Geophysical Research Abstracts
Vol. 19, EGU2017-17571, 2017
EGU General Assembly 2017

Small scale characterization of vine plant root zone via 3D electrical resistivity tomography and Mise-à-la-Masse method: a case study in a Bordeaux Vineyard

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Nowadays, best viticulture practices require the joint interpretation of climate and soils data. However, information about the soil structure and subsoil processes is often lacking, as point measurements, albeit precise, cannot ensure sufficient spatial coverage and resolution. Non-invasive methods can provide spatially extensive, high resolution information that, supported by traditional point-like data, help complete the complex picture of subsoil static and dynamic reality. So far very little emphasis has been given to investigating the role of soil properties and even less of roots activity on winegrapes. Vine plant's root systems play an important role in providing the minerals to the plants, but also control the water uptake and thus the water state of the vines, which is a key factor determining the grape quality potential. In this contribution we report about the measurements conducted since June 2016 in a vineyard near Bordeaux (France, Pessac Leognan Chateau). Two neighbor plants of different sizes have been selected. In order to spot small scale soil variations and root zone physical structure at the vicinity of the vine plants, we applied a methodology using longitudinal 2D tomography, 3D borehole-based electrical resistivity tomography and a variation of the mise-à-la-masse method (MALM) to assess the effect of plant roots on the current injection in the ground. Time-lapse measurements are particularly informative about the plant dynamics, and the focus is particularly applied on this approach. The time-lapse 3D ERT and MALM results are presented, and the potential to assimilate these data into a hydrological model that can account for the root water uptake as a function of atmospheric conditions is discussed.