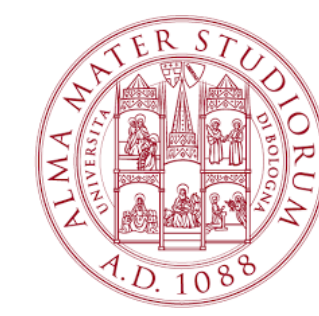




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1. INTRODUCTION AND AIMS

Early Warning Systems (EWS), generally based on rainfall thresholds, are useful tools for mitigating impacts of shallow landslides and floods (Piciullo et al., 2018). Even if satellite sensors are able to provide soil moisture and rainfall measurements over large areas (Brocca et al., 2015), threshold based EWS generally do not take into account both parameters. Instead, soil hydrological conditions can play a fundamental role in the triggering of shallow failures or flooding events (Brocca et al., 2008; Godt et al., 2012). Rainfall measures are also uncertain due to limited spatial representativeness of ground sensors and low density of available measuring networks.

The ANDROMEDA project, funded by Fondazione Cariplo (grant n°2017-0677), aims to:

- develop a new integrated hydrological-hydraulic model to predict shallow landslides and floods occurrence that integrates also spatially-distributed rainfall and soil moisture measured by satellites.
- return maps of flood and landslide prone areas and soil moisture-rainfall thresholds to use for the development of a prototypal Early Warning System for shallow landslide and flood prediction.

2. THE STUDY AREA

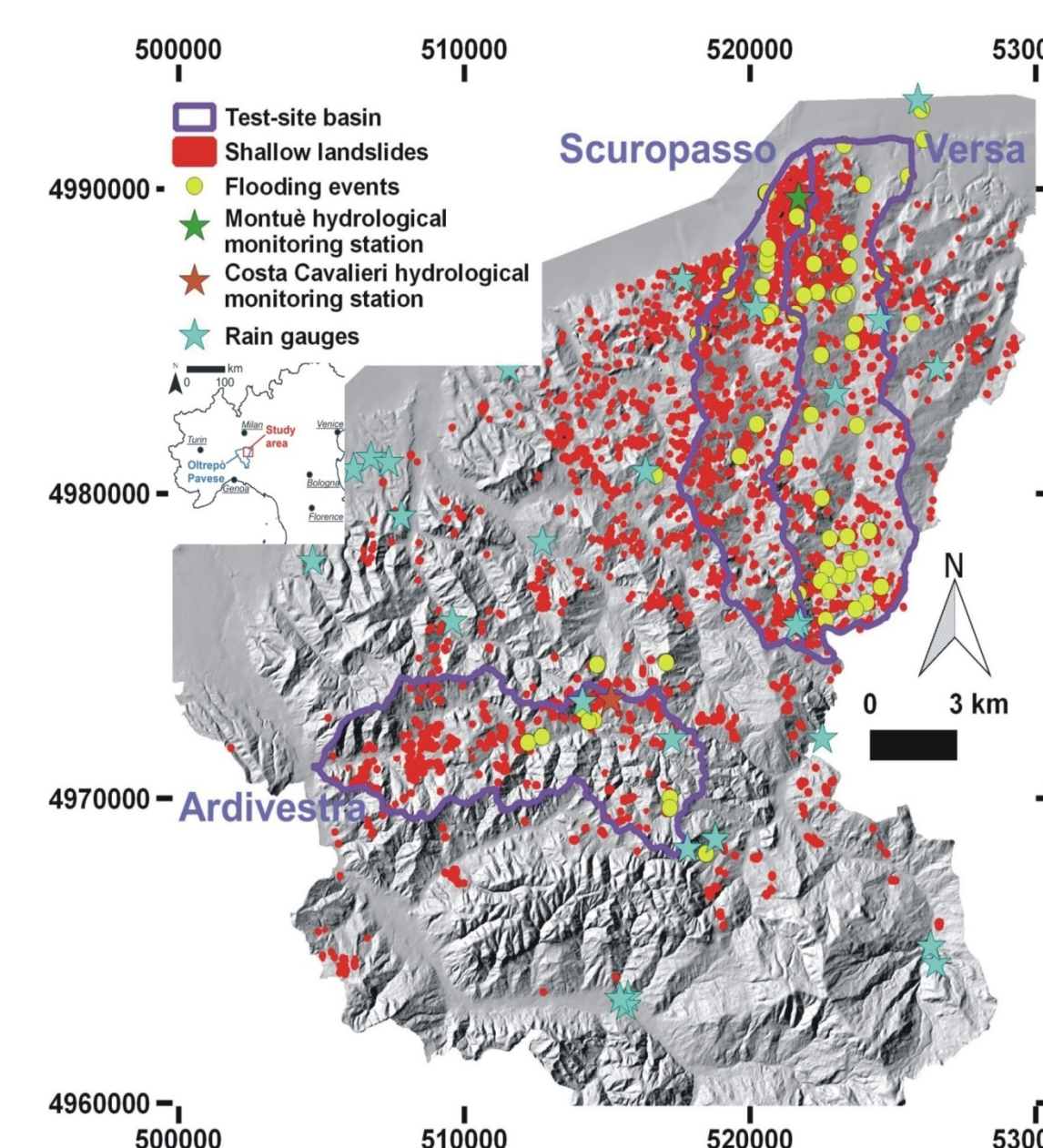
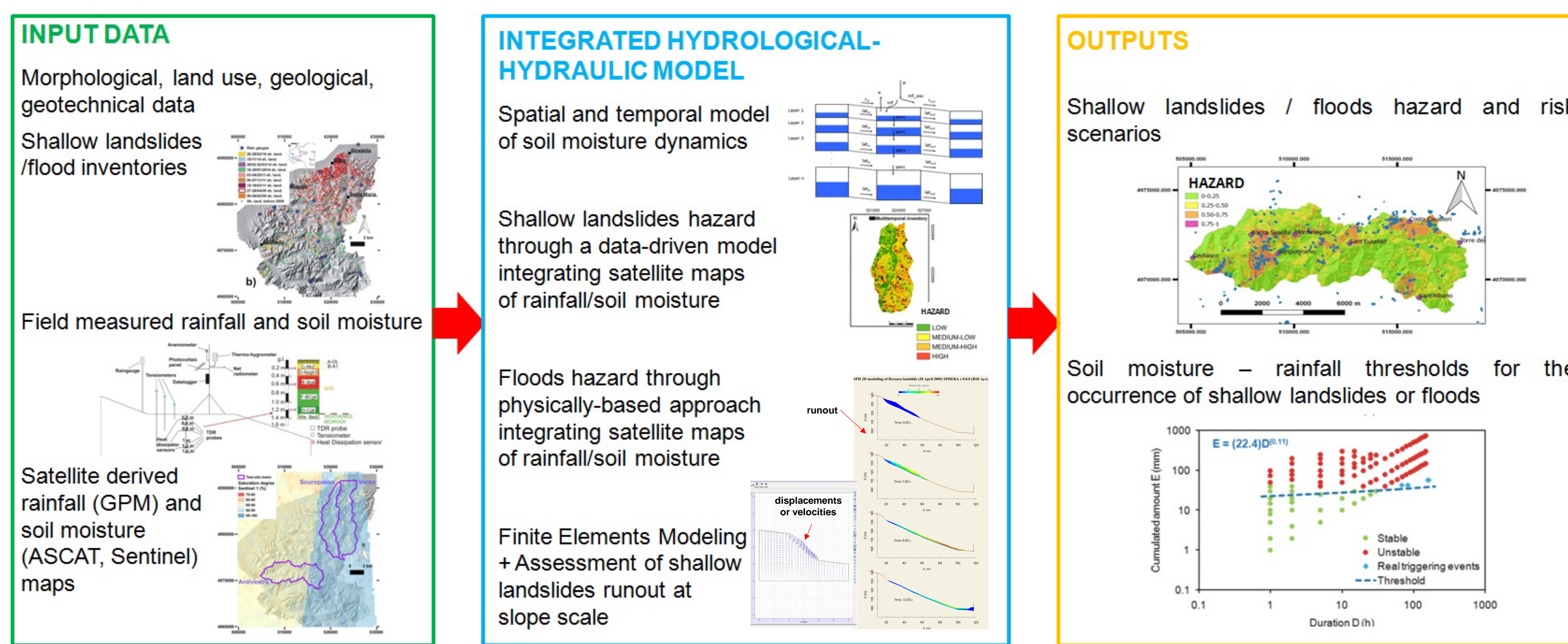


Figure 1. Location of Oltrepò Pavese area and of the three pilot sites of the project.

2. METHODS



3. PRELIMINARY RESULTS

3.1 VALIDATION OF SATELLITE DERIVED RAINFALL AND SOIL MOISTURE

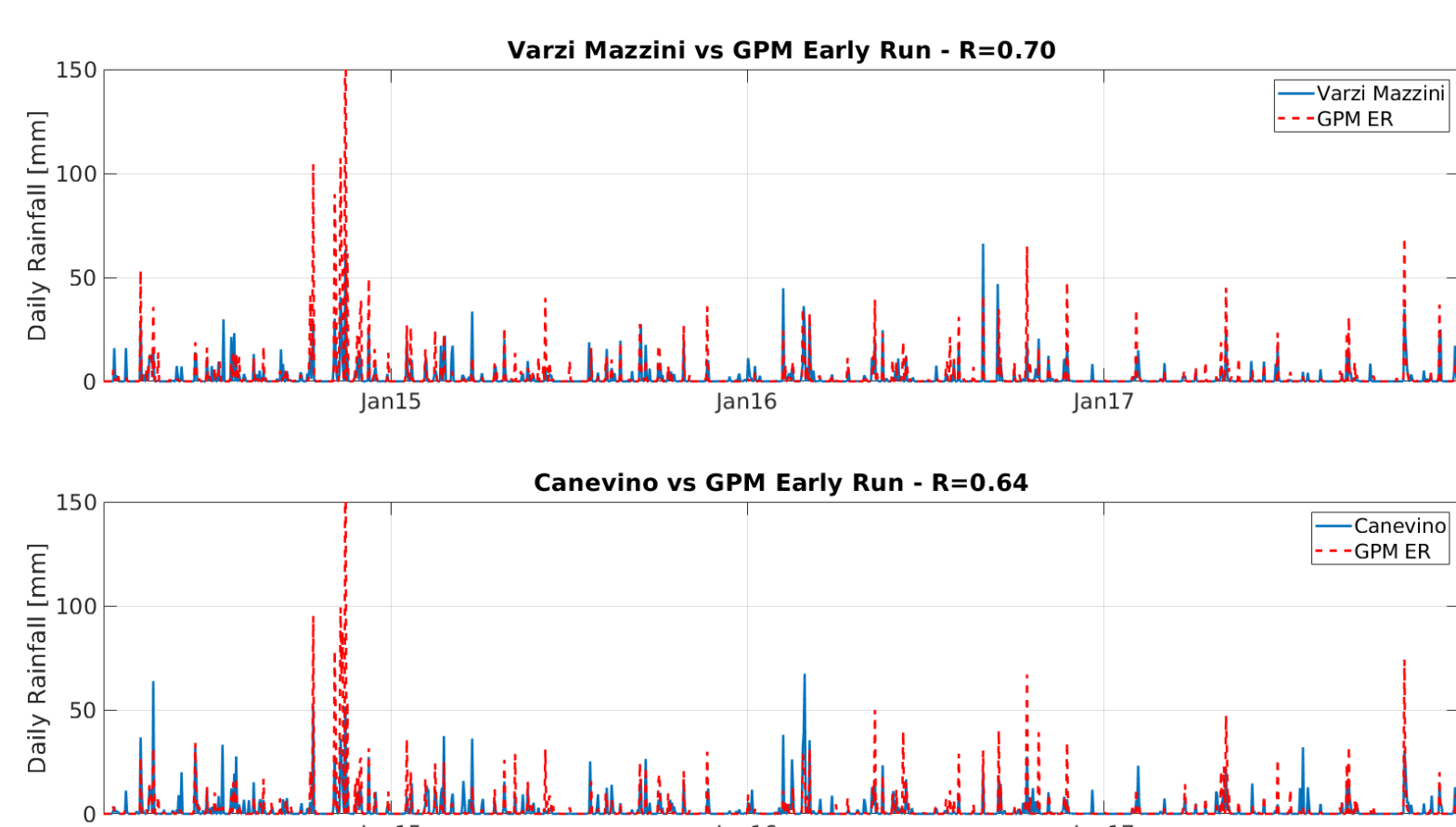


Figure 2. Comparison of daily observed rainfall data and GPM Early Run estimates.

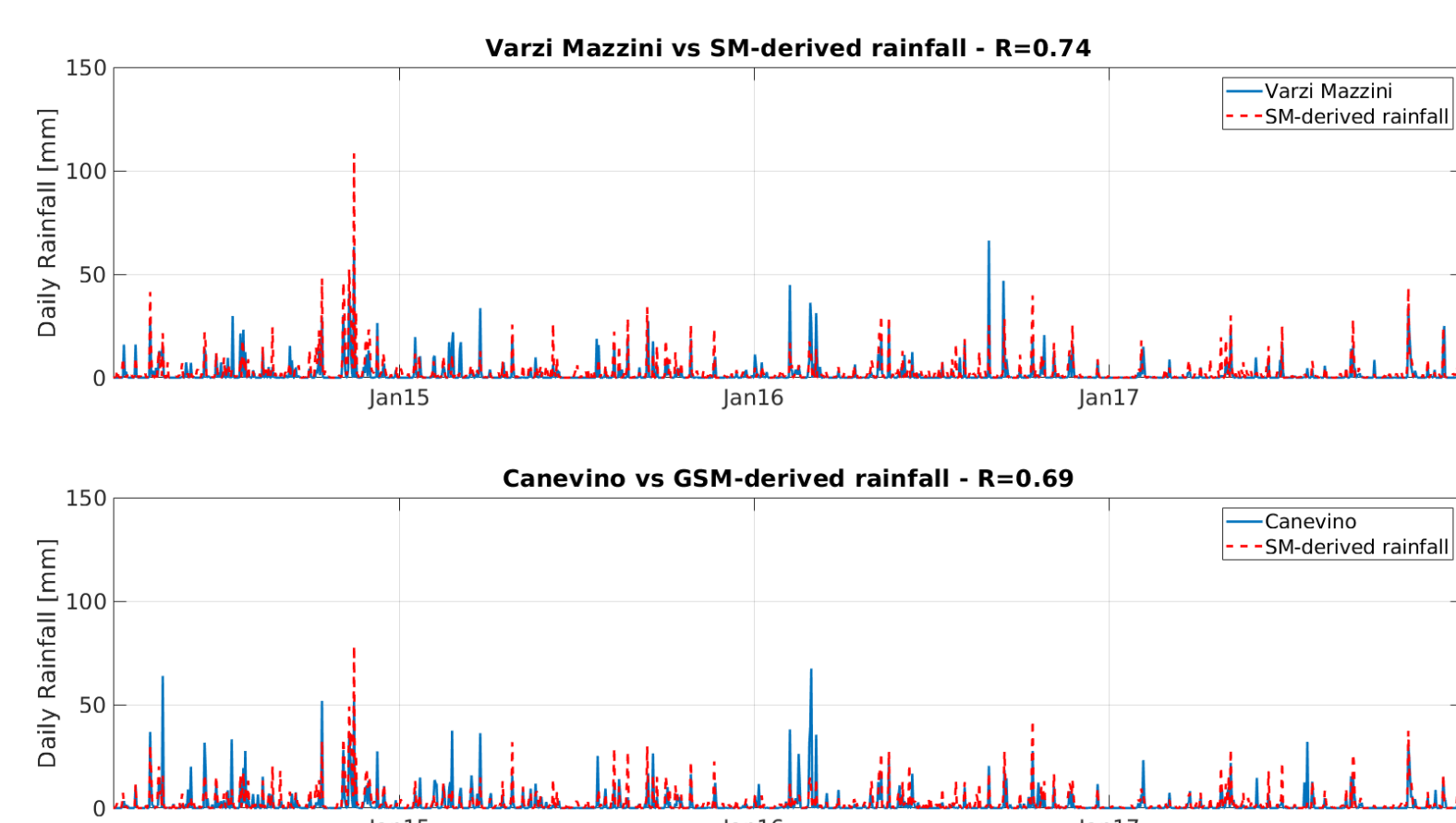


Figure 3. Comparison of daily observed rainfall data and soil moisture derived rainfall.

3.2 IMPLEMENTATION OF THE SATELLITE PRODUCTS IN THE MODEL OF SHALLOW LANDSLIDES AND FLOODS HAZARD

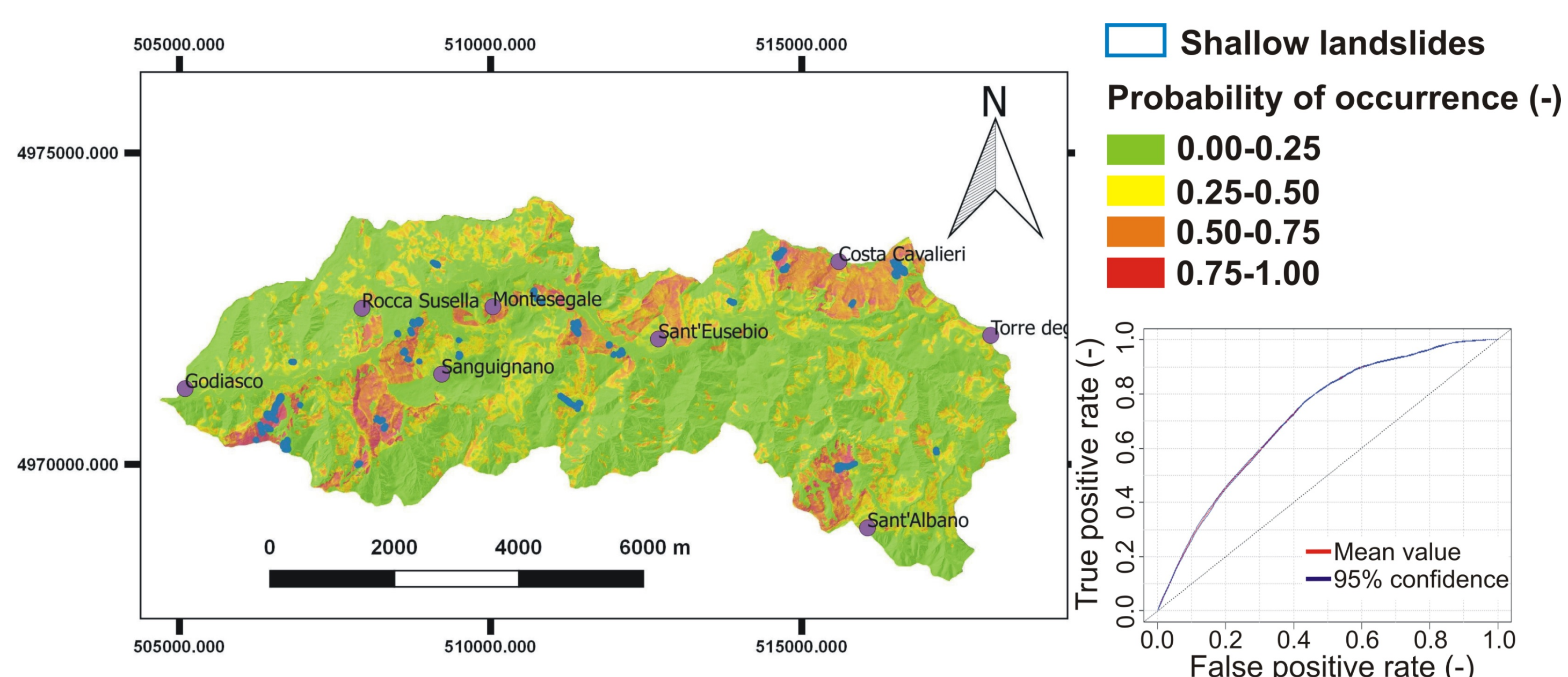


Figure 3. Probability of occurrence of shallow landslides for the event of 27-29 February 2016 (mean rainfall amount of 102 mm in 50 h). The map was obtained integrating morphological, hydrological and geological predictor variables (slope angle, topographic wetness index, catchment area, land use, lithology) with satellite measured rainfall amount and superficial soil moisture at the beginning of the event. Predictive capability of the model was good (AUC = 0.76), but it could improve considering: 1) modeled soil moisture at depths where shallow landslides sliding surfaces occur (generally, 1.0 m from ground); 2) other satellite rainfall or soil moisture products.

4. FUTURE DEVELOPMENTS

- Implementing and validating other hydrological satellite products
- Modeling shallow landslides hazard considering soil moisture maps at different depths
- Inserting satellite rainfall and soil moisture maps in the model for floods hazard
- Integrating field and satellite derived rainfall and soil moisture data for reconstructing thresholds for shallow landslides and flood occurrence

ACKNOWLEDGEMENTS

This work has been in the frame of the ANDROMEDA project, which has been supported by Fondazione Cariplo, grant n°2017-0677. We acknowledge the CINECA award under the ISCRA initiative, for the availability of High Performance Computing resources and support. SPHERA simulations refer to the HPC project HPCNHLW1. SPHERA v.9.0.0 is realised by RSE SpA thanks to the funding "Fondo di Ricerca per il Sistema Elettrico" within the frame of a Program Agreement between RSE SpA and the Italian Ministry of Economic Development (Ministero dello Sviluppo Economico). Thanks are given to RSE SpA (Dr. A. Amicarelli) for support activities on SPHERA.



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