Multiple Endmember Spectral Mixture Analysis Model applied to Water Cover Mapping using MODIS Data

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Abstract: Remote sensing is more effective way to get the land cover information than the traditional methods. This study aims to find the water boundary and area of water using remote sensing image. We found the water body keeps growing. As a result, the estimated difference of area is about 110 ㎢ over the 10 years.

1. INTRODUCTION

Lake Enriquillo is saline, terminal lakes located in the central plateau of Hispaniola along the border of Haiti and the Dominican Republic. The Lake Enriquillo is the largest and the most important lake in the Dominican Republic. The lake ecosystem shows many kinds of birds, animals and plants and a large range of others. But recently the lake water body is unusually changing due to climate change. This study describes a subpixel method to produce maps of water cover in Lake Enriquillo with Moderate Resolution Imaging Spectroradiometer (MODIS) imageries.

2. METHODS

This study examines the lake using MODIS09A1 from 2001 to 2010. Multiple Endmember Spectral Mixture Analysis (MESMA; Roberts et al., 1998) was applied to find water body using MODIS image over the lake. MESMA represents an alternative approach, in which the number and types of endmembers are allowed to vary on a per-pixel basis (Jonas et al., 2009). MESMA is well suited for land cover because it allows the number and types of endmembers to vary on a per-pixel basis. Endmember selection is vital to SMA and MESMA because it can change the physical meaning of fractions derived with them (Ryo. et al., 2012). Many methods such as principal component analysis, multidimensional visualization, Minimum noise fraction(MNF) and the pixel purity index(PPI) have been used to select endmembers. In this study, first spectral library, we used MMF and PPI to choose 3 endmembers which are water, soil, vegetation based on the image. Three representative image endmember spectra were selected from the 50 candidate spectra. For the second spectral library, we used Endmember Average RMSE(EAR), Minimum Average Spectral Angle(MASA)and Count Based Endmember Selection(CoB) using VIPER (Visualization and Image Processing for Environmental Research) tools program (Roberts et al., 2007). Maximum (1.050) and minimum (-0.050) fraction and maximum shade (0.800) fraction restriction were applied.

3. RESULTS

In the present study, we applied over a MODIS09A1 and using MESMA method based on VIPER tool in order to analyze the water body change detection. The result shows the water body has increased dramatically on the study site during 10 years from 2001 to 2010. Based on result, the changed water body is about 166 ㎢ to about 281 ㎢. The monitoring water body is important for the protection and management of the environment. In addition, future studies might compare to other remote sensing data.

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