Assessment of Polarimetric and Spatial Features for Built-up Mapping using ALOS PALSAR Polarimetric SAR Data

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SUMMARY

Fully polarimetric synthetic aperture radar (PolSAR) has the advantage for working at all time and all weather compared with optical remote sensing. It can provide four channel data, including HH, HV, VH, and VV, which is usually called sinclair matrix. The sinclair matrix can be used to describe the relative pure targets. Concerning to the distributed targets, it is necessary to use coherence or covariance matrices that computed from the sinclair matrix. Sinclair matrix, coherence matrix, or covariance matrix are directly related to the physical properties and backscattering mechanisms of natural medium. Based on these matrices, target decomposition theorem can be used to explore more additional information for the scattering medium. However, in the urban areas, the surrounding environment is complex and difficult to describe. Different targets may contribute to the same scattering mechanisms, and the same medium may produces the different scattering responses. Therefore, it is necessary to utilize the complementary information between the polarimetric and spatial feature parameters. Spatial features can reveal the orientation, geometry, and material of urban structures, which can provide essential information for built-up mapping. In this study, the polarimetric and spatial feature parameters are assessed for built-up mapping based on support vector machine (SVM) and random forest (RF). The Cloude decomposition parameters, including scattering entropy, scattering angle, and anisotropy, are selected as the representative polarimetric feature parameters. The texture parameter computed from gray level co-occurrence matrix (GLCM), including the mean, variance, homogeneity, contrast, dissimilarity, entropy, second moment, and correlation, are chosen as typical spatial feature parameters. The SVM and RF are used as the classifiers to assess the performance of feature parameters for built-up mapping. ALOS PALSAR full PolSAR data are used to conduct the experiment. From the mapping results, it is concluded that both polarimetric and spatial feature parameters, SVM and RF are effective for built-up mapping. Further works have to be continued on the selection of effective feature parameters and classifiers for built-up mapping.
