Soil salinity monitoring using electromagnetic induction sensing and inversion in an olive grove irrigated with regenerated wastewater

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The agricultural use of saline table olive processing wastewater contributes to the closure of the water cycles in this industry and helps to overcome environmental, economic and legal limitations of evaporation ponds. In order to allow growers to guarantee and certify adequate long-term soil and plant conditions when irrigating with such regenerated wastewaters an efficient soil monitoring strategy is proposed based on the use of electromagnetic induction (EMI) sensing.

An experimental olive grove (120 ha) in southern Spain with mature olive trees planted on a 12 x 10 m grid has been surveyed for apparent electrical conductivity (ECa) using a multi-receiver EMI sensor since 2013. Maps of ECa, corresponding to four depths of exploration down to a theoretical maximum of 3.0 m, reveal the spatial pattern of soil salinity, which appears to be linked to topography and soil physical properties. Depth-specific salinity estimates are obtained along transects from 2D electromagnetic conductivity images using multi-receiver EMI inversion.

Despite the implementation of an adaptive irrigation management strategy in the experimental grove, the preliminary results show a build-up of salt in 10% of the area of the grove since 2013 and an increasing salt content with depth. Yet, in 75% of the area salt content decreased since 2013.