

## INTRODUCTION

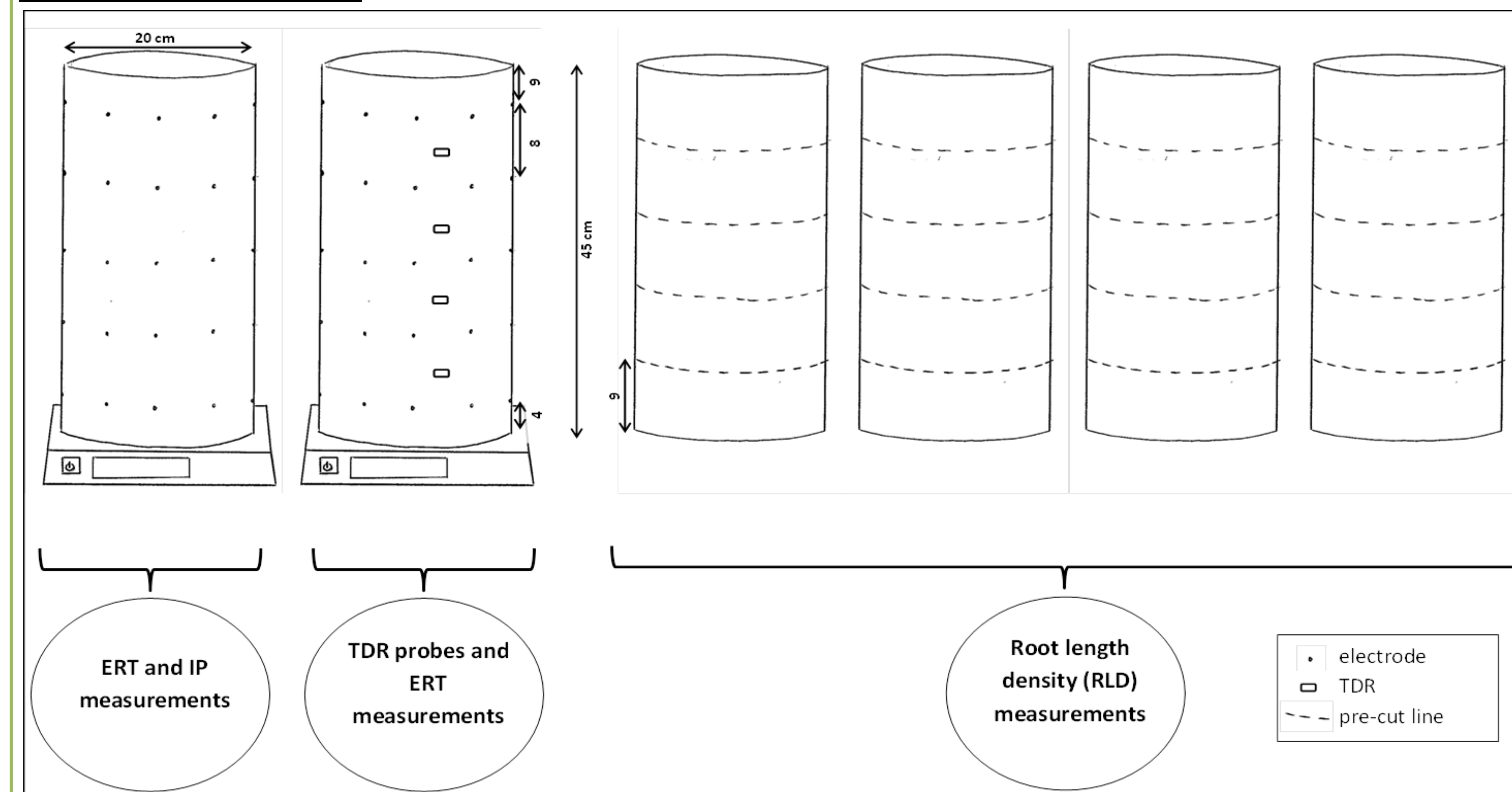
Electrical resistivity (ER) and induced polarization (IP) methods are used in many research fields. Lots of different factors influence the ER and IP of media → ROOTS may affect the electrical properties, but HOW?

### OBJECTIVES

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

## MATERIAL AND METHODS

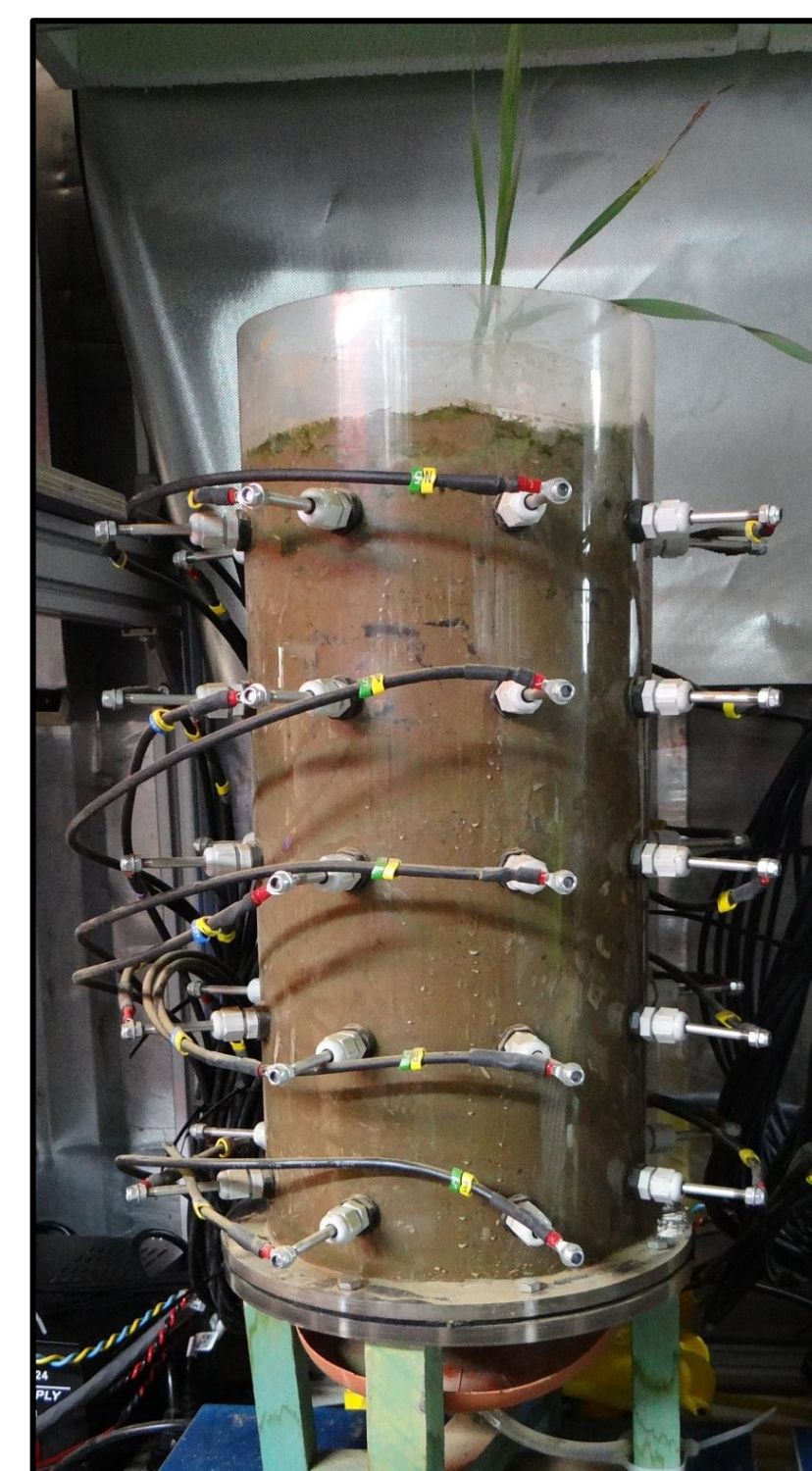
### EXPERIMENTAL SETUP



- 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

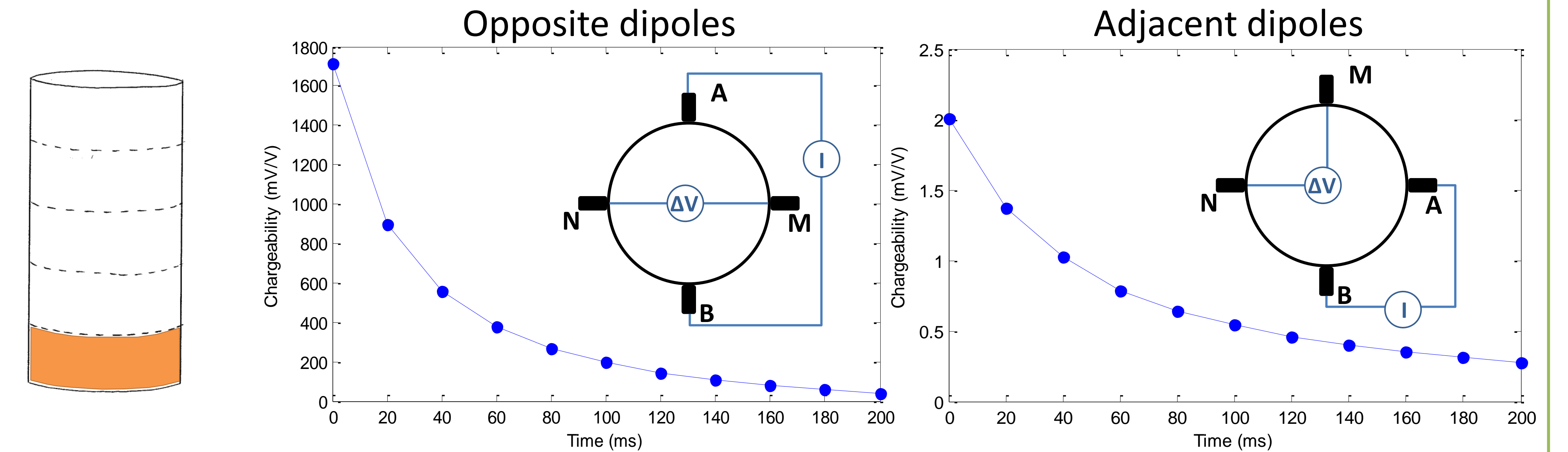
- Continuous monitoring using a skip-0 + skip-1 dipole-dipole scheme with horizontal and vertical dipoles
- Data filter: contact resistance < 10 000 Ohm
- Inversion: BERT code (Günther et al., 2006)
- Electrodes in contact with the soil surface via microsponges



## PRELIMINARY RESULTS

### A. PROOF OF CONCEPT OF PARTIALLY FILLED COLUMN

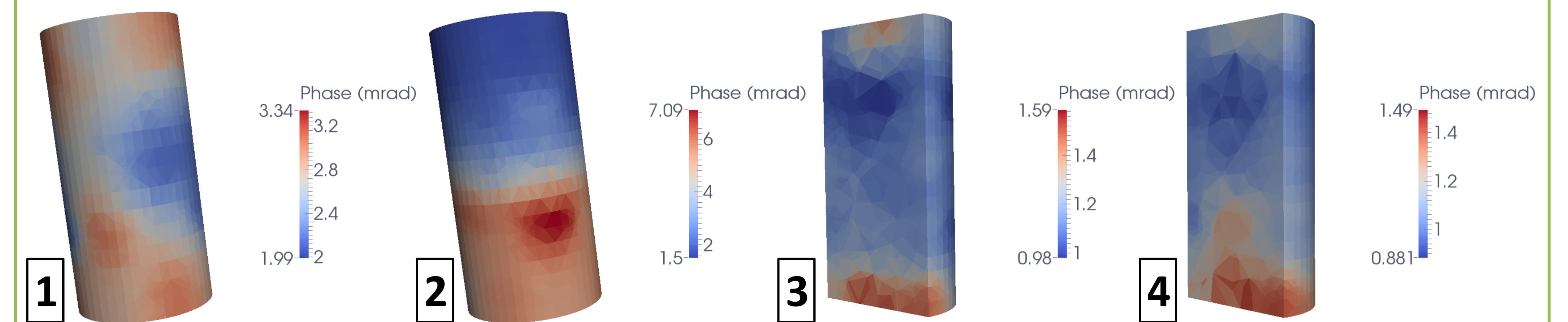
Chargeability curves of saturated sand with two different electrodes configurations



Magnitude of the chargeability is much higher for opposite configuration of dipole compared to adjacent configuration of dipole. Second configuration gives better expected value of chargeability for saturated sand.

### B. FIRST IP RESULTS OF THE EXPERIMENT

Phase angle tomography (mrad) of columns with (1) saturated sand, (2) 1/2 saturated loam and 1/2 water, (3) water only with 1 plant of *Brachipodium* in the top of the column, and (4) water only with a potato in the bottom



## CONCLUSION

The IP values for the column filled with water show that the setup can yield reliable chargeability data, but the soil column yields artefacts.

Moreover, an effect of variation of electrodes array can be seen here.

Future experiments of IP measurement (chargeability) will be conducted on water only and saturated as well as unsaturated sand columns. After having optimize this set up, a plant will be grown in the medium. The influence of plant roots (RLD) on chargeability will be observed.

### Problems and questions

- Opposite type of electrodes arrays show very high value of chargeability.
- 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.