Application of AEM to geotechnical and engineering issues 2

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The recent improvements in data acquisition (thanks to instrumentation characterized by high performance) and processing, allowed to resolve challenging targets (shallow and/or small), having a relevant importance for most of the engineering-geotechnical applications.

Figure 1 shows what is the present degree of resolution of the AEM results, actually comparable with that one of ground-based geophysics: the top panel shows the results of our inversion of SkyTEM data, imaged as interpolated contour, while at the bottom we present the 2D resistivity section derived from a Wenner-Schlumberger ERT. The agreement is really impressive, either in terms of geometry and thickness of the structures, and of resistivity values.

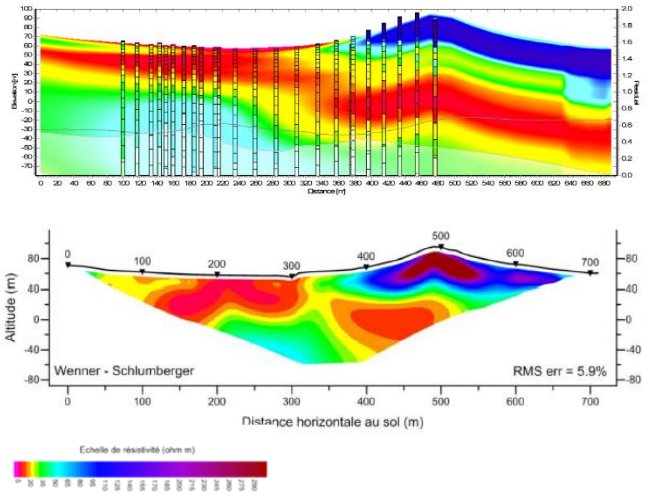

Figure 1

The capability to resolve accurately shallow layers is fundamental for the design of infrastructures (roads, railways,…). The conductive response of the weathered capping is moreover a good target for AEM.
Figure 2 shows a case-study in Amazonas, Brazil, where a road had to be realized, so that it was important to assess preliminarly the thickness of the overburden, above the granitic bedrock. This is a resistivity slice at 5-10 m depth, with the results of some boreholes. The colourscale of the latter ones was arranged so that to indicate, at the same depth, the occurrence of weathered rocks (green), fractured rocks (light blue) or hard rocks (dark blue). On the contrary the resistivity colourscale (represented at the bottom of the map) was arranged so as to point out increasing resistivity going from red to blue. There is a good match for most of the boreholes, between the highest resistivity areas and the hard rock outcrops, and between the lower resistivities and the weathered layers.
Going into depth, it is possible to get confirmation of the weathering resolution. Figure 3 shows the same comparison at 20-30 m depth.

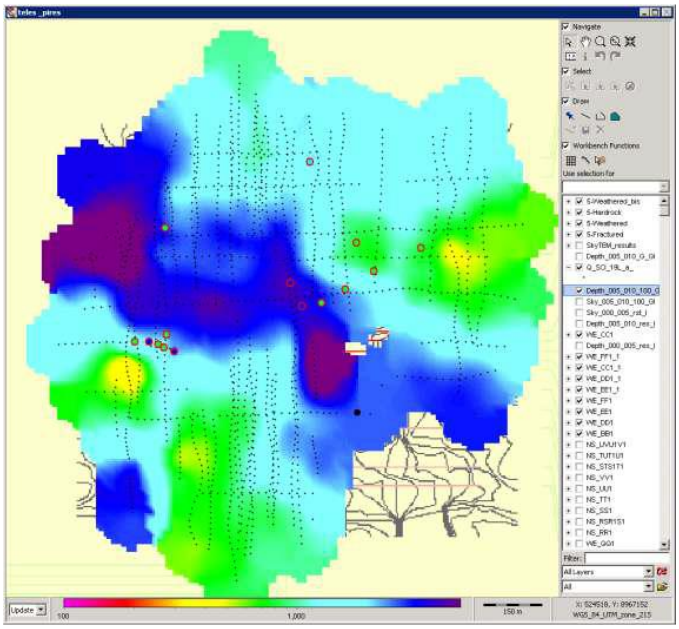

Figure 2

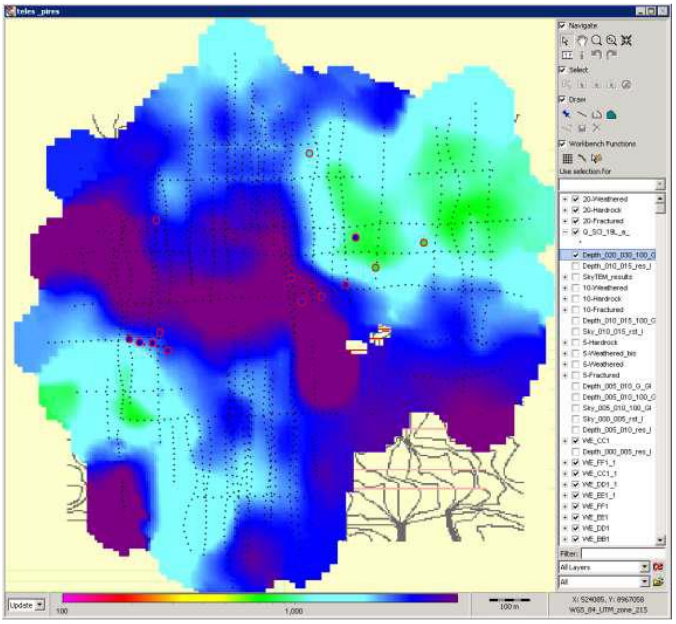

Figure 3

It must be noticed the capability to distinguish challenging resistivity contrast for EM: the weathered rocks show values of about 500 ohm-m, whereas the granitic bedrock has resistivity higher than 2000 ohm-m. It was possible to extract a map of the overburdem for the whole survey area.