PROGETTO RITA / PROJET RITA

Risposta Impatti Tempesta Alex /*Reponse Impacts Tempete Alex*

Interreg ALCOTRA
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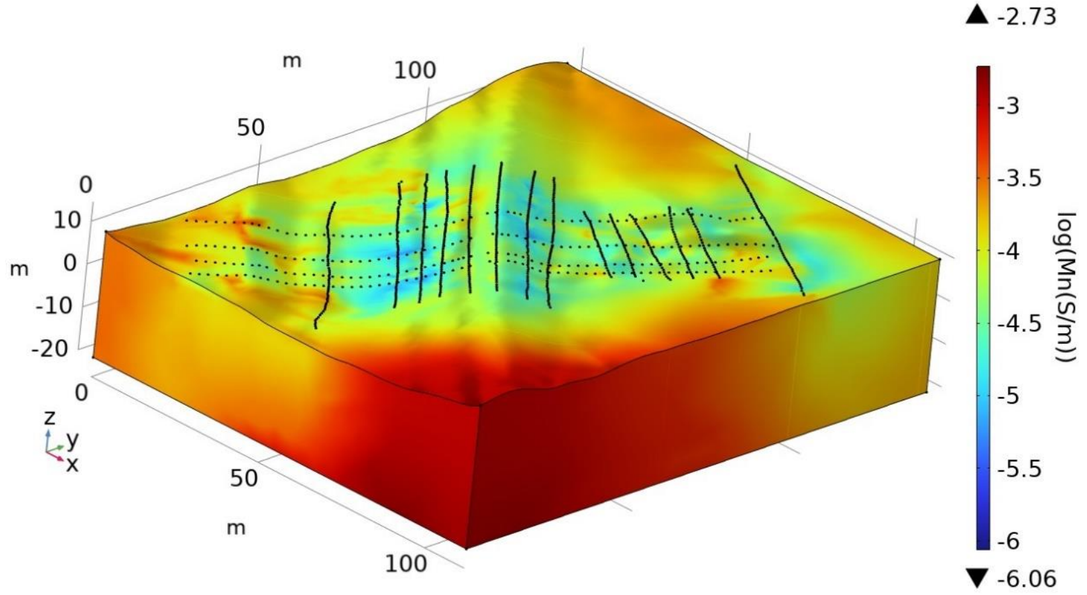
CONFERENCE FINALE / CONFERENZA FINALE 25.05.2023

Géophysique appliquée aux digues, aux barrages et aux glissements de terrain

A. Revil (USMB) A. Ghorbani, PA Duvillard, & P. Vaudelet (Naga)

A. Mouyeaux & L. Peyras (INRAE), P. Ropele & F. Colle (VDA)



la science pour la vie, l'humain, la terre

NAGA Geophysics

laboratoire edytem
environnements dynamiques territoires montagnes

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Reportage

Tempête Alex : «On entendait la nature se déchaîner»

Des intempéries marquées par des records de pluviométrie ont fait déborder les cours d'eau dans le sud-est,

Menu

Libération

Crues & glissement de terrain

Inondazione del fiume e frana

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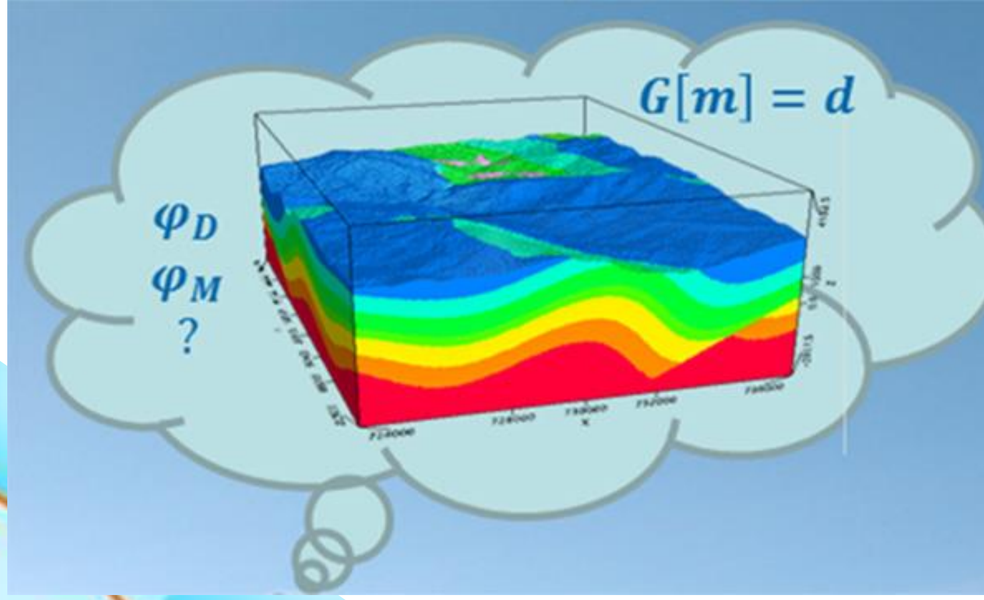
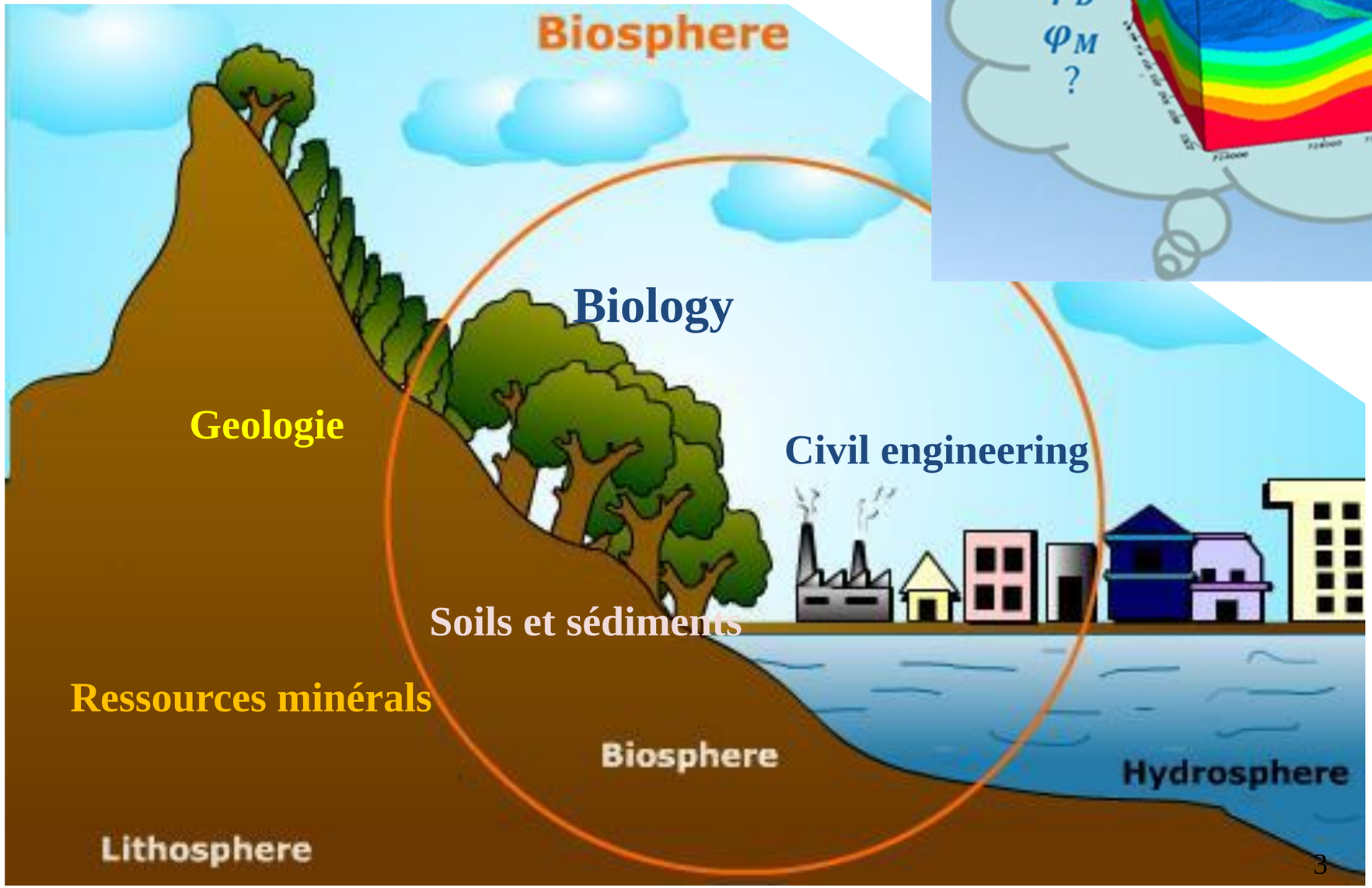
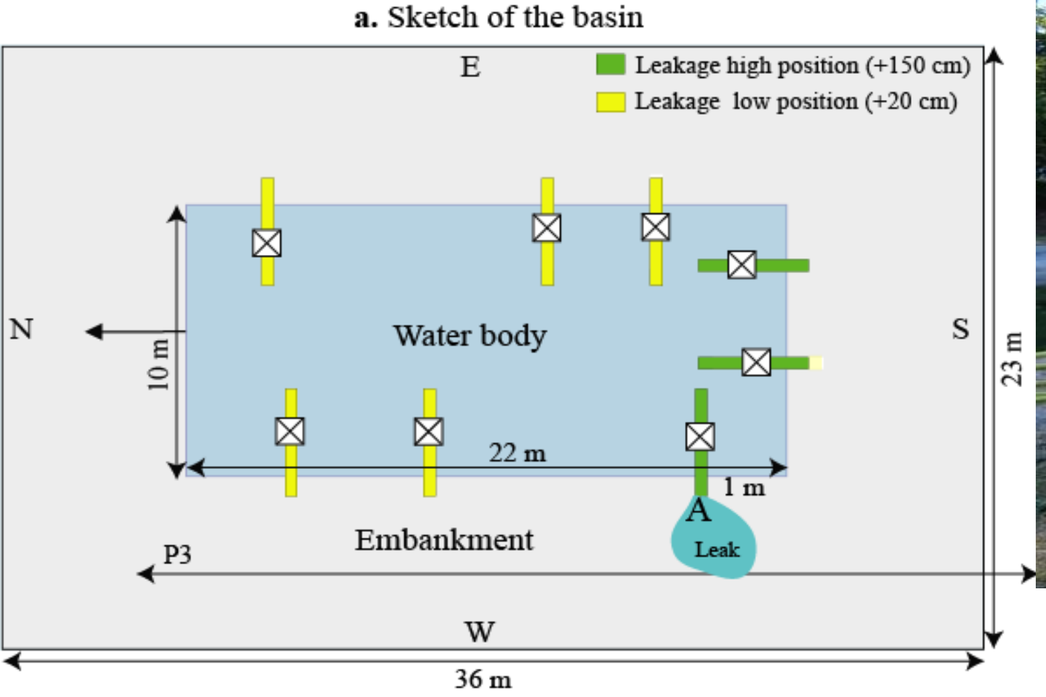
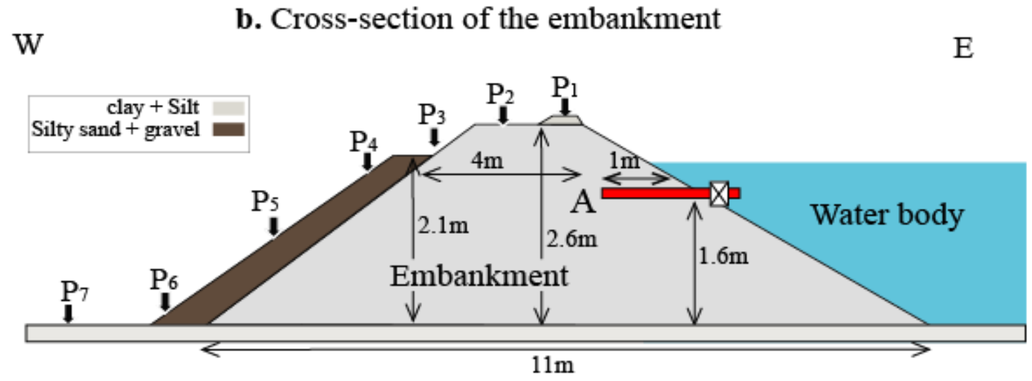
Imagerie hydrogéophysique

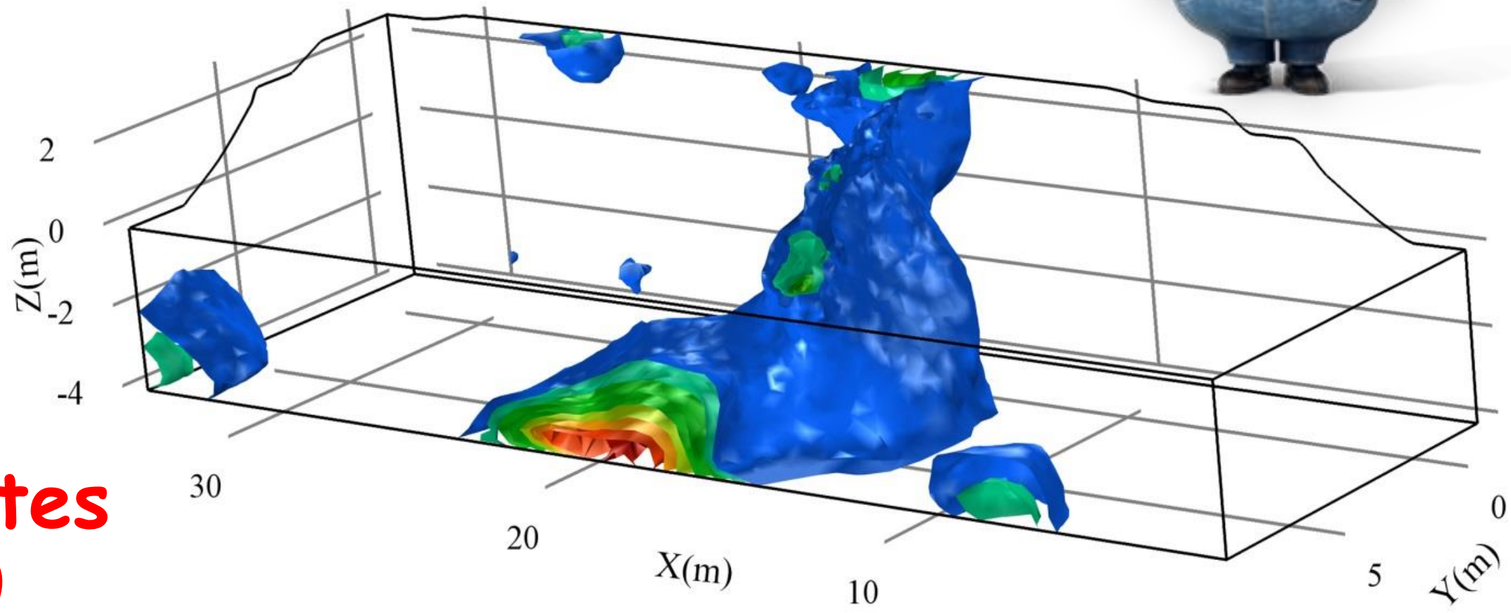
Immagini geofisiche dell'acqua

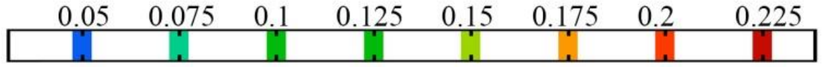












Imagerie 3D des fuites (progetti RESBA)

Posizione delle perdite in una diga

Imagerie 3D des fuites *(progetti RESBA)*

Engineering Geology 254 (2019) 89–101

Contents lists available at ScienceDirect

Engineering Geology

journal homepage: www.elsevier.com/locate/enggeo

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Induced polarization tomography applied to the detection and the monitoring of leaks in embankments

F. Abdulsamad[a], A. Revil[a,*], A. Soueid Ahmed[a], A. Coperey[a], M. Karaoulis[b], S. Nicaise[c], L. Peyras[c]

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A B S T R A C T

During an induced polarization survey, both electrical conductivity and chargeability can be imaged. Recent petrophysical models have been developed to provide a consistent picture of these two parameters in terms of water and clay contents of soils. We test the ability of this method at a test site in which a controlled artificial leakage can be generated in an embankment surrounding an experimental basin. 3D tomography of the conductivity and normalized chargeability are performed during such a controlled leakage. Conductivity and induced polarization measurements were also performed on a core sample from the site. The sample was also characterized in terms of porosity and cation exchange capacity. Combining the 3D survey and these laboratory measurements, a 3D tomogram of the relative variation in water content (before leakage and during leakage) was estimated. It clearly exhibits the ground water flow path through the embankment from the outlet of the tube used to generate the leak to the bottom of the embankment. In addition, a self-potential survey was performed over the zone of leakage. This survey evidences also the projection of the ground water flow path over the ground surface. Both methods are found to provide a consistent picture. A 2.5D time lapse tomography of the electrical conductivity and normalized chargeability was also performed and evidences the position of the preferential flow paths below the profile. These results confirm the ability and efficiency of induced polarization to provide reliable information pertaining to the detection of leakages in dams and embankments.

Imagerie 3D des fuites (progetti RESBA)

Journal of Hydrology 572 (2019) 51–65

Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Research papers

Leakage detection of water reservoirs using a Mise-à-la-Masse approach

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Mise-à-la-masse
Hydrogeophysics
Leak
Mountain reservoir

ABSTRACT

Localizing leaks of water and fluids from storage tanks and water reservoirs with geomembranes is an important task for a variety of environmental applications and water resources applications. The minimally intrusive mise-à-la-masse method is used to detect leaks with the current injected inside the reservoir and a return current electrode located remotely. We test a new approach for the inversion of the voltage data using sandbox experiments and numerical modeling. A method similar to the self-potential inversion method is proposed to inverse the voltages recorded around the tank or reservoir. A global objective function with a data misfit term and regularization term is minimized to invert the voltages. In the inversion process, a depth-weighting matrix is used to strengthen the depth resolution of the current source, and the minimum support method is used to avoid oversmoothed results in terms of leak detection. The distributions of electrical current density on the walls of reservoir indicate the position of leaks. The results show that the inversion method with source compaction accurately identifies the location of single leaks. For two separated leaks, there is an obvious bias for the deeper hole and the bias increases with its depth. For three holes, the source compaction method generally identifies the location of the three leaks when their depth ranges are similar. When one of the leaks becomes deeper, localization of the deeper one becomes more difficult. The influence of the size of the leak on the inversion results is also investigated. The inversion algorithm overestimates the depth of small leaks while it slightly underestimates the depth of large leaks. For a leak having the form of a crack, the inversion results using the source compaction method agree with the position of the leak and its shape.

Rita : Développement des applications sur 5 sites

Sviluppo di applicazioni su 5 siti

Site 1: France

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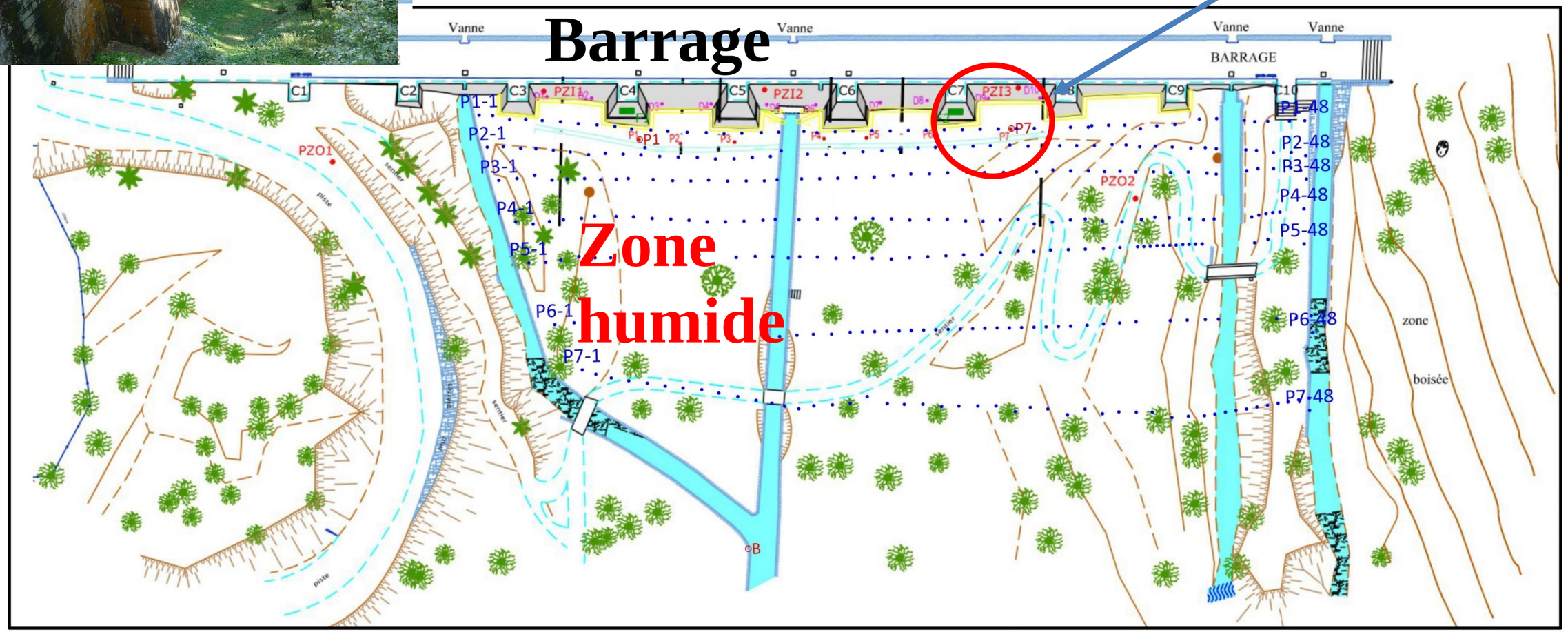
Site 1: Barrage

Zone d’étude géophysique

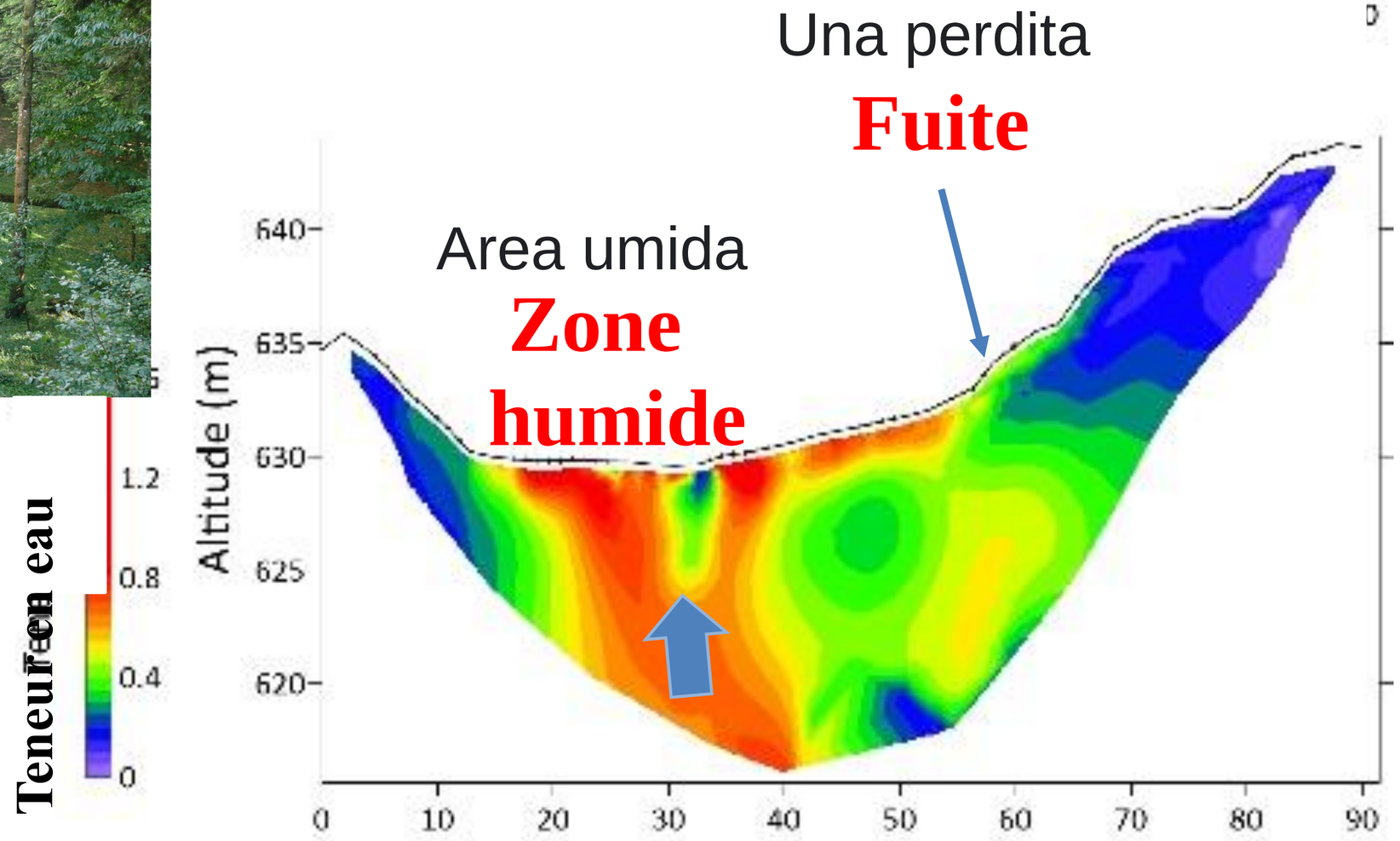
Reservoir

Fuite

Barrage



Site 1: Barrage Lampy

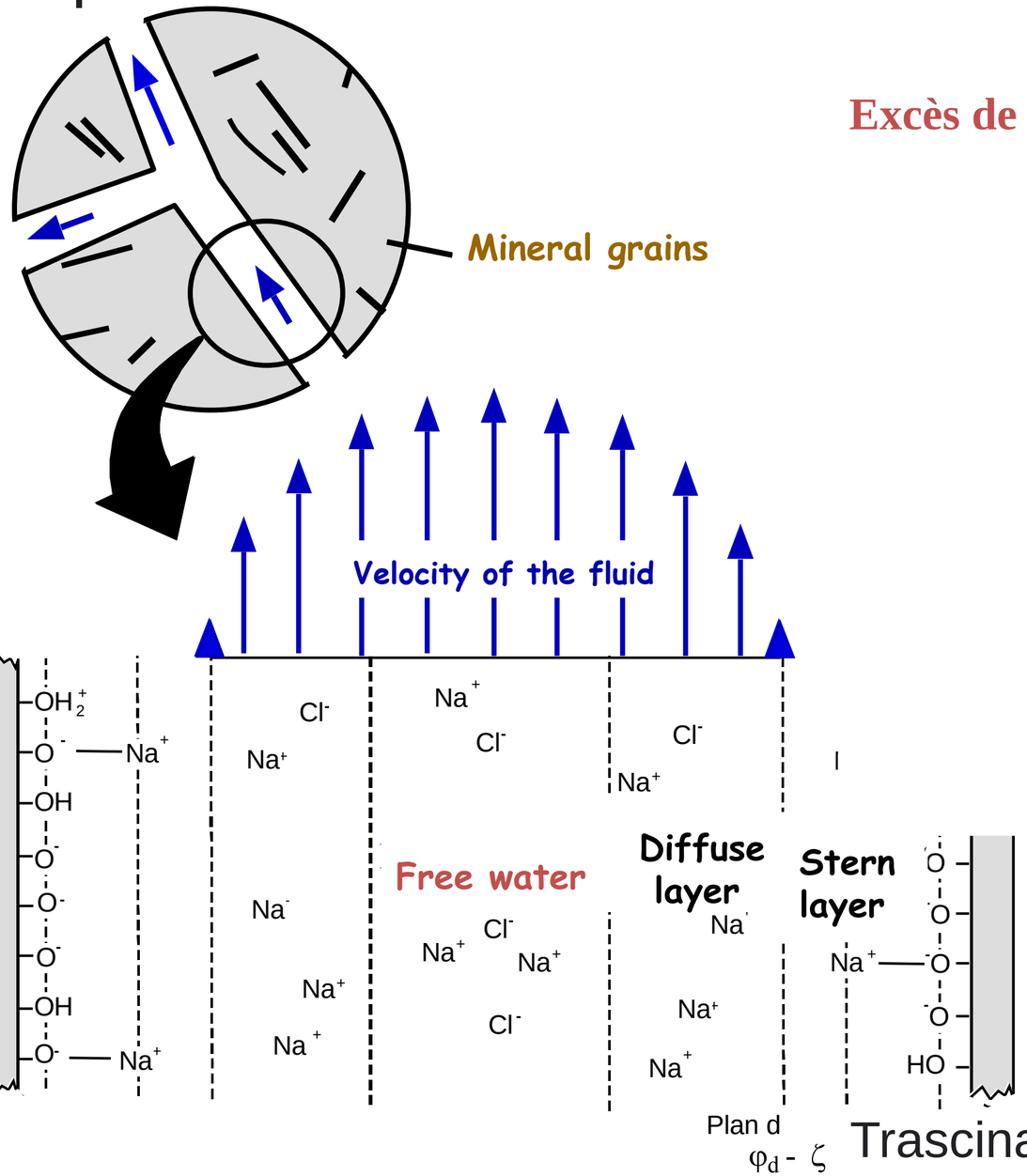


Ex. Tomographie géoélectrique en teneur en eau

Tomografia elettrica del contenuto di acqua

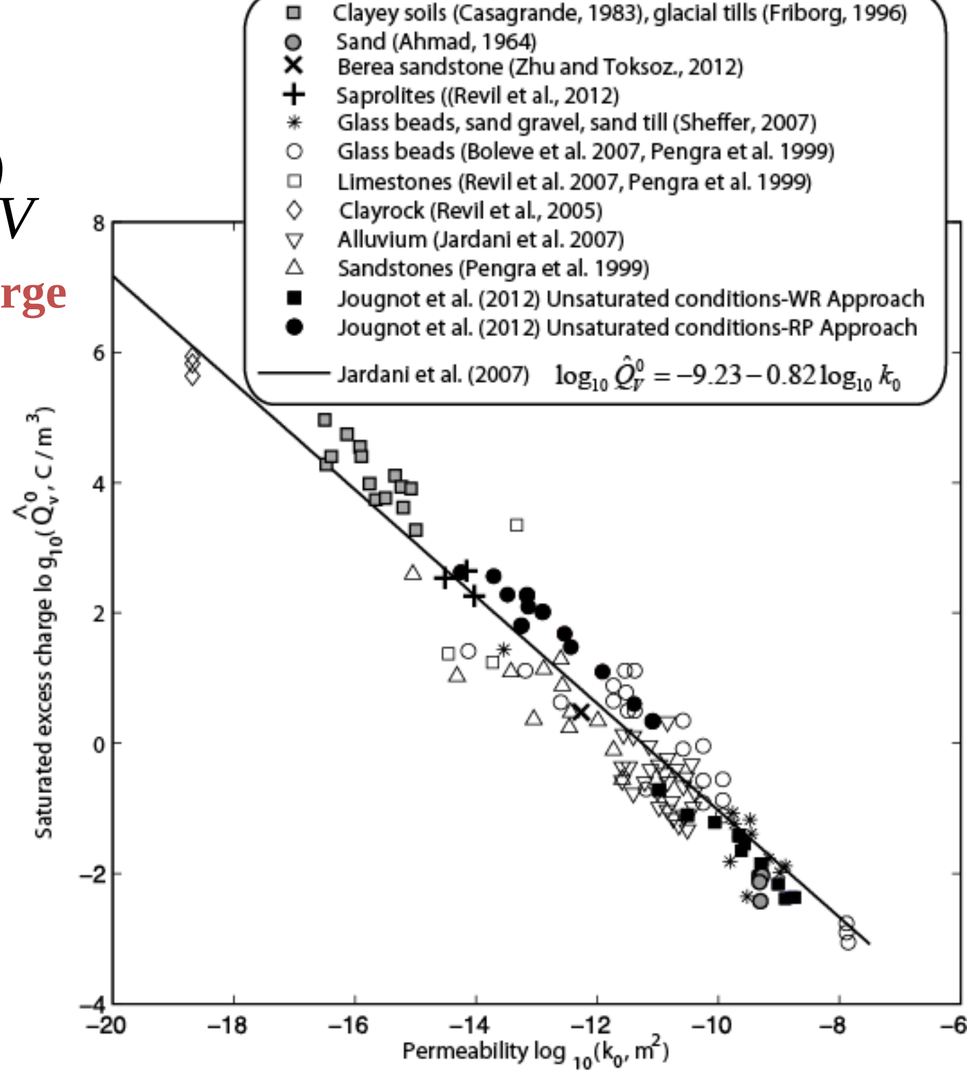
Potential spontané

Potenziale spontaneo



$\hat{Q}_V$

Excès de charge



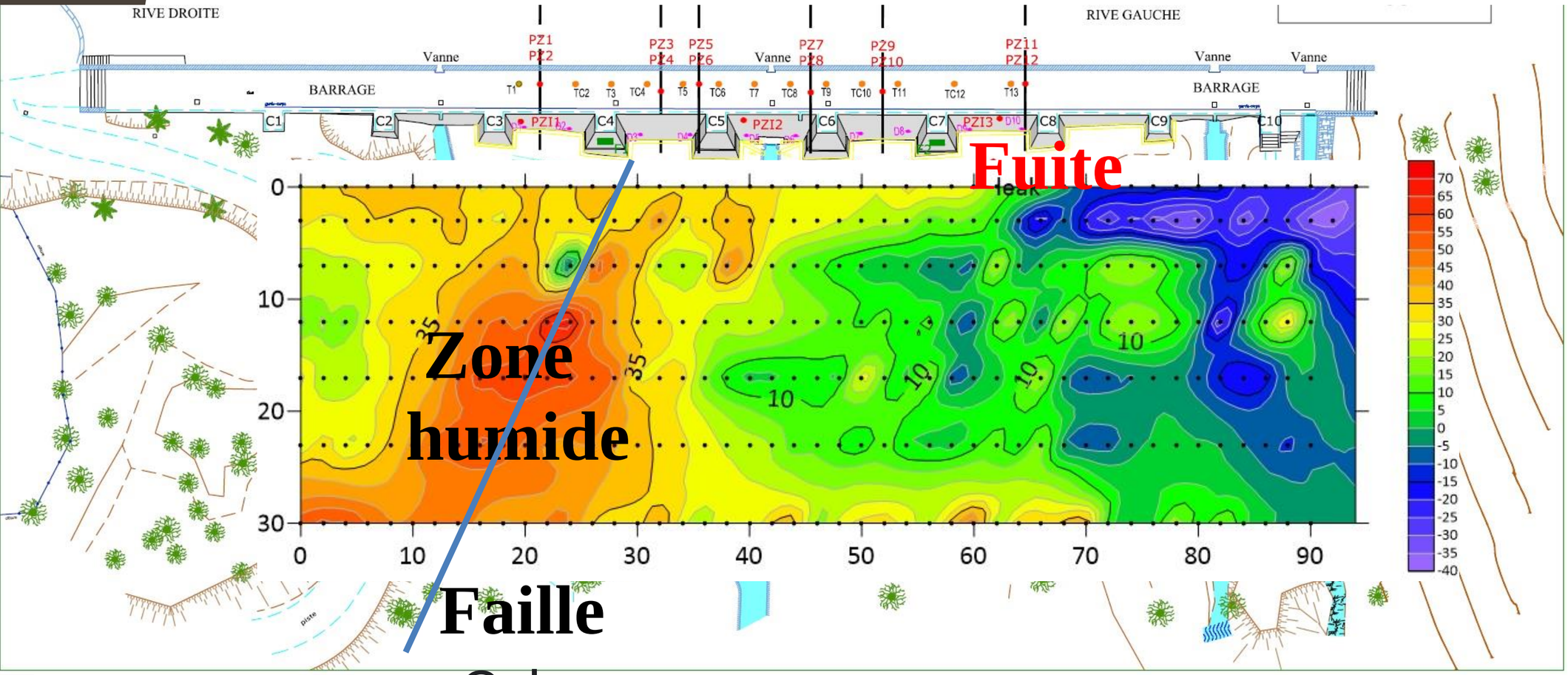
Permeabilité

Entraînement excès de charge

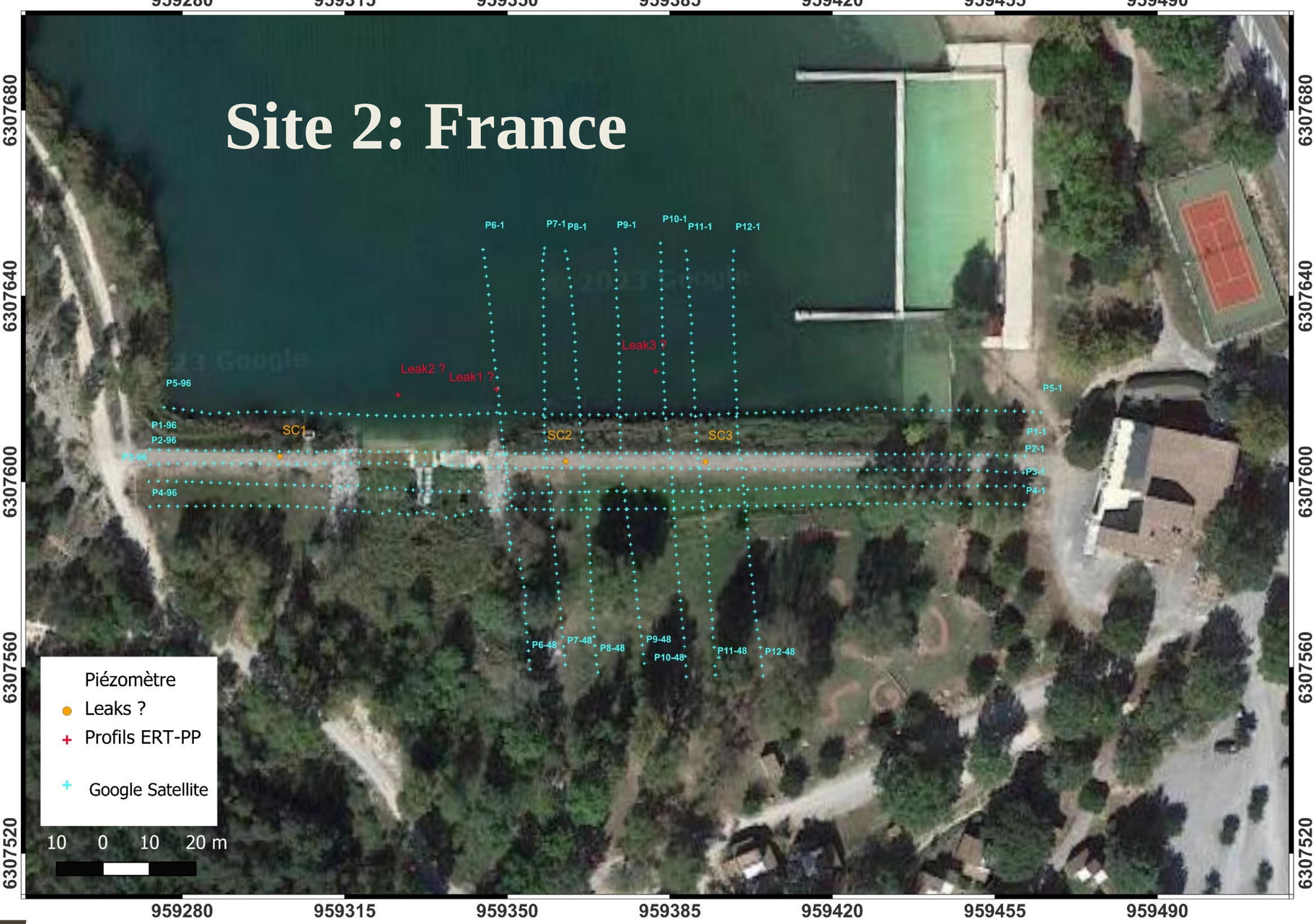
Trascinamento di cariche elettriche da parte dell'acqua

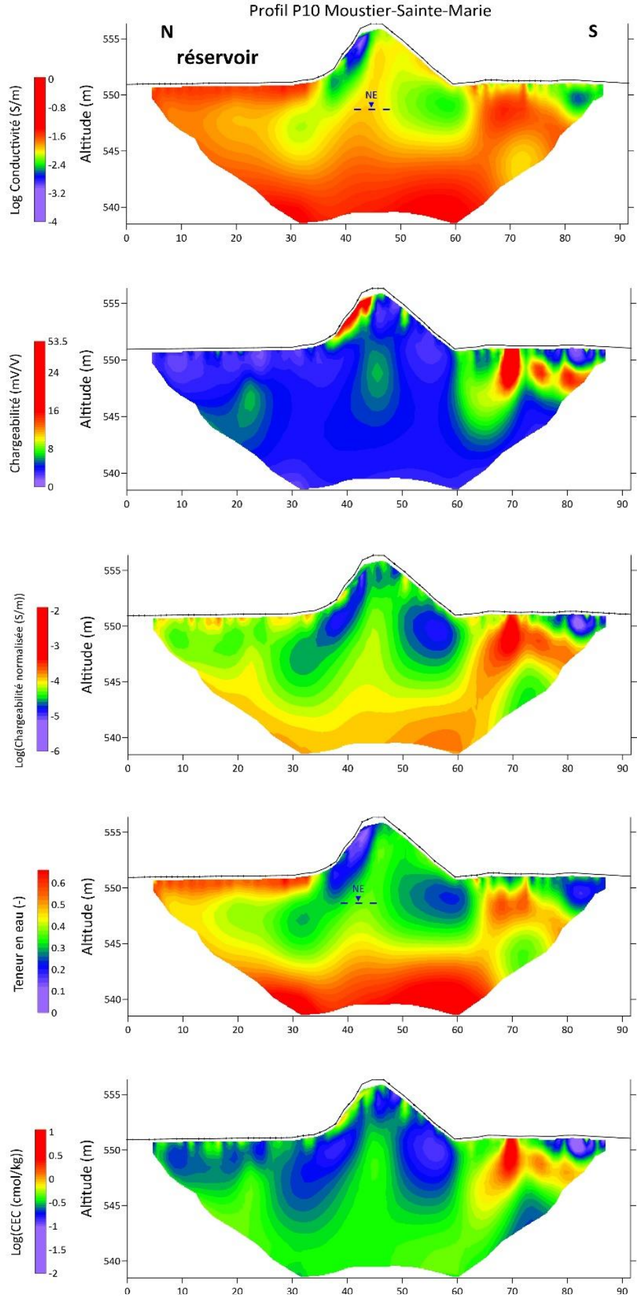
Potenziale spontaneo

Carte de potential spontané



Site 2: France





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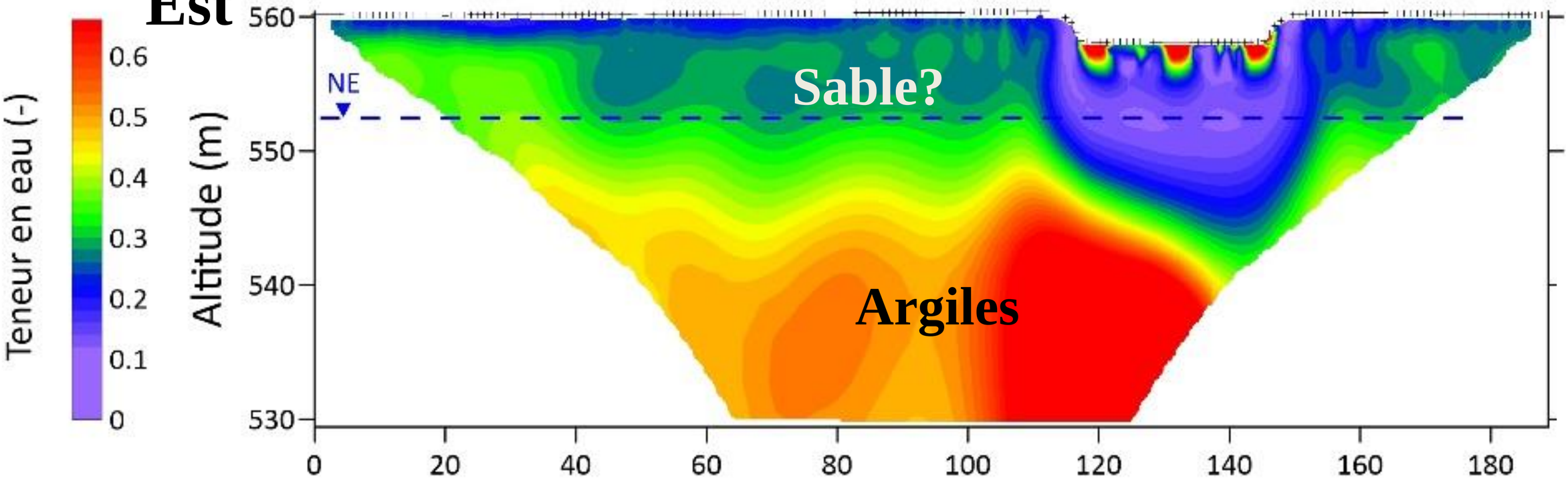
Profil sur le sommet de la digue

Profilo sulla parte superiore della diga

Trop plein

Est

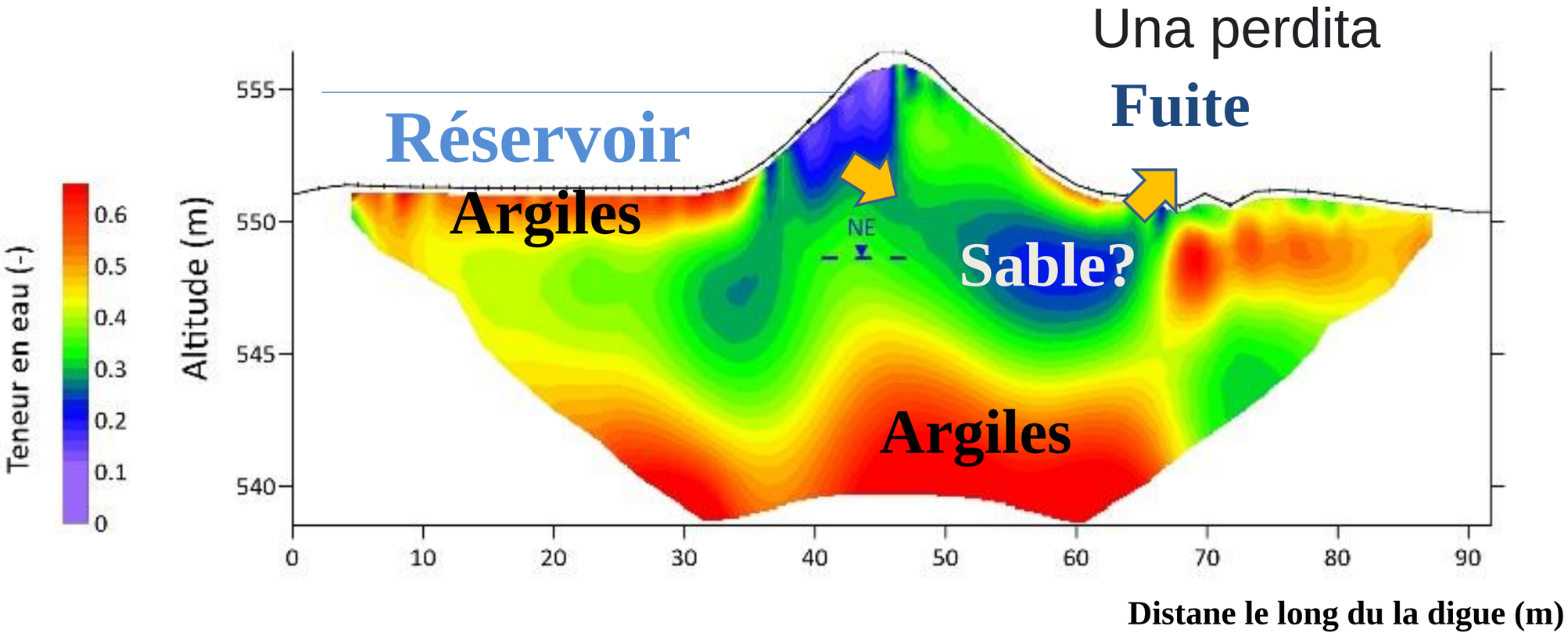
Ouest



Distane le long du la digue (m)

Tomographie 3D de la digue(P8)

Imaging 3D della diga



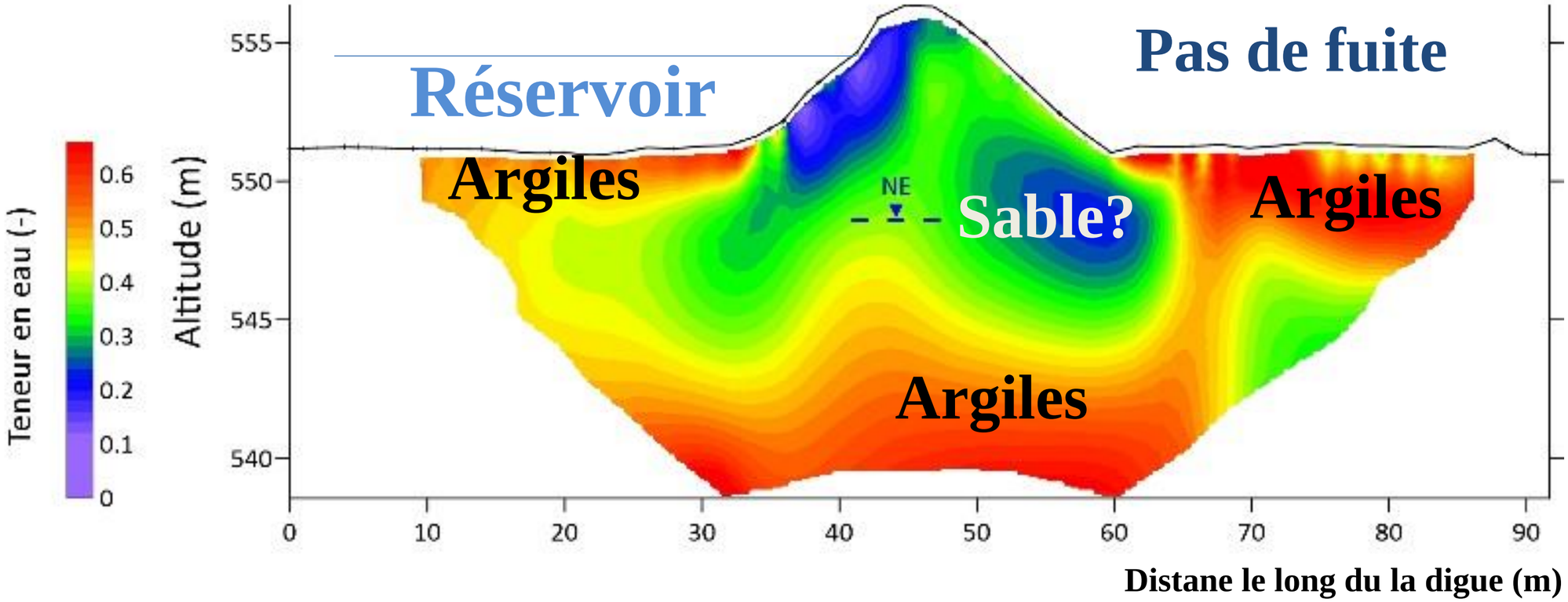
Ecoulements

Tomographie 3D de la digue (P11)

Imaging 3D della diga

Nessuna perdita

Pas de fuite



P4

P2

P3

Barrage

Site 3: Italy (Clavalité)

Réservoir

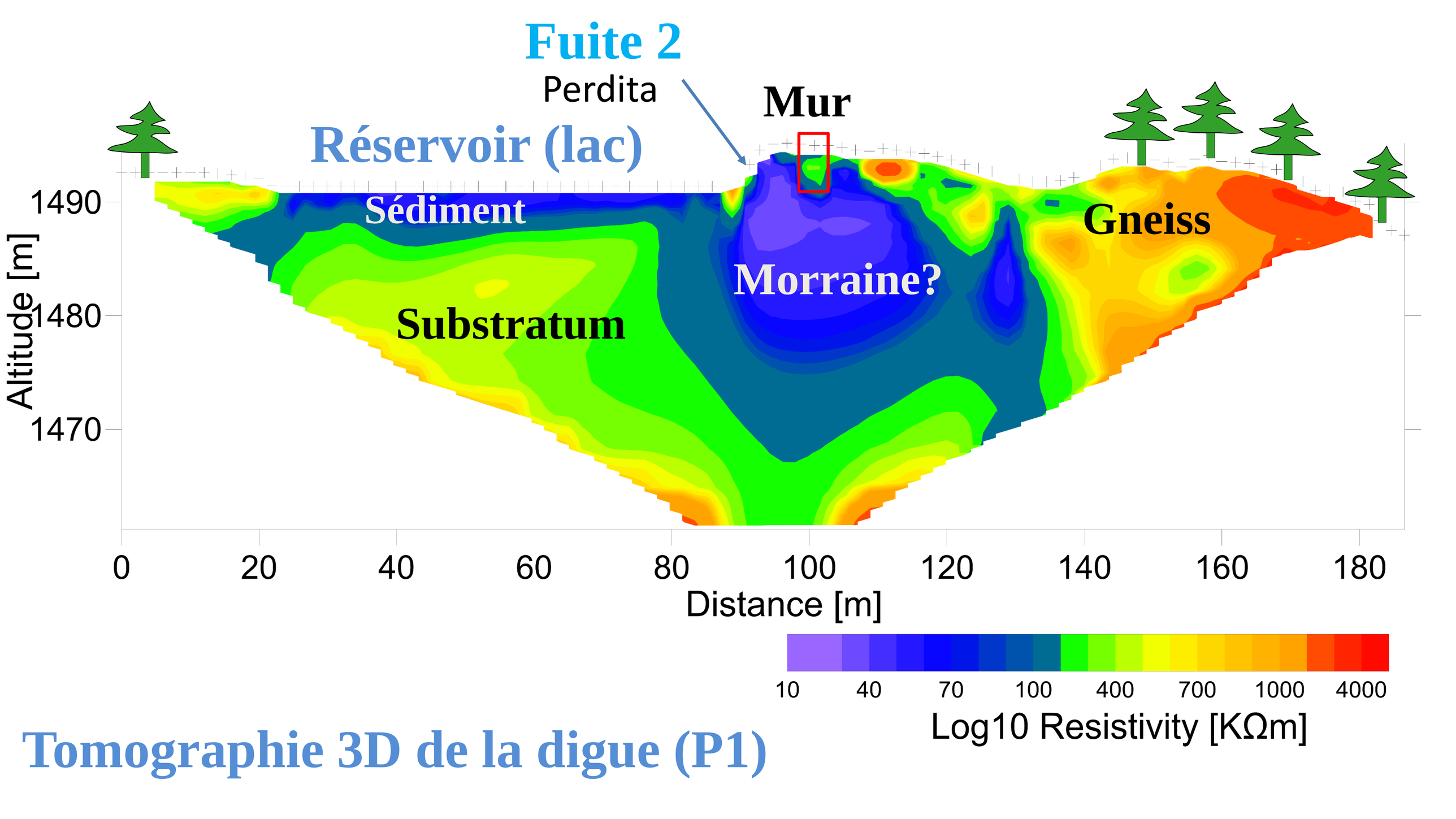
P1

0 10 20 m

Equipe franco-italienne

P. Ropele


Perdita
Déversoir
Mur
Prise d’eau
Fuite 1
Fuite 2



Tomographie 3D de la digue (P1)

Conclusions

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Reportage

Tempête Alex : «On entendait la nature se déchaîner»

Des intempéries marquées par des records de pluviométrie ont fait déborder les cours d'eau dans le sud-est,

Menu

Libération

Outils d'auscultation pour mieux prédire les zones susceptibles de pathologies

Grazie mólto

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