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***Waterborne Continuous Vertical Electric Soundings for geological characterization in shallow water environments: some field applications.***

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The protection of water resources is a current problem at a global scale, especially in regions where this resource is poorly available. In this respect there is an increased pressure on water managers to improve water use efficiency. In this context the geological characterization of the bottom sediments of lakes, rivers and canals, both natural and artificial, is essential to determine the hydrogeological properties of the deposits and to investigate the interconnecting relationships between surface water and groundwater. In natural lakes and basins the characteristics of the different typologies of sediments, the chemico-physical properties of the basin water and their interaction with the outside environment are indeed of major importance for a correct analysis of their equilibrium. In irrigation areas, a major aspect of water usage is the seepage of water from irrigation canals which is always localized and strictly connected to peculiar geological conditions of bottom sediments.

Geological analyses in water-covered areas are however difficult with traditional survey techniques. Direct investigations are often neither cost-effective nor reasonably quick and adequate in number to cover the whole surface of a basin or the whole length of a river and canal to obtain a reliable correlation of data over a wide area. Geophysical techniques can therefore be very useful to investigate areas which are entirely located beneath a water-covered surface. Among the available geophysical methods the use of non-seismic methods to study shallow inland water is relatively recent. Among the non-seismic techniques used for waterborne surveys, Continuous Vertical Electrical Soundings (CVES) have received greater attention. The possibility of using multichannel resistivity meters makes indeed possible to simultaneously perform several resistivity measurements, in a fast and cost-effective way. CVES have been applied in water-covered areas for different purposes and using different electrode configurations. In this respect there is a wide scientific literature.

Some examples of the applications of this technique for the geological and hydrogeological characterization in shallow water environments are reported. The technical characteristics of the instrumentation adopted is detailed with the results obtained in two case studies over natural lakes in Italy.