**Improvement of Scattering Models****for Retrieving the****Main Parameters of Agricultural Crops****from Time Series of Polsar Images**

Abstract

Nowadays, developing the crop monitoring methods in large scale is an important issue for reasonable management of land resources, especially for populous countries. Remote sensing is one of the most important techniques used in this field. In this research, the proposed methods for monitoring and estimation of crop parameters (including height, biomass and phenology) are based on the time series of polarimetric SAR remote sensing images. Since the polarimetric SAR data can not provide the vertical structure information of crops, and the considered parameters are dependent on vertical structure information, the proposed methods are based on the improvement of polarimetric scattering models using interferometric information. First, the efficiency of the eigenvalue decomposition for polarimetric interferometric data is investigated. Then, by applying this decomposition on the four and six-dimensional interferometric polarimetric matrices, 13 and 23 features are extracted, respectively. Some of these features have a high linear relationship with the crop height, biomass and phenology, and the other provide useful information for improving the estimation performance. Finally, the crop parameters are estimated based on these features and the artificial neural network and support vector regression. The results for wheat and barley crops using the images of E-SAR sensor of the DEMMIN region in Germany indicate the good performance of the proposed methods. Both methods used for final estimation i.e. neural network and support vector regression have good estimation of crop parameters and can be used to monitor the crops. For example for wheat, the RMSE values were 0.3, 0.45 and 0.29, using neural network and 0.3, 0.42 and 0.36, using support vector regression, in height, biomass and phenology estimation, respectively.

Keywords: Crop monitoring, scattering model, time series, polarimetric interferometric, eigenvalue decomposition

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