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The contribution of GPR to investigate damages related to the monumental buildings

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The presence of particular microclimatic conditions inside monumental buildings is responsible of bio-deterioration processes. In the many cases efflorescence and moulds are visible on the faces of several monuments of historical importance located in the Salento peninsula (southern Italy). Therefore rehabilitation and preservation of historic monuments and ancient structures is attracting more and more interest.
The conservation of architectural heritage is a difficult task due to the complex geometry of buildings and large variability of construction materials.
Ground Penetrating Radar uses electromagnetic (EM) waves, which are sensible to the dielectric properties of materials and to their moisture content. These EM waves are characterized by a specific frequency, which corresponds to the central frequency of the broad spectrum of frequencies emitted by the transmitter antenna. When a large contrast between dielectric properties between adjacent materials or objects occurs, these EM waves are reflected towards the receiver antenna.
In the old monumental buildings the masonry structures frequently exhibit cracks, voids and detachments adding to the presence of high amounts of moisture that results frequently in high contrast reflections in radar signals. However, the complexity of geometry and the high level of material and structural heterogeneity that characterizes such old structures make results from GPR often difficult to analyze and interpret.
In this research several case histories were proposed in order to evidence an approach that consider a particular processing strategies to display the data in the form of “frequency maps” to evidence absorption losses probably linked to higher moisture content.