Geophysical Research Abstracts
Vol. 14, EGU2012-11115, 2012
EGU General Assembly 2012

A methodological integrated approach to optimize a hydrogeological engineering work

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The geoelectrical survey applied to hydraulic engineering is a well known in literature. However, despite of its large number of successful cases of application, the use of geophysics is still often not considered; this due to different reasons as: the poor knowledge of the potential performances; the difficulties in the practical implementation; the cost limitations.
In this work, an integrated study of non-invasive (geoelectrical) and direct surveys is described, aimed at identifying a subsoil foundation where it possible to set up a watertight concrete structure able to protect the purifier of Senise, a little town in Basilicata Region (Southern Italy).
The purifier, used by several villages, is located in a particularly dangerous hydrogeological position, as it is very close to the Sinni river, which has been obstructed from many years by the Monte Cotugno dam. During the rainiest periods, the river could flood the purifier, causing the drainage of waste waters in the Monte Cotugno artificial lake. The purifier is located in Pliocene- Calabrian clay and clay – marly formations covered by about 10m layer of alluvional gravelly-sandy materials carried by the Sinni river.
The electrical resistivity tomography acquired with the Wenner Schlumberger array was revealed meaningful for the purpose to identify the potential depth of impermeable clays with high accuracy. In particular, the geoelectrical acquisition, orientated along the long side of purifier, was carried out using a multielectrodes system with 48 electrodes 2 m spaced leading to an achievable investigation depth of about 15 m The subsequent direct surveys have confirmed this depth so that it was possible to set up the foundation concrete structure with precision to protect the purifier.
It is worth noting that the use of this methodological approach has allowed a remarkable economic saving as it has made it possible to correct the wrong information, regarding the depth of impermeably clays, previously inferred by the engineers.