Contaminated soil diagnosis by electrical resistivity tomography in underground storage tanks of different petrol stations in SE Spain

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Introduction

Soil contamination could be produced by petroleum products spill and leaks related to activities of refinement and fuel dispensing in Service Stations. Although pipelines and Underground Storage Tanks (UST) are designed to avoid this kind of accidents, the large amount of fuel dispensed at petrol stations during years may cause a very important damage in the surrounding uncontaminated area.Through this research it has been made an environmental diagnosis to identify possible leaks in UST as plumes in the subsoil by applying Electrical Resistivity Tomography 2D (ERT 2D), a non destructive geophysical technique in three petrol stations located in Murcia Region, Spain. Three ERT profiles were carried out in each petrol station per campaign (wet and dry seasons).

Results and discussion

Figure1 shows electrical pseudosections obtained by processing ERT data with PROSYS II and RES2DINV softwares corresponding to one petrol station in wet season.These results may define different confined zones in the subsoil with electrical resistivity values up to 2000 Ω·m, very high values for a natural soil. Hydrocarbons are excellent insulators and exhibit very high values of electrical resistivity [1] around 2500 Ω·m, values assigned to a possible fuel leak [2].

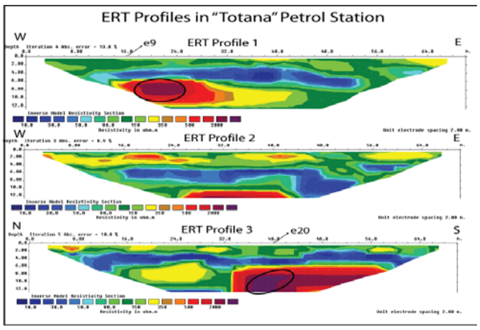

Figure 1: Processed pseudosection from ERT 2D profiles in "Totana" petrol station corresponding to wet season.

[1] Delaney *et al*. (2001) *Cold Reg. Sci. Techn.* **32**, 107–119.
[2] Znamensky (1980) *Field Geophysics. Nedra* **351**, 279–284.

On the variability of aerosol intensive optical properties over South America

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The variability of aerosol intensive optical properties, specifically single scattering albedo ($\omega_{o\lambda}$) and asymmetry parameter (g_λ), over South America have been analyzed using data from Aerosol RObotic NETwork [1]. The stations considered in the study are installed in distinct environment: Alta Floresta and Belterra are in the biomass burning regions of the southern and northeast of the Amazon basin, respectively, Cuiaba is in the *Cerrado* area, São Paulo is an urban center in the southeast of Brazil, and Arica and Surinam are coastal sites on the west and north coast of South America, respectively. The variability of aerosol optical properties inter and intra stations is significant, in particular for those located downwind of the biomass burning regions. Further differences emerge when the signal of smoke aerosols from the southern of Amazon basin are excluded from the mean calculation. For instance, São Paulo and Cuiaba locally produced aerosol is more absorbing than the indiscriminate average of optical properties suggests. The smoke transport from the southern Amazonia tends to reduce the heterogeneity that characterizes optical properties elsewhere. A clustering analysis based on the magnitude and spectral dependence of $\omega_{o\lambda}$ and g_λ was performed for each station. The factors associated with the occurrence of the identified clusters vary among the stations. For São Paulo and Cuiaba, as expected, the clusters occurrence are indeed correlated to the smoke transport. In Alta Floresta less absorbing clusters are in general associated with wetter and/or highly polluted conditions. Arica presents the lowest variability in optical properties, although a dependence on the wind diurnal cycle was observed. These results have been analyzed from the perspective of the representation of aerosol intensive optical properties in regional circulation models. Ongoing analysis evaluating the impact of the variability in optical properties on radiative balance using the Coupled Aerosol and Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modelling System [2] are discussed.

[1] Holben *et al*.(1994) *Rem. Sens. Environ*, **66**, 1–16.
[2] Freitas *et al*.(2010) *Chem. Phys. Discuss*. **7**. 8525–8569.