ESTIMATION OF GLACIERS AND SNOW COVERAGE IN WESTERN PART OF MONGOLIA USING MODIS SNOW PRODUCTS

B.Khosbayar[a*] R.Tsolmon[a] Y.Uranchimeg[b]

[a] NUM-ITC-UNESCO Laboratory for Remote Sensing and GIS, National University of Mongolia
[b] Ivanhoe Mines Mongolia Ink
azazell_2@yahoo.com [a*] tsolmon@num.edu.mn [a] Uranbilegy@ivancorp.net [b]

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ABSTRACT:

The purpose of the research study is to determine area Glaciers and Snow Coverage in Western part of Mongolia using by remote sensing methods. MODIS snow product by 8 day temporal resolution for June-August 2006 was applied in this research work. As a result of this research work, MODIS snow products are easy to use and suitable for seasonal period of many year snow cover. There is need more multi years data for snow coverage monitoring and use of Radar data for snow thickness in the study area in future.

1. PURPOSE

The purpose of this research study is to determine and examine the yearly areal extent of Glaciers and Snow Coverage in the Western part of Mongolia by using remote sensing methods. The continuity period for snow coverage is of particular interest.

2. DATA AND ANALYSIS

MODIS sensors MOD10A2 and MODIS's snow product 8 day temporal resolution data from 2000 to 2006 was applied to this research work to determine the continuity period of snow coverage and the relative difference between Glaciers and Snow coverage in square kms.

To use the MODIS products one need to calculate Mosaic and Reprojection functions (Table 1). After this calculation we can do a classification of the snow cover using the digital number representative of snow cover. We study this digital number attached to the snow cover by following the instruction for MODIS snow cover products.

Integer Value	Meaning
255	Fill Data--no data expected for pixel
254	Saturated MODIS sensor detector
200	Snow
100	Snow-Covered Lake Ice
50	Cloud Obscured
39	Ocean
37	Inland Water
25	Land--no snow detected
11	Darkness, terminator or polar
1	No Decision
0	Sensor Data Missing

Table 1 Interpretation key for MODIS snow product.

Landsat
Using the Landsat satellite data we determined the square kms difference between Snow cover and Glaciers. For this calculation was used Normalized Difference Snow Index using the K-means classification method (figure 1).
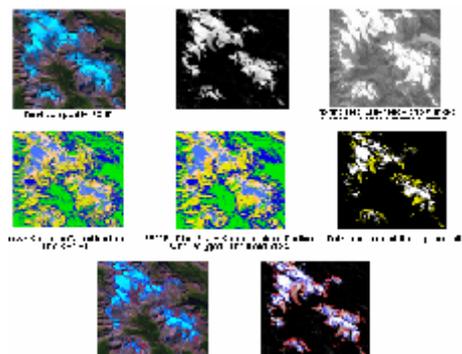
Figure 1. Classification methodology of snow cover products using by Landsat satellite data

3. RESULT

MODIS
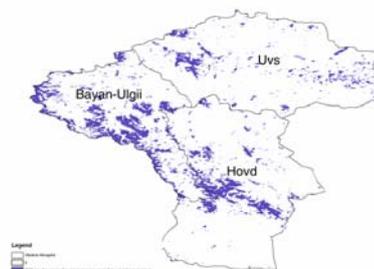
Figure 2. Total areas having snow cover during the period June-Aug,2006
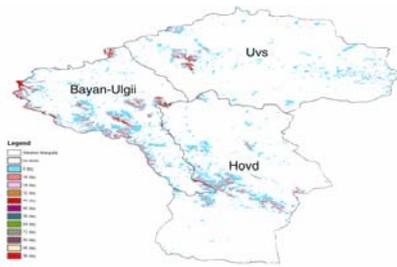
Figure 3. Map is showing areas having snow cover during the period June-Aug 2006, i.e. classified by time

From beginning of June 2006 till end of Aug 2006	
Days having snow cover	Square kms of snow cover (km^2)
8	25674,5
16	5664,25
24	1600,5
32	662,5
40	406,75
48	225,5
56	153,25
64	112,25
72	134,75
80	136,25
88	168,5
96	279,5
Total	35218,5

Table 2 Table is showing areas having snow cover during the period June-Aug 2006, i.e. classified by time

Figure 4. Areas having snow cover during the period June-Aug,2006

From beginning of June 2006 till end of Aug 2006	
Days having snow cover	Square kms of snow cover (km^2)
96	279,5

Table3 Areas having snow cover during the period June-Aug,2006

LANDSAT
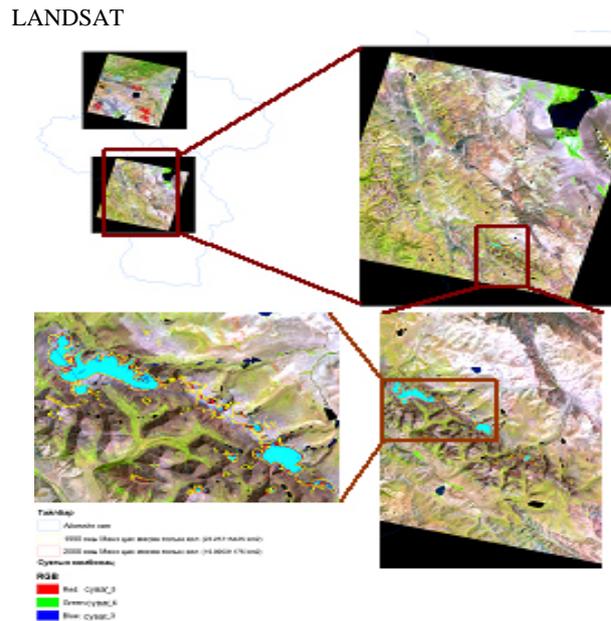
Figure 5.

4. CONCLUSION

As a result of this research work, we learned that MODIS snow products are easy to use and suitable for seasonal periods for many years of snow cover (figure 2,3 and table 2). There is a need for comparison study of the data before 2006 and after 2006. Landsat satellite information has a good distance resolution and suitable use in detail research (figure 5). We performed glaciers change detection analysis by using different satellite data. From the results glacier area is decreasing from both satellite data Landsat and MODIS. Future studies should be focused not only satellite and ground truth data but should also take analysis with synergy of climate data. There is need to use of Radar data for snow thickness in the study area. This is important information to resolve the pure water resource and the balance between glaciers and snow coverage.

REFERENCES

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