

INTRODUCTION

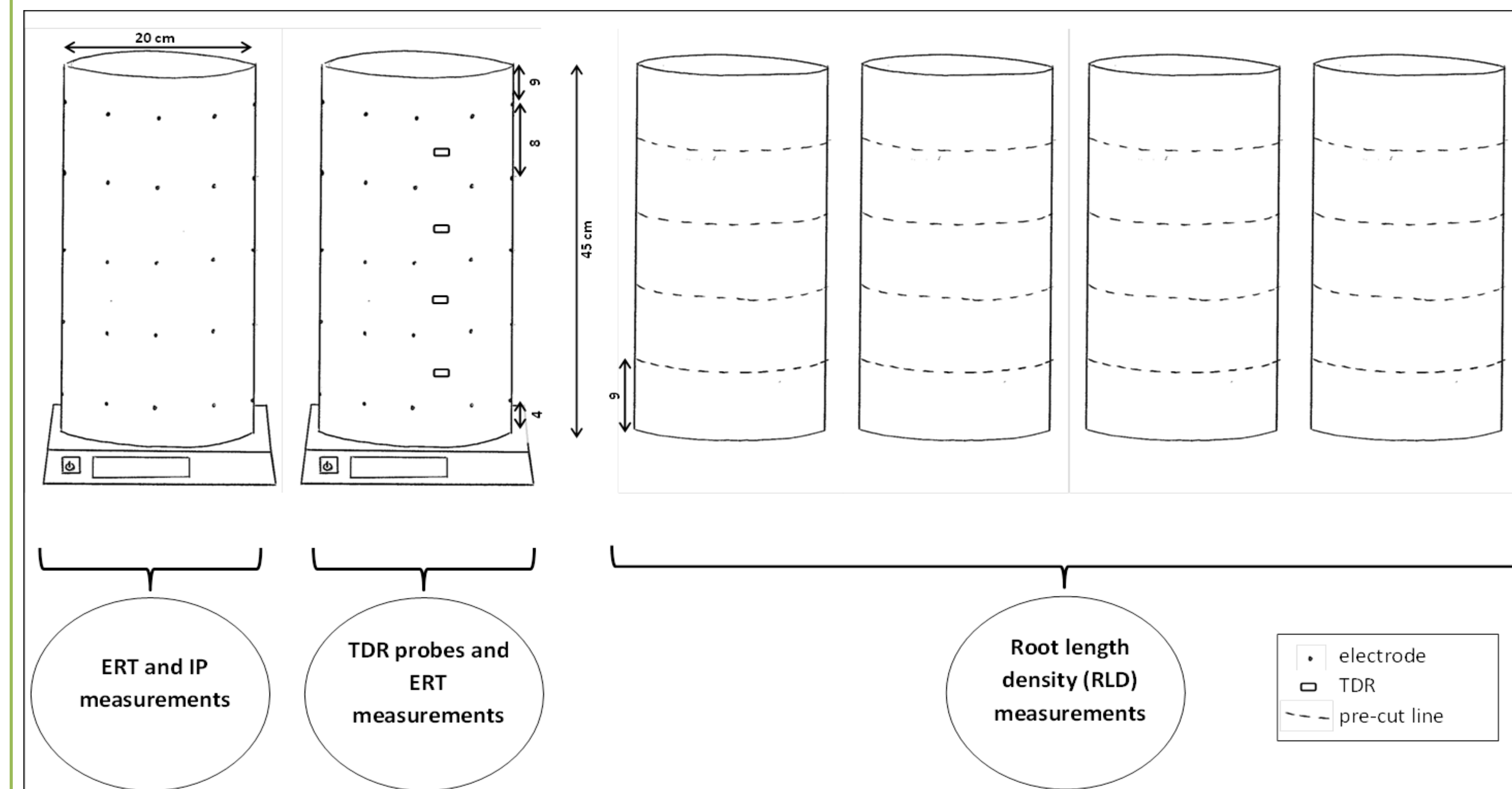
Electrical resistivity (ER) and induced polarization (IP) methods are used in many field. Lots of different factors influence the ER and IP of media → ROOTS affect the electrical properties, but HOW?

OBJECTIVES

- (1) Quantify the effect of plant roots on electrical properties of the soil subsurface
- (2) Map the root system of a plant in space and time with ERT and IP techniques

MATERIAL AND METHODS

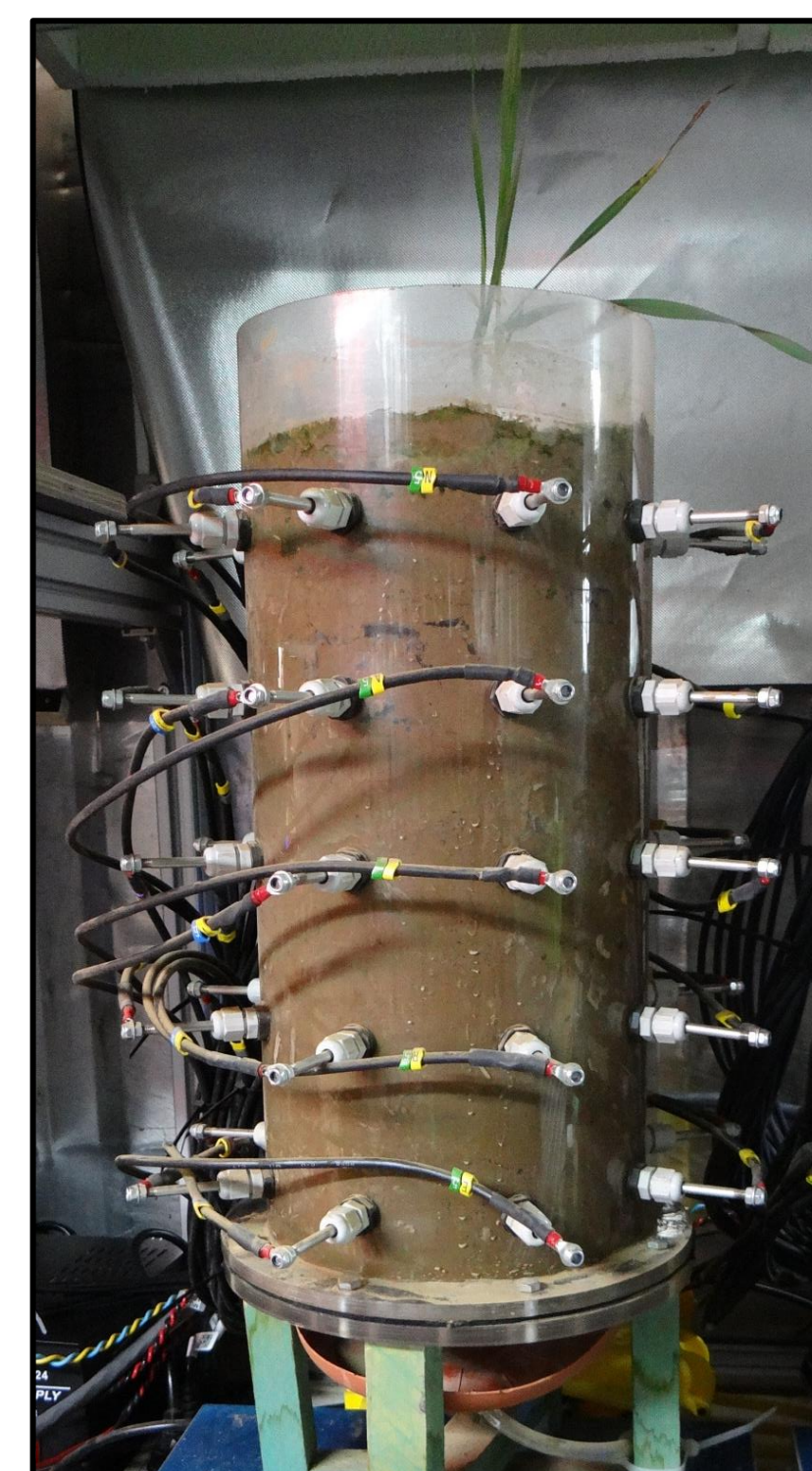
Experimental setup



- 6 columns with repacked, sieved and oven-dried loam (H: 45cm, Ø:20cm)
- 40 electrodes for each ERT/IP column (5 rings of 8 electrodes)
- 1 barley plant (*Hordeum vulgare*) in each column
- Growing chamber: controlled environment (RH, T, radiation)
- Day 1 = 04/03/2016 : application of 860ml of water on top of column
- No further irrigation

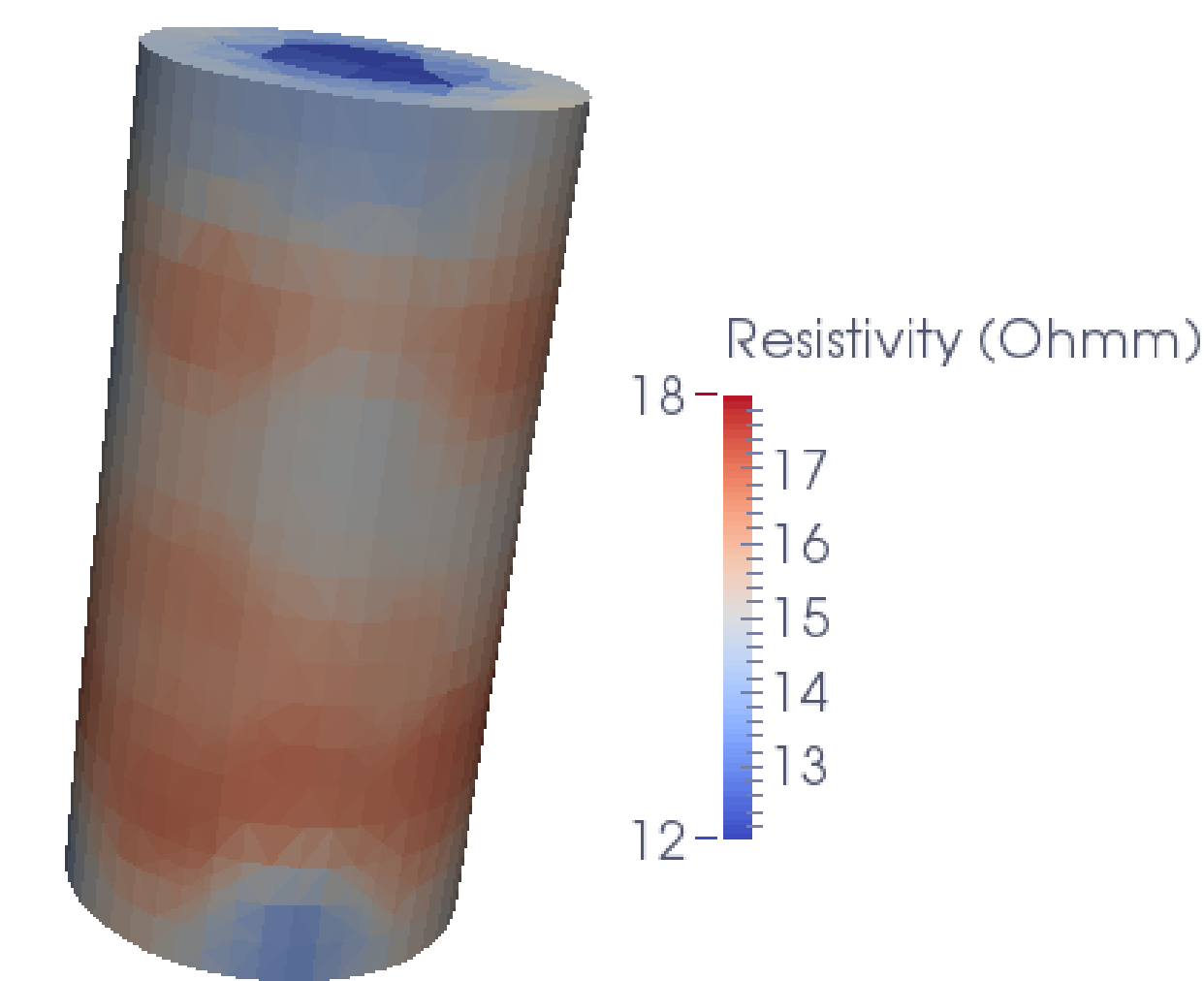
ERT & IP measurements and inversion

- Continuous monitoring using a skip-0 + skip-1 dipole-dipole scheme with horizontal and vertical dipoles
- Data filter: contact resistance < 10 000 Ohm
- Inversion: BERT code (Günther et al., 2006)

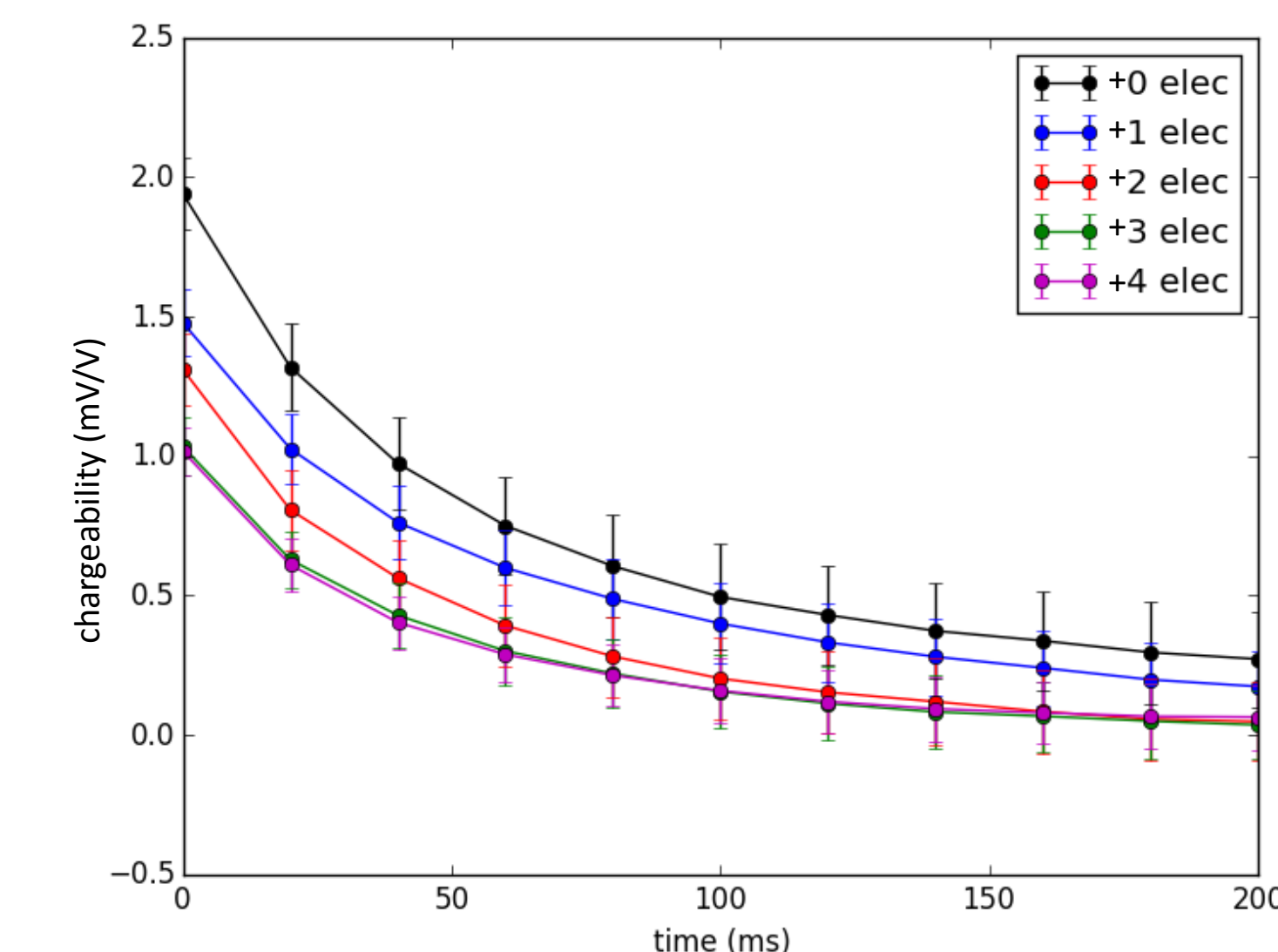


PRELIMINARY RESULTS

Column filled with water

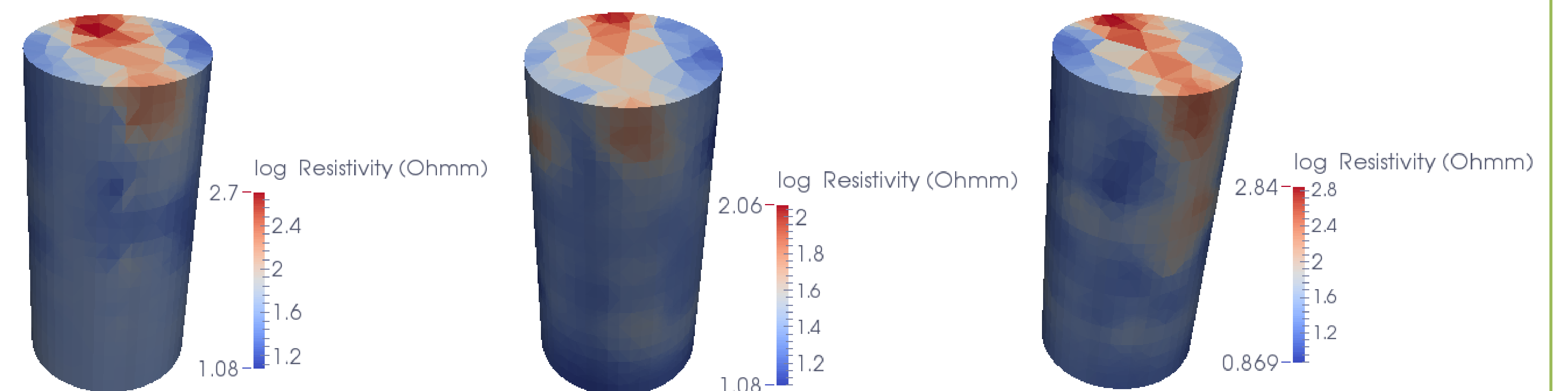


Column filled with saturated sand



Decay curves of the chargeability (mV/V) as a function of time (s). Each color correspond to the addition of a (non used) electrode

Column filled with repacked loamy soil and plant



Electrical resistivity tomography at 3 different dates: 23/03, 31/03 and 04/04. The red colors show higher resistivity and may be due to the presence of a crack in the soil column. No presence of plant roots can be detected so far. On the 31/03: resistivity is lower in the upper part of the column because the column was refilled with water that day.

CONCLUSION

The resistivity distribution obtained with ERT is clearly related to soil moisture. The obtained values are within the expected range. The IP values for the column filled with water show that the setup can yield reliable chargeability data, but the soil column yields artefacts. Further development of the column IP measurements is necessary.

Problems and questions

- The effect of electrodes polarization in the column is not yet well understood.
- The retracted electrode contact with the soil should still be improved.
- Plant growth was marginal due to highly compact soil material and must be optimized.