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# NEAR-SURFACE ELECTROSTRATIGRAPHY AS A TOOL TO DETECT THE CONNECTIVITY OF THE SEDIMENTARY BODIES

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**Summary.** The representation of heterogeneity of aquifers at different scales (from hydrofacies to hydrostratigraphic systems) is a key topic to forecast flow and transport in alluvial plains. The use of time and cost effective geophysical exploration tools for the definition of geophysical bodies with specific relationship with the heterogeneous and stratified sedimentary bodies, which form aquifers and aquitards, becomes increasingly important in order to improve the 3-D stochastic modelling of (hydro)-facies distribution, porosity and hydraulic conductivity (*K*) fields.

In order to interpret the 1-D electrical resistivity ($\rho$) models obtained by 89 DC vertical electrical soundings as a proxy of the sediments' hydrostratigraphic properties in the alluvial valley of palaeo-Sillaro river (Lodi plain, south of Milan – Italy), a Coarse/Fine litho-textural ratio (cut-off $\varnothing$=0.30 mm) was used to classify hydrofacies. The variability of C/F was compared with the *K* and $\rho$ of hydrofacies, both in the unsaturated and the saturated zone. A local petrophysical relationship between *K* and $\rho$ was then established and enabled to identify *i*) a Fine litho-textural association (C/F<1), with a prevailing "shale" conduction, low $\rho$ and small *K* and *ii*) a Coarse litho-textural association (C/F>1), with a prevailing electrolytic conduction, high $\rho$ and high *K*. The electrical resistivity at near-surface (unsaturated zone, <5 m b.g.s.) and at increasing depth (saturated zone, >70 m b.g.s) was then reclassified in term of the prevailing hydraulic properties (low to high permeability units).

3000 m of 2-D ERGI profiles gave further information to differentiate geoelectrical bodies, informally named electrostratigraphic units (EsU), defined by horizontal variations of the vertical electrostratigraphic sequence and characterized by a thickness coherent with the electrical equivalence and suppression principles. Shallow EsU (in the unsaturated zone) coincide with hydrofacies whereas deep EsU in the saturated zone can be interpreted as the geoelectrical images of the connectivity of the sedimentary bodies, assembled with a prevailing association of hydrofacies and characterized by prevailing hydraulic and electrical properties.

Therefore the electrostratigraphy provides an efficient multi-scale tool to validate and possibly revise the hydrostratigraphic framework of the aquifers in the alluvial valley of palaeo-Sillaro river.