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Modeling of soil salinity based on remote sensing processing and geochemical analysis in southern Tunisia

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Arid and semi-arid regions are largely affected by salinity. Irrigation regions and oases in southern Tunisia are, as such typical areas, where the excessive content of salt in the soil is a challenging phenomenon. Salinity engenders several environmental problems such as limiting plant growth and reducing crop productivity. This work benefits from the combination of remote sensing and ground-based geochemical measurements. We use remote sensing to diagnose and monitor arid land degradation and environmental change caused by salinity in Southern Tunisia. We aim to determine the spectral characteristics of salt-affected and deserted soils. Soil samples from the upper 10 cm top-soils were collected in southern Tunisia and analyzed to provide on-the-ground data. We then classify degraded soils using supervised and unsupervised classifications (i.e.: Maximum likelihood classification (MLC), Support Vector Machine (SVM)). SVM displays the best performances to extract patterns and features of soil salinity classes (kappa coefficient of 63% and overall accuracy of 75%). The present study highlights that classes of extreme and high saline soils are predominantly represented by gypsum rich soils. We also suggest that water logging is also affecting the soil salinity through the rising of the water table level particularly in the areas located no more than 5 km from the coastline.