

Surface Soil Moisture Estimate by Integration of Remote Sensing and Low-Cost Field Sensor Network

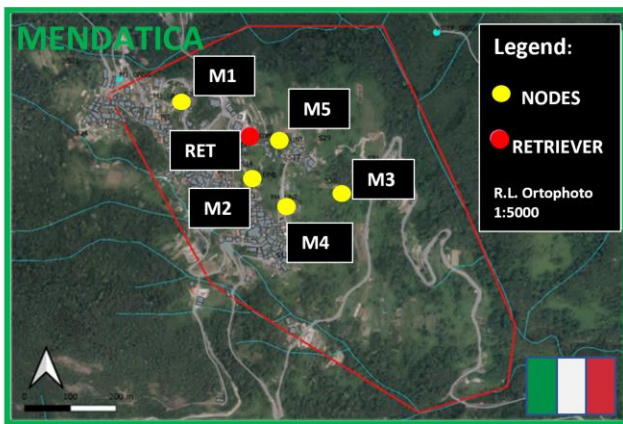
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PURPOSE

Surface Soil Moisture (SSM) is a fundamental information in the unsaturated soil mechanical analysis, and its variations induced by rainfall can be evaluated by low-cost ground-based monitoring networks integrated with remote sensing techniques. The present research aims to implement a new and innovative procedure based on the integration of ground-based data (collected using WaterScout SM100 soil moisture sensor) and multispectral Sentinel-2 Level A images for SSM estimate.

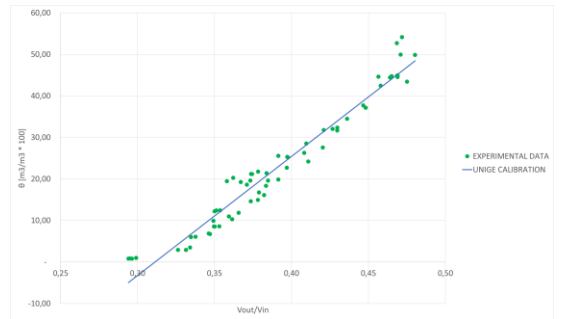


METHODS

- Soil Moisture Monitoring Network Installation



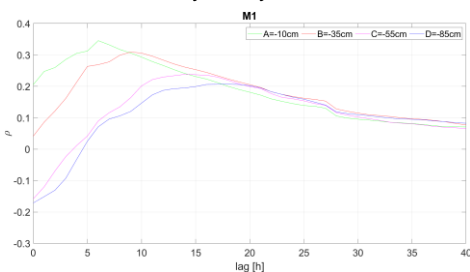
- Soil-specific calibration referred to Mendatica site



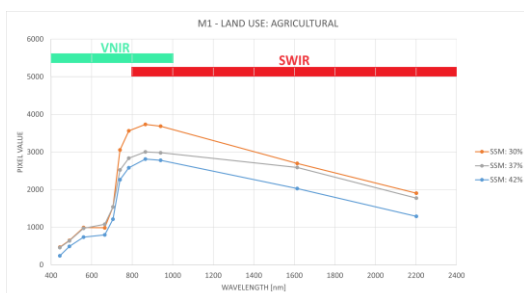
- SSM Network Reliability Analysis
- Pixel values collection from S2A multispectral images using Google Earth Engine
- SSM-Pixel values relationship evaluation

RESULTS

- SSM Network Reliability Analysis results



- Spectral signature referred to three SSM conditions (10cm depth) registered by M1 and M3 nodes (bands at 60m resolution)



CONCLUSION

High resolution SSM information over large areas, obtained by the use of direct and remote sensing, can be used for monitoring and predicting rainfall triggered landslides. The low cost of soil moisture monitoring networks, together with the use of open access remote sensing products, underlines the global sustainability of this study.

Future purposes:

- Increasing pixel values collection in order to make SSM-Pixel values relationships more consistent
- Analysing the vegetation and land use influence on the pixel values and its relationship with SSM measurements
- Obtaining SSM maps useful for the implementation of rain-triggered shallow landslide risk assessment models in unsaturated conditions

USEFUL REFERENCES

- Bovolenta, R., Iacopino, A., Passalacqua, R., Federici, B. (2020). Field Measurements of Soil Water Content at Shallow Depths for Landslide Monitoring. *Geosciences*, 10(10): 409
- Viaggio, S., Iacopino, A., Bovolenta, R., Federici, B. (2022). Landslide susceptibility assessment: soil moisture monitoring data processed by an automatic procedure in GIS for 3D description of the soil shear strength. *Free and Open Source Software for Geospatial-FOSS4G Firenze 2022* (22-28 Aug. 2022)