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# Data fusion of GPR and SAR imagery information for transport infrastructures monitoring

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Geophysical natural hazards and human-related activities are significant sources of surface evolution and structural deformation in linear transport networks, such as highways and railways. Therefore, an accurate monitoring of these occurrences stands as a crucial task to maintain the highest operational safety standards.
In such a framework, the use of Ground Penetrating Radar (GPR) is nowadays a well-known methodology among the spectrum of available non-destructive testing methods for the collection of ground-based information. As far as large-scale analyses at the network level are concerned, space-borne Interferometric Synthetic Aperture Radar (InSAR) gained consent as a viable technique for the assessment of surface deformations. However, potential of this method for transport infrastructure monitoring has not been deeply assessed yet.
According to the above, this research deals with the evaluation of the potential of integration between InSAR and GPR for monitoring transport asset at the network level. To this purpose, the permanent scatterers InSAR (PS-InSAR) technique was applied to identify ground displacements occurred over a ten kilometers long railway track located in Puglia, Southern Italy. At the same time, field tests with GPR were carried out using multi-frequency systems equipped with different high-frequency horn antennas and mounted on an inspection convoy.
Useful insights have been pointed out and relevant critical areas of possible weaknesses in the railway track have been detected, concerning both regular stretches of track bed, and punctual infrastructures (bridges). Results have demonstrated the viability of integrating InSAR and GPR methods, paving the way to future implementations of automatic algorithms for the effective assessment of safety-critical conditions of linear infrastructures.