

EGU2020-12870

<https://doi.org/10.5194/egusphere-egu2020-12870>

EGU General Assembly 2020

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AN UNSUPERVISED SOIL MOISTURE ESTIMATION MODELLING APPROACH USING C-BAND DUAL PoISAR DATA

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With the advent of remote sensing and its widescale implementation in the field of agriculture and soil studies, today remote sensing has become an integral non-evasive analysis and research tool. After decades of research with conventional optical remote sensing, both airborne and spaceborne, a need was felt to have an all-weather remote sensing data availability. Spaceborne SAR (Synthetic Aperture RADAR) or microwave remote sensing with its all-weather availability and high temporal resolution, owing to its penetration capabilities has been found highly suitable for the soil and crop health studies. Since, SAR remote sensing is highly sensitive to surface roughness and dielectrics in dry and moist soil conditions respectively, it becomes highly important to study and observe the variations of these properties in various polarisation channels. PoISAR (Polarimetric SAR) data with its different decomposition models has an advantage over conventional SAR data since it uses more than one polarisation channels and polarimetric decomposition models which consider several soil and crop parameters. This helps to study the RADAR wave interaction with the target easier. This helps in the proper and better study and understanding of retrieval of soil moisture and analysis of its variation over time. This study makes use of C-band Sentinel 1A satellite dual PoISAR, time series data of VV and VH polarisations. The datasets used are that of pre-monsoon and monsoon period of 2019, February to May respectively for Rupnagar area. In this study it has been aimed to model for retrieval of soil moisture based on RADAR backscatter values and Normalised Differential Moisture Indices values from Sentinel-1A and Sentinel 2 satellite imageries respectively. The process has been performed on both VV and VH polarisations and the results are analysed for both the time periods. Theoretically, it has been observed that VH polarisation yields better and nearer to ground truth results with least Root Mean Squared Error (RMSE) of 0.05 and high R^2 -Squared statistics of 0.72 (72%) in training and testing. This study aims at unsupervised modelling using satellite datasets for model development, training and validation and without the input of field data. The results though not very good yet give an idea of soil moisture estimation and is highly beneficial for areas and conditions when field validations and data collection is difficult or not possible. This study also aims at reducing field validation dependence. Once integrated with field data, accuracy is expected to increase.