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Combining ERT and modeling for investigating soil water content variability in a Maize field

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In this study we monitored the 3-D soil water content (SWC) evolution in a Maize field plot (3.9 m long, 1.8 m wide and 1.4 m deep) during a drying period of two weeks with Electrical Resistivity Tomography (ERT). Our aim was to identify how SWC was evolving with time and whether SWC variability was mainly induced by difference between plants (inter-plants) and by the roots distribution of the plants themselves (intra-plant). Field SWC monitoring was realized at four dates with Electrical Resistivity Tomography (ERT). At the plot scale, the variability was mainly impacted by the vertical differences of SWC (between 61% and 85%), especially at the end of the drying period when the difference of SWC between surface and depth was the most important. The SWC distribution was largely affected by the presence of the maize rows. When the soil dried out, the SWC variability induced by root distribution, and indirectly by the sowing pattern in rows, became prevalent. By using biophysical numerical model, we were able to properly simulate the evolution of the SWC variability induced by the root distribution during the 15-d period and characterize the amount of compensation induced by the plant root system.