



## **A modern subsurface investigation concept**

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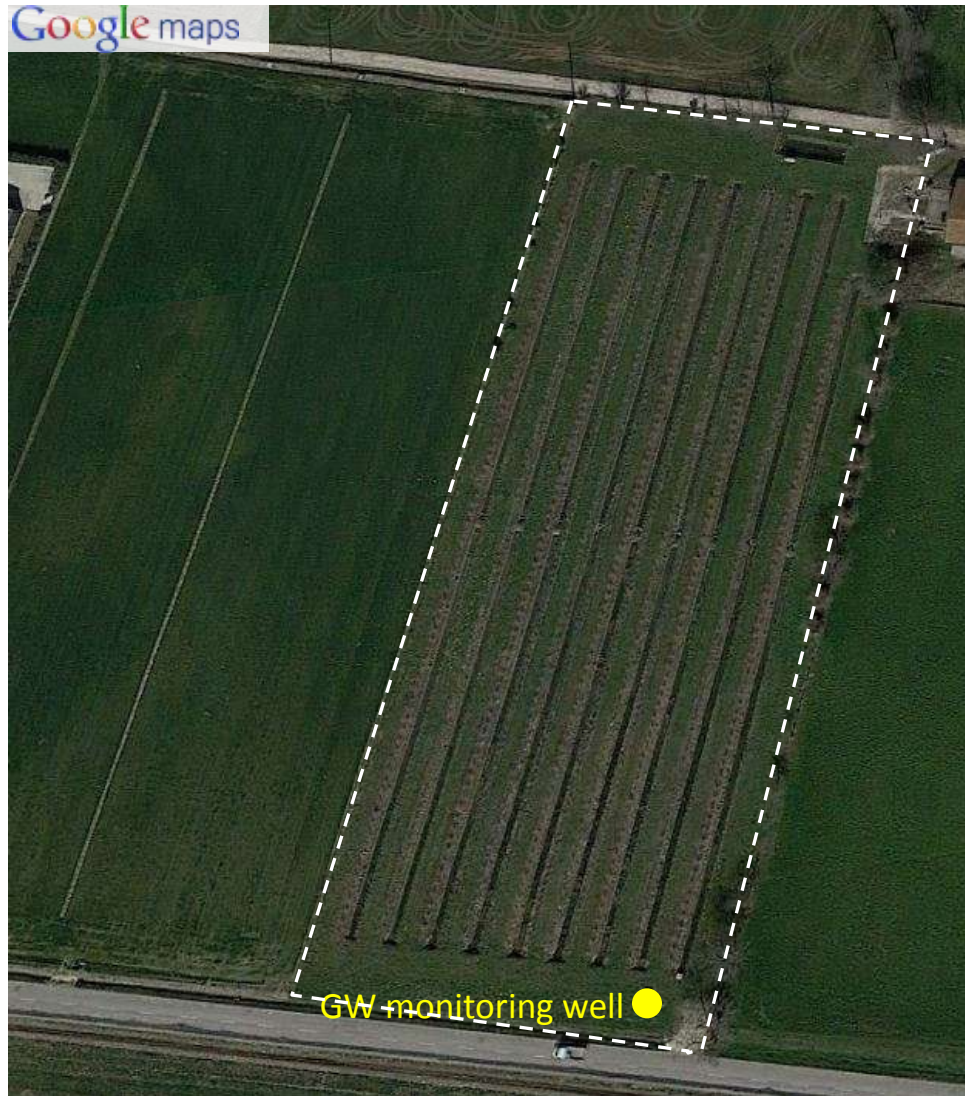


Loria infiltration basin, Italy

- Basin and trench infiltration systems are large infrastructures with high infiltration potential
- Space demanding and hence associated with higher costs for installation and maintenance
- Infiltration capacity is governed by vertical hydraulic conductivity ( $K_v$ )
- High impact of (thin) low  $K_v$  layers or lenses
- Site characterization prior to large scale MAR infrastructure installation often limited to sparse sampling
- Questionable how representative results are and what the uncertainties are for layout and operation
- Economic sustainability with high functionality and low maintenance is key factor for MAR implementation.

- How to characterize the heterogeneous River Brenta mega fan deposits at very shallow depth to evaluate infiltration capacity
- How to describe and evaluate effects of clogging on infiltration capacity



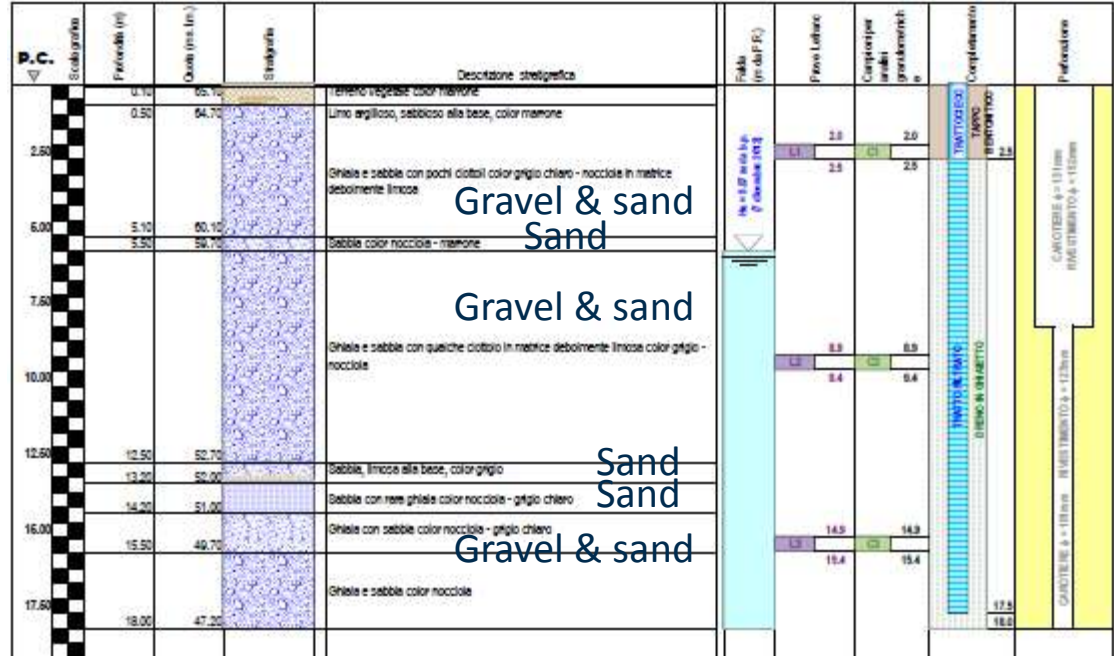


## Schiavon Forested Infiltration Site:

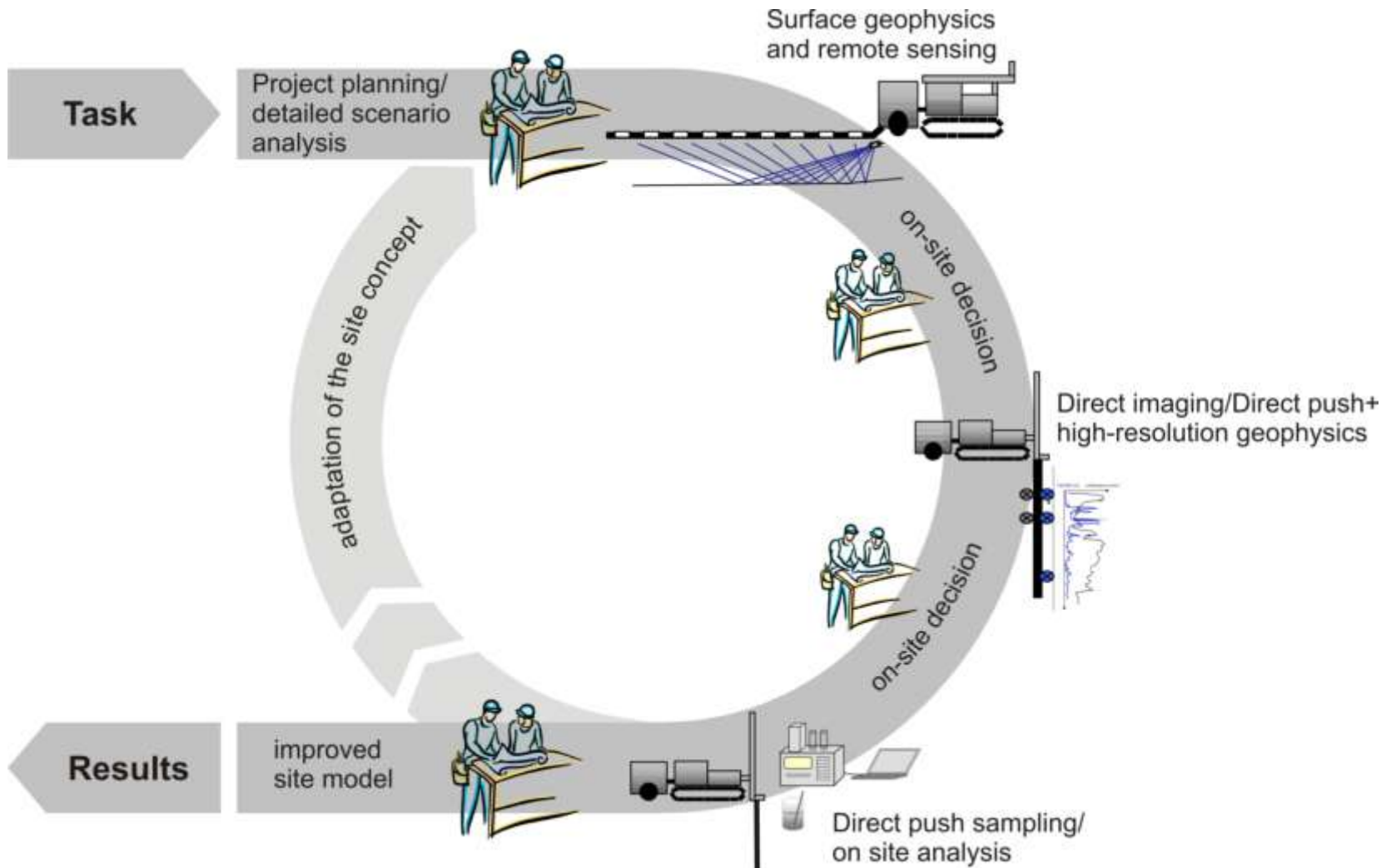
- 9 infiltration trenches with 1420m total length
- Trapezoidal cross section (width at surface 80 cm, depth 80cm)
- Forested infiltration, 1,400 plants/ha, 5 year short rotation forestry
- Demo site

## 2013-2014 Recharge Season (Oct-Feb):

- 116 recharge days
- 234,700 m<sup>3</sup> surface water infiltrated
- 23.42 l/s avg. infiltration rate



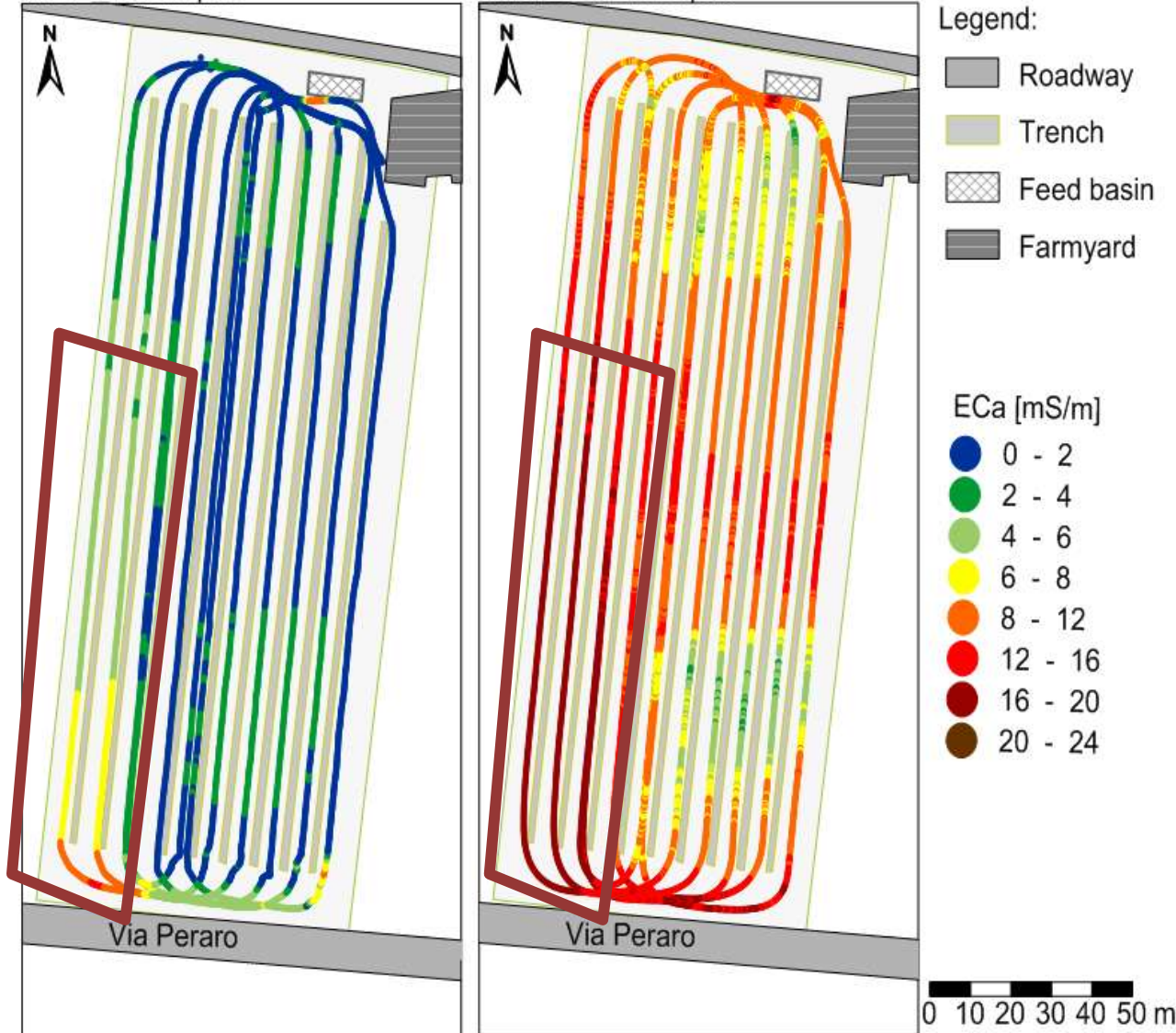
Sample	Slichter	Terzaghi	Krüger	Kozeny	Zunker	Zamarin	Mean	Lefranc
SH_C1	-	-	1.72E-03	1.42E-03	1.14E-03	1.43E-03	1.43E-03	1.10E-03
SH_C2	1.70E-05	2.43E-05					2.07E-05	8.50E-05
SH_C3	5.07E-05	7.23E-05					6.15E-05	1.50E-04





EM31- vertical dipole

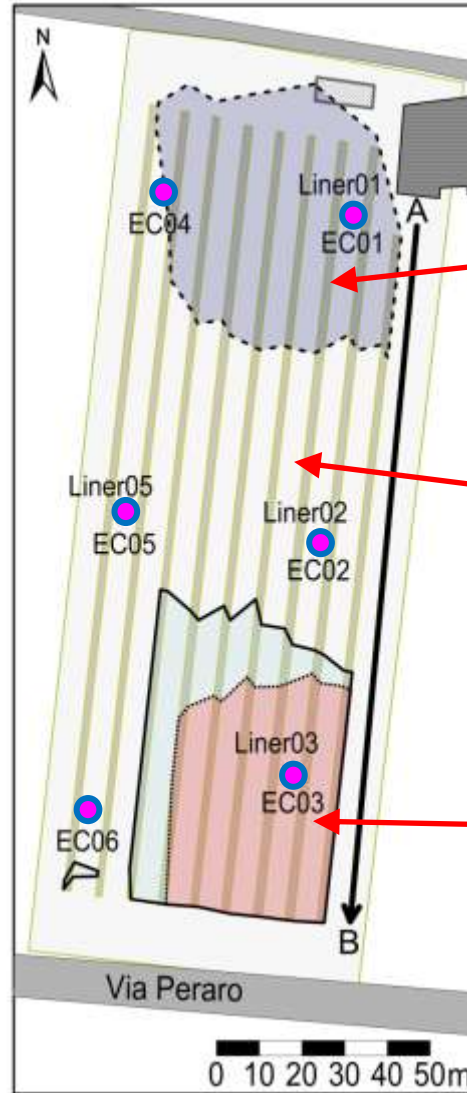
EM38DD- vertical dipole



- EM31 vertical dipole up to 6 m penetration depth
- EM38DD vertical dipole up to 1,5 m penetration depth
- In general higher conductivities at the near surface
- Distinct anomalies, differentiated by EC values
- **water in trenches causes higher conductivities**



EM38DD- vertical dipole



Legend:

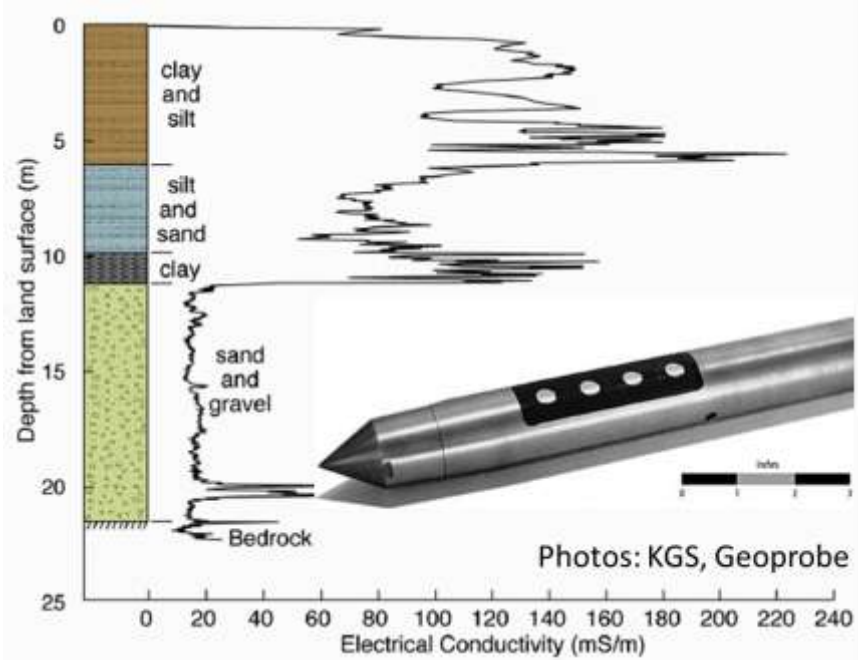
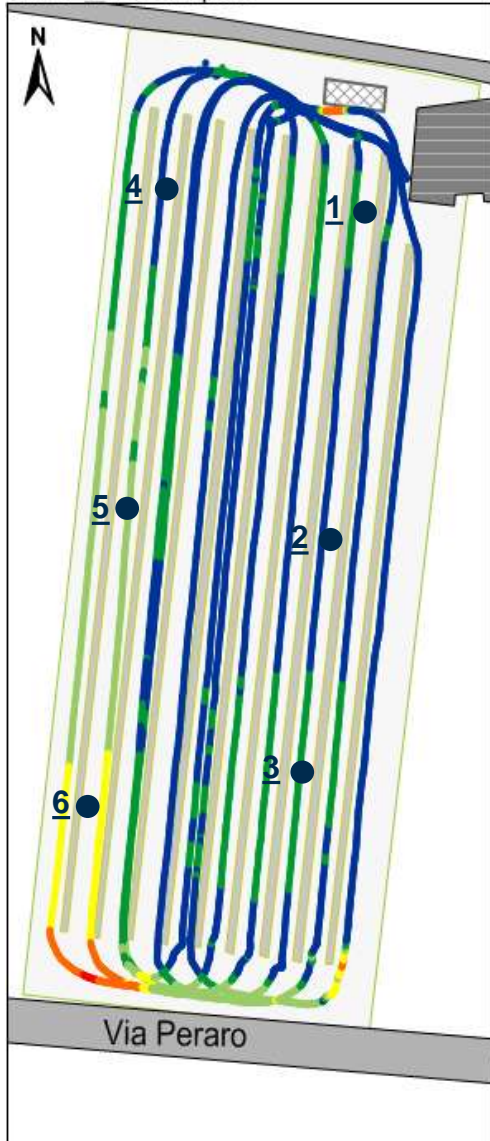
- Roadway
- Trench
- Feed basin
- Farmyard
- ERT profile
- DP EC-log
- DP Liner
- Facies 1
- Facies 2
- Facies 3
- Facies 4

ECa [mS/m]

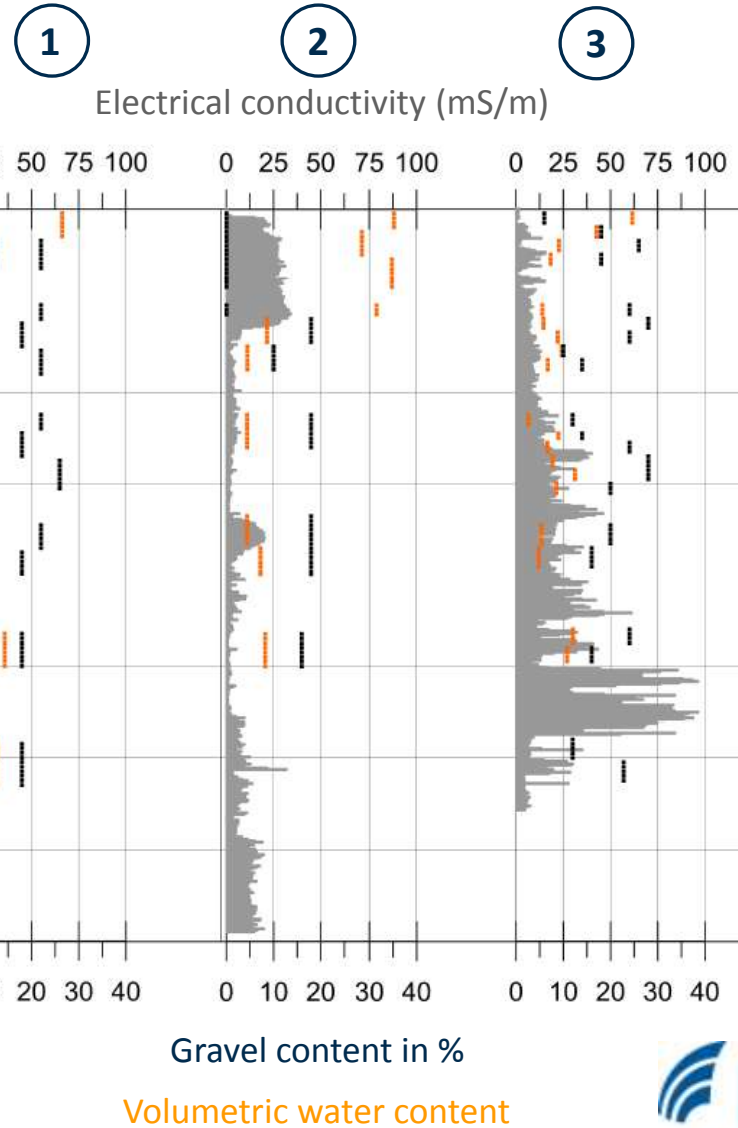
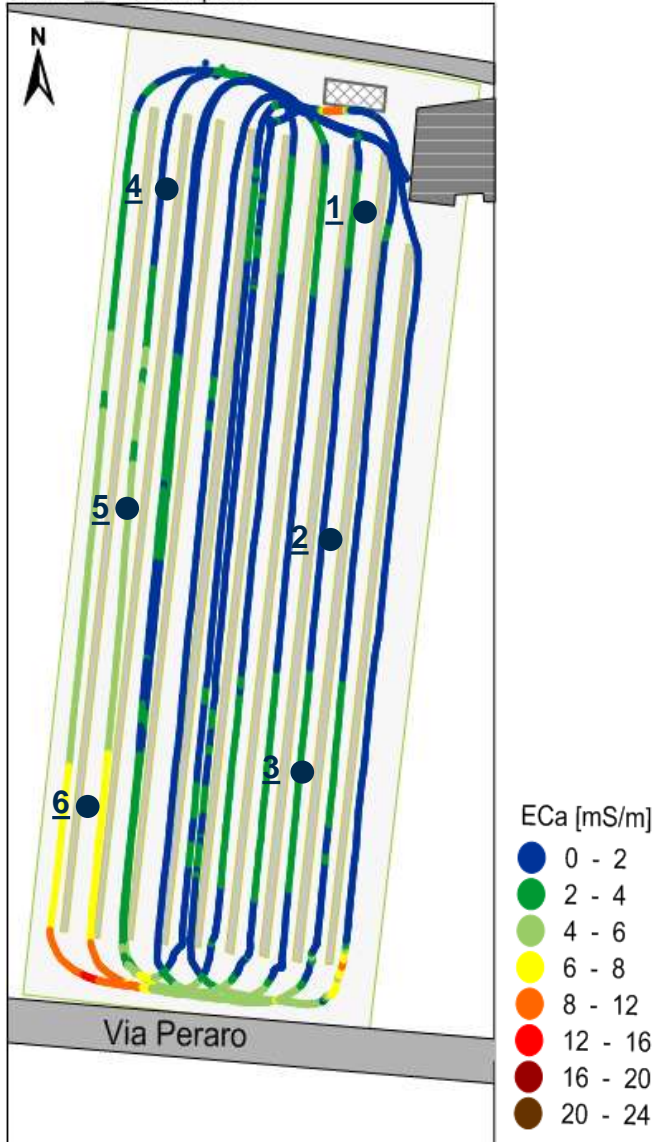
- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 12
- 12 - 16
- 16 - 20
- 20 - 24



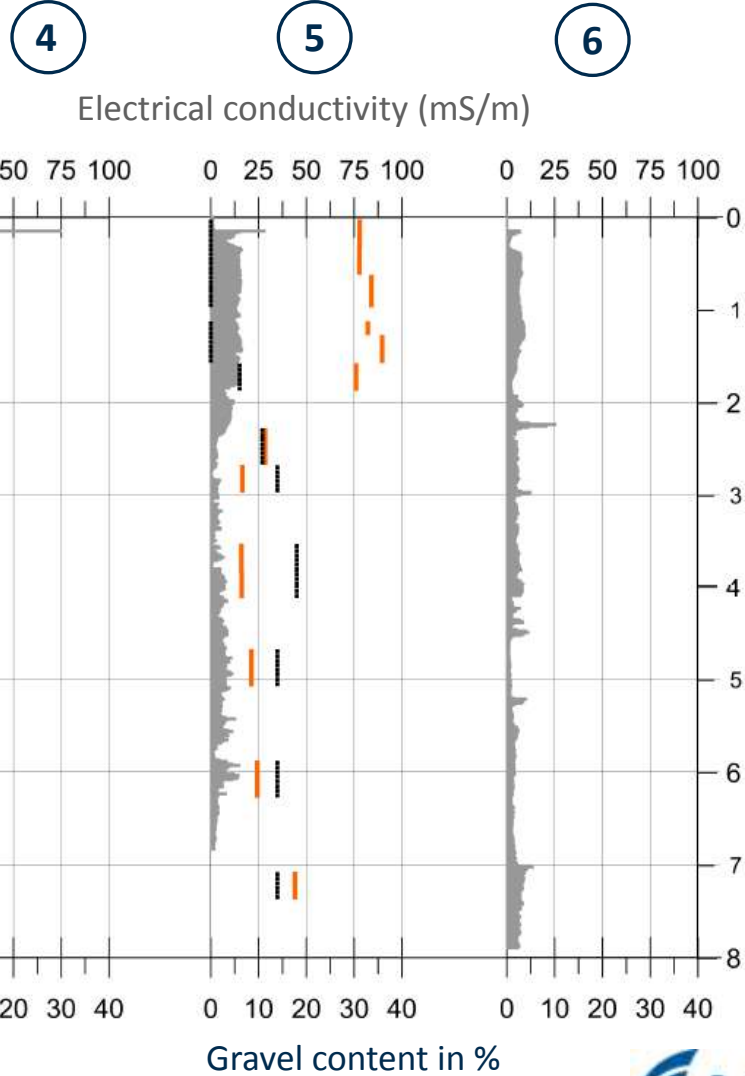
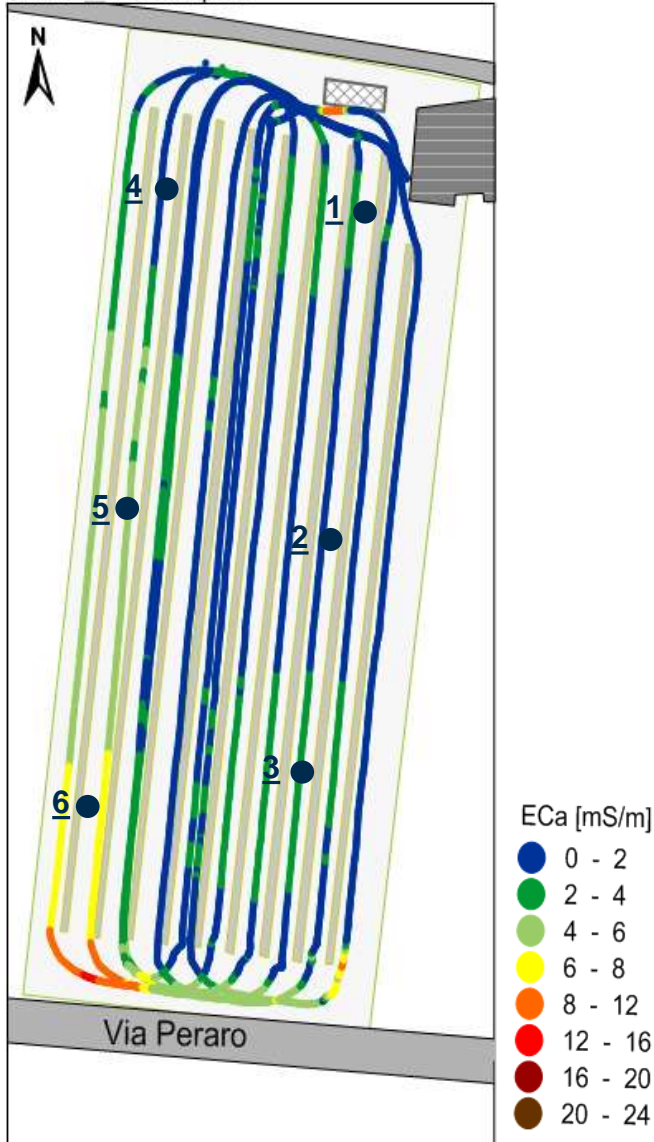
EM31- vertical dipole



EM31- vertical dipole

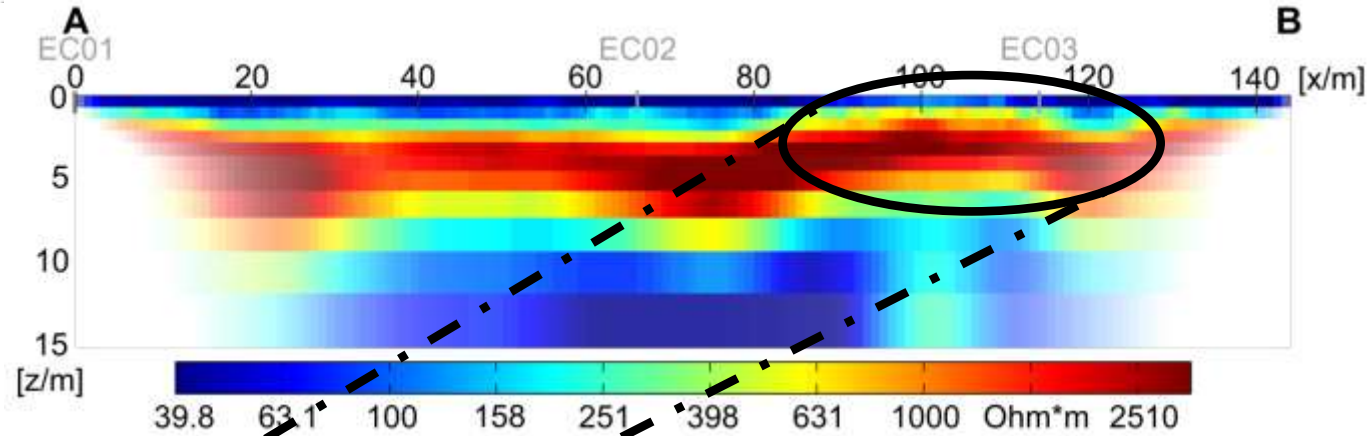
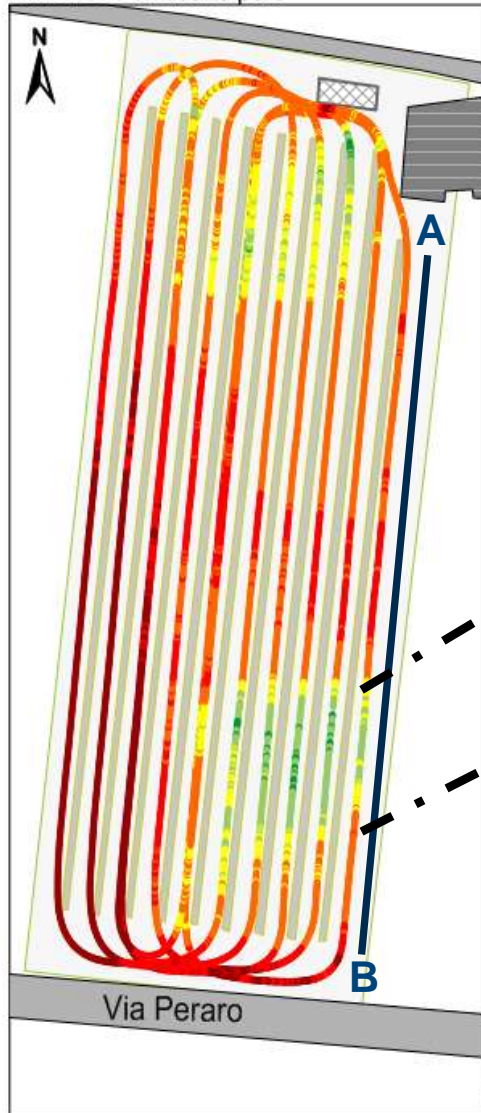


EM31- vertical dipole



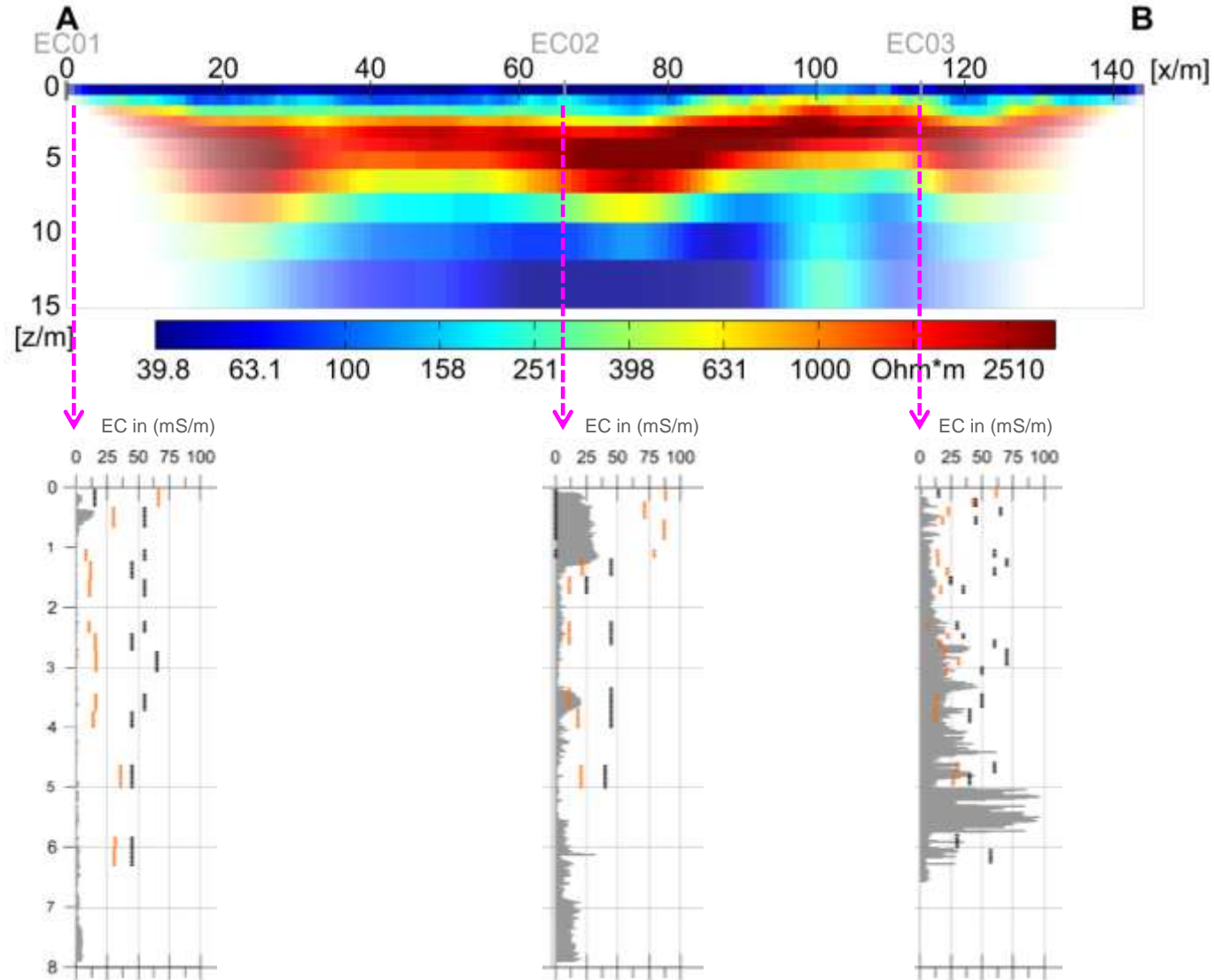
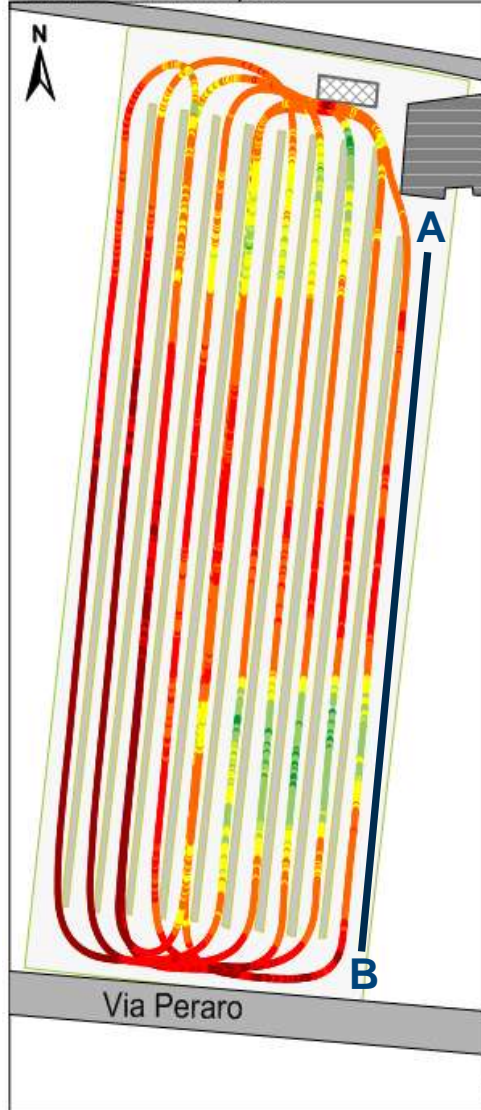
Volumetric water content

EM38DD- vertical dipole



Profile of electrical resistivity  
(electrode spacing 1m, Wenner alpha)

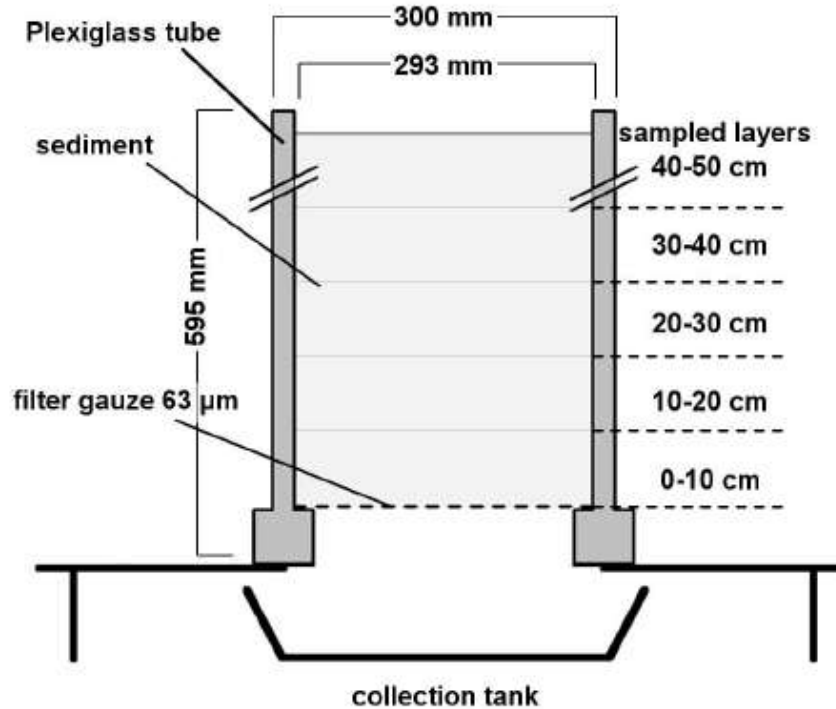
EM38DD- vertical dipole



*...in progress...*



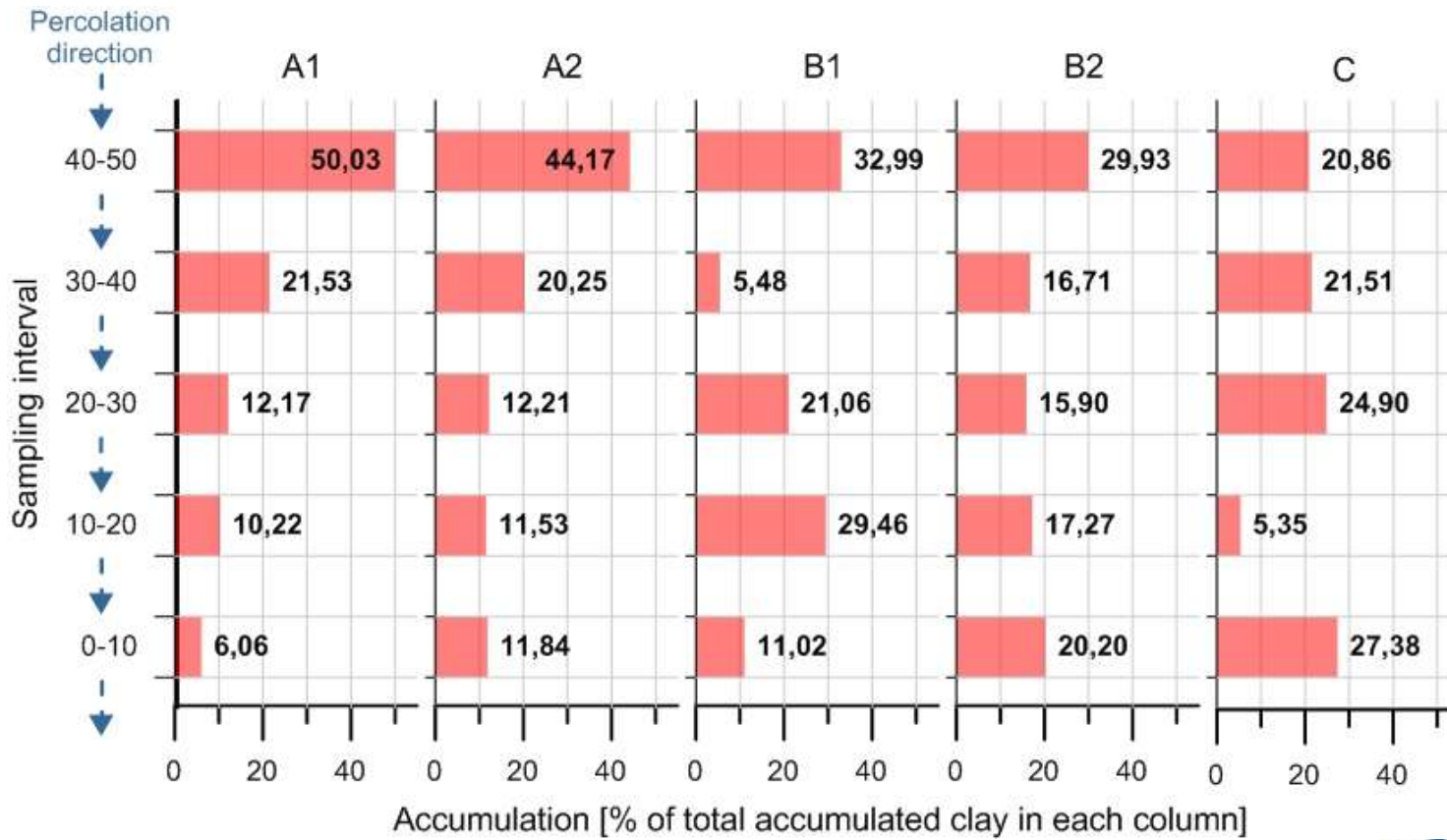
Clogging - what is the effect of sediment load and trench filling on long term performance of MAR systems? First results of lab experiments:



Column	Sediment	Suspension
GS1/GS2	glass spheres 0.4-0.7 mm	10x 35 l with each 3.57 g clay
GS3/GS4	glass spheres 0.4-0.7 mm	1x 35 l with 35.7 g clay
Sphere1.5	glass spheres 1.5 mm	10x 35 l with each 3.57 g clay



Clogging - what is the effect of sediment load and trench filling on long term performance of MAR systems? First results of lab experiments:



- Combination of surface geophysics and minimum invasive DP technology was successfully applied for the efficient characterization of the Schiavon FIS.
- Detailed information leads to a better understanding of subsurface structures and determination of representative sampling points.
- Applied techniques are already available on the market today and advantageous over traditional site investigation approaches – however, uptake is yet beyond capabilities.
- Locations of infiltration infrastructure need to be carefully chosen based on (hydro-) geological as well as hydrological aspects (e.g. sediment loads) to allow environmental and economically sound system operation.