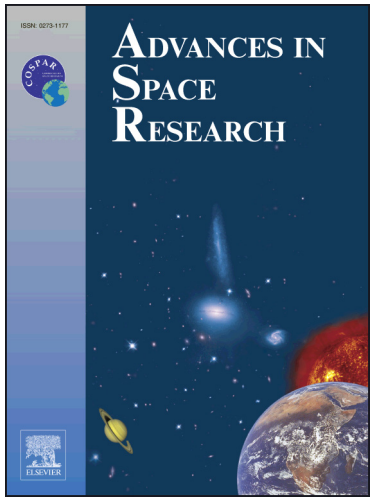

Soil Moisture Retrieval Using Ground based Bistatic Scatterometer Data at X-band

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Soil Moisture Retrieval Using Ground based Bistatic Scatterometer Data at X- band

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Abstract

Several hydrological phenomenon and applications need high quality soil moisture information of the top Earth surface. The advent of technologies like bistatic scatterometer can retrieve soil moisture information with high accuracy and hence used in present study. The radar data is acquired by specially designed ground based bistatic scatterometer system in the specular direction of 20^0 to 70^0 incidence angles at steps of 5^0 for HH and VV polarizations. This study provides first time comprehensive evaluation of different machine learning algorithms for the retrieval of soil moisture using the X-band bistatic scatterometer measurements. The comparison of different artificial neural network (ANN) models such as back propagation artificial neural network (BPANN), radial basis function artificial neural network (RBFANN), generalized regression artificial neural network (GRANN) along with linear regression model (LRM) are used to estimate the soil moisture. The performance indices such as %Bias, Root Mean Squared Error (RMSE) and Nash-Sutcliffe Efficiency (NSE) are used to evaluate the performances of the machine learning techniques. Among different models employed in this study, the BPANN is found to have marginally higher performance in case of HH polarization while RBFANN is found suitable with VV polarization followed by GRANN and LRM. The results obtained are of considerable scientific and practical value to the wider scientific community for the number of practical applications and research studies in which radar datasets are used.

Keywords: Soil moisture; Microwave remote sensing; BPANN; RBFANN; GRANN; Regression analysis

1. Introduction:

Soil moisture is an important variable for hydro-meteorological applications and has significant effect on catchment water balance, water yield, groundwater recharge, and storage (Al-Shrafany