



Tim NZALI

Géophysique en forage

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Verkenningboringen

Namen, 10 februari 2009

Les forages de reconnaissance

Namur, le 10 février 2009



PLAN

1) Introduction

2) Géophysique en forage

a) Sismique

- Tomographie
- Downhole (uphole)
- Crosshole

b) Radar

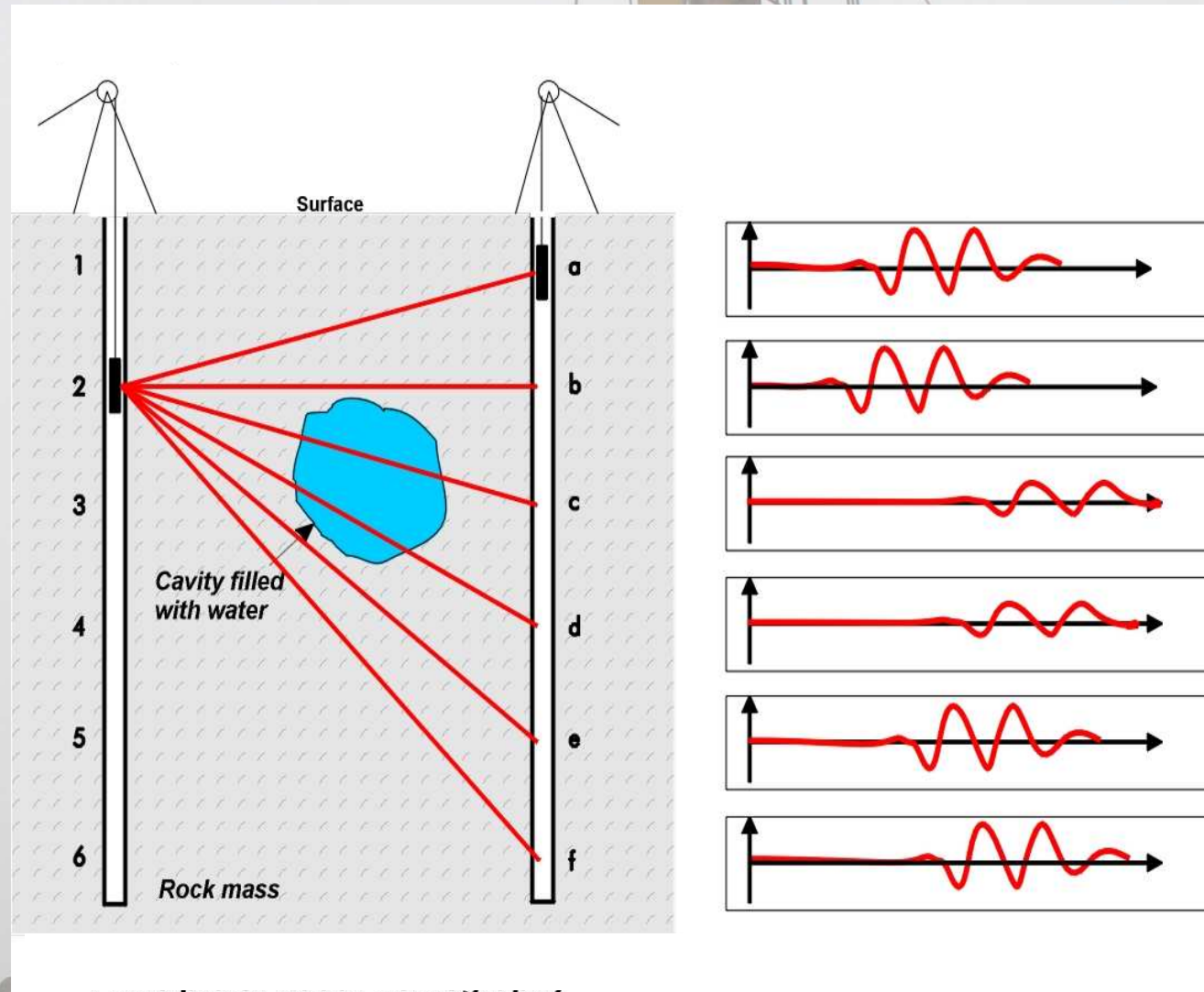
- Tomographie
- Crosshole
- Réflexion

c) Magnétométrie

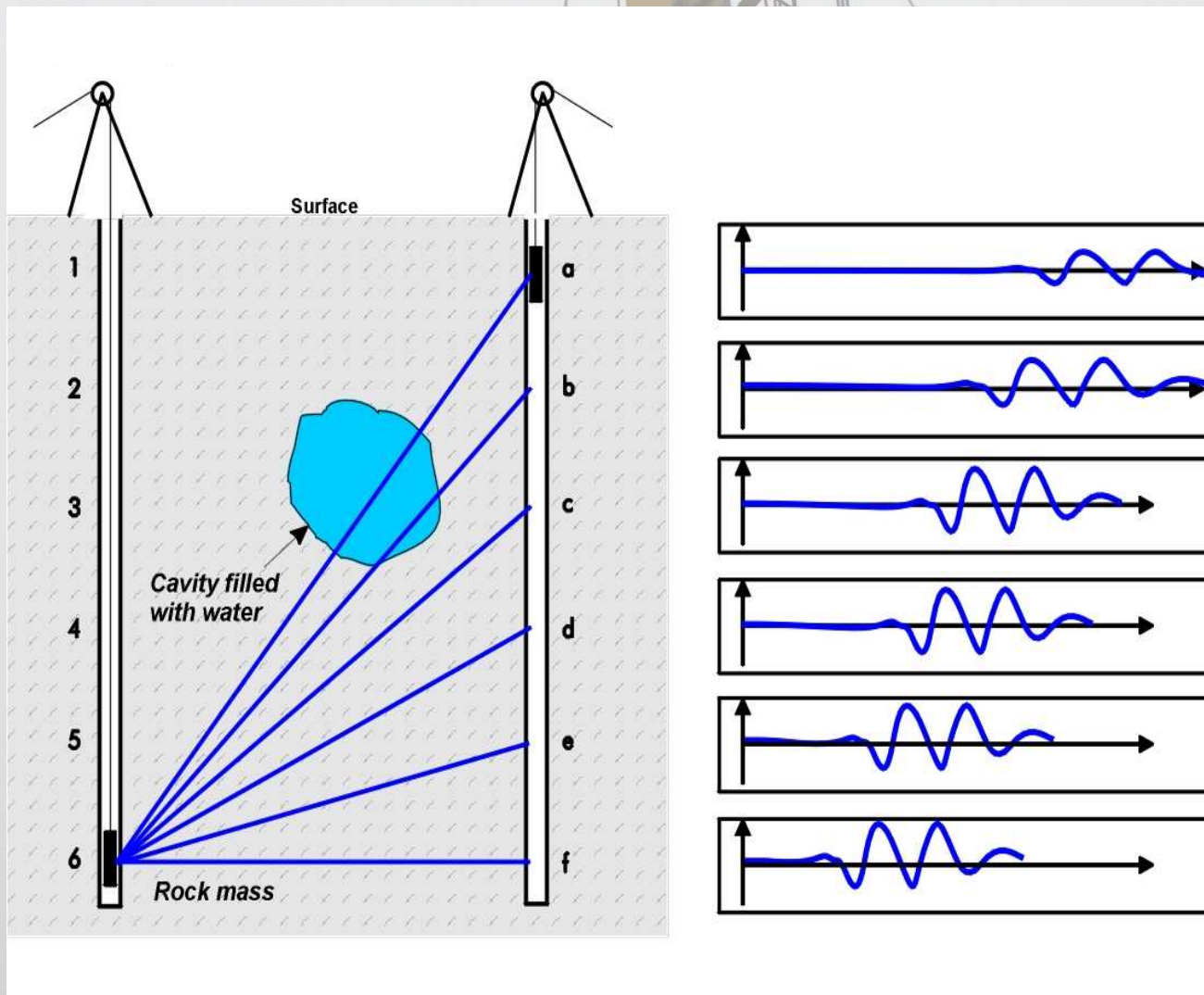
3) Caractéristiques des forages



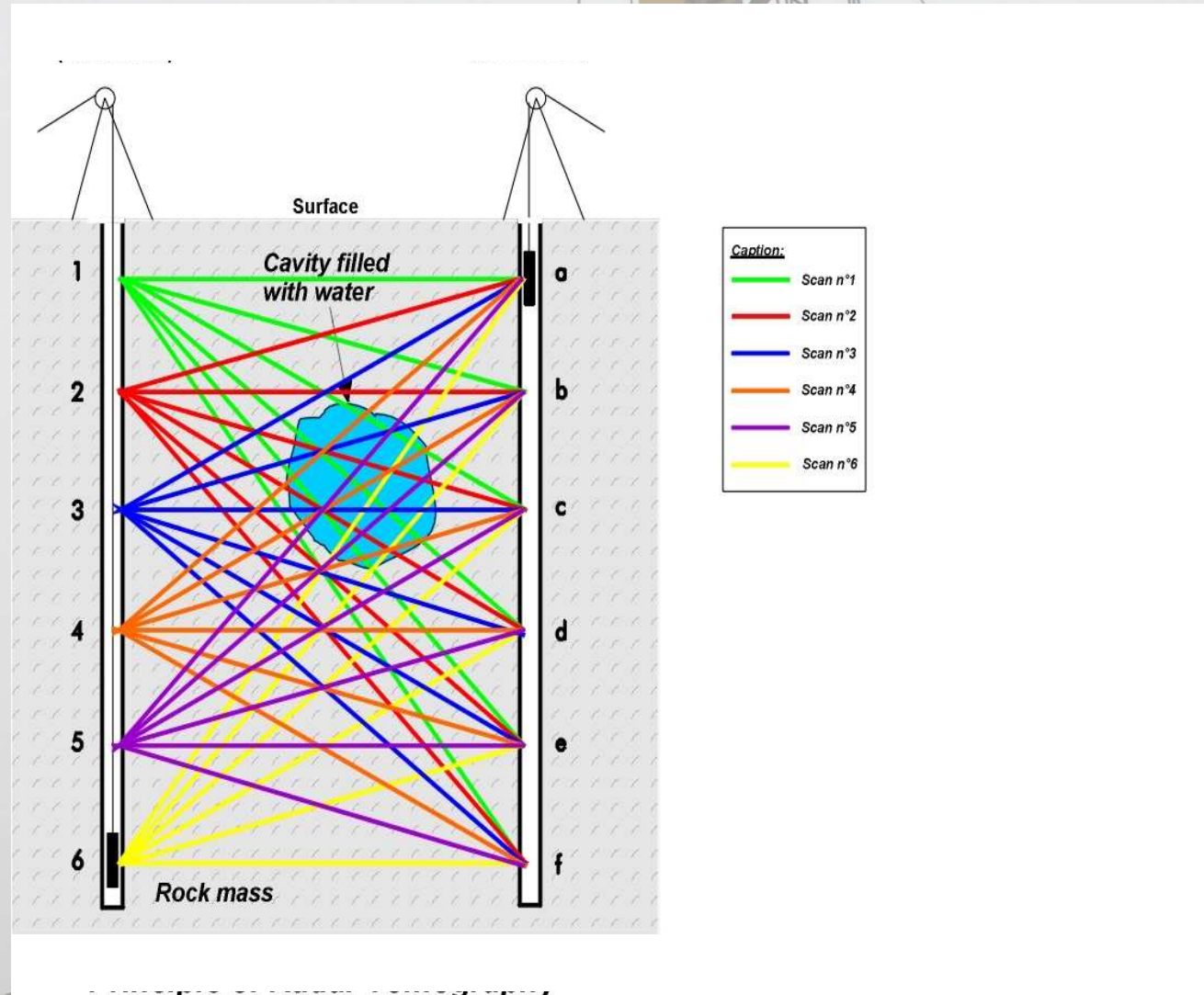
Sismique en forage: Tomographie



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Sismique en forage: Tomographie

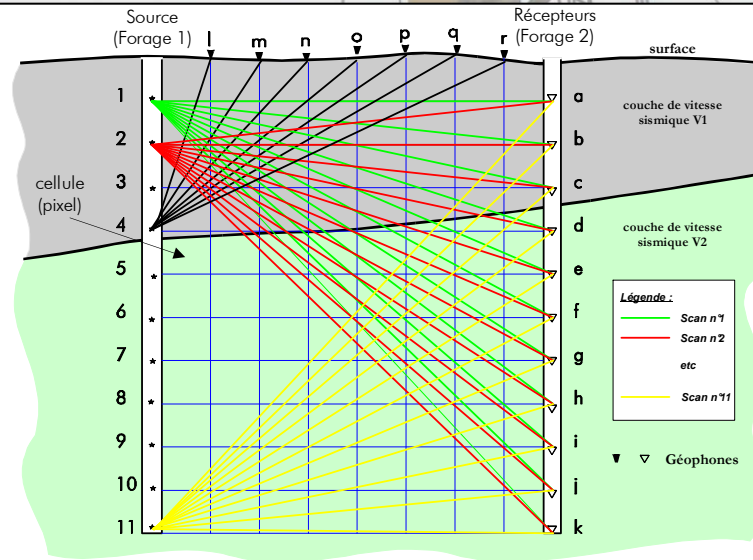


Figure 4 : Principe des mesures tomographiques

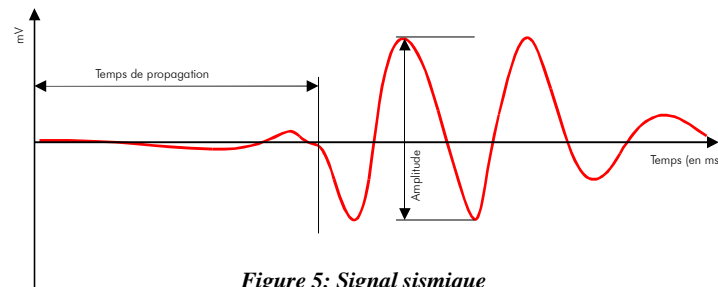


Figure 5: Signal sismique

Sismique en forage: Sources ondes P

Air gun

DHS-5500

The DHS-5500 is a small, light-weight Air gun suitable for operation at depths to 100 metres. The DHS-5500 is designed for chamber volumes ranging from 1 in³ to 20 in³, and operates at a pressure of 2,000 psi.



DHS-5500 Downhole Source

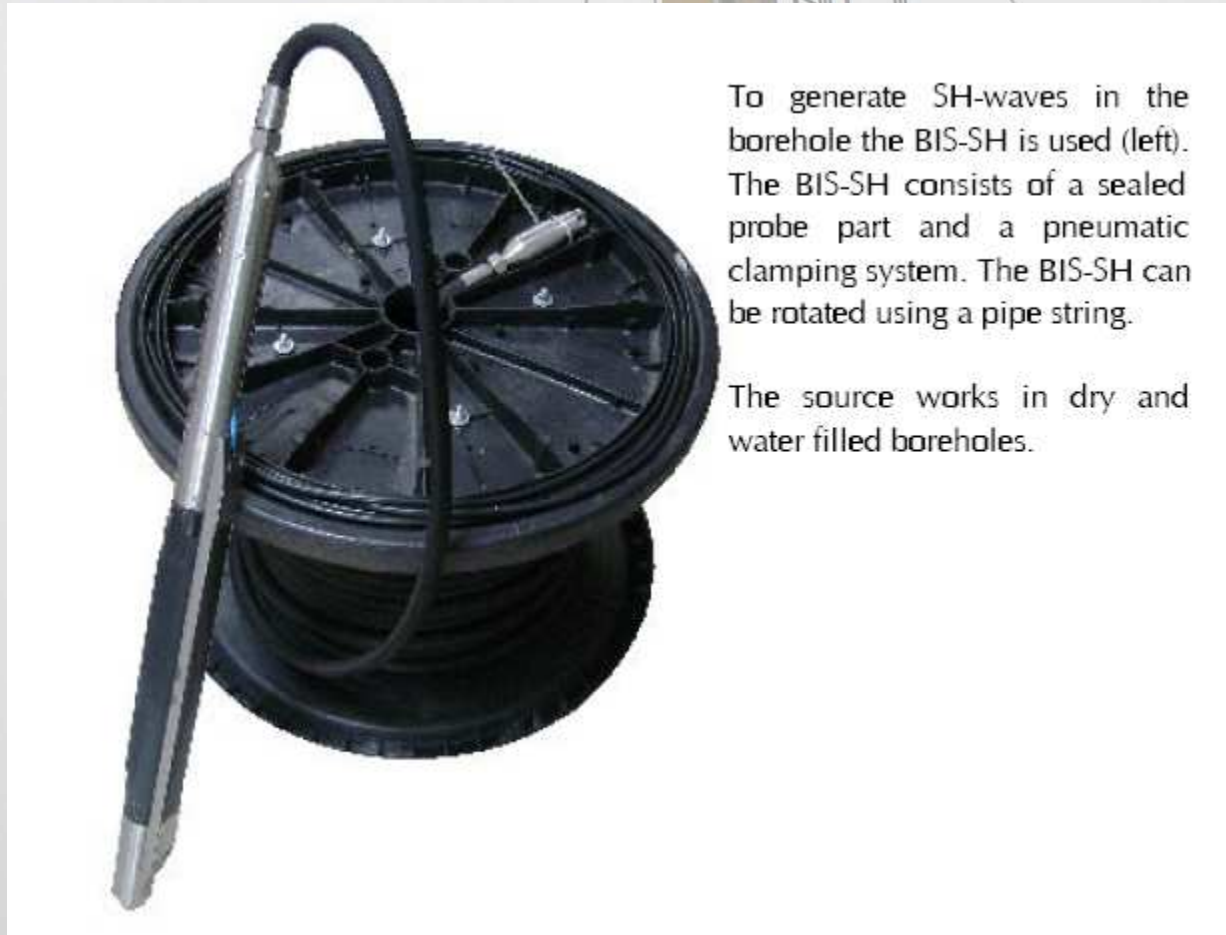
The DHS-5500 can be deployed in a shallow borehole, and at 16 lbs. is light enough to be easily managed by hand, without resorting to expensive mechanical winches. The DHS-5500 is also configured with composite air tanks as a portable air gun for remote operations.

Sparker



To generate the sparker pulses within the borehole the p-wave sparker probe SBS 42 is used (left). The SBS 42 consists of a probe tube and a rubber tube system. The sparker predominantly produces high frequency p-waves even over large distances as shown below.

Sismique en forage: Sources ondes S

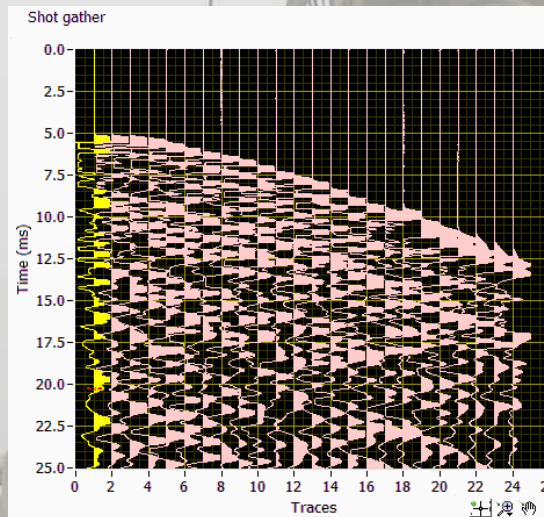
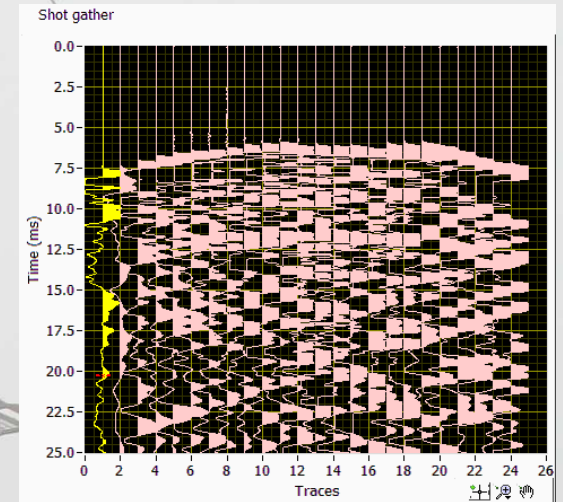
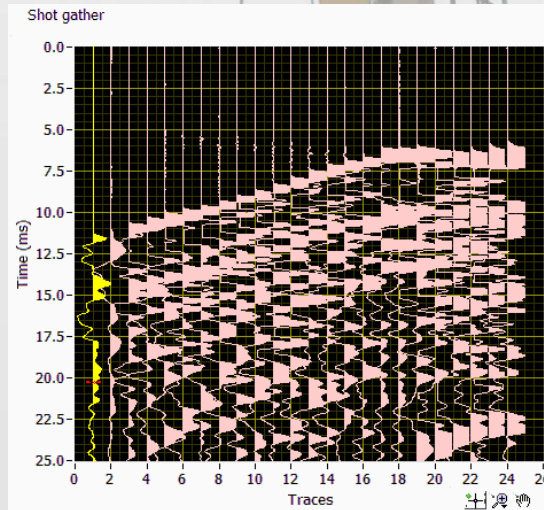
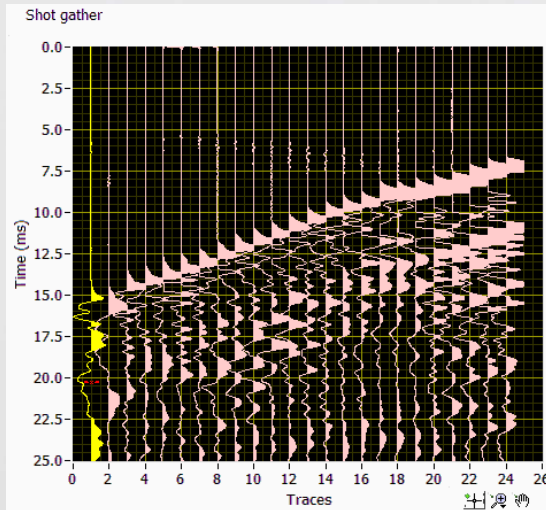


To generate SH-waves in the borehole the BIS-SH is used (left). The BIS-SH consists of a sealed probe part and a pneumatic clamping system. The BIS-SH can be rotated using a pipe string.

The source works in dry and water filled boreholes.

Sismique en forage: Tomographie

Exemples de résultats de tirs sismiques



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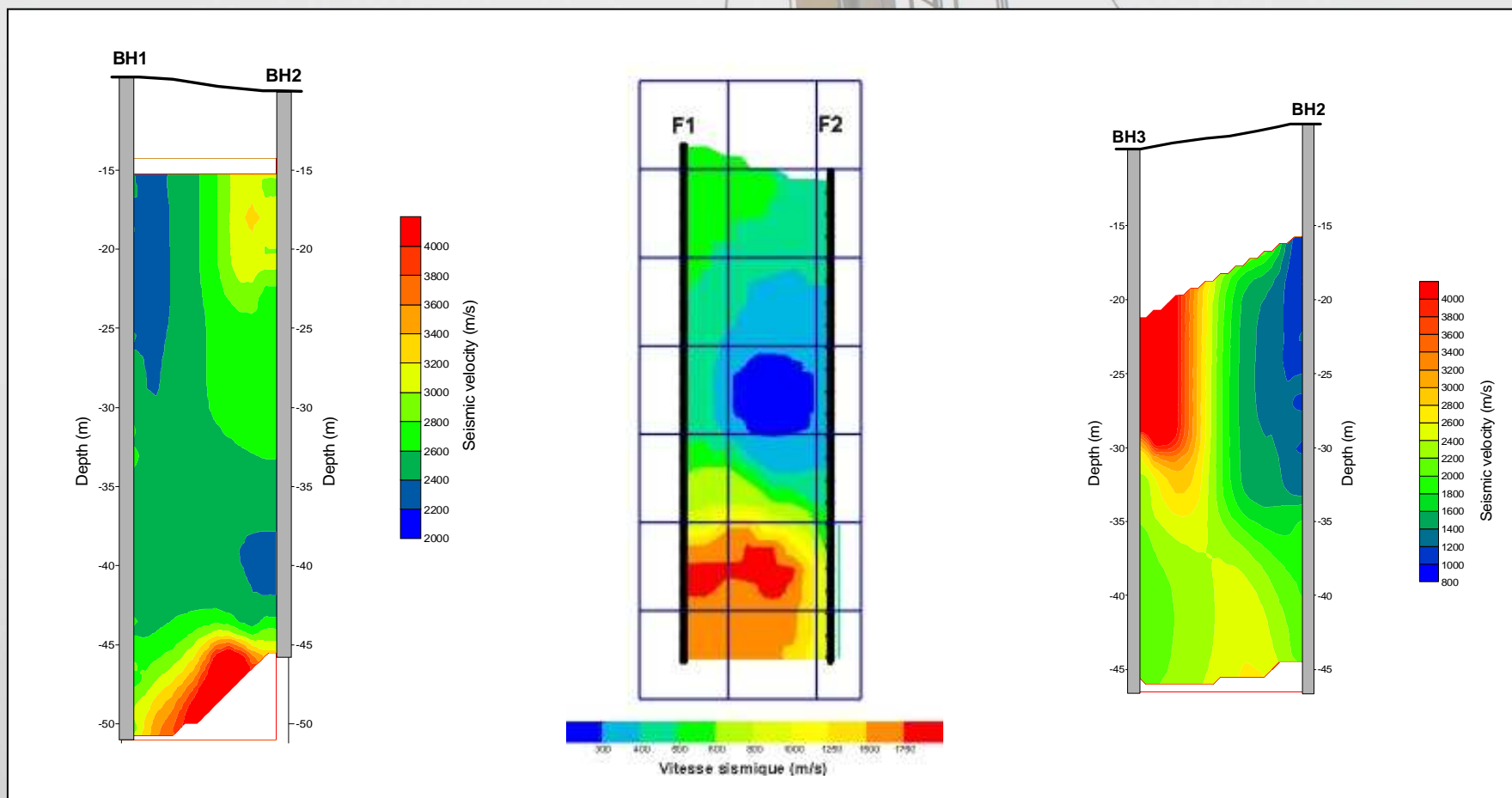
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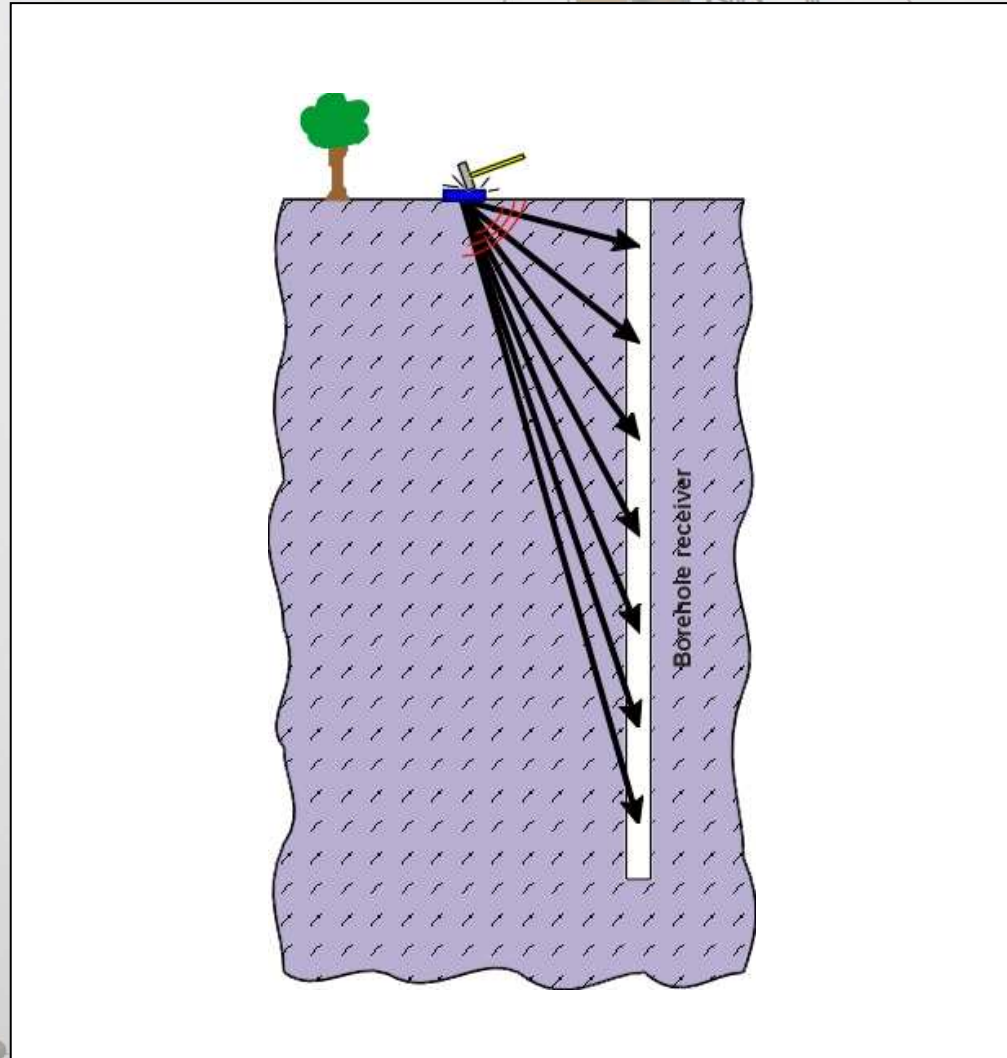


Sismique en forage: Tomographie

Exemples de résultats de tomographies

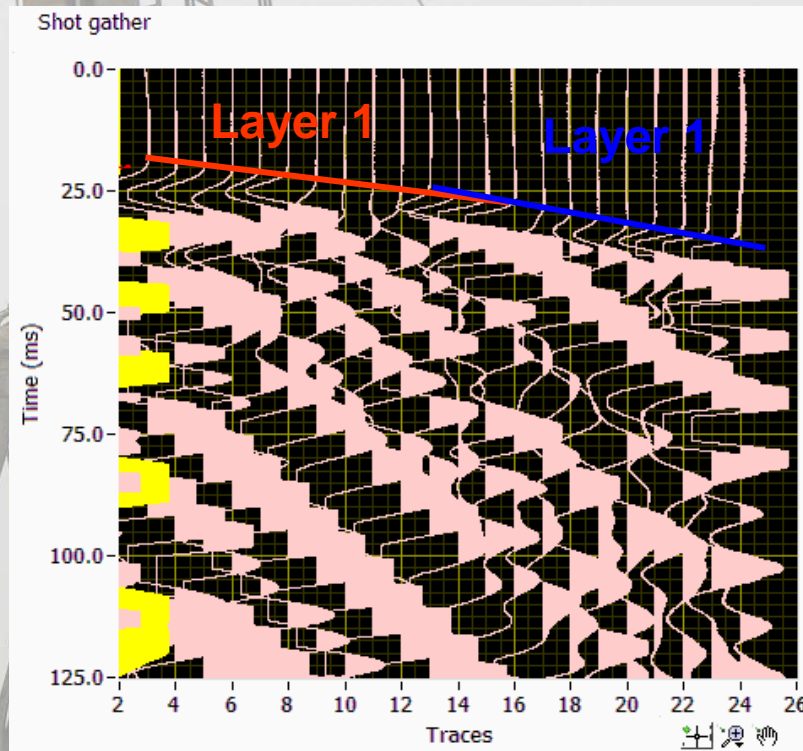
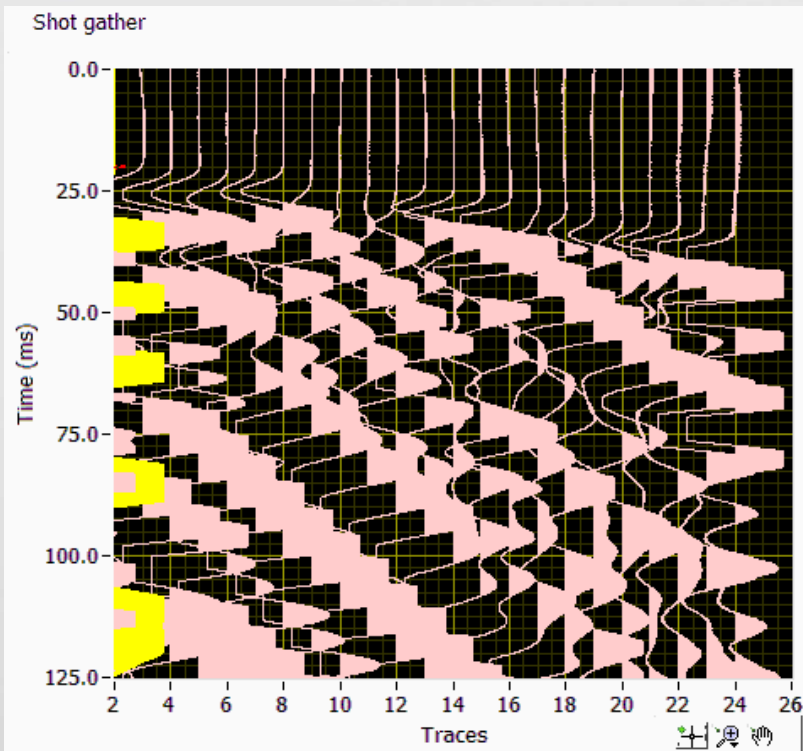


Sismique en forage: downhole

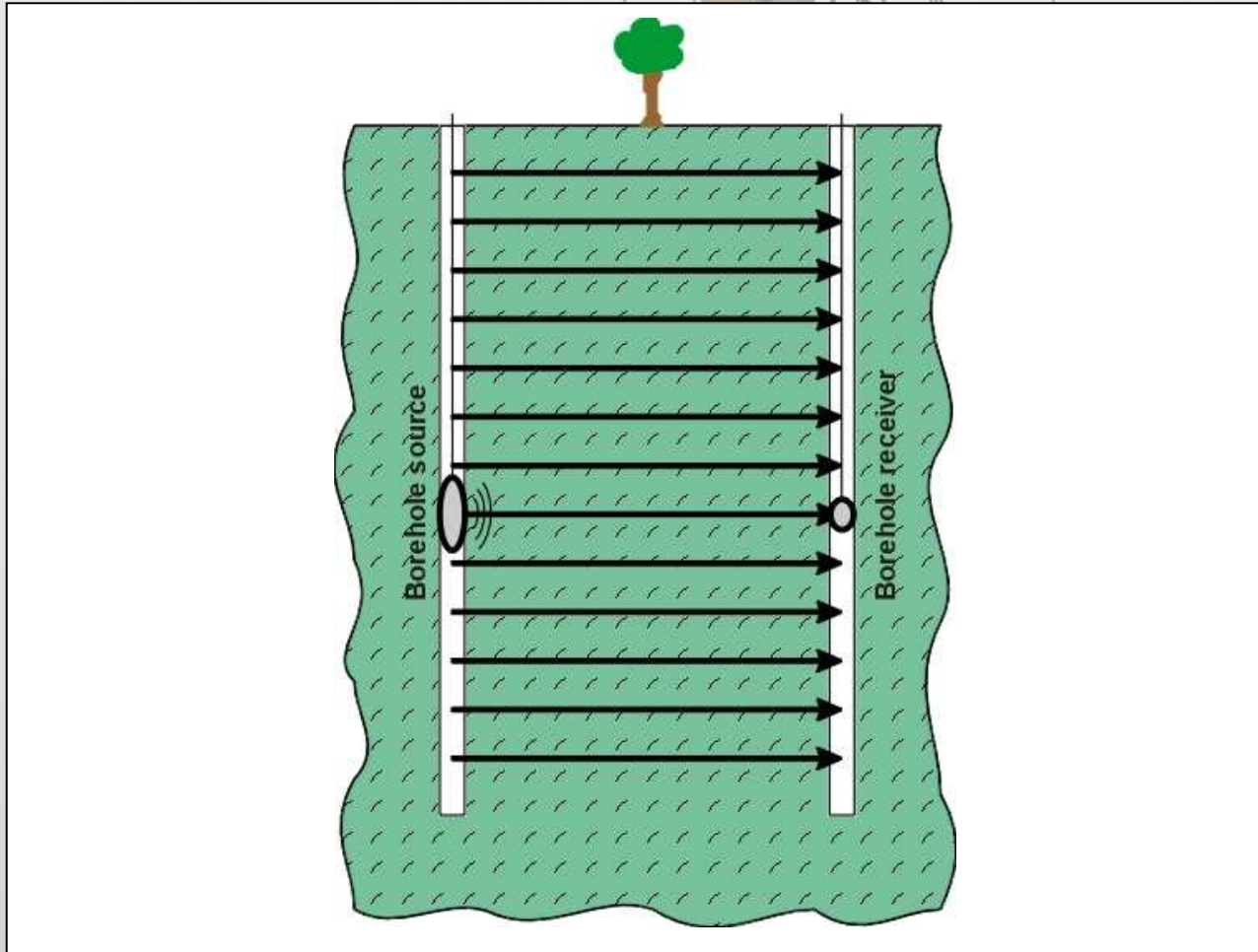


Sismique en forage: downhole

Exemples de résultats de tirs sismiques

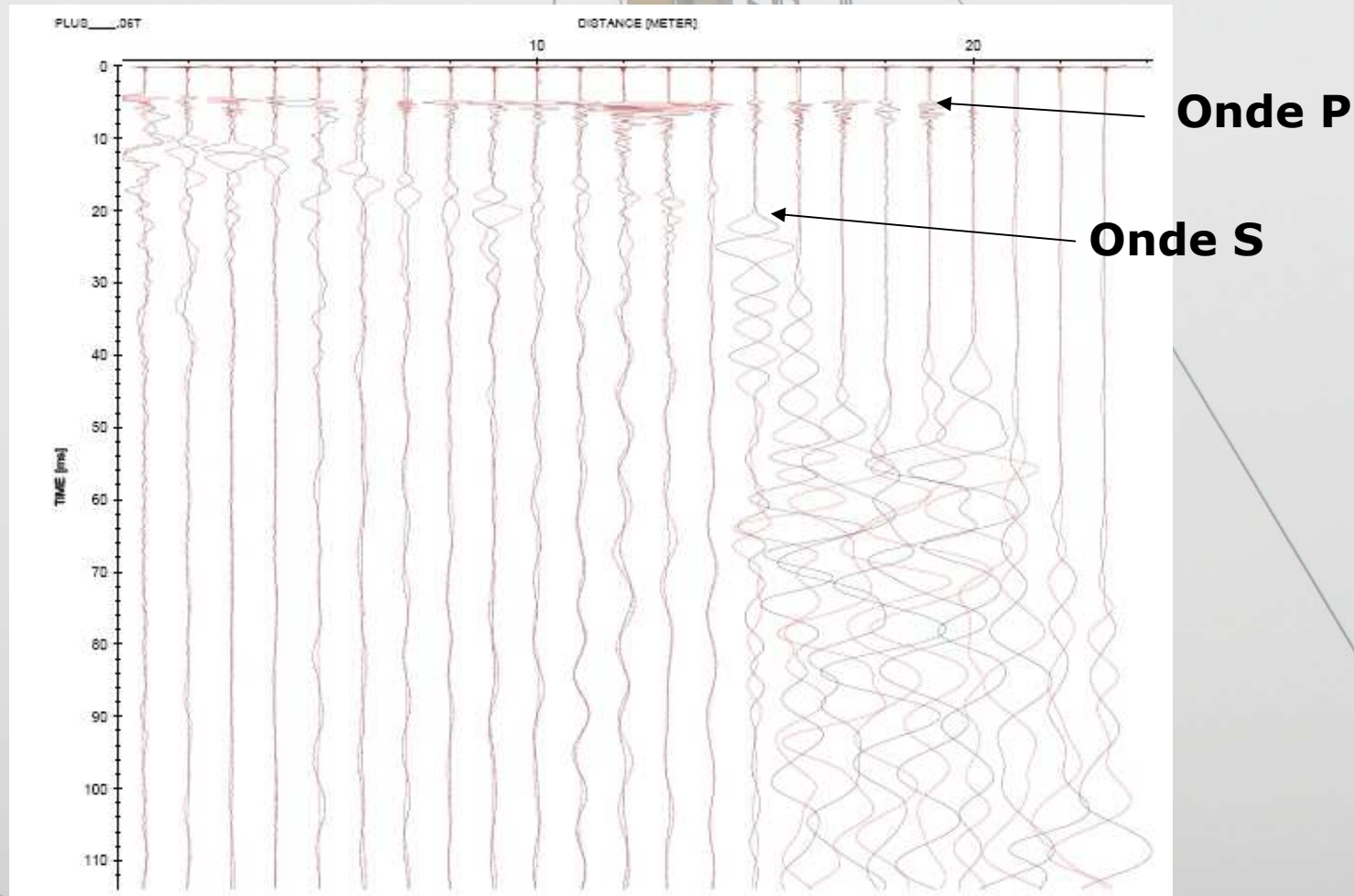


Sismique en forage: crosshole



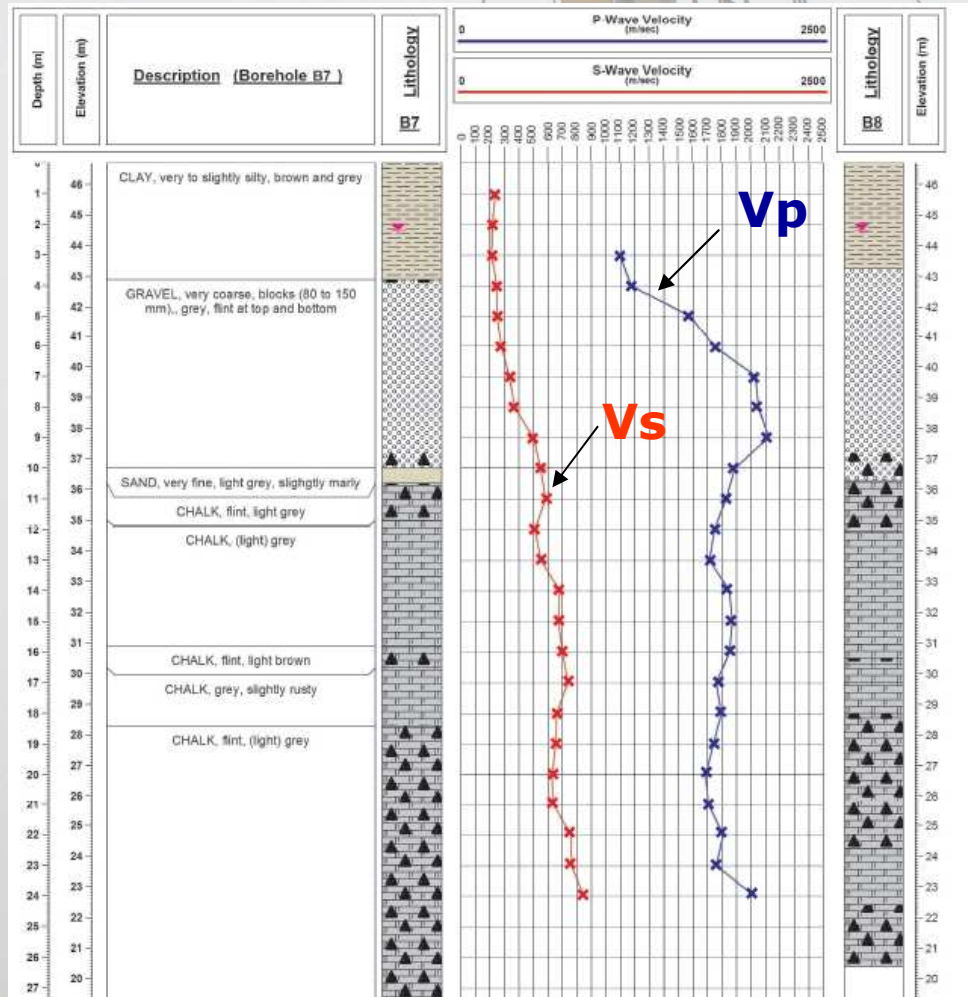
Sismique en forage: crosshole

Exemples de résultats de tirs sismiques



Sismique en forage: crosshole

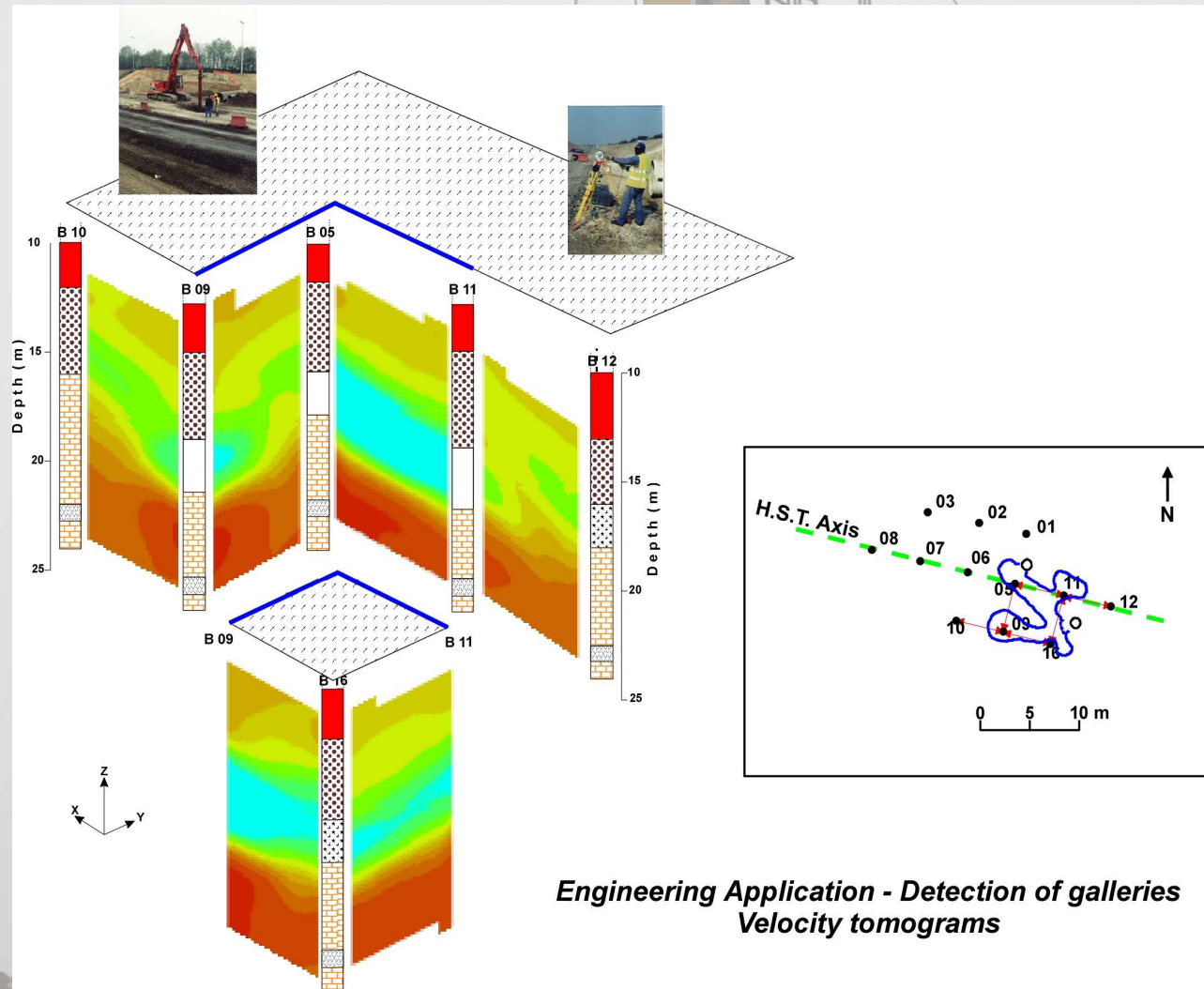
Exemples de résultats



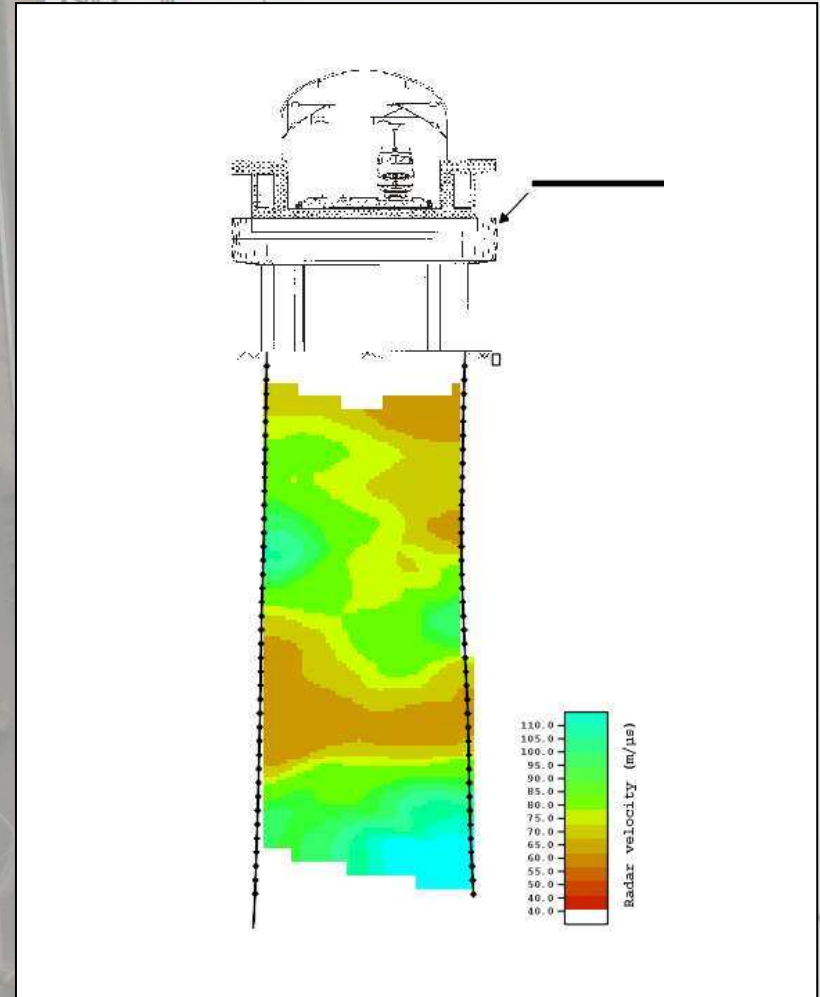
V_p , V_s , densité

E , ν

Radar en forage: Tomographie Tracé TGV

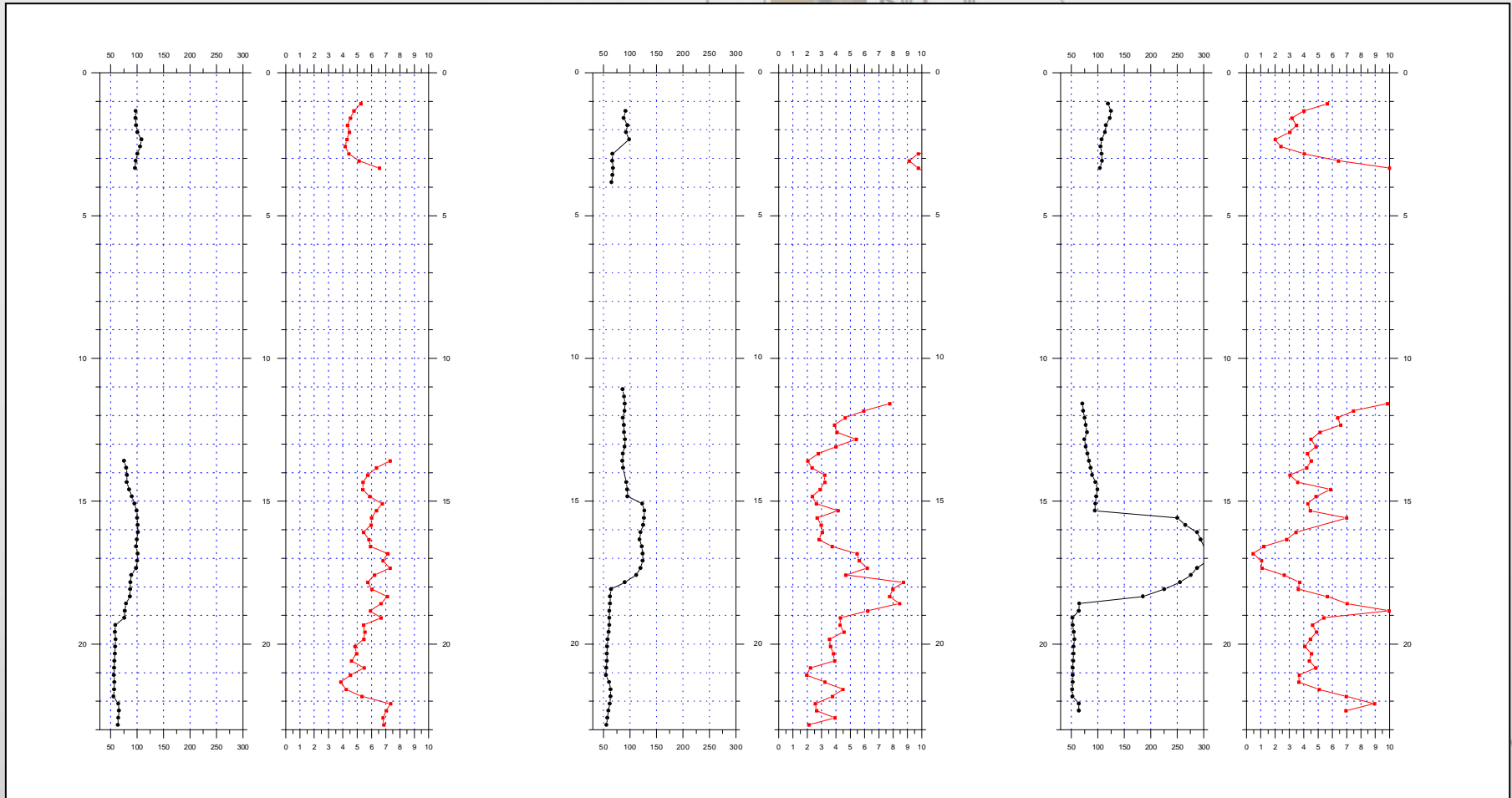


Radar en forage: Tomographie Viaduc d'Arbre



Radar en forage: crosshole

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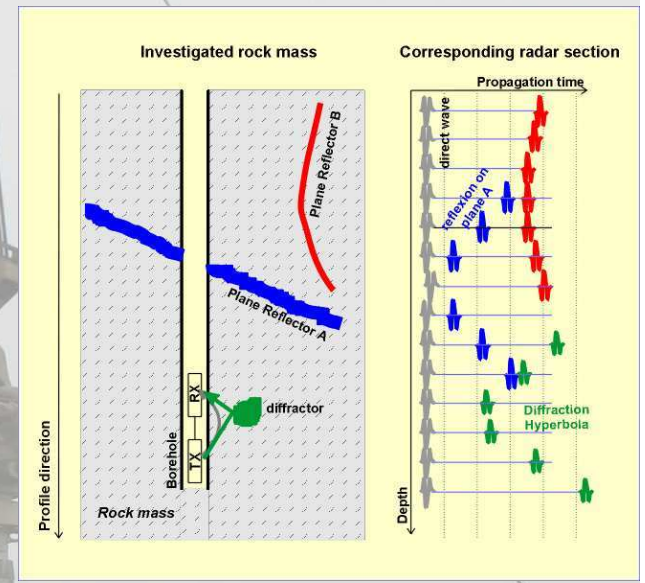
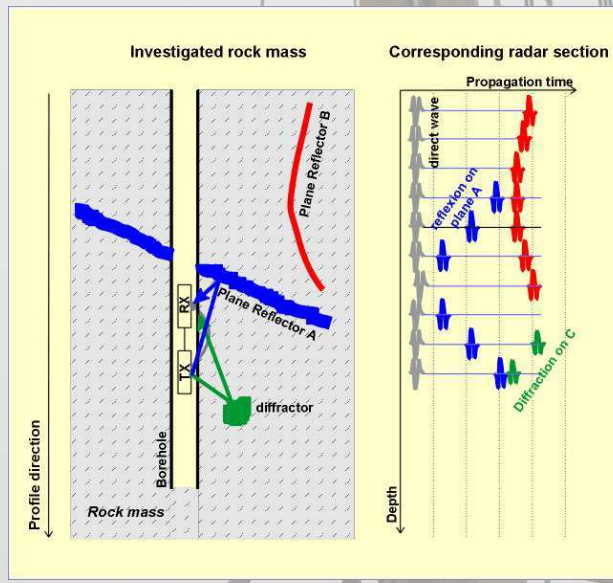
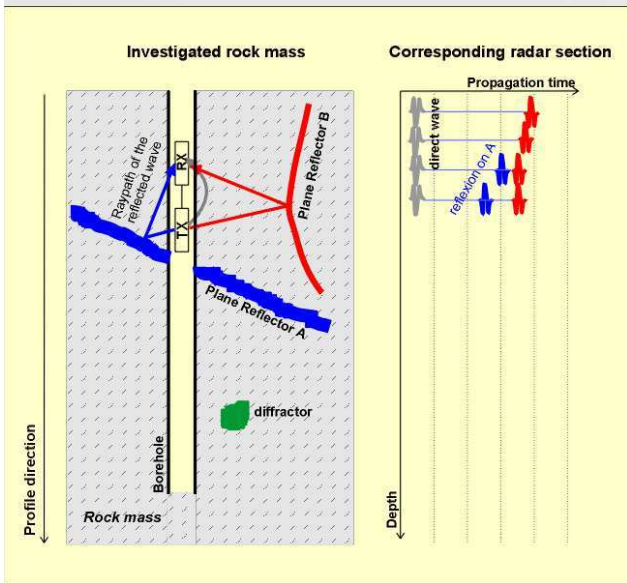
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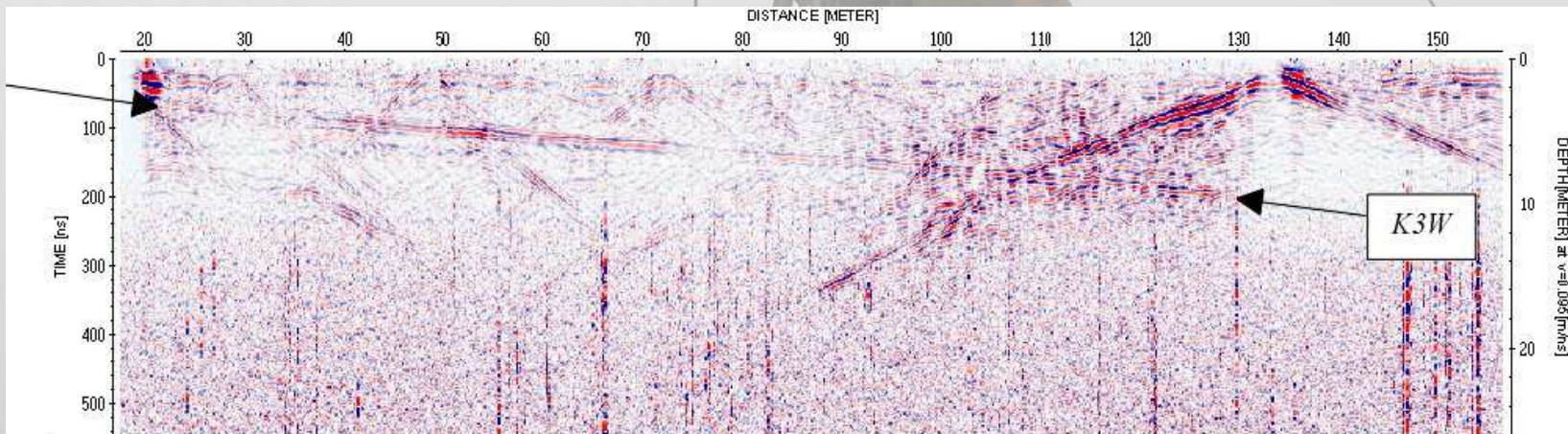
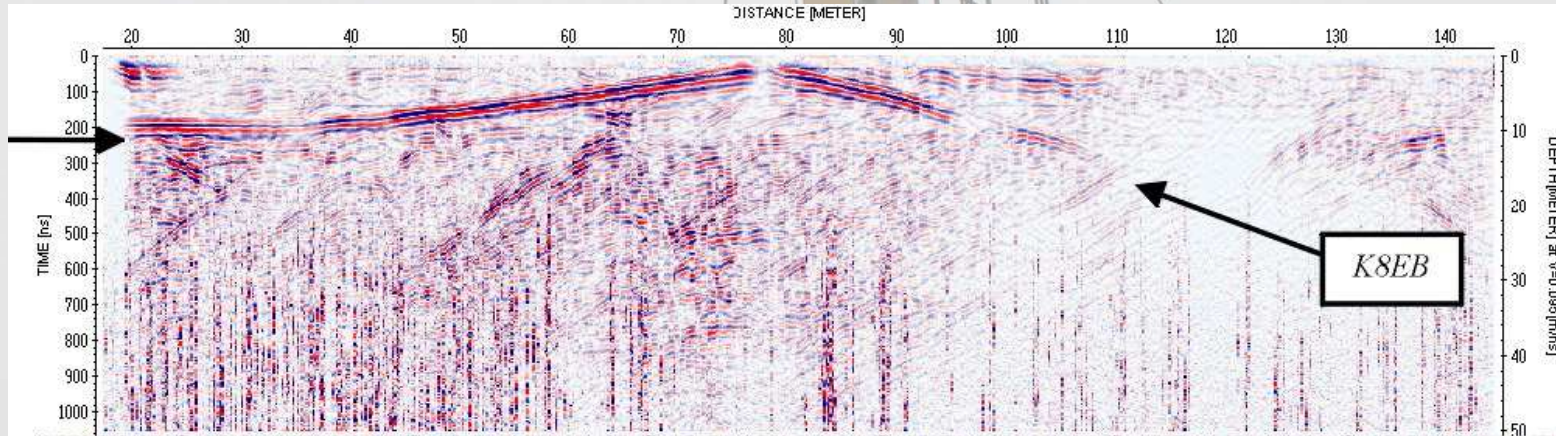
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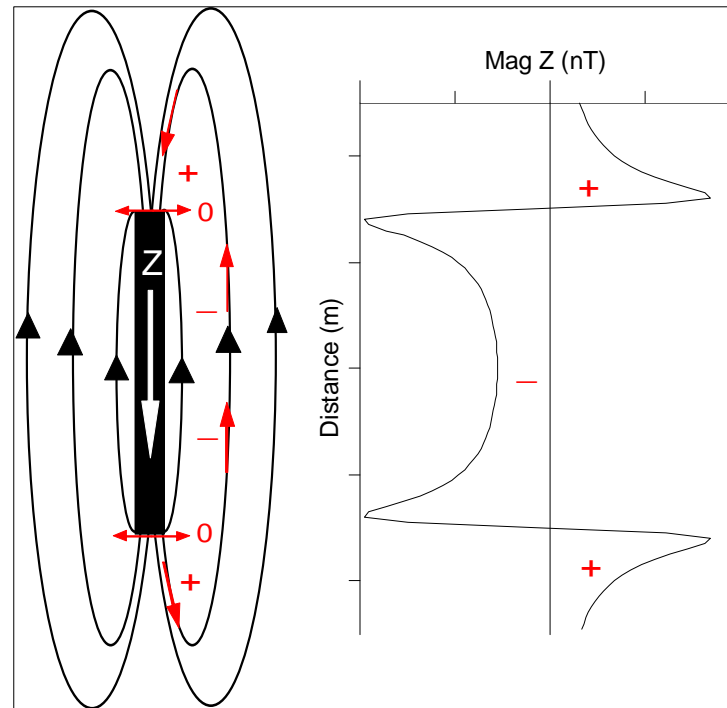
Radar en forage: Mode réflexion



Forages K8EB et K3W : Détection de forages de reconnaissance et une shear zone (venue d'eau) dans un tunnel

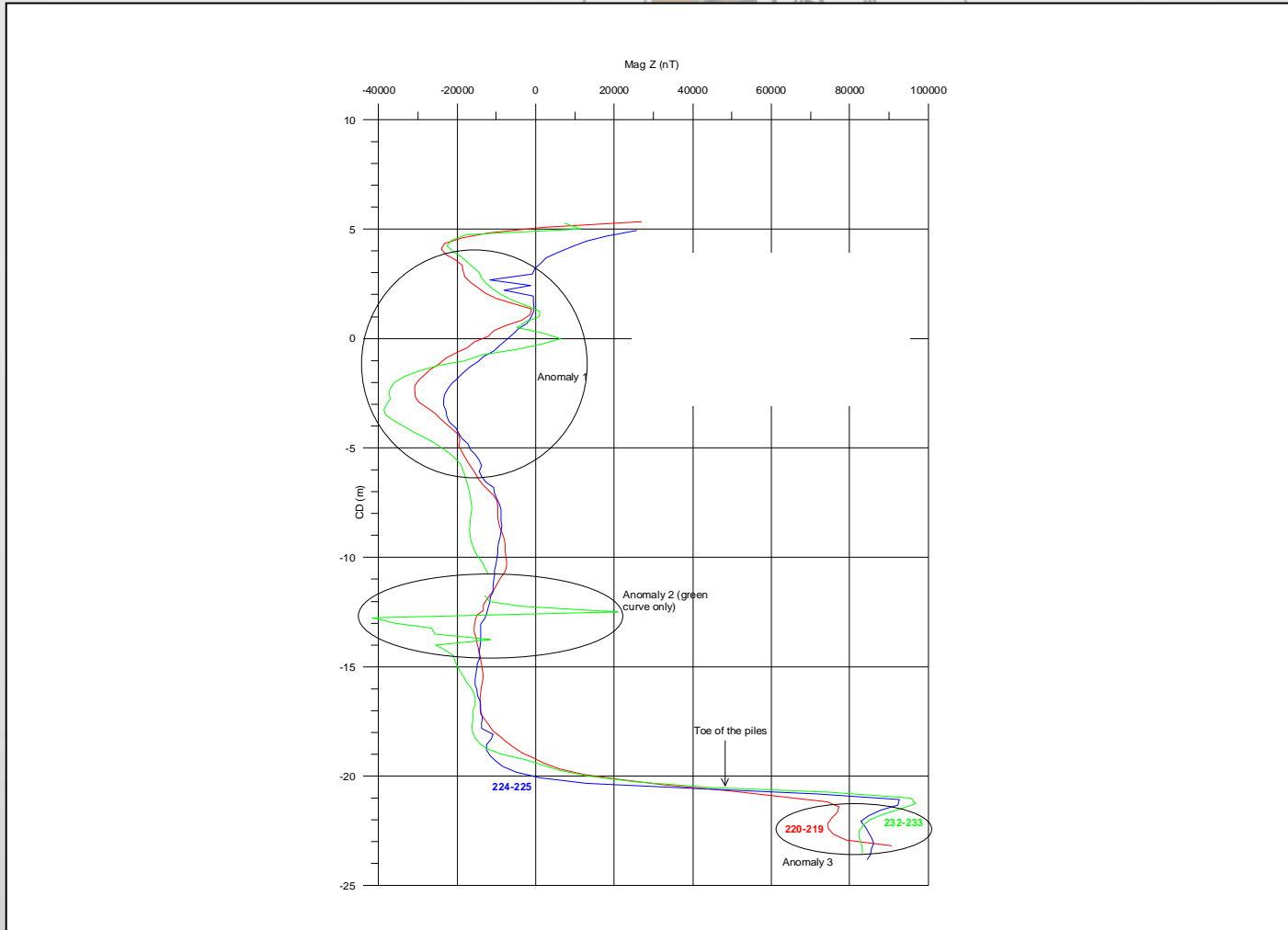


Magnétométrie en forage: détection de La base d'une palplanche



Amplitude de la composante verticale du champ magnétique liée à la présence d'une palplanche

Magnétométrie en forage: exemple de résultat



Caractéristiques des forages

	Tomographie radar	Tomographie sismique	Magnétométrie
Technique de forage	Carotté ou destructif	Carotté ou destructif	Indifférent
Fluide de forage	Utilisation de bentonite à proscrire	Indifférent	Indifférent
Tubage	PVC, diamètre interne 57 mm minimum (de préférence 64 mm)	PVC robuste, diamètre interne 80 mm minimum (air gun) 64mm (sparker)	PVC, diamètre interne 57 mm
Cimentation du tubage	Non requise	Requise hors nappe	Non requise
Verticalité	Contrôle de verticalité vivement conseillé	Contrôle de verticalité vivement conseillé	Non requise