

CHEERS!

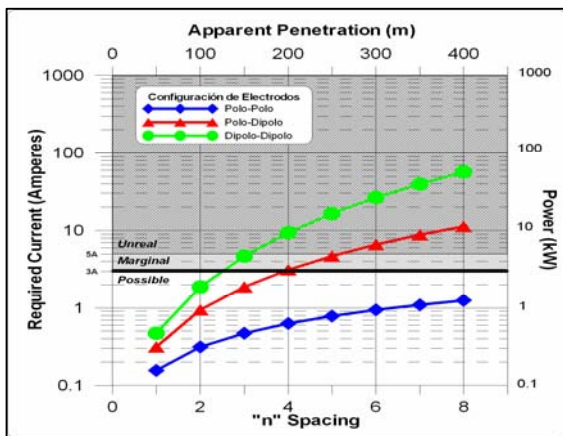
The Environmental and Engineering Geophysical Society (EEGS), that periodically publishes the Newsmagazine *FastTIMES*, issued invitations to selected authors to contribute with specialized notes about geophysical activity all over the World. The project started in mid-2004 with cooperation of the SEG (USA), EAEG (Europe), AEG (USA), NSG (USA), SEGJ (Japan), EIGG (Europe) and CGS (Taiwan), with the purpose of obtaining a broad representation of geophysical techniques currently being employed. The *FastTIMES* newsmagazine, volume 9, number 3, of November 2004 included several articles by authors from USA, Japan, Australia, China, Korea, Taiwan, India, PERU and Senegal. Our permanent editor, José R. Arce, who regularly prepares our newsletter *Perfiles*, published his paper MODERN GEOPHYSICAL ADVANCES IN PERÚ, in conjunction with other ones from the above mentioned countries.

José E. Arce

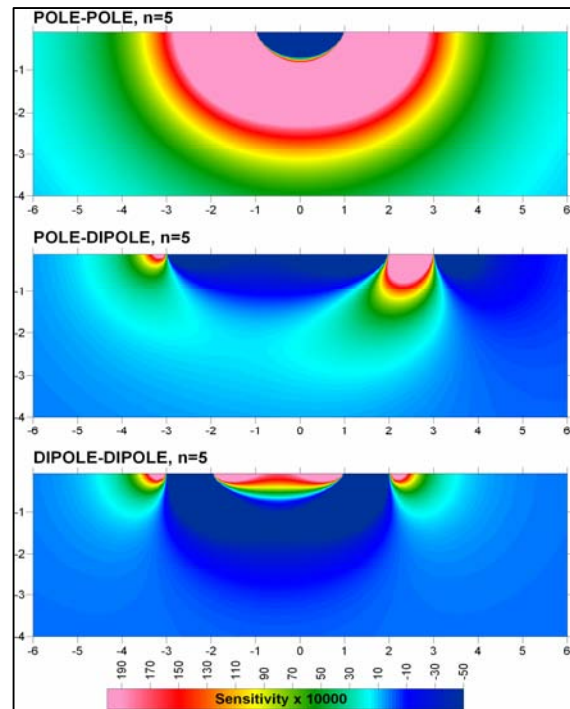
SENSIBILITY AND PENETRATION OF THE VARIOUS IP/RESISTIVITY ARRAYS

The main topic of this *Perfiles* is a partial adaptation of the article *Reconstrucciones Icónicas Tomográficas del Subsuelo* presented by José R. Arce on the XII Congreso Peruano de Geología (2004).

One common mistake in electrical geophysical methods is to not choose an adequate electrode array which allows sufficient depth penetration of the induced electric field. Each array has a specific range of applications, as well as advantages and disadvantages, and their mathematical modeling is inherently non-singular, so one field dataset may yield several different geophysical models. This is why it is important to select an electrode array which provides the required penetration, maximum signal quality and high detection sensitivity. The chart shown below for the three most common arrays presents apparent penetration and required power for increasing "n" spacings. To prepare this chart, we used an electrode "a" spacing of 50m in a 100 ohm-meter medium, with a minimum input voltage of 5mV and a contact resistance of 1000 ohms, all common conditions in IP/Resistivity operation in Perú.



The following image shows sensitivity responses for the same electrode arrays. The apparent penetration used for this image is the 5th "n" spacing. It is readily appreciated that Pole-Pole has the highest vertical penetration and signal strength, while dipole-dipole has the least. It is worth mentioning that dipole-dipole is very similar in signal to the gradient and Schlumberger arrays. The lesser horizontal resolution in Pole-Pole, particularly near the surface has been compensated with better modeling techniques and improved measurements of modern instrumentation, allowing it to detect small targets such as veins of less than 0.8m width. Pole-Dipole has less signal sensitivity and better lateral resolution but is asymmetrical, which is why surveys with this array must repeat measurements with electrodes in opposite directions along lines, in order to generate proper models, but this translates into double fieldwork. It is easy to deduct from the image that Dipole-Dipole (or gradient or Schlumberger) has very low sensitivity, which is why we do not use it or recommend it. Our 44 years of experience allowed us to work with all existing electrode arrays and in the last few years, with the advent of modern 2D and 3D modeling techniques, we have had the best results with the Pole-Pole array in the exploration of a wide range of mineral deposits. This positive experience ranges from the large copper porphyry systems of Southern Perú to large gold bearing deposits associated to silicification (Pierina, Quicay, and many more over the Apurímac-Cusco-Ayacucho trend), to manto-type and veins (Pataz, Arequipa, Ayacucho, Lima, among others.).



Until next time....

