STUDY ON THE BACKSCATTERING CHARACTERISTIC OF TYPICAL EARTH SUBSTANCES IN NORTHWEST OF CHAINA

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1. ABSTRACT

Study of microwave scattering characteristics of earth substances are the basis of microwave remote sensing for classification, identification, interpretation of data and image interpretation [1]. With the application of microwave remote sensing research requires not only a qualitative analysis of the effects of the radar parameters [2] (frequency, polarization, incidence angle) and surface parameters (such as humidity, surface roughness, biomass etc.) on the microwave scattering characteristics of earth substances but also more quantitative study of the complexity relationship of function between radar backscattering coefficient and various parameters and research on extracting and inversing the interest parameters from a variety of data source.

2. THE PROPOSED METHOD

In this research, the AIEM model [3] was used to study the scattering characteristics of bare soil and frozen soil qualitatively and quantitatively. Combined with the AIEM model and the Water-Cloud model[4] to analyze backscattering of vegetation(such as bulrush and maize) and inverse some parameters of vegetation.

2.1 Bare soil and frozen soil

Used S-band land-base scatterometer, we had measured the bare soil just after harvest of rape at Minle County and the seasonally frozen soil at Arou rural, obtained the HH, VV, HV polarized backscattering coefficient and the corresponding surface parameters. The main parameters that affect scattering coefficient are surface roughness and soil dielectric constant. Fig.1 shown the comparison between the measured scattering coefficient curve of soil and simulation results by AIEM model.

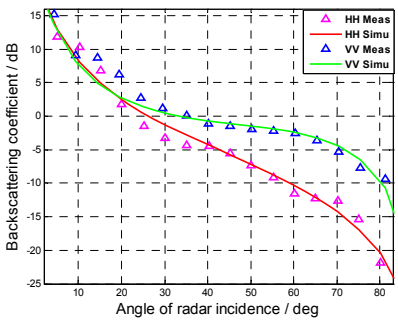

Fig.1 scattering coefficient comparison of bare soil between measurement and simulation

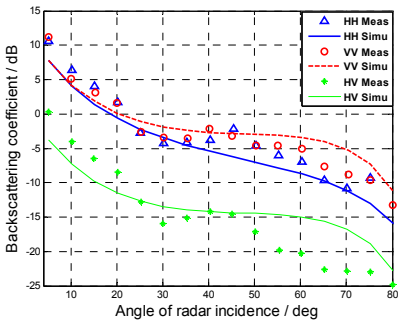

Fig.2 scattering coefficient comparison of frozen soil between measurement and simulation

There were good agreement between the measurement results and the inversion parameters of bare soil. such as dielectric Constant($\varepsilon_r = 10.6875$), the root-mean-square height($s = 0.9897cm$), correlation length($l = 18.8792mm$); the inversion parameters of frozen soil such as the root-mean-square height($s = 1.06478cm$), correlation length($l = 22.7841cm$), However, there was a large deviation in dielectric parameters(the inversion result was $\varepsilon_r = 20.5247$), it was mainly due to the higher lever of unfrozen water under frozen soil. All of these shown used land-based radar scatterometer could study the scattering mechanism of soil effectively and it was feasible to inverse some useful parameters in remote sensing applications.

2.3 Bulrush and maize

In order to study the volume scattering properties of vegetation, we measured different polarization, different angle of incidence of bulrush and maize backscattering used C-band scatterometer at the Grass Study Station of Lanzhou University of Zhangye city in July 2008, Fig 4 and 5 shown the curves of the simulation results and measured datas. Combining with the measured datas and simulative models to inverse some parameters of vegetation (shown as tabal 1 and 2)

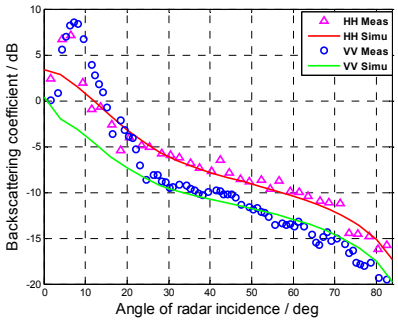

Fig.4 scattering coefficient comparison of bulrush between measurement and simulation

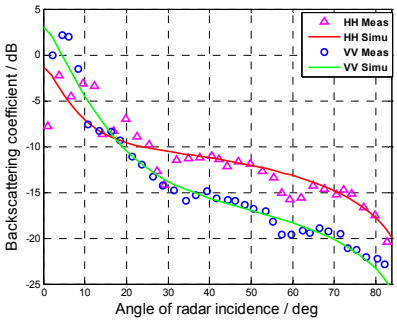

Fig.5 Scattering coefficient comparison of maize between measurement and simulation

Table.4 the fitting parameters in the Water-Cloud model

	Ah	Bh	Av	Bv
bulrush	0. 1430	1. 0832	0. 0466	1. 8516
maize	0. 2328	0. 8375	0. 2648	0. 4672

Table.5 Vegetation reflectance factor and attenuation factor

	α_h	η_h	α_v	η_v
bulrush	3. 0949	0. 8851	5. 2903	1. 5103
maize	0. 5076	0. 2363	0. 2831	0. 1318

3. CONCLUSION

The study founded that the process of thaw the backscattering coefficient would gradually decrease but gradually increase in the process of frost and gave a reasonable explanation of the reasons for the change by used the law of water transfer in frozen soil. As for the vegetation, we also combined with the corresponding features of the scattering model to study the backscattering coefficient as a function of surface parameters quantitatively. Through the semi-empirical model and inversion to obtain the vegetation scattering and attenuation factors, provided a new, more intuitive analysis method for the study of the influence of vegetation layer the microwave scattering process. it would in help to analyze quantitatively in back-scattering characteristic accurately and prepared for the validation of the remote sensing mechanism of the HJ-3 satellite and help to optimize working parameters of multi-band and multi-polarization SAR.

4. REFERENCE

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