Georadar: Locating dangerous zones prior to drilling the 57 km long Gotthard Tunnel in Switzerland

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Location of the „Gotthard“ Tunnel

Piora Formation
Cut Through on 15 October 2010

Dangerous Geological Formations
**Measuring Principle of Ground Penetrating Radar**

**Principle:**

Electromagnetic pulses are emitted by the Transmitter (Tx) and the reflected signal is received by the receiver antenna (Rx).

**Signal:**
- **Rx**: Receiver antenna
- **Tx**: Transmitter
- **Signal amplitude**: The amplitude of the signal received by the receiver antenna.
- **Measuring position**: The position at which the signal is measured.
- **Field recording**: The recorded signal data.
- **Assembled single signals**: The process of assembling individual signals into a complete recording.

**Rotary Bit of the Tunnel Boring Machine**

[Image of a rotary bit]
Passing the GPR Antennas through the Manhole

Results
Good and critical Prognosis

- Good rock formations
- Critical rock formations

Series of Georadar Profiles
Summary and conclusion

- Georadar is a feasible tool for detecting dangerous waterfilled zones in granitic rocks
- It is a very quick method and can be carried out during the check of the drilling bits
- Pilot holes are still necessary for safety reasons. However, the number of pilot holes can be reduced and limited to the critical zones.

Thank you for listening to the world in the underground!