

Measuring the Impact of Heat Waves on Underground Medium Voltage Cables: A Field Measurement Campaign for Cable Behavior Assessment

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MOTIVATION

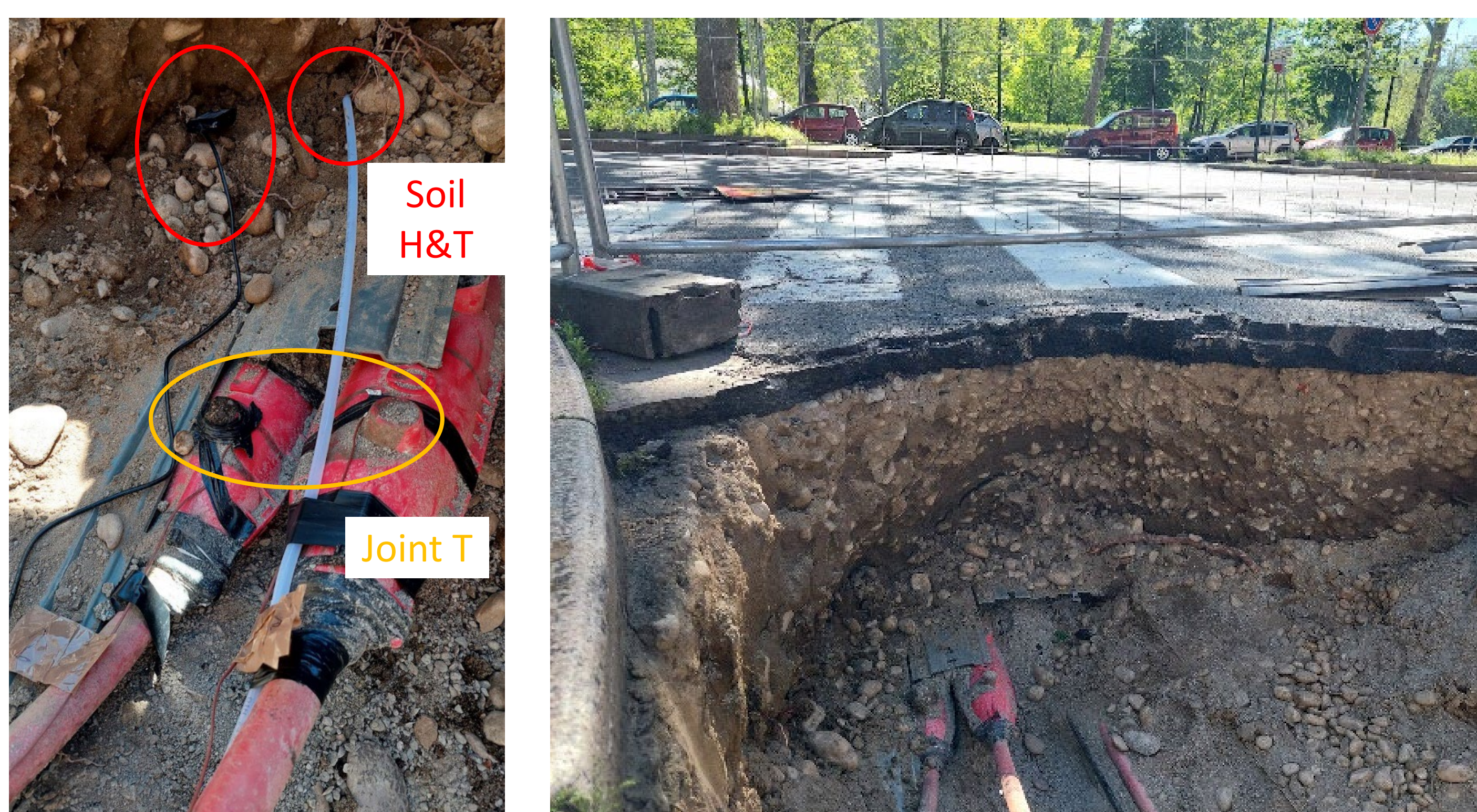
- Increase of temperature: heat waves are becoming more and more common
- Increase of the number of faults, especially in summer
- Do heat waves affect the temperature of buried medium voltage (MV) cables, compromising their integrity and lifespan?

WHAT WE PRESENT

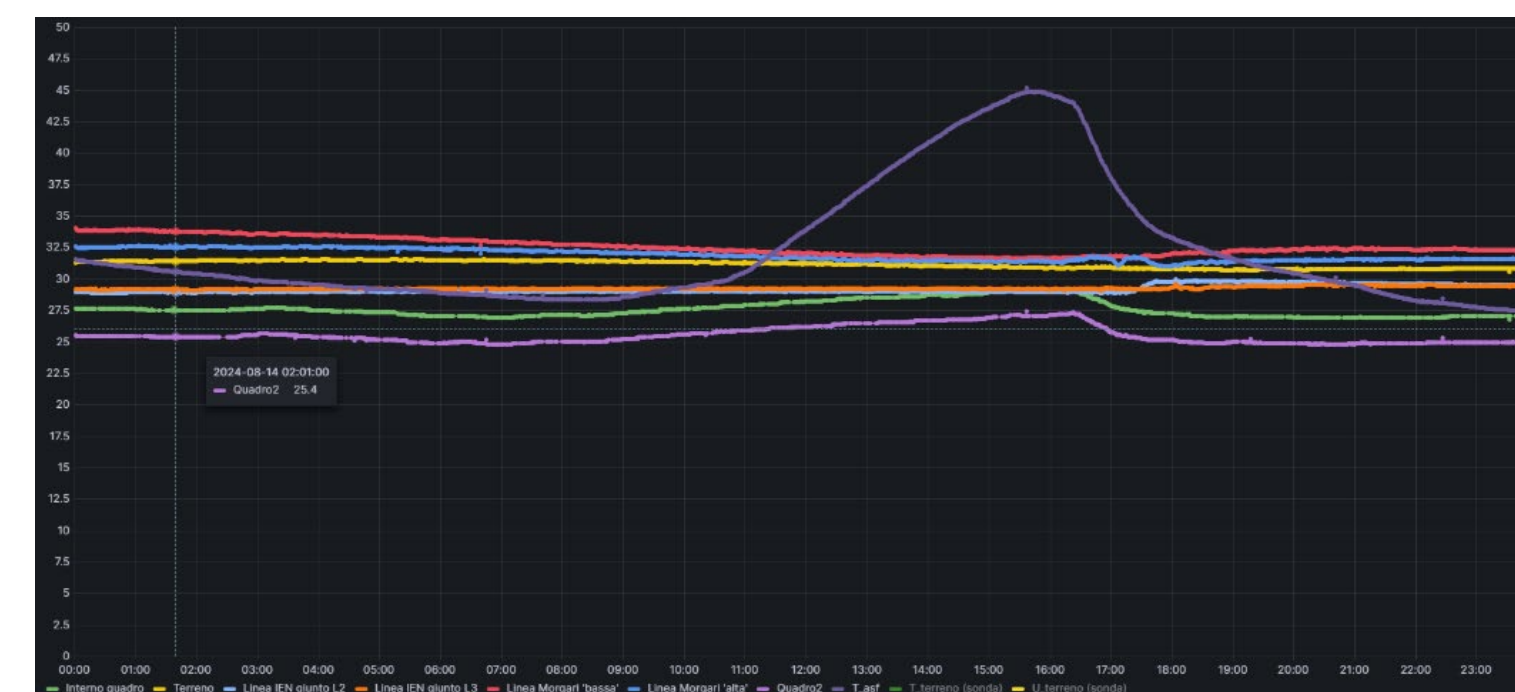
- THE ABOVE working hypothesis is the basis of the National project Resilience Evaluation by Experimental and Theoretical Approaches in Electrical Distribution Systems with Underground Cables (EXTRASTRONG)
- We present a comprehensive field measurement campaign designed to assess the impact of heat waves on buried Medium Voltage (MV) cables.

TECHNICAL INFORMATION ON THE MEASUREMENT INSTALLATION

- Continue measurements of:
 - Cable and Joint temperature (by thermo-couple on external insulation)
 - Filling material (crushed-stone) or cable pipe (by thermo-couple) temperature
 - Ground temperature and humidity (some issues met)
 - Ambient parameter

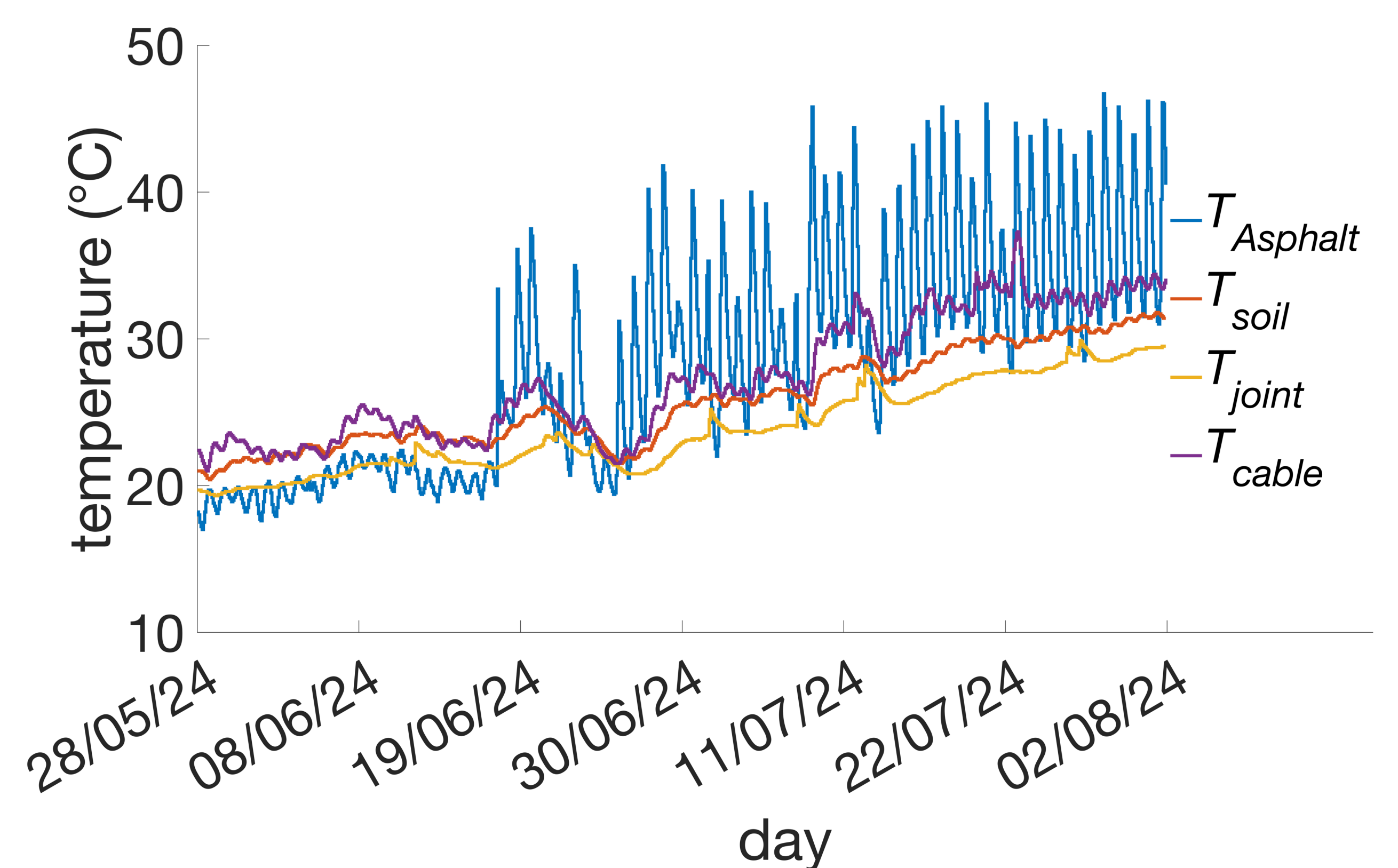


- **Measure database accessible by project partners:** to effectively manage and analyze the continuous stream of sensor data, a data acquisition system has been implemented:
 - the system consists of an **online data logger** that recorded sensor readings at regular intervals and a **database** (InfluxDB) for data storage.
 - The **InfluxDB** database provided a scalable and reliable repository for the large volume of time-series data generated by the sensors.
- To facilitate data exploration and analysis, a **data visualization platform (Grafana)** was integrated into the system. Grafana enabled the creation of interactive dashboards that displayed the collected data in real-time and allowed for in-depth analysis. The dashboards provided a comprehensive overview of the sensor readings, enabling researchers to identify patterns, trends, and correlations between the various parameters



- **Traceability** of measure to National Standards

RESULTS



- The data revealed that cable temperature can rise significantly during hot periods.
- Moreover, it is evident the point in which the asphalt starts to have an impact on the soil, cable and joint temperatures
- This could lead to a potentially exceed of the cable's permissible temperature limits, posing a risk to cable integrity and lifespan.

FUTURE WORKS

- Develop more accurate models of cable behavior under thermal stress, enabling the design of more resilient cable systems and mitigation strategies to protect the power grid from the detrimental effects of heat waves.
- The implemented data acquisition and visualization system proved to be an effective tool for managing and analyzing large datasets collected during field measurement campaigns.

ACKNOWLEDGEMENT

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