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New methodologies of GPR Assessment for analysing water content in sedimentary deposits; Application to the Hospital Sant Pau Urban Area in Barcelona, Spain

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Ground Penetrating Radar was used in this study as a non-destructive geophysical method. The main objective of this research is focused on enhancing the local seismic soil site analysis. The study employs GPR images to determine changes in the ground that can be associated with changes on the seismic soil response. To determine the GPR capacity in detecting changes in the ground materials and improve new methodologies of the radar data processing.

Results could be used to improve the selection of areas for more intensive scrutiny, enhancing the analysis of local seismic behaviour studies. Soil site studies are crucial in the analysis of seismic hazard in populated areas. This study and analysis will be carried out in an urban environment at the Sant Pau Hospital in Barcelona city (Spain). Data were acquired in the field along with two different directions: parallel and perpendicular to the coastline of the Mediterranean Sea in Barcelona city.

The procedure is based in integrated data from the laboratory experiments by using 1600 MHz centre frequency and obtaining real GPR field images in the field by using 25 MHz centre frequency antenna in the Sant Pau Hospital. Therefore, radar data will be first processed using the commercial software ReflexW, followed by a more specific processing sequence (both in amplitude and frequency domains) with a specific algorithm developed with MATLAB.

Finally, the mathematical processing of the radargrams in terms of water content compared to the information based on historical maps. Results show that GPR is a promising method and compared to previous studies a good agreement was observed in this specific case study.