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Integrating passive and active remote sensing methods to assess and map soil salinity

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Irrigated lands in Israel are subjected to salinization processes, mostly as a result of using low-quality irrigation water. The Jezre'el Valley in northern Israel is an example of this phenomenon and thus it was selected to carry out this study. This area is characterized by increasing soil salinity over the years, followed by an increase in soil SAR (Sodium Adsorption Ration), which leads to a significant
deterioration of the soil structure and a reduced infiltration rate. The traditional
methods of mapping, by soil sampling (sampling, laboratory checks, and mapping) are time-consuming and do not provide near real-time information. An alternative method is suggested herein using active and passive remote sensing methods: (1) an hyperspectral data from the ground ASD field spectrometer and from the air, by AISA air-born sensor (2) EFDM- Frequency Domain Electro-Magnetic, and (3) GPR- ground penetration radar. The constructed PLS model was applied on the hyperspectral images, producing an EC thematic map of the surface. In addition, a sub-surface salinity map was generated by applying the surface – sub-surface correlation on the surface EC thematic map. The generated maps were found to be in good agreement with maps based on chemical data. The results indicated that traditional methods are correlated with the remote sensing ones and that merging the three remote sensing methodologies may yield a better picture than each of them alone. In addition, we discuss the advantages and disadvantages of applied in this study methods. It can be concluded that it is possible to account for soil salinity based on active and passive remote sensing means.