Geophysical Research Abstracts
Vol. 20, EGU2018-16131, 2018
EGU General Assembly 2018

Application of ERT method on gypsum core samples for the study of failure propagation.

Chiara Caselle, Cesare Comina, and Sabrina Bonetto
Torino University , Via Valperga Caluso 35, Torino, Italy, Earth Science, Italy (chiara.caselle@unito.it)

The failure modes of geomaterials subjected to the application of an external load is an important rock property, extensively studied, because it can provide information on the mechanical behaviour of the material. The study of the failure propagation within the rock, the evaluation of the load thresholds that lead to the opening of the first microcracks, their reorganization to create a failure surface give important information on the mechanical behaviour of rock materials, useful in several frameworks (underground and open pit quarry environments, civil engineer constructions, landslides,...).
The interest in investigate and understand failure modes of geomaterials in known load and environmental conditions brought to the research of methodologies to investigate this rock property in laboratory environment, in order to have the possibility to study the failure propagation during the preformation of a mechanical test.
The methodology proposed in this work includes the use of ERT method on a cylindrical sample which, thanks to the electrical resistivity contrast among the intact rock and the fracture, allows the reconstruction of orientation and continuity of failures.
The methodology was tested on resistivity models and validated by the application on gypsum cylindrical samples, after the execution of a UCS test. The samples showed a clearly recognizable failure surface on the external surface, which however maintains a cohesion that keeps the sample intact.
The ERT of cylindrical samples were acquired with 48 electrodes, along 4 rows of 12 elements. The spacing of electrodes along each row is equidistant. A specific tool for the acquisition and a specific acquisition array were developed. For each acquired quadripole, both the direct and the inverse measurement were acquired, in order to check the data quality.
A three-dimensional cylindrical mesh with the geometrical features of the sample and the position of the electrodes has been developed and the measured apparent resistivity data were inverted using the R3 software.
The results of both models and sample tests offered a good visualization of the failure surface into the samples, compatible with the direction of the fracture observable from the external surface.
Samples were tested in different saturation conditions: results highlighted a better visualization of failure surfaces when the sample is saturate.
The possibility to apply this methodology during the execution of UCS test may provide a detailed knowledge of the failure propagation within a rock material during the application of an external load.