APPROACHES TO USING END-MEMBERS FOR SUB-PIXEL SNOW MAPPING WITH MODIS DATA IN QINGHAI-TIBET PLATEAU

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1. INTRODUCTION

So far, only a binary snow mapping of remote sensing image is successful, but, the binary classification does not consider mixed pixels in the remote sensing image [1]-[4]. Therefore, the accuracy of binary snow product may be reduced a lot. Unmixing of pixel can solve the problem, for it can divide one mixed pixel into different classes of ground object [5]-[8]. However, it is difficult to achieve automatic sub-pixel snow mapping for large area in terms of existing unmixing methods of pixel at present. Qinghai-Tibet plateau is the highest district in the world, and has very large area. Moreover, it can cause changes of climate and hydrological cycle in the region, and even the whole world. Then, it is important to develop automatic sub-pixel snow mapping in Qinghai-Tibet plateau. With regard to unmixing of pixel, it is a key step to extract end-members of different classes. Here, we don't intent to discuss how to obtain end-members of different classes, but only how to use those obtained end-members in this article.

2. METHOD

In the research, we developed a method for selecting end-member with multi-index, which can select different end-members for one class of ground object. Certainly, all the ground objects only classified as

two classes, that is, snow and non-snow. Therefore, we can obtain a huge database of end-member, which has a very large number of end-members. If every end-member in the database joins calculation of unmixing pixel, the amount of calculation would be very great. In fact, such a calculation is difficult to be implemented. However, the end-members of one class can be divided into different groups, and a mean value pixel in one group, named as a typical end-member, is used to substitute the others in the group to join the calculation of unmixing pixel in our research.

In addition, every scene of MODIS image covers a large space region, and same class of ground objects in different regions generally has different features, consequently, same class of ground objects in a same region should be more similar in their spectra than those in different regions. If some mixed pixel is adjacent to a pixel of end-member, which is named as a neighboring end-member, and not the typical end-member, that the neighboring end-member is used to unmix the pixel should be more reliable than the typical end-member be done.

We have developed a new approach using those obtained end-members, in which uses of the typical and neighboring end-members are combined in unmixing of pixel. When sub-pixel snow mapping is implemented in some scene of MODIS image, the process is as follow.

(1) According to the method for selecting end-member with multi-index, the database of end-member can be formed, and every end-member must have its spatial information of position.

(2) All the same class end-members in the database are divided into some groups, and the typical end-members of each group is found.

(3) Before a pixel is unmixing, its neighborhood will be searched so that its neighboring end-members can be found.

(4) When a pixel is unmixing, the neighboring end-member will be firstly used in the unmixing of pixel. If there are not neighboring end-members, the typical end-member would be used in the unmixing of pixel.

3. DISCUSSION AND CONCLUSION

The method can improve reliability of result, and reduce amount of calculation greatly. The result using typical and neighboring end-members is different much from that using only typical end-member, in which the neighboring end-members has participated in 25-60% of unmixings of pixel.

In order to find accuracy of the unmixing of pixel, its result was compared to that of classification of ASTER images. In light of the correlation analysis between them, square of their correlation coefficient is greater than 0.9.

4. REFERENCES

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