A SUITALBE SOLUTION FOR EXTRACTION OF ALTERATION ANOMALIES FROM THE REMOTE SENSING DATA: A CASE STUDY OF THE BAOGUTU PORPHYRY COPPER DEPOSIT INTRUSION, XINJIANG, CHINA USING ASTER DATA

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1. INTRODUCTION

The RM (Ratio Method), SAM (Spectral Angle Mapping) and PCA (Principle Component Analysis) are the traditional methods for extraction of alteration anomalies from the remote sensing data. Comparing these methods with each other by validation and analysis of their principles, all of them have merits and drawbacks. Alteration anomalies in geology are weak information, particularly in landscape observation. Also because of the effects that same object with different spectra, different objects with same spectrum, alteration anomalies could turn out to be different phenomena depending on varied areas. A suitable solution is to find the characteristic bands of altered minerals or combination of altered minerals. In this study, based on statistical analysis, more than 100 spectra of field measured samples in the study area were used to determine the best method for extraction of alteration Remote Sensing (RS) anomalies.

2. METHODOLOGY

In this study, samples collected in field include almost all kinds of rocks in the study area, and also most of the important alteration anomalies samples. And even more, some samples without alteration anomalies were also included. All the spectra of these samples were measured by Analytical Spectral Devices (ASD) which has 2nm spectral resolution from VNIR to TIR. The data processing is as below: Fist, obtain the minerals of each sample contained by processing the spectra data. Second, resample the spectra data to ASTER and then classify them using cluster analysis. Third, compare the result of minerals and the classification results. If the two results anatomies match each other, the classification criteria can be established rationally. If they cannot match well, we use discriminant analysis method to build a discriminant function to distinguish several kinds of alteration anomalies. And based on a series of classification criteria establishment, we extract the alteration anomalies over the whole field using Aster data.

3. RESULTS

The preliminary result shows when the samples' spectra were clustered to three classes, the ferric contamination anomaly matched well with one of the three classes, and chlorite, biotite, illite mostly mixed in the other two classes. By using discriminant analysis, the discriminant functions were established to distinguish these minerals. By using these criterions, the alteration anomalies were extracted perfectly by using the ASTER data, which introduced in detecting alteration anomalies for finding minerals effectively.

4. CONCLUSION

The method makes full use of the measured spectral characteristics of the field samples. Consequently, it is suitable for realizing the spectral variation due to the specific study area. First, based on the spectral clustering of cosine-distance measurement, our study described overall characteristics of different mineral alteration and classified them to types. Furthermore, on the basis of the classification result, a method of discriminant analysis improved the results of cluster analysis for better understanding characteristics of specific minerals. The present results show a suitable framework for extraction of alteration anomalies from the remote sensing data. This study took ASTER data for example. It can also be used in TM, ETM or even high spectral data in future, for achieving high accuracy.