



## **Comparative Evaluation of Semi-empirical Backscatter Model and Artificial Neural Network Model for Estimating Soil Moisture from ERS-2 SAR Data**

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**Abstract:** ERS-2 SAR images from active microwave sensors can be effectively used for estimating soil moisture beneath the ground surfaces up to 0 to 5 cm depth. A number of analytical and empirical models are available which relate the Synthetic Aperture Radar (SAR) back scatter coefficient to the surface soil moisture. Each model has its own merits and demerits. In this paper, a study, on soil moisture retrieval from ERS-2 SAR backscatter coefficient has been reported. Two markedly different approaches, namely i) semi-empirical backscatter model and ii) back-propagation neural network (BPNN) algorithm, have been evaluated to estimate soil moisture over barren as well as vegetated surfaces. A catchment of Solani river in Northern part of India has been selected. The study area is covered with three agricultural crops and grassland, which together form the set of vegetated cover surface along with barren surface. After establishing the relation between backscatter coefficient and volumetric soil moisture over a sample of field observations, maps depicting spatial distribution of soil moisture have also been developed. The results demonstrate that the Artificial Neural Network (ANN) model (BPNN algorithm) can be more effectively used than the semi-empirical backscatter model in mapping the spatial variation of soil moisture from ERS-2 SAR data.

**Key words:** Artificial neural network, Backscatter coefficient, Leaf area index, Microwave remote sensing, Plant water content, Soil moisture.