Integrated Geophysics and Data Science for Soil Moisture Characterization and Hydrogeological Risk Assessment in Urban and Peri-Urban Areas

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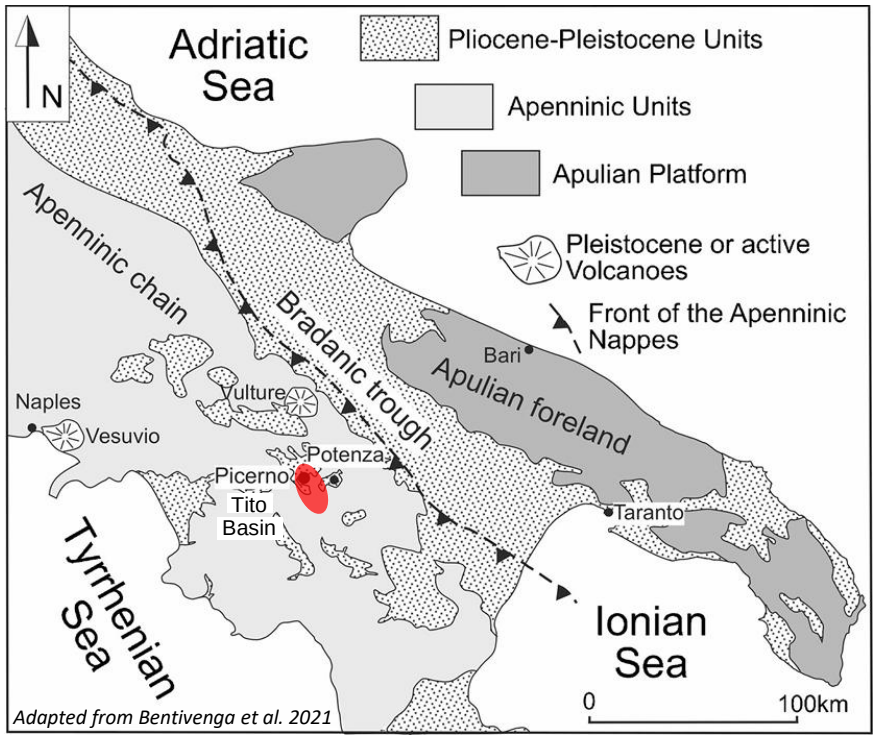
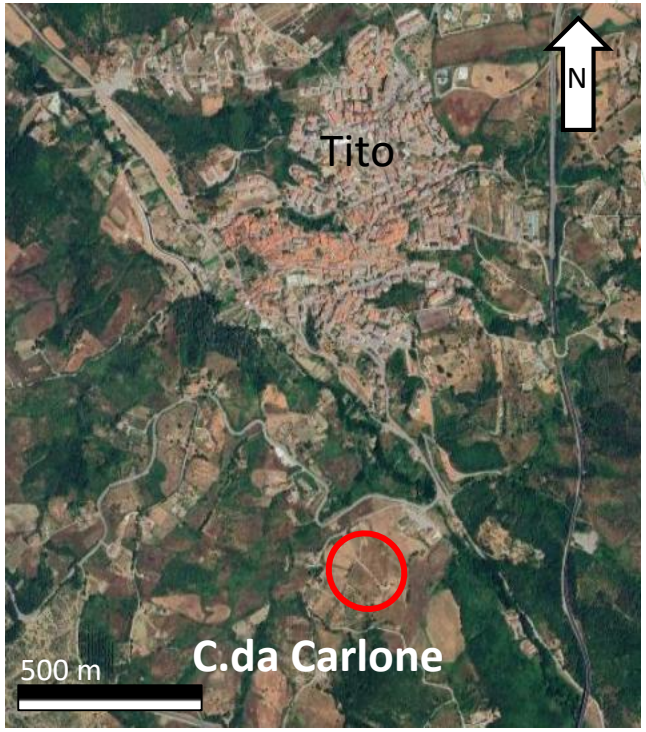
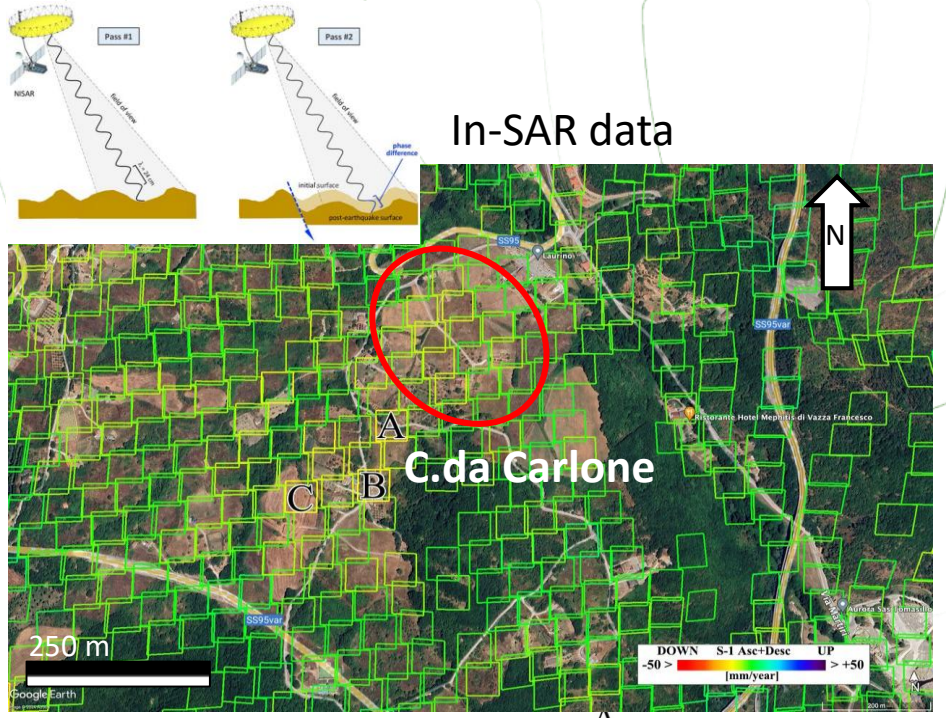
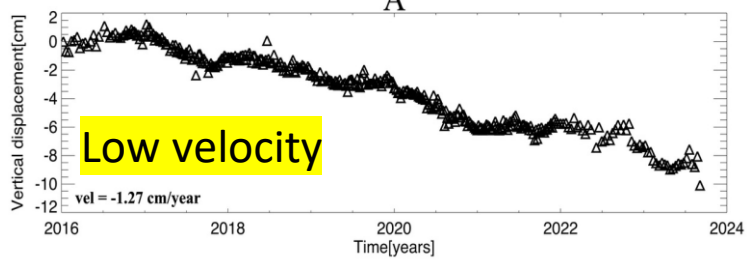
Study area *shaping the research methodology*









Low velocity

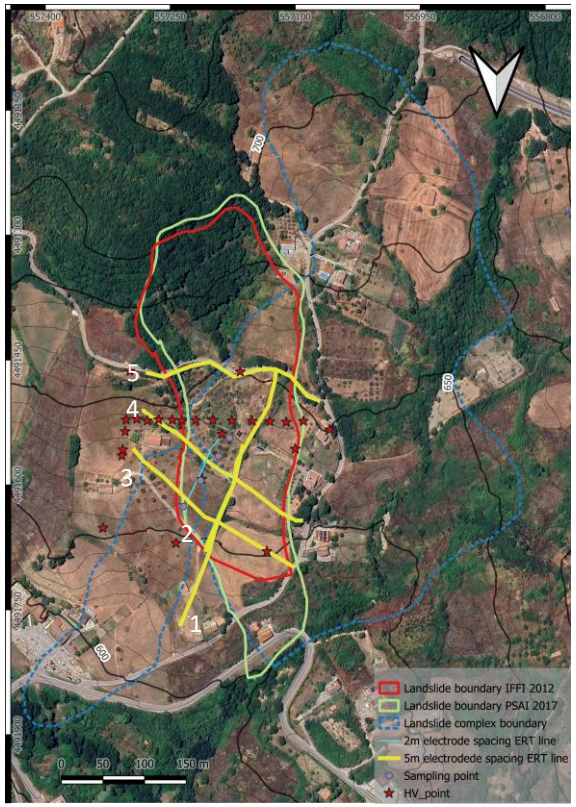
Key messages

- Peri-Urban area • Hydrogeologic risk • Logistical ease and feasibility
- Methodology
  - Setup of an open-air laboratory
  - Multidisciplinary, multiscale, multiparametric approach
  - Geophysical, hydrologic and metereological data at lab, site scale

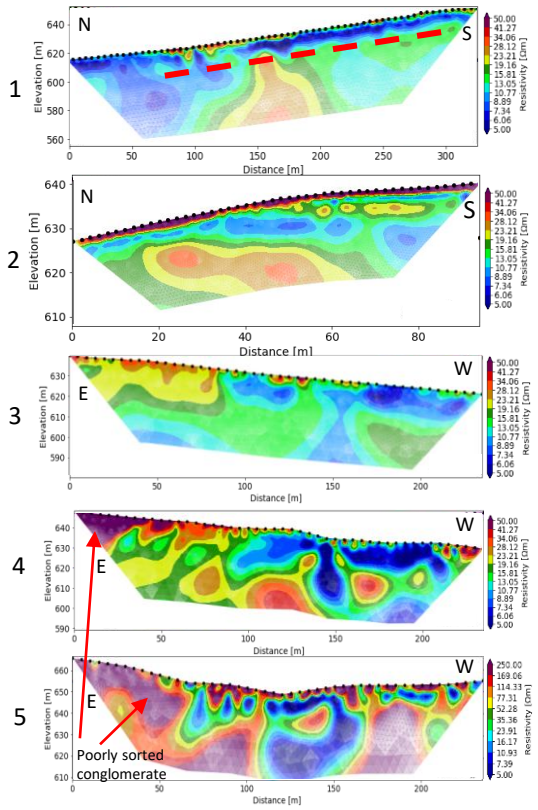
Key Results so far

field and lab strategies for site characterization

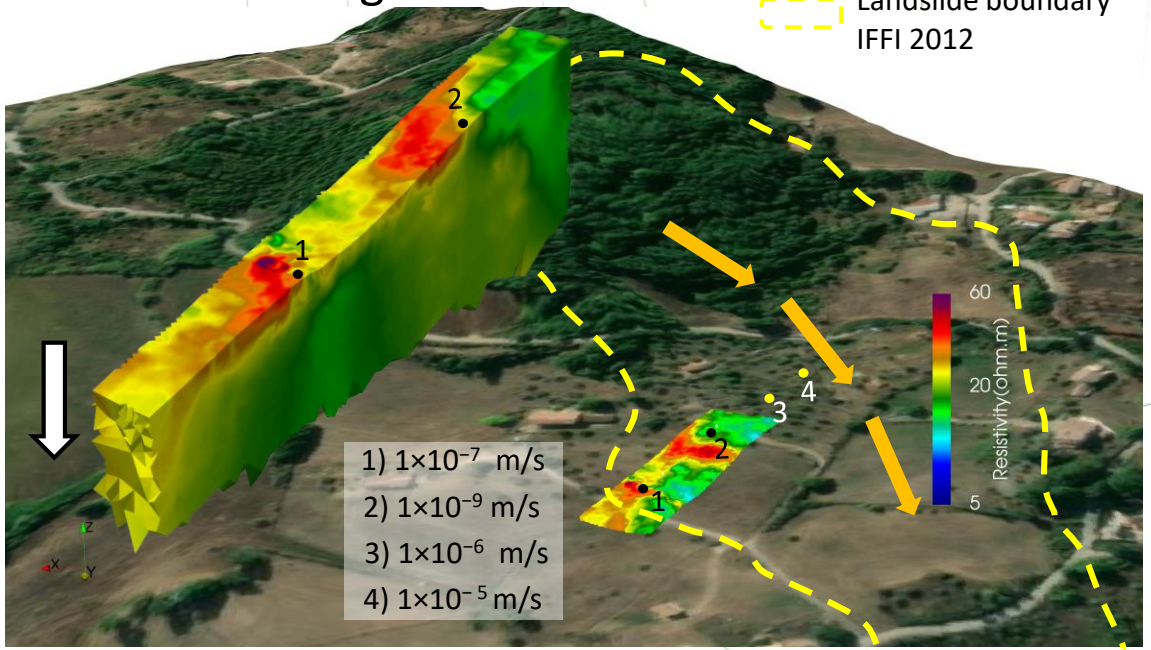
Geomorfological survey



2D ERT modeling

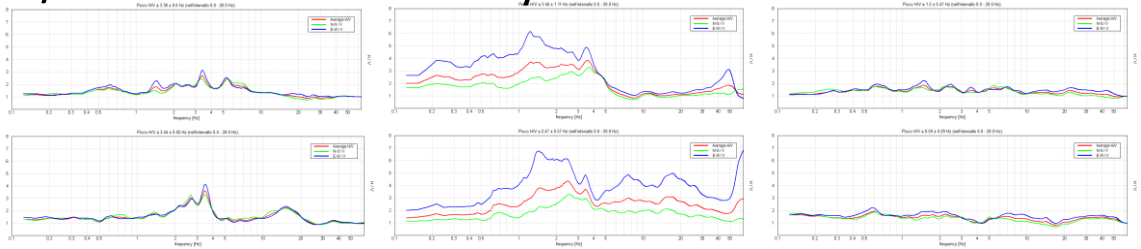


3D ERT modeling



Hydraulic conductivity

H/V Microtremor Surveys



Key messages

- Landslide Geometry
- Heterogeneity Mapping
- Channeling bedrock
- Building Prior Knowledge

Ongoing Efforts *bridging site and lab insights*

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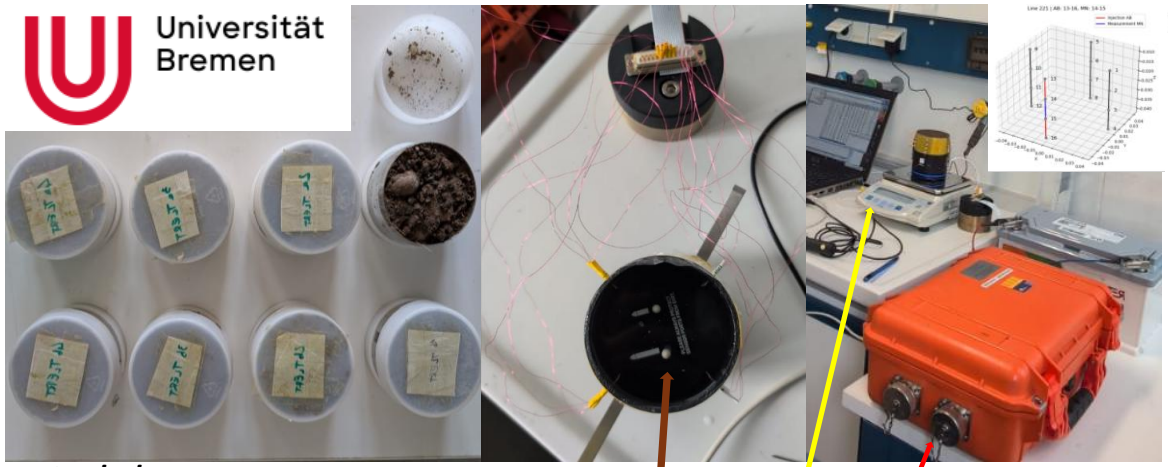


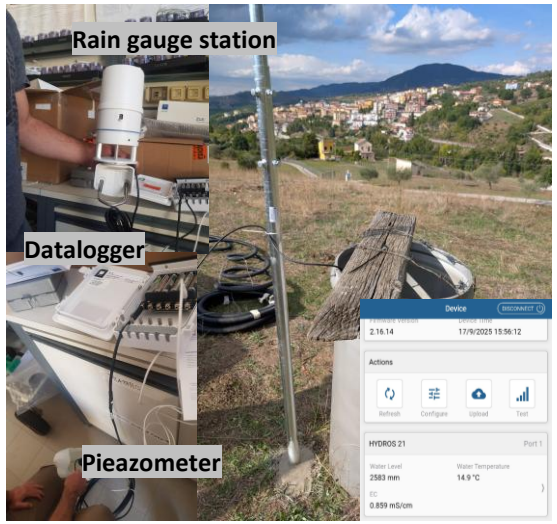
…In lab

Water content

Tensiometr

TL ERT system

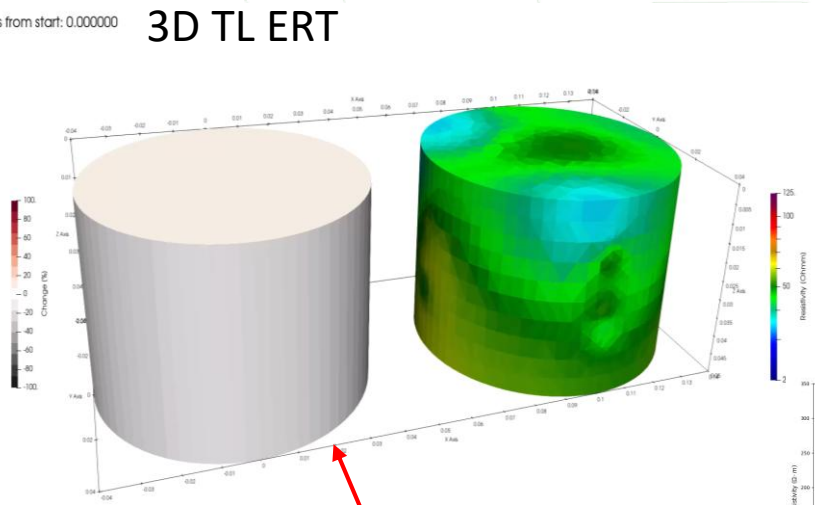
Meteorological sensors



…On site

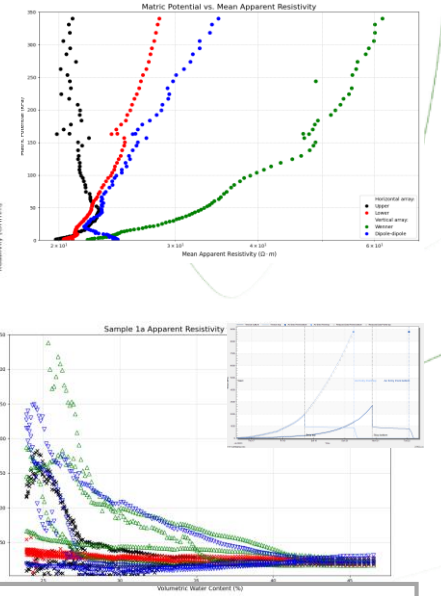
TL Data gathering

3D TL ERT

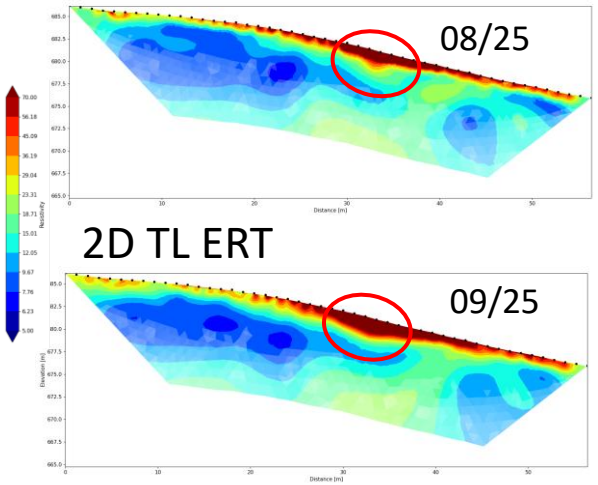


Capturing drying process

TL data analysis



2D TL ERT

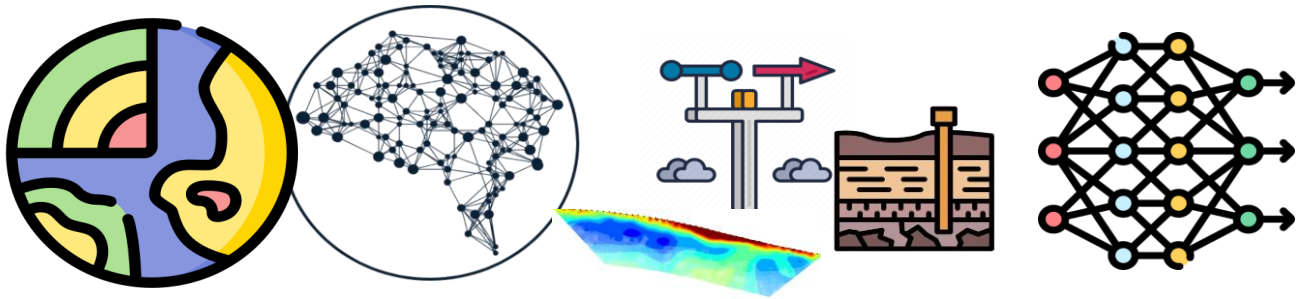


Key messages

- Field-to-Lab Replication
- Imaging and TL Data analysis
- Comparing Processes Across Scales
- Assembling a Dataset

Next Steps

Data mining using Machine learning technique



Measured and Derived property

Model Inference

Processing & Modelling

We aim to apply machine learning to quantify relationships between time-lapse resistivity variations, measured hydrological properties, and derived geotechnical parameters, in order to develop predictive models of landslide body behavior over time.

Final Question

What is the real contribution that the ERT method can offer to advanced landslide monitoring, early warning systems, and to a broader range of applications, from agriculture to environmental remediation?

THANKS!

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