Ground Penetrating Radar (GPR)
Detection of service pipes and the risk of collapsing sinkholes at the Lake of Constance in Switzerland

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Presented at the FIG Working Week 2019, April 22-26, 2019 in Hanoi, Vietnam
Arbon: summer days - winter days

Lake of Constance. View from Arbon
Hidden large holes

Ice shield on the shore in February (left) and collapsed ground after melting of the ice in March 2018 (right)
GPR investigation

Was that the only hole?

I have the answer!

• I am a GPR system with 250- / 700-MHz double antennas
• I can see up to 6 meters deep
• I don’t destroy
• My images show a high resolution
• I can measure very fast
How I measure:

I emit a short electromagnetic pulse
I have an emitter- (E) and receiver (R)
I see a change in electrical resistivity

That is my receiver signal

I add the receiver signals to form a profile

I am pulled to the next position

Amplitude

Threshold

Airwave

Surfacewave

Reflector-signal

Do you like colors?

Measuring position
Process of the measures

- Fairground plaza: 55 parallel profiles
- Pedestrian walkway: 5 parallel profiles
- With the associated ramp
Radargram on the pedestrian walkway

250 MHz Antenna

F3_B_250.02T

POSITION [METER]

TRAVELTIME [ns]

DEPTH [METER] at v=0.1 [m/ns]
Why do we see hyperbolas?

Measuring position
High resolution radargram on the quay wall

700 MHz Antenna

Reinforcing bar’s are located at the top of each hyperbola
3-D Dataacquisition at the fairground plaza

55 parallel profiles
3-D Dataprocessing – Layer Interpolation

1.1 m

2 m

pipes

3-D Profiles

3-D Layers
Summary and Outlook

• Often the maps are old and not up to date, GPR tells you precisely the position of water pipes and electric cables
• GPR can see electrical properties of the subsurface and NOT elastic properties
• GPR is a rapid method for a 3-dimensional documentation of the underground as well in walls

➢ In the future this method will become very important, because many flat places are full of pipes and old waste

Thank you for listening and good-bye!