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Drought Detection and Water Stress Impact on Vegetation Cover Sustainability Using Radar Data

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Abstract : Mapping water stress provides important baseline data for sustainable agriculture. Recent developments in the new Sentinel-1 data which allow the acquisition of high resolution images and varied polarization capabilities. This study was conducted to detect and quantify vegetation water content from canopy backscatter for extracting spatial information to encourage drought mapping activities throughout new reclaimed sandy soils in western Nile delta, Egypt. The performance of radar imagery in agriculture strongly depends on the sensor polarization capability. The dual mode capabilities of Sentinel-1 improve the ability to detect water stress and the backscatter from the structure components improves the identification and separation of vegetation types with various canopy structures from other features. The fieldwork data allowed identifying of water stress zones based on land cover structure; those classes were used for producing harmonious water stress map. The used analysis techniques and results show high capability of active sensors data in water stress mapping and monitoring especially when integrated with multi-spectral medium resolution images. Also sub soil drip irrigation systems cropped areas have lower drought and water stress than center pivot sprinkler irrigation systems. That refers to high level of evaporation from soil surface in initial growth stages. Results show that high relationship between vegetation indices such as Normalized Difference Vegetation Index NDVI the observed radar backscattering. In addition to observational evidence showed that the radar backscatter is highly sensitive to vegetation water stress, and essentially potential to monitor and detect vegetative cover drought.

Keywords : canopy backscatter, drought, polarization, NDVI
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