

Méthodes utilisant la conductivité électrique du sous-sol électrique – électrostatique - électromagnétique

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Quelle est l'origine de la conductivité électrique des roches et des sols ?

Le déplacement des ions

- dans le volume de l'eau interstitielle,
- à la surface des grains solides.

Elle sera donc croissante avec la température.

Elle va donc dépendre de la teneur en eau, de la quantité de sels dissous, de la surface spécifique.

Conductivité σ

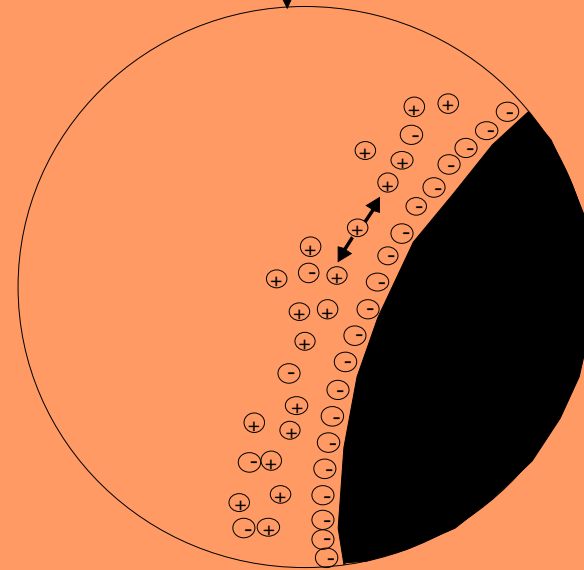
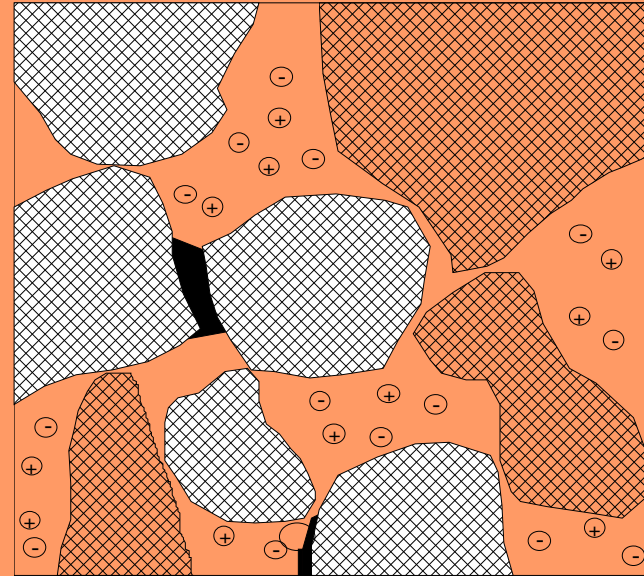
Résistivité $\rho = \frac{1}{\sigma}$

Milieu sans argile

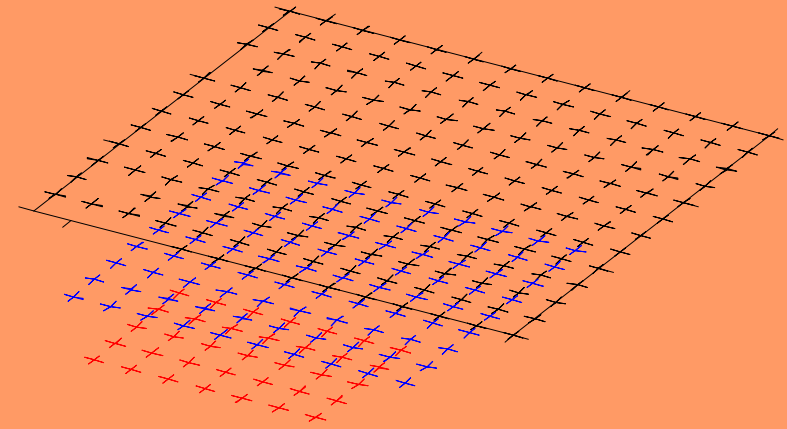
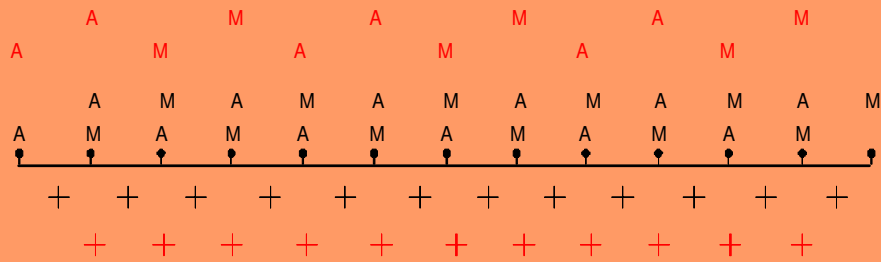
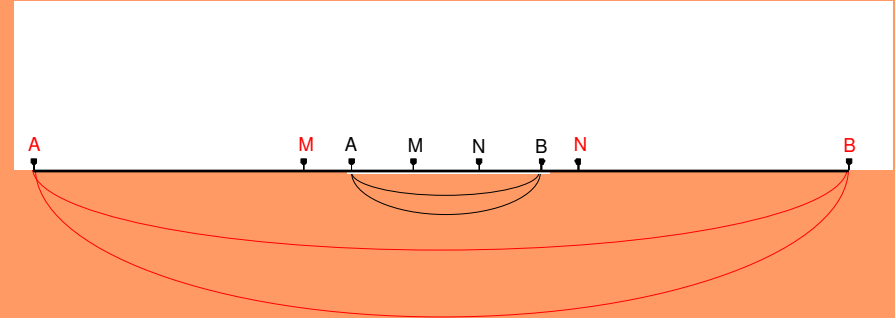
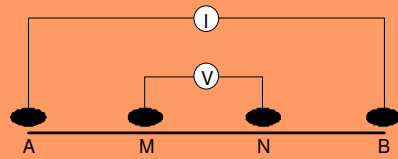
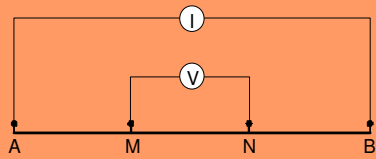
$$F = \frac{\rho}{\rho_w} = \frac{\sigma_w}{\sigma} = an^{-m}$$

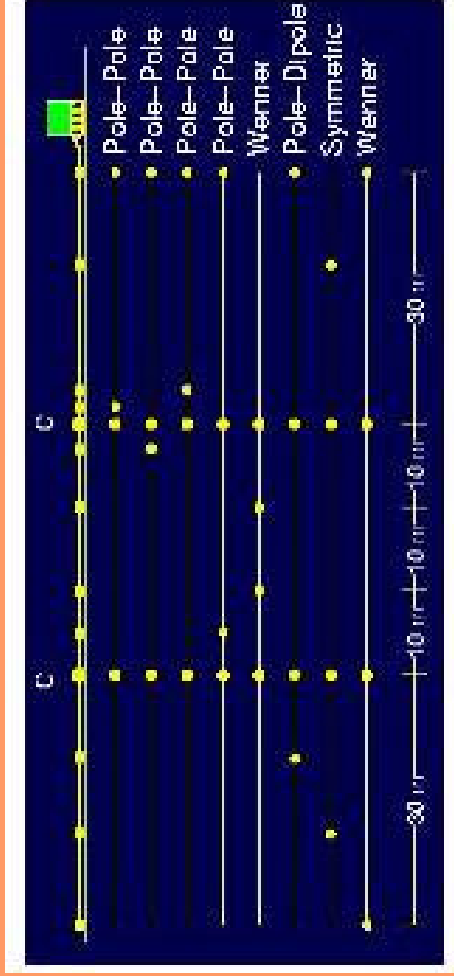
Milieu avec argile dispersée

$$\sigma = \frac{\sigma_w}{F} + \sigma_s$$



- Une formation conductrice peut donc correspondre à un matériau ayant soit une teneur importante en eau fortement minéralisée, soit une surface spécifique importante et donc un contenu en argile important.
- Pour les formations superficielles en milieu continental, la conductivité électrique doit d'abord être interprétée comme liée au contenu en argile.
- Parmi les différentes propriétés physiques utilisées en prospection, la conductivité électrique est celle qui présente la plus large gamme de variation







rendement : 2 ha/jour
maille de 5 x 5 m

poids : 15 kg
fréquence = 9.8 kHz

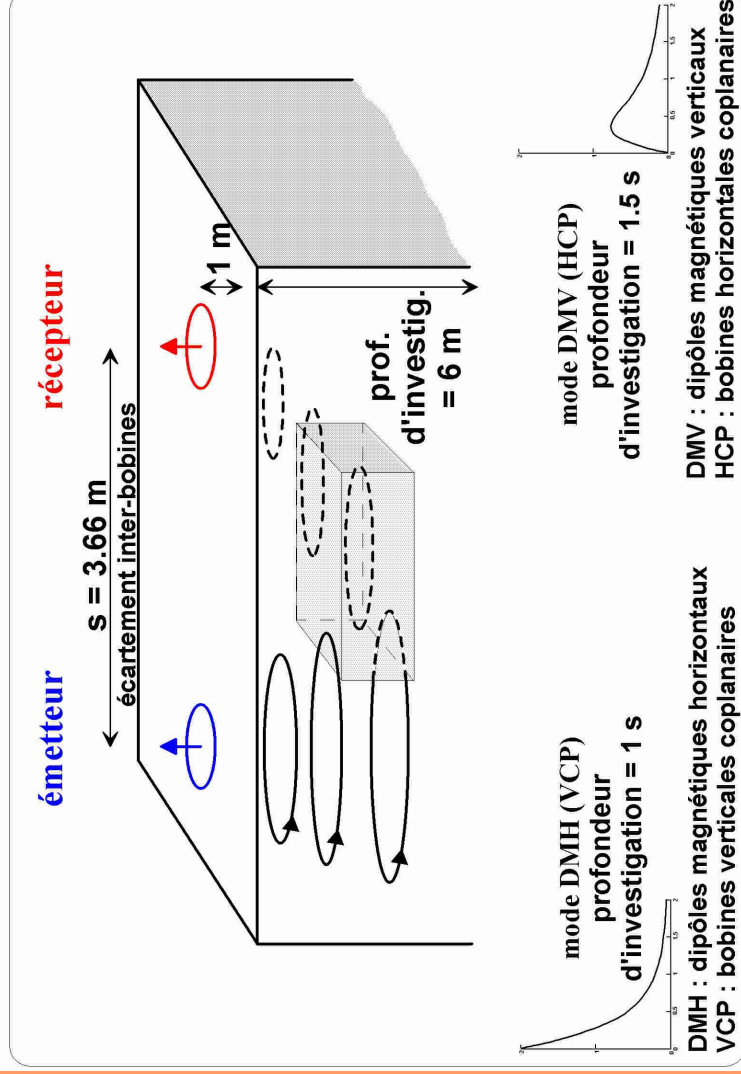
EM38

s=1 m, f=14.8 kHz

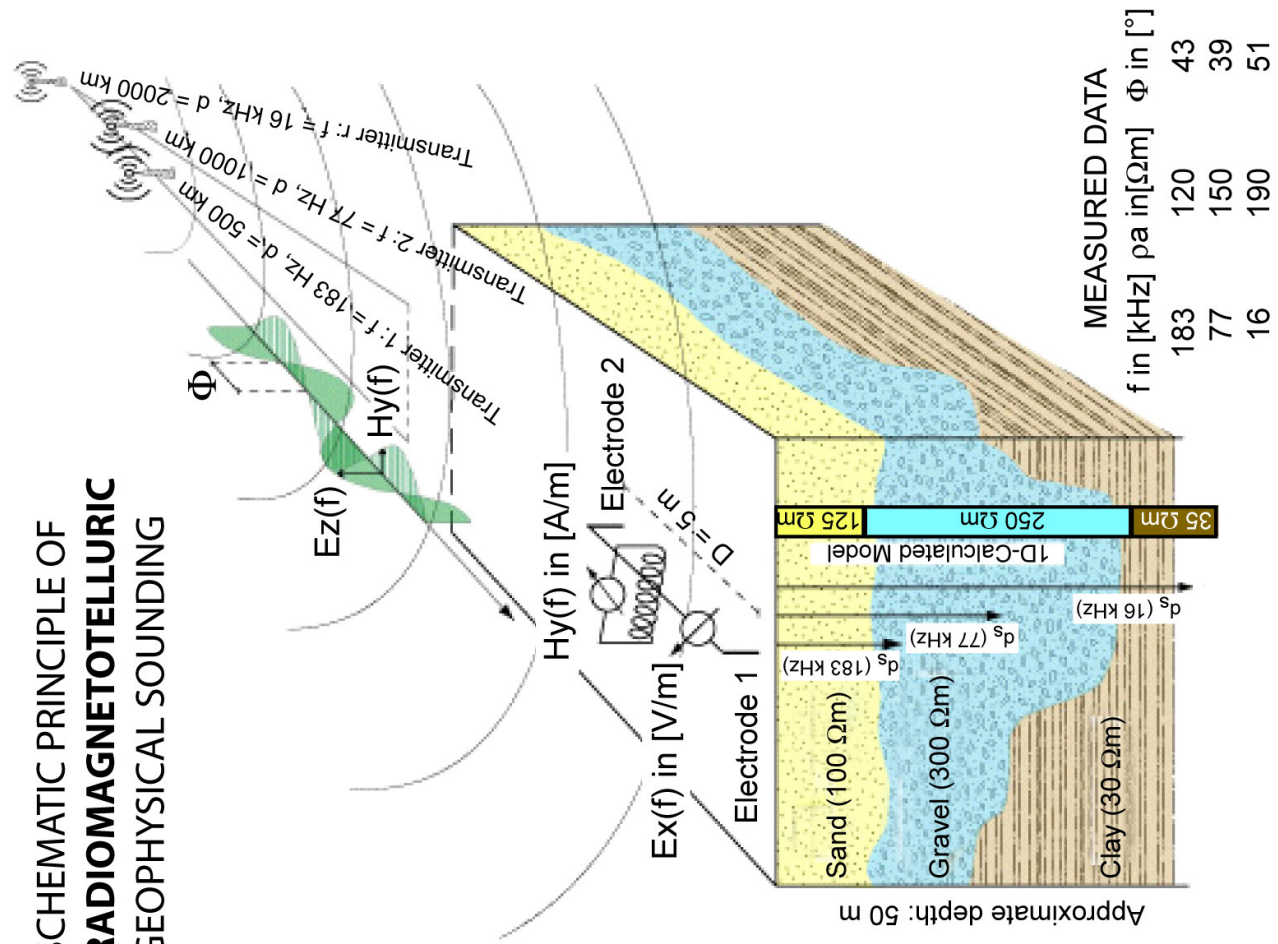
appareil EM31
(Geonics Ltd.)

EM34

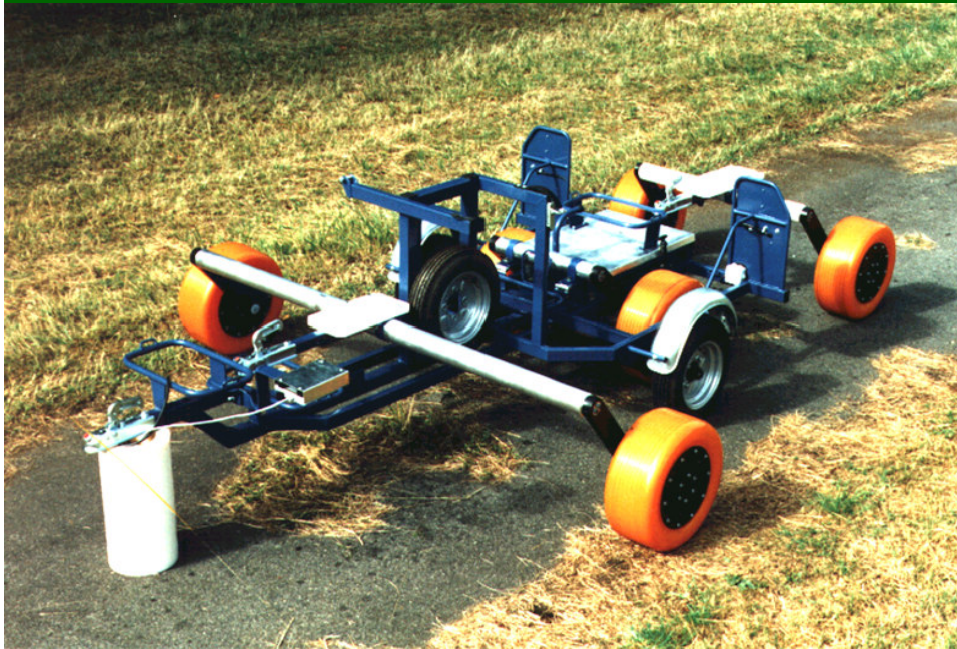
s=10 m, f=6.4 kHz
s=20 m, f=1.6 kHz
s=40 m, f=0.4 kHz

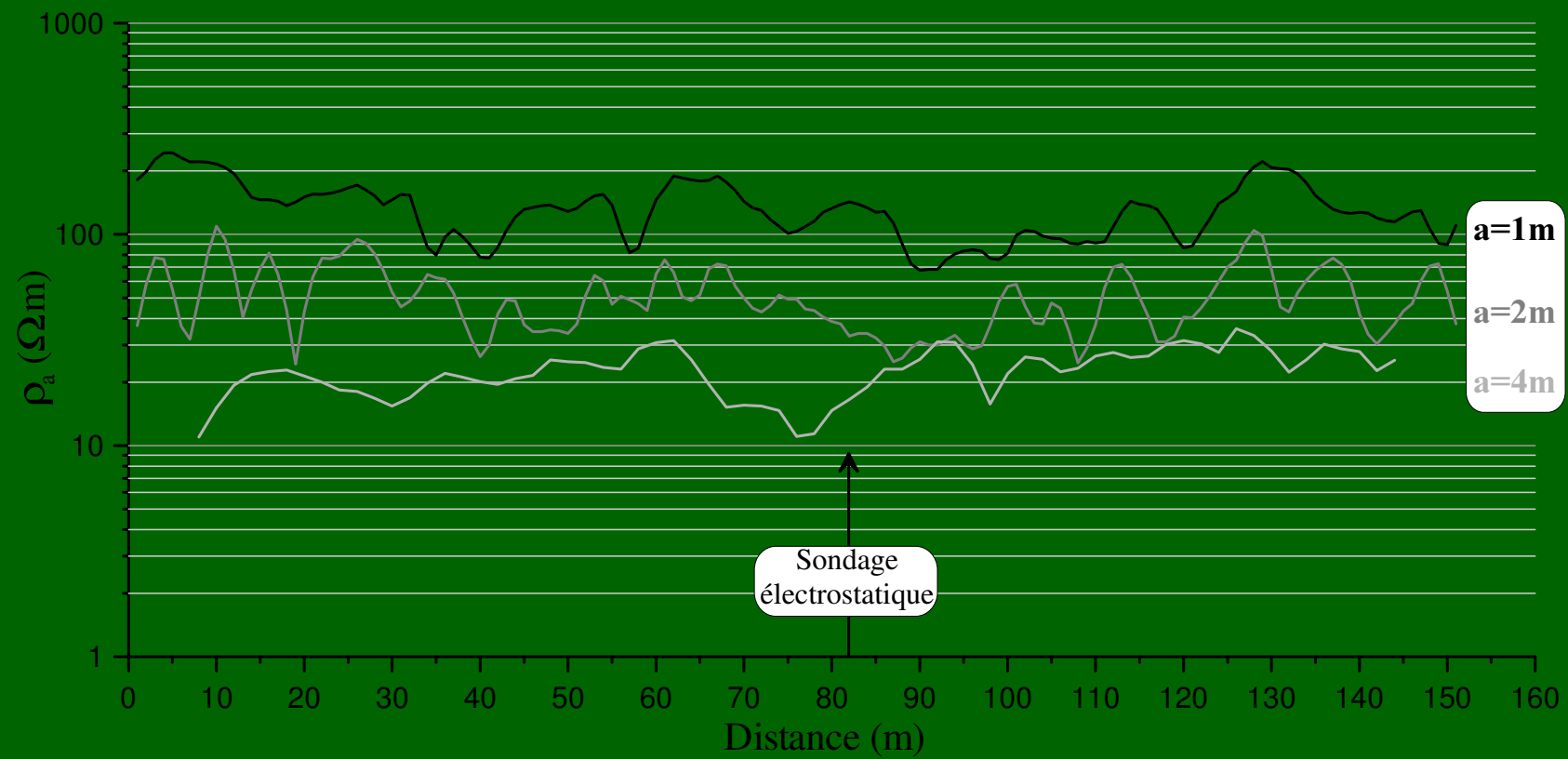


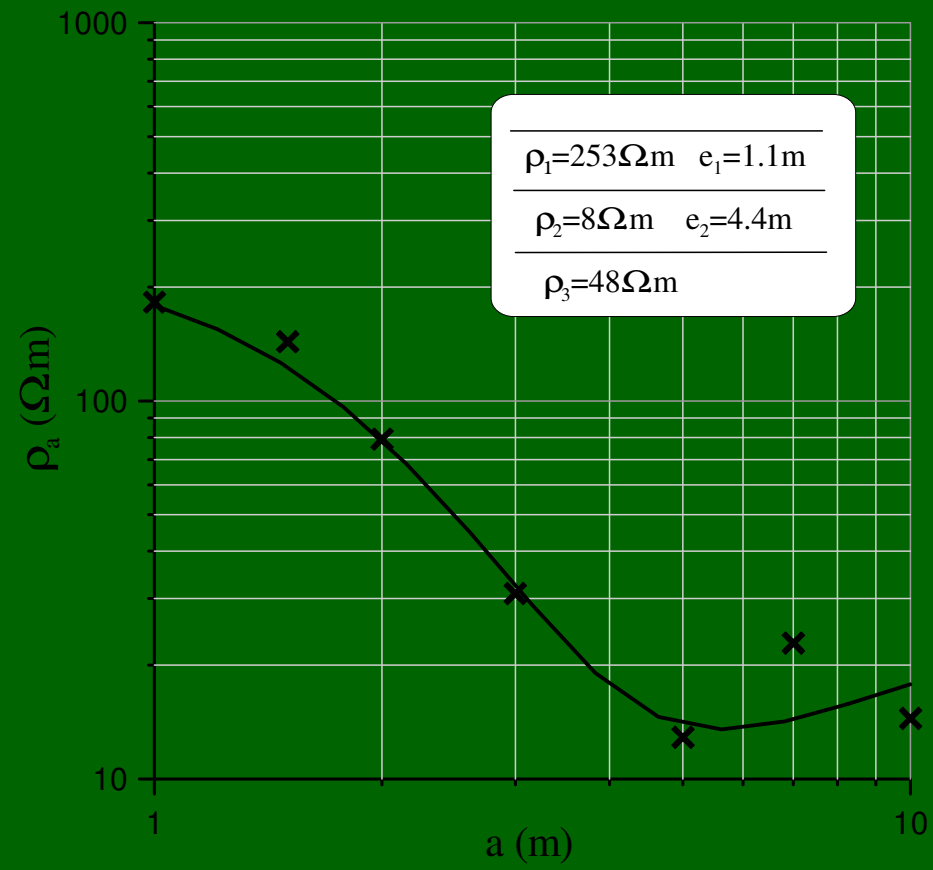
**SCHEMATIC PRINCIPLE OF
RADIOMAGNETOTELLURIC
GEOPHYSICAL SOUNDING**



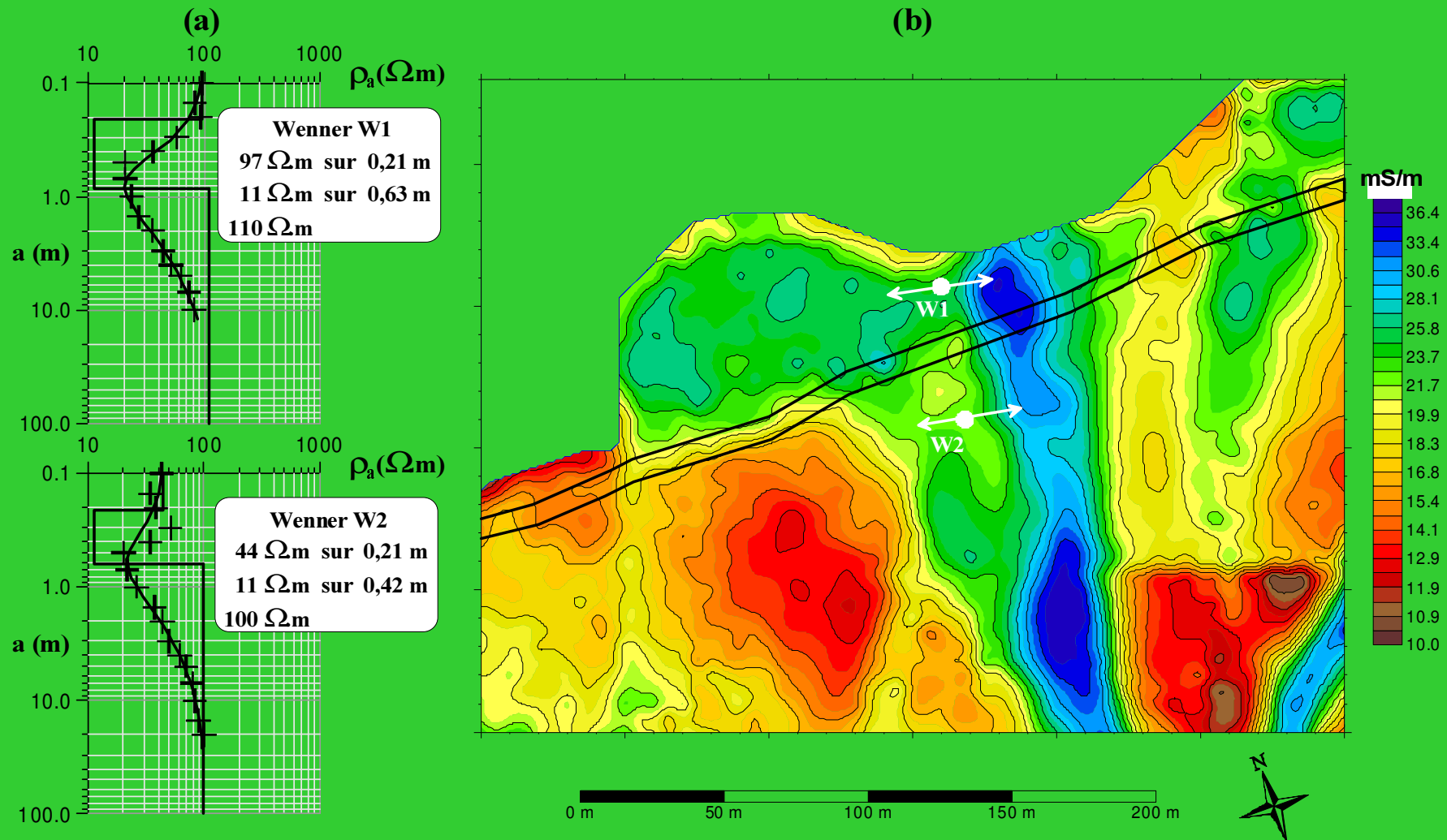
Prospection électrostatique rue de Mulhouse à Champigny sur Marne



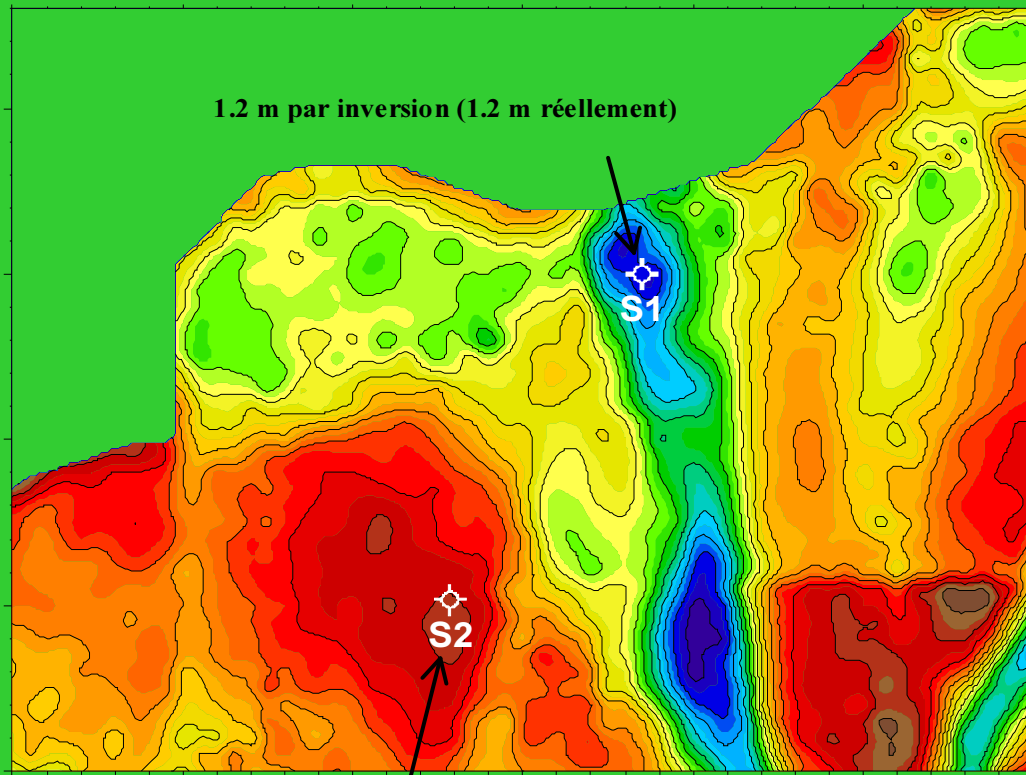




Etude de la répartition des zones de gravier en milieu alluvial. Exemple de Boulage (Aube)



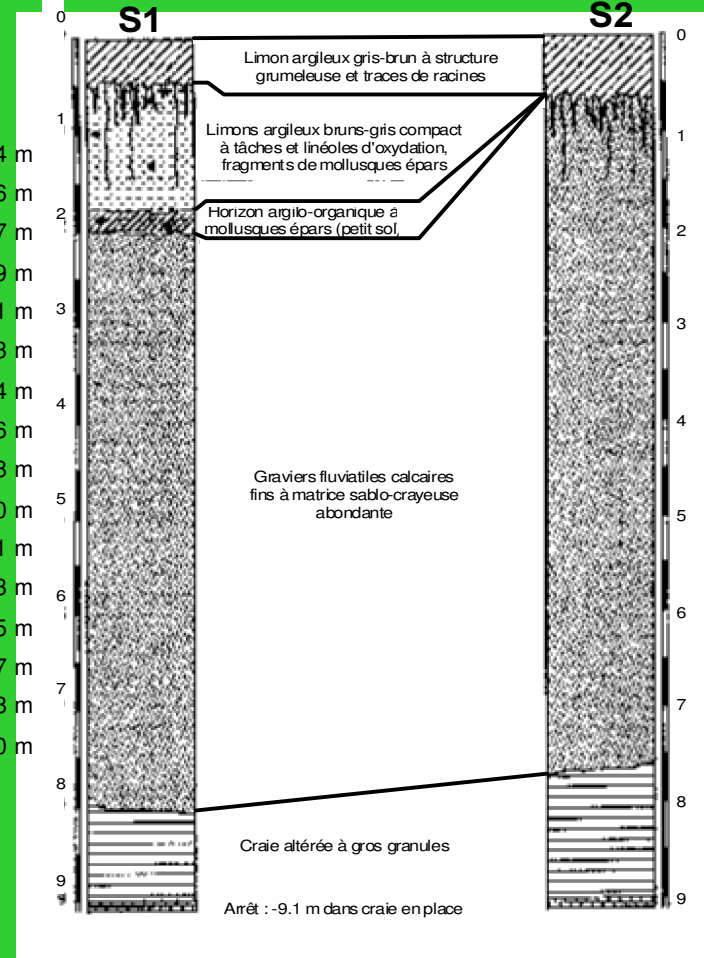
(a)



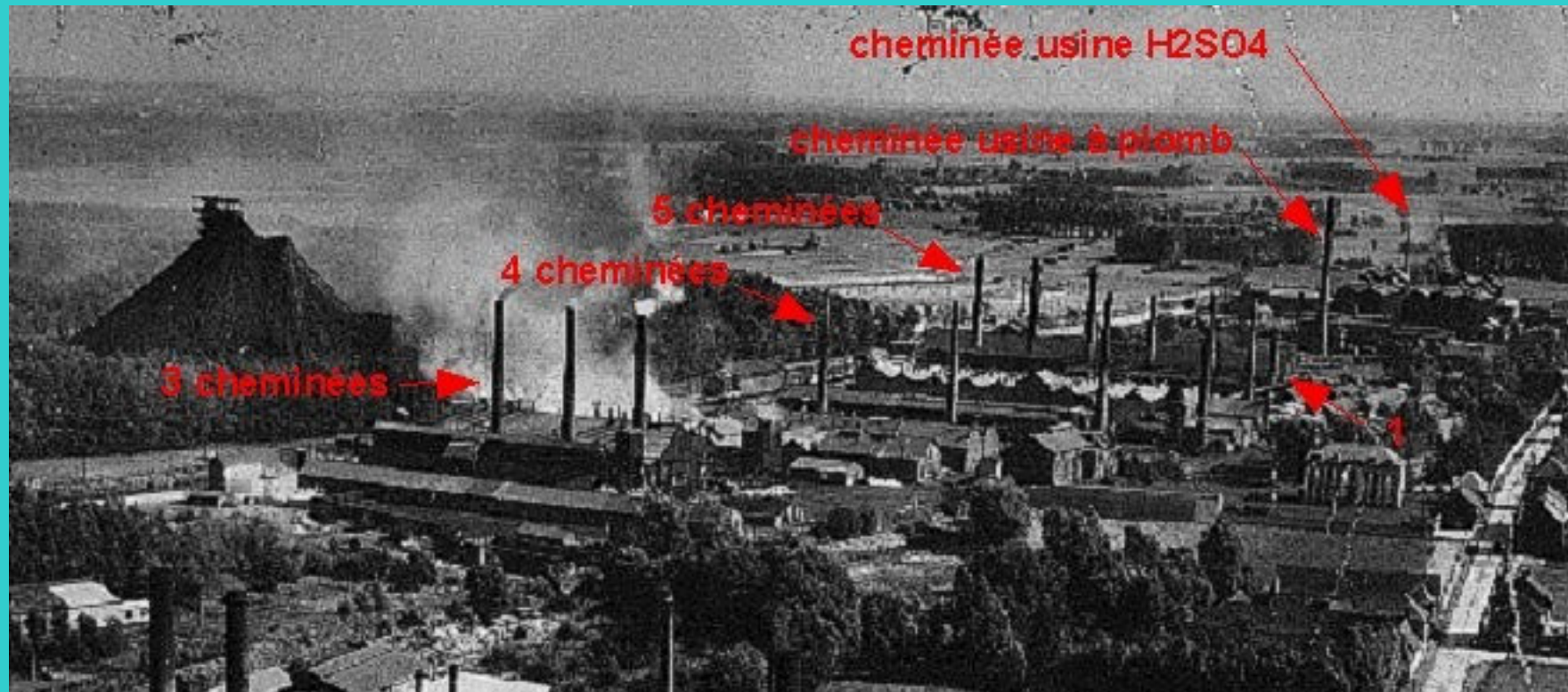
0 m 50 m 100 m 150 m 200 m

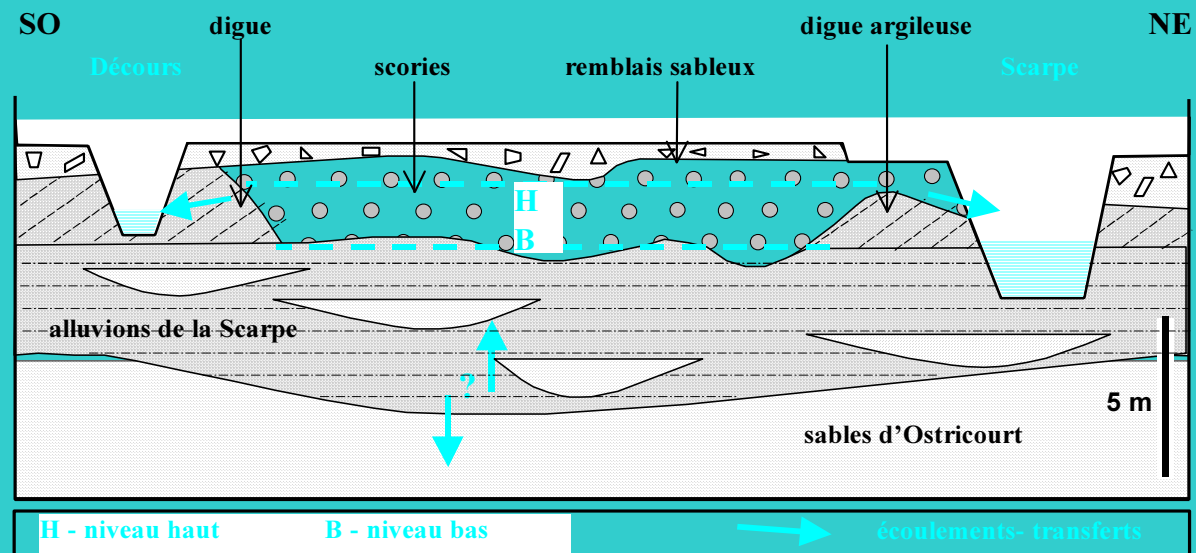
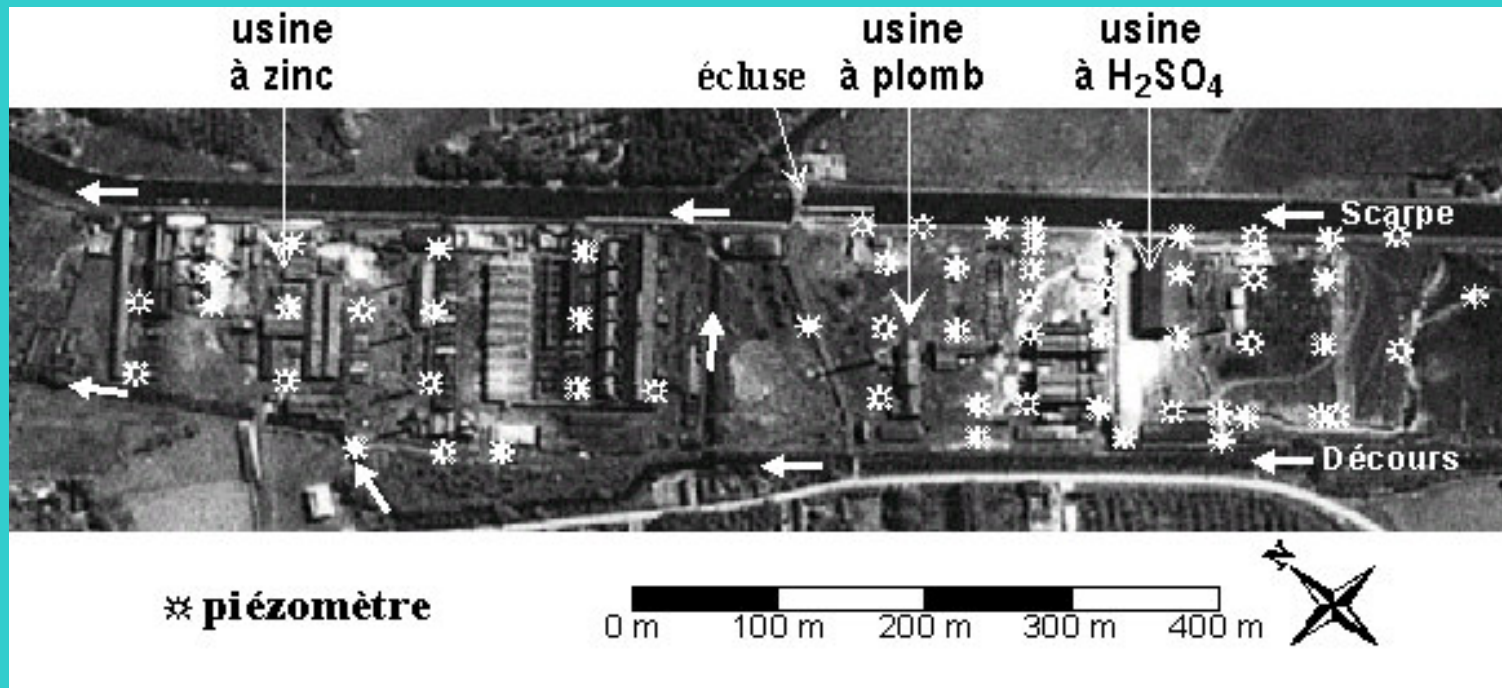


(b)



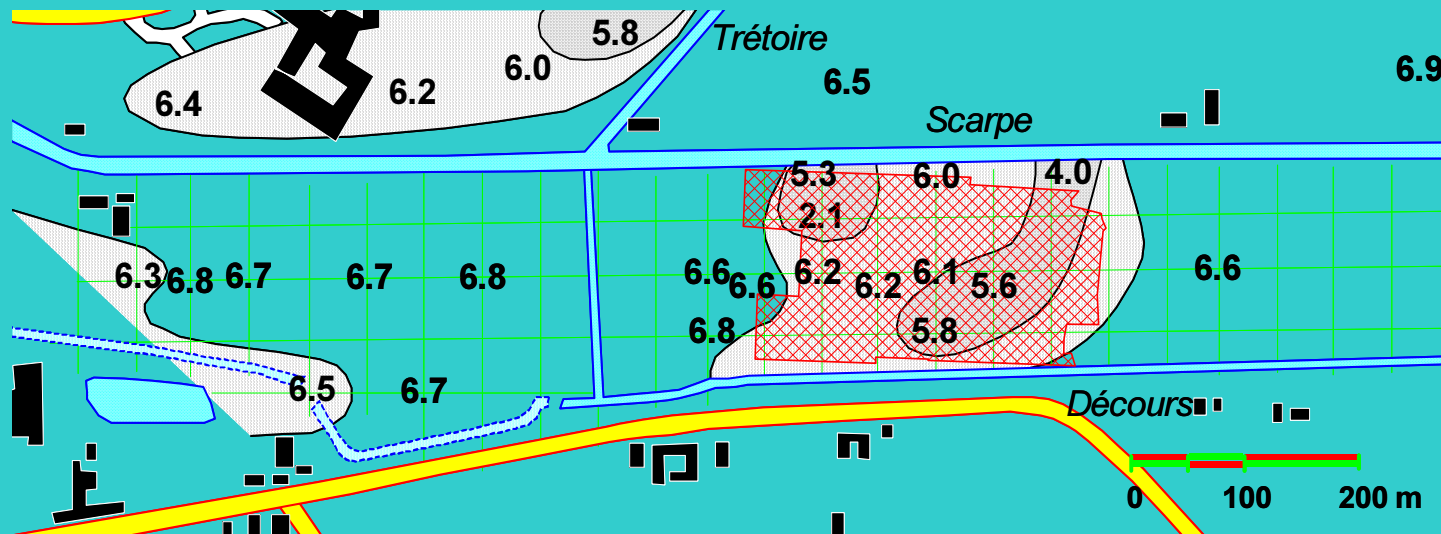
Friche industrielle de Mortagne (59)



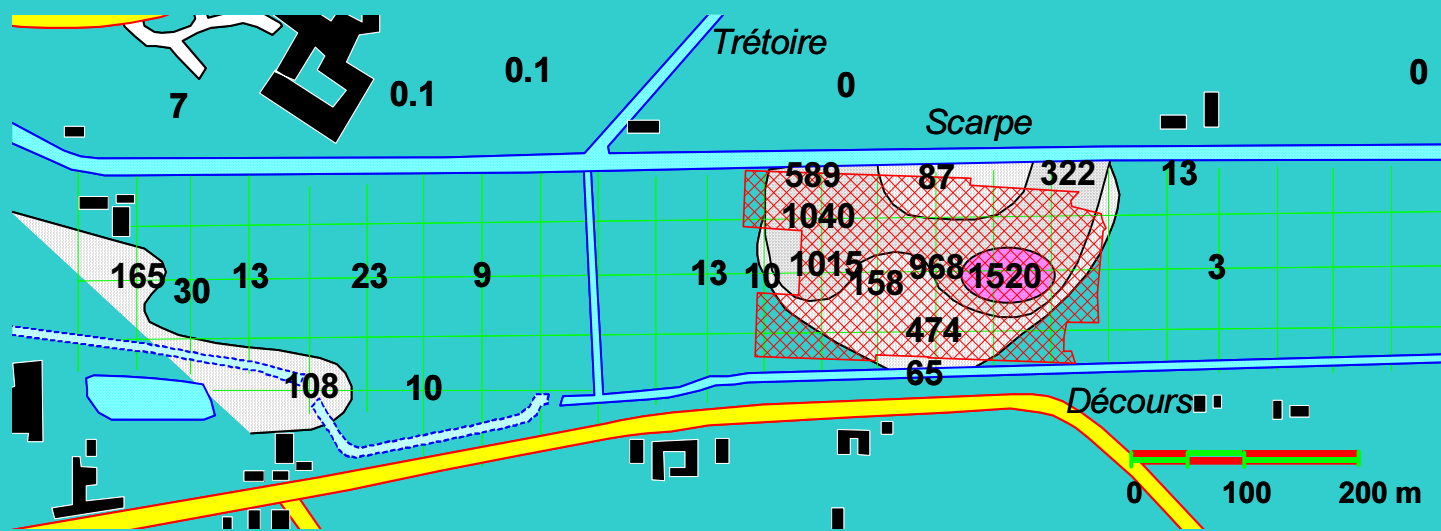




Analyses géochimiques

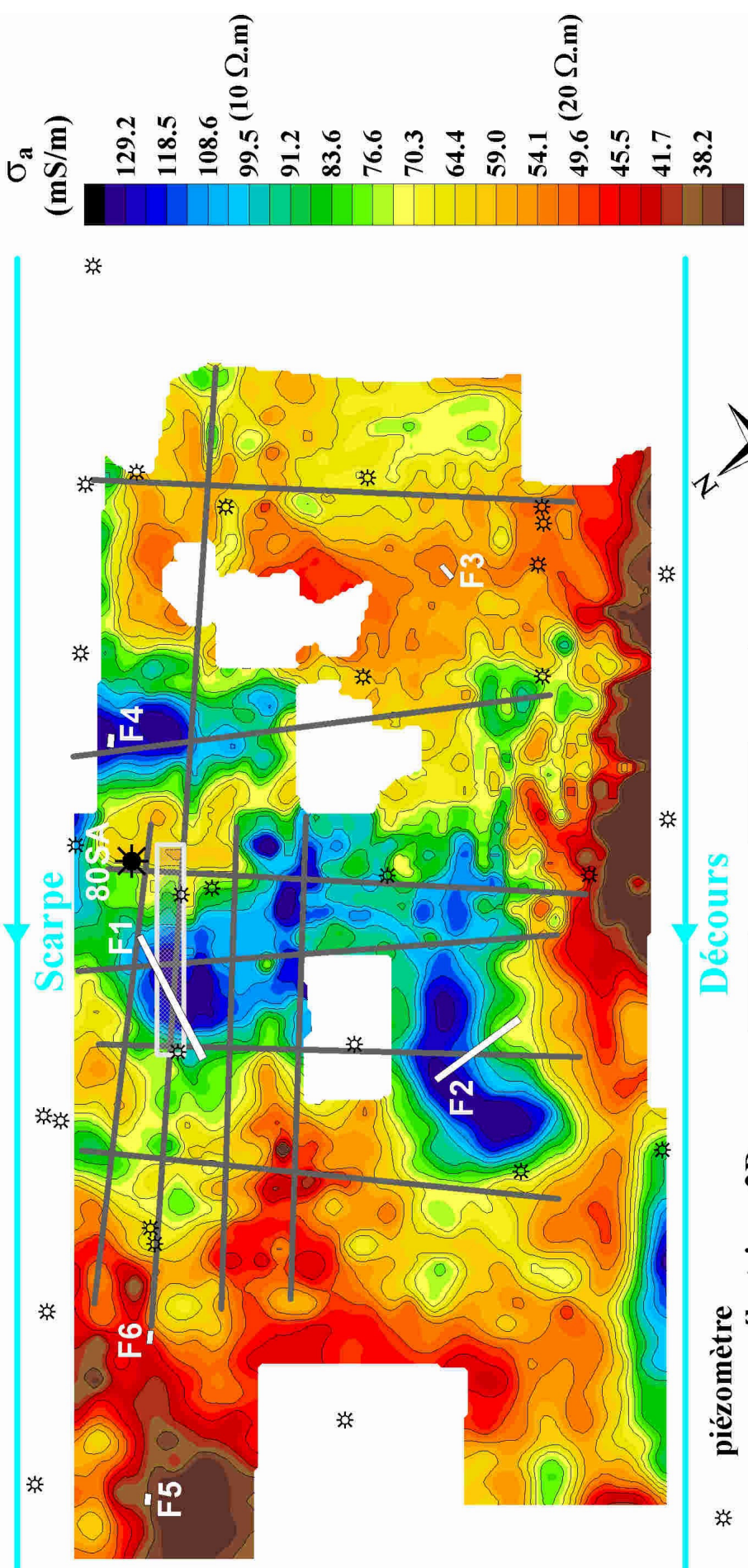


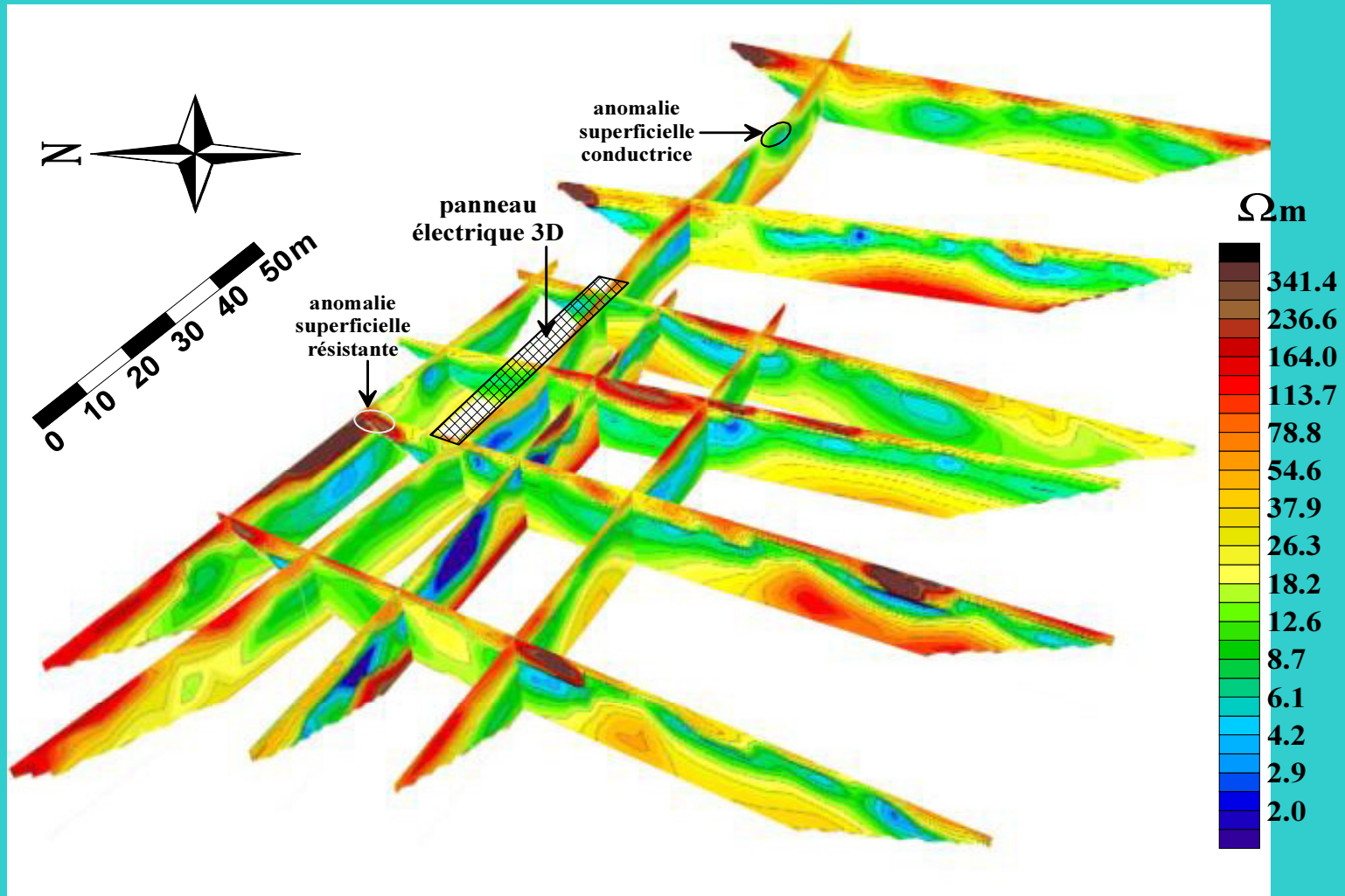
pH

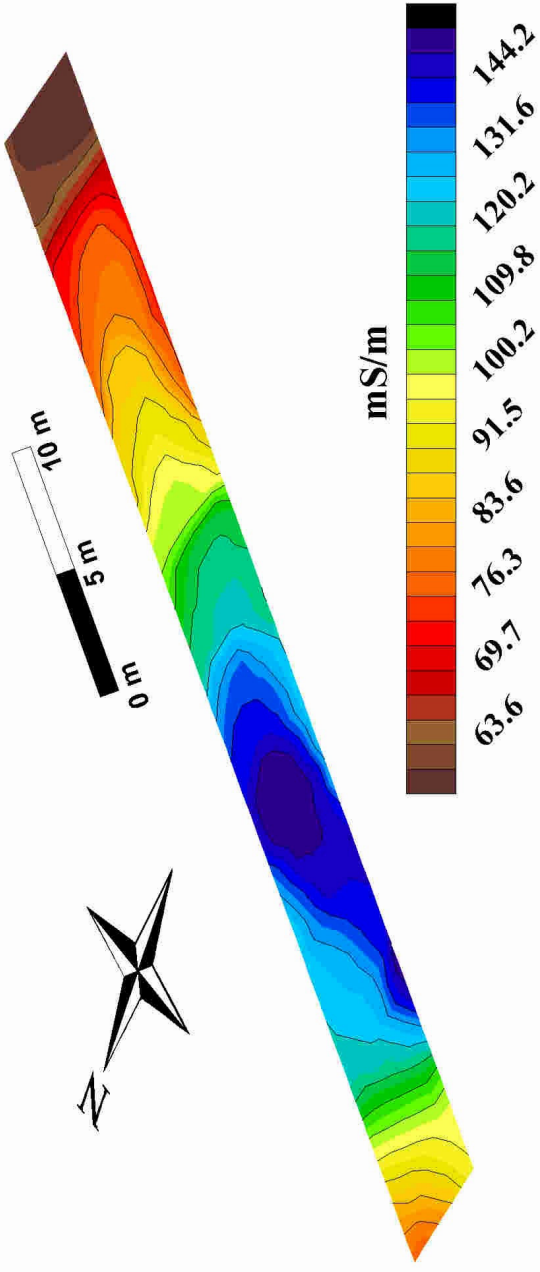


Zn⁺⁺
(mg/L)

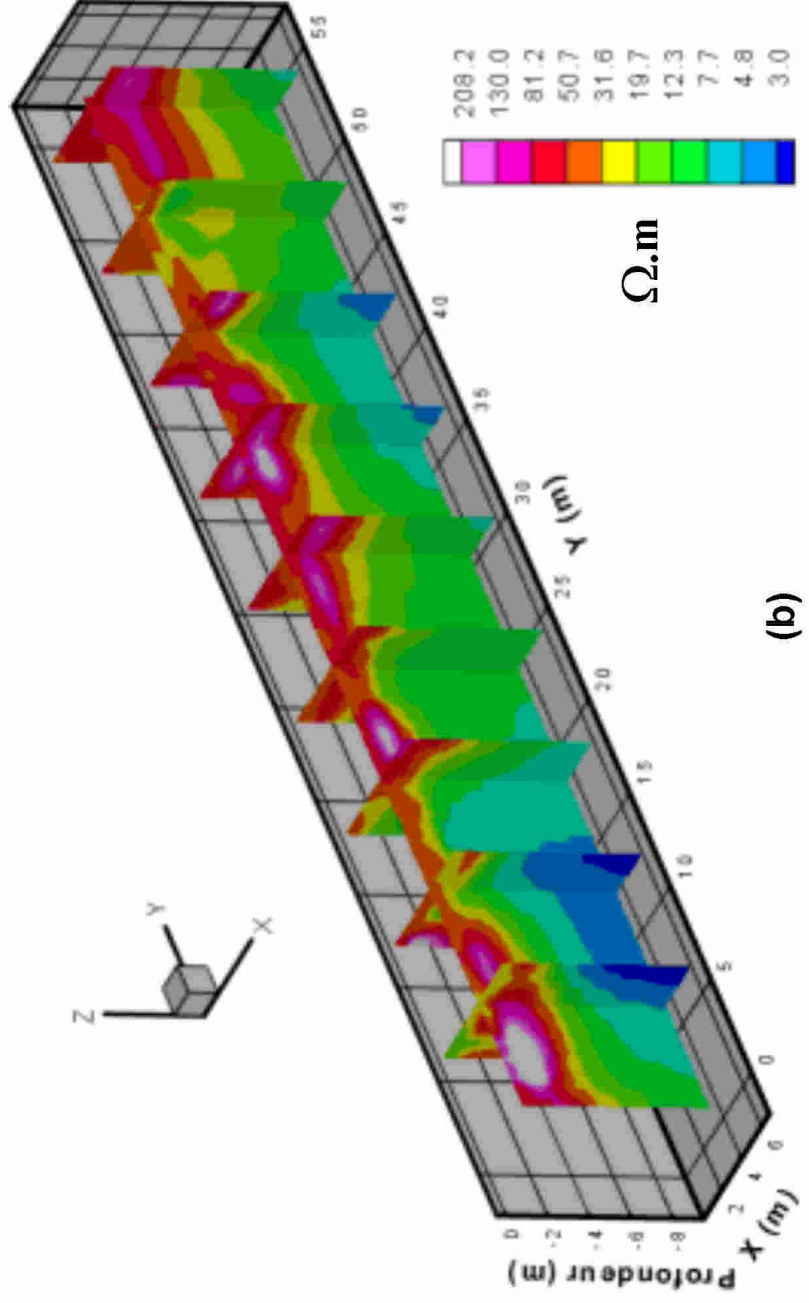








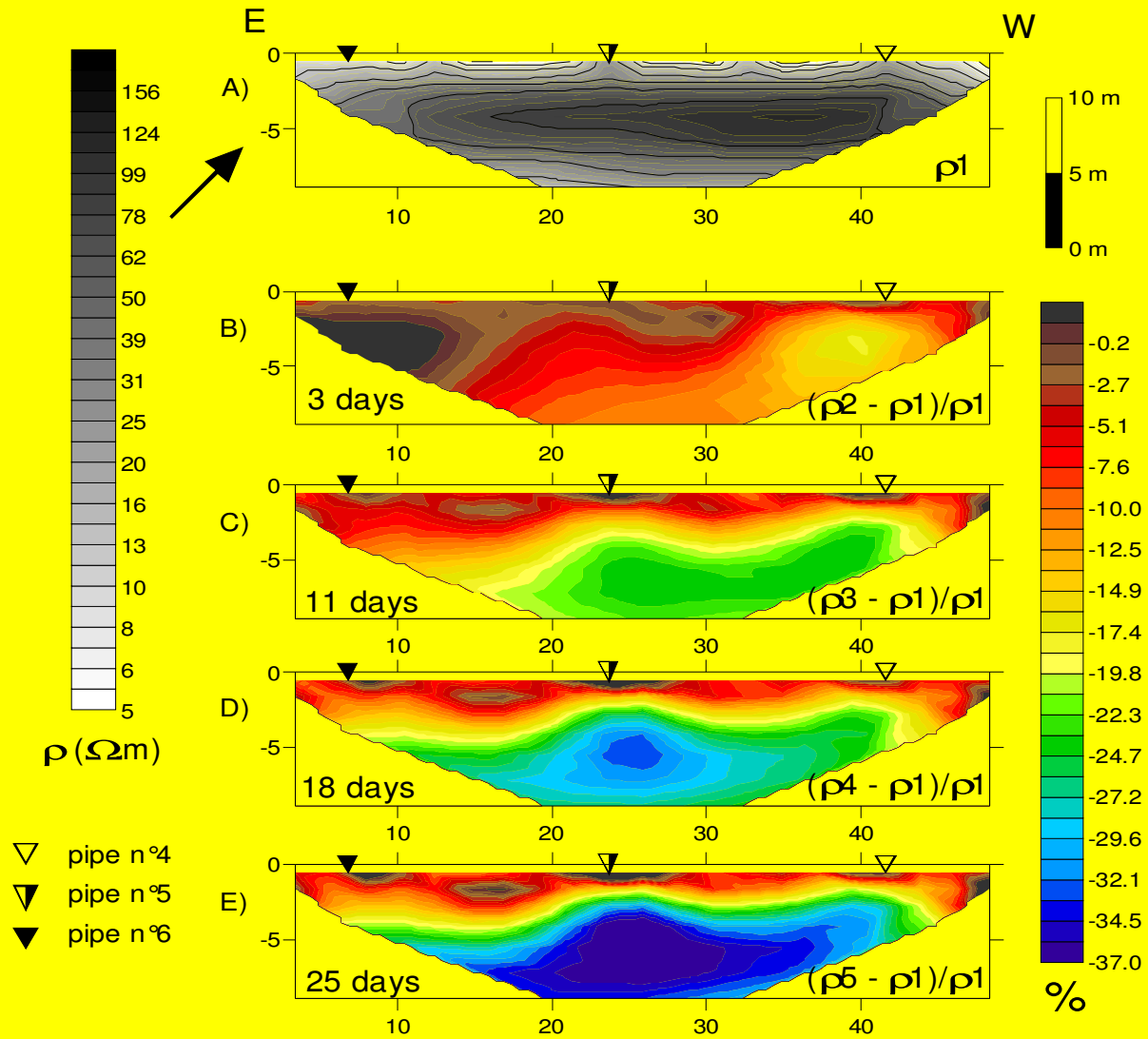
(a)



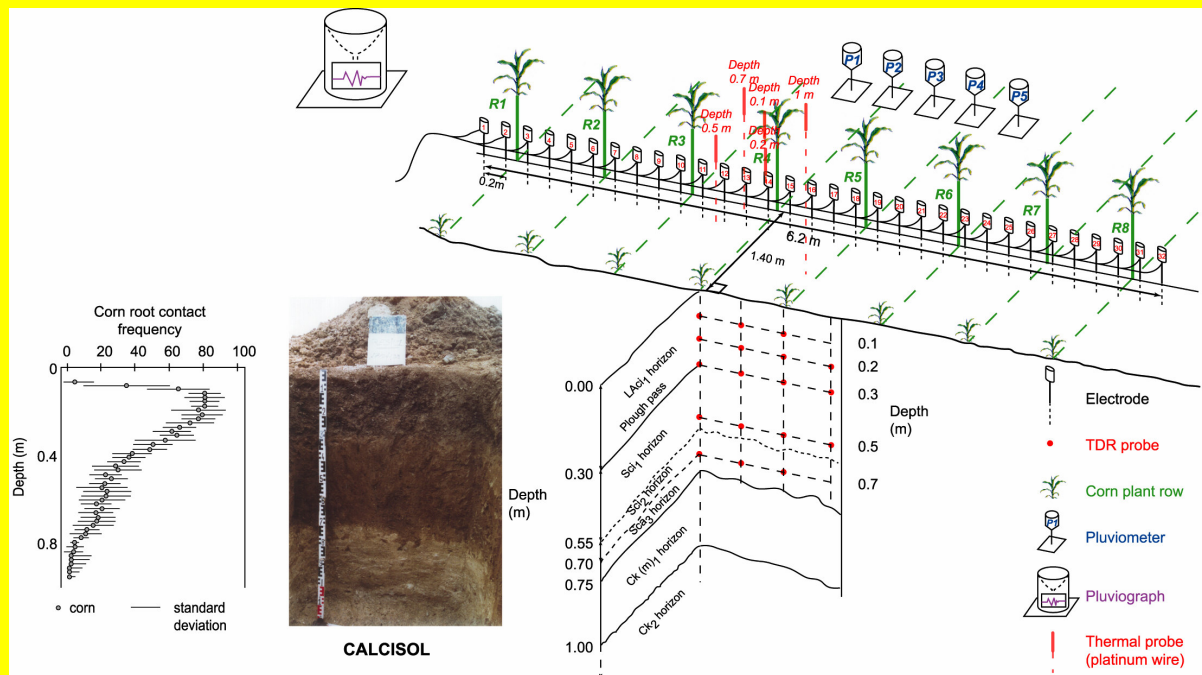
(b)

Suivi de la réinjection de lixiviats dans une décharge

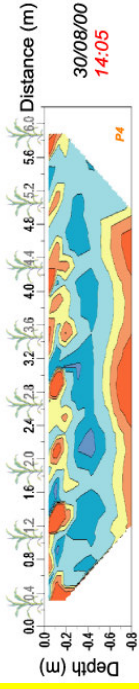
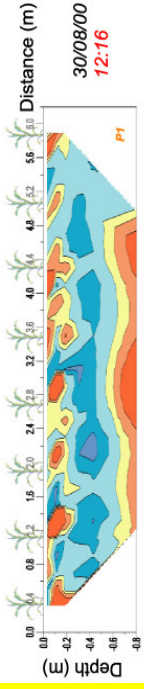




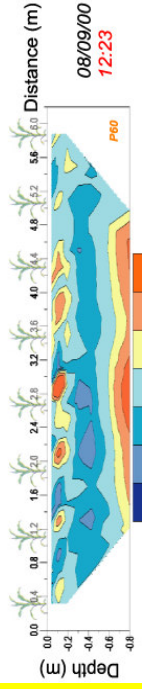
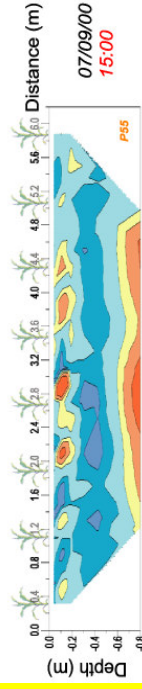
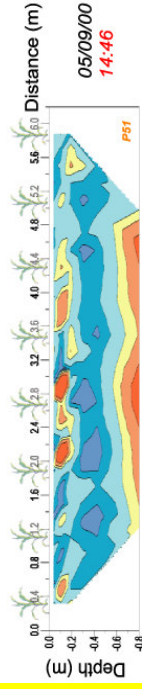
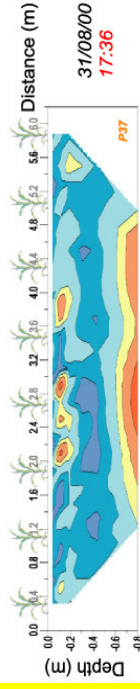
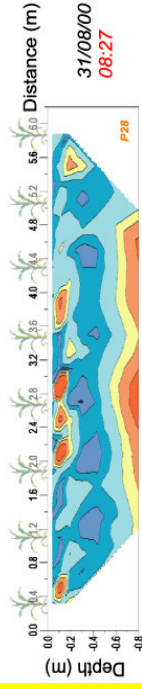
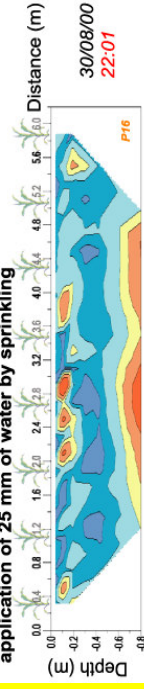
Suivi de l'évolution temporelle de la section de résistivité électrique pendant et après l'irrigation du maïs



Soil section true resistivity measured over time before irrigation

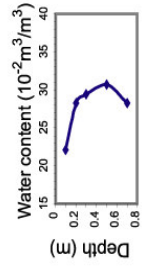
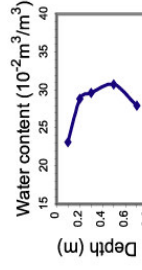
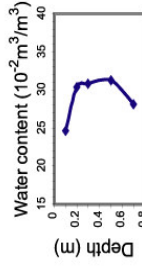
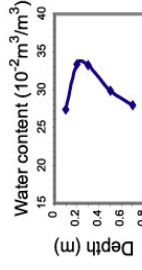
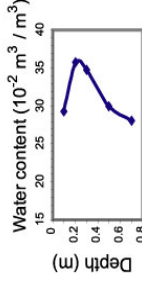
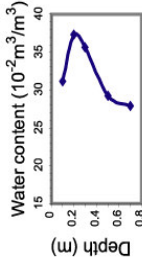
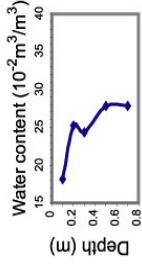
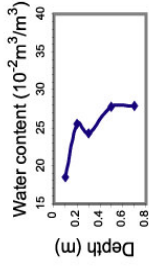


Soil section true resistivity measured over time following application of 25 mm of water by sprinkling

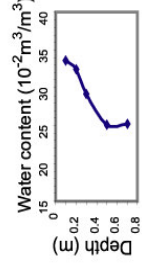
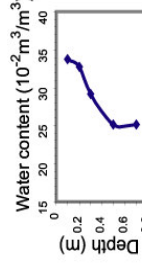
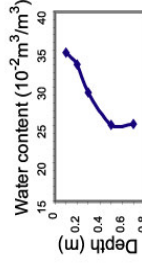
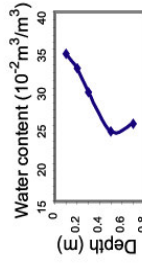
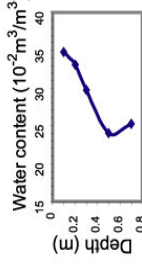
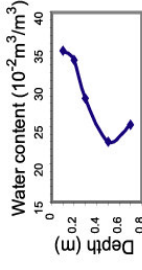
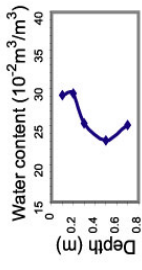
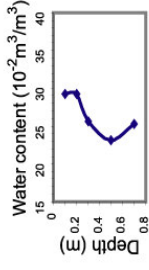


Electrical resistivity ($\Omega \cdot m$)

Hydric profile change under corn row R 4



Hydric profile change between corn row R 4 and R 5



ARP ©

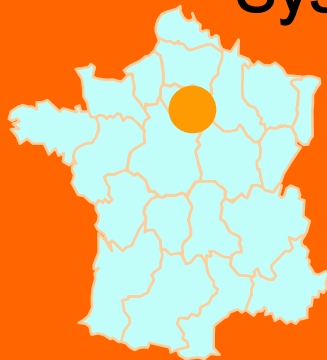
Rateau
(CNRS)



MuCEP
(CNRS)

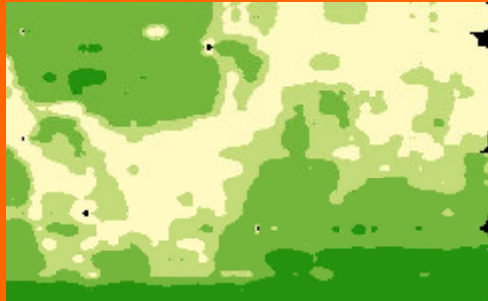


Systeme industrialisé : ARP01 (CNRS-GEOCARTA)

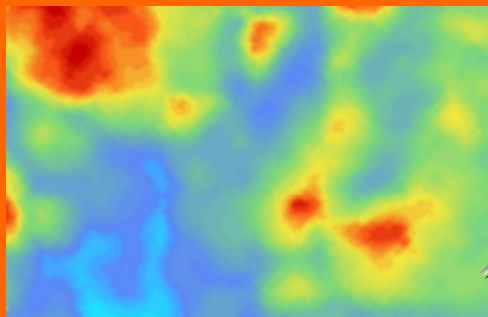


Comparaison avec d'autres méthodes

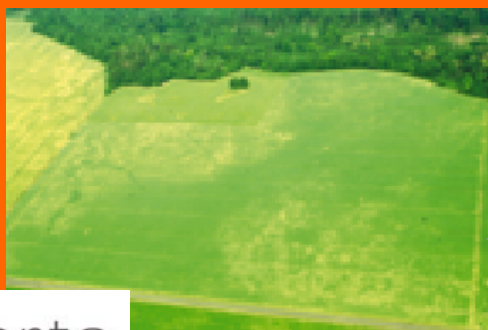
ARP



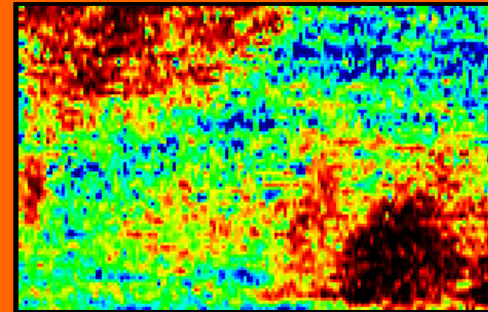
RMT



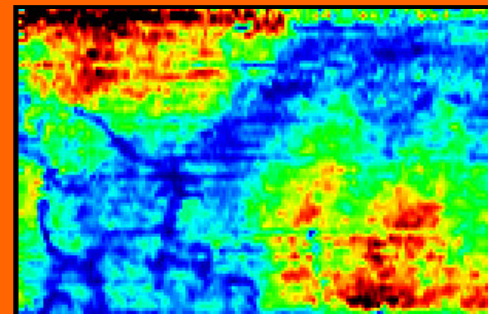
EM38



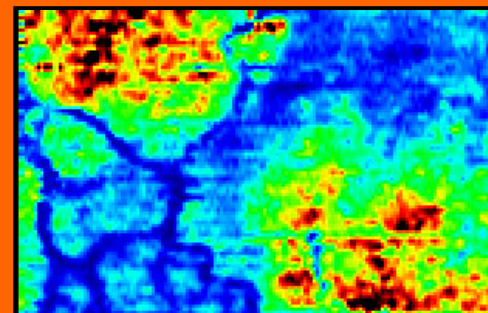
Aérien



0 à 0,5m

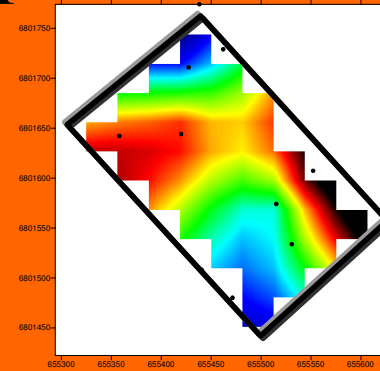
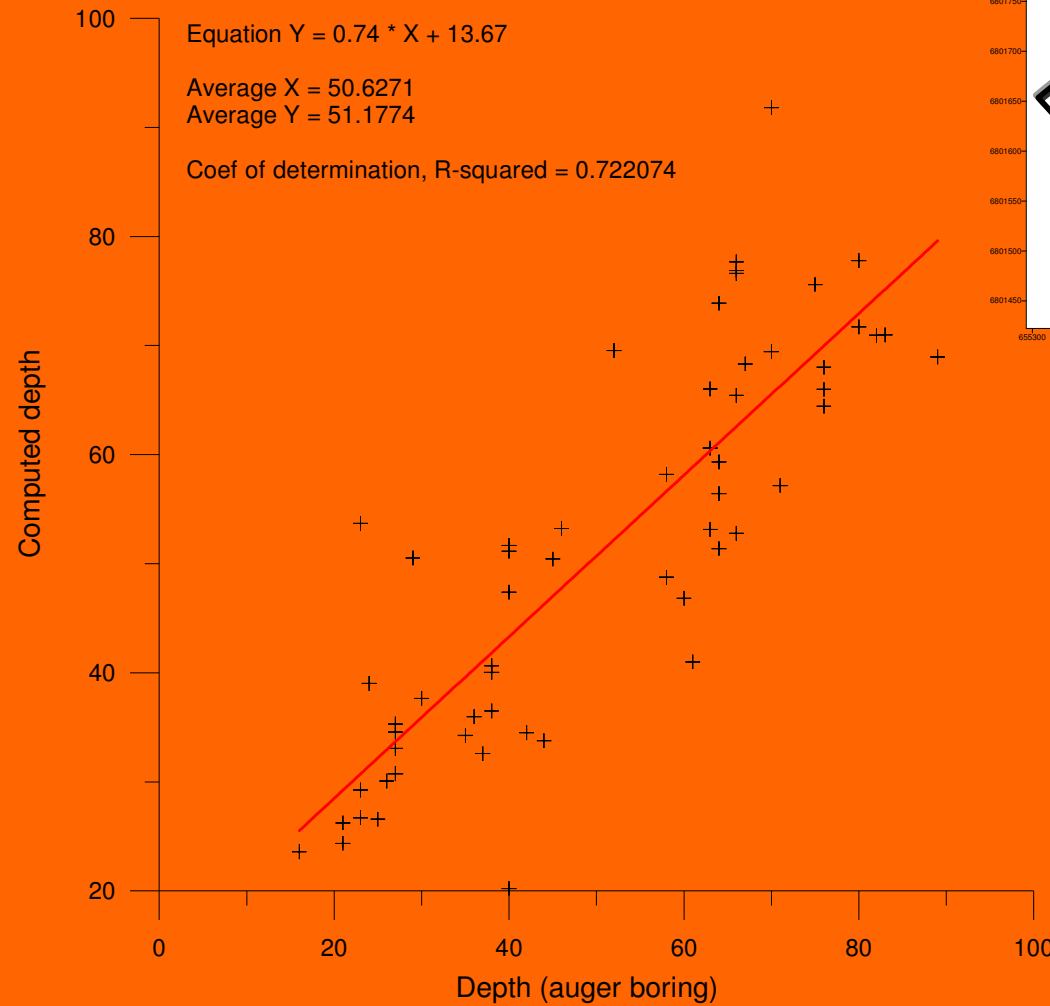


0 à 1m

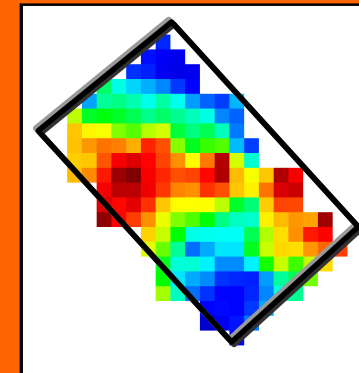


0 à 2m

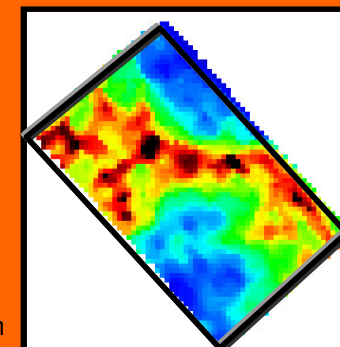
Corrélation avec les paramètres agronomiques: **EPAISSEUR** (par intercorrélacion)



Tarière (10)



Tarière (74)



**ER avec 10
tarières**

Corrélation avec les paramètres agronomiques: **RENDEMENT**

ARP

(Boigneville test plot, ITCF, 8ha)

Rendement

