

## Sub-Canopy Ground Characteristics Retrieval of PolinSAR Using Spectral Analysis Technique

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**Abstract:** The advances in Polarimetric SAR Interferometry techniques (PolinSAR) provide a promising way to extract ground characteristics such as sub-canopy soil moisture and roughness using SAR data. Cloude(2005) proposed a negative Alpha method to estimate the sub-canopy soil moisture which has been applied to DLR E-SAR L band airborne PolInSAR data. From the negative Alpha method, Neumann *et al.*(2007) presented a first investigation to extend the negative alpha approach to agricultural fields considering of oriented volume effects.

Spectral analysis techniques have been proposed to extract the vegetation and building parameters. Yamada *et al.*(2001) proposed the ESPRIT algorithm to estimate the vegetation height; Sauer *et al.*(2008) use spectral analysis technique to estimate the building height and extract scattering mechanism characteristics from multi-baseline PolinSAR data. In these applications, the useful parameters are mainly derived from the phase information or phase center, but, the role of the reflectivity information obtained from spectral analysis technique used to invert the sub-canopy ground characteristics are not investigated. So, in this paper, the potential and validation of spectral analysis technique used for sub-canopy ground characteristics such as soil moisture and roughness are demonstrated. Polarimetric single and dual baseline spectral analysis method such as Beamforming, Capon, MUSIC and WSF are used to distinguish ground surface scattering center from the one of vegetation, and then extract the scattering vector and the reflectivity of ground scattering center, based on estimated ground surface reflectivity, relative co-HH, VV and cross-HV polarization backscattering coefficient are obtained, finally, the sub-canopy soil moisture and roughness are inverted using Oh's approach.

From airborne AgriSAR and BioSAR data acquired by Dragon Project, in this paper, two sub-canopy ground surface are investigated, one is agriculture terrain, another is

forest terrain. Compared the sub-canopy ground characteristics with the ground truth, it indicates that the result from the proposed method are reasonable and reliable, and the proposed method has good inversion accuracy.

**References:**

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