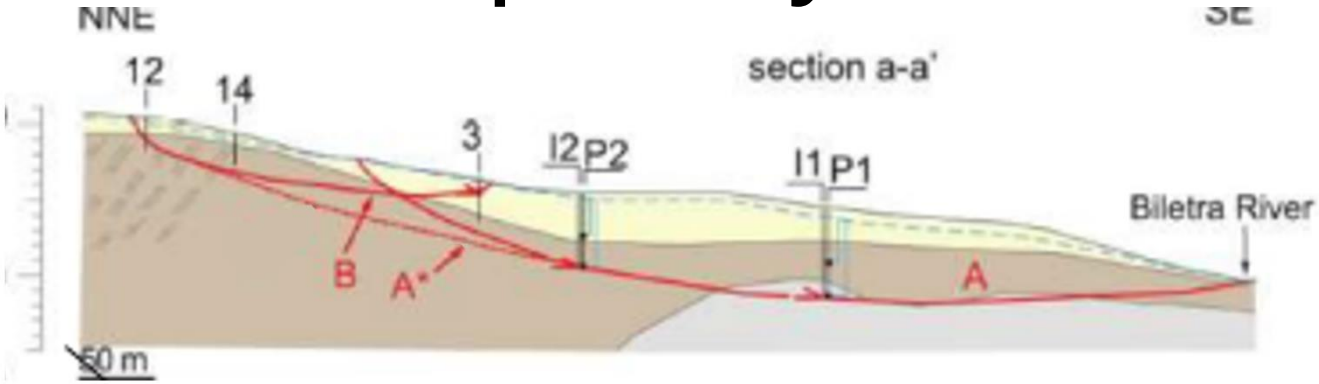
Susceptibility to landslides





Pianello landslide, Bovino, Italy

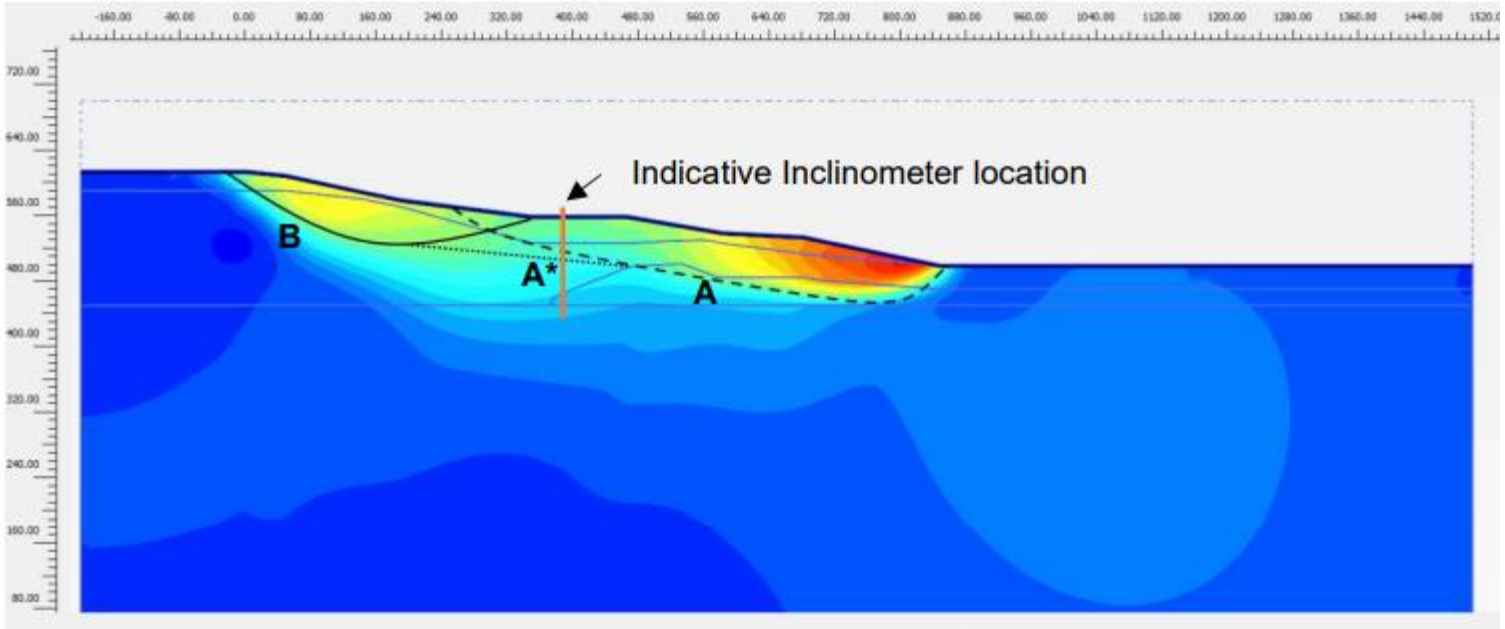
Susceptibility to landslides



Losacco et al., 2021

Failure patterns from literature

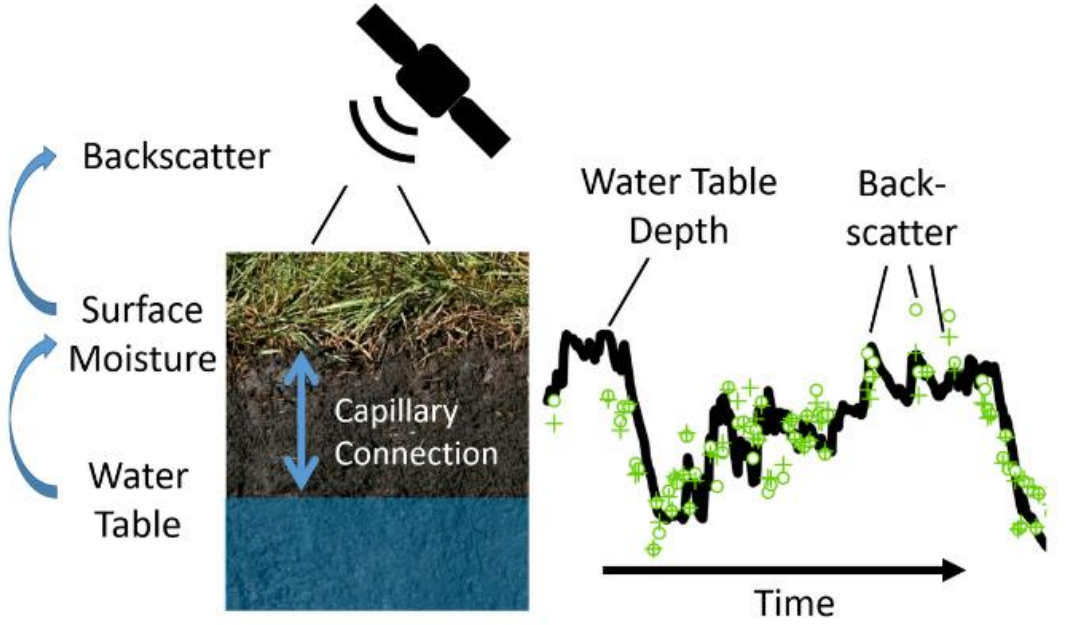
Failure patterns from our own FEA model

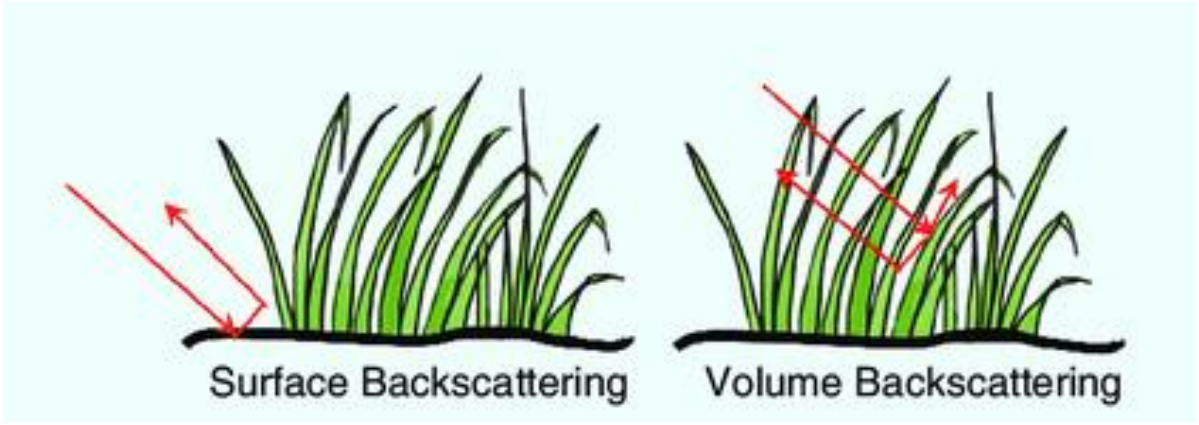


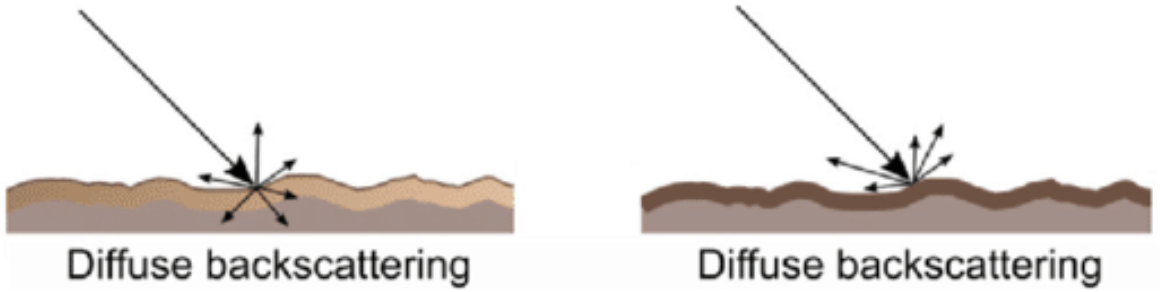
Pianello landslide, Bovino, Italy

Susceptibility to swelling clays

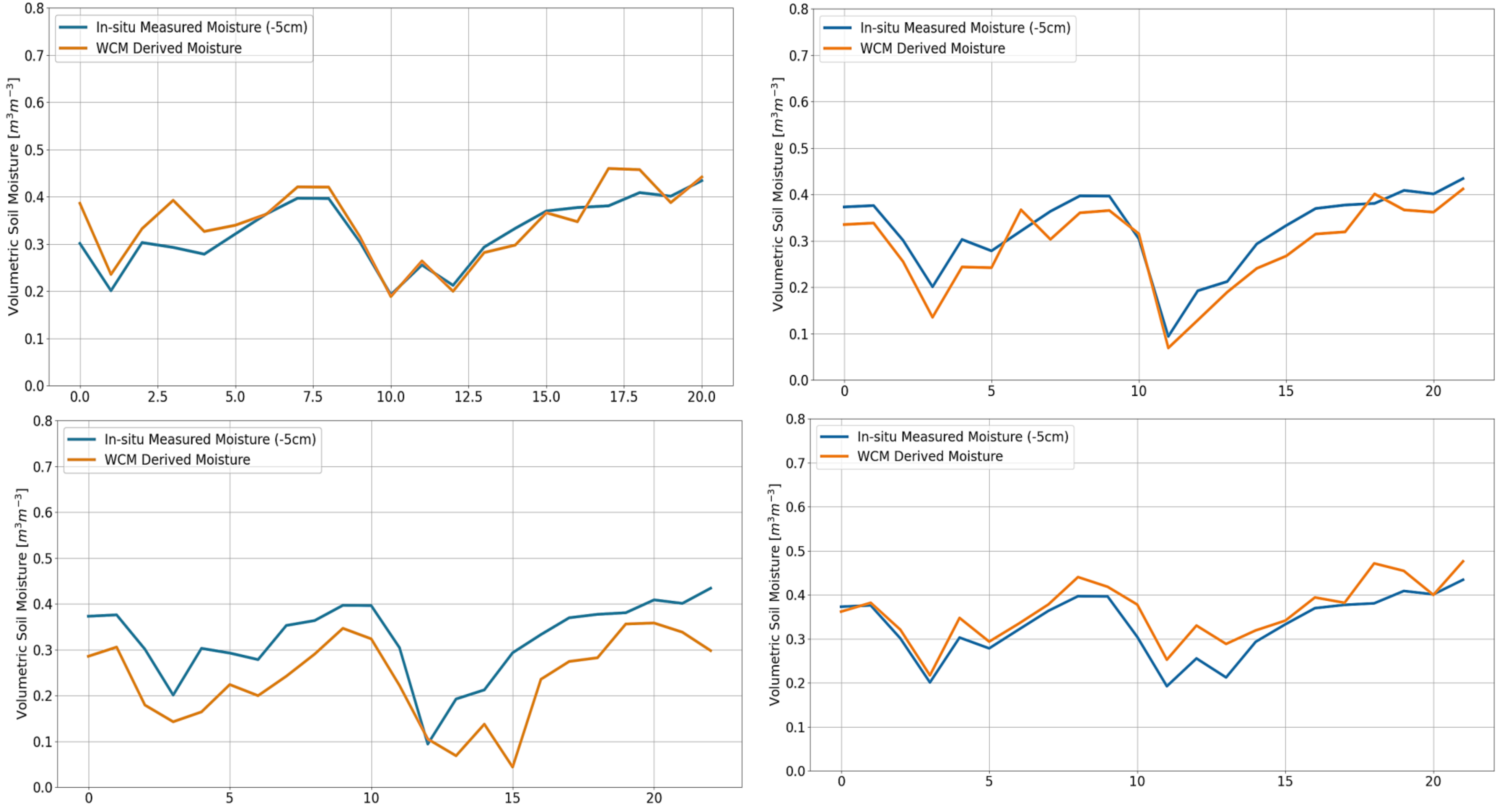
Radar waves
scattering dynamics







Susceptibility to swelling clays



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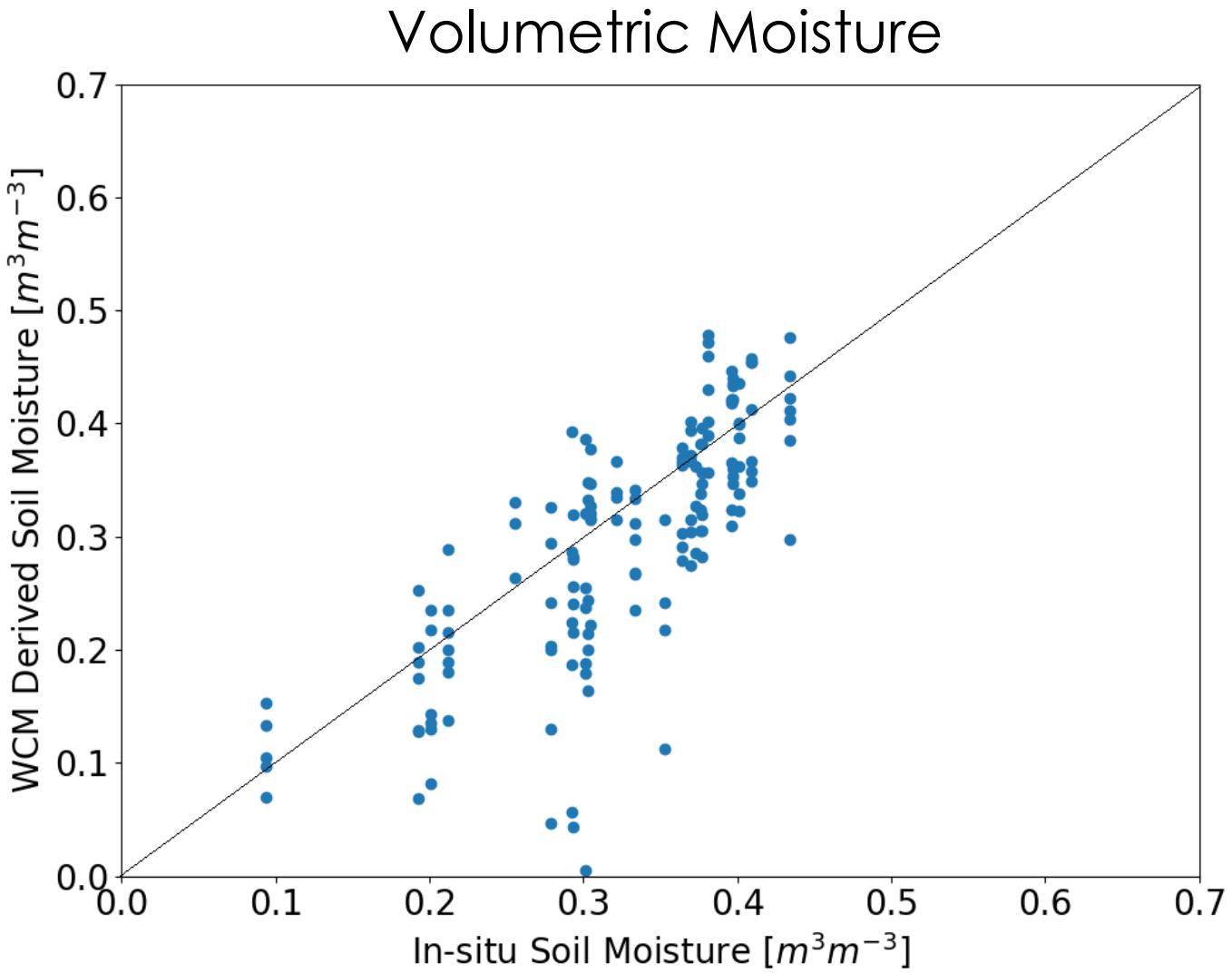

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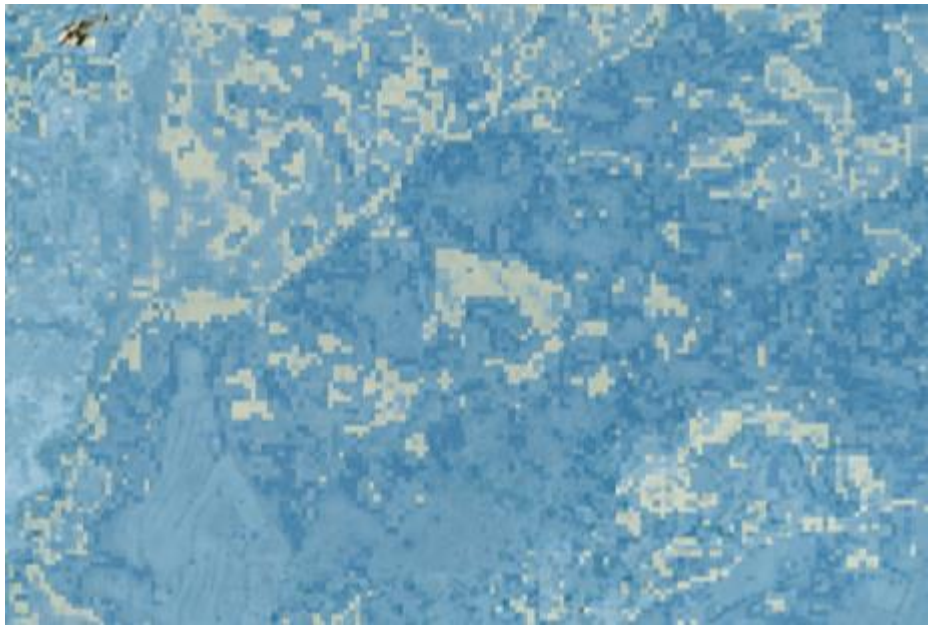
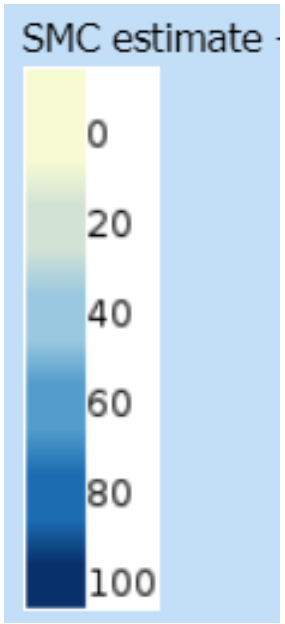
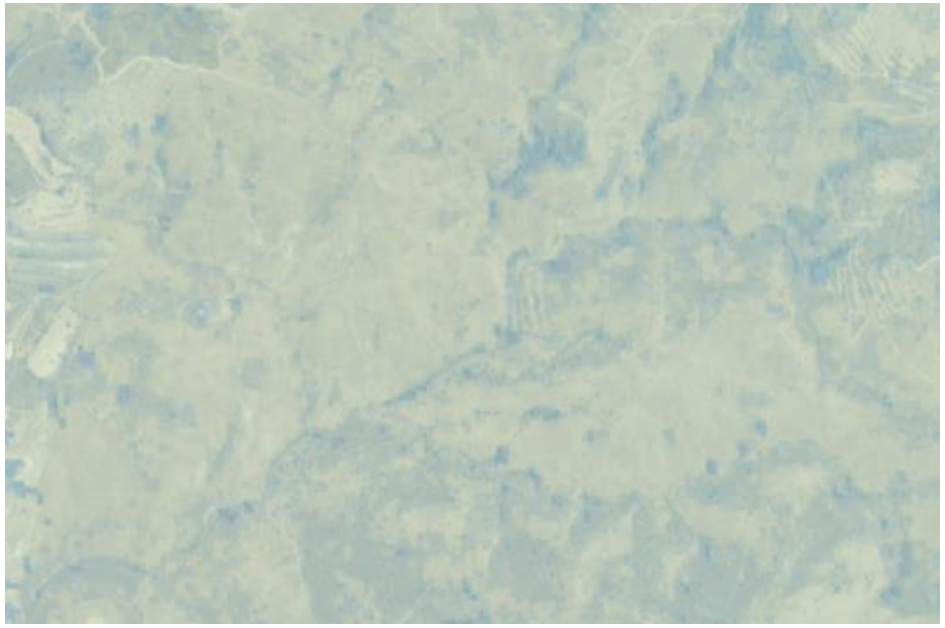


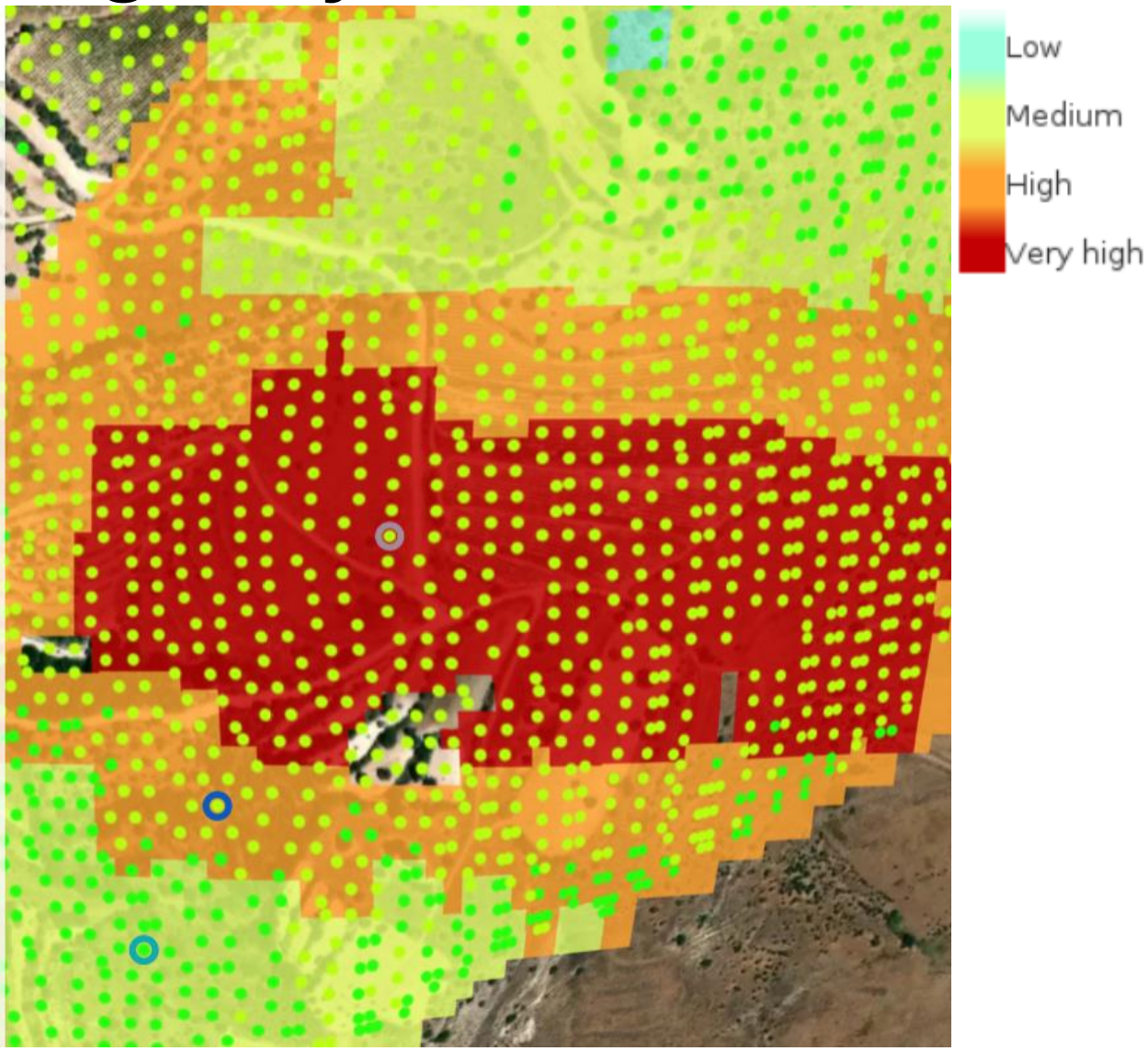




March 2021

September 2020

Susceptibility to swelling clays



Summary

- Assess whole infrastructure networks for geohazard susceptibility using SAR combined with other data
- Target investigation and monitoring resources at the high-risk locations
- Detect trends for improved planning and proactive maintenance
- Improve resilience to climate change

Thank you

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skevi.perdikou@geofem.com