SURFACE PARAMETERS RETRIEVAL FROM ALLUVIAL FAN IN EJINA AREA OF INNER MONGOLIA USING MULTI-POLARIZATION SAR DATA

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Abstract

The surface parameters of alluvial fan consist of roughness and moisture. It is very important to show the characteristics and formation of alluvial fan using these parameters. Synthetic aperture radar (SAR) is sensitive to surface texture and roughness, so it is a power tool to retrieve the surface parameters of alluvial fan.

In the paper, we present the capabilities of multi-polarization SAR data to estimate the surface parameters of alluvial fan in Ejina area of Inner Mongolia, China. The SAR data used in the study consist of ALOS PALSAR dual-polarization (HH and HV polarizations) data and ENVISAT ASAR alternating polarizations (HH and VV) data. The approach is based on the **G**enetic Algorithm (GA) combined with the backscattering models (Advanced Integrated Equation model, AIEM and Oh model). Firstly, the theoretic backscattering coefficients were simulated based on the backscattering model. Then the cross function of GA was generated by the simulated backscattering coefficients and the backscattering coefficients from SAR imagery, and the globally optimized parameter groups can be obtained. The errors between the estimation values and field measurements are analyzed. By the comparison of simulated results and field measurements, it shows that the method is efficient for surface parameters retrieval from alluvial fan. This method presented that the cross function of surface parameters inversion could be variable with the amount of data acquired. The data used for surface parameters inversion must be more than two scenes. The more data could generate the more accurate results. The root mean square errors of roughness between measured and estimated values based on AIEM model and Oh model are 0.0486cm and 0.0392cm respectively. Finally, the surface parameters of alluvial fan in Ejina Area of the Inner Mongolia are estimated using ENVISAT ASAR and ALOS PALSAR data. The estimation results shows that the ground surface of Ejina alluvial fan is very flat, so

the range of its roughness is small, and the root mean squared heights in most party of the alluvial fan are no more than 1.0cm. The roughness in the area along Hehe River is big, and it is very small in the other areas far from Hehe River. The estimation result of soil moisture shows that this area is very arid, and the soil moisture volume in most part is no more than 10%.The study show the potential for the multi-polarization SAR data to estimate the surface parameters of alluvial fan.

Key words: surface parameters, inversion, alluvial fan, multi-polarization SAR